Investigation and Demonstration of Intervention Strategies to Improve Water Quality on Country Club Bayou

Final Report

by

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Photo: Dragonfly on Country Club Bayou at HB&T Railroad Bridge

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Executive Summary

This research tested the potential effectiveness of various strategies for improving water quality on Country Club Bayou. Pollution of the bayou has been problematic for at least a dozen years. Currently suspected high organic loading in the upstream covered portion of the bayou contributes to observed low dissolved oxygen values, septic odor conditions, and septic (black) color in the bayou water. Attempts at eliminating the sources of organic loading to the bayou have not produced an obvious increase in water quality. Despite repair of numerous sewage leaks and reductions in industrial discharges, septic odor and low dissolved oxygen conditions continue to exist.

The investigation included field monitoring of selected water quality parameters, a series of dye tracer studies, and a computer simulation of water quality to evaluate possible intervention strategies.

The field monitoring indicated that when septic odor conditions are prevalent, DO and BOD levels are significantly different than during non-odor conditions. The elevated BOD indicates that some source (commercial wash water, industrial discharge, etc.) supplies an additional organic load to the bayou that in-turn depresses the DO. Odor likely results when this mixture sits relatively stagnant under the Hughes facility.

The field monitoring also indicated that the mean values of DO and sulfate meet existing or proposed state water quality standards for an unclassified stream. The fecal coliform (FC) values do not. Only about 25% of the FC values measured in this research meet the current standard (2000 cfu/100mL). A *change* in water quality occurs between Evergreen Cemetery and Hughes Street. Between these two locations the DO declines, the ammonia increases, and the BOD declines. The BOD decline is diagnostic because it suggests that the bayou has assimilative capacity and that there is either no source between these two locations or there is significant dilution by some unknown source of water. The changes are greater between these two locations than elsewhere in this study, and this section of bayou corresponds with the stagnant section just described.

A computer model of the water quality of Country Club Bayou was developed to predict the effect of selected intervention strategies developed over the course of the research by the research partners. Based on the model's predictions flow augmentation (one of several strategies) provides improvement in water quality at all flows simulated and is reasonably simple to implement.

In addition to flow augmentations, routine monitoring, continued enforcement (source control), and cleaning of portions of the bayou is recommended for long-term management of water quality on Country Club Bayou. Suggestions for funding the implementation are provided.

1. Introduction

Problem Statement

Country Club Bayou, formerly Slaughterhouse Ditch, is located in southeast Houston. The bayou drains from east to west connecting to Brays Bayou. The upper portion of the bayou is conveyed in a concrete channel that was initially placed in the early 1900's. The lower portion of the bayou from the Hughes Street railroad bridge to the confluence with Braes Bayou is open, unlined channel.

Pollution of the bayou has been problematic for at least a dozen years. Currently suspected high nutrient loading somewhere in the covered portion of the bayou contributes to observed low dissolved oxygen values, a septic odor, and septic (black) color. The out-fall from the covered portion of the bayou to the open portion is just upstream of the Hughes Street Bridge. Samples collected at the bridge by the City of Houston Health Department confirm these historical observations.

At times the water at the out-fall just upstream of the Hughes Street Bridge has not meet state water quality standards for unclassified waters. Unclassified waters are waters which are not specifically listed in Appendices A or D of §307.10 of Title:30, Part 1, Chapter 307 of the Texas Administrative Code. Table 1.1 lists some of the relevant standards. While symptomatic treatment is technologically feasible, the purpose of this research is to document an investigation protocol to locate sources of pollution and evaluate possible intervention strategies to mitigate the effects of pollution.

The investigation included field monitoring of selected water quality parameters, a series of dye tracer studies, and a computer simulation of water quality to evaluate possible intervention strategies.

Table 1.1 Selected Water Quality Standards for Unclassified Waters

Parameter	Value	Remarks
Dissolved Oxygen	2.0 mg/L - 24 hr. average 1.5 mg/L - absolute minimum 3.0 mg/L - proposed[1]	
Sulfate	65 mg/L - proposed[1]	
pH	6.5-9.0 - proposed[1]	
Fecal Coliform	200 cfu/100mL 2000 cfu/100mL	Contact recreation Non-contact recreation
Temperature	4°F above ambient 1.5°F above ambient	Fall, Winter, Spring Summer

[1] These values are proposed for Segment 1014 (Buffalo Bayou above tidal) for contact recreation and limited aquatic life use.
See: (http://www.tnrcc.state.tx.us/ water/quality/standards/revisions.html)

Study Area Description

Figure 1.1 is a portion of a USGS map of the study area based on field survey data from 1915. The map shows the bayou branching upstream of Evergreen Cemetery, with both branches depicted as open ditch. The upper branch runs west towards downtown, stopping near the present day US 59. The lower branch runs southwest towards the University of Houston, stopping somewhere near where the present day Law Center sits. The map suggests that in 1915 most of the bayou was open ditch.

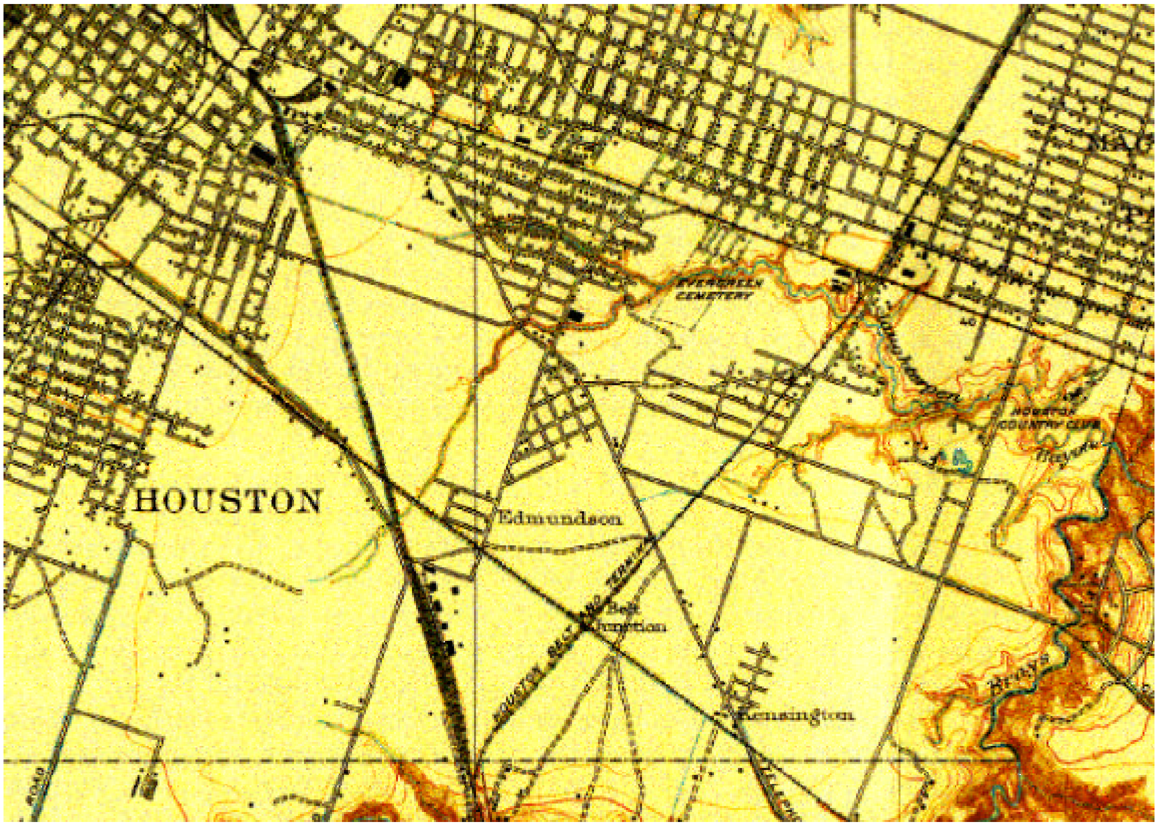


Figure 1.1 USGS Map of Country Club Bayou Area (Circa 1920's)

Figure 1.2 is a portion of a recent USGS map of the same area (different scale) with the present day storm and sanitary sewer network superimposed on the map. Sometime between 1922 and the late 1930's the bayou west of Evergreen Cemetery was covered over – reportedly as part of a WPA project. In 1948 the open portion from Evergreen Cemetery to Hughes Street (the Hughes Tool Complex) was covered.

The present day system map is based on a City of Houston GIMS system map that was cross-checked with the traditional storm sewer project maps located in the basement of 1801 Main Street. The sanitary system is shown as the violet network on the map while the storm sewer system is shown as the green network.

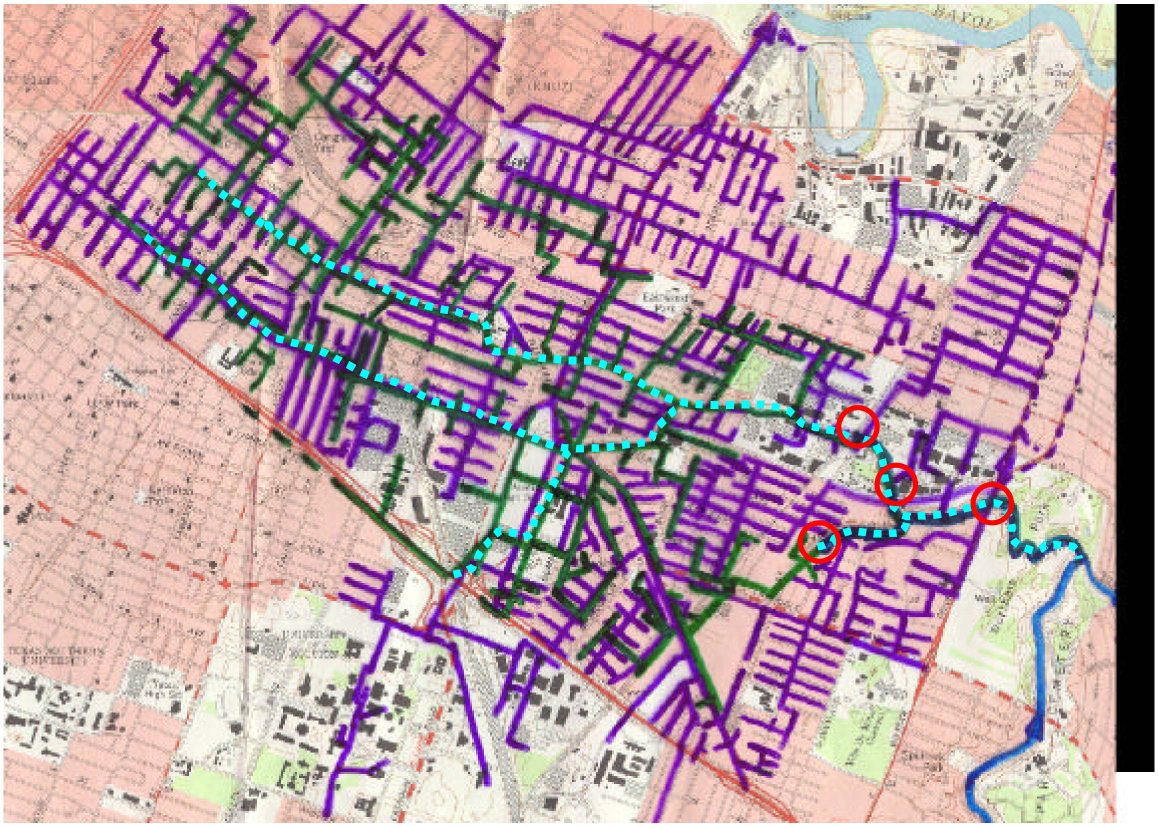


Figure 1.2. USGS Map of Country Club Bayou (Circa 1980's)
Violet network is sanitary sewer system. Green network is storm sewer system. Red circles indicate approximate locations of photographs in the next section.

The current land-use in the area ranges includes residential, light-industrial, and several large manufacturing facilities. The covered portion of the storm sewer system is owned by the City of Houston, while the open portion appears to be privately owned except for the portion through Wortham Park (COH). There are no known discharge permits issued by any authority for discharge into Country Club Bayou.

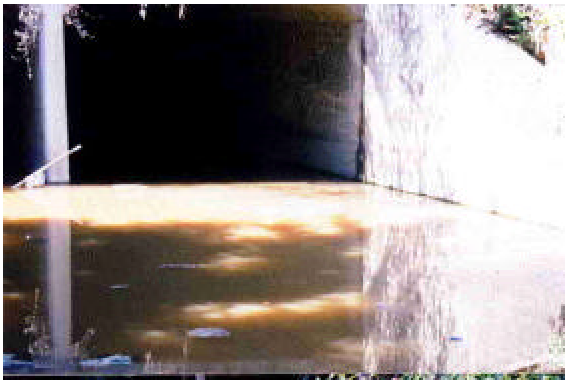
Bayou Photographs

The field monitoring effort included occasional photographing at different locations along the open portion of the bayou. The photographs were collected to document the sampling locations in the open portion and document the typical appearance of the bayou. The bayou's appearance is remarkably changeable, especially in the August 1999 photographs collected during a dye study where the water clarity changed from excellent to milky grey in less than 30 hours.

The photographs are arranged first by location then by download date.

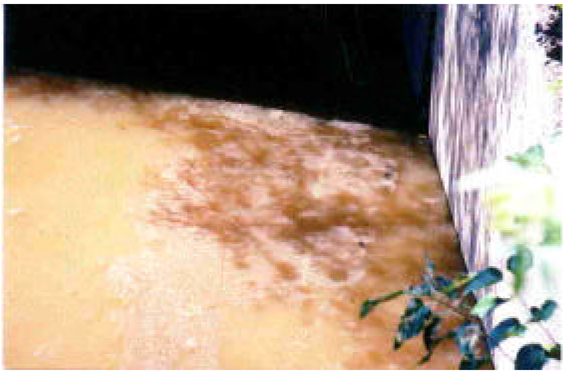
Country Club Bayou at Hughes Street

HB&T Railroad Bridge at Hughes Street. Photograph is looking upstream. Sampling location is at upstream side of bridge. March, 1998.



Country Club Bayou Outfall. Upstream of HB&T Railroad Bridge. March, 1998

View from HB&T Railroad Bridge. Observe oily sheen in right side of photograph. March, 1998.



Another view of oil-sheen. March, 1998.

Typical trash appearance during odor episode. Observe black film over much of the material. March, 1998

Typical water appearance after re-aeration in fast moving part of bayou. March, 1998

View looking upstream under HB&T RR Bridge. Trash consists of grocery bags, cans, clothing, paper goods, prophylatics, insulin syringes, fiberglass insulation, shoes, yard waste (leaves). March, 1998

View of sampling location at end of concrete slab in lower left of figure. March, 1998

View under RR Bridge showing trash accumulation in piers of bridge. March, 1998

View just downstream of RR bridge. Velocity measurements are made near this location because water flows in narrow channel in this area. March, 1998

Water in fast-flowing narrow channel beneath RR bridge. Good clarity, black streaks are sediment. May, 1998

Water in fast-flowing narrow channel beneath RR bridge. Good clarity, black streaks are sediment. May, 1998


Spheratolis beneath RR bridge
May, 1998


Cloudy water at Hughes outfall
May, 1998


Culvert used to estimate water level for field notes
May, 1998


Clear water at Hughes outfall
May, 1998


Culvert view
May, 1998


Cloudy (brown) water
June, 1998


Cloudy (brown) water
June, 1998

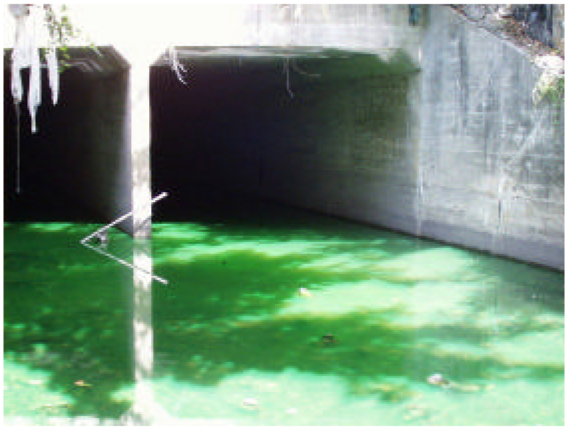

Milky (grey) water at Hughes outfall
June, 1998


Milky water at culvert
June , 1998


Milky water downstream of RR bridge
June, 1998


Milky water at culvert
August, 1998


Clear water at culvert
August, 1998


August 17, 1999 (During dye tracer study)


August 17, 1999 Looking upstream from hughes Street, water clarity good.


August 17, 1999 (11:00) Bottom visible, good water clarity


August 18, 1999 (16:00) Bottom obscured, poor water clarity, Milky water.


August 17, 1999


August 18, 1999

Polk and 66th


Looking upstream from culvert under Polk Street. March 1998


Looking down from culvert
June, 1998


Looking upstream during milky water event
June, 1998


Looking upstream after rainfall
August,1998

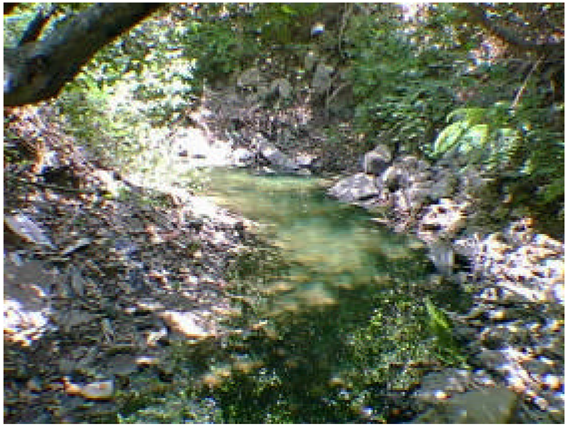

Typical trash (flotables) accumulation
August, 1998


Looking upstream
August, 1998

Yates Gully

Yates Gully looking upstream behind 901 Hackney
June, 1998

Yates Gully looking downstream behind 901 Hackney
June, 1998



Clear water with slight fluorescent green-yellow color June, 1998

Immediately after heavy rainfall
August, 1998

One week after heavy rainfall
August, 1998

Downstream of sampling location
August, 1998

Wayside Drive

Country Club Bayou at Wayside Drive
Samples are collected upstream of photograph. Flow is from left to right
August, 1998

Country Club Bayou at Wayside Drive
Sample collected at this location
August, 1998

Country Club Bayou at Wayside Drive
August, 1998

Country Club Bayou at Wayside Drive
August, 1998

Country Club Bayou at Wayside Drive
August, 1998

Organization

The remainder of this report is organized into the following sections: Literature Review, Methods, Field Monitoring, Tracer Study, Computer Modeling, Conclusions. The literature review section is a brief review of specific literature used in this research. The methodology section briefly states the purpose and general approach for each of the remaining topics. The field monitoring section describes the details of the field-monitoring program, presents tabular, statistical, and graphical results for the field-monitoring program and interprets these results. The tracer study section describes the details of the tracer tests used to determine time-of-travel for the computer modeling effort. The computer modeling section describes the conceptual hydraulic and water quality models used in this research. The results of calibration and application of the model to evaluate four of five intervention strategies are reported in this section. The conclusion section summarizes the results reported in the previous sections and makes recommendations based on the data collected in this study.

The appendices include the data collected in the various parts of this research, and several reference documents used to support the calculations in this effort.

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2. Literature Review

The EPA developed and published a user's guide for addressing pollutant inputs into storm water systems (USEPA 1993). This guide identified sanitary wastewater, industrial or commercial pollutant entries, septic tank systems, and vehicle maintenance activities as the most significant potential sources of pollutants into a storm water system. The guide provided a protocol for survey activities to locate and correct non-storm water entries into the storm drainage system. The EPA document focused on systems where direct connection of industrial, and municipal sewers were present and outline corrective techniques that were educational, structural (rehabilitation, disconnection), or administrative (ordinances).

Cleveland et. al. (1993) investigated methods for detection of rainfall induced infiltration into a sanitary sewer system at the Newport Subdivision near Houston, Texas. One of the methods used was chemical analysis of the sanitary wastewater for dilution of key parameters (ammonia). In the subdivision study mapping, chemical analysis, and flow monitoring were used to locate areas in the system where infiltration was most likely. Several of the techniques in this study appeared appropriate for the Country Club Bayou problem.

Most of the activities conducted during the research on Country Club Bayou were based on the EPA guide and the Newport Subdivision Study. Country Club Bayou is unique in that a large portion of the drainage is covered with areas of limited subsurface access so that many of the techniques in the guide can only identify approximate pollutant locations.

One of the proposed intervention strategies is to consider a constructed wetland at Hughes Street to treat the low flows and remove the pollutants that contribute to conditions that create odor episodes. The authors of this report conclude from the literature that at the present time there is not enough knowledge to create an effective constructed wetland on Country Club Bayou. The following materials are presented in support of this conclusion.

The Urban Water Resources Research Council (UWRRC) of ASCE compiled a bibliography on over 800 BMP evaluations. This bibliography was converted into the National Stormwater Best Management Practices (BMP) Database that was funded by cooperative agreement with ASCE and the US EPA. The database was released in the fourth quarter of 1999. The database allows one to search for all BMPs of a particular type and various groups of performance/water quality data. Table 1 lists the results of several searches and the types of water quality data that are currently recorded in the database. The data types were searched as a group, thus the DO/BOD type corresponds to all STORET parameters related to dissolved oxygen or oxygen demand.

Table 1. Wetland Basin BMPs for Stormwater Quality Management
(source: ASCE National Stormwater BMP Database Version 1.0 June 1999)

Location	BMP Type	Data Type	Number of sites	Number of BMPs
Worldwide	Wetland Basin	All	7	8
Worldwide	Wetland Basin	Solids	7	8
Worldwide	Wetland Basin	Turbidity	3	3
Worldwide	Wetland Basin	Metals	3	4
Worldwide	Wetland Basin	Nitrogen species	3	4
Worldwide	Wetland Basin	DO/BOD	1	1
Worldwide	Wetland Basin	Organics	1	1
Worldwide	Wetland Basin	Temperature	1	1
Worldwide	Wetland Basin	Coliform	0	0
Worldwide	Wetland Basin	Phosphorous	7	8
Worldwide	Wetland Basin	Inorganics	1	1
Texas	Wetland Basin	All	0	0
Texas	Detention Basin	All	2	4
Texas	Biofilter	All	3	3
Texas	Media Filter	All	3	5
Texas	Porous Pavement	All	4	4

Table 1 illustrates that of 800 BMPs categorized only 8 are considered wetland basins. Of the 8 only a couple of sites collected enough data to evaluate water quality enhancement. None of the sites are in Texas. While there is an enormous literature base in constructed wetlands, relatively little is known of their performance when designed to treat stormwater. Table 2. is a listing of the average pollutant removals expressed as percent removal (outflow concentration/inflow concentration). The solids removals are all comparable, on the order of 70%, however the other parameters vary considerably. The limiting nutrient parameters in some cases increase at the outlet, and in one case the total organic carbon, a surrogate for oxygen demanding compounds nearly triples. Admittedly this database excludes many wetlands projects and most stormwater quality management is aimed at solids control because solids are the indicator parameters suggested by the NURP study. Nevertheless, a constructed wetland as a water quality enhancement device needs careful consideration to achieve success.

Komor (1999) reported on a Nutrient and Sediment Control System (NSCS) that can best be described as a four cell system. The four cells are a grass swale at the inlet, a shallow pond, a deep pond, and a shallow swale at the outlet. The purpose of the project was to reduce N, P, pathogens, and sediments (solids) in agricultural runoff. Runoff for the study was collected from a nearby cow pasture.

Table 2. Removal values for Wetland Basin Stormwater Quality BMPs
(source: ASCE National Stormwater BMP Database Version 1.0 June 1999)

BMP Name	Parameter Name	Avg Pollutant Removal
Hidden River Wetland	RESIDUE, TOTAL NONFILTRABLE (MG/L)	68.28
Hidden River Wetland	NITROGEN, TOTAL (MG/L AS N)	-30.44
Hidden River Wetland	NITROGEN, ORGANIC, TOTAL (MG/L AS N)	-53.64
Hidden River Wetland	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	18.52
Hidden River Wetland	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	-54.21
Hidden River Wetland	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	75.51
Hidden River Wetland	PHOSPHORUS, TOTAL (MG/L AS P)	60.69
Hidden River Wetland	PHOSPHORUS, DISSOLVED ORTHOPHOSPHATE (MG/L AS P)	69.92
Hidden River Wetland	CARBON, TOTAL ORGANIC (MG/L AS C)	-191.22
Hidden River Wetland	HARDNESS, TOTAL (MG/L AS CACO3)	56.55
Hidden River Wetland	CALCIUM (MG/L AS CACO3)	42.68
Hidden River Wetland	MAGNESIUM, TOTAL (MG/L AS MG)	-123.91
Hidden River Wetland	SODIUM, TOTAL (MG/L AS NA)	-190.34
Hidden River Wetland	POTASSIUM, TOTAL MG/L AS K)	10.19
Hidden River Wetland	CHLORIDE,TOTAL IN WATER MG/L	-163.03
Hidden River Wetland	SULFATE, TOTAL (MG/L AS SO4)	24.89
Hidden River Wetland	CADMIUM, TOTAL (UG/L AS CD)	26.19
Hidden River Wetland	COPPER, TOTAL (UG/L AS CU)	31.46
Hidden River Wetland	IRON, TOTAL (UG/L AS FE)	-21.98
Hidden River Wetland	LEAD, TOTAL (UG/L AS PB)	24.78
Hidden River Wetland	MANGANESE, TOTAL (UG/L AS MN)	-21.51
Hidden River Wetland	ZINC, TOTAL (UG/L AS ZN)	66.92
Franklin Wetland	RESIDUE, TOTAL NONFILTRABLE (MG/L)	73.8
Franklin Wetland	NITROGEN, TOTAL (MG/L AS N)	3.15
Franklin Wetland	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	2.77
Franklin Wetland	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	13.44
Franklin Wetland	PHOSPHORUS, TOTAL (MG/L AS P)	23.41
Franklin Wetland	PHOSPHORUS, DISSOLVED (MG/L AS P)	5.25
Franklin Wetland	PHOSPHORUS, DISSOLVED ORTHOPHOSPHATE (MG/L AS P)	-14.47
Queen Anne's Pond	RESIDUE, TOTAL NONFILTRABLE (MG/L)	72
Queen Anne's Pond	NITROGEN, TOTAL (MG/L AS N)	-46.99
Queen Anne's Pond	NITROGEN, ORGANIC, TOTAL (MG/L AS N)	-43.5
Queen Anne's Pond	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	40.41
Queen Anne's Pond	NITRATE NITROGEN, TOTAL (MG/L AS N)	53.53
Queen Anne's Pond	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	56.34
Queen Anne's Pond	PHOSPHORUS, TOTAL (MG/L AS P)	34.48
Queen Anne's Pond	PHOSPHORUS, DISSOLVED (MG/L AS P)	53.75
Queen Anne's Pond	PHOSPHORUS, SUSPENDED (MG/L AS P)	12.03
Swift Run Wetland	RESIDUE, TOTAL NONFILTRABLE (MG/L)	75.43
Swift Run Wetland	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	-90.52
Swift Run Wetland	PHOSPHORUS, TOTAL (MG/L AS P)	45.37
Swift Run Wetland	IRON, TOTAL (UG/L AS FE)	52.41
Swift Run Wetland	LEAD, TOTAL (UG/L AS PB)	80

The treatment effectiveness was reported as concentration changes between inlet and outlet. The data indicated that the wetland reduced average concentrations of nitrate, suspended ammonia+organics, suspended phosphorous, calcium, potassium, and sulfate, but increased concentrations of ammonia, dissolved phosphorous, and organic nitrogen. There was a slight increase in total solids, but the data appear to display the effects of a large storm (where all the solids washed through the system). These results are consistent with data in the ASCE BMP database suggesting that insufficient knowledge exists for a constructed wetland to confer water quality benefit as well as serve as a storm water BMP.

3. Methodology

General Approach

The general approach to this research was to conduct field monitoring, tracer studies, and computer modeling to test several possible intervention strategies for Country Club Bayou. The field monitoring and tracer study supported the computer modeling as well as documenting the water quality of the bayou. The computer modeling is principally used to test strategies for potential effectiveness in improving water quality during conditions when odor is likely.

Field Monitoring

The field-monitoring program was conducted to collect water quality data that could be used to calibrate a computer model of the bayou and to develop a database that could be used to interpret the relative health of the bayou, and any quantifiable cause-effect relationships.

Water samples from Country Club Bayou were collected at locations and days agreed upon by the representatives of the City of Houston and University of Houston. The samples were analyzed for selected water quality parameters using Hach^{TM} (Hach Corporation, Loveland CO) and standard methods screening level analytical techniques.

The resulting data are stored in an ACCESS database and filtered using descriptive variables of odor, filaments, before-after, and upstream-downstream at Hughes Street. The filtered data sets were analyzed using two-sample t-tests to determine whether or not the mean value of a particular parameter is different during odor episodes. Such a difference would indicate that some perturbation in the water quality creates conditions where odor is produced. If a difference is not detected then the odor episodes cannot be explained using the particular parameters selected.

Tracer Study

The purpose of the tracer study was to determine system connectivity and to determine travel times for water parcels in different parts of the Country Club Bayou drainage system. The travel times are used to help calibrate the hydraulic model used to test the different intervention strategies. The travel times also identify portions of the bayou with low flow velocities and near-stagnant conditions where odor can be produced.

The tracer used in the tracer studies is Sodium Fluorescein, an organic dye that is commonly used in tracer studies and medical applications. It is considered conservative although it is strongly adsorbed by alumina. These tracers are detected visually for high concentrations using a fluorometer for low concentrations. The tracers are released at a upstream location, monitored at that location for a short time, then monitored at the downstream location to determine time-of-travel.

Computer Modeling

The purpose of computer modeling of the water quality of Country Club Bayou is to provide a tool to predict the effect of selected intervention strategies developed over the course of the research by the research partners. Several “brainstorming” meetings developed six plausible intervention strategies. Table 3.1 is a list of these six strategies with notations on the author’s perceived complexity, cost, and reliability.

Table 3.1 Intervention Strategies for Country Club Bayou

Strategy	**Complexity**	**Cost**	**Reliability**	**Modeled**
Channel modification	Complex	High	High	Yes
Mechanical/chemical aeration	Complex	High	Unknown	Yes
Constructed wetland	Complex	Unknown	Unknown	No
Flow augmentation	Simple	Low	High	Yes
Divert low flow to treatment	Simple	Moderate	High	Hydraulics
Source control	Variable	Moderate	Moderate	Indirecty

Channel Modification

The channel modification strategy proposes to narrow the box culvert underneath the Hughes facility by construction of a wall along the length of the channel (could be as simple as sandbags) to force the low dry weather flow to a narrower channel. Because the volumetric rate is unchanged, the flow would travel faster through this reach than at present (assuming the tail-water depth is maintained). The premise for this strategy is that during an odor episode the covered portion under the Hughes facility is thought to act like a large septic tank. The organic load in the storm water uses all the dissolved oxygen in the storm water resulting in anaerobic conditions in much of the water column thus creating the odor conditions. By moving the water faster, one could deliver the storm water to the open portion of the bayou where re-aeration is likely to be greater and more able to accommodate the organic load of an odor episode.

Mechanical/Chemical Aeration

The mechanical/chemical aeration option proposes to install some device or devices that deliver more oxygen to the storm water while in the covered portion. Because the slope is relatively small, a passive system (hydraulic draft tube, etc.) is not considered useable so the mechanical/chemical system would involve some active approach. Based on video logs during non-odor episodes the air in the covered portion is breathable, thus mechanical aeration of the water surface combined with small blowers to move the air in the covered portion could work. Such a concept is the basis for the remark that this strategy is complex.

Constructed Wetland

The constructed wetland strategy is a concept that would use the land between the outfall and Hughes Street Bridge (approximately 400 feet by 100 feet) to place a constructed wetland to enhance the water quality of the storm water from the outfall at Hughes. Based on a literature review, this strategy is considered unlikely to produce the desired water quality improvement in the available space. Generally, wetlands appear to function best for BOD and nutrient removal if retention times are large (on the order of weeks).

Flow Augmentation

The flow augmentation option is a strategy where fire-hydrants would be routinely opened and the water allowed to flow into a storm inlet upstream of the wide covered section and eventually mixing with the water in this section of the bayou. This water would principally supply air and the volumes involved are not modeled to be large enough for dilution. The locations of the releases considered in modeling are upstream and downstream of a point source that is used to represent the pollutant load to the bayou.

Diversion

Diversion of all low dry weather flow to a wastewater treatment plant is also considered as a feasible option. This option would involve the installation of a lift station either at Evergreen Cemetery (Altic junction box) or near the outfall at Hughes Street. This lift station would pump dry weather flow to a nearby sanitary sewer for eventual treatment at a treatment plant. The principal modeling question is what effect would such a diversion have downstream of the outfall.

Source Control

Source control by continued field monitoring and DHHS enforcement activity is a remaining option. Source elimination, in principle, should be able to prevent organic loads that exceed the assimilative capacity of the bayou from entering the bayou. Removal of undocumented/illicit connections to the bayou is technically feasible as such connections are identified. Removal could be as simple as plugging the connections in the covered portion (where worker access is possible). However, because the bayou must function as a storm water drain, surface inlets will always need to connect to the bayou. Protecting these inlets from truck wash water, ice melt from food service, and similar inputs will require continued monitoring and DHHS enforcement activities.

4. Field Monitoring and Data Analysis

Purpose

The field monitoring program was conducted to collect water quality data that could be used to calibrate a computer model of the bayou and to develop a database that could be used to interpret the relative health of the bayou, and any quantifiable cause-effect relationships.

Sampling Locations

Water samples from Country Club Bayou were collected at locations and days agreed upon by the representatives of the City of Houston and University of Houston. A team approach was used to extend the analytical capabilities of both organizations. Figure 4.1 is a map of the study area showing the approximate locations of field sampling sites.

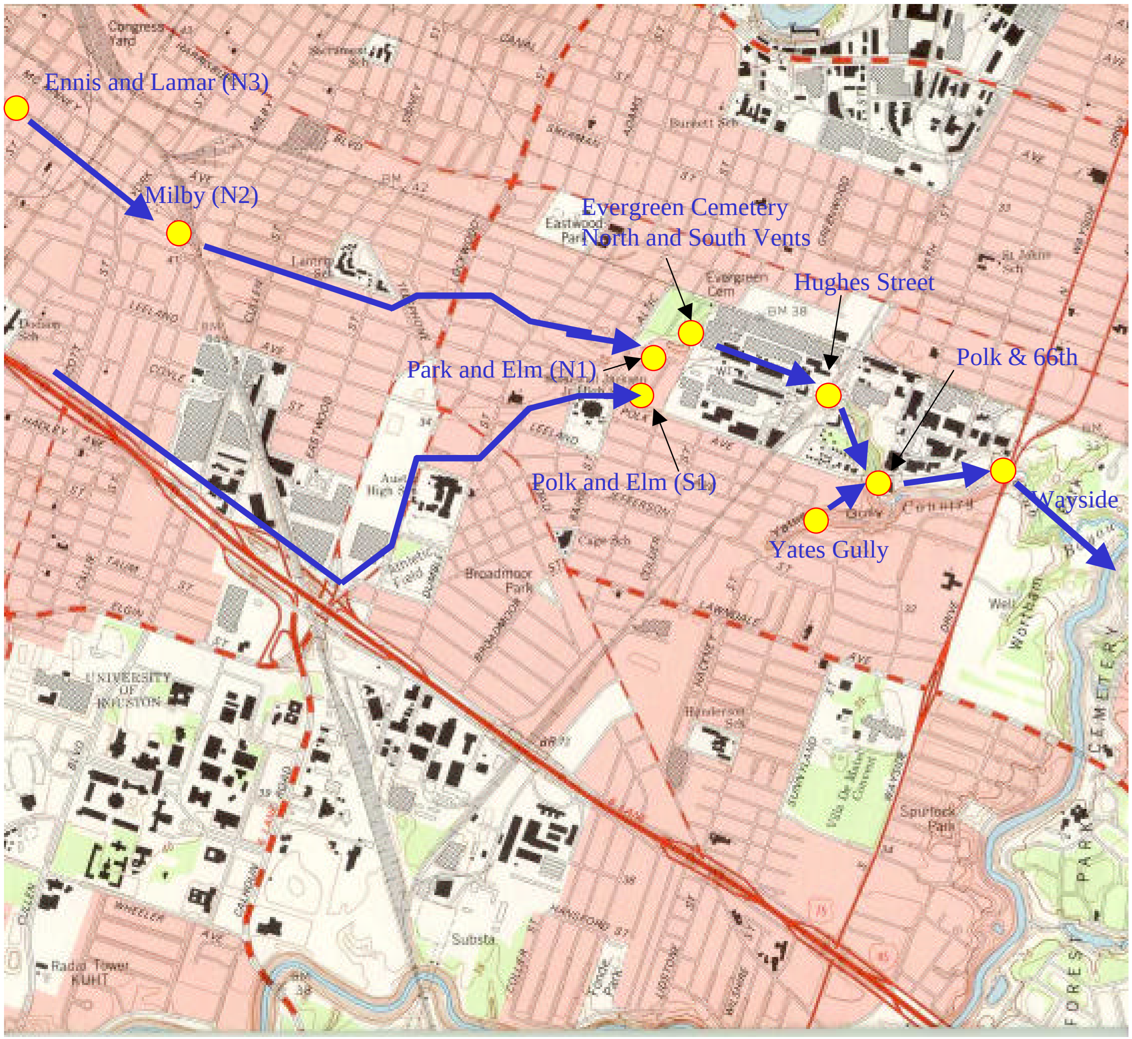


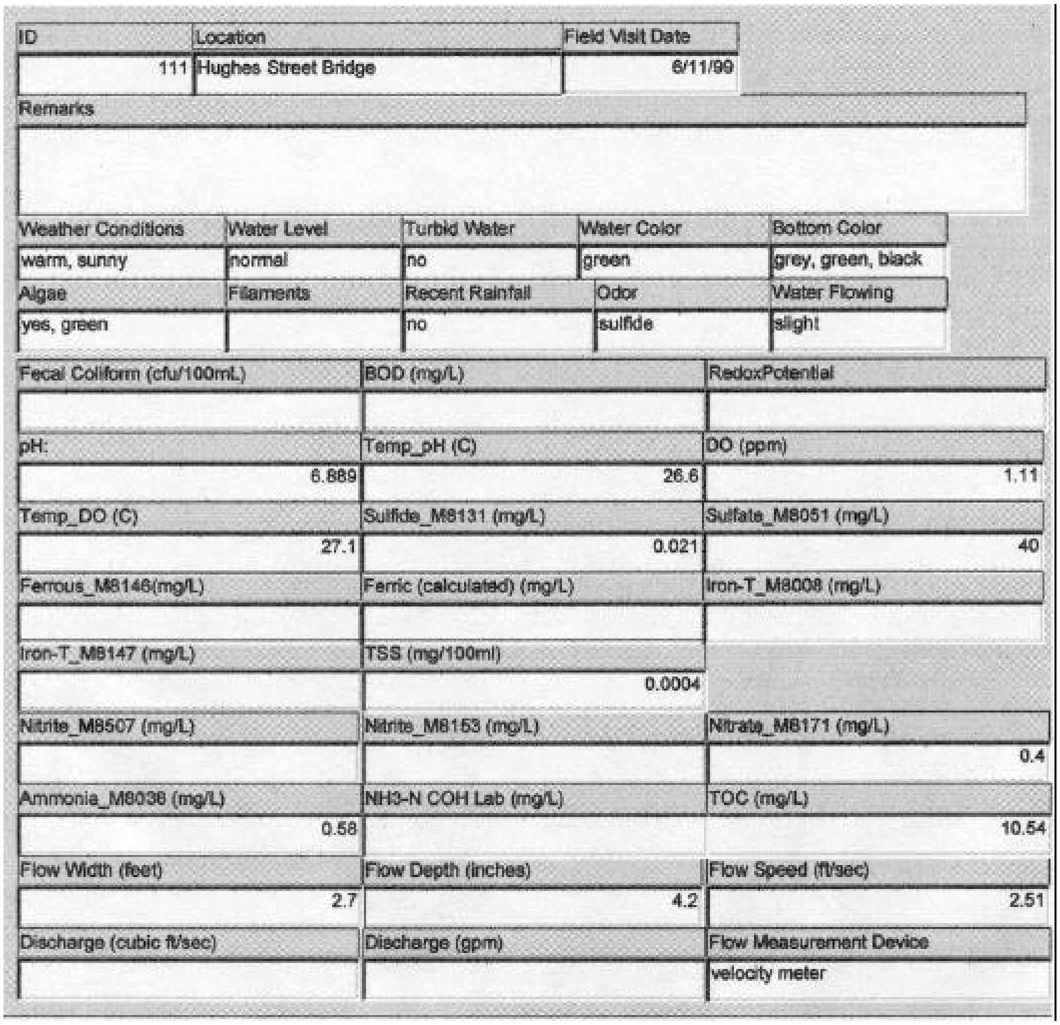
Figure 4.1 Map showing sampling locations

Blue lines are approximate flow alignment of Country Club Bayou

The locations were divided into covered and uncovered locations. The covered locations were at Ennis at Lamar (N3), Polk at Elm (S1), Park at Elm (N1), the North and South vents and Evergreen cemetery. The open locations were Hughes Street under the railroad bridge, 901 Hackney Street (Yates Gully), Polk at 66th street, and Wayside Street under the bridge near a Kroger grocery store. The Milby street sampling location (N2) was not sampled by the University of Houston team because traffic redirection is needed. When feasible the UH team did accompany the COH team at this location.

Parameter Selection

Figure 4.2 is a screen capture of the data entry form used in this research. On the form are the various hydraulic, water quality, and description parameters that were collected during this research.



ID	Location	Field Visit Date
111	Hughes Street Bridge	6/11/99

Remarks

Weather Conditions	Water Level	Turbid Water	Water Color	Bottom Color
warm, sunny	normal	no	green	grey, green, black
Algae	Filaments	Recent Rainfall	Odor	Water Flowing
yes, green		no	sulfide	slight

Fecal Coliform (cfu/100mL)	BOD (mg/L)	RedoxPotential
pH:	Temp_pH (C)	DO (ppm)
6.889	26.6	1.11
Temp_DO (C)	Sulfide_M8131 (mg/L)	Sulfate_M8051 (mg/L)
27.1	0.021	40
Ferrous_M8146(mg/L)	Ferric (calculated) (mg/L)	Iron-T_M8008 (mg/L)
Iron-T_M8147 (mg/L)	TSS (mg/100ml)	
	0.0004	
Nitrite_M8507 (mg/L)	Nitrite_M8153 (mg/L)	Nitrate_M8171 (mg/L)
		0.4
Ammonia_M8038 (mg/L)	NH3-N COH Lab (mg/L)	TOC (mg/L)
0.58		10.54
Flow Width (feet)	Flow Depth (inches)	Flow Speed (ft/sec)
2.7	4.2	2.51
Discharge (cubic ft/sec)	Discharge (gpm)	Flow Measurement Device
		velocity meter

Figure 4.2 Microsoft ACCESS Data Entry Form

The descriptive parameters were selected based on the early photograph efforts when the changeable nature of the bayou was first apparent. The algae and filaments descriptive parameters were chosen because the COH field team used these observations as indications of possible sewage discharge into the bayou.

The descriptive odor variable was selected because the odor complaints are the driving force behind this entire project. The field sampling team was trained to distinguish between sanitary-type odors (sweet smell), and the "black water" sulfide odor. A hydrogen sulfide safety badge was used to warn the field team to evacuate the outfall is the H_2S concentration exceeded 25 ppm. The alarm never sounded indicating that even during the field visits with the worst odor, the concentration in air never exceeded this value.

Sampling Procedure

The samples were collected in clean 500-ml jars and placed into a cooler. Two jars per sample site were used. 10-ml of undiluted Nitric acid was added to one of the two jars as a preservative for samples to be tested later for total iron. Water Temperature, dissolved oxygen (DO), oxidation-reduction potential (ORP), and pH were monitored on-site. Velocity, depth, and width of the water stream were also measured at the sites where one could make such measurements. The intended sampling interval was weekly. During poor water quality conditions from the September of 1998 though May 1999, water samples at the Hughes Street were collected twice a week. Water samples were collected at all weather conditions and any unusual site conditions were photographed using a digital camera. During extremely high (storm) flows, water samples were not collected if the samples could not be safely retrieved.

Water Sampling and Storage

At the open sites, the water samples were collected into clean jars directly from the bayou. Such sites included Hughes and Hackney Streets. However, at other open sites, such as Wayside Street and Polk at 66th Street such method of sample collection was not used because direct access to the water was impossible (confined entry). In such cases, a clean utility bucket with a synthetic rope tied to its handle was used. The stormwater was retrieved from the center of the water body where the water appeared to be well mixed. The water was then allowed to flow into the bucket for a few seconds and retrieved with as minimal shaking or distraction of water sample as possible. This was done in order to minimize the introduction of air into the sample. The Dissolved Oxygen (DO), temperature, Oxidation-Reduction Potential (ORP) and pH were immediately measured when the bucket was pulled to the surface. DO was always measured first. Any physical properties of the water such as odor, color, turbidity were recorded into the Laboratory Research Notebook. The DO, ORP and pH meters were then rinsed with distilled water for 15 seconds to avoid faulty result values. The samples from each site were then collected into two containers with one of the containers having 10 ml of Nitric acid present as a preservative. The containers had been previously washed with Alconox® cleaning agent, rinsed with tap water and lastly rinsed with distilled water. A water sample with a preservative was refrigerated and later analyzed for iron using Hach^{TM} iron digestion method.

Samples that were analyzed for non-metallic constituents were stored in 500-ml glass containers that had been washed previously with Alconox®, rinsed with tap water and then rinsed with distilled water. The samples were stored in a portable cooler while on site or in transit, and were refrigerated at the laboratory at 4° C until the samples were ready to be tested. Prior to testing, the samples were allowed to come to room temperature.

The containers were labeled with date and location of the sites prior to collection. The Hach^{TM} pH, DO, and ORP devices were checked and calibrated as necessary before leaving to the collection sites. 10ml of undiluted nitric acid was added to one of the glass container before stormwater was collected. This preservative was used when immediate testing of samples for iron was not feasible.

Laboratory Analysis

The City of Houston team analyzed samples for BOD and Fecal Coliform (FC) at selected sites because their laboratory has dedicated expertise for these water quality parameters. The University team chose not to conduct FC and BOD because of the strict timing required for success and relatively high cost of expendables. Furthermore these two methods require a fair amount of analyst skill and dedication while the Hach^{TM} methods used for the remaining parameters are relatively simple. Additionally, the city team was able to lift the manhole covers more safely than the university team. Finally, the presence of a city vehicle during sampling reduced the number of confrontations with citizens and business owners. This partnership has been beneficial and four students have been exposed to the limitations and practice of field monitoring.

Refrigerated samples were allowed to warm gently to room temperature prior to analysis. Most samples collected were analyzed for parameters presented in Table 1. Preserved samples were treated with 5 ml of distilled 1:1 hydrochloric acid (HCl) per 100 ml of sample, just before analysis. Near the end of the research parameters were dropped from the analysis as laboratory supplies were exhausted.

The principle technique used for constituent analysis was a colorimetric method using a Hach^{TM} DR/2000 spectrophotometer. For each of the tests, 25 ml of blank sample was compared to 25 ml of sample in which reaction has taken place. Generally, sample preparation consisted of adding and mixing a pre-measured reagent to 25 ml of the sample and allowing time for a reaction to complete and a specific color to develop. The spectrophotometer measured the amount of light of a particular wavelength that passed through the blank sample and considered that measurement as zero, the measurement of a previously reacted sample then was related to that zero measurements. The methods for analyzing ammonia, sulfide, nitrate MR, involved comparing the reaction in de-ionized water to that in a reacted sample.

The Hach™ methods are generally adaptations of the Standard Methods shown in Table 4.1. Samples whose values were outside the range of the method were diluted using 2:1 or 5:1 volumetric dilutions to reduce the concentrations in the measurement vessels to some value within the instrument range. The concentration in the original sample is obtained by multiplication of the diluted value with the dilution ratio.

The samples were also tested for Total Organic Carbon (TOC) using Shimadzu model TOC 50508 A. Each sample was first filtered using Millpore Millex®-GP gamma sterile 0.22 μm filter unit. If the testing was not performed immediately, the test tube with filtered sample was covered using aluminum foil and refrigerated. Four drops of concentrated hydrochloric acid were added to the filtered sample placed in a 13x100 mm disposable culture tube. The sample was then purged with high purity air for 3-5 minutes. It was then placed in the TOC-5050A analyzer and tested for TOC. The TOC concentration was obtained automatically by the machine by subtracting the Inorganic Carbon from Total Carbon concentration. Prior to testing, a calibration curve was obtained by shifting the intersecting Y-axis of the sample of known value above zero to the origin. A water sample, filtered and purged with purified air was then measured for TOC and the values recorded.

Table 4.1. Analytical Procedures - Method References

Parameter	Range (mg/L)	Hach™ Method #[1]	Standard Methods[2]	USGS Method[3]
Iron,Total	0-3.00	8008	3500-Fe	
Iron, Total	0-1.30	8147	3500-Fe	
Sulfide		3181	4500-S^{2-}	
Ferrous ion	0-3.00	8146	3500-Fe	
Ammonia	0-2.5	8038	4500-NH_3	I-1520-85
Nitrate	0-4.5	8171	4500-NO_3^-	
Nitrite	0-150	8153	4500-NO_2^-	
Nitrite	0-0.300	8507	4500-NO_2^-	
Sulfate	0-70	8051	4500 SO_4^{2-}	I-2823-85
Organic Carbon, Total			5310	
Suspended Solids, Total			2540	
Oxygen, Dissolved	0-10.0	8157	4500-O	
Oxygen Demand, Biochemical[4]		8043	5210	
Coliform, Fecal[4]			9221 or 9222	

[1] Hach Company, 1992

[2] APHA-AWWA-WEF, 1992

[3] Fishman and Freidman, 1989

[4] These parameters were analyzed by the City of Houston

Samples from all of the sites were further tested for Total Suspended Solids (TSS). The sample was shaken to suspend the settled out particles. In this manner, the filtered solids were a very good representation of the field water. For this test, 100 ml of well-mixed sample was measured and filtered using type AP Millipore pre-filters. A vacuum pump was used to filter the solids from the water sample. Prior to testing, each filter was marked and its weight was recorded. After filtering the sample, the filter with residue was placed into the oven at 109°C and allowed to dry for 24 hours. The filter was then allowed to cool completely and it new weight with the residue was measured to the nearest 1/10000 of a gram. Total Suspended Solids weight was calculated by subtracting the weight of the filter from the weight of the filter with residue.

The data were entered into an EXCEL spreadsheet up until September 1999 when the entire database was converted into the ACCESS database program. The ACCESS database is supplied as part of this report.

Data Analysis

The sample data were grouped in 4 different ways to determine if meaningful relationships between the descriptive variables and the measurable parameters were present. At each sample collection site the arithmetic mean value of selected parameters were compared during odor and no-odor conditions; filaments and no-filaments (spheratolis) conditions; before and after conditions. The data were also grouped into a set of upstream and downstream conditions. The comparisons are all made with reference to Hughes Street conditions except where indicated.

If there were a difference in the mean values of f the sample groupes being compared, it is likely that there would also be some difference in the sample variances. A two-sample t-test assuming unequal variances was selected to compare the mean values of the sample groups being tested (Dixon and Massey, 1983).

A t-test on each grouping was performed to test the hypotheses that the mean value of one group was equal to another group (the null hypothesis). A level of significance of 5% was used. This level of significance represents the chance that one will falsely reject the null hypothesis.

In all cases the t-statistic used is

$$t = \frac{X_1 - X_2}{s_p \sqrt{\frac{1}{N_1} + \frac{1}{N_2}}}$$

where $X_n =$ mean of sample group n,

$N_n =$ number of observations in sample group n,

$$s_p^{\ 2} = \frac{(N_1 - 1)s_1^{\ 2} + (N_2 - 1)s_2^{\ 2}}{N_1 + N_2 - 2}$$ = pooled estimate of the population variance,

and s_n = variance observed in sample *n*.

As an example, this data analysis approach can answer the question: Is the DO in the bayou different, on the average, during an odor episode as compared to a non-odor episode?

The purpose of such analysis was to identify specific water quality parameters whose values are either predictive of or responsive to the non-numeric, descriptive conditions. The descriptive conditions were classified in a binary (yes/no) fashion to group the data. Before-after and upstream-downstream analyses were grouped based on dates and locations.

Table 4.2 lists the descriptive variables from the field notes that were analyzed using the statistical test. Table 4.2 also lists the location and time variables analyzed.

Table 4.2 Descriptive Parameters and Perceived Importance

Variable	Analysis Variation	Significance
Odor	Odor vs. No Odor	Complaint generator variable
Water Clarity	Clear vs. Turbid	Indicator of suspended solids
Filaments/Algae	Yes vs. No	Indicator of sanitary discharge
Date	Before vs. After	Determine impact of research
Location	Upstream vs. Downstream	Determine spatial variation

The mechanical procedure for using the descriptive variables is to split the data into two different sets of data at each sampling location using the QUERY feature of the MS ACCESS database management program. One set of data represents samples collected during on particular value of the descriptive condition the other set of data represents the samples collected during the other value of the descriptive condition.

Each of the data groupings are reproduced in Appendix IV. In the appendix the data are ordered by grouping and then location. All the t-tests were performed using the Excel statistical analysis packages included with Microsoft Excel. The results of the individual t-tests are suppressed, but the determination as to whether two mean values are different is indicated by **Bold** typesetting.

Results: Odor versus No-Odor

Table 4.3 is a listing of the results for the analysis for odor versus no-odor conditions.

Table 4.3 Mean values for all location during odor and no-odor conditions

		DO	Ammonia	Sulfate	Fecal Coliform	BOD
Ennis and Lamar (N3)	Odor	4.59	**2.44**	57.14	114,470	
	No Odor	5.33	**1.73**	48.86	31,883	
Park and Elm (N1)	Odor	5.34	1.05	52.78	107,477	*100.00*
	No Odor	5.81	0.72	48.87	164,806	*12.00*
Polk and Elm (S1)	Odor	4.95	0.55	62.59	17,043	**39.25**
	No Odor	5.34	0.66	55.57	15,462	**9.62**
Evergreen,North and South Vents	Odor	4.73	**0.98**	53.57	59,944	**64.06**
	No Odor	4.73	**0.72**	46.77	182,356	**10.49**
Hughes Street	Odor	**2.29**	0.88	**52.68**	**285,550**	**23.25**
	No Odor	**3.64**	0.71	**39.68**	**149,721**	**6.87**
Polk and 66th	Odor	**3.65**	**0.93**	**52.49**	20,244	**74.10**
	No Odor	**4.79**	**0.73**	**43.38**	171,827	**8.98**
Yates Gully	Odor	4.15	0.88	**55.55**		
	No Odor	4.77	0.67	**45.44**		
Wayside Drive	Odor	4.82	0.80	**51.37**		
	No Odor	4.40	0.79	**42.35**		

Differences in **Bold** values are statistically significant at p=0.05
Differences in *Italic* are statistically significant at p=0.10

These analysis indicates that when odor conditions are observed at Hughes Street, the DO at Hughes Street is 1 mg/L lower, on average, than when odor is not observed. The DO at Polk and 66th exhibits a similar pattern. Upstream of Hughes, and downstream of Polk and 66th, the DO values are the same, regardless of whether odor is observed at Hughes or not. One interpretation of these results for the downstream portion is that the Wayside drive site receives water from both the main branch and Yates Gully. The dilution effect of Yates Gully water along with natural re-aeration can explain the relative recovery of DO values in the bayou. An interpretation for the upstream portion is that the process that exerts an oxygen demand on the water occurs between Evergreen and Hughes, even though the oxygen demanding compounds can come from upstream. The time-of-travel of water in the bayou between Evergreen and Hughes is about 18 hours of ½mile as compared to 7 hours for nearly twice the distance upstream of this location.

The BOD at all locations where data were collected was always greater during odor episodes than during no-odor episodes. This result supports the concept that one cause of the odor condition is some upstream source of organic load that exerts an oxygen demand on the water. This increased oxygen demand thus lowers the DO in the stream, and creates conditions where odor is produced.

Only at Hughes are the FC numbers significantly higher during odor conditions. This result suggests that during odor conditions when the organic load is higher that either the source of the load contains elevated FC numbers or the organic load creates conditions where the FC organisms thrive. Intuition suggests both explanations are reasonable.

Results: Filaments versus No-Filaments

Table 4.4 is a listing of the results for the analysis for filaments versus no-filaments conditions. Filaments are used as a visual indicator of pollutants that are likely to have come from sanitary sewerage leaks into the bayou.

Table 4.4 Mean values for all location during filaments and no-filaments conditions

		DO	Ammonia	Sulfate	Fecal Coliform	BOD
Ennis and Lamar (N3)	Filaments	**4.49**	**2.59**	**59.83**	59,935	
	No Filaments	**7.74**	**1.36**	**41.92**	189,000	
Park and Elm (N1)	Filaments	**4.79**	**1.17**	*55.59*	230,267	90
	No Filaments	**7.43**	**0.53**	*39.48*	60,800	13
Polk and Elm (S1)	Filaments	5.53	**0.66**	**66.53**	11,940	25.74
	No Filaments	5.91	**0.49**	**51.25**	36,000	***420.75***
Evergreen,North and South Vents	Filaments	5.32	1.12	**58.61**	162,186	38.14
	No Filaments	5.00	0.55	**39.21**	114,248	87.47
Hughes Street	Filaments	**2.47**	**0.92**	**55.67**	**303,089**	15.86
	No Filaments	**3.94**	**0.51**	**30.29**	**11,162**	10.92
Polk and 66th	Filaments	4.03	0.92	**57.86**		
	No Filaments	4.61	0.84	**39.67**		
Yates Gully	Filaments	4.98	0.89	*53.27*		
	No Filaments	6.42	0.57	*41.88*		
Wayside Drive	Filaments	4.67	0.85	**58.20**		
	No Filaments	5.18	0.85	**45.13**		

Differences in **Bold** values are statistically significant at p=0.05
Differences in *Italic* are statistically significant at p=0.10
Bold ***Italic*** indicates a suspicious value (data series contained one very high value)

These analysis indicates that when filaments are observed at Hughes Street, the DO at Hughes Street is 1 mg/L lower, on average, than when filaments are not observed. The DO at Park and Elm exhibits a similar pattern, but Evergreen, and Polk and Elm do not exhibit such a pattern. One interpretation of these results is that the source of pollutants that cause visible filaments at Hughes enters the system near or upstream of Park and Elm. Although the analysis does not show a significant difference in the mean values at Evergreen, the water at Evergreen is conceptualized to represent a mixture of Polk and

Elm flow and Park and Elm flow (combination of North and South branch flows). The south branch exhibits uninteresting behavior in this particular grouping.

The BOD at all locations was not significantly different in this particular grouping, although the numerical values were near the mean value for odor conditions.

Only at Hughes are the FC numbers significantly higher during filament conditions. This result suggests that during filament conditions the pollutant sources contain elevated FC numbers and a BOD load similar to the loads experienced during odor conditions.

Results: Before-After

Table 4.5 is a listing of the results for the analysis for before versus after conditions. The only location with more than two years of data was Hughes. The data were grouped by year (1998 and 1999) except at Hughes where all data prior to 1998 were grouped into a separate group. All the groups in this analysis include data during odor and non-odor conditions. Therefore these results only represent relatively long-term changes (if any).

Table 4.5 Mean values for all locations Before-After analysis

		DO	Ammonia	Sulfate	Fecal Coliform	BOD
Ennis and Lamar (N3)	Mean_98	*5.71*	*1.45*	*44.50*	*48,594*	
	Mean_99	*4.71*	*2.35*	*56.90*	*98,518*	*149.1*
Park and Elm (N1)	Mean_98	6.34	0.44	50.38	**21,650**	**14.70**
	Mean_99	5.00	1.28	52.79	**145,827**	**58.29**
Polk and Elm (S1)	Mean_98	6.00	0.62	58.23	**5,561**	9.09
	Mean_99	4.77	0.58	59.74	**15,974**	85.24
Evergreen,North and South Vents	Mean_98	4.77	0.60	52.90	134,839	**14.49**
	Mean_99	4.65	0.92	49.40	136,396	**43.04**
Hughes Street	Mean_97		1.39		**329,703**	**16.84**
	Mean_98	3.05	1.45	46.67	**236,995**	**9.81**
	Mean_99	2.79	0.76	45.80	**83,918**	12.38
Polk and 66th	Mean_98	3.88	0.91	47.63		
	Mean_99	3.80	0.92	48.13		
Yates Gully	Mean_98	4.72	0.71	50.25		
	Mean_99	4.58	0.79	44.97		
Wayside Drive	Mean_98	3.66	0.96	55.93		
	Mean_99	4.47	0.78	49.69		

The DO, ammonia, and sulfate at all locations was unchanged during the entire research period. At Hughes, the FC numbers declined from a pre-research mean of 330,000 to 83,000. Upstream of Hughes, the FC numbers were unchanged or increased from 1998 to 1999. These increases upstream of Evergreen (N1 and S1 locations) are not evident in the data at Evergreen suggesting some mixing process in the stagnant section of the bayou from Evergreen to Hughes.

Results: Upstream-Downstream

Data in this analysis were grouped into one upstream group and one downstream group. Park and Elm N1, Polk and Elm S1 and Evergreen Cemetery were taken as a single group. Hughes Street, and Polk and 66th were taken as the downstream group. The choice of the downstream grouping was based on exploratory analysis that indicated that the behavior of the water quality at these two location was similar. The purpose of combined grouping is to increase the size of the data series in each group to produce a large enough data set for meaningful upstream-downstream analysis. The dates are ignored in this analysis so the results reflect upstream versus downstream behavior over the entire research period.

Table 4.6 is a listing of the results for the analysis for upstream-downstream analysis.

Table 4.6 Mean values for Upstream-Downstream analysis

		DO	Ammonia	Sulfate	Fecal Coliform	BOD
All Data	Upstream	**5.20**	**0.70**	**55.50**	**68,122**	**48.16**
	Downstream	**3.28**	**1.13**	**46.89**	**257,015**	**12.77**
Mean_98	Upstream	**5.56**	**0.56**	**53.70**	**47,431**	12.66
	Downstream	**3.35**	**1.34**	**47.02**	**293,456**	12.88
Mean_99	Upstream	**4.86**	0.85	**57.19**	80,608	**72.30**
	Downstream	**3.21**	0.81	**46.78**	83,918	**12.38**
No Odor	Upstream	**5.16**	**0.68**	**52.12**	106,725	**57.81**
	Downstream	**3.97**	**1.29**	**40.66**	149,721	**6.87**
Odor	Upstream	**5.31**	0.77	58.39	**60,458**	**65.00**
	Downstream	**2.69**	0.99	53.22	**355,502**	**22.64**

Differences in **Bold** values are significant at p=0.05
Underline pairs represent values that are not different at p=0.05

The DO values decrease moving downstream as expected. The bayou's oxygen demand and low re-aeration capabilities in the covered portion are one explanation of this decline.

The BOD values also decrease moving downstream, except in 1998. These results suggest that the bayou has some assimilative capacity for organic materials entering from runoff.

All the upstream FC values regardless of grouping are within one standard deviation of the mean value for all upstream data except for the No Odor condition when the upstream value is nearly two standard deviations higher. This result means that for all practical purposes the FC values in the upstream locations are the same for Mean_98, Mean_99, and Odor groupings. The downstream FC values are always greater than the upstream value except for the Mean_99 grouping and the No Odor grouping where the values are the same (downstream is same as upstream). These results can be interpreted to suggest that during No Odor conditions the FC values are unchanged as one moves downstream, but during odor conditions the FC increases moving downstream.

Further comparison of the Odor and No Odor grouping shows that the upstream DO, FC, and BOD are all about the same value, but downstream during odor conditions, the FC triples. This result suggests that the odor conditions are either caused by some input between Evergreen and Hughes or by some process difference between Evergreen and Hughes. The 1999 FC difference is negligible suggesting that the input or process involved has changed. Because a natural process change is unlikely, one can conclude that the input character into this section of the bayou has changed since 1998.

This section of bayou is particularly interesting because it is very slow moving, and although it has a free surface it is not directly open to the air. Based on video tapes, the air in this section of bayou is breathable (workers were shown in the bayou without supplied air) during no-odor conditions.

Results: Quarterly Data Summaries

The data sets were grouped into quarterly time blocks for a summary analysis of selected water quality parameters. Statistical tests are not performed on the data presented in this section. The quarterly bar charts use the following conventions. Q1 represents data collected in January, February, or March. Q2 is data collected in April, May, or June. Q3 is data collected in July, August, or September. Q4 is data collected in October, November, or December.

Figure 4.3 is a bar chart relating the mean DO value when odor was reported in the field notes and when no odor was reported, grouped quarterly, at the downstream location group. The mean values during the first five quarters of the research are remarkably consistent, with the odor conditions being producing a 1mg/L reduction in DO at Hughes Street Bridge.

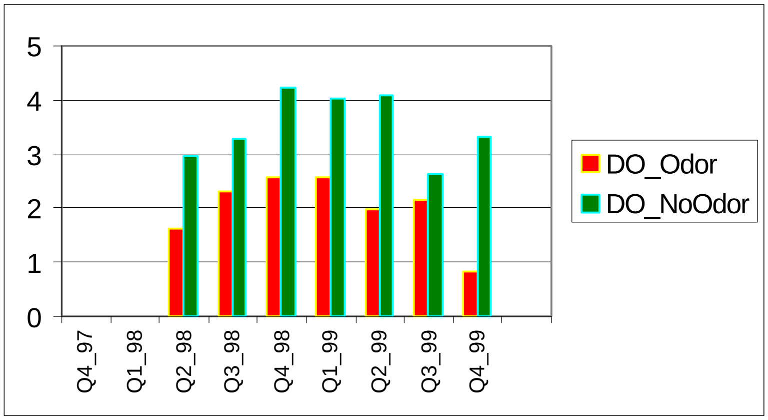


Figure 4.3 Mean DO values when odor was observed (not observed) grouped quarterly

Figure 4.4 is a bar chart relating the mean ammonia value when odor was reported in the field notes and when no odor was reported, grouped quarterly, at the downstream location group. The mean values are about the same regardless of whether odor is reported or not, except for the first quarter of 1998. This result suggests that ammonia is not a useful indicator or predictor of odor conditions.

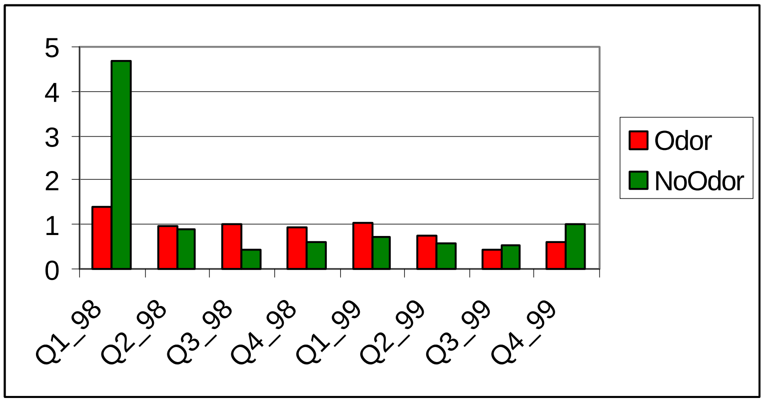


Figure 4.4 Mean Ammonia values when odor was observed (not observed) grouped quarterly.

Figure 4.5 is a bar chart relating the mean sulfate value when odor was reported in the field notes and when no odor was reported, grouped quarterly, at the downstream location group. Although the differences in the mean values are significant, this parameter is not considered useful as a predictor/indicator of odor conditions because it had a wide range of values and the upstream-downstream behavior was inconsistent.

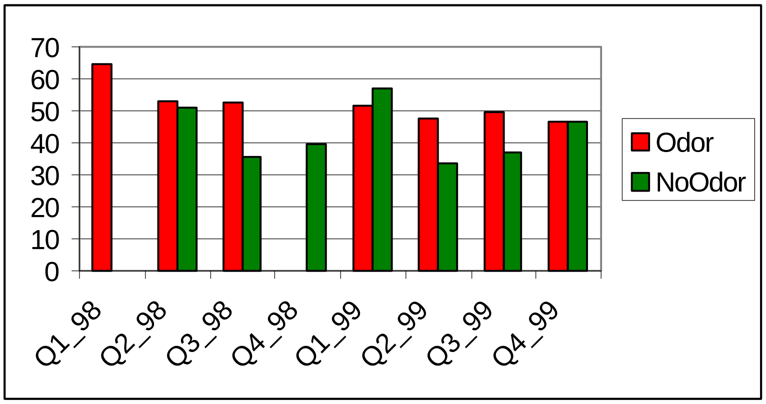


Figure 4.5 Mean Sulfate values when odor was observed (not observed) grouped quarterly

Figure 4.6 is a bar chart relating the mean FC values when odor was reported in the field notes and when no odor was reported, grouped quarterly, at the downstream location group. The mean values are about the same regardless of whether odor is reported or not. The last three quarters indicate a downward trend in the value of FC.

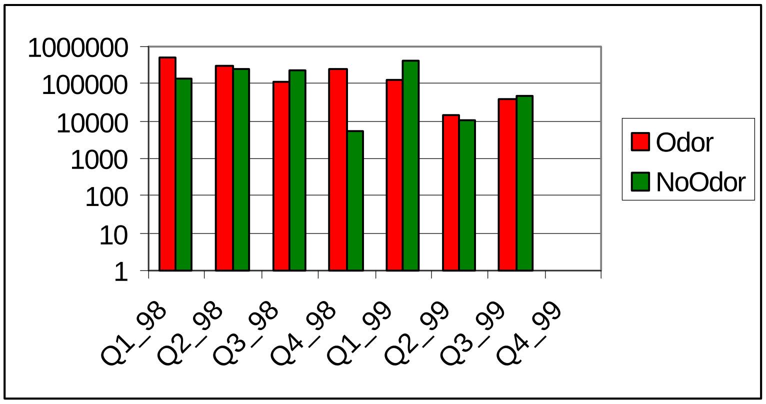


Figure 4.6 Mean FC values when odor was observed (not observed) grouped quarterly

Figure 4.7 is a bar chart relating the mean BOD value when odor was reported in the field notes and when no odor was reported, grouped quarterly, at the downstream location group. The mean values are much higher when odor is reported indicating that one cause of the odor is an organic load that elevates the BOD values. BOD appears to be a good predictor of odor conditions, (with DO responding in a downward fashion as the oxygen demand uses DO in the water column).

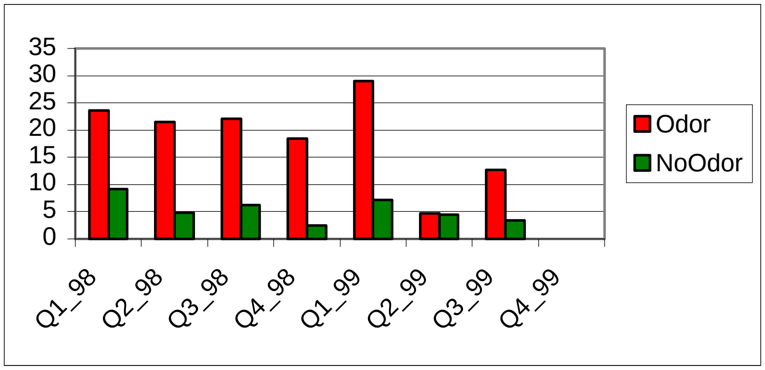


Figure 4.7 Mean BOD values when odor was observed (not observed) grouped quarterly

Figure 4.8 is a bar chart relating the fraction of field visits when odor was reported in the field notes and the fraction of field visits when no odor was reported, grouped quarterly. The odor fraction is plotted as the left bar, while the no-odor fraction is plotted as the right bar. The ideal condition is the right bar at 100% and the left bar absent. The number of field visits in each quarter is different, but the minimum number during the study period was six visits where data were collected. This minimum number is roughly a visit once every two weeks. Most of the quarters reflect weekly visits. The third quarter of 1999 and fourth quarter of 1999 had a relatively low fraction of observed odor, suggesting that the water quality during this period was acceptable.

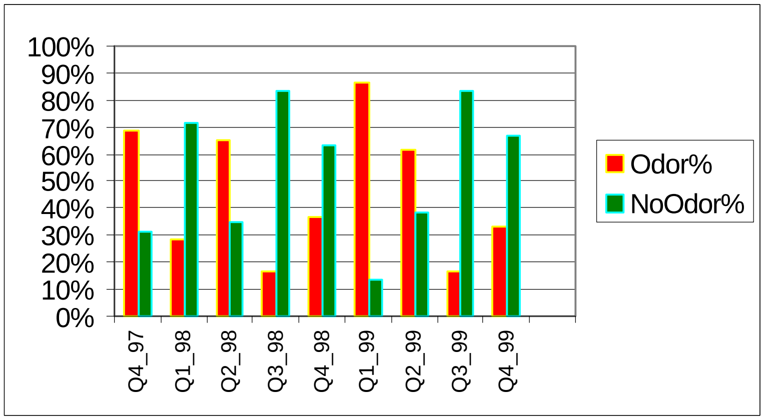


Figure 4.8 Fraction of field visits when odor was observed grouped quarterly

These summary statistics display two useful characteristics. The first is that the frequency of odor reports is lowest in the third quarter of each year studied (July-September) and highest in the first quarter of each year (January -March). The frequency of odor occurrences is about the same for quarters two and four. The question as to why the number of observed odor incidents is smallest in the third quarter is unanswered.

The second useful characteristic is that the DO at Hughes during no-odor conditions is about 1 mg/L higher than the DO regardless of quarter suggesting that the cause of the odor conditions is something that exerts an oxygen demand on the bayou system. The third quarter is again anomalous in that the difference in DO between the two conditions is the smallest and the value of DO is smallest.

The third useful characteristic is that BOD is significantly higher during odor conditions - consistent with the DO behavior above.

Summary

During odor conditions DO and BOD are significantly different than during non-odor conditions. The elevated BOD indicates that some source (sewage, industrial discharge, etc.) supplies an additional organic load to the bayou that in-turn depresses the DO. Odor likely results when this mixture sits relatively stagnant under the Hughes facility. The sediment in this area exerts an oxygen demand as well and because the water is moving slowly vertical mixing does not occur. The sediment is postulated to become anaerobic and sulfate reducing bacteria in this zone produce sulfide that contributes to the odor.

The mean value of DO and Sulfate meets existing or proposed state water quality standards for an unclassified stream. The FC values do not. Only about 25% of the FC values meet the current standard (2000 cfu/100mL). However, many samples were collected when the bayou water quality appeared poor (especially the older data) so this poor performance may be from a biased sampling protocol.

Based on the upstream-downstream data differences a *change* in water quality occurs between Evergreen Cemetery and Hughes Street. The upstream-downstream analysis supports the concept that the source of BOD is upstream of Evergreen Cemetery.

5. Tracer Study

Purpose

The purpose of the tracer test is to determine connectivity and average time-of-travel (residence time) in different sections of Country Club Bayou and to estimate the degree of mixing. The tracer tests were conducted in response to a series of tests reported by the City of Houston team. The COH tests were conducted in February 1999. Table 5.1 lists the results reported by the COH team in a project meeting at HDHHS on March 23, 1999.

Table 5.1 Time of Travel COH Tests

Deployment Location	Distance to Hughes	Time-of-travel
North Vent	2250 feet	1 day
South Vent	2250 feet	3 days
Polk and Elm (S1)	3000 ft	2 days, North tunnel
Park and Elm (N1)	2800 ft	2 days, North tunnel

The University of Houston experiments were conducted as independent confirmation of the visual tracer tests performed by the city team.

Methods

The tracer used in the tracer studies is Sodium Fluorescein, an organic dye that is commonly used in tracer studies and medical applications. It is considered conservative although it is known to be strongly adsorbed by alumnia (a component of clay). These tracers are detected visually for high concentrations and using a fluorometer for low concentrations. The tracers are released at a upstream location, monitored at that location for a short time, then monitored at the downstream location to determine time-of-travel.

The tracer concentration curve is interpreted by fitting an advection-dispersion model. The purpose of the model is to infer peak arrival time and dispersion characteristics of the tracer. Prior to deployment the analyst estimates the system volume and flow rate to calculate a hydraulic retention time. The release is scheduled so that the pulse arrives at the downstream location over a convenient period. Generally travel times less that 8 hours or greater than 20 hours are ideal because nighttime sample collection is avoided.

The volume estimate is also used to determine the tracer dose. In these studies the dose was designed so that if the tracer is uniformly mixed into the entire system volume the concentration is 0.1 to 1.0 mg/Kg (mg/L). These concentrations are barely visible. The choice of a concentration that is barely visible has advantages in terms of public perception of impact – although the tracers are considered non-toxic, the color is nearly identical to glycol-based anti-freeze and large concentrations in the water can cause concern among the public.

Results

Figure 5.1 is a map of the area for the three experiments. In the first study a fluorescein dye tracer is released at the North Vent access shaft and concentration is monitored at the outfall near Hughes Street Bridge. The flow-line distance from the North Vest to the Railroad Bridge was estimated as 2,250 feet using the storm sewer division map of the area (Sheet 209B; 12-1-1980)

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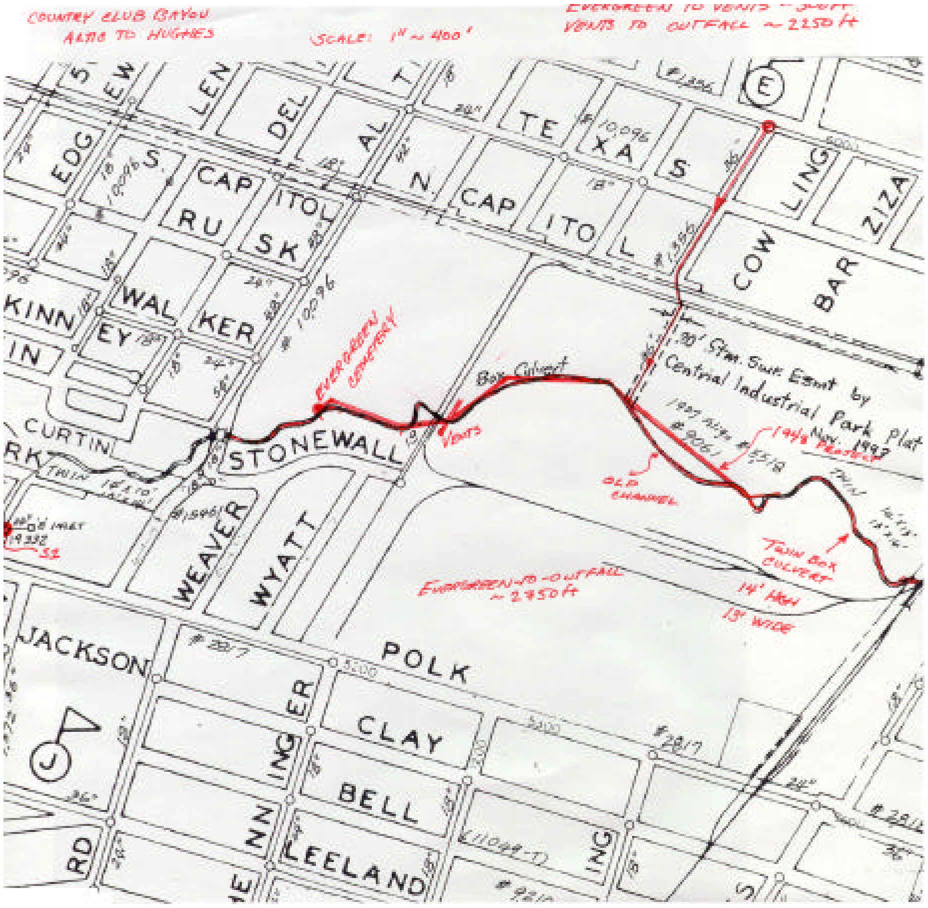


Figure 5.1. Map of Tracer-Test Area for Tracer Study

flow width is assumed to be a uniform 13 feet based on the construction drawings for the 1948 storm sewer project in the area when the entire Hughes site was covered (Drawing 9061). The maximum low flow depth is 3.25 feet based on the same drawing. In the drawing openings with a bottom sill of 3.25 feet are shown every 200 feet. If the flow depth is above 3.25 feet, then there would be potential for mixing between the two culverts, otherwise flow is in separate channels.

The stagnant water volume is estimated as the product of this flow depth, the flow length and the flow width. The stagnant water volume on 5/6/1999 was 2796 cubic meters. 277 grams of dye is required to label this mass of water at 0.1 mg/Kg. At a flow depth of one-tenth the maximum (about 3 inches) only 27 grams of dye is required to label the entire water mass.

The tracer mass used in this first experiment was 20 grams (20,000mg), about one-tenth to mass required to label the entire volume. This mass was selected because the water is known to be moving relatively slowly and mixing should be small. We assumed we could label and detect one-minute of flow and used this volume to calculate the massof tracer required. The field-measured depths on 5/6/99 are 2.33 feet at the North Vent, and 2.5 feet at the outfall. The discharge at the outfall is 520 gpm. The expected hydraulic retention time is 18.4 hours.

The outfall location had a sulfide odor characteristic of a poor water quality episode and the water was cloudy. The bottom of the bayou was black-brown. Spheratolis was visible downstream of the outfall in the faster flowing portion between the railroad bridge and Hughes Street.

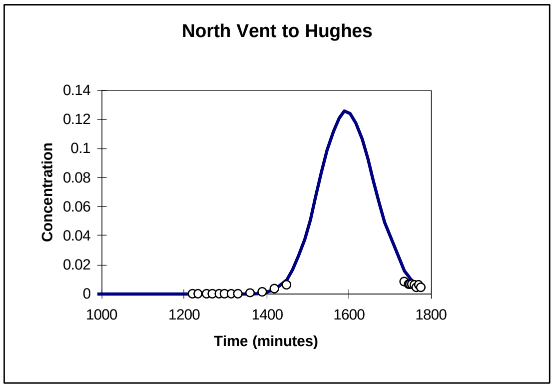


Figure 5.2 Tracer Study #1

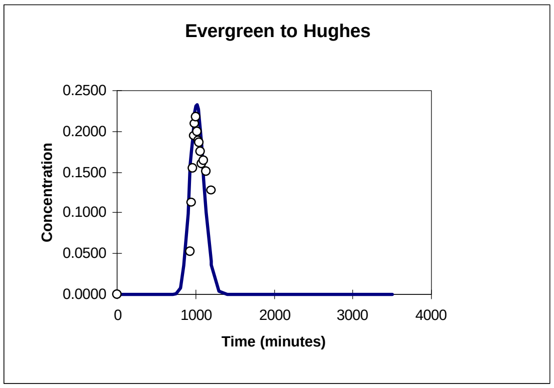


Figure 5.3 Tracer Study #2

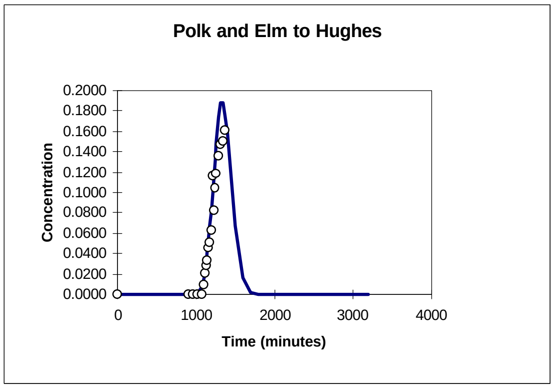


Figure 5.4 Tracer Study #3

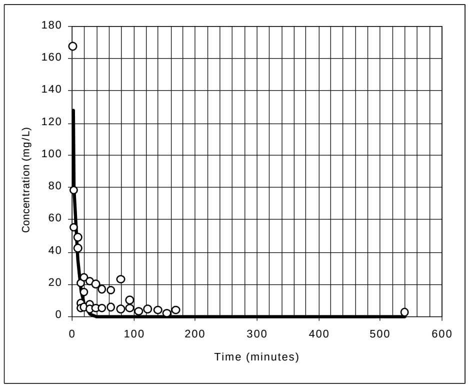


Figure 5.5 Tracer Study #4

The North Vent water was clear with some decaying plant matter (juniper leaves) and dirt. The odor was unremarkable. Dye was placed at 9:50 am on 5/6/99. Two samples were collected at 10:00 and 10:05 am at the North Vent, to be sure dye was diluting and moving downstream. Later dye studies will monitor the release location for several hours. The field team left the Hughes property at 10:05 am at the request of the Baker-

Hughes plant manager. The downstream location was monitored hourly for 9 hours. No dye was visible after 9 hours. The location was monitored the next morning for 4 hours, and the afternoon for 2 hours.

Figures 5.2 through 5.5 are plots of the concentration histories for all the tracer studies. The markers are the observations, the solid line is the fitted model. The parameters used to fit the model were used to estimate discharge and determine a mixing length. A large mixing length indicates that the system is functioning like a mixed reactor, while a small length indicates plug-flow type behavior. The mixing lengths are relatively small suggesting that the covered portion of the bayou is similar to a plug flow system.
Table 5.2 is a summary listing the results of the tracer studies.

Table 5.2 Time of Travel UH Tests

Release	Recovery	Distance	Travel time	Discharge[1]	Discharge[2]	Mixing Length
North Vent	Hughes	2250 feet	1.1 day	520 gpm	342 gpm	2 feet
Evergreen	Hughes	2750 feet	0.7 days	1694 gpm	660 gpm	11 feet
Polk and Elm	Hughes	3750 feet	0.9 days	2500 gpm	630 gpm	13 feet
Ennis	Milby	2400 feet	0.3 days	N/A		N/A
Hughes	Polk and 66th	1450 feet	0.2 days	600 gpm	598 gpm	N/A
Ennis	Ennis	1 feet	N/A	N/A	2.5 gpm[3]	N/A

[1] Discharge measured at Hughes Street using method in Appendix I
[2] Discharge calculated from travel time
[3] Discharge estimated by dilution

Appendix III contains the data collected in the tracer tests and the interpretation calculation spreadsheets.

Interpretation

The travel time in the covered portion is on the order of several hours upstream of the junction box at Altic. The covered portion from Altic to Hughes has a remarkably long travel time for the linear distances involved. The large width of this section of bayou allows relatively small changes in depth to store large volumes of flow and thus upstream flow changes are passed through this section undetected. Even the highest flow event had a travel time through this portion of the system on the order of one day. This long travel time in the section between Altic and Hughes may contribute to odor conditions because the water in this portion of the bayou is essentially stagnant.

6. Computer Modeling

Hydraulic Model

Hydraulic modeling is used to predict flow velocities for use in a water quality model that considers the advection of dissolved compounds as the principal transport mechanism. The gradually varied flow equation is used (same equation as HEC-2; WSPRO, etc.). The idea in the hydraulic modeling is to construct a model that produces realistic travel time when field measured flow depths are supplied.

Figure 6.1 is a sketch defining the terms used in the hydraulic calculations. The spreadsheet implementation uses the following difference equations for calculating flow depth.

$$y_i = y_{i-1} + \Delta x(S_o - S_f) \qquad 6.1$$

$$y_i = y_i + \frac{Q^2}{2gA_i^{\,2}} \qquad 6.2$$

where h_i is the flow depth in the section, S_o and S_f are the bottom and friction slope, respectively, and Δx is the length of the section.

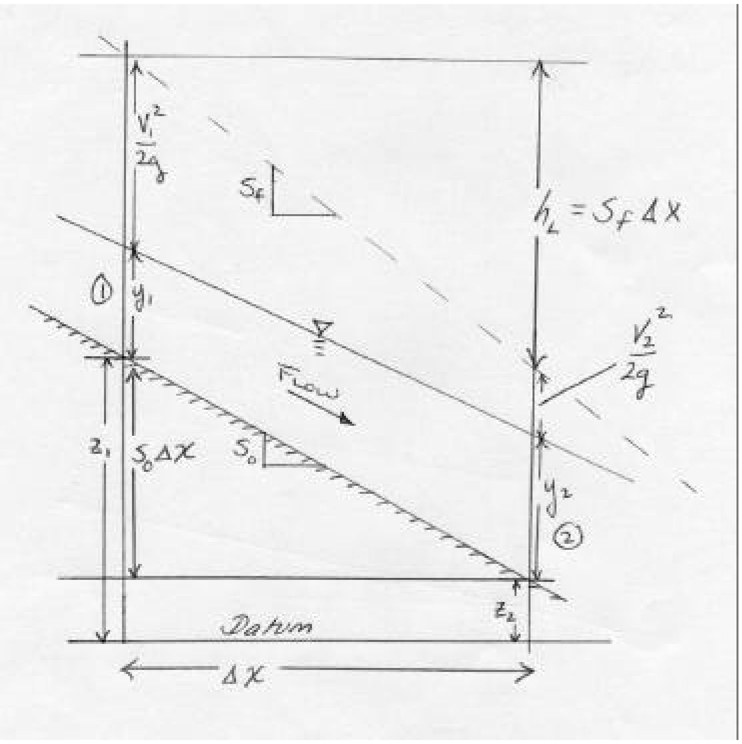
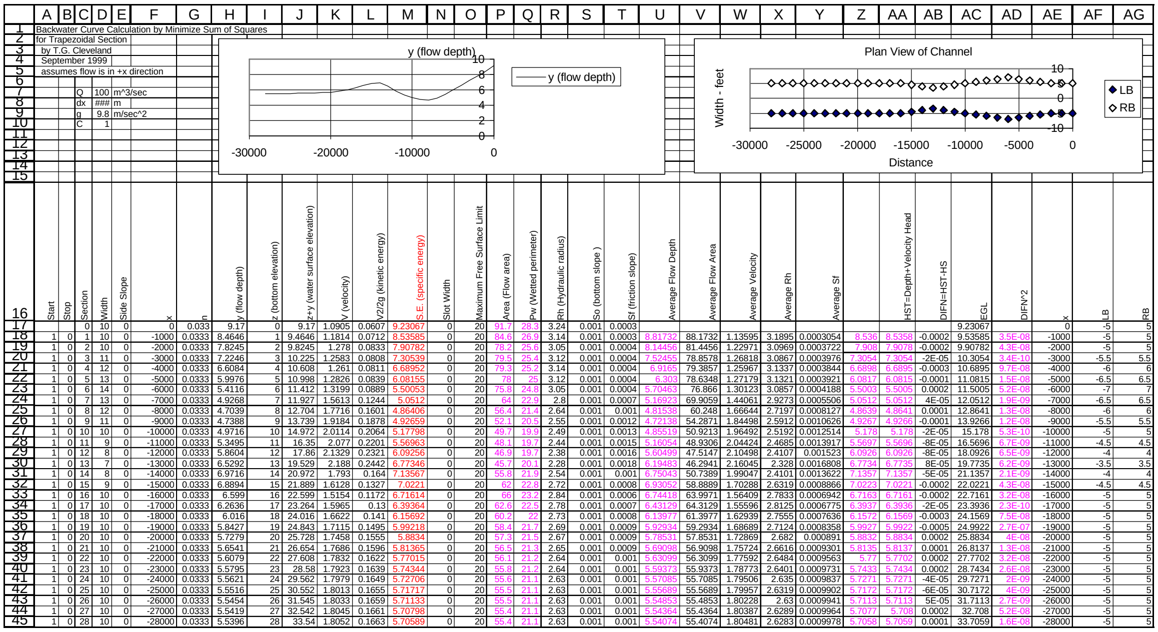


Figure 6.1 Sketch of variables used in hydraulic calculations

The difference between these two equations is minimized by the choice of h_i for each section using the SOLVER feature in Excel. When the minimum is found for all sections the result is a backwater curve that satisfies the gradually varied flow equation.
Figure 6.2 is an example spreadsheet that implements the method.



Backwater Curve Calculation by Minimize Sum of Squares
for Trapezoidal Section
by T.G. Cleveland
September 1999
assumes flow is in +x direction

Q	100	m^3/sec
dx	###	m
g	9.8	m/sec^2
C	1	

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
16	Start	Stop	Section	Width	Side Slope	x	n	y (flow depth)	z (bottom elevation)	z+y (water surface elevation)	V (velocity)	V2/2g (kinetic energy)	S.E. (specific energy)	Slot Width	Maximum Free Surface Limit	Area (Flow area)	Pw (Wetted perimeter)	Rh (Hydraulic radius)	So (bottom slope)	Sf (friction slope)	Average Flow Depth	Average Flow Area	Average Velocity	Average Rh	Average Sf		HST=Depth+Velocity Head	DIFN=HST-HS	EGL	DIFN^2	x	LB	RB
17			0	10	0	0	0.033	9.17	0	9.17	1.0905	0.0607	9.23067	0	20	91.7	28.3	3.24	0.001	0.0003									9.23067		0	-5	5
18	1	0	1	10	0	-1000	0.0333	8.4646	1	9.4646	1.1814	0.0712	8.53585	0	20	84.6	26.9	3.14	0.001	0.0003	8.81732	88.1732	1.13595	3.1895	0.0003054	8.536	8.5358	-0.0002	9.53585	3.5E-08	-1000	-5	5
19	1	0	2	10	0	-2000	0.0333	7.8245	2	9.8245	1.278	0.0833	7.90782	0	20	78.2	25.6	3.05	0.001	0.0004	8.14456	81.4456	1.22971	3.0969	0.0003722	7.908	7.9078	-0.0002	9.90782	4.3E-08	-2000	-5	5
20	1	0	3	11	0	-3000	0.0333	7.2246	3	10.225	1.2583	0.0808	7.30539	0	20	79.5	25.4	3.12	0.001	0.0004	7.52455	78.8578	1.26818	3.0867	0.0003976	7.3054	7.3054	-2E-05	10.3054	3.4E-10	-3000	-5.5	5.5
21	1	0	4	12	0	-4000	0.0333	6.6084	4	10.608	1.261	0.0811	6.68952	0	20	79.3	25.2	3.14	0.001	0.0004	6.9165	79.3857	1.25967	3.1337	0.0003844	6.6898	6.6895	-0.0003	10.6895	9.7E-08	-4000	-6	6
22	1	0	5	13	0	-5000	0.0333	5.9976	5	10.998	1.2826	0.0839	6.08155	0	20	78	25	3.12	0.001	0.0004	6.303	78.6348	1.27179	3.1321	0.0003921	6.0817	6.0815	-0.0001	11.0815	1.5E-08	-5000	-6.5	6.5
23	1	0	6	14	0	-6000	0.0333	5.4116	6	11.412	1.3199	0.0889	5.50053	0	20	75.8	24.8	3.05	0.001	0.0004	5.70463	76.866	1.30123	3.0857	0.0004188	5.5003	5.5005	0.0002	11.5005	5.2E-08	-6000	-7	7
24	1	0	7	13	0	-7000	0.0333	4.9268	7	11.927	1.5613	0.1244	5.0512	0	20	64	22.9	2.8	0.001	0.0007	5.16923	69.9059	1.44061	2.9273	0.0005506	5.0512	5.0512	4E-05	12.0512	1.9E-09	-7000	-6.5	6.5
25	1	0	8	12	0	-8000	0.0333	4.7039	8	12.704	1.7716	0.1601	4.86406	0	20	56.4	21.4	2.64	0.001	0.001	4.81538	60.248	1.66644	2.7197	0.0008127	4.8639	4.8641	0.0001	12.8641	1.3E-08	-8000	-6	6
26	1	0	9	11	0	-9000	0.0333	4.7388	9	13.739	1.9184	0.1878	4.92659	0	20	52.1	20.5	2.55	0.001	0.0012	4.72138	54.2871	1.84498	2.5912	0.0010626	4.9267	4.9266	-0.0001	13.9266	1.2E-08	-9000	-5.5	5.5
27	1	0	10	10	0	-10000	0.0333	4.9716	10	14.972	2.0114	0.2064	5.17798	0	20	49.7	19.9	2.49	0.001	0.0013	4.85519	50.9213	1.96492	2.5192	0.0012514	5.178	5.178	-2E-05	15.178	5.3E-10	-10000	-5	5
28	1	0	11	9	0	-11000	0.0333	5.3495	11	16.35	2.077	0.2201	5.56963	0	20	48.1	19.7	2.44	0.001	0.0015	5.16054	48.9306	2.04424	2.4685	0.0013917	5.5697	5.5696	-8E-05	16.5696	6.7E-09	-11000	-4.5	4.5
29	1	0	12	8	0	-12000	0.0333	5.8604	12	17.86	2.1329	0.2321	6.09256	0	20	46.9	19.7	2.38	0.001	0.0016	5.60499	47.5147	2.10498	2.4107	0.001523	6.0926	6.0926	-8E-05	18.0926	6.5E-09	-12000	-4	4
30	1	0	13	7	0	-13000	0.0333	6.5292	13	19.529	2.188	0.2442	6.77346	0	20	45.7	20.1	2.28	0.001	0.0018	6.19483	46.2941	2.16045	2.328	0.0016808	6.7734	6.7735	8E-05	19.7735	6.2E-09	-13000	-3.5	3.5
31	1	0	14	8	0	-14000	0.0333	6.9716	14	20.972	1.793	0.164	7.13567	0	20	55.8	21.9	2.54	0.001	0.001	6.75043	50.7389	1.99047	2.4101	0.0013622	7.1357	7.1357	-5E-05	21.1357	2.1E-09	-14000	-4	4
32	1	0	15	9	0	-15000	0.0333	6.8894	15	21.889	1.6128	0.1327	7.0221	0	20	62	22.8	2.72	0.001	0.0008	6.93052	58.8889	1.70288	2.6319	0.0008866	7.0223	7.0221	-0.0002	22.0221	4.3E-08	-15000	-4.5	4.5
33	1	0	16	10	0	-16000	0.0333	6.599	16	22.599	1.5154	0.1172	6.71614	0	20	66	23.2	2.84	0.001	0.0006	6.74418	63.9971	1.56409	2.7833	0.0006942	6.7163	6.7161	-0.0002	22.7161	3.2E-08	-16000	-5	5
34	1	0	17	10	0	-17000	0.0333	6.2636	17	23.264	1.5965	0.13	6.39364	0	20	62.6	22.5	2.78	0.001	0.0007	6.43129	64.3129	1.55596	2.8125	0.0006775	6.3937	6.3936	-2E-05	23.3936	2.3E-10	-17000	-5	5
35	1	0	18	10	0	-18000	0.0333	6.016	18	24.016	1.6622	0.141	6.15692	0	20	60.2	22	2.73	0.001	0.0008	6.13977	61.3977	1.62939	2.7555	0.0007636	6.1572	6.1569	-0.0003	24.1569	7.5E-08	-18000	-5	5
36	1	0	19	10	0	-19000	0.0333	5.8427	19	24.843	1.7115	0.1495	5.99218	0	20	58.4	21.7	2.69	0.001	0.0009	5.92934	59.2934	1.68689	2.7124	0.0008358	5.9927	5.9922	-0.0005	24.9922	2.7E-07	-19000	-5	5
37	1	0	20	10	0	-20000	0.0333	5.7279	20	25.728	1.7458	0.1555	5.8834	0	20	57.3	21.5	2.67	0.001	0.0009	5.78531	57.8531	1.72869	2.682	0.000891	5.8832	5.8834	0.0002	25.8834	4E-08	-20000	-5	5
38	1	0	21	10	0	-21000	0.0333	5.6541	21	26.654	1.7686	0.1596	5.81365	0	20	56.5	21.3	2.65	0.001	0.0009	5.69098	56.9098	1.75724	2.6616	0.0009301	5.8135	5.8137	0.0001	26.8137	1.3E-08	-21000	-5	5
39	1	0	22	10	0	-22000	0.0333	5.6079	22	27.608	1.7832	0.1622	5.77015	0	20	56.1	21.2	2.64	0.001	0.001	5.63099	56.3099	1.77592	2.6484	0.0009563	5.77	5.7702	0.0002	27.7702	3.2E-08	-22000	-5	5
40	1	0	23	10	0	-23000	0.0333	5.5795	23	28.58	1.7923	0.1639	5.74344	0	20	55.8	21.2	2.64	0.001	0.001	5.59373	55.9373	1.78773	2.6401	0.0009731	5.7433	5.7434	0.0002	28.7434	2.6E-08	-23000	-5	5
41	1	0	24	10	0	-24000	0.0333	5.5621	24	29.562	1.7979	0.1649	5.72706	0	20	55.6	21.1	2.63	0.001	0.001	5.57085	55.7085	1.79506	2.635	0.0009837	5.7271	5.7271	-4E-05	29.7271	2E-09	-24000	-5	5
42	1	0	25	10	0	-25000	0.0333	5.5516	25	30.552	1.8013	0.1655	5.71717	0	20	55.5	21.1	2.63	0.001	0.001	5.55689	55.5689	1.79957	2.6319	0.0009902	5.7172	5.7172	-6E-05	30.7172	4E-09	-25000	-5	5
43	1	0	26	10	0	-26000	0.0333	5.5454	26	31.545	1.8033	0.1659	5.71133	0	20	55.5	21.1	2.63	0.001	0.001	5.54853	55.4853	1.80228	2.63	0.0009941	5.7113	5.7113	5E-05	31.7113	2.7E-09	-26000	-5	5
44	1	0	27	10	0	-27000	0.0333	5.5419	27	32.542	1.8045	0.1661	5.70798	0	20	55.4	21.1	2.63	0.001	0.001	5.54364	55.4364	1.80387	2.6289	0.0009964	5.7077	5.708	0.0002	32.708	5.2E-08	-27000	-5	5
45	1	0	28	10	0	-28000	0.0333	5.5396	28	33.54	1.8052	0.1663	5.70589	0	20	55.4	21.1	2.63	0.001	0.001	5.54074	55.4074	1.80481	2.6283	0.0009978	5.7058	5.7059	0.0001	33.7059	1.6E-08	-28000	-5	5

Figure 6.2 Hydraulic Model Spreadsheet

The cross sectional areas are determined from cross-sectional geometry inferred from a USGS topographic map. These sections are individually analyzed to produce a depth-area function that is used in the spreadsheet to relate flow depth to cross sectional area. The USGS map and the sections are attached in Appendix V.

After considerable experimentation the channel sections were changed to a simple rectangular geometry and only the width was adjusted. This change was made because the low flow depths required were on the order of 3-6 feet and we did not have actual bathymetry from the USGS maps. Additionally in early September 1999 the channel passing by the METRO Polk Garage was modified. As of November 10, 1999 the construction is still in-progress. The work will extend the box culvert under Polk Street several hundered feet to create an additional section of covered bayou.

Roughness Coefficients

Figure 6.3 is a table of roughness coefficients for use in open channel flow modeling.

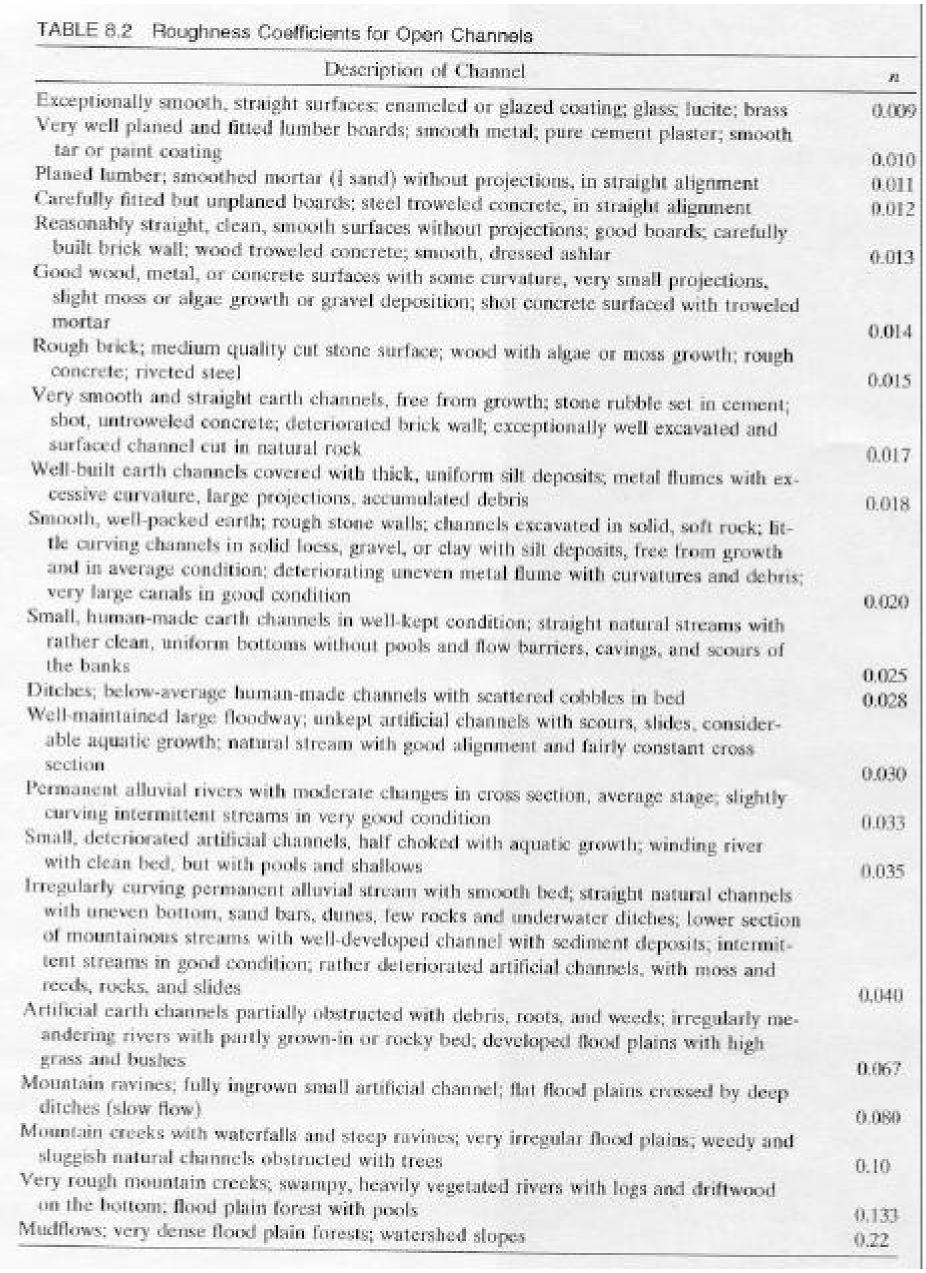


TABLE 8.2 Roughness Coefficients for Open Channels

Description of Channel	n
Exceptionally smooth, straight surfaces: enameled or glazed coating; glass; lucite; brass	0.009
Very well planed and fitted lumber boards; smooth metal; pure cement plaster; smooth tar or paint coating	0.010
Planed lumber; smoothed mortar (⅓ sand) without projections, in straight alignment	0.011
Carefully fitted but unplaned boards; steel troweled concrete, in straight alignment	0.012
Reasonably straight, clean, smooth surfaces without projections; good boards; carefully built brick wall; wood troweled concrete; smooth, dressed ashlar	0.013
Good wood, metal, or concrete surfaces with some curvature, very small projections, slight moss or algae growth or gravel deposition; shot concrete surfaced with troweled mortar	0.014
Rough brick; medium quality cut stone surface; wood with algae or moss growth; rough concrete; riveted steel	0.015
Very smooth and straight earth channels, free from growth; stone rubble set in cement; shot, untroweled concrete; deteriorated brick wall; exceptionally well excavated and surfaced channel cut in natural rock	0.017
Well-built earth channels covered with thick, uniform silt deposits; metal flumes with excessive curvature, large projections, accumulated debris	0.018
Smooth, well-packed earth; rough stone walls; channels excavated in solid, soft rock; little curving channels in solid loess, gravel, or clay with silt deposits, free from growth and in average condition; deteriorating uneven metal flume with curvatures and debris; very large canals in good condition	0.020
Small, human-made earth channels in well-kept condition; straight natural streams with rather clean, uniform bottoms without pools and flow barriers, cavings, and scours of the banks	0.025
Ditches; below-average human-made channels with scattered cobbles in bed	0.028
Well-maintained large floodway; unkept artificial channels with scours, slides, considerable aquatic growth; natural stream with good alignment and fairly constant cross section	0.030
Permanent alluvial rivers with moderate changes in cross section, average stage; slightly curving intermittent streams in very good condition	0.033
Small, deteriorated artificial channels, half choked with aquatic growth; winding river with clean bed, but with pools and shallows	0.035
Irregularly curving permanent alluvial stream with smooth bed; straight natural channels with uneven bottom, sand bars, dunes, few rocks and underwater ditches; lower section of mountainous streams with well-developed channel with sediment deposits; intermittent streams in good condition; rather deteriorated artificial channels, with moss and reeds, rocks, and slides	0.040
Artificial earth channels partially obstructed with debris, roots, and weeds; irregularly meandering rivers with partly grown-in or rocky bed; developed flood plains with high grass and bushes	0.067
Mountain ravines; fully ingrown small artificial channel; flat flood plains crossed by deep ditches (slow flow)	0.080
Mountain creeks with waterfalls and steep ravines; very irregular flood plains; weedy and sluggish natural channels obstructed with trees	0.10
Very rough mountain creeks; swampy, heavily vegetated rivers with logs and driftwood on the bottom; flood plain forest with pools	0.133
Mudflows; very dense flood plain forests; watershed slopes	0.22

Figure 6.3. Roughness coefficients for open channels
(from: Simon A.L., and Korom, S.F., 1997. Hydraulics 4ed., Prentice Hall, Ohio. 443 p.)

The portion of the bayou from Hughes Street to the confluence with Braes Bayou was modeled with a roughness coefficient of ranging from 0.035 at the confluence to 0.06 for the section between Polk Street and the outfall at Hughes Street. The later value is near the upper range of values listed in the table. The justification for selecting this value is that the bayou meanders in this location and has a relatively rough, uneven bed.

This hydraulic model was used to develop flow-depth-velocity data for the water quality model. In developing these data a range of discharges was chosen an the hydraulic model used to compute the depth with matching conditions forced at the downstream portion of the model. The average depth for each section in the hydraulic model was saved and a linear regression model was used to develop a discharge-depth power-law relationship for use in the water quality model.

Water Quality Model

Figure 6.4 is a map of the QUAL2E model used in evaluating water quality impacts on Country Club Bayou from the five alternative intervention measures. The blocks represent the approximate location of the element centroids in the QUAL2E computer program and the numbers are the element numbers used in the program. Two reaches, upstream from block 1 are displayed in the figure as a single block labeled 20+. These reaches represent the portion of the bayou from Ennis and Lamar to Altic.

The conceptual model for the basin assumes that the upstream portion of the bayou can be approximated as a water source (headwater) element in the program and the entire south branch is simulated in the same fashion. The input, if any, at Yates Gully is simulated as a point source of water with associated water quality constituents.

The sub-basin model simulates dissolved oxygen (DO) and BOD using flow values independently computed using a hydraulics model. This separation is necessary because the hydraulic component included in QUAL2E could not produce the backwater-type flow regime observed in Country Club bayou.

Installation, Testing, and Calibration

The program was installed from the US EPA website. After downloading the program a series of simulations using EPA supplied input files was performed to test the installation. Table 6.1 lists the more significant test simulations, the purpose of the test, and important remarks. The last three test simulations used the geometry depicted in Figure 6.4.

Table 6.1 Installation and Testing Simulations

Simulation	Purpose	Remarks	Data File
T001	Verify QUAL2E install	Use EPA supplied files	WRKSHOP1.DAT
T002	Disable DAM feature	Modify EPA file	NOT SAVED
T003	Disable Algae	Modify EPA file	NOT SAVED
T004	CCBayou geometry	Modify EPA file – rename	NOT SAVED
T005	Test element sequence		NOT SAVED
T006	Test line-plot		NOT SAVED
T007	Sub-model geometry	Junction element sequence OK	NOT SAVED
T008	Plot commands	Plot sequence OK	NOT SAVED
T009	Point loads	Load at Vents – Impact visible	NOT SAVED
T010	Correct dimensions	River km actual dimensions	BAYOU1.DAT

Calibration for No-Odor conditions was accomplished by trial-and-error. Various input parameters in the QUALE input files were changed and the simulation output compared to the mean values observed in the field monitoring study. The goal in these cases was to force the predicted DO and BOD to fall within a prescribed calibration range based on the data analysis.

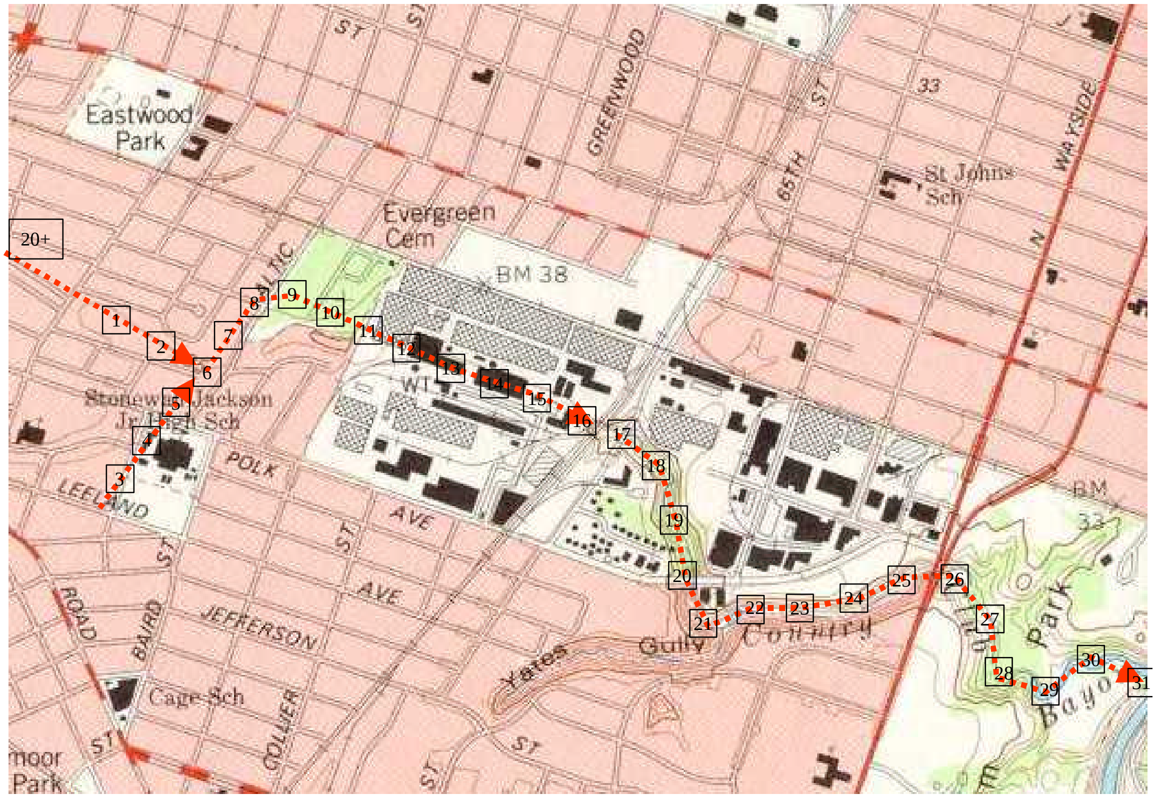


Figure 6.4. Diagram of QUAL2E sub-basin model for water quality prediction on Country Club Bayou.

A series of hydraulic simulations was used to determine appropriate hydraulic coefficients for the test runs. The coefficients were determined by fitting the mean flow depths and mean flow velocities to power-law stage-discharge and velocity-discharge relationships. These relationships are the models used in QUAL2E when the functional hydraulics representation is used. Table 6.2 lists the more significant simulations, the purpose, and meaningful remarks. The last five of these simulations involved testing the effect of flow variation on the calibration.

Table 6.2 Calibration Simulations Set#1

Simulation	Purpose	Remarks	Data File
C001	Calibrate flows		BAYOU2.DAT
C002	DO,BOD Inputs	Try to get BOD,DO at Hughes	CCB_CR1.DAT
C003	DO,BOD Inputs		CCB_CR2.DAT
C004	BOD point load	5% Flow BOD=10	CCB_CR3.DAT
C005	Increase BOD point	5% Flow BOD=30	CCB_CR4.DAT

C006	Increase BOD point	5% Flow BOD=50;Up loads =1	CCB_CR5.DAT
C007	Adjust SOD	0% Flow 0 BOD	CCB_CR6.DAT
C008	Adjust SOD rates	0% Flow; 6.5 BOD;DO up 6.0	CCB_CR7.DAT
C009	Adjust geometry	Add reach for Ennis and Lamar	CCB_CR8.DAT
C010	Refine calibration	DO Ok, BOD low	CCB001.DAT
C011	Refine calibration	DO Ok, BOD Ok	CCB002.DAT
C012	Fix flow coefficients	Adjust from 5 hydraulics runs	NOT SAVED
H001	Lowest flow	Calibrate to fit DO,BOD	CCBH01.DAT
H002	Mean-SD Flow	Calibrate to fit DO,BOD	CCBH02.DAT
H003	Mean Flow	Calibrate to fit DO,BOD	CCBH03.DAT
H004	Mean+SD Flow	Calibrate to fit DO,BOD	CCBH04.DAT
H005	High Flow	Calibrate to fit DO,BOD	CCBH05.DAT

The effect of flow variation was significant so the five simulations using flows distributed about the mean flow were used in further calibration exercises. The values in the mean flow simulation were used and the range of validity of the calibration was tested. Table 6.3 lists the results of this second set of calibration exercises.

Table 6.3 Calibration Set#2: All input values are held constant except the flow.

Flow	DO at Hughes	BOD at Hughes	DO at Wayside
Q = 145 gpm (lowest)	3.86	1.42*	5.02
Q = 286 gpm (Mean-SD)	3.54	3.22*	4.88
Q = 370 gpm (Tracer test)	3.44	4.08*	4.80
Q = 520 gpm (Tracer test)	3.37	5.18	4.67
Q = 855 gpm (Mean)	3.29	6.63*	4.48
Q = 1424 gpm (Mean+SD)	3.43	7.92*	4.36
Q = 2800 gpm (Highest)	3.63	8.91*	4.36
Target Ranges[1]	3.24 – 3.96	5.04-6.16	4.32-5.28

[1] Target ranges are the No Odor mean values +/- 10%
* These values are outside prescribed target range

This set of simulations indicated that the calibration is valid (in terms of matching observed mean values) only for a single flow rate. Trial-and-error sensitivity analysis suggested that either re-aeration parameters or BOD loading could be changed to try to satisfy the prescribed calibration target values. Changing the re-aeration values was not selected because the purpose of the model is to test effects of different loading and different hydraulic changes on the water quality of the bayou. Instead the BOD loading was varied in an attempt to establish a useful range of validity of the model.

The approach to extend the range of usefulness of the model was to vary the BOD loading as the flow rate changes. The arbitrarily selected prescribed BOD range was 6.0 to 14.0 mg/L. The values in each program execution values were adjusted to try to meet all the target values. Table 6.4 shows the results of this series of simulations.

Table 6.4 Calibration Set #3.

Flow	DO at Hughes	BOD at Hughes	DO at Wayside	Upstream BOD

Q = 145 gpm (lowest)	3.01*	3.64*	4.99	15.5*
Q = 286 gpm (Mean-SD)	3.21*	4.82*	4.79	15.0*
Q = 370 gpm (Tracer test)	3.24	5.10	4.73	12.5
Q = 520 gpm (Tracer test)	3.37	5.18	4.67	10.0
Q = 855 gpm (Mean)	3.41	5.97	4.54	9.5
Q = 1424 gpm (Mean+SD)	3.76	5.54	4.59	7.0
Q = 2800 gpm (Highest)	3.96	5.35	4.68	6.0
Target Ranges[1]	3.24 – 3.96	5.04-6.16	4.32-5.28	8.5-10.5

[1] Target ranges are the No Odor mean values +/- 10%

* These values are outside prescribed target range

From this series of calibration exercises the baseline No-Odor condition was represented using the higher tracer test values with an upstream BOD concentration set in a range defined by the observed mean value to approximately twice the observed mean value at Hughes Street Bridge.

Odor conditions are simulated by adding point loads near the suspected locations in the study area (Near 3100 Lamar upstream of Altic). The selection of the input location is based on a theme-map constructed from the HDHHS and Field reports. The locations of reported discharges were determined by GPS and then adjusted manually to create an EXCEL overlay on a map image. Multiple locations were shifted slightly so that when plotted, these locations appeared to have "depth". Figure 6.5 is a copy of the map created by this process.

Figure 6.5 Theme Map for Country Club Bayou

Visual inspection shows two areas that are likely source areas. The first is the area far upstream near N3 and the other is the area just upstream of Evergreen Cemetery. The field data do not suggest one area is more likely because the change in water quality parameters is observed only after the water has traversed the section beneath the Hughes Street facility.

Odor calibration was performed in a similar as the No-Odor cases fashion. The No-Odor cases were modified to include a point load with flow set to a 10% of the total flow and the BOD adjusted by trial and error until a set of target values was matched at Hughes Street. Table 6.5 shows the results of this series of simulations.

Table 6.5 Calibration Set #4.

Flow	DO at Hughes	BOD at Hughes	DO at Wayside	Point BOD
Q = 370 gpm (Tracer test)	1.06	15.43	4.03	99.0
Q = 520 gpm (Tracer test)	1.49	14.52	3.95	99.0
Q = 855 gpm (Mean)	0.74	21.30	3.88	99.0
Q = 1424 gpm (Mean+SD)	1.45	21.20	3.36	99.0
Q = 2800 gpm (Highest)	0.79	19.42	3.29	99.0
Target Ranges[1]	<2.5	>15.0	>3.0	

[1] Target ranges are arbitrary

[*] These values are outside prescribed target range

The two sets represented by calibration sets #3 and #4 are used as the models to compare various water quality enhancement strategies.

Channel Modification Simulations

The channel modification simulation assumed that the section underneath the Hughes Facility is reduced to a width of 3 feet. The hydraulic model was used with this modification to produce a set of depth-velocity values for use in the QUAL2E model.

The result for this set of simulations is shown in Figures 6.6-6.9. On each figure the base (Odor) case is plotted in blue with the modified case plotted in green. The red arrow corresponds to a point source located near Milby that represents all the unknown upstream inputs of BOD into the model. The grey arrow simply indicates the outfall location in the model. Flow is from left to right in the figures. The leftmost location is at Ennis and Lamar while the rightmost location is at Wayside Drive. The number on the figure (e.g. C370D) refers to the flowrate in gallons per minute. The letter codes correspond to various simulation types.

The only types of simulations plotted in this report are for odor cases.

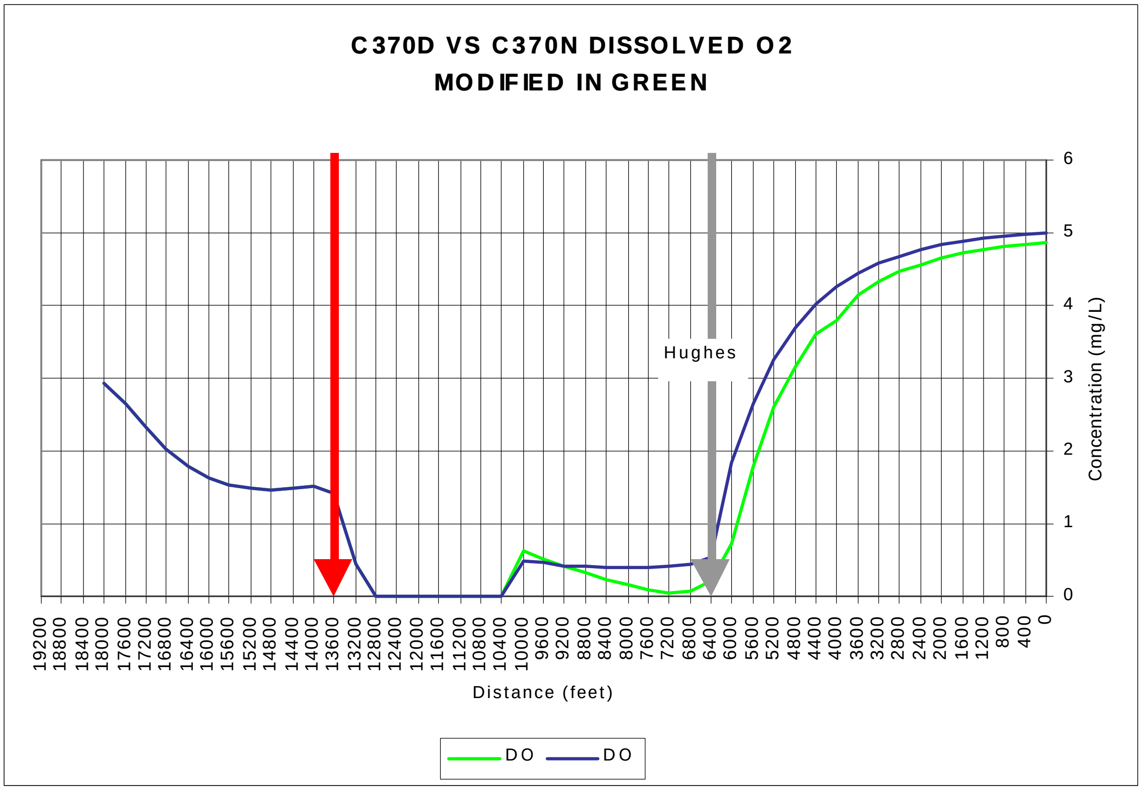


Figure 6.6. DO in system at Q=370GPM

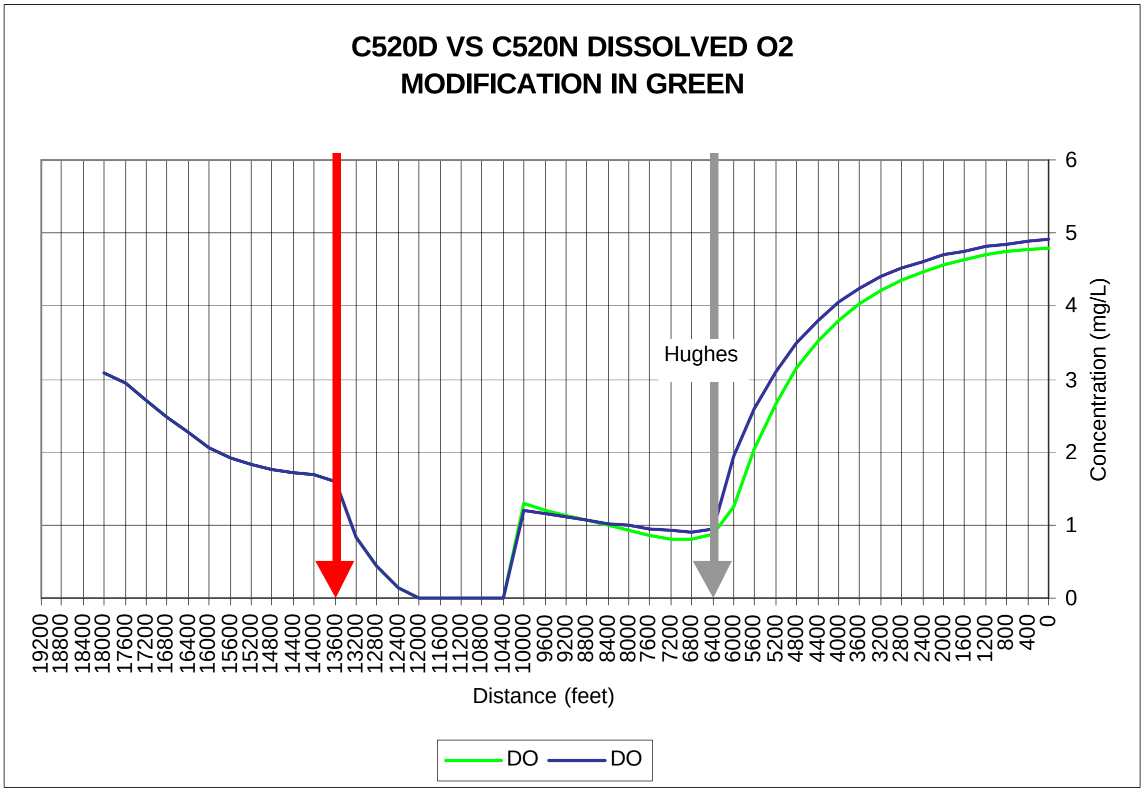


Figure 6.7. DO in system at Q=520GPM

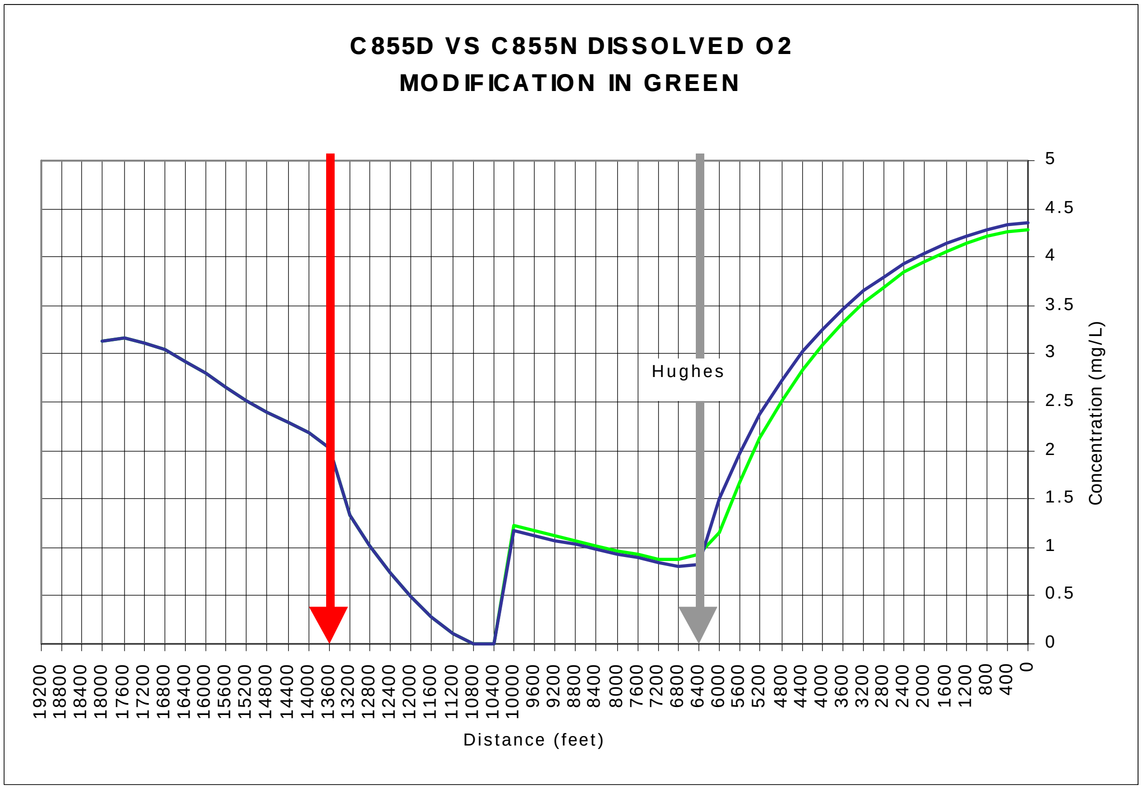


Figure 6.8. DO in system at Q=855GPM

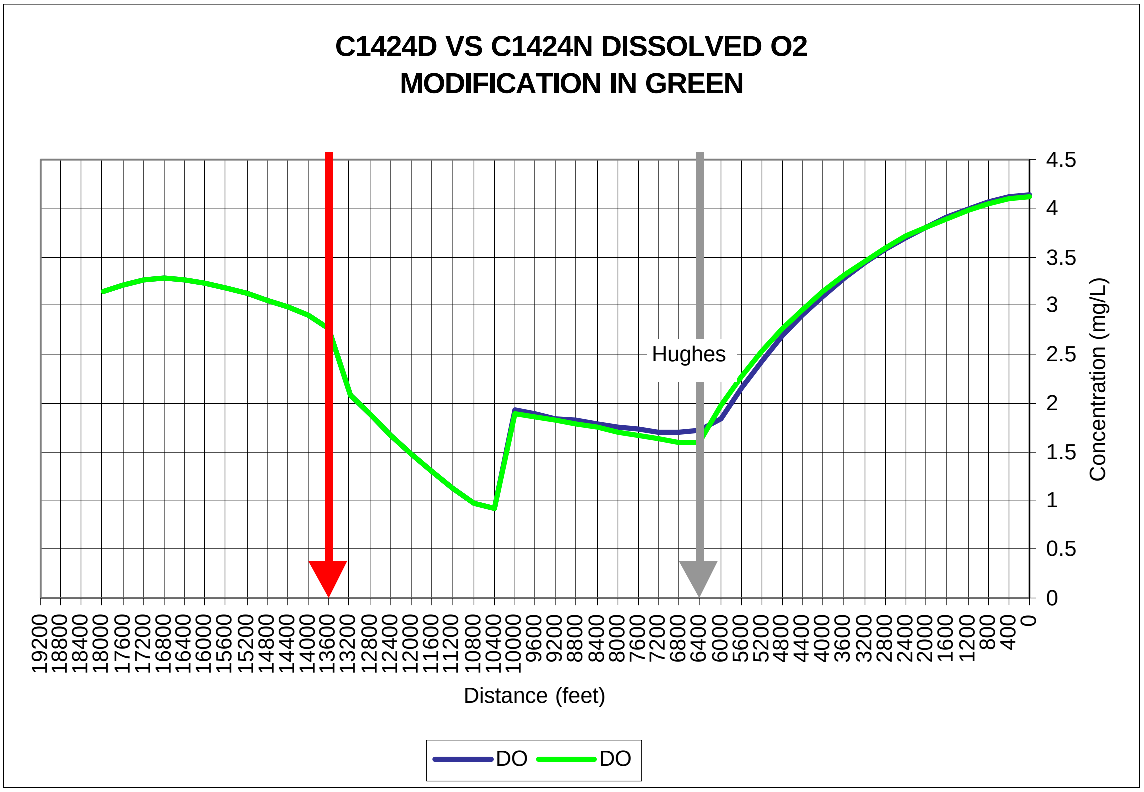


Figure 6.9. DO in system at Q=1424GPM

At the lowest flow the model predicts that a narrower channel actually makes the DO situation worse. Even at high flow the model predicts negligible improvement using the narrower channel, thus based on this model this strategy is not expected to be effective.

Scheduled Flow Augmentation Simulations

The scheduled flow augmentation strategy assumed that the flows were increased by 64 gpm at selected locations by release of water from a fire-hydrant. Two locations were studied with the model. The first location is upstream of the Altic street junction box, but downstream of the point load used to simulate the effect up upstream BOD loading in the drainage area. The second location is upstream of the point source. The two different locations were selected to determine if augmentation in the upper end of the drainage area produces a more improved water quality than augmentation in the lower (downstream) end of the watershed.

Figures 6.10-6.13 are plots comparing the odor baseline case with the augmented case at different system flow rates. Because the flow augmentation rate is constant the greatest impact occurs at the lowest system flow rate.

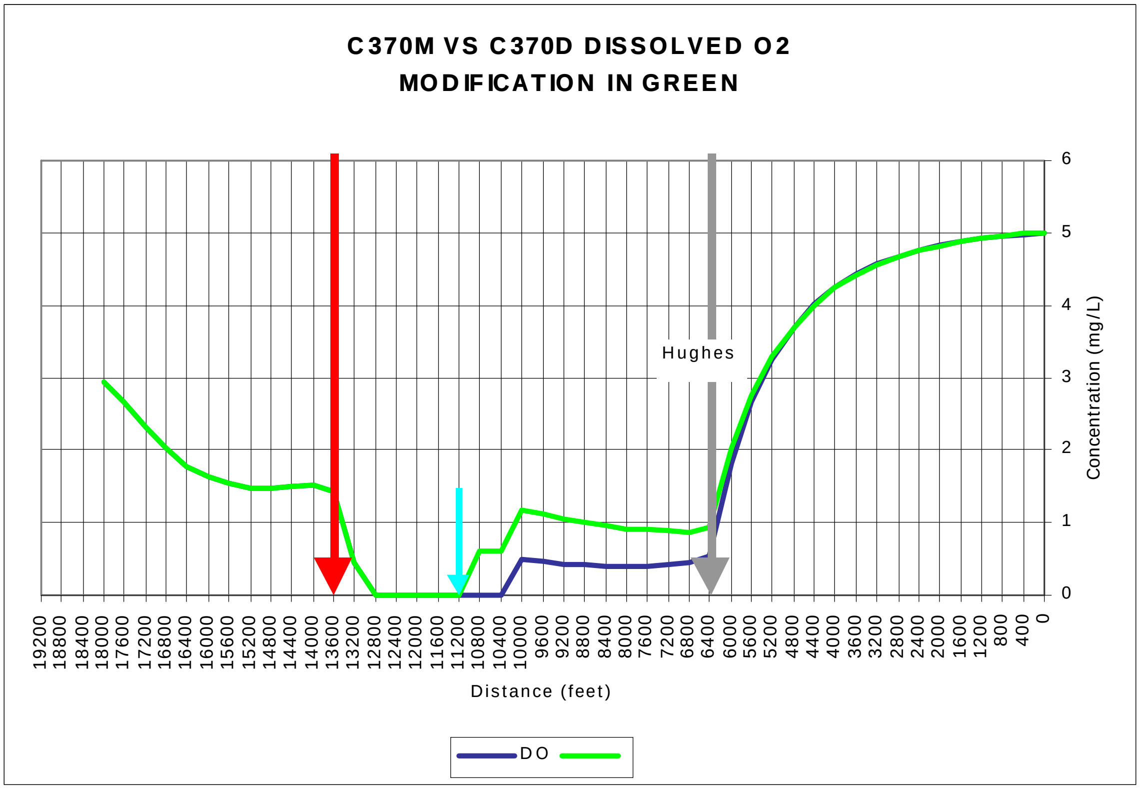


Figure 6.10. DO at Q=370GPM; Flow Augmentation near Altic St. Junction Box

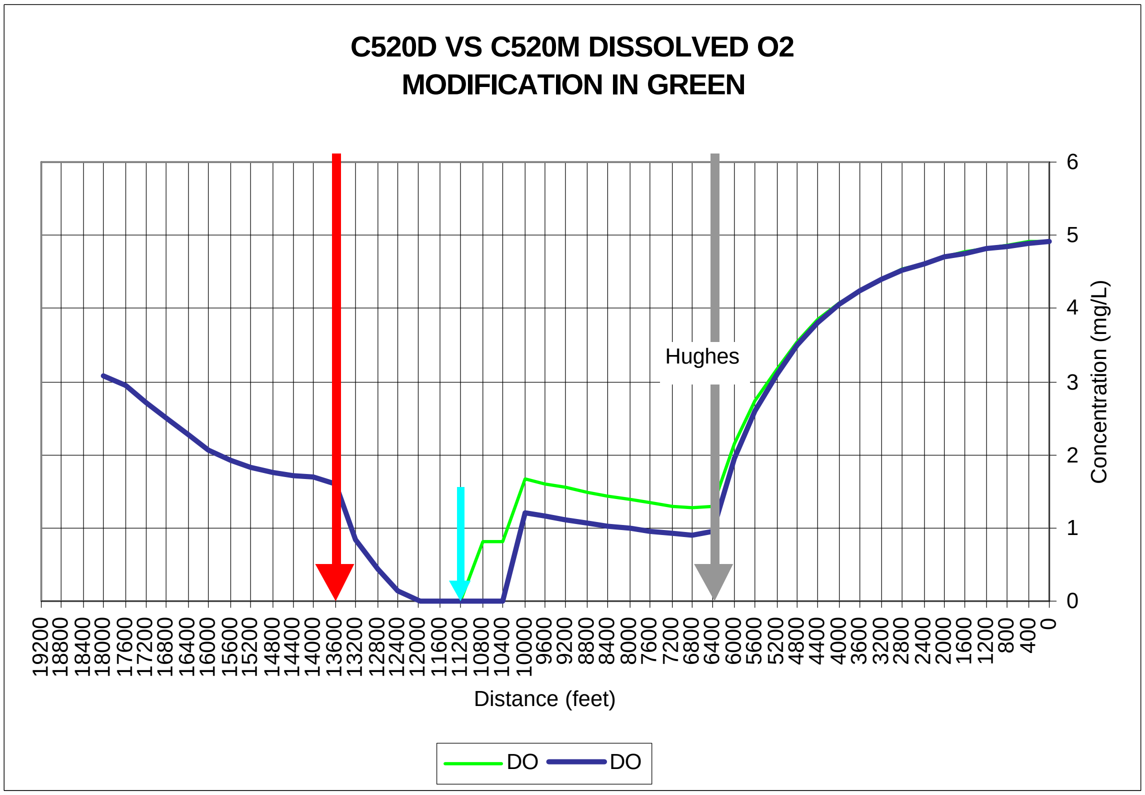


Figure 6.11. DO at Q=520GPM; Flow Augmentation near Altic St. Junction Box

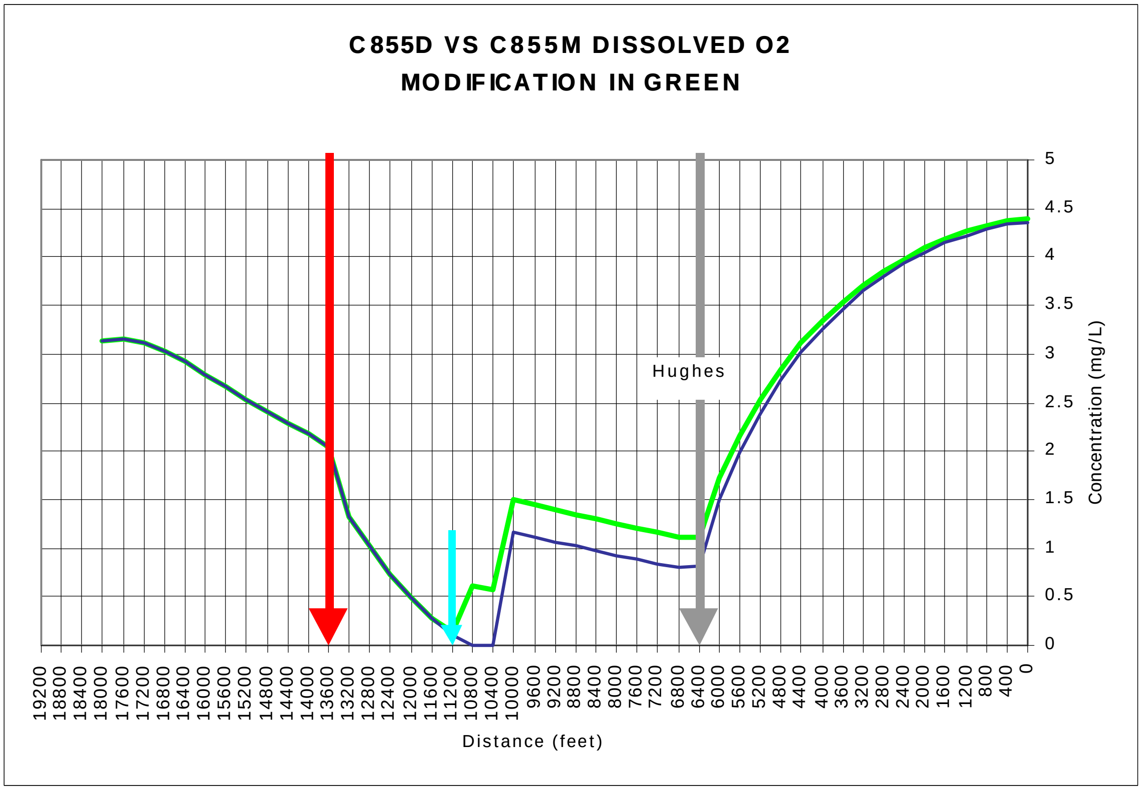


Figure 6.12. DO at Q=855GPM; Flow Augmentation near Altic St. Junction Box

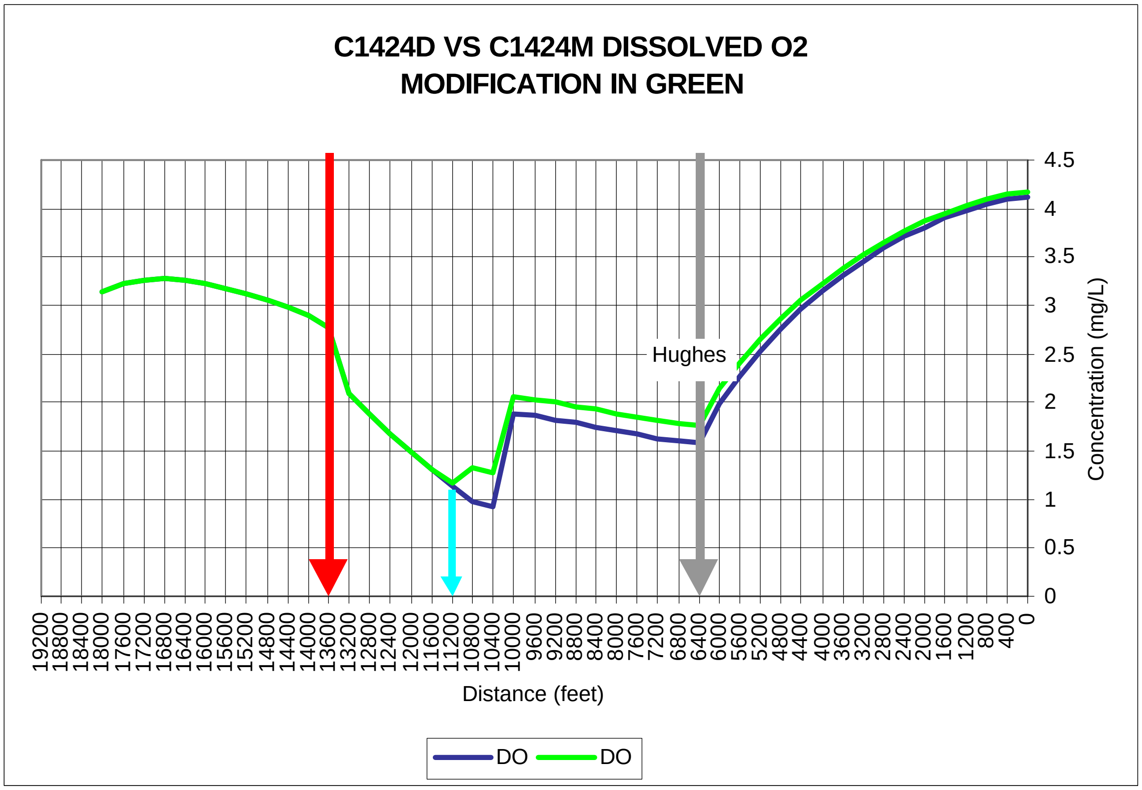


Figure 6.13. DO at Q=1424GPM; Flow Augmentation near Altic St. Junction Box

In all cases the model predicts that the addition of a small volume (4-20% of the total flow) of high quality (DO =5.5 mg/L) water improves the water quality at the Hughes Street outfall.

Figures 6.14-6.17 are a set of plots that present a similar set of simulations except the location of the flow augmentation has been moved upstream of the point source. These simulations represent flow augmentation near the upstream end of the drainage area, rather than just before the outfall.

Like the previous set of simulations the model predicts that the addition of a small volume (4-20% of the total flow) of high quality (DO =5.5 mg/L) water improves the water quality at the Hughes Street outfall. The amount of improvement is slightly less than the previous set of cases, however the results suggest that the location of the flow augmentation is unimportant (as long as it is upstream of the outfall). This insensitivity to input location is beneficial because multiple hydrants upstream of the outfall could be used.

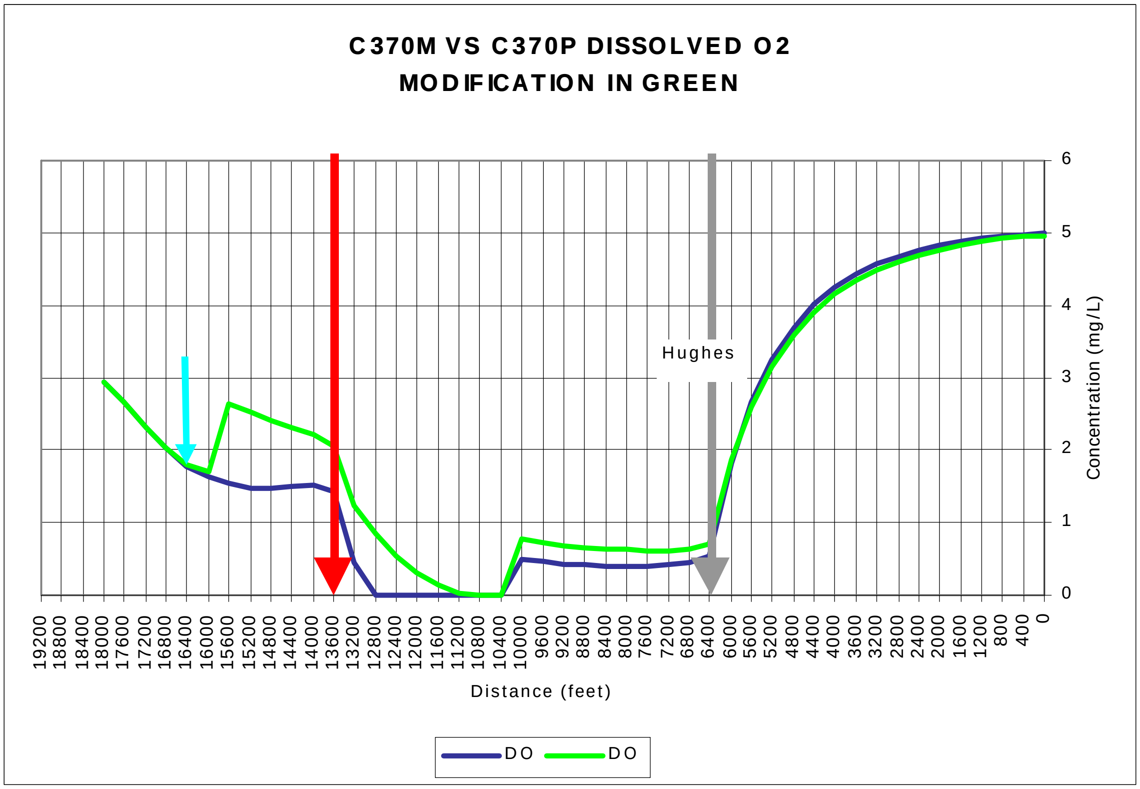


Figure 6.14. DO at Q=370GPM; Flow Augmentation between Ennis and Milby.

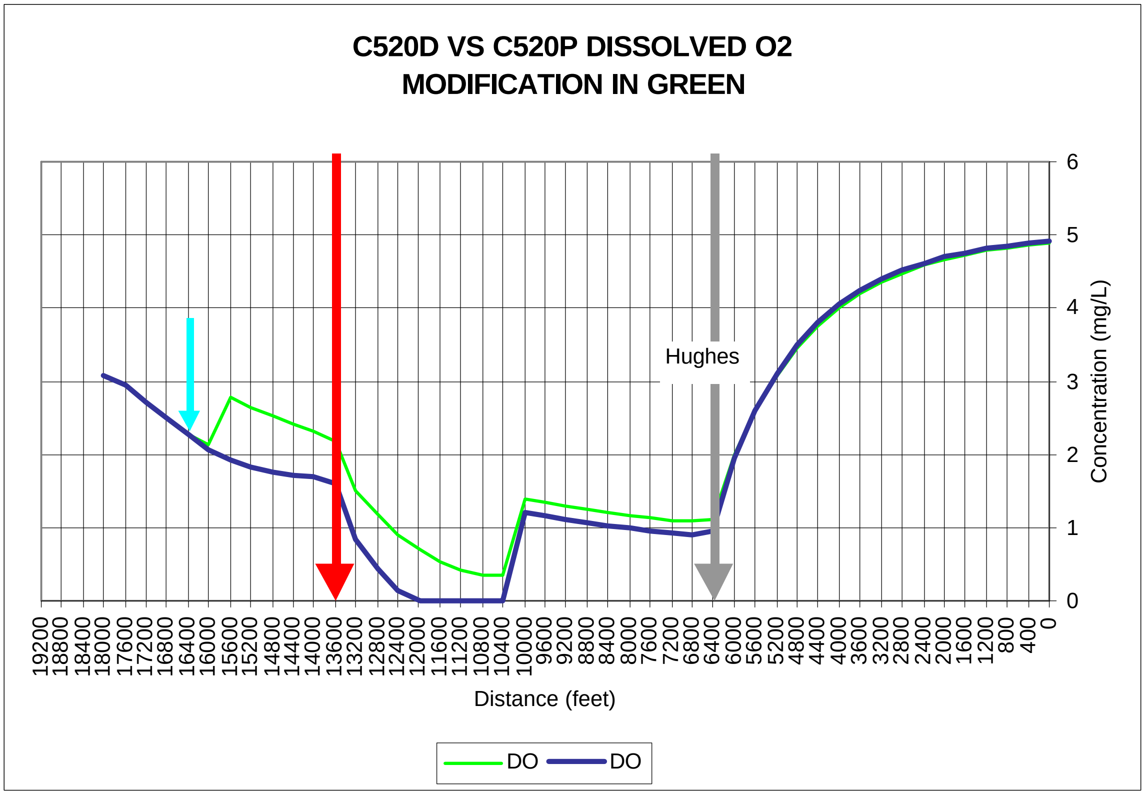


Figure 6.15. DO at Q=520GPM; Flow Augmentation between Ennis and Milby.

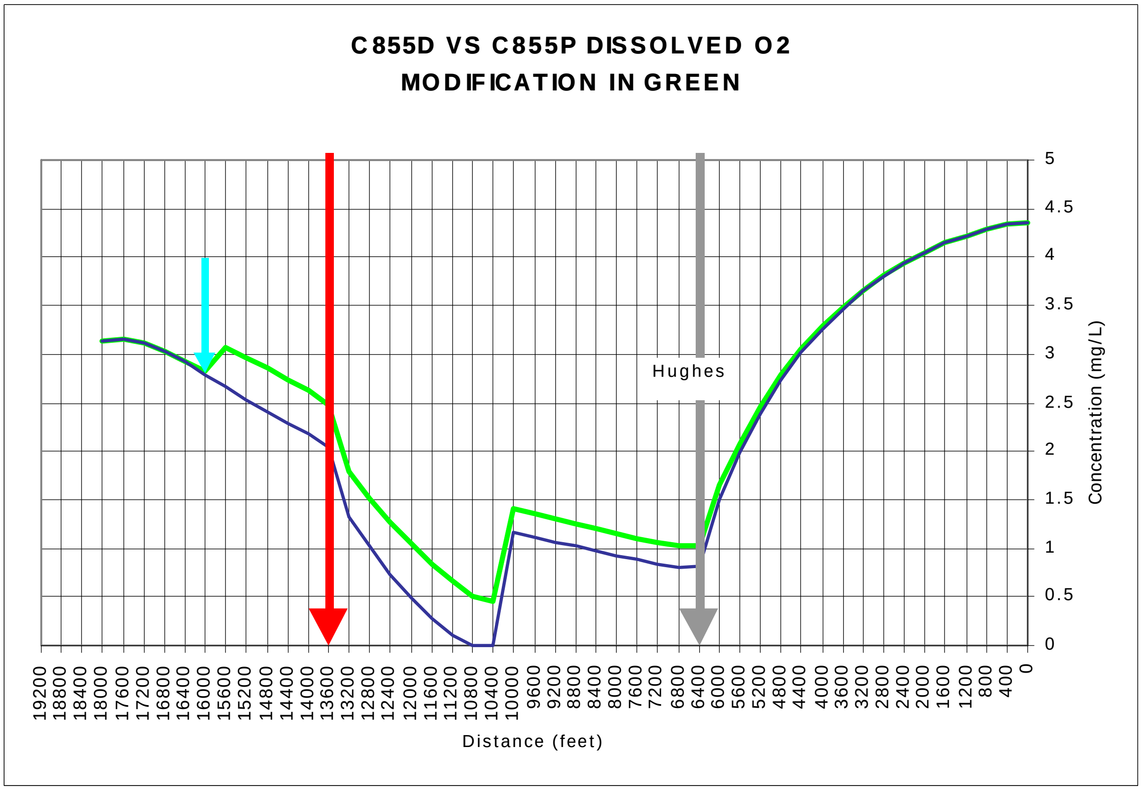


Figure 6.16. DO at Q=855GPM; Flow Augmentation between Ennis and Milby.

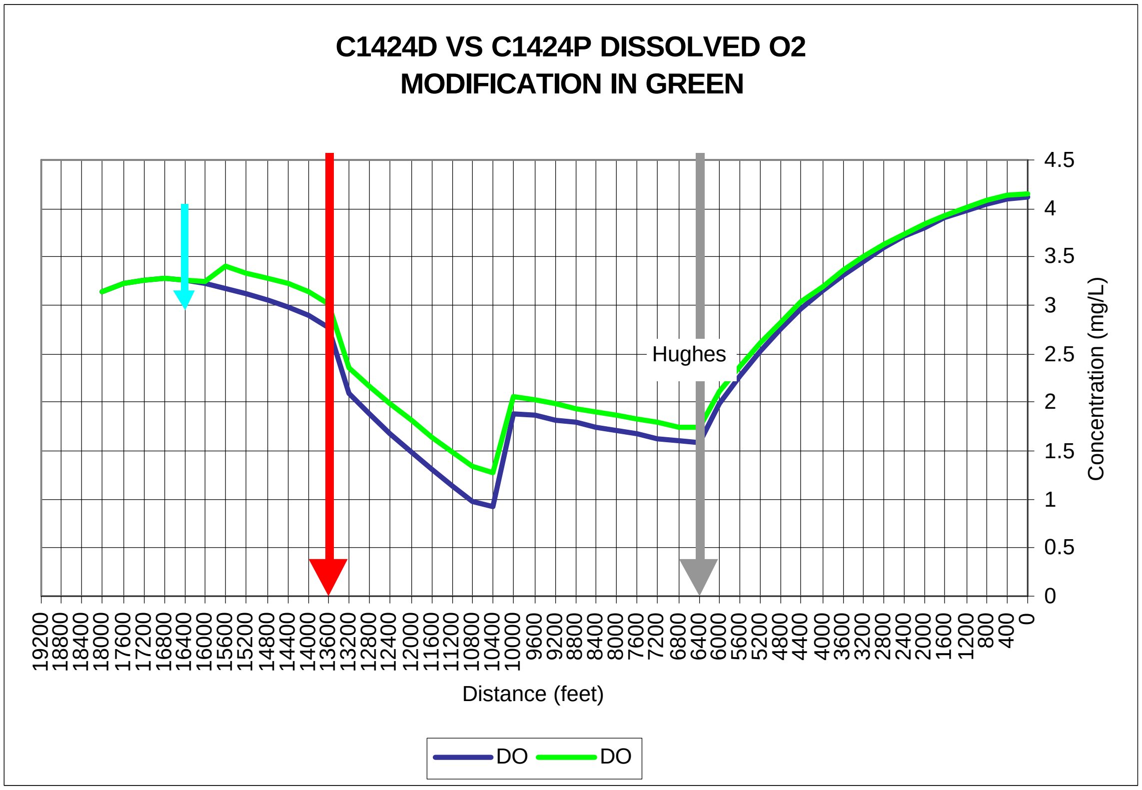


Figure 6.17. DO at Q=1424GPM; Flow Augmentation between Ennis and Milby.

Source Control (Reduced Input Loads) Simulations

Source control was simulated as fractional reductions in BOD loads at the point source without changing any other input in the computer model. Only the Q=855 gpm case is presented as the trends for this case would be consistent with trends for each modeled system flow rate.

The simulations used the odor baseline and the no-odor baseline as the two extremes. The no-odor case represents complete source control (100% reduction in input load). Figure 6.18 is a plot of these two extremes with two intermediate cases (50% and 75% reduction).

Assuming continued efforts achieve a 50% reduction in source magnitudes, one expects far more water quality benefit than either channel modification (negligible) or flow augmentation alone.

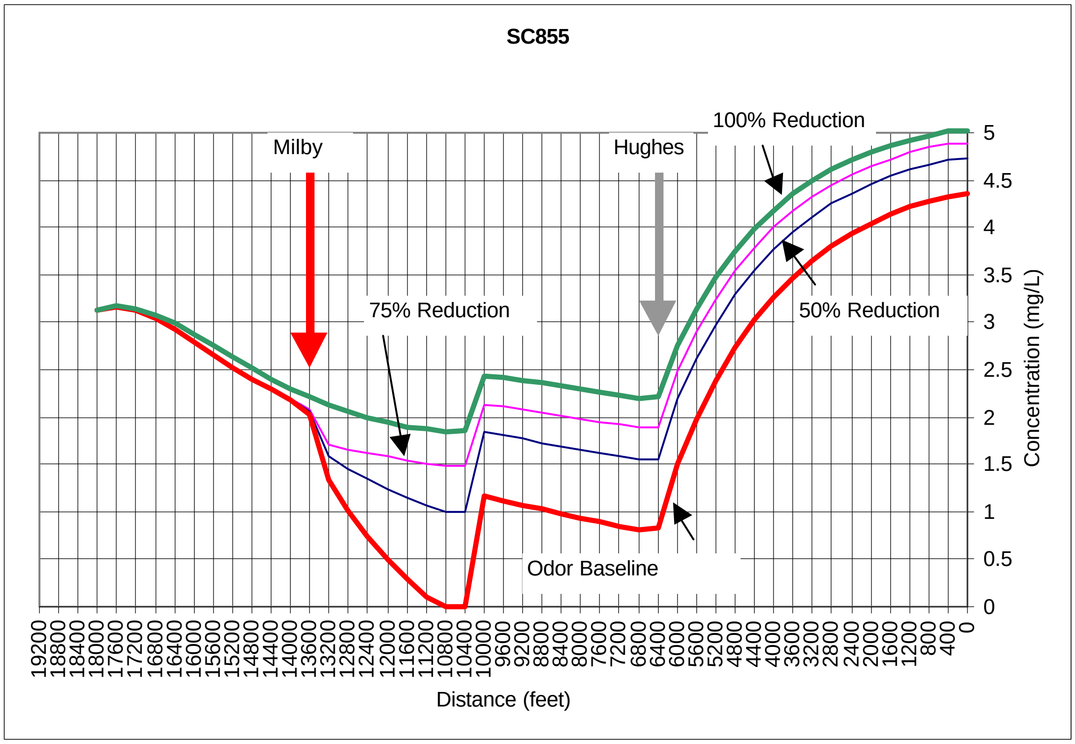


Figure 6.18 DO at Q=855 gpm; Various source load reductions.

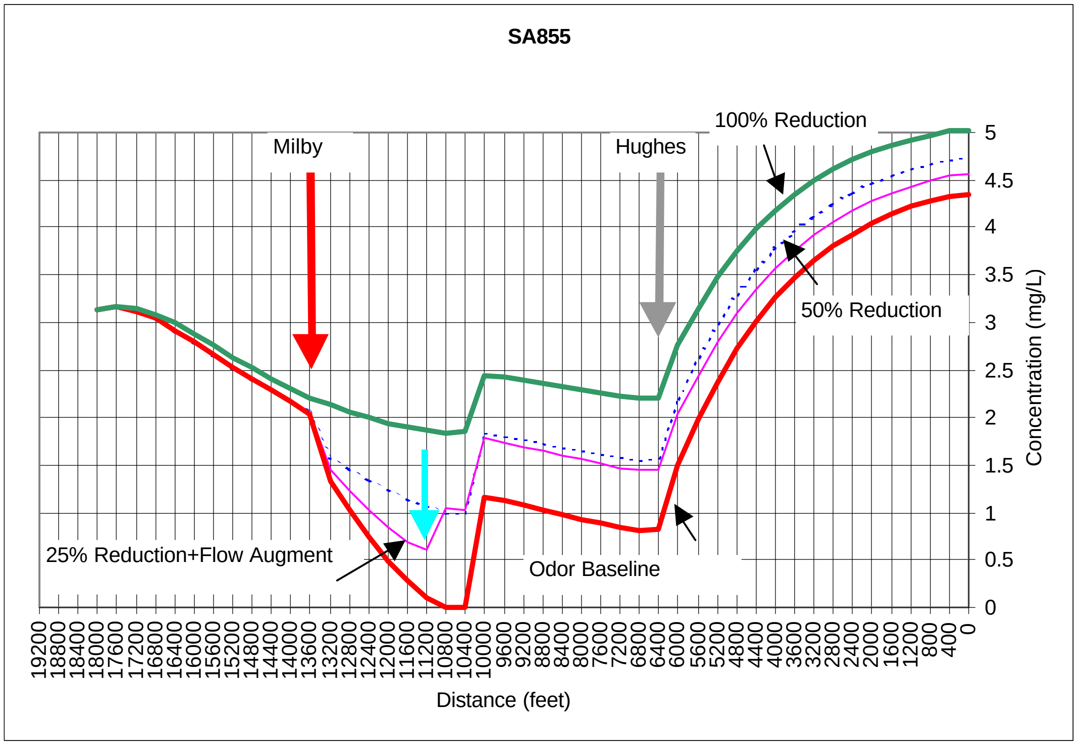


Figure 6.19 DO at Q=855 gpm; 25% Reduction in Combination with 64 gpm Flow Augmentation.

A reduction in source magnitude of 50% using field monitoring and enforcement may not be realistic.

An second set of simulations studied the effect if only 25% source control is achieved in combination with flow augmentation. Figure 6.19 plots the simulated water quality in this scenario. The result is that flow augmentation in combination with 25% source reduction can achieve nearly the same effect as 50% source reduction.

Re-aeration (Modify Re-aeration Coefficient in Covered Portion) Simulations

This strategy is modeled assuming that some efforts to improve mixing in the covered portion between the Altic St. junction box and the outfall, increases the re-aeration in this reach. The increased re-aeration is modeled by assuming that the re-aeration coefficient is increased by 10% and 50%, respectively. Figure 6.20 is a plot comparing the Q=855 gpm baseline case and the increased re-aeration case.

The 10% increase in the Hughes Facility section improves the water quality at the outfall while the 50% increase produces a dramatic increase. In both cases although the DO in the water is predicted to be higher, the BOD loading is unchanged and the sediment oxygen demand is the same so that downstream of the outfall the conditions approach the baseline conditions.

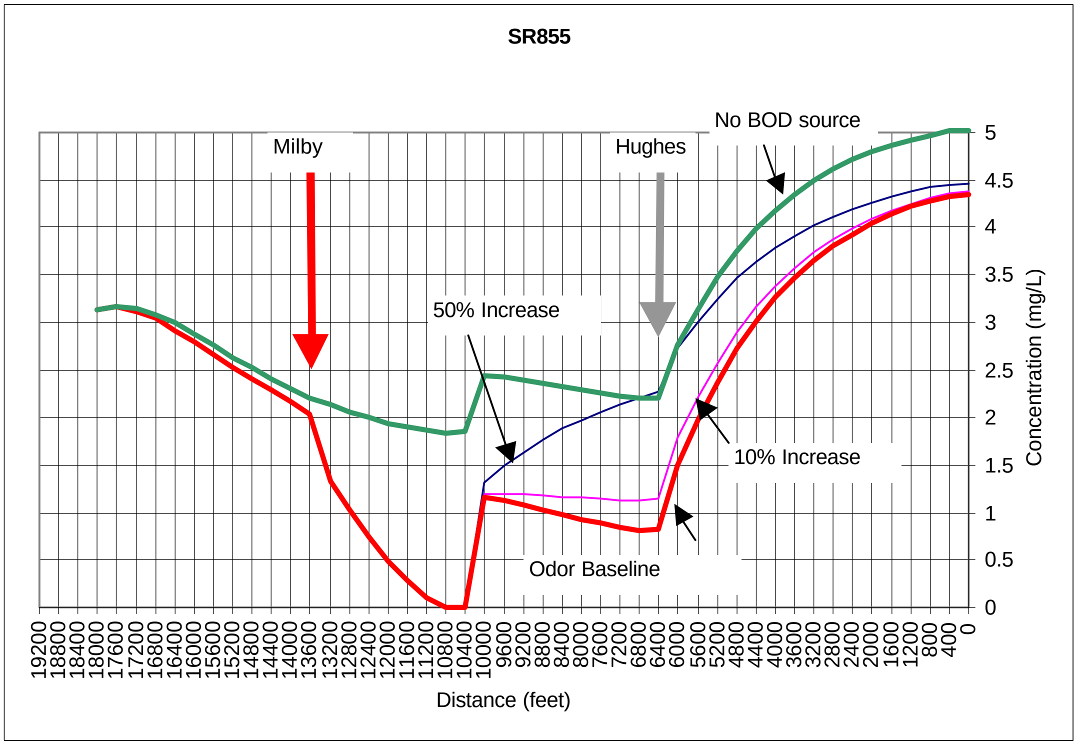


Figure 6.20 DO at Q=855 gpm; Increased re-aeration is section upstream of Hughes.

Summary

The computer model was used to evaluate the feasibility of several intervention strategies that could be applied on Country Club Bayou. Table 6.6 lists the predicted values of DO at the Hughes Street Outfall for the different intervention strategies.

Table 6.6 Water quality predictions for various strategies.

	DO(mg/L) at Hughes									
Discharge (gpm)	Base Case	Channel Modification	Flow Augment at Altic	Flow Augment at Milby	100% Source Reduce	75% Source Reduce	50% Source Reduce	25% Source Reduce + Augment at Alt	5% Increase in reaeration	50% Increase in reaeration
370	0.54	0.21	0.93	0.7						
520	0.96	0.89	1.3	1.11						
855	0.82	0.92	1.12	1.02	2.21	1.91	1.56	1.44	1.15	2.28
1424	1.59	1.72	1.77	1.74						
2800	0.77	0.87	1.08	0.98						

Based on the computer predictions the channel modification option only marginally improves water quality (measured as DO at Hughes), and would be costly to implement. Flow augmentation at either location provides a good improvement in water quality at all flows simulated. The insensitivity of location means that many different hydrants can be identified if this strategy is implemented.

Source control is predicted to have the most improvement, however it is not possible to predict how much source control can be achieved by vigorous monitoring and enforcement. A combination of a lower degree of source control and flow augmentation can produce results similar to a more rigorous source control alone.

Artificial addition of air into the system under the Hughes facility can also achieve good results, however it is not possible to predict what a reasonable estimate of aeration increase can be achieved using the computational tools in this research.

7. Conclusions and Recommendations

Conclusions

This research tested strategies and evaluated potential effectiveness in improving water quality on Country Club Bayou. Pollution of the bayou has been problematic for at least a dozen years. Currently suspected high organic loading in the upstream covered portion of the bayou contributes to observed low dissolved oxygen values, septic odor conditions, and septic (black) color in the bayou water. Attempts at eliminating the sources of organic loading to the bayou have not produced an obvious increase in water quality. Despite repair of numerous sewage leaks and reductions in industrial discharges, septic odor and low dissolved oxygen conditions continue to exist. Investigation of other options for improving water quality became necessary, thus providing impetus for this project.

The investigation included field monitoring of selected water quality parameters, a series of dye tracer studies, and a computer simulation of water quality to evaluate possible intervention strategies.

The field-monitoring program was conducted to collect water quality data that could be used to calibrate a computer model of the bayou and to develop a database that could be used to interpret the relative health of the bayou, and any quantifiable cause-effect relationships.

The hydraulic model was difficult to calibrate because simulated channel slopes much smaller than expected were needed to fit the observed flow depths. The presence of debris in the covered portion underneath the Hughes facility is documented in video surveys. The presence of these “sand bars” contributes to the poor flow conditions beneath the Hughes facility and cleaning of this section of storm sewer should be considered.

When septic odor conditions are prevalent, DO and BOD levels are significantly different than during non-odor conditions. The elevated BOD indicates that some source (commercial wash water, industrial discharge, etc.) supplies an additional organic load to the bayou that in-turn depresses the DO. Odor likely results when this mixture sits relatively stagnant under the Hughes facility. The sediment in this covered reach exerts an oxygen demand as well and because the water is moving slowly, vertical mixing does not occur. The sediment is postulated to become anaerobic and sulfate reducing bacteria in this zone produce sulfide that contributes to the odor.

The mean values of DO and sulfate meets existing or proposed state water quality standards for an unclassified stream. The fecal coliform (FC) values do not. Only about 25% of the FC values measured in this research meet the current standard (2000 cfu/100mL).

Based on a series of tracer studies the travel time in the covered portion is on the order of several hours upstream of the junction box at Altic Street. The covered portion from Altic St. to Hughes has a remarkably long travel time for the distances involved (on the order of one day). The large width of this section of bayou (box culverts) allows relatively small changes in depth to store large volumes of flow and thus upstream flow changes are passed through this section undetected. Even the highest flow event measured during this study had a travel time through this portion of the system on the order of one day. This stagnant water in the section between Altic and Hughes contributes to odor conditions.

A *change* in water quality occurs between Evergreen Cemetery and Hughes Street. Between these two locations the DO declines, the ammonia increases, and the BOD declines. The BOD decline is diagnostic because it suggests that the bayou has assimilative capacity and that there is either no source between these two location or there is significant dilution by some unknown source of water. These changes are greater between these two locations than elsewhere in this study, and this section of bayou corresponds with the stagnant section just described.

A computer model of the water quality of Country Club Bayou was developed to predict the effect of selected intervention strategies developed over the course of the research by the research partners. Several “brainstorming” meetings developed six plausible intervention strategies. Table 7.1 is a list of these six strategies with notations on the author’s perceived complexity, estimated cost, and reliability.

Table 7.1 Intervention Strategies for Country Club Bayou

Strategy	**Complexity**	**Cost**[1]	**Reliability**	**Modeled**
Channel modification	Complex	\$500,000[a]	Low	Yes
Mechanical/chemical aeration	Complex	High	Unknown	Yes
Constructed wetland	Complex	Unknown	Unknown	No
Flow augmentation	Simple	\$185,000[b]	High	Yes
Divert low flow to treatment	Simple	\$350,000[c]	High	No
Source control	Moderate	\$250,000[d]	Moderate	Indirectly

[1] Cost estimate basis: Costs are totals for five years of service.

a) Channel modification: 0.5 miles of underground construction. Assume cost is 1 million dollars/mile. Cost of channel modification is estimated to be at least \$500,000, excluding maintenance.

b) Flow augmentation: Assume water for augmentation costs \$2.00/1000 gallons. Then the estimated cost for five years of continuous augmentation is about \$185,000.

c) Diversion to treatment: Assume installation of a lift station to pump 1000 gpm into the sanitary system is \$100,000. Assume diversion operating costs are \$0.10/1000 gallons. Estimated cost for five years is \$350,000.

d) Source control: Assume that the University expenditures represent one-half the costs that would be incurred by the City of Houston (monitoring, enforcement, follow-up) The estimated annual cost to maintain the level of effort at that of September 1999 is \$50,000/year.

Based on the model’s predictions, the channel modification option only marginally improves water quality (measured as DO at Hughes), and would be costly to implement. Flow augmentation at either location provides improvement in water quality at all flows simulated. The insensitivity of location means that many different hydrants can be identified if this strategy is implemented. Figure 7.1 identifies several possible locations along the bayou alignment (not shown) that could be used for flow augmentation.

It is difficult to predict how much improvement in water quality can be can be achieved by source control. Vigorous monitoring and enforcement have achieved limited success in the past. A combination of a lower degree of source control and flow augmentation can produce results similar to a more rigorous source control alone. Nevertheless, continued source control will reduce organic loading to the bayou and is recommended.

Source control by the methods assumed in this research (monitoring, enforcement, and follow-up) is unlikely to be able to achieve a high-percentage source reduction. If structural methods were employed (packing undocumented lateral connections to the storm sewer) a higher reduction could be achieved. However, even with structural controls, there will still be inputs to the storm system containing pollutants, some of these intentional because of archaic or ignorant business practices. These remaining inputs will still require some level of monitoring and enforcement to control.

Artificial addition of air into the system under the Hughes facility may also improve water quality, however it is not possible to accurately predict the improvement using the computational tools in this research. The approach used in this work was to adjust a re-aeration parameter, which is, at best, a crude surrogate for actual simulation of artificial addition of air.

Figure 7.1 GIMS map of possible hydrant locations for flow augmentation.
(Blue lines are approximate alignment of Bayou)

Flow augmentation is predicted to be effective at relatively small volumes (70 gpm). Figure 7.1 is a map of candidate hydrants for flow augmentation near the downstream portion of the covered section. The computer program is a steady-state program so the duration of augmentation on an as-needed basis cannot be evaluated. Based on the travel time study, one could expect that the bayou would respond to augmentation within a day, and during the augmentation period, an effort to locate and eliminate the pollutant source could be employed. Thus, augmentation may only be needed for symptomatic treatment only a few days during any particular odor episode.

Recommendations

Routine monitoring continued enforcement (source control), flow augmentations, and cleaning of portions of the bayou are recommended for long-term management of water quality on Country Club Bayou.

Routine water quality monitoring should be conducted monthly at Evergreen Cemetery, Hughes Street Bridge, and at Wayside Drive. Department of Health and Human Services (DHHS) personnel could conduct this monitoring because DHHS has the authority to conduct enforcement activities and currently is a responsible agency for water quality monitoring in the City of Houston.

The water should be analyzed in the field for temperature, pH, dissolved oxygen, ammonia and sulfide. The last three parameters require special equipment, but the equipment is rugged and reasonably inexpensive. Water samples should be collected and analyzed for CBOD and Fecal Coliform. Depressed DO or elevated sulfide or elevated ammonia should be investigated immediately to identify possible sources. Table 7.2 lists the water quality measures and alert values based on data collected in this research. The alert values represent the mean values from data collected during odor episodes, or estimates of values indicative of odor conditions. If alert values are exceeded, flow augmentation and source control procedures should be implemented as described below.

Table 7.2 Water Quality Alert Values

Measurement	Value	Recommended action
Dissolved Oxygen[1]	<1.0 mg/L	search for pollutant source; consider flow augmentation
Ammonia[1]	>1.5 mg/L	search for pollutant source
Sulfide[1]	>0.15 mg/L	search for pollutant source; rotten egg odor should be present; bottom sediment should be black; consider flow augmentation.
Spheratolis (filaments)[1]	visible	search for pollutant (sanitary) source
Fecal Coliform	>200[2] >10,000[3]	begin search for sanitary source; industrial source possible.
CBOD	>15 mg/L[3]	begin search of pollutant source

[1] Field measurement; assumes instrument(s) available

[2] State value

[3] Practical value based on data collected in this project.

Because CBOD and Fecal Coliform require laboratory analysis, immediate investigation is not possible. Elevated CBOD and Fecal Coliform should be investigated in a follow-up visit to attempt to identify possible sources of these pollutant indicators.

Non-routine monitoring in response to complaints should collect these same data and consider the same response procedures. Non-routine monitoring events should include samples at the routine monitoring locations. These extra samples can be analyzed to develop updated alert values for triggering an aggressive investigation.

Current enforcement activities should continue. These activities include education of the various industries in the watershed that may engage in practices that carry wash water and process water to the storm sewer rather than to the sanitary collection system. Past examples of known negligent business practices in the Country Club Bayou watershed include: ice melts from a fish processor, wash water from a dairy; wash water from a bulk sweetener processor, wash water from a commercial bus operator, and sanitary sewer leaks. When the DHHS monitoring personnel identify a source they can immediately contact the owner/operator in an attempt to remove the source. If the source is a sanitary system excursion, then the Customer Response Center (CRC) (713-837-0600) should be contacted so that the excursion can be repaired. Follow-up of identified sources is required to confirm that the sources are removed and excursions repaired. In the event sources are not removed, the DHHS can follow existing protocol to use citations and other administrative tools to achieve compliance.

Flow augmentation supplements this monitoring and enforcement effort by providing a tool to address low water quality by a short-term intervention. When a contaminant source is identified that has degraded the water quality, an augmentation release can be used to temporarily improve the water quality while the source is being eliminated. When flow augmentation is used, the water should be released near the location where the alert level water quality parameter was detected. The release amount and duration should follow the routine release protocol below. The bayou segment between the release location and the alert location should be inspected to be sure that there is not a pollutant source between the release point and the sampling point, otherwise the source will be undetectable. Investigation should proceed upstream of the release point until the source can be located, or the source appears to have stopped.

In addition to symptomatic flow augmentation releases, a scheduled approach is recommended to release augmentation water after a prescribed period without rainfall to serve as an artificial “storm” event. This “artificial storm” will keep the bayou water refreshed with high quality water regardless of the current water quality of the bayou. The actual waiting period and release duration would best be determined by trial and error. A suggested protocol to start is listed.

1. Release rate: 70 gpm
2. Duration: 3 days, maximum
3. Frequency: every 15 days without measurable rainfall

4. Monitoring: DO at Hughes, should observe increase after 24 hours.

This protocol should be adjusted by trial and error to determine the most effective release frequency and duration. For example, more frequent, higher flow-rate, or longer duration releases should be attempted if the suggested release protocol results in continued water quality and odor problems. Less frequent, lower flow-rate, or shorter duration releases could be tested if the suggested approach is successful. The release frequency may vary seasonally. If trial-and-error indicate continuous release is necessary, then more aggressive source control is indicated.

One final recommendation is related to the physical structure of the drainage system itself. A cleaning of the storm sewer between the Altic St. Junction Box and Hughes Street bridge is recommended to remove the blockages to flow that may contribute to stagnation in this area.

Implementation Funding

Currently funding sources appear to exist for some of the recommendations, including the following:

- Investigations by DHHS (ongoing)
- Routine water quality monitoring (DHHS through agreement with HGAC)
- Investigation and repair of sanitary sewer excursions (ongoing via City of Houston maintenance quadrants)

No funding sources are identified for flow augmentation or for cleaning the storm sewer between Altic Street and Hughes Street. None of the parties in this research project including the City of Houston's Wastewater Operations Division, The DHHS, and the TNRCC demonstrate obvious responsibility for funding these recommendations. A cooperative approach will be necessary for any funding applied to address Country Club Bayou's long term water quality management.

An alternative that appears to be gaining favor in recent regulatory documents is the watershed approach to water quality. The complexity of the responsibilities within the City's current structure for even this small area lends some credence to the watershed concept where the entire services are integrated instead of separated along historical disciplinary lines. An integrated service could probably charge an assessment to fund water quality management based on past and current expenditures within the watershed to address water quality problems. This assessment would create an economic incentive to reduce source contributions to lower the assessment rate as the magnitude and frequency of low water quality events is reduced. Non-government organizations could be funded to provide the educational services to reduce the source loads and ultimately reduce the need for the assessment. Such arrangements are beyond the scope of this research and the author's expertise but could be considered in planning the implementation.

8. References

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Appendix – I Discharge Measurements in Open Portion of Country Club Bayou.

The measurement of discharge is accomplished by measuring flow velocity near the surface of the water, and measurement or estimation of flow depth and flow width. Simple channel geometry is assumed for making discharge calculations.

A correction factor is applied to the velocity measurement to approximate the mean section velocity. The correction factor was determined by graphical analysis of the velocity distributions for the trapezoidal and the shallow ditch in Figure A.1 below.

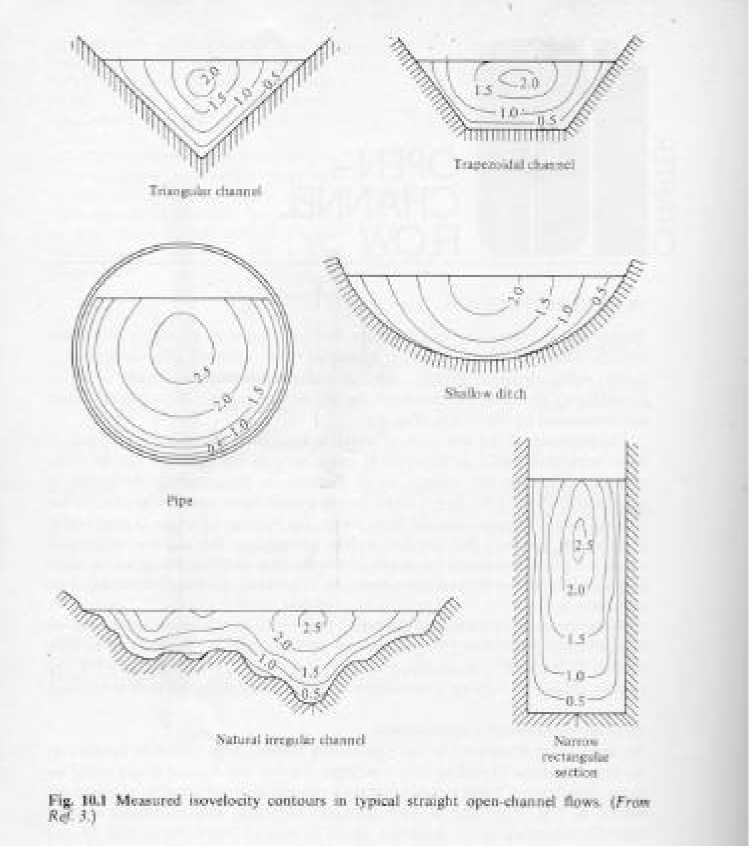
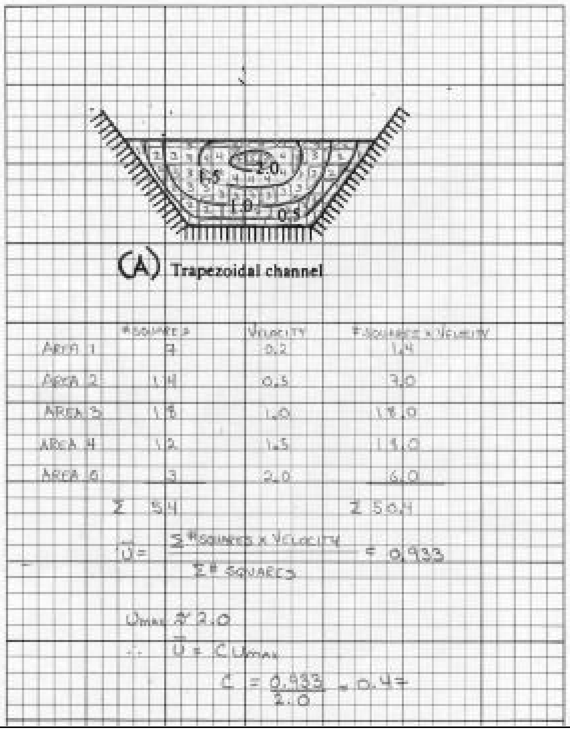


Fig. 10.1 Measured isovelocity contours in typical straight open-channel flows. (*From Ref. 3.*)

Figure A.1 Velocity Distributions in Open Channels
(from F.M. White, 1979. Fluid Mechanics, McGraw Hill, New York p598)

The graphical analysis is performed as follows. The velocity distribution in Figure A.1 was transferred to graph paper and the areas between the iso-velocity contours were determined by counting the number of squares in the inter-contour panels. The product of the lower iso-velocity value and the panel area represents the proportion of discharge in the channel contributed by the panel. These discharges are summed for all the panels, then the ratio of this sum and the total area of all panels represents the equivalent mean section velocity. The ratio of this mean velocity and the maximum velocity near the centerline of flow is the correction factor used to convert maximum (measured) velocity to mean section velocity for computation of discharge from the field data. Figures A.2

and A.3 show this graphical approach applied to a trapezoidal and a shallow ditch section. The other sections were not analyzed because they are not relevant to application on Country Club Bayou.



	#SQUARES	VELOCITY	#SQUARES x VELOCITY
AREA 1	7	0.2	1.4
AREA 2	14	0.5	7.0
AREA 3	18	1.0	18.0
AREA 4	12	1.5	18.0
AREA 6	3	2.0	6.0
Σ	54		Σ 50.4

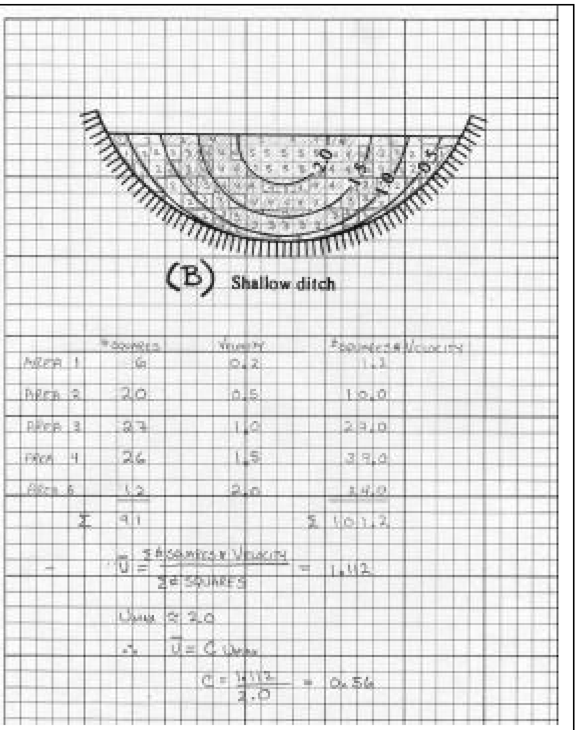
$\bar{U} = \frac{\Sigma \text{ \#SQUARES x VELOCITY}}{\Sigma \text{ \# SQUARES}} = 0.933$

$U_{MAX} \cong 2.0$

$\therefore \bar{U} = C U_{MAX}$

$C = \frac{0.933}{2.0} = 0.47$

Figure N.2 Graphical Analysis for a Trapezoidal Channel Section.



	#SQUARES	VELOCITY	#SQUARES x VELOCITY
AREA 1	6	0.2	1.2
AREA 2	20	0.5	10.0
AREA 3	23	1.0	23.0
AREA 4	26	1.5	39.0
AREA 6	12	2.0	24.0
Σ	91		Σ 101.2

$\bar{U} = \frac{\Sigma \text{ \#SQUARES x VELOCITY}}{\Sigma \text{ \# SQUARES}} = 1.112$

$U_{MAX} \cong 2.0$

$\therefore \bar{U} = C U_{MAX}$

$C = \frac{1.112}{2.0} = 0.56$

Figure N.3 Graphical Analysis for a Shallow Ditch Section.

The correction factors from these two sections range from 0.47 to 0.56. The value selected based on analyst judgement for the Country Club Bayou flow measurements is 0.52. This correction factor allows a single velocity measurement at the fastest portion of the flow field to provide an estimate of total section discharge.

Using this correction factor, the procedure to measure flow in Country Club Bayou is the following:

1) Determine flow section depth and width. Record these values and the associated units (feet, inches, etc.) The simplest geometry is rectangular, and all calculations in the field notebook assumed this section geometry. The product of these two measurements is the flow area, A. $A = d \times w$

2) Measure velocity in the center of the flow field by either the velocity meter or using a drift tracer. Record the measurement as feet per seconds (e.g. using a three foot floating ruler and a drift tracer, one might record 3 feet / 14 seconds - the conversion to feet per second can be done in the office).

3) Compute discharge as the product of velocity, depth, and width. This computation will produce a flow rate in cubic feet per second. $Q = U \times A = U \times d \times w$

4) Multiply the discharge by the correction factor. $Q_c = C \times Q = 0.52 \times Q$

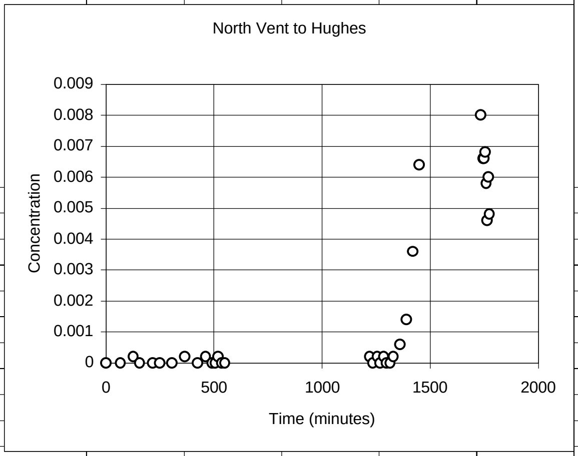
5) Convert the corrected discharge to gallons per minute.

$$Q_{gpm} = Q_{c-cfs} \times \frac{7.48 gal}{cu.ft.} \times \frac{60 \sec}{\min}$$

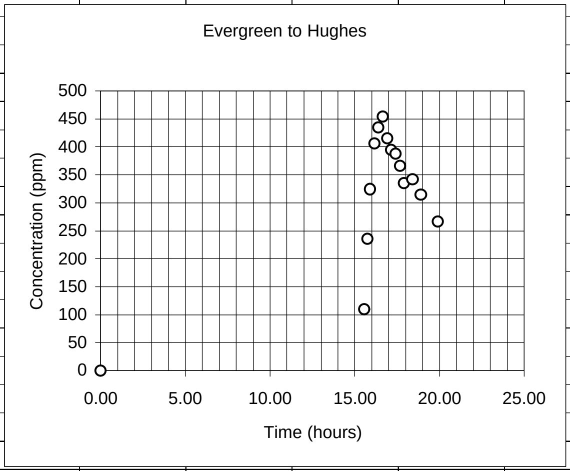
Appendix II Tracer Studies

Part 1: Data for various tracer studies

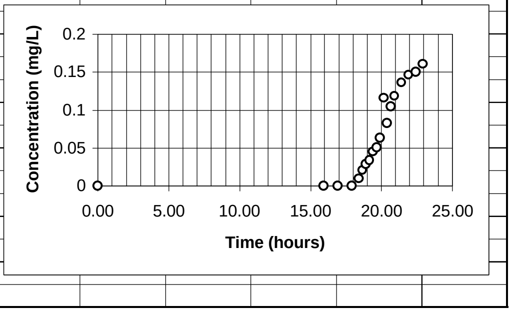
	A	B	C	D	E	F	G	H	I	J	K
1	Tracer Study #1 North Vents to Hughes Street										
2	Date:										
3	Time(minues)	SampleID	Reading	Concentration (mg/L)							
4	0.0001	H Back	0	0							
5	67	H 1057	0	0							
6	126	H 1156	1	0.0002							
7	156	H 1226	0	0							
8	217	H 1327	0	0							
9	249	H 1359	0	0							
10	306	H 1456	0	0							
11	365	H 1555	1	0.0002							
12	425	H 1655	0	0							
13	461	H 1731	1	0.0002							
14	491	H 1801	0	0							
15	505	H 1815	0	0							
16	520	H 1830	1	0.0002							
17	535	H 1845	0	0							
18	550	H 1900	0	0							
19	1220	H 5/7 061	1	0.0002							
20	1235	H 0625	0	0							
21	1255	H 0645	1	0.0002							
22	1270	H 0700	0	0							
23	1285	H 0715	1	0.0002							
24	1300	H 0730	0	0							
25	1315	H 0745	0	0							
26	1330	H 0800	1	0.0002							
27	1360	H 0830	3	0.0006							
28	1390	H 0900	7	0.0014							
29	1420	H 0930	18	0.0036							
30	1450	H 1000	32	0.0064							
31	1735	H 1445	40	0.008							
32	1745	H 1450	33	0.0066							
33	1750	H 1455	33	0.0066							
34	1755	H 1500	34	0.0068							
35	1760	H 1505	29	0.0058							
36	1765	H 1510	23	0.0046							
37	1770	H 1515	30	0.006							
38	1775	H 1520	24	0.0048							
39											



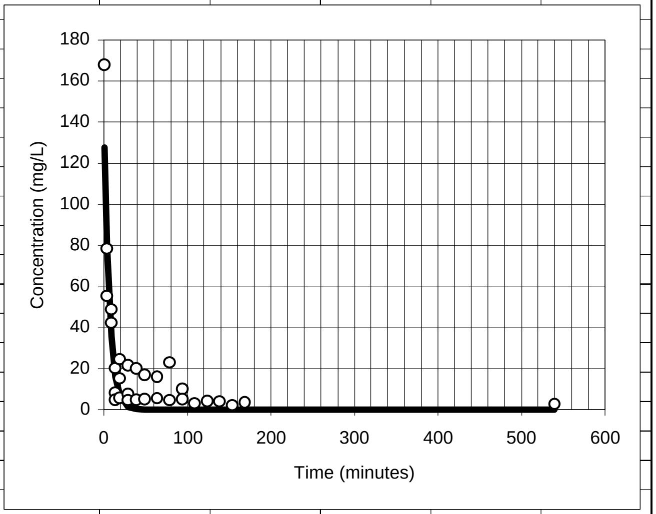
	A	B	C	D	E	F	G	H	I	J
1	Tracer Study #2 Evergreen to Hughes Street									
2	Date:									
3	Time	time (hrs)	reading	Conc (ppm)						
4	8/16/99 16:05	0.00	0	0.0000						
5	8/17/99 7:40	15.58	109	0.0523						
6	8/17/99 7:50	15.75	235	0.1128						
7	8/17/99 8:00	15.92	324	0.1555						
8	8/17/99 8:15	16.17	406	0.1949						
9	8/17/99 8:30	16.42	435	0.2088						
10	8/17/99 8:45	16.67	454	0.2179						
11	8/17/99 9:00	16.92	415	0.1992						
12	8/17/99 9:15	17.17	394	0.1891						
13	8/17/99 9:30	17.42	387	0.1858						
14	8/17/99 9:45	17.67	366	0.1757						
15	8/17/99 10:00	17.92	335	0.1608						
16	8/17/99 10:30	18.42	342	0.1642						
17	8/17/99 11:00	18.92	314	0.1507						
18	8/17/99 12:00	19.92	266	0.1277						
19										
20	blank	0.00								
21	0.48ppm std	1000.00								
22										



	A	B	C	D	E	F	G	H	I	J	K	L
1	Tracer Study #3 Polk and Elm to Hughes Street						Discharge at Hughes					
2	Date:	8/19/99										
3	Time	reading	Sample ID	Time	conc (ppm)		Time	v	w	d	Q (gpm-un	Q (gpm)
4	8/19/99 16:05	0		0.00	0		800	5.88	3.1	0.54	4417.592	2297.148
5	8/20/99 8:00	0		15.92	0		900	5.88	3.1	0.56	4581.207	2382.228
6	8/20/99 9:00	0		16.92	0		1000	6.07	3.1	0.58	4898.14	2547.033
7	8/20/99 10:00	0		17.92	0		1100	6.03	3.1	0.62	5201.439	2704.748
8	8/20/99 10:30	20		18.42	0.0096		1200	6.48	3.1	0.64	5769.916	3000.357
9	8/20/99 10:45	43		18.67	0.02064		1300	6.13	3.14	0.66	5701.471	2964.765
10	8/20/99 11:00	59		18.92	0.02832							
11	8/20/99 11:15	70		19.17	0.0336							
12	8/20/99 11:30	94		19.42	0.04512							
13	8/20/99 11:45	106		19.67	0.05088							
14	8/20/99 12:00	132		19.92	0.06336							
15	8/20/99 12:15	242		20.17	0.11616							
16	8/20/99 12:30	172		20.42	0.08256							
17	8/20/99 12:45	218		20.67	0.10464							
18	8/20/99 13:00	247		20.92	0.11856							
19	8/20/99 13:30	284		21.42	0.13632							
20	8/20/99 14:00	305		21.92	0.1464							
21	8/20/99 14:30	313		22.42	0.15024							
22	8/20/99 15:00	335		22.92	0.1608							
23												



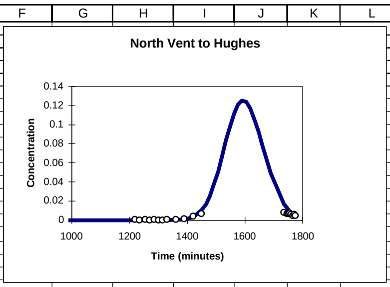
	A	B	C	D	E	F	G	H	I	J
1	Tracer Study #4 Dilution at Ennis and Lamar									
2	Date:									
3	Co	150	mg/L							
4	U	0.16	ft/min	Q (cfm)	0.32	Q(gpm)	2.3936			
5	Depth	0.5	ft							
6	Width	4	ft							
7		Time	C(mg/L)	C(model)						
8	1056	1	167.8795	127.8216						
9	1100	4	55.36413	79.09386						
10	1100	4	78.31362	79.09386						
11	1105	9	48.85116	35.53916						
12	1105	9	42.2828	35.53916						
13	1110	14	20.17437	15.96878						
14	1110	14	8.106345	15.96878						
15	1110	14	4.711465	15.96878						
16	1115	19	24.49553	7.175233						
17	1115	19	15.17734	7.175233						
18	1115	19	5.603195	7.175233						
19	1125	29	21.65771	1.448655						
20	1125	29	7.625067	1.448655						
21	1125	29	4.540498	1.448655						
22	1135	39	19.96782	0.292478						
23	1135	39	4.876759	0.292478						
24	1145	49	16.96126	0.05905						
25	1145	49	5.09434	0.05905						
26	1200	64	16.05137	0.005357						
27	1200	64	5.553237	0.005357						
28	1215	79	23.01395	0.000486						
29	1215	79	4.560278	0.000486						
30	1230	94	9.931295	4.41E-05						
31	1230	94	5.093933	4.41E-05						
32	1245	109	3.047482	4E-06						
33	1300	124	4.232686	3.63E-07						
34	1315	139	3.873174	3.29E-08						
35	1330	154	2.075615	2.99E-09						
36	1345	169	3.586728	2.71E-10						
37	1956	540	2.785625	4.5E-36						



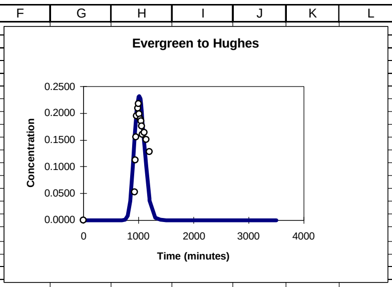
Visual tracer tests

Release	Recovery	Time	
Hughes - 07:15 u=4.03 ft/sec W=2.9 ft D=0.22 ft	Polk- 12:00	4.75 hours	Visual only
Ennis Same as study#4	N2	~7 hours	Visual only

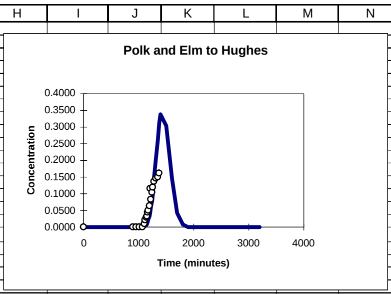
Part 2. Interpretation Calculations



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Country Club Bayou Tracer Test Model																	
2	Advection and Dispersion																	
3																		
4	North Vents to Hughes Street Bridge																	
5																		
6	Tracer mass	20	grams															
7	Depth	2.5	ft															
8	Width	13	ft															
9	Length	1	ft															
10	Labeled Volume	0.94674556	cu.meters.															
11	Label Concentration	21.125	mg/L															
12																		
13	Transport Parameters																	
14	Co	21.125	Tracer Concentration		(mg/liter)													
15	U	1.41	Fluid Velocity		(feet/min)													
16	a	2	Mixing Length		(feet)													
17	D	2.82	Dispersion Coefficient		(ft^2/min)													
18	τ	1	Pulse Length		(min)													
19	Computed Constants																	
20	v/D	0.5																
21																		
22																		Model
23						Intermediate Calculations				Results					Intermediate Calculations			
24				(1)	(2)	(3)	(4)	(5)	(6)	(7)	Simulation Parameters		(1)	(2)	(3)	(4)	(5)	(6)
25	x (feet)	t (minutes)	C(x,t) Field Data	x-vt	x+vt	2 SQRT (Dt)	ERFCC[(1)/(3)]	ERFCC[(2)/(3)]	EEXP [x v/D]	C(x,t) (mg/m^3)	x (meters)	t (years)	x-vt	x+vt	2 SQRT (Dt)	ERFCC[(1)/(3)]	ERFCC[(2)/(3)]	EEXP [x v/D]
26	2250	0.0001	0	2249.99986	2250.00014	0.03358571	0	0	2.6881E+43	0	2250	0	2250	2250	0	#DIV/0!	#DIV/0!	2.6881E+43
27	2250	67	0	2155.53	2344.47	27.4910895	0	0	2.6881E+43	0	2250	66	2156.94	2343.06	27.2851608	0	0	2.6881E+43
28	2250	126	0.0002	2072.34	2427.66	37.6998674	0	0	2.6881E+43	0	2250	125	2073.75	2426.25	37.5499667	0	0	2.6881E+43
29	2250	156	0	2030.04	2469.96	41.9485399	0	0	2.6881E+43	0	2250	155	2031.45	2468.55	41.8138733	0	0	2.6881E+43
30	2250	217	0	1944.03	2555.97	49.4748421	0	0	2.6881E+43	0	2250	216	1945.44	2554.56	49.3607131	0	0	2.6881E+43
31	2250	249	0	1898.91	2601.09	52.9973584	0	0	2.6881E+43	0	2250	248	1900.32	2599.68	52.890831	0	0	2.6881E+43
32	2250	306	0	1818.54	2681.46	58.751	0	0	2.6881E+43	0	2250	305	1819.95	2680.05	58.6549231	0	0	2.6881E+43
33	2250	365	0.0002	1735.35	2764.65	64.1654112	0	0	2.6881E+43	0	2250	364	1736.76	2763.24	64.0774531	0	0	2.6881E+43
34	2250	425	0	1650.75	2849.25	69.2387175	0	0	2.6881E+43	0	2250	424	1652.16	2847.84	69.1572122	0	0	2.6881E+43
35	2250	461	0.0002	1599.99	2900.01	72.1115802	0	0	2.6881E+43	0	2250	460	1601.4	2898.6	72.0333256	0	0	2.6881E+43
36	2250	491	0	1557.69	2942.31	74.4209648	0	0	2.6881E+43	0	2250	490	1559.1	2940.9	74.3451411	0	0	2.6881E+43
37	2250	505	0	1537.95	2962.05	75.474499	0	0	2.6881E+43	0	2250	504	1539.36	2960.64	75.3997347	0	0	2.6881E+43
38	2250	520	0.0002	1516.8	2983.2	76.5872052	0	0	2.6881E+43	0	2250	519	1518.21	2981.79	76.5135282	0	0	2.6881E+43
39	2250	535	0	1495.65	3004.35	77.6839752	0	0	2.6881E+43	0	2250	534	1497.06	3002.94	77.6113394	0	0	2.6881E+43
40	2250	550	0	1474.5	3025.5	78.7654747	0	0	2.6881E+43	0	2250	549	1475.91	3024.09	78.6938371	0	0	2.6881E+43
41	2250	580		1432.2	3067.8	80.8851037	0	0	2.6881E+43	0	2250	579	1433.61	3066.39	80.8153451	0	0	2.6881E+43
42	2250	625		1368.75	3131.25	83.9642781	0	0	2.6881E+43	0	2250	624	1370.16	3129.84	83.8970798	0	0	2.6881E+43
43	2250	670		1305.3	3194.7	86.9344581	0	0	2.6881E+43	0	2250	669	1306.71	3193.29	86.8695574	0	0	2.6881E+43
44	2250	730		1220.7	3279.3	90.7435948	0	0	2.6881E+43	0	2250	729	1222.11	3277.89	90.6814204	0	0	2.6881E+43
45	2250	790		1136.1	3363.9	94.3991525	0	0	2.6881E+43	0	2250	789	1137.51	3362.49	94.3393873	0	0	2.6881E+43
46	2250	850		1051.5	3448.5	97.9183333	0	0	2.6881E+43	0	2250	849	1052.91	3447.09	97.8607173	0	0	2.6881E+43
47	2250	910		966.9	3533.1	101.315349	0	0	2.6881E+43	0	2250	909	968.31	3531.69	101.259666	0	0	2.6881E+43
48	2250	970		882.3	3617.7	104.602103	0	0	2.6881E+43	0	2250	969	883.71	3616.29	104.548171	0	0	2.6881E+43
49	2250	1015		818.85	3681.15	107.000935	0	0	2.6881E+43	0	2250	1014	820.26	3679.74	106.948212	0	0	2.6881E+43
50	2250	1220	0.0002	529.8	3970.2	117.309846	1.6924E-10	0	2.6881E+43	2.16E-10	2250	1219	531.21	3968.79	117.261758	1.4884E-10	0	2.6881E+43
51	2250	1235	0	508.65	3991.35	118.02881	1.097E-09	0	2.6881E+43	1.32E-09	2250	1234	510.06	3989.94	117.981015	9.7175E-10	0	2.6881E+43
52	2250	1255	0.0002	480.45	4019.55	118.980671	1.1253E-08	0	2.6881E+43	1.26E-08	2250	1254	481.86	4018.14	118.933259	1.006E-08	0	2.6881E+43
53	2250	1270	0	459.3	4040.7	119.689599	5.7328E-08	0	2.6881E+43	6.06E-08	2250	1269	460.71	4039.29	119.642467	5.1589E-08	0	2.6881E+43
54	2250	1285	0.0002	438.15	4061.85	120.394352	2.6506E-07	0	2.6881E+43	2.64E-07	2250	1284	439.56	4060.44	120.347497	2.4005E-07	0	2.6881E+43
55	2250	1300	0	417	4083	121.095004	1.1162E-06	0	2.6881E+43	1.05E-06	2250	1299	418.41	4081.59	121.04842	1.0171E-06	0	2.6881E+43
56	2250	1315	0	395.85	4104.15	121.791625	4.2963E-06	0	2.6881E+43	3.79E-06	2250	1314	397.26	4102.74	121.745308	3.9378E-06	0	2.6881E+43
57	2250	1330	0.0002	374.7	4125.3	122.484285	1.5162E-05	0	2.6881E+43	1.25E-05	2250	1329	376.11	4123.89	122.438229	1.3976E-05	0	2.6881E+43
58	2250	1360	0.0006	332.4	4167.6	123.857983	0.00014743	0	2.6881E+43	0.000106	2250	1359	333.81	4166.19	123.812439	0.00013737	0	2.6881E+43
59	2250	1390	0.0014	290.1	4209.9	125.216612	0.00105129	0	2.6881E+43	0.000654	2250	1389	291.51	4208.49	125.171562	0.00098935	0	2.6881E+43
60	2250	1420	0.0036	247.8	4252.2	126.560657	0.00562346	0	2.6881E+43	0.002981	2250	1419	249.21	4250.79	126.516086	0.00534119	0	2.6881E+43
61	2250	1450	0.0064	205.5	4294.5	127.890578	0.02306126	0	2.6881E+43	0.010248	2250	1449	206.91	4293.09	127.84647	0.02209101	0	2.6881E+43
62	2250	1464		185.76	4314.24	128.506498	0.04092509	0	2.6881E+43	0.016638	2250	1463	187.17	4312.83	128.462602	0.03934991	0	2.6881E+43
63	2250	1478		166.02	4333.98	129.11948	0.06900674	0	2.6881E+43	0.02554	2250	1477	167.43	4332.57	129.075792	0.06658874	0	2.6881E+43
64	2250	1492		146.28	4353.72	129.729565	0.11079416	0	2.6881E+43	0.037128	2250	1491	147.69	4352.31	129.686083	0.10727908	0	2.6881E+43
65	2250	1506		126.54	4373.46	130.336794	0.16974724	0	2.6881E+43	0.051192	2250	1505	127.95	4372.05	130.293515	0.16490068	0	2.6881E+43
66	2250	1520		106.8	4393.2	130.941208	0.24871377	0	2.6881E+43	0.067044	2250	1519	108.21	4391.79	130.898128	0.24236642	0	2.6881E+43
67	2250	1534		87.06	4412.94	131.542845	0.34928364	0	2.6881E+43	0.083518	2250	1533	88.47	4411.53	131.499962	0.34137663	0	2.6881E+43
68	2250	1548		67.32	4432.68	132.141742	0.47123242	0	2.6881E+43	0.099096	2250	1547	68.73	4431.27	132.099054	0.46185051	0	2.6881E+43
69	2250	1562		47.58	4452.42	132.737937	0.6122069	0	2.6881E+43	0.112141	2250	1561	48.99	4451.01	132.695441	0.60159004	0	2.6881E+43
70	2250	1576		27.84	4472.16	133.331467	0.76777088	0	2.6881E+43	0.121183	2250	1575	29.25	4470.75	133.289159	0.75629792	0	2.6881E+43
71	2250	1590		8.1	4491.9	133.922366	0.93183559	0	2.6881E+43	0.125206	2250	1589	9.51	4490.49	133.880245	0.91998174	0	2.6881E+43
72	2250	1604		-11.64	4511.64	134.510669	1.0974021	0	2.6881E+43	0.12383	2250	1603	-10.23	4510.23	134.468732	1.08567856	0	2.6881E+43
73	2250	1618		-31.38	4531.38	135.09641	1.25745993	0	2.6881E+43	0.117363	2250	1617	-29.97	4529.97	135.054656	1.24634859	0	2.6881E+43
74	2250	1632		-51.12	4551.12	135.679623	1.4058509	0	2.6881E+43	0.106715	2250	1631	-49.71	4549.71	135.638048	1.39574771	0	2.6881E+43
75	2250	1646		-70.86	4570.86	136.260339	1.53792784	0	2.6881E+43	0.093188	2250	1645	-69.45	4569.45	136.218941	1.52910528	0	2.6881E+43
76	2250	1660		-90.6	4590.6	136.838591	1.65090297	0	2.6881E+43	0.078233	2250	1659	-89.19	4589.19	136.797368	1.64349633	0	2.6881E+43
77	2250	1674		-110.34	4610.34	137.41441	1.74386523	0	2.6881E+43	0.063203	2250	1673	-108.93	4608.93	137.37336	1.73788154	0	2.6881E+43
78	2250	1688		-130.08	4630.08	137.987826	1.81752309	0	2.6881E+43	0.049183	2250	1687	-128.67	4628.67	137.946946	1.81286676	0	2.6881E+43
79	2250	1735	0.008	-196.35	4696.35	139.895675	1.95284591	0	2.6881E+43	0.016306	2250	1734	-194.94	4694.94	139.855354	1.95130219	0	2.6881E+43
80	2250	1745	0.0066	-210.45	4710.45	140.298254	1.96610736	0	2.6881E+43	0.012263	2250	1744	-209.04	4709.04	140.258048	1.96494633	0	2.6881E+43
81	2250	1750	0.0066	-217.5	4717.5	140.49911	1.97142327	0	2.6881E+43	0.010568	2250	1749	-216.09	4716.09	140.458962	1.97042275	0	2.6881E+43
82	2250	1755	0.0068	-224.55	4724.55	140.69968	1.97599302	0	2.6881E+43	0.009069	2250	1754	-223.14	4723.14	140.659589	1.97513441	0	2.6881E+43
83	2250	1760	0.0058	-231.6	4731.6	140.899965	1.97990505	0	2.6881E+43	0.007751	2250	1759	-230.19	4730.19	140.85993	1.97917127	0	2.6881E+43
84	2250	1765	0.0046	-238.65	4738.65	141.099965	1.98324023	0	2.6881E+43	0.006597	2250	1764	-237.24	4737.24	141.059987	1.98261571	0	2.6881E+43
85	2250	1770	0.006	-245.7	4745.7	141.299682	1.98607203	0	2.6881E+43	0.005591	2250	1769	-244.29	4744.29	141.259761	1.98554266	0	2.6881E+43



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Country Club Bayou Tracer Test Model																	
2	Advection and Dispersion																	
3																		
4	Evergreen to Hughes																	
5																		
6	Tracer mass	50	grams															
7	Depth	2.5	ft															
8	Width	13	ft															
9	Length	1	ft															
10	Labeled Volume	0.94674556	cu.meters.															
11	Label Concentration	52.8125	mg/L															
12																		
13	Transport Parameters																	
14	Co	52.8125	Tracer Concentration		(mg/liter)													
15	U	2.7	Fluid Velocity		(feet/min)													
16	a	11	Mixing Length		(feet)													
17	D	29.7	Dispersion Coefficient		(ft^2/min)													
18	τ	1	Pulse Length		(min)													
19	Computed Constants																	
20	v/D	0.09090909																
21																		
22																		Model
23						Intermediate Calculations				Results					Intermediate Calculations			
24				(1)	(2)	(3)	(4)	(5)	(6)	(7)	Simulation Parameters		(1)	(2)	(3)	(4)	(5)	(6)
25	x (feet)	t (minutes)	C(x,t) Field Data	x-vt	x+vt	2 SQRT (Dt)	ERFCC[(1)/(3)]	ERFCC[(2)/(3)]	EEXP [x v/D]	C(x,t) (mg/m^3)	x (meters)	t (years)	x-vt	x+vt	2 SQRT (Dt)	ERFCC[(1)/(3)]	ERFCC[(2)/(3)]	EEXP [x v/D]
26	2750	0.001	0.0000	2749.9973	2750.0027	0.34467376	0	0	2.6881E+43	0	2750	0	2750	2750	0	#DIV/0!	#DIV/0!	2.6881E+43
27	2750	10		2723	2777	34.4673759	0	0	2.6881E+43	0	2750	9	2725.7	2774.3	32.6986238	0	0	2.6881E+43
28	2750	50		2615	2885	77.0713955	0	0	2.6881E+43	0	2750	49	2617.7	2882.3	76.2967889	0	0	2.6881E+43
29	2750	100		2480	3020	108.995413	0	0	2.6881E+43	0	2750	99	2482.7	3017.3	108.449066	0	0	2.6881E+43
30	2750	200		2210	3290	154.142791	0	0	2.6881E+43	0	2750	199	2212.7	3287.3	153.756951	0	0	2.6881E+43
31	2750	300		1940	3560	188.785593	0	0	2.6881E+43	0	2750	299	1942.7	3557.3	188.470687	0	0	2.6881E+43
32	2750	400		1670	3830	217.990825	0	0	2.6881E+43	0	2750	399	1672.7	3827.3	217.718166	0	0	2.6881E+43
33	2750	500		1400	4100	243.721152	4.4409E-16	0	2.6881E+43	2.93E-15	2750	499	1402.7	4097.3	243.477309	3.3307E-16	0	2.6881E+43
34	2750	600		1130	4370	266.983146	2.1556E-09	0	2.6881E+43	6.38E-09	2750	599	1132.7	4367.3	266.760567	1.9141E-09	0	2.6881E+43
35	2750	650		995	4505	277.884868	4.1107E-07	0	2.6881E+43	9.62E-07	2750	649	997.7	4502.3	277.671028	3.7464E-07	0	2.6881E+43
36	2750	700		860	4640	288.374756	2.4701E-05	0	2.6881E+43	4.55E-05	2750	699	862.7	4637.3	288.168701	2.298E-05	0	2.6881E+43
37	2750	750		725	4775	298.496231	0.00059277	0	2.6881E+43	0.00085	2750	749	727.7	4772.3	298.297167	0.0005606	0	2.6881E+43
38	2750	800		590	4910	308.285582	0.00679892	0	2.6881E+43	0.007473	2750	799	592.7	4907.3	308.092843	0.00651591	0	2.6881E+43
39	2750	850		455	5045	317.773504	0.04287518	0	2.6881E+43	0.035362	2750	849	457.7	5042.3	317.586524	0.04153602	0	2.6881E+43
40	2750	900		320	5180	326.986238	0.16635911	0	2.6881E+43	0.099829	2750	899	322.7	5177.3	326.804529	0.16257861	0	2.6881E+43
41	2750	935	0.0523	225.5	5274.5	333.283663	0.33863891	0	2.6881E+43	0.158713	2750	934	228.2	5271.8	333.105389	0.33262846	0	2.6881E+43
42	2750	945	0.1128	198.5	5301.5	335.061188	0.40213109	0	2.6881E+43	0.174832	2750	944	201.2	5298.8	334.88386	0.39551025	0	2.6881E+43
43	2750	955	0.1555	171.5	5328.5	336.829334	0.47148752	0	2.6881E+43	0.189725	2750	954	174.2	5325.8	336.652937	0.46430265	0	2.6881E+43
44	2750	970	0.1949	131	5369	339.464284	0.58523913	0	2.6881E+43	0.208754	2750	969	133.7	5366.3	339.289257	0.57733365	0	2.6881E+43
45	2750	985	0.2088	90.5	5409.5	342.078938	0.70829817	0	2.6881E+43	0.222649	2750	984	93.2	5406.8	341.90525	0.69986651	0	2.6881E+43
46	2750	1000	0.2179	50	5450	344.673759	0.83745299	0	2.6881E+43	0.230511	2750	999	52.7	5447.3	344.501379	0.82872358	0	2.6881E+43
47	2750	1015	0.1992	9.50000001	5490.5	347.24919	0.96913764	0	2.6881E+43	0.231966	2750	1014	12.2	5487.8	347.078089	0.96035313	0	2.6881E+43
48	2750	1030	0.1891	-31	5531	349.80566	1.09973651	0	2.6881E+43	0.227174	2750	1029	-28.3	5528.3	349.635811	1.09113349	0	2.6881E+43
49	2750	1045	0.1858	-71.5	5571.5	352.343582	1.22587391	0	2.6881E+43	0.216772	2750	1044	-68.8	5568.8	352.174957	1.21766479	0	2.6881E+43
50	2750	1060	0.1757	-112	5612	354.863354	1.34465283	0	2.6881E+43	0.201762	2750	1059	-109.3	5609.3	354.695926	1.33701214	0	2.6881E+43
51	2750	1075	0.1608	-152.5	5652.5	357.365359	1.45381937	0	2.6881E+43	0.183367	2750	1074	-149.8	5649.8	357.199104	1.44687528	0	2.6881E+43
52	2750	1105	0.1642	-233.5	5733.5	362.31754	1.63791921	0	2.6881E+43	0.141552	2750	1104	-230.8	5730.8	362.153559	1.63255867	0	2.6881E+43
53	2750	1135	0.1507	-314.5	5814.5	367.202941	1.7741957	0	2.6881E+43	0.100449	2750	1134	-311.8	5811.8	367.041142	1.77039171	0	2.6881E+43
54	2750	1195	0.1277	-476.5	5976.5	376.783758	1.92630248	0	2.6881E+43	0.040304	2750	1194	-473.8	5973.8	376.626075	1.92477615	0	2.6881E+43
55	2750	1200		-490	5990	377.571185	1.93354197	0	2.6881E+43	0.036884	2750	1199	-487.3	5987.3	377.413831	1.93214518	0	2.6881E+43
56	2750	1300		-760	6260	392.988549	1.99376094	0	2.6881E+43	0.00439	2750	1299	-757.3	6257.3	392.837371	1.9935947	0	2.6881E+43
57	2750	1400		-1030	6530	407.823491	1.99964538	0	2.6881E+43	0.000294	2750	1399	-1027.3	6527.3	407.677814	1.99963427	0	2.6881E+43
58	2750	1500		-1300	6800	422.137418	1.9999867	0	2.6881E+43	1.24E-05	2750	1499	-1297.3	6797.3	421.996682	1.99998623	0	2.6881E+43
59	2750	1600		-1570	7070	435.981651	1.99999965	0	2.6881E+43	3.59E-07	2750	1599	-1567.3	7067.3	435.845385	1.99999963	0	2.6881E+43
60	2750	1700		-1840	7340	449.399599	1.99999999	0	2.6881E+43	7.66E-09	2750	1699	-1837.3	7337.3	449.267404	1.99999999	0	2.6881E+43
61	2750	1800		-2110	7610	462.428373	2	0	2.6881E+43	1.26E-10	2750	1799	-2107.3	7607.3	462.299903	2	0	2.6881E+43
62	2750	1900		-2380	7880	475.099989	2	0	2.6881E+43	1.68E-12	2750	1899	-2377.3	7877.3	474.974947	2	0	2.6881E+43
63	2750	2000		-2650	8150	487.442304	2	0	2.6881E+43	0	2750	1999	-2647.3	8147.3	487.320428	2	0	2.6881E+43
64	2750	2100		-2920	8420	499.479729	2	0	2.6881E+43	0	2750	2099	-2917.3	8417.3	499.360791	2	0	2.6881E+43
65	2750	2200		-3190	8690	511.233802	2	0	2.6881E+43	0	2750	2199	-3187.3	8687.3	511.117599	2	0	2.6881E+43
66	2750	2300		-3460	8960	522.723636	2	0	2.6881E+43	0	2750	2299	-3457.3	8957.3	522.609988	2	0	2.6881E+43
67	2750	2400		-3730	9230	533.966291	2	0	2.6881E+43	0	2750	2399	-3727.3	9227.3	533.855037	2	0	2.6881E+43
68	2750	2500		-4000	9500	544.977064	2	0	2.6881E+43	0	2750	2499	-3997.3	9497.3	544.868057	2	0	2.6881E+43
69	2750	2600		-4270	9770	555.769736	2	0	2.6881E+43	0	2750	2599	-4267.3	9767.3	555.662847	2	0	2.6881E+43
70	2750	2700		-4540	10040	566.356778	2	0	2.6881E+43	0	2750	2699	-4537.3	10037.3	566.251887	2	0	2.6881E+43
71	2750	2800		-4810	10310	576.749512	2	0	2.6881E+43	0	2750	2799	-4807.3	10307.3	576.646512	2	0	2.6881E+43
72	2750	2900		-5080	10580	586.958261	2	0	2.6881E+43	0	2750	2899	-5077.3	10577.3	586.857052	2	0	2.6881E+43
73	2750	3000		-5350	10850	596.992462	2	0	2.6881E+43	0	2750	2999	-5347.3	10847.3	596.892955	2	0	2.6881E+43
74	2750	3100		-5620	11120	606.860775	2	0	2.6881E+43	0	2750	3099	-5617.3	11117.3	606.762886	2	0	2.6881E+43
75	2750	3200		-5890	11390	616.571164	2	0	2.6881E+43	0	2750	3199	-5887.3	11387.3	616.474817	2	0	2.6881E+43
76	2750	3300		-6160	11660	626.130977	2	0	2.6881E+43	0	2750	3299	-6157.3	11657.3	626.036101	2	0	2.6881E+43
77	2750	3400		-6430	11930	635.547008	2	0	2.6881E+43	0	2750	3399	-6427.3	11927.3	635.453539	2	0	2.6881E+43
78	2750	3500		-6700	12200	644.825558	2	0	2.6881E+43	0	2750	3499	-6697.3	12197.3	644.733433	2	0	2.6881E+43



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Country Club Bayou Tracer Test Model																	
2	Advection and Dispersion																	
3																		
4	Polk and Elm to Hughes																	
5																		
6	Tracer mass	100	grams															
7	Depth	2.5	ft															
8	Width	13	ft															
9	Length	1	ft															
10	Labeled Volume	0.94674556	cu.meters.															
11	Label Concentration	105.625	mg/L															
12																		
13	Transport Parameters																	
14	Co	105.625	Tracer Concentration		(mg/liter)													
15	U	2.6	Fluid Velocity		(feet/min)	632.06												
16	a	13	Mixing Length		(feet)													
17	D	33.8	Dispersion Coefficient		(ft^2/min)													
18	τ	1	Pulse Length		(min)													
19	Computed Constants																	
20	v/D	0.07692308																
21	Q (gpm)	632.06																
22																		Model
23						Intermediate Calculations				Results					Intermediate Calculations			
24				(1)	(2)	(3)	(4)	(5)	(6)	(7)	Simulation Parameters		(1)	(2)	(3)	(4)	(5)	(6)
25	x (feet)	t (minutes)	C(x,t) Field Data	x-vt	x+vt	2 SQRT (Dt)	ERFCC[(1)/(3)]	ERFCC[(2)/(3)]	EEXP [x v/D]	C(x,t) (mg/m^3)	x (meters)	t (years)	x-vt	x+vt	2 SQRT (Dt)	ERFCC[(1)/(3)]	ERFCC[(2)/(3)]	EEXP [x v/D]
26	3750	0.001	0.0000	3749.9974	3750.0026	0.36769553	0	0	2.6881E+43	0	3750	0	3750	3750	0	#DIV/0!	#DIV/0!	2.6881E+43
27	3750	10		3724	3776	36.7695526	0	0	2.6881E+43	0	3750	9	3726.6	3773.4	34.8826604	0	0	2.6881E+43
28	3750	50		3620	3880	82.2192192	0	0	2.6881E+43	0	3750	49	3622.6	3877.4	81.3928744	0	0	2.6881E+43
29	3750	100		3490	4010	116.275535	0	0	2.6881E+43	0	3750	99	3492.6	4007.4	115.692696	0	0	2.6881E+43
30	3750	200		3230	4270	164.438438	0	0	2.6881E+43	0	3750	199	3232.6	4267.4	164.026827	0	0	2.6881E+43
31	3750	300		2970	4530	201.395134	0	0	2.6881E+43	0	3750	299	2972.6	4527.4	201.059195	0	0	2.6881E+43
32	3750	400		2710	4790	232.55107	0	0	2.6881E+43	0	3750	399	2712.6	4787.4	232.260199	0	0	2.6881E+43
33	3750	500		2450	5050	260	0	0	2.6881E+43	0	3750	499	2452.6	5047.4	259.73987	0	0	2.6881E+43
34	3750	600		2190	5310	284.81573	0	0	2.6881E+43	0	3750	599	2192.6	5307.4	284.578284	0	0	2.6881E+43
35	3750	650		2060	5440	296.445611	0	0	2.6881E+43	0	3750	649	2062.6	5437.4	296.217488	0	0	2.6881E+43
36	3750	700		1930	5570	307.636149	0	0	2.6881E+43	0	3750	699	1932.6	5567.4	307.41633	0	0	2.6881E+43
37	3750	750		1800	5700	318.433667	1.3323E-15	0	2.6881E+43	1.17E-14	3750	749	1802.6	5697.4	318.221307	1.1102E-15	0	2.6881E+43
38	3750	800		1670	5830	328.876877	6.9089E-13	0	2.6881E+43	3.96E-12	3750	799	1672.6	5827.4	328.671264	6.1595E-13	0	2.6881E+43
39	3750	850		1540	5960	338.998525	1.3232E-10	0	2.6881E+43	6.42E-10	3750	849	1542.6	5957.4	338.799055	1.2017E-10	0	2.6881E+43
40	3750	900		1410	6090	348.826604	1.0879E-08	0	2.6881E+43	4.46E-08	3750	899	1412.6	6087.4	348.632758	1.0034E-08	0	2.6881E+43
41	3750	900	0	1410	6090	348.826604	1.0879E-08	0	2.6881E+43	4.46E-08	3750	899	1412.6	6087.4	348.632758	1.0034E-08	0	2.6881E+43
42	3750	955	0	1267	6233	359.327149	6.1462E-07	0	2.6881E+43	2.09E-06	3750	954	1269.6	6230.4	359.13897	5.7504E-07	0	2.6881E+43
43	3750	1015	0	1111	6389	370.442978	2.2214E-05	0	2.6881E+43	6.13E-05	3750	1014	1113.6	6386.4	370.260449	2.1054E-05	0	2.6881E+43
44	3750	1075.2	0	954.48	6545.52	381.270298	0.00039956	0	2.6881E+43	0.000885	3750	1074.2	957.08	6542.92	381.092955	0.0003828	0	2.6881E+43
45	3750	1105	0.0096	877	6623	386.517787	0.00133282	0	2.6881E+43	0.002639	3750	1104	879.6	6620.4	386.342853	0.00128285	0	2.6881E+43
46	3750	1120	0.02064	838	6662	389.132368	0.00232277	0	2.6881E+43	0.004339	3750	1119	840.6	6659.4	388.95861	0.00224061	0	2.6881E+43
47	3750	1135	0.02832	799	6701	391.729499	0.00391995	0	2.6881E+43	0.006904	3750	1134	801.6	6698.4	391.556892	0.00378923	0	2.6881E+43
48	3750	1150	0.0336	760	6740	394.309523	0.00641491	0	2.6881E+43	0.010639	3750	1149	762.6	6737.4	394.138047	0.00621347	0	2.6881E+43
49	3750	1165	0.04512	721	6779	396.872776	0.01019318	0	2.6881E+43	0.015901	3750	1164	723.6	6776.4	396.702407	0.0098921	0	2.6881E+43
50	3750	1180	0.05088	682	6818	399.419579	0.01574653	0	2.6881E+43	0.023076	3750	1179	684.6	6815.4	399.250297	0.01530959	0	2.6881E+43
51	3750	1195	0.06336	643	6857	401.950246	0.02367776	0	2.6881E+43	0.032554	3750	1194	645.6	6854.4	401.78203	0.02306135	0	2.6881E+43
52	3750	1210	0.11616	604	6896	404.465079	0.03469605	0	2.6881E+43	0.044691	3750	1209	606.6	6893.4	404.29791	0.03384984	0	2.6881E+43
53	3750	1225	0.08256	565	6935	406.964372	0.04960063	0	2.6881E+43	0.059762	3750	1224	567.6	6932.4	406.79823	0.04846905	0	2.6881E+43
54	3750	1240	0.10464	526	6974	409.448409	0.06925132	0	2.6881E+43	0.077917	3750	1239	528.6	6971.4	409.283276	0.06777596	0	2.6881E+43
55	3750	1255	0.11856	487	7013	411.917467	0.09452626	0	2.6881E+43	0.099142	3750	1254	489.6	7010.4	411.753324	0.09264901	0	2.6881E+43
56	3750	1285	0.13632	409	7091	416.811708	0.16522576	0	2.6881E+43	0.149695	3750	1284	411.6	7088.4	416.649493	0.1623913	0	2.6881E+43
57	3750	1315	0.1464	331	7169	421.649143	0.26692344	0	2.6881E+43	0.207046	3750	1314	333.6	7166.4	421.48879	0.26300303	0	2.6881E+43
58	3750	1345	0.15024	253	7247	426.431706	0.40144322	0	2.6881E+43	0.263881	3750	1344	255.6	7244.4	426.273152	0.39644665	0	2.6881E+43
59	3750	1375	0.1608	175	7325	431.161223	0.5659665	0	2.6881E+43	0.311564	3750	1374	177.6	7322.4	431.004408	0.56006706	0	2.6881E+43
60	3750	1400		110	7390	435.063214	0.72066868	0	2.6881E+43	0.338725	3750	1399	112.6	7387.4	434.907806	0.71425494	0	2.6881E+43
61	3750	1500		-150	7650	450.33321	1.36239905	0	2.6881E+43	0.302672	3750	1499	-147.4	7647.4	450.183074	1.35666798	0	2.6881E+43
62	3750	1600		-410	7910	465.102139	1.78748034	0	2.6881E+43	0.146336	3750	1599	-407.4	7907.4	464.956772	1.78470948	0	2.6881E+43
63	3750	1700		-670	8170	479.416312	1.95189161	0	2.6881E+43	0.042674	3750	1699	-667.4	8167.4	479.275286	1.95108357	0	2.6881E+43
64	3750	1800		-930	8430	493.315315	1.99232588	0	2.6881E+43	0.008168	3750	1799	-927.4	8427.4	493.178264	1.99217122	0	2.6881E+43
65	3750	1900		-1190	8690	506.833306	1.99910127	0	2.6881E+43	0.001097	3750	1899	-1187.4	8687.4	506.699911	1.9990805	0	2.6881E+43
66	3750	2000		-1450	8950	520	1.99991969	0	2.6881E+43	0.000109	3750	1999	-1447.4	8947.4	519.869984	1.99991763	0	2.6881E+43
67	3750	2100		-1710	9210	532.84144	1.99999433	0	2.6881E+43	8.37E-06	3750	2099	-1707.4	9207.4	532.714558	1.99999418	0	2.6881E+43
68	3750	2200		-1970	9470	545.380601	1.99999968	0	2.6881E+43	5.14E-07	3750	2199	-1967.4	9467.4	545.256637	1.99999967	0	2.6881E+43
69	3750	2300		-2230	9730	557.637875	1.99999998	0	2.6881E+43	2.6E-08	3750	2299	-2227.4	9727.4	557.516637	1.99999998	0	2.6881E+43
70	3750	2400		-2490	9990	569.63146	2	0	2.6881E+43	1.11E-09	3750	2399	-2487.4	9987.4	569.512774	2	0	2.6881E+43
71	3750	2500		-2750	10250	581.377674	2	0	2.6881E+43	4.1E-11	3750	2499	-2747.4	10247.4	581.261387	2	0	2.6881E+43
72	3750	2600		-3010	10510	592.891221	2	0	2.6881E+43	1.34E-12	3750	2599	-3007.4	10507.4	592.777193	2	0	2.6881E+43
73	3750	2700		-3270	10770	604.185402	2	0	2.6881E+43	0	3750	2699	-3267.4	10767.4	604.073505	2	0	2.6881E+43
74	3750	2800		-3530	11030	615.272297	2	0	2.6881E+43	0	3750	2799	-3527.4	11027.4	615.162418	2	0	2.6881E+43
75	3750	2900		-3790	11290	626.162918	2	0	2.6881E+43	0	3750	2899	-3787.4	11287.4	626.05495	2	0	2.6881E+43
76	3750	3000		-4050	11550	636.867333	2	0	2.6881E+43	0	3750	2999	-4047.4	11547.4	636.76118	2	0	2.6881E+43
77	3750	3100		-4310	11810	647.394779	2	0	2.6881E+43	0	3750	3099	-4307.4	11807.4	647.290352	2	0	2.6881E+43
78	3750	3200		-4570	12070	657.753753	2	0	2.6881E+43	0	3750	3199	-4567.4	12067.4	657.650971	2	0	2.6881E+43

Appendix – III Field Data (ACCESS Database Printout)

ID	Location	Remarks	Field Visit Date	Weather Conditions	Water Level	Turbid Water	Water Color	Bottom Color	Algae	Filaments	Recent Rainfall	Odor	Water Flowing	Fecal Coliform (cfu/100mL)	BOD (mg/L)	RedoxPotential	pH:	Temp_pH (C)	DO (ppm)	Temp_DO (C)	Sulfide_M8131 (mg/L)	Sulfate_M8051 (mg/L)	Ferrous_M8146(mg/L)	Ferric (calculated) (mg/L)	Iron-T_M8008 (mg/L)	Iron-T_M8147 (mg/L)	Nitrite_M8153 (mg/L)	Nitrite_M8507 (mg/L)	Nitrate_M8171 (mg/L)	Ammonia_M8038 (mg/L)	Flow Depth (inches)	Flow Width (feet)	Flow Speed (ft/sec)	Discharge (cubic ft/sec)	Discharge (gpm)	TOC (mg/L)	Flow Measurement Device	NH3-N COH Lab (mg/L)	TSS (mg/100ml)
2	Hughes Street Bridge	the gr	01-Nov-99	cool, s	high	slightly	clear	brown	green,		no	none	yes				6.63	22.5	4.54	22.2	0.009	40							0.7	0.63	5.46	3.1	4.65				flowmet		5E-04
3	Hughes Street Bridge	COH	05-Nov-97			no	clear				yes	sulfide	yes	310000	53.4															3.8									
4	Hughes Street Bridge	COH	06-Nov-97			no	brown				no	sulfide		330000	10															0.2									
5	Hughes Street Bridge	COH	07-Nov-97			yes	gray				no	sulfide		60000	8															0.2									
6	Hughes Street Bridge	COH	10-Nov-97			yes	gray				no	sulfide		155000	16.1															0.5									
7	Hughes Street Bridge	COH	12-Nov-97			yes	gray				yes	sulfide	yes	86000	19.2															0.4									
8	Hughes Street Bridge	COH	14-Nov-97			yes	gray				no	sulfide		320000	33.7															1.2									
9	Hughes Street Bridge	COH	17-Nov-97			yes	green-				no	sulfide		2000000	40.6															2.5									
10	Hughes Street Bridge	COH	19-Nov-97			yes	black				no	sulfide		520000	114.9															5.7									
11	Hughes Street Bridge	COH	21-Nov-97			yes	gray				no	sulfide		500000	15.6															0.6									
12	Hughes Street Bridge	COH	24-Nov-97			no					no	none		260000	1.6																								
13	Hughes Street Bridge	COH	26-Nov-97			no					no	none		43000	10.1															1.2									
14	Hughes Street Bridge	COH	01-Dec-97			no					no	none		57000	5.1															0.1									
15	Hughes Street Bridge	COH	10-Dec-97			no			yes	yes	no	none		640000	26.6															1.3									
16	Hughes Street Bridge	COH	15-Dec-97			yes	black				no	sulfide		270000	9.4															1.3									
17	Hughes Street Bridge	COH	19-Dec-97						yes	yes	no	sulfide		230000	62.7															0.7									
18	Hughes Street Bridge	COH	30-Dec-97			no			yes	yes	no	none		780	3.4															1.3									
19	Hughes Street Bridge	COH	15-Jan-98			no					no	none		8700	0															6									
20	Hughes Street Bridge	COH	21-Jan-98							yes	yes	sulfide	yes	1100000	0.1															10.7									
21	Hughes Street Bridge		29-Jan-98			no					no	none		720000	0.03															57									
22	Hughes Street Bridge	COH	12-Feb-98			no					yes	none	yes	38000	0.2															3.3									
23	Hughes Street Bridge	COH	24-Feb-98			no					no	none		1400	8.2															0.18									
24	Hughes Street Bridge	COH	03-Mar-98			no					no	none		120	5.5															0.1									
25	Hughes Street Bridge	COH	25-Mar-98							yes	no	sulfide		200000	16.8															1.6									
26	Hughes Street Bridge	COH	01-Apr-98							yes	no	sulfide		1400000	27.1															1									
27	Hughes Street Bridge		02-Apr-98	cloudy	norma	no	gray-g	black	green,	yes		sulfide	yes				7.173	19.8				75				0.48			0.9		4	6	0.6	1.2	280.1		drift tra		
28	Hughes Street Bridge	COH	15-Apr-98							yes	no	sulfide		360000	30.3															0.2									
29	Hughes Street Bridge	COH	21-Apr-98							yes	no	none		32000	3.8															0.5									
30	Hughes Street Bridge		27-Apr-98					black		yes	no	sulfide		31000	6.3															0.8									
31	Hughes Street Bridge		28-Apr-98	sunny	norma	yes	black	black	green-	yes		sulfide	yes				6.9	19.6	0.6	20.2	0.855	59	0.01	0.68	0.69	0.718		0.024	1.2	1.3									
32	Hughes Street Bridge	COH	06-May-98							yes	no	sulfide		6200	4.6															1.1									
33	Hughes Street Bridge	COH	12-May-98					black			no	sulfide		45000																									
34	Hughes Street Bridge		12-May-98	pt.clou	norma	yes	green	black	green-	yes		sulfide	yes				7	21.6	1.41	21.6	0.021			0.56	0.56	0.596		0.01	1.1	0.66									
35	Hughes Street Bridge		21-May-98	sunny,l	low	no	green-	black	green,	yes	mosquit	sulfide	yes				7.2	23.9	1.2	24.4	0.315	61	0.16	0.52	0.68	0.722	0	0.185	0.9	1.23									
36	Hughes Street Bridge		27-May-98	cloudy,	very l	yes	black	not vis	green,	none	AM Rai	sulfide	yes				6.9	23.6	1.1	23.9	0.42	63	0.1	0.78	0.88	0.98		0	0.4	0.36									
37	Hughes Street Bridge		28-May-98	sunny,	low	no	green-	black	green,	yes	previous	none	yes,swif				7.3	23.2	1.7	23.4	0.019	65	0.09	0.44	0.53	0.527		0.022	0.2	0.54									
38	Hughes Street Bridge		03-Jun-98	pt.clou	low	no	green-	black	green,	yes	mosquit	none	yes,swif				7.2	24.1	1.2	24.7	0.033	70	0.12	0.35	0.47	0.468	5	0.005	0.3	0.31									
39	Hughes Street Bridge		08-Jun-98	pt.clou	low	yes	dk. br	brown	not ab			none	no				7.1	24.8	1	24.9	0.14	36	0.27	0.72	0.99	1.01	4	0.007	0.7	3.96									
40	Hughes Street Bridge		11-Jun-98	pt.clou	low	no	green	brown-	not ab			sulfide	no				7	24.9	1.7	26.3	0.113	44	0.31	0.48	0.79	0.781	5	0.041	1.8	2.5									
41	Hughes Street Bridge		15-Jun-98	sunny,l	low	yes	lt. gray	brown	green-			none	slow				7.2	25	2.9	27.9	0.062	62	0.11	0.36	0.47	0.463	3	0.213	5.6	0.57									
42	Hughes Street Bridge		17-Jun-98	pt.clou	low	yes	green	brown-	not ab			sulfide	slow				6.8	27.1	2.74	26.9	0.187	56	0.18	0.65	0.83	0.82	6	0.003	0.7	0.99									
43	Hughes Street Bridge		22-Jun-98	pt.clou	low	no	green	black	black			sulfide	slow				6.9	26	2.71	26.4	0.998	60	0.14	0.36	0.5	0.333	1	0.006	0.3	0.82									
44	Hughes Street Bridge		26-Jun-98	cloudy,	low	yes	lt.gray	brown	green-			none	slow				7.3	27.2	3.1	26.9	0.034	64	0.07	0.17	0.24	0.27	2	0.084	0.5	1.29	5	3	0.5	0.625	145.9		velocity		
45	Hughes Street Bridge		29-Jun-98	sunny,l	high	yes	brown-	not vis	not vis			none	fast				7.7	26.2	7.9	26.9	0.103	16	0.09	0.27	0.36	0.298		0.023	0.7	0.28									
46	Hughes Street Bridge		08-Jul-98	sunny	norma	no	clear	gray	not ab	yes	mosquit	none	slow				6.5	26.2	0.28	26.4	0.524	47	0.27	0.11	0.38	0.368	2	0.004	0.1	0.21									
47	Hughes Street Bridge		13-Jul-98	sunny,	norma	no	clear	black	green-			sewage	slow				7.1	25.8	2.8	25.9	0.015	57	0.1	0.26	0.36	0.356		0.014	0.2	0.65									
48	Hughes Street Bridge		20-Jul-98	pt.clou	norma	yes	brown	brown	not ab			none	fast				6.5	28	8.1	28.1	0.037	24	0	0.38	0.38	0.403	4	0	0.2	0.32	6	3	1.52	2.28	532.1		velocity		
49	Hughes Street Bridge		29-Jul-98	pt.clou	norma	yes	gray	green	green-			none	fast				6.6	25	1.37	27.1	0.062	55	0.14	0.27	0.41	0.42	4	0.007	0	0.85	7.8	7	1.49	6.78	1582		velocity		
50	Hughes Street Bridge		12-Aug-98		norma	yes	brown	brown	not ab			none	fast				6.7	25	1.88	29.4	0.023	32	0.04	0.48	0.52	0.44	5	0.342	1.3	0.29	7.2	3	2.57	4.626	1080		velocity		
51	Hughes Street Bridge		19-Aug-98		norma	yes	brown-	brown	not ab			none	fast				6.7	25	2.72	27.2	0.013	25	0.01	-0.01		0.308	3	0.062	0.6		4.8	3	1.42	1.704	397.7		velocity		
52	Hughes Street Bridge		26-Aug-98		norma	no	clear	brown	not ab			sulfide	fast				6.7	25	1.8	27.8	0.02	58	0.02	0.48	0.5	0.43	10	0.058	0.5	0.27	5.4	3	1.5	2.025	472.6		velocity		
53	Hughes Street Bridge		02-Sep-98	sunny,	low	no	clear	brown	red-gr	yes		none	slow			211.7	7.1	25	3.1	25.9	0.027	20	0.04	0.34	0.38	0.43	8	0.268	1.1	0.16	6	3	1.11	1.665	388.6		velocity		
54	Hughes Street Bridge		14-Sep-98		high	yes	brown	brown	not ab	none	yes-TS	none	slow			714.3	7	25	2.76	23.4	0.021	35	0.05	0.47	0.52	0.546	4	0.033	0.9	0.24									
55	Hughes Street Bridge		16-Sep-98		high	yes	yellow	brown	none		yes-Rai	none	fast				7.3	25	7.65	26.5	0.032	3	0.05	0.72	0.77	0.772	0	0.008	0.4	0.27	14.4	10	1	12	2801		drift tra		
56	Hughes Street Bridge		22-Sep-98	sunny,	low	no	clear	brown	yes	yes		none	fast	370000	8.1		7.1	25	1.78	26.6	0.008		0.02	0.35	0.37	0.352		0.013	0.2	0.35	6	3.9	1	1.95	455.1		velocity	0.5	
57	Hughes Street Bridge		30-Sep-98	sunny/l	norma	no	clear	brown/	none	yes	no	none	slow	83000	4.4	135	6.8	25			0.008	52	0.01	0.26	0.27	0.236	3	0.08	0.8	0.32	6.72	4	1.53	3.427	799.8		velocity	0.3	
58	Hughes Street Bridge		02-Oct-98	sunny/	norma	yes	green	grey/b	red-gr	yes	no	sewage	fast			-145	7.1	25	1.56	26.6	0.018	57	0.05	0.41	0.46	0.473	7	0.079		0.39	6.75	4	1.52	3.42	798.1		velocity		
59	Hughes Street Bridge		07-Oct-98	cool/hu	above	yes	clay-b	brown	none	none	no	none	fast			125.6	6.99	22.7	2.95	24.1	0.04	13	0.44	0.18	0.62	0.591	2	0.029	1.3	0.33	9.12	4	1.76	5.35	1249		velocity		
60	Hughes Street Bridge		09-Oct-98	sunny/	above	no	clear	brown	red-gr	yes	no	none	fast			48	7.3	23	3.32	24.3	0.009	75	0	0.51	0.51	0.496	3	0.085	1	0.72	6.72	4	1.64	3.674	857.3		velocity		
61	Hughes Street Bridge		12-Oct-98	sunny	norma	no	green	green/	red	yes	no	none	fast			33.4	7.29	25	3.56	24.1	0.005	67	0.01	-0.01			1	0.097	0.3	1.38	6	3.3	1.34	2.211	516		velocity		
62	Hughes Street Bridge		14-Oct-98	sunny/	norma	no	clear	yellow-	red-gr	yes	no	none	slow	2500	1.5	-20	7.62	22.8	3.55	24	0.004	63	0	0			2	0.075	0.4	0.79	4.8	3.5	1.33	1.862	434.5		velocity	0.7	
63	Hughes Street Bridge		21-Oct-98	cool/cl	norma	yes	brown/	brown/	small	none	no	none	yes			138.5	7.52	22.2	6.05	23.7	0.014	25	0	0.31	0.31	0.311	3	0.018	0.9	0.61	8.4	4	1.55	4.34	1013		velocity		
64	Hughes Street Bridge		28-Oct-98	warm/s	high	yes	milky	beige	small	yes	no	none	fast				7.37	22.7	1.14	24.2	0.037	70	0.02	0.16	0.18	0.349	2	0.006	0.4	1.06	7.44	4	1.72	4.266	995.5		velocity		
65	Hughes Street Bridge		29-Oct-98	warm/s	above	yes	milky	not vis	green	yes	no	sewage	yes			5.91	7.22	22.6	3.11	24.3	0.003	76	0.02	0.26	0.28	0.31	1	0.071	0.5	1.26	6.48	4	2.08	4.493	1049		velocity		
66	Hughes Street Bridge		02-Nov-98	cool/su	little a	yes	brown	brown	green	none	no	none	fast			4.333	7.92	20.9			0.036	3	0.05	0.23	0.28	0.265	0	0.03	0.8	0.33	7.2	4	1.95	4.68	1092		velocity		
67	Hughes Street Bridge		04-Nov-98	cool/su	low	no	clear	brown	small	none	no	none	yes			5.31	7.37	21	1.118	22.6	0.006		0.04	0.31	0.35	0.328	0	0.058	0.6	0.32	6.96	4	1.09	2.529	590.2		velocity		
68	Hughes Street Bridge		12-Nov-98	cool/cl	high	yes	milky	brown	yes, g	yes	no	none	fast			6.572	7.11	19.6	4.62	21.1	0.011	45	0.04	0.44	0.48	0.465	0	0.011	0.7	0.64	7.2	3	1.06	1.908	445.3		velocity		
69	Hughes Street Bridge		13-Nov-98	cool/we	high	yes	brown	not vis	green	none	yes	none	fast			7.774	7	17.9	7.92	18.6	0.022	3	0.05	0.52	0.57	0.635	0	0.01	1.1	0									
70	Hughes Street Bridge		16-Nov-98	overca	high	yes	milky	not vis	dark b	yes	yes	none	yes			5.558	7.5	18.5	9.24	20.1	0.049	30	0.06	0.27	0.33	0.384	2	0.035	1.2	0.69	8.64	3.3	1.94	4.609	1076		velocity		
71	Hughes Street Bridge		18-Nov-98	sunny/	above	yes	yellow	brown	brown	yes	no	none	slow			6.239	8.48	19.2	3.01	20.7	0.005	40	0.01	-0.01		0.46	0	0.138	0.8	0	7.44	3.3	1.23	2.517	587.3		velocity		
72	Hughes Street Bridge	**084	25-Nov-98	warm/s	high	yes	milky	green/	abund	yes	no	sulfide	yes			5.776	8.327	20.2	2.06	22	0.025	75	0.05	-0.05			1	0.086	2.4	0.51	8.4	4	1.39	3.892	908.3		velocity		

73	Hughes Street Bridge	**085	25-Nov-98	warn/o	high	yes	milky v	cov.w	beige,	yes	no	sulfide	yes			6.348	7.458	20.2	2.85	22	0.028	53	0.04	-0.04			0	0.262	0.7	0.27	8.64	4	1.47	4.234	988		velocity		
74	Hughes Street Bridge		02-Dec-98	overca	norma	yes	milky l	grey	green,	yes	no	sulfide	yes			10.35	7.411	21.4	0.52	23.1	0.04	12	0.07	-0.07			1	0.003	0.3	0.66	6.24	4	0.86	1.789	417.5		velocity		
77	Hughes Street Bridge		23-Dec-98	overca	low	yes	clear	black	N/A	yes	yes	sewage	slow			8.655	6.702	15.4	2.55	16.2	0.024	74	0.53	-0.53			5	0.006	0.7	0	9.36	3	1.01	2.363	551.6		velocity		
78	Hughes Street Bridge		30-Dec-98	cool,su	high	yes	milky g	N/A	brown	none	no	sewage	yes			5.107	6.638	16.3	5.4	15.2	0.033	40	0.06	-0.06			0	0.03	1	0.26	9.36	4	1.18	3.682	859.2		velocity		
79	Hughes Street Bridge		06-Jan-99	cool,su	high	yes	milky g	N/A	lt. Bro	yes	no	sewage	yes			8.472	6.968	14.4	3.66	16.7	0.02	67	0.11	-0.11			0	0.048	0.5	1.26	8.04	3.3	1.41	3.118	727.6		velocity		
80	Hughes Street Bridge		13-Jan-99	warm/s	norma	no	clear	grey	yes, g	yes	no	none	slow			5.223	7.156	16.7	3.42	18.4	0.023	71	0.06	-0.06			3	0.075	0.7	0.79	5.76	4.5	1.83	3.953	922.5		velocity		
81	Hughes Street Bridge		21-Jan-99	cool,ov	norma	no	green	brown	red &	yes	no	sewage	yes			7.952	6.844	17.1	3.93	18.8	0.017	66	0.02	-0.02				0.006	0.4	0.38	6	4	1.34	2.68	625.4	6.36	velocity		
82	Hughes Street Bridge		22-Jan-99	warm,	high	yes	milky g	brown	green,	yes	no	sewage	yes			6.363	7.371	17.7	2.04	19.6	0.02	68						0.006	0.4	1.24	7.2	4	1.47	3.528	823.4		velocity		
83	Hughes Street Bridge		26-Jan-99	warm,	norma	yes	black	black/g	grey, b	none	no	sewage	yes			8.049	7.222	16.6	1.15	18.1	0.019	53						0.001	0.4	2.13	6.24	3.3	1.53	2.625	612.7		velocity		
84	Hughes Street Bridge		02-Feb-99	Cloudy	norma	no	green	grey/bl	green,	yes	no	sewage	yes			6.09	7.509	17.4	2.54	18.9		58						0.094	0.2	1.19	7.56	3.2	1.47			7.268	velocity		
85	Hughes Street Bridge		04-Feb-99	cool, o	norma	yes	green	slimy,	green,	yes	slight dri	sewage	yes			9.231	7.369	17.4	2.22	19.5		58						0.004	0.3	1.64	6.24	3							
86	Hughes Street Bridge		05-Feb-99	Cloudy	norma	yes	black	black	black/	yes	no	sewage	yes			9.647	7.01	17.6	0.26	19.2	0.028	53	0.3	-0.3			2	0.008	0.6	1.49						5.769			
87	Hughes Street Bridge		09-Feb-99	warm,	high	no	black	black	white/	yes	no	sulfide	yes			9.911	7.087	18.2	3.29	22.9	0.178	48	0.17	-0.17			0	0.006	0.2	0.98									
88	Hughes Street Bridge		12-Feb-99	cloudy,	high	yes	black	black	black/	yes	no	sulfide	yes			9.018	7.653	16.6			0.273	47	0.16	-0.16			0	0	0.9	2.12	6	3.2				6.556			
89	Hughes Street Bridge		16-Feb-99	cloudy	low	no	milky g	white/g	dark g	yes	no	sewage	yes			7.243	8.36	16.7	5.45		0.008	58	0.03	-0.03			0	0.081	0.9	1.55	5.76	4	3.28			5.11	velocity		
90	Hughes Street Bridge	looks l	18-Feb-99	cool, s	norma	yes	muddy	brown	green,	none	no	sewage	yes			7.52	7.644	10.8	4.58		0.029	9	0.05	-0.05			1	0.043	0.8	0.47	5.76	4	2.47			5.422	velocity		
91	Hughes Street Bridge	saw m	23-Feb-99	cool,su	high	no	green	brown/	green	none	no	none	strong			6.97	8.735	16.5	1.63		0.008	36	0.12	-0.12			0	0.187	0.6	0.15	7.2	3	3.79			7.984	velocity		
92	Hughes Street Bridge		26-Feb-99	warm,w	norma	no	green(	brown	brown	yes	no	sewage	fast			8.469	7.122	17.9	1.43	19.8	0.029	51	0.34	-0.34			3	0.007	0.3	0.35	5.76	3.5	2.8			7.198	velocity		
93	Hughes Street Bridge		02-Mar-99	cool, o	norma	yes	dark g	black	green	yes	no	sulfide	yes, fast			9.496	7.329	18.1	1.3	19.4	0.058	40	0.5	-0.5			0	0.011	0.2	0.74	6	4	2.85			11.8	velocity		
94	Hughes Street Bridge		05-Mar-99	cloudy,	norma	no	green	black	green	yes	no	sewage	yes, fast			9.385	6.709	18.5	1.28	19.6	2.472	41	0.16	-0.16			2	0.002	1.6	1.41	5.04	3.5	3.06				velocity		
95	Hughes Street Bridge	odor a	09-Mar-99	warm,	norma	yes	grey	black	green	yes	no	sulfide	yes			8.444	7.199	17.8	1.3	19.3	0.255	38	0.12	-0.12			0	0.008	0.4	0.73	6	3.5	3.93			7.943	velocity		
96	Hughes Street Bridge	oil film	11-Mar-99	cool, o	norma	slightly	black	black/v	green	none	no	sewage	yes, stro			9.529	7.055	18.4	0.97	20.1	0.654	53	0.17	-0.17			0	0.018	0	0.83	5.52	3.2	3.23			8.425	velocity		
97	Hughes Street Bridge		16-Mar-99	cool, s	norma	no	greeni	grey	no	none	no	none	yes			7.578	7.867	15.9	7	17.6	0.02	49	0.07	-0.07			0	0.018	2.4	0.99	6	3.5	2.62			6.725	velocity		
98	Hughes Street Bridge		23-Mar-99	warm,	norma	no	clear	black	rusty,	none	no	sulfide	yes			7	7.501	19.7	2.1	19.5	0.005	57	0	0			1	0.044	1.9	0.36	7.2	3.2	3.35			8.289	velocity		
99	Hughes Street Bridge		25-Mar-99	cool, s	norma	no	greeni	grey	a lot o	yes	no	sewage	fast			10.55	6.92	19.8	1.14	19.7	0.013	55	0.06	-0.06			3	0.007	0.4	0.21	5.04	3.5	3.85			9.121	velocity		
100	Hughes Street Bridge		30-Mar-99	cool, ra	high	slightly	browni	brown	no	none	yes	sewage	fast				6.263	18.8	7.6	18.7	0.016	18	0.03	-0.03				0.015	1.3	0.19						6.545			
101	Hughes Street Bridge		01-Apr-99	sunny,	high	no	green	green	brown	yes	no	none	strong				6.964	20	4.62	19.9	0.017	37					1			0.43	6	3.2	4.56			8.889	velocity		
102	Hughes Street Bridge		05-Apr-99	cool, s	norma	slightly	clear	grey	rusty,	yes	no	sewage	yes				7.253	20.2	1.44	20.4	0.015	62							0.3	0.46	6	3.4	2.76				velocity		
103	Hughes Street Bridge		07-Apr-99	cool, o	norma	yes	cloudy	black/g	green	yes	no	sewage	fast				7.122	21.2	1.35	21.2	0.054	53							1.1	0.74	5.52	3.5	2.8				velocity		
104	Hughes Street Bridge		15-Apr-99	cool, s	norma	very tur	grey (r	grey	green	none	no	none	yes				7.707	20.6	4.03	20.5	0.105	24							0	0.79	6.24	5	2.6				velocity		
105	Hughes Street Bridge		23-Apr-99	hot, su	low	slightly	dark g	black a	a lot o	yes	no	sulfide	fast				7.146	23.7	3.14	24.4	0.048	53							0.6	0.89	6	3.5							
106	Hughes Street Bridge		27-Apr-99	warm,	norma	very tur	green	brown	N/A	none	no	sewage	strong				7.455	22.7	2.82	22.8	0.106	27							1.5	1.16	6	2.9	3.68				velocity		
107	Hughes Street Bridge		11-May-99	warm,	high	very tur	brown	brown	green	none	yes	none	very fas				6.73	22.1	7.72	22.1	0.048	7							1.1	0.41									0.003
108	Hughes Street Bridge		18-May-99																																				7E-04
109	Hughes Street Bridge		25-May-99	warm,	norma	very tur	greyish	black	green		no	sulfide	fast			-286.6	7.211	23.4	0.6	23.1	1.96	39							1.2	1.31						6.226			0.005
110	Hughes Street Bridge		08-Jun-99	hot, su	norma	yes	greyish	black/g	green,		no	sulfide	light				6.943	24.8	0.88	24.3	0.022	65							5	0.28	4.56	3.5	1.89			7.209	velocity		0.001
111	Hughes Street Bridge		11-Jun-99	warm,	norma	no	green	grey, g	yes, g		no	sulfide	slight				6.889	26.6	1.11	27.1	0.021	40							0.4	0.58	4.2	2.7	2.51			10.54	velocity		4E-04
112	Hughes Street Bridge	slight	15-Jun-99	warm,	high	no	clear	brown	green		no	none	yes			-73	7.508	26.2	2.91	26.1	0.007	54							0.7	0.88	6	4	2.94			9.101	velocity		6E-04
113	Hughes Street Bridge		22-Jun-99	warm,	high	yes	milky	green,	green,		previous	none	very slo			-168.9	6.843	26.2	1.16	21.6	0.016	34							1.2	0.39	7.2	4	3.15			6.374	velocity		0.002
114	Hughes Street Bridge		29-Jun-99	sunny,	very h	yes	milky	greyish	light g		no	sewage	yes			-65.2	7.127	28	4.59	27.9	0.019	53							0.9	0.97	8.4	6	0.14			5.672	velocity		0.002
115	Hughes Street Bridge		06-Jul-99	hot,ove	norma	little	browni	brown	rusty b		night B-	none	yes			-171	6.8	27.7	2.1	27.4	0.018	29							0.7	0.29	7.6	3	3.88			8.077	velocity		9E-04
116	Hughes Street Bridge		15-Jul-99	hot, su	norma	no	clear	stone g	lt. Gre		no	none	yes			-206.1	7.08	27.5	3.19	27.7	0.011	20							0.3	0.52	4.8	2.72	3.84			7.807	velocity		9E-04
117	Hughes Street Bridge	the mo	20-Jul-99	overca	high	no	browni	stone b	dark b		day b-4	none	yes			-154.8	7.14	26.2			0.019	10							1.1	0.3	4.56	2.92	3.52			5.885	velocity		0.002
118	Hughes Street Bridge		27-Jul-99	hot, su	norma	yes	yellow	green	green,		no	sewage	yes			-191.2	6.88	26.4	4.3	26.6	0.019	52							0.3	0.42	4.8	2.83	2.59			9.366	velocity		4E-04
119	Hughes Street Bridge	iol she	03-Aug-99	hot, ov	norma	no	greeni	green	green		no	none	yes			-197.6	7.35	26.5			0.013	53							0.2	0.68						6.186			2E-04
120	Hughes Street Bridge		13-Aug-99	hot, su	norma	no	clear	brown,	green,		no	none	yes			-163.5	7.16	26.7			0.001	69							0.2	0.81									
121	Evergreen Cemetery		08-Sep-97																																				
122	Evergreen Cemetery		02-Apr-98																																				
123	Evergreen Cemetery		28-Apr-98																																				
124	Evergreen Cemetery		12-May-98																																				
125	Evergreen Cemetery		21-May-98																																				
126	Evergreen Cemetery		27-May-98																																				
127	Evergreen Cemetery		28-May-98																																				
128	Evergreen Cemetery		03-Jun-98																																				
129	Evergreen Cemetery		08-Jun-98																																				
130	Evergreen Cemetery		11-Jun-98																																				
131	Evergreen Cemetery		15-Jun-98																																				
132	Evergreen Cemetery		17-Jun-98																																				
133	Evergreen Cemetery		22-Jun-98																																				
134	Evergreen Cemetery		26-Jun-98																																				
135	Evergreen Cemetery		29-Jun-98																																				
136	Evergreen Cemetery		08-Jul-98																																				
137	Evergreen Cemetery		13-Jul-98																																				
138	Evergreen Cemetery		20-Jul-98																																				
139	Evergreen Cemetery	underg	29-Jul-98		norma	yes	green	N/A	N/A			dead fis	slow				6.2	25	2.7	28.6	0.06	53	0.08	0.5	0.58	0.615	7	0.01	0	0.47									
140	Evergreen Cemetery		12-Aug-98		norma	yes	gray	N/A	N/A			none	none				7.3	25	4.08	28.8	0.037	53	0.05	0.53	0.58	0.569	3	0.49	0.5	0.85									
141	Evergreen Cemetery		19-Aug-98		norma	yes	yellow	N/A	N/A			none	none				6.6	25	1.7	27.1	0.064	41	0.12	-0.12		0.914	4	0.007	0.8										
142	Evergreen Cemetery		26-Aug-98		norma	no	clear	N/A	N/A			none	none				6.9	25	1.24	27.4	0.016	67	0.03	0.23	0.26	0.264	7	0.268	1.5	0.57									
143	Evergreen Cemetery		09-Sep-98		low	yes	brown					none	slow			550.3	7.6	25	3.98	26.6	0.055	30	0.05	0.31	0.36	0.357	0	0.052	2	0.4									
144	Evergreen Cemetery		14-Sep-98		high	yes	brown	brown	N/A		soil wet	none	slow			714.3	7	25	2.76	23.4	0.021		0.05	-0.05			4	0.033											
145	Evergreen Cemetery		16-Sep-98		high	no	yellow					sulfide	slow				7.2	25.4	4.9	26.7	0.024	27	0.05	0.54	0.59	0.59	3	0.015	0.3	0.28									
146	Evergreen Cemetery		23-Sep-98		norma	no	clear	N/A	N/A		yes	none	slow			143.2	6.7	25	1.64	27.4	0.039	73	0.08	0.49	0.57	0.408	11	0.097	0.6	0.53									
147	Evergreen Cemetery		30-Sep-98	sunny	norma	yes	beige	N/A	N/A		no	sulfide	none	200000	27.1	132	6.8	25			0.05	59	0.09	0.77	0.86	0.877	5	0.07	0.4	0.82								0.6	
148	Evergreen Cemetery		07-Oct-98	cool/hu	high	yes	yellow					none	fast			84.5	7.59	23.2	1.28	24.3	0.016	50	0.04	0.49	0.53	0.51	3	0.05	1.4	0.46									
149	Evergreen Cemetery		14-Oct-98	sunny		no	clear				no	none	none	20000	4	68.4	7.54	23.4	1.76	24.4	0.014	65					2	0.041	0.5	1.19								0.8	
150	Evergreen Cemetery		21-Oct-98	cool/cl	high	yes	yellow	N/A	N/A		no	none	none			157.2	7.381	22.6	5.44	23.7	0.023	55		0.36	0.36	0.355	3	0.059	0.7	0.49									
151	Evergreen Cemetery		28-Oct-98	warm/s	high	yes	milky v	N/A	N/A		no	sewage	none				7.66	22.6	8.634	23.9	0.051	72	0.06	0.27	0.33	0.213	1	0.068	0.9	2.13									
152	Evergreen Cemetery	Sulfate	04-Nov-98	cool/su	N/A	no	clear	N/A	N/A		no	none	none			7.108	7.3	21.6	1.7	22.9	0.007	63	0	0.32	0.32	0.316	0	0.008	0.2	0.21									
153	Evergreen Cemetery		13-Nov-98	cool/we	high	yes	yellow	N/A	N/A		yes	sulfide	yes			5.768	8.26	15.7	6.33	17.1	0.032	0	0.08	0.47	0.55	0.739	0	0.024	1.2	0.58									
154	Evergreen Cemetery		18-Nov-98	sunny/	slightl	no	clear	N/A	N/A		no	sulfide	none			6.057	8.576	20.1	8.3	21.1	0.015	57	0	0		0.43	0	0.072	1.3	0.57									
155	Evergreen Cemetery	oil she	25-Nov-98	warn/o	high	yes	cloudy	N/A	N/A		no	none	slow			5.8	7.594	20.2	4.6	21.8	0.087	68	0.11				0	0.205	1.1	1.31									

156	Evergreen Cemetery		02-Dec-98	overca	norma	no	clear	N/A	N/A		no	none	N/A			6.855	7.213	20.9	12.76	21.3	0.016	20	0.02				0	0.07	0.9	0.43									
157	Evergreen Cemetery		17-Dec-98	cool,cle	norma											7.639	9.345	17.6	5.58	19.2	0.009	69	0.01				2	0.122	0	0.37									
158	Evergreen Cemetery	oil she	23-Dec-98	overca	high	yes	yellow	N/A	N/A		yes	sewage	slow			8.281	7.349	13.1	7.23	13.9	0.06	72	0.31				5	0.021	1	0.13									
159	Evergreen Cemetery		30-Dec-98	cool,su	high	yes	milky v	N/A	N/A		no	none	yes			4.909	7.216	14	8.73	12.9	0.046	64	0.03				3	0.04	0.6	1.21									
160	South Vent		06-Jan-99	cool,su	N/A	no	slightly	N/A	N/A		no	sulfide	N/A			5.81	7.008	16.3	4.25	17.9	0.025	48	0				7	0.135	1.5	0.86									
161	South Vent		13-Jan-99	warm/s	norma	no	clear	N/A	N/A		no	none	N/A			5.141	7.309	17.1	12.95	18.8	0.008	58	0.01					0.117	0.7	0.99						5.718			
162	South Vent	SOUT	21-Jan-99	cool,ov	N/A	yes	yellow	N/A	N/A		no	sulfide	slight			6.79	7.366	18.3	5.97	20.3	0.008	57						0.107	1.4	1.41									
163	South Vent	thick o	02-Feb-99	sunny,	N/A	yes	clear v	N/A	N/A		no	none	N/A			5.96	7.099	17.6	1.73	19.2		46						0.06	0.5	1.85									
164	South Vent		09-Feb-99	warm,	N/A	yes	cloudy	N/A	N/A		no	none	N/A			8.202	8.503	19	3.52	21.3	0.111	49	0.04				3	0.286	0.9	2.66						23.59			
165	South Vent		16-Feb-99	cloudy	N/A	slightly	slight	N/A	N/A		no	none	N/A			6.866	9.818	17.4	4.79		0.018	57	0.05				1	0.036	1	2.36						10.9			
166	South Vent		23-Feb-99	cool,su	norma	yes	oil film	N/A	N/A		no	none	no			6.66	8.294	16	2.47		0.016	32	0.016				22	0.2	0.9	0.6						10.69			
167	South Vent	oil film	02-Mar-99	cool, o	N/A	yes	yellow	N/A	N/A		no	sewage	no, stag			7.056	8.161	18	2.41	19.8	0.02	67	0.01				3	0.311	1.1	0.64						9.623			
168	South Vent	oil film	09-Mar-99	warm,	below	yes	slight	N/A	N/A		no	sewage	no			7.742	7.238	18	1.8	19.7	0.039	55	0.04				22	0.136	0.4	0.66						6.697			
169	South Vent		16-Mar-99	cool, s	norma	no	yellow	N/A	N/A		no	none	slight	3500		7.774	7.401	16.5	5.49	18	0.016	47					5	0.018	2.2	0.96						5.956			
170	South Vent	thick o	23-Mar-99	warm,	N/A	yes	yellow	N/A	N/A		no	sulfide	N/A			8.846	7.71	19.7	3.57	19.5	0.041	30	0.11				5	0.081	1.1	0.69						23.17			
171	South Vent	oil film	30-Mar-99	cool, ra	high	slightly	rusty c	N/A	N/A		yes	sulfide	slow				6.963	18.3	7.66	18.5	0.035	20	0.03					0.031	0.5	0.42						7.866			
172	South Vent		05-Apr-99	cool, s	N/A	yes	slightly	N/A	N/A		no	none	N/A				7.46	20.7	3.93	20.8	0.081	50							1	1.35									
173	South Vent		15-Apr-99	cool, s	N/A	very tur	grey w	N/A	N/A		no	none	no				7.801	20.5	6.93	20.5	0.065	25							0.8	0.55									
174	South Vent	lots of	23-Apr-99	hot, su	low	very tur	black	N/A	N/A		no	sewage	no				7.656	24.4	6.2	24	0.073	28							0.8	2.13									
175	South Vent		27-Apr-99	hot, su	norma	very tur	grey w	N/A	N/A		no	sewage	no				7.071	22.4	5.32	22.4	0.081	28							1.2	1.33									
176	South Vent		11-May-99	warm,	norma	yes	greyisl	N/A	N/A		yes	none	no				7.13	22.4	7.91	22.5	0.035	26							0.9	0.45									0.002
177	South Vent	no wat	25-May-99	hot, hu																																			
178	South Vent	no wat	08-Jun-99	hot, su																																			
179	South Vent	no wat	15-Jun-99	hot, ov																																			
180	South Vent	no wat	22-Jun-99																																				
181	South Vent	there i	29-Jun-99	hot, su																																			
182	South Vent	no wat	06-Jul-99	hot, ov																																			
183	South Vent	there i	15-Jul-99																																				
184	South Vent	no wat	27-Jul-99	hot, su																																			
185	South Vent	no wat	03-Aug-99	hot, ov																																			
186	North Vent		06-Jan-99	cool,su	N/A	no	clear	N/A	N/A		no	sulfide	N/A			6.794	6.79	15.8	3.25	17.5	0.04	74	0.05				4	0.011	0.4	2.79									
187	North Vent		13-Jan-99	warm/s	norma	no	yellow	N/A	N/A		no	none	slow			4.716	7.199	16.9	9.97	18.6	0.021	70	0.01				2	0.36	1.2	1.95						6.302			
188	North Vent	NORT	21-Jan-99	cool,ov	N/A	yes	yellow	N/A	N/A		no	none	none			6.814	6.738	17.7	3.33	19.6	0.029	60	0.1					0.037	0.6	1.36									
189	North Vent		02-Feb-99	sunny,	N/A	yes	milky v	N/A	N/A		no	none	N/A			5.945	7.22	1.67	18.8			68						0.094	2.3	0.7									
190	North Vent		09-Feb-99	warm,	N/A	yes	cloudy	N/A	N/A		no	none	N/A			8.389	8.482	18.5	3.9	20.6	0.054	49	0.09				1	0.111	1.5	1.34						5.704			
191	North Vent		16-Feb-99	cool, cl	N/A	yes	cloudy	N/A	N/A		no	none	none			7.609	8.862	17.3	1.28		0.05	68	0.18				6	0.019	0.7	0.89						14.88			
192	North Vent		23-Feb-99	cool,su	N/A			N/A	N/A		no	none	N/A			6.5	7.479	16.2	2.63		0.004	65	0				4	0.084	0.9	0.15						7.131			
193	North Vent		02-Mar-99	cool, o	N/A	yes	greyisl	N/A	N/A		no	sulfide	stagnan			6.97	7.821	18.2	1.2	19.6	0.177	72	0.15				0	0.041	1	0.71						26.5			
194	North Vent	oil film	09-Mar-99	warm,	below	yes	cloudy	N/A	N/A		no	sewage	none			8.535	6.964	17.4	1.88	19.6	0.058	48	0.22				7	0.006	0.7	1.15						14.89			
195	North Vent		16-Mar-99	cool, s	norma	no	clear	N/A	N/A	none	no	none	slight	53000		7.778	7.541	16.6	4.04	18.4	0.016	62	0.02				7	0.062	1.4	0.35						6.016			
196	North Vent		23-Mar-99	warm,	N/A	yes	yellow	N/A	N/A		no	none	N/A			7	7.87	19.8	4.78	19.8	0.015	73	0.14				8	0.119	0.8	0.06						7.21			
197	North Vent	oil film	30-Mar-99	cool, ra	high	slighty	rusty c	N/A	N/A	none	yes	sulfide	slow				6.826	18.5	8.05	18.5	0.028	26	0.07					0.032	0.7	0.26						8.893			
198	North Vent		05-Apr-99	cool, s	N/A	yes	slightly	N/A	N/A		no	sulfide	N/A				7.241	20.5	1.38	20.6	0.041	64							0.4	0.67									
199	North Vent		15-Apr-99	cool, s	N/A	yes	grey	N/A	N/A		no	none	N/A				7.327	20.8	2.63	21	0.078	31							0.6	0.57									
200	North Vent	many	23-Apr-99	hot, su	norma	no	slightly	N/A	N/A	none	no	none	none				7.392	22.8	3.23	22.6	0.01	72							0.1	0.36									
201	North Vent		27-Apr-99	hot, su	norma	very tur	grey	N/A	N/A		no	none	none				6.988	22.8	4.35	22.8	0.074	20							1.3	1.61									
202	North Vent		11-May-99	warm,	above	yes	yellow	N/A	N/A		yes	none	none				7.049	22.4	7.9	22.4	0.026	28							1.4	0.21									7E-04
203	North Vent		18-May-99																																				0.003
204	North Vent		25-May-99	hot, hu	norma	yes	cloudy	cannot	N/A		no	sewage	none			-174.5	7.183	24.1	5.8	24.4	0.028	60							2.3	0.32	29.5					6.624			3E-04
205	North Vent		08-Jun-99	hot, su	norma	slightly	yellow	N/A	N/A		no	sewage	none				7.052	25	1.14	28.1	0.016	65							0.3	0.19	44					11.46			0.001
206	North Vent		15-Jun-99	hot, ov	N/A	no	clear	N/A	N/A		a day be	none	none			-75.4	7.429	26.7	3.26	26.5	0.009	54							1	0.93						11.58			3E-04
207	North Vent	oil she	22-Jun-99	warm, l	N/A	slight	slightly	N/A	N/A		a day be	none	none			-142.2	7.052	26.5	3	26.5	0.039	45							0.9	0.73						8.294			0.003
208	North Vent		29-Jun-99	sunny,	N/A	no	clear	N/A	N/A		no	none	yes			-65.2	7.183	28.4	4.46	28.4	0.018	54							1	0.95	32					5.672			0.002
209	North Vent		06-Jul-99	hot, ov	N/A	no	clear y	N/A	N/A		night B-	sewage	none			-173.4	6.49	28.1	1.84	28.2	0.019	15							0.7	0.27						7.002			0.001
210	North Vent		15-Jul-99	hot, su	N/A	no	clear	N/A	N/A		no	none	none			-195.9	7.06	27.5	3.88	28	0.009	25							0.5	0.43						7.788			0.001
211	North Vent		20-Jul-99	overca	N/A	no	browni	N/A	N/A		day b-4	none	none			-139.3	7.24	26.7	5.8	26.7	0.022	32							0.6	0.29						7.194			0.002
212	North Vent		27-Jul-99	hot, su	N/A	no	yellow	N/A	rusty r		no	none	none			-195.9	3.9	27.3	7.15	27.4	0.007	51							0.3	0.57						11.77			0.001
213	North Vent		03-Aug-99	hot, ov	N/A	no	clear	N/A	N/A		no	sewage	none			-238.9	7.35	26.9			0.013	66							0.2	0.49						5.745			0.004
214	North Vent		13-Aug-99	hot, su	low	no	clear	N/A	N/A		no	none	none			-166.2	7.48	27.1			0.008	67							0.4	1.64									
215	Park and Elm N1	assum	22-Sep-98	clear,s		no	clear-f	black-	none	none		none	yes	4600	2.1		7.3	25	2.61	27.3	0.004		0.01	0.46	0.47	0.495		0.028	0.5	0.45					68		drift tra	0.2	
216	Park and Elm N1		30-Sep-98	sunny/l	low	yes						none	slow	45000	44.7	126	7.1	25.7	2.99	18.9	0.014	70	0.01	1.79	1.8	1.888	1	0.006	0.4	1.13					53		drift tra	0.1	
217	Park and Elm N1		07-Oct-98	cool/hu	low	yes	yellow				no	none	medium			123.7	7.55	22.9	2.86	23.6	0.012	42	0.01	0.36	0.37	0.282	2	0.055	3.4	1.39					182		drift tra		
218	Park and Elm N1		14-Oct-98	sunny/		no	yellow				no	insectici	slow	5400	4.9	92.4	7.58	22.7	1.25	23.6	0.002	30					2	0.005	0	0.32					93		drift tra	0.3	
219	Park and Elm N1	oil she	21-Oct-98	cool/clo	high	no	clear	brown	N/A		no	none	yes			133.4	7.65	22.5	8.02	23.7	0	52			0.41	0.388	3	0.029	0.6	0.15	4	1	0.75	0.25	58.34		drift tra		
220	Park and Elm N1		28-Oct-98	warm/s	N/A	no	clear	N/A	N/A		no	sewage	N/A				7.54	23.7	10.29	24.6	0.006	88	0.02	0.8	0.82	0.848	1	0.09	1	1.27									
221	Park and Elm N1	clear fi	04-Nov-98	cool/su	low	no	clear	N/A	N/A		no	none	N/A			6.457	8.12	21.3	10.3	22	0.004	70	0	0.47	0.47	0.485	0	0.005	0.2	0.12	2	1	0.429	0.071	16.67		drift tra		
222	Park and Elm N1		13-Nov-98	cool/we	high	yes	yellow	N/A	N/A		yes	sewage	yes			6.442	7.41	16.2	8.63	17.4	0.027	7	0.03	0.48	0.51	0.465	1	0.02	2.1	0.55									
223	Park and Elm N1		18-Nov-98	sunny/	above	no	clear	N/A	N/A		no	none	yes			6.322	9.008	20.9	5.38	22.2	0.002	32	0.01			0.537	4	0.001	0.2	0.1	3	1	0.632	0.158	36.85		drift tra		
224	Park and Elm N1		25-Nov-98	warn/o	N/A	no	clear	N/A	N/A		no	none	yes			6.334	7.696	21.4	4.93	22.5	0.07	46	0				0	0.007	0.4	0.1									
225	Park and Elm N1		02-Dec-98	overca	below	no	slightly	N/A	N/A		no	none	yes			6.168	8.406	21.4	6.61	22.7	0.001	42	0				0	0.006	0.3	0.24	1.75	1	0.5	0.073	17.02		drift tra		
226	Park and Elm N1		17-Dec-98	cool,cle	norma	no	clear	N/A	N/A		no	none	N/A			7.237	9.754	18.2	7.14	18.5	0.001	66	0				5	0.009	0.2	0.39									
227	Park and Elm N1	oil she	23-Dec-98	overca	high	yes	yellow	N/A	N/A		yes	sewage	slow			6.17	7.758	14.6	7.21	16.2	0.019	66	0.01				44	0.007	0.4	1									
228	Park and Elm N1		30-Dec-98	cool,su	high	yes	milky	N/A	N/A		no	none	yes			3.751	7.382	13	10.59	14.3	0.05	44	0.06				0	0.026	0.9	1.02									
229	Park and Elm N1		06-Jan-99	cool,su	low	no	clear	N/A	N/A		no	sulfide	yes			4.765	7.455	17	5.64	19	0.034	72	0.28				5	0.043	0.8	2.44									
230	Park and Elm N1		13-Jan-99	warm/s	norma	no	yellow	N/A	N/A	yes	no	sewage	slow			4.571	8.033	18	8.86	19.8	0.021	85	0.01					0.014	0.8	2.66	3	1	0.429	0.107	25	6.508	drift tra		
231	Park and Elm N1		21-Jan-99	cool,ov	N/A	yes	milky v	N/A	N/A		no	sewage	slow			6.927	7.366	19.5	5.38	21.4	0.059	59	0.05					0.019	0.8	2.45									
232	Park and Elm N1		02-Feb-99	sunny,	low	no	slightly	N/A	N/A		no	none	yes			6.542	7.311	17.7	0.92	19.4		55						0.005	0.5	0.85	2.5	1	0.429	0.089	20.84		drift tra		
233	Park and Elm N1		09-Feb-99	warm,	norma	no	slightly	N/A	N/A		no	none	N/A			8.709	7.068	19.6	3.87	21.6	0.017	55	0.45				0	0.009	1	1.44	2.75	1	0.316	0.072	16.89		drift tra		
234	Park and Elm N1		16-Feb-99	warm/s	low	slightly	clear	white s	N/A		no	sewage	yes			7.632	8.353	18.2	2.61		0.044	36	0.86				0	0.006	1	4.1	2.57	1	0.343	0.073	17.14	225.8	drift tra		
235	Park and Elm N1		23-Feb-99	cool,su	very l	no	yellow	white s	N/A		no	sulfide	very slo			6.297	8.36	17.2	5.01	19.3	0.006	55	0.06				3	0.01	0.5	1.74	2.25	1	0.4	0.075	17.5	123	drift tra		
236	Park and Elm N1	green	02-Mar-99	cool, o	low	yes	cloudy	N/A	N/A		no	sewage	no			7.595	7.329	18.7	2.52	20.2	0.013	51	0.62				0	0.008	0.5	4.68	3	1	0.286	0.072	16.69	361.3	drift tra		

237	Park and Elm N1		09-Mar-99	warm,	low	yes	cloudy	N/A	N/A	yes	no	sewage	slight			7.974	7.281	19.1	5.89	20.2	0.035	54	0.02				0	0.045	0.7	0.87	3.5	1	0.545	0.159	37.1	7.283	drift tra		
238	Park and Elm N1	many,	16-Mar-99	cool, s	norma	no	clear	N/A	N/A		no	none	slow	94000		7.751	8.553	17.2	6.51	19	0.008	0.3	0.01				1	0.044	0.3	0.4	2.25	1	0.44	0.083	19.25	6.178	drift tra		
239	Park and Elm N1		23-Mar-99	warm,	low	no	clear	N/A	N/A		no	none	N/A			7	7.998	20.6	6.55	20.3	0.004	69	0.01				0	0.034	0.5	0.32	2	1	0.522	0.087	20.3	6.234	drift tra		
240	Park and Elm N1		30-Mar-99	cool, ra	above	slightly	rusty c	N/A	N/A		yes	none	fast				7.495	18.8	8.38	18.8	0.024	16	0.04					0.027	1	0.37						7.868			
241	Park and Elm N1		05-Apr-99	cool, s	N/A	no	clear	N/A	N/A		no	none	N/A				7.605	20.7	4.34	20.7	0.007	58							0.4	1.99									
242	Park and Elm N1		08-Jun-99	hot, su	low	slightly	slightly	N/A	N/A		no		slight				7.898	24.58	4.33	25.3	0.04	59							0.1	0						8.634			0.003
243	Park and Elm N1		15-Jun-99	hot, ov	N/A	no	clear	N/A	N/A		a day pr	none	slight			-95.5	7.608	25.3	2.83	25.4	0.002	42							0.6	0.28						9.544			0.001
244	Park and Elm N1	Didn't	22-Jun-99	warm,																																			
245	Park and Elm N1	the flo	29-Jun-99	sunny,	high	yes	milky	N/A	N/A		no	none	very str			15.7	7.39	29	4.93	29.5	0.031	49							1.3	1.11						5.107			0.006
246	Park and Elm N1	Didn't	06-Jul-99	hot, ov																																			
247	Park and Elm N1	Didn't	15-Jul-99	hot, su																																			
248	Park and Elm N1		27-Jul-99	hot, su	N/A	no	clear	N/A	N/A		no	sewage	yes			-169.9	7.78	26.3	6.4	26.4	0.001	73							0.1	0.17						5.398			7E-04
249	Park and Elm N1		03-Aug-99	hot, ov	norma	no	clear	N/A	N/A		no	sewage	normal			-142.8	8.04	26.5			0.006	62							0.8	0.3						5.43			2E-04
250	Ennis and Lamar N3	assum	16-Sep-98			yes	gray				yes-PM	none	yes				7.2	25	4.8	26.9	0.157	28	0.04	1.53	1.57	1.355		0.025	0.8	0.7	3	3	0.063	0.047	21.04		drift tra		
251	Ennis and Lamar N3	66" pi	22-Sep-98	clear,s	low	no	clear		none	none	none	none	none	240000			7	25	3	28.6	0.007		0	0.49	0.49	0.518		0.031	0.4	4.12	3	3	0						
252	Ennis and Lamar N3		30-Sep-98	sunny/l	very l	yes					none	sulfide	none	22000		20	6.7	26.8	4.57	19.8	0.006	65	0.04	0.45	0.49	0.521	4	0.033	0.4	5.22	3	3	0						
253	Ennis and Lamar N3		07-Oct-98	cool hu	very l	no	clear				none	none	slow			40.7	7.51	22			0.003	35	0.01	0.58	0.59	0.564	8	0.127	1.6	0.28	3	3	0.03	0.023	10.1		estimat		
254	Ennis and Lamar N3		14-Oct-98	sunny/		no	clear	brown			none	none	slow	810		47.5	6.68	24.4	3.3	25.8	0	24					1	0.043	0.6	1.47	3	3	0.03	0.023	10.1		estimat		
255	Ennis and Lamar N3		21-Oct-98	cool/cl	above	no	clear	brown	N/A		none	none	none			117.2	6.76	22.7	9.24	24.3	0.003	45			0.29	0.302	2	0.15		0.15									
256	Ennis and Lamar N3		28-Oct-98	warm/s	norma	no	clear	N/A	N/A		none	none	none				6.97	24.5	6.16	25.7	0.006	69	0.02	0.27	0.29	0.32	1	0.035	0.3	0.81									
257	Ennis and Lamar N3	Sulfate	04-Nov-98	cool/su	low	no	clear	N/A	N/A		none	none				2.47	7.11	22.2	9.45	23.1	0	44	0.02	0.25	0.27	0.275	1	0.076	1	0.64									
258	Ennis and Lamar N3		13-Nov-98	cool/we	above	yes	yellow	N/A	N/A		yes	none	yes			7.715	7.73	17.2	9.03	18.2	0.023	3	0.04	0.4	0.44	0.478	2	0.043	1.4	1.06									
259	Ennis and Lamar N3		18-Nov-98	sunny/	above	no	clear	N/A	N/A		none	none	no			10.38	8.433	22.5	3.84	23.7	0.004	74	0			0.688	2	0.029	0.7	0.69									
260	Ennis and Lamar N3		25-Nov-98	warm/c	above	yes	slightly	N/A	N/A		none	sewage	no			6.74	7.044	22.5	3.3	23.6	0.027	42	0.47				1	0.044	0.7	1.86									
261	Ennis and Lamar N3		02-Dec-98	sunny,	slightl	no	clear	N/A	N/A		none	sulfide	slight flo			6.484	7.633	22.8	6.41	24.2	0.003	46	0				1	0.048	0.4	1.25									
262	Ennis and Lamar N3		17-Dec-98	cool,cl	norma	no	clear	N/A	N/A		none	gasoline	N/A			7.347	8.565	20.2			0.016	40	0.02				2	0.052	0.6	0.88									
263	Ennis and Lamar N3	water	23-Dec-98	overca	norma	yes	green	N/A	N/A		none	sewage	no			6.63	7.254	15.8	5.45	17	0.062	56	0.04				9	0.079	1.2	1.25									
264	Ennis and Lamar N3		30-Dec-98	cool,su	very h	yes	milky v	N/A	N/A		none	none	strong			3.957	7.627	12.1		13.5	0.052	52	0.09				0	0.018	1	1.44									
265	Ennis and Lamar N3		06-Jan-99	cool,su	low	no	clear	N/A	N/A		none	sulfide	no			5.257	6.803	18.2	4.22	19.9	0.038	69	0.01				1	0.056	0.7	2.06									
266	Ennis and Lamar N3		13-Jan-99	warm,	norma	no	yellow	N/A	N/A		none	none	slow			4.994	6.917	19.8	6.92	21.5	0.004	73	0.02				0	0.118	0.9	1.07						5.856			
267	Ennis and Lamar N3		21-Jan-99	cool,ov	above	no	clear	N/A	N/A		none	none	no			5.734	7.005	20.4	4.32	22.2	0.006	70						0.298	1.2	1.59									
268	Ennis and Lamar N3		02-Feb-99	sunny,	norma	no	clear	N/A	N/A		none	none	no			6.361	7.718	19.2	0.95	20.6		56						0.243	1.2	3.48									
269	Ennis and Lamar N3		09-Feb-99	warm,	norma	no	clear	N/A	N/A		none	none	no			7.811	6.995	21.5	4.38	23.4	0.009	70	0.02				6	0.296	1.7	3.76									
270	Ennis and Lamar N3		16-Feb-99	warm,	norma	yes	milky	N/A	N/A		none	none	no			6.192	9.001	19.8	3.12		0.067	61	0.17				4	0.247	1.3	6.2						6.79			
271	Ennis and Lamar N3		23-Feb-99	cool,su	low(n	no	yellow	N/A	N/A		none	sewage	N/A			6.287	7.603	18.7	4.36	20.7	0.012	63	0.02				6	0.824	2.5	3.04									
272	Ennis and Lamar N3		02-Mar-99	cool, o	norma	yes	yellow	N/A	N/A		none	none	slight flo			6.931	8.255	20.3	4.44	21.6	0.017	82	0.02				4	0.504	2.7	2.88						9.633			
273	Ennis and Lamar N3		09-Mar-99	warm,	above	yes	rusty c	N/A	N/A		none	dead fis	no			7.808	8.076	20.2	4.43	21.4	0.034	60	0.01				1	0.284	1.7	3.68						16.29			
274	Ennis and Lamar N3		16-Mar-99	cool, s	above	yes	yellow	N/A	N/A		none	none	slow	10000		7.614	8.444	18.1	6.85	20	0.029	55	0.06				1	0.187	1	2.78						6.353			
275	Ennis and Lamar N3		23-Mar-99	warm,	norma	yes	yellow		N/A		none	none	N/A			7	7.488	21.6	4.74	21.5	0.019	68	0.02				2	0.311	1.2	2.52						10.72			
276	Ennis and Lamar N3		30-Mar-99	cool, ra	above	slightly	rusty c	N/A	N/A		yes	none	slow				7.561	19.3	8.15	19.3	0	22	0.05					0.068	1.1	0.57						7.37			
277	Ennis and Lamar N3		05-Apr-99	cool, s	N/A	yes	yellow	N/A	N/A		none	none	N/A				7.53	21.2	5.71	21.1	0.007	70							0.3	2.31									
278	Ennis and Lamar N3		15-Apr-99	cool, s	low	slightly	yellow	N/A	N/A		none	none	no				7.679	20.3	8.79	20.3	0.016	51							2.2	1.06									
279	Ennis and Lamar N3		23-Apr-99	hot, su	above	very tu	milky b	N/A	N/A	none	none	none	no				7.664	26.3	7.5	26.4	0.211	48							3.8	3.74									
280	Ennis and Lamar N3		27-Apr-99	hot, su	above	very tu	cloudy	N/A	N/A	none	none	none	no				7.302	23.4	7.93	23.5	0.078	35							2.8	2.08									
281	Ennis and Lamar N3		11-May-99	warm,	above	yes	yellow	N/A	N/A	none	none	none	slight flo				7.274	23.4	8.9	23.4	0.022	30							1.9	0.72									0.033
282	Ennis and Lamar N3		25-May-99	hot, hu	above	yes	slight y	N/A	N/A		none	none	slight flo			-68.4	7.064	25.3	2.7	25.6	0	70							0.4	3.6	2.25					5.01			9E-04
283	Ennis and Lamar N3		08-Jun-99	hot, su													7.074	25.8	2.37	26.8	0.001	70							0.8	2.56						5.127			0.004
284	Ennis and Lamar N3		15-Jun-99	hot, ov	very l	no	clear	N/A	N/A		a day B	none	no			-111.6	6.793	26.2	2.42	26.4	0.001	35							1.4	0.82						8.379			9E-04
285	Ennis and Lamar N3		22-Jun-99	warm,	high	yes	milky	green,	green,		Yes afte	none	high			-185.5	6.853	26	2.107	26.3	0.001	54							1	0.52						6.793			4E-04
286	Ennis and Lamar N3		29-Jun-99	hot, su	very h	yes	milky	N/A	N/A		no	none	extreme			29.8	7.423	29.6	4.33	29.8	0.035	46							1.3	1						4.371			0.007
287	Ennis and Lamar N3	oil she	06-Jul-99	hot, su	norma	no	clear	N/A	N/A		night B4	none	no			-155.4	6.69	27.7	2.93	27.7	0.008	45							0.8	0.44						11.26			2E-04
288	Ennis and Lamar N3		15-Jul-99	hot, su	norma	no	clear g	N/A	N/A		no	sulfide	no			-179.9	7.11	26.9	4.2	27.4	0.022	58							0.9	4.24						7.512			0.022
289	Ennis and Lamar N3	very st	20-Jul-99	overca	norma	no	yellow	N/A	N/A		day B-4	sulfide	no			-152.7	7.13	26.8	3.3	27	0.009	52							0.6	1.77						6.556			0.002
290	Ennis and Lamar N3		27-Jul-99	hot, su	norma	no	clear	N/A	N/A		no	none	no			-176.9	7.11	26.9	5.4	27.1	0.007	63							0.4	3.68						7.748			0.005
291	Ennis and Lamar N3		03-Aug-99	hot, ov	norma	slightly	yellow	N/A	N/A		no	none	slight flo			-168.5	7.25	27.4			0	73							1	3.08						5.59			0.002
292	Polk and Elm S1	assum	22-Sep-98	clear,s		no	clear		none	none		none	yes-slo	690	4.6		7.3	25	3.54	28.1	0.008		0.02	0.2	0.22	0.219		0.223	0.9	0.96	19	11.5	0.013	0.228	53.12		4 minut	0.6	
293	Polk and Elm S1		29-Sep-98	sunny/l		yes	beige	na	na		no	none	slow	4300	32.5	154.3	7.5	26.5			0.018	71	0.03	1.06	1.09	1.048	2	0.191	1.2	1.24								0.9	
294	Polk and Elm S1		07-Oct-98	cool/hu		yes	yellow	na	na		no	none	slow			155.8	7.85	22.4	2.94	23.2	0.013	59	0.01	0.57	0.58	0.521	3	0.061	1.4	0.55									
295	Polk and Elm S1		14-Oct-98	sunny/		no	clear	na	na		na	sewage	none	2800	2.3	90	7.55	23.4	4.3	23.7	0.006	71					1	0.048	0.7	1								0.7	
296	Polk and Elm S1		21-Oct-98	cool/cl	high	yes	yellow	brown	N/A		no	sewage	none			162.9	7.47	23	8.39	23.6	0.002	60			0.1	0.135	2	0.075	1	0.5									
297	Polk and Elm S1		28-Oct-98	warm/s	high	yes	milky y	N/A	N/A		no	sulfide	very str				7.82	22.7	9.27	24.2	0.07	64	0.09	0.24	0.33	0.379	0	0.051	1.3	1.42									
298	Polk and Elm S1	oil film	04-Nov-98	cool/su	N/A	a little	clear	N/A	N/A		no	none	N/A			6.91	7.67	22	5.4	22.9	0.023	60	0.05	0.26	0.31	0.319	8	0.155	0.9	0.79									
299	Polk and Elm S1		13-Nov-98	cool/we	high	yes	yellow	N/A	N/A		yes	none	yes			6.567	7.37	16.4	5.72	17.6	0.029	14	0.06	0.6	0.66	0.672	1	0.013	2.3	0.62									
300	Polk and Elm S1		18-Nov-98	sunny/	above	no	clear	N/A	N/A		no	sewage	N/A			6.06	8.934	20.3	7.8	20.8	0.007	46	0.04			0.423	4	0.138	1.3	0.58									
301	Polk and Elm S1		25-Nov-98	warn/o	N/A	yes	cloudy	N/A	N/A		no	none	N/A			6.026	7.623	20.1	6.3	22.9	0.037	72	0.08				0	0.173	1.2	0.97									
302	Polk and Elm S1		02-Dec-98	overca	norma	no	clear	N/A	N/A		no	none	N/A			6.515	7.192	20.9	4.63	22.1	0.008	53	0				3	0.126	0.7	0.26									
303	Polk and Elm S1		17-Dec-98	cool,cl		no	clear	brown	N/A		no	none	none			6.949	9.102	14.5			0.004	66	0.01				1	0.096	0.4	0.25									
304	Polk and Elm S1	oil she	23-Dec-98	overca	high	yes	yellow	N/A	N/A		yes	sewage	none			6.679	7.592	14.8	7.7	15.7	0.038	47	0.04				5	0.1	1.1	0.11									
305	Polk and Elm S1		30-Dec-98	cool,su	high	no	slight y	N/A	N/A		no	sulfide	none			4.924	7.792	16.2			0.006	74	0				0	0.133	1	0.64									
306	Polk and Elm S1		06-Jan-99	cool,su	N/A	no	clear	N/A	N/A		no	none	N/A			5.04	7.299	17	4.49	18.5	0.06	74	0				4	0.121	1	0.04									
307	Polk and Elm S1		13-Jan-99	warm/s	norma	no	clear	N/A	N/A		no	none	slow			4.772	7.299	16.8	13.02	18.6	0.006	72	0					0.115	1.2	0.49						5.769			
308	Polk and Elm S1		21-Jan-99	cool,ov	N/A	yes	milky v	N/A	N/A		no	sulfide	none			5.671	7.618	18.2	7.59	20.4	0.003	74	0.02					0.246	1.2	0.62									
309	Polk and Elm S1		02-Feb-99	sunny,	N/A	no	clear	N/A	N/A		no	none	none			5.933	7.228		0.59	19		72						0.239	1.2	0.27									
310	Polk and Elm S1		09-Feb-99	warm,	N/A	yes	cloudy	N/A	N/A		no	none	none			8.017	7.51	18.62	4.53	21	0.048	59	0.07				0	0.149	1.7	1.34									
311	Polk and Elm S1		16-Feb-99	cloudy	high	no	clear	N/A	N/A		no	none	none			6.806	9.631	17.8	4.4		0.005	76	0.03				2	0.344	1.7	0.92						6.984			
312	Polk and Elm S1	green	23-Feb-99	cool, s	norma		oil film	N/A	N/A		no	sewage	slow			6.229	7.612	16.7	4.59	18.8	0.037	73	0.05				9	0.148	1.5	1.07						11.47			
313	Polk and Elm S1		02-Mar-99	cool, o	high	yes	slight y	N/A	N/A		no	sewage	slight flo			6.99	7.314	18.4	3.86	20	0.032	73	0.03				3	0.196	1.3	1.17	16					9.605			
314	Polk and Elm S1	oil	09-Mar-99	warm,	norma	no	clear	N/A	N/A	none	no	sewage	slight flo			7.688	7.94	18.4	2.82	19.8	0.035	61	0.05				0	0.242	1.5	0.62						8.45			
315	Polk and Elm S1		16-Mar-99	cool, s	high	yes	yellow	N/A	N/A	none	no	sulfide	N/A	22000		7.418	8.107	17	4.94	18.9	0.038	62	0.02				5	0.15	1.7	0.82						13.35			
316	Polk and Elm S1		23-Mar-99	warm,	high	no	clear	N/A	N/A		no	none	N/A			9.606	7.465	20.3	3.87	20	0.024	56	0.02				4	0.111	0.3	0.32						24.28			
317	Polk and Elm S1		30-Mar-99	cool, ra	norma	slightly	rusty c	N/A	N/A	none	yes	none	slow				7.284	18.6	8.15	18.6	0.037	24	0.01					0.041	0.9	0						7.778			

318	Polk and Elm S1		05-Apr-99	cool, su	N/A	yes	yellow	N/A	N/A		no	none	N/A				7.378	20.8	1.19	20.7	0.053	70							1	1.17									
319	Polk and Elm S1		15-Apr-99	cool, su	high	slightly	yellow	N/A	N/A		no	none	slow				7.623	20.4	6.62	20.8	0.018	53							0.9	0									
320	Polk and Elm S1		23-Apr-99	hot, su	norma	slightly	yellow	N/A	N/A		no	sewage	none				7.506	23.8	7.24	23.7	0.012	75							1	0.43									
321	Polk and Elm S1		27-Apr-99	hot, su	high	slightly	yellow	N/A	N/A	none	no	rotten fl	slight flo				7.077	22.6	6.14	22.5	0.033	42							0.8	0.46									
322	Polk and Elm S1		11-May-99	warm, (	above	slightly	clear	N/A	N/A		yes	sewage	slight flo				7.23	22.7	8.27	22.7	0.018	38							1.1	0.19									1E-04
323	Polk and Elm S1		18-May-99																																				0.001
324	Polk and Elm S1		25-May-99	hot, hu	norma	yes	slight y	N/A	N/A		no	sewage	slight flo			-160.9	7.074	25.2	7.6	28.9	0.046	66							1.1	1.03						8.373			0.004
325	Polk and Elm S1		08-Jun-99	hot, su	high	highly	slightly	N/A	N/A		no	sulfide	none				6.97	26.2	6.33	25.8	0.043	63							0.7	0.53						41.69			0.003
326	Polk and Elm S1		15-Jun-99	hot, ov	N/A	no	clear	N/A	N/A		yes, a d	none	N/A			0	7.452	27.4	2.96	27.5	0.008	55							1.3	1.09						16.59			0.001
327	Polk and Elm S1		22-Jun-99	muggy	N/A	yes	milky	N/A	N/A		yes, a d	none	N/A			-183.7	6.996	27	1.22	26.9	0.061	50							0.7	0.67						10.21			0.005
328	Polk and Elm S1		29-Jun-99	sunny,	N/A	no	clear	N/A	N/A		no	none	none			-140.1	7.146	27.4	2.72	27.9	0.016	61							0.6	0.82						13.58			0.002
329	Polk and Elm S1		06-Jul-99	hot, ov	N/A	yes, ve	milky v	N/A	N/A		night B-	none	none			-176.6	6.06	27.7	1.29	27.7	0.108	31							1.6	1.37						91.38			0.006
330	Polk and Elm S1		15-Jul-99	hot, su	N/A	no	clear	N/A	N/A		no	none	none			-195.8	7.33	27.5	3.3	27.7	0.01	64							0.3	0.15						5.998			0.001
331	Polk and Elm S1	a very	20-Jul-99	overcas	norma	yes	milky v	N/A	N/A		day b-4	none	none			-134.8	7.4	27	4.5	26.9	0.01	51							0.8	0.23						8.243			0.006
332	Polk and Elm S1		27-Jul-99	hot, su	N/A	no	clear	N/A	N/A		no	none	none			-180.1	7.11	26.8	4.8	27	0.002	65							0.7	0.25						6.664			0.002
333	Polk and Elm S1		03-Aug-99	hot, ov	N/A	no	clear	N/A	N/A		no	none	none			-153.2	7.58	27.4			0.006	84							1	0.34						5.18			0.003
334	Polk and Elm S1		13-Aug-99	hot, su	low	no	clear	N/A	N/A		no	none	none			-153.8	7.44	26.1			0.001	64							0.6	0.39									
335	Polk and 66th		08-Sep-97																																				
336	Polk and 66th		02-Apr-98																																				
337	Polk and 66th		28-Apr-98																																				
338	Polk and 66th		12-May-98																																				
339	Polk and 66th		21-May-98																																				
340	Polk and 66th		27-May-98																																				
341	Polk and 66th		28-May-98																																				
342	Polk and 66th		03-Jun-98																																				
343	Polk and 66th		08-Jun-98																																				
344	Polk and 66th		11-Jun-98																																				
345	Polk and 66th		15-Jun-98																																				
346	Polk and 66th		17-Jun-98	pt.clou	low	yes	green-	N/A	none	none		none	none				6.9	26.8	2.17	27	0.049	50	0.28	0.56	0.84	0.835	6	0.006	0.7	1.06									
347	Polk and 66th		23-Jun-98	pt.clou	low	yes	green	brown	none	none		none	none				7.1	25.4	2.4	25.6	0.02	62	0.2	0.55	0.75	0.245	5	0.006	0.1	0.76									
348	Polk and 66th		26-Jun-98	cloudy,	low	yes	green-	brown-	greeni	none		none	none				7.1	27	2.6	27.2	0.02	69	0.03	0.56	0.59	0.389	3	0.047	0.3	1.15									
349	Polk and 66th		29-Jun-98	sunny,l	norma	yes	clay-br	N/A	none	none		none	fast				7.3	26.8	7.2	27.2	0.102	25	0.1	0.07	0.17	0.773	0	0.028	0.7	0.37									
350	Polk and 66th	oil she	08-Jul-98	sunny,l	low	yes	clay-br	N/A	none	none		none	slow				6.8	26.5	0.285	26.8	0.025	49	0.62	-0.11	0.51	0.338	4	0.027	0.1	0.11									
351	Polk and 66th		13-Jul-98	sunny	very l	yes	green	N/A	N/A			sewage	none				7.2	26.7	2.3	27.1	0.019	42			0.69	0.596	3	0.006	0.3	1.46									
352	Polk and 66th		20-Jul-98	cloudy	low	yes	green	N/A	N/A			none	slow				6.5	27.2	6.1	27.6	0.045	29	0.07	0.77	0.84	0.837	4	0.166	0.2	0.33									
353	Polk and 66th		29-Jul-98	pt.clou	norma	yes	green	N/A	N/A			none	slow				6.8	25	2.84	27.1	0.026	50	0.05	0.06	0.11	0.751	4	0.043	0	1.09									
354	Polk and 66th		12-Aug-98	sunny	norma	yes	gray-b	N/A	N/A			none	none				6.9	25	2.76	29.9	0.013	40	0.04	0.51	0.55	0.709	3	0.84	0.9	0.53									
355	Polk and 66th		19-Aug-98	sunny,r	low	yes	clay	brown	none	none		none	slow				8.8	25	4.08	28.1	0.012	26	0.02	0.48	0.5	0.568	3	0.072	0.4	0.45									
356	Polk and 66th		28-Aug-98		low	no	clear	brown	none	none		none	stagnan			197.4	7	25	2.04	26.1	0.02	14	0.01	0.41	0.42	0.418	4	0.04	0.7	1.46									
357	Polk and 66th		31-Aug-98	cloudy	low	yes	green	N/A	N/A			none	none				7	25	2.42	26.2	0.029	55	0.08	0.5	0.58	0.584	6	0.017	0.2	1.82									
358	Polk and 66th		14-Sep-98		high	yes	brown	brown	N/A		TS Fran	none	fast			1189	6.8	25	2.75	25.3	0.022	47	0.02	0.56	0.58	0.604	2	0.031	0.7	0.87									
359	Polk and 66th		18-Sep-98		norma	yes	green-	brown	yes			none	stagnan			130	7	25	1.6	25.9	0.011	57	0.01	1.91	1.92	1.53	2	0.045	0.3	1.85									
360	Polk and 66th		23-Sep-98		norma	no	yellow	brown	none	none	yes-mos	none	none			104.2	7.1	25	1.95	26.6	0.012		0.01	1.08	1.09	1.109	3	0.019	0.3	1.74									
361	Polk and 66th		02-Oct-98	warm s		yes	green-	cant se	N/A	none		none	stagnan				7.1	25	3.4	26.6	0.004	62	0.01	1.63	1.64	2.57	3	0.302		1.27									
362	Polk and 66th		09-Oct-98	sunny (	high	no	yellow	brown	N/A	none	no	none	none				7.03	20.6	5.9	22.1	0.004	73	0.04	0.45	0.49	0.512	5	0.091	1.7	0.09									
363	Polk and 66th		12-Oct-98	warm s	low	no	clear	brown	none	none	no	none	none			67	7.01	21.5	6.3	23.1	0.022	48							0	2.46									
364	Polk and 66th		29-Oct-98	warm/s	N/A	yes	milky (	cant se	N/A		no	sulfide	none			5.742	7.15	23	3.52	24.6	0.013	78	0.02	0.43	0.45	0.365	0	0.078	0.6	1.33									
365	Polk and 66th		02-Nov-98	cool/su	high	yes	green/	brown	N/A		no	sewage	none			5.13	7.22	19.7			0.046	7	0.07	0.68	0.75	1.201	0	0.028	1.2	0.56									
366	Polk and 66th		12-Nov-98	cool/cl	low	no	clear	brown	N/A		no	none	slow			6.993	7.22	16.4	9.2	18	0.018	44	0.12	1.01	1.13	1.142	1	0.006	0.1	0.39									
367	Polk and 66th		16-Nov-98	overcas	low	yes	milky y	brown	N/A		no	none	none			6.256	8.057	18.1	7.67	19.4	0.042	30	0.1			0.541	0	0.026	0.9	0.54									
368	Polk and 66th		25-Nov-98	warm/s	low	yes	milky v	N/A	N/A		no	none	none			7.559	7.205	20	1.87	22.2	0.015	66	0.03				0	0.086	0.8	0.65									
371	Polk and 66th	oil she	23-Dec-98	overcas	very l	no	slightly	brown	N/A		no	none	none			7.196	8.322	10.8	5.18	9.8	0.009	57	0.01				0	0.008	0.2	0									
372	Polk and 66th		30-Dec-98	cool,su	high	yes	milky g	N/A	N/A		no	none	none			4.243	7.115	13.4	6.7	15	0.035	63	0.07				0	0.036	0.6	0.38									
373	Polk and 66th		06-Jan-99	cool,su	low		green	N/A	N/A		no	none	none			4.145	7.627	15.3	5.57	17.9	0.081	70	0.32				0	0.047	0.8	1.39									
374	Polk and 66th		13-Jan-99	warm/s	norma	no	yellow	green	yes, gr		no	none	slow			4.87	6.863	17.4	3.55	19.3	0.02	75	0.01					0.064	0.1	0.96						5.538			
375	Polk and 66th		22-Jan-99	warm, s	low		yellow	brown	N/A		no	none	none			6.099	7.269	18.1	3.55	20.1	0.022	69						0.006	0.4	0.88									
376	Polk and 66th		26-Jan-99	cool, w	below	yes	green	brown	N/A		no	sulfide	none			6.748	7.148	15.2	3.33	16.5	0.016	61						0.002	0.4	1.45									
377	Polk and 66th		04-Feb-99	cool, o	low	no	milky g	brown/	N/A		no	none	none			7.541	7.128	17.6	6.34	19.6		69						0.057	0.3	0.84									
378	Polk and 66th		05-Feb-99	Cloudy	norma	yes	milky g	N/A	N/A		no	none	none			8.949	9.448	16.4	2.08	18.3	0.018	60	0.12				8	0.034	0.5	1.52						7.221			
379	Polk and 66th		12-Feb-99	cloudy,	low	yes	dark m	brown	none	none	no	none	none			7.987	7.261	18			0.025	62	0.18				2	0.008	0.6	2.64									
380	Polk and 66th		18-Feb-99	warm, s	low	yes	greeni	clay br	N/A	none	no	none	none			7.235	8.907	15.5	4.88		0.017	23	0.03				0	0.041	0.7	0.47						6.249			
381	Polk and 66th		26-Feb-99	warm, v	above	yes	green	brown	none		no	none	none			6.523	7.628	19.7	2.38	21.3	0.025	52	0.02				1	0.006	0.5	0.83									
382	Polk and 66th		05-Mar-99	cloudy,	low	yes	green	N/a	N/A		no	none	none			8.26	6.753	19.2	1.11	20.4	0.057	35	0.27				0	0.007	1	1.11									
383	Polk and 66th		11-Mar-99	cool, o	norma	slightly	milky g	black	N/A		no	none	yes			7.789	6.796	19.4	1.01	20.3	0.042	47	0.38				2	0.008	0	0.85						7.127			
384	Polk and 66th		16-Mar-99	cool, su	below	slightly	green	brown	none	none	no	none	slight			7.282	8.838	16.4	7.41	17.5	0.019	55	0.07				0	0.042	0.7	0.87						5.426			
385	Polk and 66th		25-Mar-99	cool, su	above	N/A	greeni	brown	brown,	none	no	none	slight				7.224	20.4	5.2	20.3	0.003	55	0				9	0.029	0	0.59						8.028			
386	Polk and 66th		01-Apr-99	warm, s	slightl	no	green	brown	none		no	sewage	none				7.535	20.2	6.6	20.1	0.013	43							0.8	0.61						8.058			
387	Polk and 66th	a lot o	07-Apr-99	cool, o	low	slightly	milky g	brown	none	none	no	gasoline	none				7.312	21.8	0.72	21.7	0.054	55							0.8	0.88									
388	Polk and 66th		15-Apr-99	cool, su	low	yes	browni	brown	N/A	none	no	none	slight				7.666	18.7	6.26	18.8	0.085	26							1.1	0.86									
389	Polk and 66th		23-Apr-99	hot, su	norma	yes	milky g	can't s	green		no	none	none				7.237	25.4	2.39	25.1	0.039	55							0.7	0.49									
390	Polk and 66th		27-Apr-99	warm, s	high	very clo	greeni	N/A	green		no	none	none				7.022	22.3	4.56	22.3	0.09	28							1.2	1.23									
391	Polk and 66th	saw bl	18-May-99	warm, s	low	slightly	cloudy	brown	green		day befo	sewage	slight				7.071	22.6	4.57	22.4	0.016	55							0.2	0.96						29.88			7E-04
392	Polk and 66th		11-Jun-99	warm, s	norma	yes	dark m	gbrown	lots of		no		none				7.032	26.6	2.91	27.2	0.01	39							0.3	0.78						9.105			2E-04
393	Polk and 66th	the are	15-Jun-99	hot, ov	norma	no	clear	brown/	green		a day pr	none	none			-122.3	7.13	26.5	2.76	26.7	0.002	42							0.8	0.71						7.751			3E-04
394	Polk and 66th	the are	22-Jun-99	warm, (	norma	yes	slightly	brown,	brown-		a day pr	none	none			-196.2	6.995	26.6	2.11	27.8	0.014	35							0.8	0.49						6.874			7E-04
395	Polk and 66th		29-Jun-99	hot, su	norma	yes	slightly	brown	N/A		no	none	none			-105	7.119	28.5	3.5	29.9	0.022	51							0.7	1.23						5.038			0.002
396	Polk and 66th		06-Jul-99	hot, ov	low	no	clear g	brown	green		night B-	none	none			-164.8	6.79	28	1.85	28.5	0.003	32							0.4	0.97						6.912			0.001
397	Polk and 66th		15-Jul-99	hot, su	norma	no	clear	brown	green		no	none	none			-173.9	7.09	26.8	4.76	26.6	0.004	21							1	0.31						6.946			4E-04
398	Polk and 66th		20-Jul-99	overcas	norma	no	greyis	brown	N/A		day befo	none	none			-142.2	7.21	26.1	4.1	26.1	0.014	16							0.5	0.46						5.702			8E-04
399	Polk and 66th		27-Jul-99	hot, su	norma	no	clear	brown	yes		no	none	none			-164.9	6.99	27.4	6.3	27.9	0.016	47							0.2	0.78						7.838			0.001
400	Polk and 66th		03-Aug-99	hot, ov	norma	no	clear	green	yes, gr		no	none	none			-170.3	7.23	27.7			0.003	56							0.3	0.88						5.792			6E-04

401	Polk and 66th	a lo of	13-Aug-99	hot, su	low	no	very cl	greenis	green		no	none	none			-162.7	7.3	26.9			0.003	66							0.3	0.62									
402	Yates Gully at Hackney		08-Sep-97																																				
403	Yates Gully at Hackney		02-Apr-98																																				
404	Yates Gully at Hackney		28-Apr-98																																				
405	Yates Gully at Hackney		12-May-98																																				
406	Yates Gully at Hackney		21-May-98																																				
407	Yates Gully at Hackney		27-May-98																																				
408	Yates Gully at Hackney		28-May-98																																				
409	Yates Gully at Hackney		03-Jun-98																																				
410	Yates Gully at Hackney		08-Jun-98																																				
411	Yates Gully at Hackney		11-Jun-98																																				
412	Yates Gully at Hackney	stream	15-Jun-98	sunny,l	norma	no	green-	brown	none	none		none	yes				7.2	28	3.6	29	0.004	65	0.01	0.59	0.6	0.596	4	0.122	0.8	1.38									
413	Yates Gully at Hackney		17-Jun-98	sunny,(	low	no	clear		none	none		none	yes				6.9	26.2	4.12	26.7	0.008	58	0.01	0.35	0.36	0.352	6	0.075	0.4	1.26									
414	Yates Gully at Hackney		22-Jun-98	sunny,r	low	no	clear	brown	none	none		none	slow				7.3	25	4.2	27	0.006	65	0.01	0.15	0.16	0.158	3	0.22	0.8	1.06									
415	Yates Gully at Hackney	drift tra	26-Jun-98	cloudy,	low	no	clear	brown	none	none		none	slow				7	27	3.3	28.5	0.021	61	0	0.19	0.19	0.238	5	0.408	1.3	0.8	2.5	3	3	1.875	437.6		velocity		
416	Yates Gully at Hackney		29-Jun-98	sunny,l	norma	yes	beige	brown	none	none	yes-flow	none	fast				7.1	26.7	5.6	27.4	0.018	32	0.03	0.43	0.46	0.446	1	0.032	0.5	0.26									
417	Yates Gully at Hackney		08-Jul-98	sunny,l	low	no	clear	brown	none	none	mosquit	none	slow				7.1	26.7	0.537	26.9	0.004	62	0	0.84	0.84	0.2	4	0.314	1.7	0.11									
418	Yates Gully at Hackney		13-Jul-98	sunny,r	low	yes	brown	brown	none	none		none	slow				7.1	26.5	4.5	26.9	0.006	59	0	0.28	0.28	0.237	3	0.388	2	0.16									
419	Yates Gully at Hackney	velocit	20-Jul-98	pt.clou	low	yes	brown	brown	none	none		none	slow				7	27.4	3.7	27.7	0.007	31	0.01	0.31	0.32	0.273	12	0.112	1	0.5	4	3.75	0.75	0.938	218.8		velocity		
420	Yates Gully at Hackney		29-Jul-98	pt.clou	high	no	clear	brown	none	none		none	fast				7.1	25	4.16	27.5	0.023	54	0.02	0.69	0.71	0.692	4	0.182	1.4	0.03	7.8	7	1.6	7.28	1699		velocity		
421	Yates Gully at Hackney		12-Aug-98		high	yes	gray	brown	none	none		none	fast				7.4	25	6.32	30.3	0.102	44	0.12	1.1	1.22	1.213	6	0.095	0.9	1.54	3.6	5	1.19	1.785	416.6		velocity		
422	Yates Gully at Hackney		19-Aug-98		norma	no	clear	brown	none	none		none	fast				7	25	4.25	28.5	0.032	45	0.02			0.278	2	0.227	0.9										
423	Yates Gully at Hackney		28-Aug-98	sunny,v	low	no	clear	brown	none	none		none	slow			215.7	7.1	25	3.76	26.6	0.014	47	0.02	0.39	0.41	0.408	5	0.324	1.3	0.23									
424	Yates Gully at Hackney		31-Aug-98		low	no	clear	brown	none	none		none	slow			183	7	25	1.78	26.4	0.035	49	0.03	0.45	0.48	0.479	6	0.28	2	0.25	3.6	4	0.37	0.444	103.6		velocity		
425	Yates Gully at Hackney	no san	14-Sep-98																																				
426	Yates Gully at Hackney		18-Sep-98		low	yes	brown	brown	none	none		none	medium			127.2	7.1	25	4.25	25.7	0.003	60	0.01	0.66	0.67	0.679	2	0.159	1	0.51									
427	Yates Gully at Hackney		23-Sep-98		norma	no	clear	brown	none	none	yes-mos	none	slow			115	7.5	25	4	27.5	0.004		0.01	0.48	0.49	0.517	4	0.073	0.5	0.7									
428	Yates Gully at Hackney		02-Oct-98	warm s	low	no	clear	brown	none	none	no	none	slow			34	6.8	25	4.7	26.4	0.013	67	0.01	0.41	0.42	0.409	4	0.006		0.47	3.6	4.5	0.26	0.351	81.91		velocity		
429	Yates Gully at Hackney		09-Oct-98	sunny (	norma	no	clear	brown	yes-br	none	no	none	slow				6.88	21.5	11.62	22.6	0.004	67	0.01	0.54	0.55	0.6	2	0.091	2	1.19	4.2	2.6	0.36	0.328	76.45		velocity		
430	Yates Gully at Hackney		12-Oct-98	warm s	low	yes	green-	green	none	none	no	none	slow			-79	7.11	22.5	3.42	24	0	48	0						0.9	0.21									
431	Yates Gully at Hackney		29-Oct-98	warm/s	above	yes	milky (	orange	orange	none	no	none	none			6.089	7.31	21.5	3.78	23.1	0.003	45	0	0.98	0.98	0.863	0	0.024	0.5	0.41									
432	Yates Gully at Hackney		02-Nov-98	cool/su	norma	yes	green/	brown/	none	none	no	none	yes			4.889	7.16	19.2			0.016	24	0.19	0.25	0.44	0.503	2	0.004	27.2	0.3	6	3.5	0.31	0.543	126.6		velocity		
433	Yates Gully at Hackney	oil she	12-Nov-98	cool/clo	very l	yes	green	brown	none	none	no	none	none			7.747	6.79	17.7	5.08	19.3	0.006	54	0.02	0.63	0.65	0.507	1	0.053	0.6	0.67									
434	Yates Gully at Hackney		16-Nov-98	overca	high	yes	milky	brown	none	none	no	none	yes			6.823	7.776	18.1	4.35	19.5	0.007	0	0.03			0.476	1	0.033	1.3	0.59	4.8	2.3	0.9	0.828	193.2		velocity		
435	Yates Gully at Hackney		25-Nov-98	warm/s	low	yes	milky	brown	green/	yes	no	none	slow			8.009	7.181	19.7	1.85	21.7	0.004	54	0.03				0	0.039	0.8	1.13									
438	Yates Gully at Hackney		23-Dec-98	overca	low	yes	lt. Bro	brown	none	none	no	none	slow			6.975	7.751	10	8.76	11.4	0	47	0.03				3	0.017	0.6	2.42	3.6	4	0.23	0.276	64.41		velocity		
439	Yates Gully at Hackney		30-Dec-98	cool,su	very h	yes	milky	N/A	green	none	no	none	fast			4.113	7.136	13.6	11.6	15.1	0.014	68	0.02				0	0.054	0.7	0.83	5.76	4	1.41	2.707	631.8		velocity		
440	Yates Gully at Hackney		06-Jan-99	cool,su	low	yes	lt. Gre	N/A	green	none	no	none	yes			4.054	7.215	15.2	7.65	17.2	0.086	64	0				0	0.038	1	1.17	4.8	2.6	1.48	1.539	359.2		velocity		
441	Yates Gully at Hackney		13-Jan-99	warm/s	low	no	yellow	brown	none	none	no	none	slow			4.965	6.93	16.4	4.79	18.5	0.021	60	0.01					0.001	0.5	2.17	1.8	4.5	0.12	0.081	18.9	8.026	velocity		
442	Yates Gully at Hackney		22-Jan-99	warm, s	norma	no	clear	brown	dk bro	none	no	none	slow			5.7	7.291	18.2	3.52	20.9	0.003	62						0.019	0.1	0.37									
443	Yates Gully at Hackney		26-Jan-99	cool, w	above	no	milky b	brown	brown	none	no	none	none			6.588	7.123	15	4.93	15.8	0.006	58						0.007	0.2	0.42									
444	Yates Gully at Hackney		04-Feb-99	cool, o	low	no	slight b	brown	brown,	none	no	none	slight			7.318	7.396	16.9	4.78	19.4		66						0.019	0.4	1.24									
445	Yates Gully at Hackney		05-Feb-99	Cloudy	low	no	cloudy	browni	green/	none	no	none	slight			7.835	7.646	15.8	3.59	18.1	0.003	64	0.04				1	0.01	0.2	0.32									
446	Yates Gully at Hackney		12-Feb-99	cloudy,	norma	yes	milky b	brown	brown	none	no	none	yes			7.306	7.306	10.5			0.006	63	0.18				0	0.006	0.2	0.56						7.742	velocity		
447	Yates Gully at Hackney	dead c	18-Feb-99	cool, s	low	no	yellow	brown	reddis	none	no	none	slight			7.352	7.552	15.1	4.61	15.1	0.006	41	0.01				1	0.054	1.2	0.3	7.2	4	0.01	0.024	5.601	7.217	velocity		
448	Yates Gully at Hackney		26-Feb-99	warm, v	norma	no	browni	brown	brown	none	no	none	slight			6.882	7.082	19.8	6.72	20.7	0.001	70	0.02				3	0.04	0.6	0.39	5.4	4	0.01	0.018	4.201	7.594	velocity		
449	Yates Gully at Hackney		05-Mar-99	cool, cl	low	yes	greyisl	brown	none	none	no	none	none			7.538	7.086	18.9	2.61	20	0.031	46	0				4	0.006	0.5	0.43									
450	Yates Gully at Hackney		11-Mar-99	cool, o	norma	yes	milky g	black/b	green	none	no	none	slight			7.248	6.918	18.9	2	20.5	0.126	34	0.15				0	0.008	0	0.86	2.88	4	0.01	0.01	2.24	13.42	velocity		
451	Yates Gully at Hackney		16-Mar-99	cool, s	norma	no	slightly	brown	green	none	no	none	slight			7.292	8.066	14.9	7.55	15.5	0.008	61	0.06				0	0.047	0.9	0.86	4.32	3.5	0.01	0.013	2.941	6.557	velocity		
452	Yates Gully at Hackney		25-Mar-99	cool, s	norma	very tur	milky	grey	green	none	no	sulfide	slight flo			7	7.06	19.7	2.91	19.5	0.024	48	0.02				0	0.004	0.5	0.52	4.8	3.5	0.01	0.014	3.267	12.98	velocity		
453	Yates Gully at Hackney		01-Apr-99	warm, s	high	no	clear	stone c	brown	none	no	none	yes				7.109	20	6.14	19.8	0.001	48							0.8	1.08	2.4	2.5	0.01	0.005	1.167	10.92	velocity		
454	Yates Gully at Hackney		07-Apr-99	cool, o	very h	very tur	milky v	can't s	none	none	no	none	very fas				7.617	21.6	9.3	21.6	0.221	34							1.3	2	6.24	4	2.33	4.846	1131		velocity		
455	Yates Gully at Hackney		15-Apr-99	cool, s	low	yes	greyisl	brown	none	none	no	none	slight				7.44	17.5	7.35	17.3	0.041	30							0.9	0.31	5.28	3.5	0.46	0.708	165.3		velocity		
456	Yates Gully at Hackney		23-Apr-99	hot, su	low	no	clear	brown	brown	none	no	none	slight				7.326	25.7	6.65	25.1	0.005	49							0.2	0.89									
457	Yates Gully at Hackney		27-Apr-99	warm, s	norma	yes	greyisl	brown/	red	none	no	none	slight				7.12	20.7	6.87	20.7	0.047	19							1	0.69	5.04	3	0.01	0.013	2.941		velocity		
458	Yates Gully at Hackney	some l	18-May-99	warm, s	low	no	yellow	brown	red		no	none	none				7.185	22.4	7.74	22.3	0.01	55							0.3	0.28						10.31			0.002
459	Yates Gully at Hackney		11-Jun-99	warm, s	very l	yes	milky	brown	a little		no	none	none				7.141	27.8	4.02	29.2	0.042	29							0.7	0.67	1.2					13.76			0.005
460	Yates Gully at Hackney		15-Jun-99	hot, ov	very l	no	clear	brown	none		a day B4	none	light			-117.5	7.34	25.7	2.72	26.3	0.002	47							1.5	1.84						8.106			4E-04
461	Yates Gully at Hackney		22-Jun-99	warm, (	high t	no	greeni	brown	N/A		a day B4	none	slight			-238.9	6.913	25.9	1.38	26.1	0.018	25							0.5	0.44						9.485			0.001
462	Yates Gully at Hackney		29-Jun-99	hot, su	little h	no	clear b	brown	none		no	none	none			-134.1	7.21	26.8	2.14	27.4	0.005	43							0.3	1						8.751			0.002
463	Yates Gully at Hackney		06-Jul-99	hot, su	high	no	clear r	brown	none		night B4	none	none			-155.8	7.1	27.8	1.99	27.2	0.012	30							0.6	2.75						12.05			0.001
464	Yates Gully at Hackney		15-Jul-99	sunny,	norma	no	clear	brown	none		no	none	none			-155.5	6.93	24.9	1.18	24.6	0.009	43							1	0.31						7.391			4E-04
465	Yates Gully at Hackney		20-Jul-99	overca	high	yes	grey cl	grey cl	none		day B-4	none	none			-141	7.46	26.3	5.2	26.3	0.042	41							0.5	0.71						7.314			0.004
466	Yates Gully at Hackney	tadpol	27-Jul-99	hot, su	high	no	browni	brown	none		no	none	none			-178.2	7.27	27.2	4.2	27.9	0.031	29							0.5	0.74						12.75			0.001
467	Yates Gully at Hackney	green	03-Aug-99	hot,ove	norma	no	greeni	green	green		no	none	none			-167	7.39	27.4			0.01	29							0.3	0.8						12.72			0.002
468	Yates Gully at Hackney	green	13-Aug-99	hot, su	low	no	greeni	green	green		no	none	none			-172	7.44	27.1			0.013	36							0.3	0.1									
470	Wayside Drive		08-Sep-97																																				
471	Wayside Drive		02-Apr-98																																				
472	Wayside Drive		28-Apr-98																																				
473	Wayside Drive		12-May-98																																				
474	Wayside Drive		21-May-98																																				
475	Wayside Drive		27-May-98																																				
476	Wayside Drive		28-May-98																																				
477	Wayside Drive		03-Jun-98																																				
478	Wayside Drive		08-Jun-98																																				
479	Wayside Drive		11-Jun-98																																				
480	Wayside Drive		15-Jun-98																																				
481	Wayside Drive		17-Jun-98																																				
482	Wayside Drive		22-Jun-98																																				
483	Wayside Drive		26-Jun-98																																				
484	Wayside Drive		29-Jun-98																																				

485	Wayside Drive		08-Jul-98																																				
486	Wayside Drive		13-Jul-98																																				
487	Wayside Drive		20-Jul-98																																				
488	Wayside Drive		29-Jul-98																																				
489	Wayside Drive		12-Aug-98																																				
490	Wayside Drive		19-Aug-98																																				
491	Wayside Drive		28-Aug-98		low	yes	green	N/A	N/A			none	none			169.4	6.9	25	2.18	27.4	0.006	60	0	0.38	0.38	0.25	3	0.019	0.4	1.56									
492	Wayside Drive		31-Aug-98	cloudy	low	yes	green	N/A	N/A			sewage	none				6.8	25	1.53	26.5	0.035	56	0.04	0.93	0.97	0.83	6	0.013	0.4	1.89									
493	Wayside Drive		14-Sep-98		high	yes	brown	N/A	N/A		TS Fran	none	fast			201.6	6.8	25	2.25	25.8	0.018	46	0.04	0.35	0.39	0.416	3	0.047	1.9	0.63									
494	Wayside Drive		18-Sep-98		norma	yes	brown-	N/A	N/A			none	none			142.5	6.9	25	1.25	26.3	0.009	56	0.01	0.84	0.85	0.909	2	0.032	0.4	1.22									
495	Wayside Drive		23-Sep-98		norma	yes	clear	brown	N/A			none	none			118.1	7.1	25	2.2	27.2	0.01		0	1.25	1.25	1.196	2	0.008	0.1	1.37									
496	Wayside Drive		02-Oct-98	warm s	norma	yes	brown-	green	N/A			none	very slo			76	6.9	25.4	3.08	27.4	0.004	69	0.02	0.44	0.46	0.449	3	0.02		1.27									
497	Wayside Drive		09-Oct-98	sunny (	norma	yes	clay	brown	N/A			none	none			57.8	7.05	20.3	5.4	21.8	0.01	72	0.01	0.64	0.65	0.684	2	0.087	1.3	0.94									
498	Wayside Drive		12-Oct-98	warm s	norma	yes	dark g					none	none			53.4	7.01	22.9	2.51	24.1	0.008	74	0.01				2	0.074	0.4	1.94									
499	Wayside Drive		29-Oct-98	warm/s	norma	yes	dark b	N/A	N/A		no	none	none			6.271	7	22.9	6.72	24.8	0.002	78	0.01	0.35	0.36	0.29	1	0.057	0.4	1.07									
500	Wayside Drive		02-Nov-98	cool/su	norma	yes	green/	N/A	N/A		no	none	slow			4.782	7.27	19.3			0.025	10	0.05	0.3	0.35	0.47	2	0.022	0.9	0.34									
501	Wayside Drive		12-Nov-98	cool/cl	norma	yes	dark g	N/A	N/A		no	none	none			8.369	6.51	17	4.66	18.6	0.031	40	0.2	0.58	0.78	0.819	3	0.007	0.5	0.31									
502	Wayside Drive		16-Nov-98	overca	high	yes	milky	N/A	N/A		no	none	none			7.167	8.233	17.6	6.88	19.1	0.05	35	0.1			0.52	0	0.033	1.4	0.58									
503	Wayside Drive		25-Nov-98	warm/s	low	yes	cloudy	brown	N/A		no		none			7.661	7.066	19.5	1.72	21.7	0.009	48	0.03				0	0.097	1.1	0.79									
506	Wayside Drive		23-Dec-98	overca	norma	yes	dark g	green	no	none	no	none	none			7.215	7.605	9.5	2.94	10.9	0.013	73	0.01				1	0.003	0.2	0.04									
507	Wayside Drive		30-Dec-98	cool,su	high	yes	milky (	N/A	brown		no	none	slow			4.471	7.23	12.8	7.92	14.4	0.027	66	0.06				1	0.051	0.5	0.52									
508	Wayside Drive		06-Jan-99	cool,su	norma		green	N/A	N/A		no		none			4.16	7.005	14.4	9.84	16.2	0.077	63	0.15				0	0.077	1.1	1.02									
509	Wayside Drive		13-Jan-99	warm/s	low	no	green	brown	N/A		no	none	none			9.77	7.222	16.2	12.66	19.4	0.015	71	0.03				0	0.068	0.7	0.94						6.128			
510	Wayside Drive		22-Jan-99	warm,	norma	no	browni	N/A	N/A		no	none	none			5.556	7.209	18.2	3.86	20.2	0.014	64						0.027	0.4	0.63									
511	Wayside Drive		26-Jan-99	cool, w	norma	slightly	green	brown	N/A		no	none	none			6.801	7.102	14.9	7.45	16.9	0.013	70						0.005	0.4	1.64									
512	Wayside Drive		04-Feb-99	cool, o	norma	yes	green	brown	N/A		no	none	slight			7.091	7.219	17.5	7.3	19.6																			
513	Wayside Drive		05-Feb-99	Cloudy	norma	slightly	browni	brown	N/A		no	none	none			8.457	8.066	17	3.02	18.7	0.01	69	0				22	0.058	0.5	1.17									
514	Wayside Drive		12-Feb-99	cloudy,	norma	no	brown	brown	N/A		no	none	slight			7.674	7.622	11.5	1.95	13.5	0	52	0				0	0.005	0.1	2.14						6.258			
515	Wayside Drive		26-Feb-99	warm,	low	yes	green	brown	no		no	none	none			6.54	7.263	20	2.97	21.6	0.024	53	0.02				1	0.005	0.5	0.5						7.297			
516	Wayside Drive		05-Mar-99	cloudy,	above	yes	greyis	N/A	N/A		N/A	sewage	N/A			8.182	7.022	18.2	2.34	19.8	0.04	46	0.28				0	0.007	0.6	0.66									
517	Wayside Drive	oil film	11-Mar-99	cool, o	norma	slightly	greeni	black	N/A		no	sewage	slight			8.697	6.924	19.4	1.78	21.1	0.039	44	0.04				5	0.007	0.1	1.2									
518	Wayside Drive		16-Mar-99	cool, s	norma	yes	green	brown	N/A	none	no	none	slight			7.394	7.717	15.2	5.46	16.8	0.013	57	0.02				1	0.046	0.6	0.47						5.913			
519	Wayside Drive		25-Mar-99	cool, s	norma	N/A	green	brown	N/A	none	no	none	yes, me				7.398	20.7	5.38	20.8	0.008	54	0.02				2	0.043	0.7	0.37						7.808			
520	Wayside Drive		01-Apr-99	warm, (	high	slightly	green	green	N/A		no	sewage	yes				7.512	20.2	5.36	20.1	0.015	42							0.8	0.56						8.209			
521	Wayside Drive		07-Apr-99	cool, o	very l	yes	milky (	muddy	N/A	none	no	none	slight				7.566	22.5	1.49	22.5	0.064	53							0.4	0.71									
522	Wayside Drive		15-Apr-99	cool, s	low	yes	greyis	brown	N/A		no	none	slow				7.432	17.3	6.61	17	0.055	32							0.9	0.73									
523	Wayside Drive		23-Apr-99	hot, su	low	yes	milky	brown	N/A		no	none	slight				7.332	27.3	6.29	27.3	0.028	60							0.2	0.49									
524	Wayside Drive		27-Apr-99	warm,	very h	very tur	grey	can't s	N/A		no	none	yes				7.069	21.7	4.82	21.6	0.099	36							0.8	1.25									
525	Wayside Drive	a lot o	18-May-99	warm,	norma	yes	brown	brown	N/A			sewage	yes				7.234	24.1	4.09	24.1	0.019	60							0.4	0.29						10.35			0.001
526	Wayside Drive	oil film	11-Jun-99	warm,	high	yes	greeni	green,	green		no	rotten fl	none				7.034	28.2	2.19	29	0	35							0.5	0.82						8.891			
527	Wayside Drive		15-Jun-99	hot, ov	norma	no	clear	brown	green		afternoo	none	not very			1113	7.092	26.6	2.52	26.8	0.017	30							0.5	0.66						7.596			0.001
528	Wayside Drive		22-Jun-99	warm, (	high	no	clear	brown	N/A		a day pr	none	none			-176.1	7.126	26.5	2.85	26.6	0.008	27							0.5	0.55						6.494			9E-04
529	Wayside Drive		29-Jun-99	hot, su	high	no	clear g	N/A	N/A		no	none	slight			-116.5	7.177	28.4	3.34	29.2	0.023	49							0.8	1.09						4.849			0.002
530	Wayside Drive		06-Jul-99	hot, su	low	no	clear	brown	N/A		night B4	none	no			-168.5	6.8	27.9	2.23	28.5	0.007	43							0.2	0						8.372			2E-04
531	Wayside Drive		15-Jul-99	hot, su	norma	no	clear	brown	N/A		no	none	no			-172.6	7.05	26.9	3.98	27.1	0.007	31							0.3	0.86						7.583			5E-04
532	Wayside Drive		20-Jul-99	overca	high	no	clear	N/A	N/A		day B-4	none	no			-158.1	7.27	26.6	4	26.5	0.018	24							0.5	0.78						6.444			0.003
533	Wayside Drive	the wa	27-Jul-99	hot, su	norma	no	clear	brown	N/A		no	none	slight			-153.1	7.11	28.4	4.6	28.4	0.011	50							0.4	0.61						5.978			9E-04
534	Wayside Drive		03-Aug-99	hot, ov	norma	slightly	slightly	brown	N/A		no	none	slight			-170.5	7.27	28.9			0.016	62							0.4	0.45						5.8			0.022
535	Wayside Drive		13-Aug-99	hot, su	low	no	clear	brown	N/A		no	none	no			-166.4	7.4	27.8			0.011	71							0.6	0.7									
557	Hughes Street Bridge		04-Oct-99	warm,	low	no	clear	brown	dark g		none	slight se	yes				6.96	24.6	0.84	24.6	0.016	46							0.3	0.42	27.36	2.84	2.28			7.284	flowmet		9E-04
558	North Vent		04-Oct-99	warm,	N/A	yes	milky	N/A	N/A		no	no	slight				6.53	25.7	1.43	25.7	0.003	57							0.2	0.25						25.41	none		0.005
559	Polk and Elm S1		04-Oct-99	warm,	N/A	no	clear	N/A	N/A		no	no	slightly				7.18	26.3	2.62	26.3	0.001	48							0.6	0.01						5.997	none		2E-04
560	Yates Gully at Hackney		04-Oct-99	warm,	very l	no	clear	brown	dark g		no	no	no			-68.2	7.07	23.1	3.33	23	0.002	51							0.8	0.26						5.961	none		1E-04
561	Ennis and Lamar N3		04-Oct-99	warm,	high	no	clear	brown	N/A		no	yes, rott	yes				7.44	27.7	3.25	27.5	0.003	59							1.9	0.24						6.208	none		1E-04
562	Polk and 66th		04-Oct-99	warm,	very l	no	clear	brown	no		no	no	no			-150	7.29	24.1	3.24	24	0.006	47							0.5	0.77						5.786	none		1E-04
563	Wayside Drive		04-Oct-99	warm ,	high	yes	greeni	N/A	N/A		no	no	no				7.14	25.6	2.71	25.5	0.003	42							0.7	0.65						6.087	none		0.002
564	Hughes Street Bridge		21-Oct-99	cool, s	low	no	clear	brown	brown		no	none	yes				6.95	22.5	2.06	22.2	0.007	54							0.4	1.32	4.08	3	4.42				flowmet		4E-04
565	North Vent	oil she	21-Oct-99	cool, s	n/a	no	clear,	n/a	n/a		no	none	no				6.91	24	2.06	23.6	0.028	54							0.7	1.85							none		0.002
566	Polk and Elm S1		21-Oct-99	cool, s	n/a	no	clear	n/a	n/a		no	no	no				6.73	23.8	3.93	23.7	0.007	45							0.6	0.48									8E-04
567	Ennis and Lamar N3		21-Oct-99	cool, s	norma	no	clear	n/a	n/a		no	yes, stro	yes				7.3	25.2	3.39	25.1	0.005	48							1.1	4.22							none		9E-04
568	Yates Gully at Hackney		21-Oct-99	cool, s	low	no	clear	brown	no		no	no	no				6.7	15.3	3.13	15.4	0	36							0.4	0.12							none		5E-04
569	Polk and 66th	there i	21-Oct-99	cool, s	low	no	clear	brown	no		no	no	yes				7.02	19.5	3.28	19.4	0.003	49							0.3	1.13							none		8E-04
570	Wayside Drive		21-Oct-99	cool, s	norma	yes	greeni	n/a	n/a		no	no	no				7.01	18	4.14	18.2	0.018	51							0.5	0.61							none		0.002
571	North Vent		01-Nov-99	cool, s	N/A	no	clear	N/A	N/A		no	no	no				6.67	23			0.006	53							0.7	0.79									1E-04
572	Polk and Elm S1	white t	01-Nov-99	coll, su	norma	no	clear	n/a	n/a		no	no	no				7.01	22.9	4.87	23.2	0.023	51							1.2	0.9									2E-04
573	Yates Gully at Hackney		01-Nov-99	cool, s	low	no	browni	brown	no		no	no	no				6.26	17.7	3.93	17.9	0.023	28							0.4	0.58									1E-04
574	Ennis and Lamar N3		01-Nov-99	cool, s	low	no	clear	N/A	N/A		no	no	no				6.64	25.1	4.43	25	0.028	51							1.5	0.82									2E-04
575	Polk and 66th	slight (	01-Nov-99	cool, s	low	slight	browni	brown	no		no	no	yes				6.75	20.3	3.78	20.4	0.075	44							0.9	0.99									0.01
2616	Hughes Street Bridge		16-Feb-90	Rain										160000																									
2617	Hughes Street Bridge		30-May-90	N										160000																									
2618	Hughes Street Bridge		15-Jun-90	N										160000																									
2619	Hughes Street Bridge		28-Sep-92	N										160000																									
2620	Hughes Street Bridge		24-Feb-93											170	1.6		7.9												0.8	0.7							3M-281	1.1	
2621	Hughes Street Bridge		16-Apr-93	N										160000																									
2622	Hughes Street Bridge		22-Apr-93											12000	2		7.7												2.4	0.2							3P-361	0.9	
2623	Hughes Street Bridge		29-Jun-93	N										160000																									
2624	Hughes Street Bridge		15-Jul-93											690000																							3T-187		
2625	Hughes Street Bridge	Sampl	22-Jul-93											1300000																							3T-249		
2626	Hughes Street Bridge		04-Aug-93	N										160000																									
2627	Hughes Street Bridge		17-Aug-93											660000	4.4		7.7												0.4	0.9							3U-262	1.6	
2628	Hughes Street Bridge		26-Oct-93											9	1.6		7.8												0.9	1							3X-341	1.3	

2629	Hughes Street Bridge		28-Oct-93	N										90000																									
2630	Hughes Street Bridge		17-Feb-94	N										200																									
2631	Hughes Street Bridge		31-Mar-94											7700	2.4		7.5												0.9	1.6							4N-439	3.4	
2632	Hughes Street Bridge		12-Apr-94	Rain										160000																									
2633	Hughes Street Bridge		27-Sep-94											3300	1.9		7.9												0.9	1							4W-440	1.1	
2634	Hughes Street Bridge		02-Nov-94											485000	2.7		7.8												0.3	1.2							4Y-28	1.7	
2635	Hughes Street Bridge		13-Dec-94	Lt.Rain										160000																									
2636	Hughes Street Bridge		25-Jan-95	N										22000																									
2637	Hughes Street Bridge		06-Feb-95											100000	5.4		7.6												0.4	1.4							5M-75	2.6	
2638	Hughes Street Bridge		23-Mar-95	N										160000																									
2639	Hughes Street Bridge		01-May-95											1415000	5.5		7.6												0.1	2.5							5Q-27	4.5	
2640	Hughes Street Bridge		23-May-95	N										160000																									
2641	Hughes Street Bridge		15-Jun-95											2000000																							5R-382		
2642	Hughes Street Bridge		20-Jul-95	N										160000																									
2643	Hughes Street Bridge		08-Aug-95											150000	3.3														0.6	0.2							5T-114	0.6	
2644	Hughes Street Bridge		22-Aug-95											850000																							5T-336		
2645	Hughes Street Bridge		13-May-95											2000000																							5U-161		
2646	Hughes Street Bridge		20-Sep-95	N										2300																									
2647	Hughes Street Bridge		05-Oct-95	N										160000																									
2648	Hughes Street Bridge		17-Oct-95											200000	6.7		7.7												0	2							5W-275	2	
2649	Hughes Street Bridge		15-Nov-95	N										160000																3.2									
2650	Hughes Street Bridge		13-Dec-95	N										160000																									
2651	Hughes Street Bridge		13-Dec-95											210000																							5Z-186		
2652	Hughes Street Bridge		04-Jan-96	N										160000																									
2653	Hughes Street Bridge		07-Feb-96	Lt.Rain										160000																2.06									
2654	Hughes Street Bridge		05-Mar-96											6500	4.4		7.2												2	0.73							6N-110	1.5	
2655	Hughes Street Bridge		02-Apr-96	N										50000																3.24									
2656	Hughes Street Bridge		24-Apr-96	N										17000																									
2657	Hughes Street Bridge		07-May-96	N										160000	18		7													0.32									
2658	Hughes Street Bridge		05-Jun-96	Lt. Rai										160000	8		7.5													0.33									
2659	Hughes Street Bridge		18-Jun-96											28000	6.1		7.2												1.4	1.1							6S-306	2.1	
2660	Hughes Street Bridge		03-Jul-96	N										160000																									
2661	Hughes Street Bridge		05-Aug-96	N										90000																									
2662	Hughes Street Bridge		11-Sep-96	N										160000																									
2663	Hughes Street Bridge		12-Sep-96											110000																							6W-204		
2664	Hughes Street Bridge		08-Oct-96	N										7000																									
2665	Hughes Street Bridge		24-Oct-96											72000	10.2														1.3	0.9							6X-372	2.6	
2666	Hughes Street Bridge		20-Nov-96	N										200																									
2667	Hughes Street Bridge		02-Jan-97	N										160000																									
2668	Hughes Street Bridge		05-Feb-97											65000	20.9		7												0.4	1.4							7M-75	2.7	
2669	Hughes Street Bridge		05-Feb-97	N										160000																									
2670	Hughes Street Bridge		14-May-97											1900000	35.1		7.1												0.2	4.2							7R-173	6.5	
2671	Hughes Street Bridge		09-Sep-97											180000	40.2		7.3												1.3	1							7W-83	5.8	
2672	Hughes Street Bridge		17-Nov-97											2000000																							7Y-196		
2673	Hughes Street Bridge		19-Nov-97											920000																							7Y-239		
2674	Hughes Street Bridge		21-Nov-97											500000	15.6															0.6							7Y-285		
2675	Hughes Street Bridge		24-Nov-97											260000																1.6							7Y-305		
2676	Hughes Street Bridge		26-Nov-97											43000	10.1															1.2							7Y-327		
2677	Hughes Street Bridge		01-Dec-97											57000																							7Z-9		
2678	Hughes Street Bridge		10-Dec-97											470000																							7Z-190		
2679	Hughes Street Bridge		15-Dec-97											270000																							7Z-288		
2680	Hughes Street Bridge		30-Dec-97											780	3.4															1.3							7Z-560		
2681	Hughes Street Bridge		15-Jan-98											8700	6															0							8L-145		
2682	Hughes Street Bridge		21-Jan-98											1100000	10.7															0.1							8L-197		
2683	Hughes Street Bridge		29-Jan-98											15000	57.4																						8L-321		
2684	Hughes Street Bridge		12-Feb-98											38000	3.3															0.2							8M-134		
2685	Hughes Street Bridge		24-Feb-98											1400	8.2															0.2							8M-248		
2686	Hughes Street Bridge		03-Mar-98											120	5.5															0.1							8N-43		
2687	Hughes Street Bridge		25-Mar-98											200000	16.8		7.1												0.6	1.6							8N-300	3.3	
2688	Hughes Street Bridge		01-Apr-98											1400000	27.1		7.1													1							8P-23	2.9	
2689	Hughes Street Bridge		15-Apr-98											360000	30.3															0.2							8P-266		
2690	Hughes Street Bridge		21-Apr-98											32000	3.8															0.5							8P-333	1.4	
2691	Hughes Street Bridge		27-Apr-98											31000	6.3															0.8							8P-400		
2692	Hughes Street Bridge		05-May-98											6200	4.6															1.1							8R-48		
2693	Hughes Street Bridge		12-May-98											45000	7.7															0.6							8R-138		
2694	Hughes Street Bridge		20-May-98											100000	9.3															0.4							8R-261		
2695	Hughes Street Bridge		27-May-98											48000	26.5															0							8R-318		
2696	Hughes Street Bridge		02-Jun-98											60000	3.3															0.5							8S-15		
2697	Hughes Street Bridge		09-Jun-98											370000																1.8							8S-110		
2698	Hughes Street Bridge		17-Jun-98											200000	22.1															0.4							8S-227		
2699	Hughes Street Bridge		26-Jun-98											720000	6.8															0.6							8S-314		
2700	Hughes Street Bridge		30-Jun-98											14	4.3															0.8							8S-358		
2701	Hughes Street Bridge		13-Jul-98											27000																							8T-124		
2702	Hughes Street Bridge		23-Jul-98											710000	13.2															0.1							8T-283		
2703	Hughes Street Bridge		28-Jul-98											550000	21.6															0.2							8T-353		
2704	Hughes Street Bridge		04-Aug-98											300000	7.6															0.6							8U-38		
2705	Hughes Street Bridge		17-Aug-98												0.8															1							8U-237		
2706	Hughes Street Bridge		25-Aug-98											210000	3															0.6							8U-365		
2707	Hughes Street Bridge		01-Sep-98											230000	4															0.1							8W-8		
2708	Hughes Street Bridge		03-Sep-98											18000																							8W-48		
2709	Hughes Street Bridge		22-Sep-98											370000	8.1															0.5					455		8W-282		

2710	Hughes Street Bridge		30-Sep-98											83000	4.4															0.3					800		8W-386		
2711	Hughes Street Bridge		14-Oct-98											2500	1.5															0.7					435		8X-177		
2712	Hughes Street Bridge		29-Oct-98											25000																							8X-381		
2713	Hughes Street Bridge		04-Nov-98											4100	2.1															0.3							8Y-81		
2714	Hughes Street Bridge		18-Nov-98											13000	4.7															0.3							8Y-279		
2715	Hughes Street Bridge		02-Dec-98											8800	5.4															0.2							8Z-27		
2716	Hughes Street Bridge		09-Dec-98											560000	4.1															0.2							8Z-104		
2717	Hughes Street Bridge		22-Dec-98											79000	4.6															0.5							8Z-248		
2718	Hughes Street Bridge		30-Dec-98												18.7															0.8							8Z-304		
2719	Hughes Street Bridge		06-Jan-99				Turbid							470000	28.8															1							9L-56		
2720	Hughes Street Bridge		13-Jan-99				Clear							1200000	10.9															0.9							9L-135		
2721	Hughes Street Bridge		02-Feb-99				Clear							8100	4.5															0.9							9M-19		
2722	Hughes Street Bridge		09-Feb-99				Black							68000																1.4							9M-122		
2723	Hughes Street Bridge		16-Feb-99				Dark							450	2.5															2							9M-197		
2724	Hughes Street Bridge		23-Feb-99				Clear							1400	3.4															0.4							9M-265		
2725	Hughes Street Bridge		02-Mar-99				Dark							220000	121.7															0.2							9N-11		
2726	Hughes Street Bridge		09-Mar-99				Black								13.1															0.6							9N-100		
2727	Hughes Street Bridge		16-Mar-99				Turbid							10																							9N-177		
2728	Hughes Street Bridge		23-Mar-99				Clear							2300	3.9															0.4							9N-250		
2729	Hughes Street Bridge		13-Apr-99				Turbid							4700	2.3															0.6							9P-173		
2730	Hughes Street Bridge		25-May-99				Black							8700																0.1							9R-254		
2731	Hughes Street Bridge		01-Jun-99				Clear							5600	2.5															0.1							9S-4		
2732	Hughes Street Bridge		08-Jun-99				Turnin							34000	6.8															0.3							9S-127		
2733	Hughes Street Bridge		15-Jun-99				Clear							5900	6.1															0.4							9S-215		
2734	Hughes Street Bridge		22-Jun-99				Clear							16000	2.8															0.2							9S-304		
2735	Hughes Street Bridge		29-Jun-99				Turbid							20	2.6															0.8							9S-390		
2736	Hughes Street Bridge		13-Jul-99				Clear,							540	4.6															0.3							9T-141		
2737	Hughes Street Bridge		20-Jul-99				Clear,							4000	2.4															0.1							9T-238		
2738	Hughes Street Bridge		27-Jul-99				Clear,							38000	12.7															0.1							9T-348		
2739	Hughes Street Bridge		03-Aug-99				Clear,							87000	4.3															0.5							9U-38		
2740	Hughes Street Bridge		10-Aug-99				Clear,							5900	8.8															0.8							9U-113		
2741	Hughes Street Bridge		17-Aug-99				Clear,							8700	3.3															0.6							9U-204		
2742	Hughes Street Bridge		31-Aug-99				Soybe							130000	39															1.1							9U-375		
2743	Hughes Street Bridge		13-Sep-99				Slightl							20000	4.1															0.3							9W-117		
2744	Hughes Street Bridge		20-Sep-99				Clear,							7600	3.2															2.2							9W-198		
2745	Hughes Street Bridge		27-Sep-99				Clear,							380	2.9															0.9							9W-336		
2746	Hughes Street Bridge		02-Nov-99				Clear,							2400																							9Y-56		
2747	Hughes Street Bridge		16-Nov-99				Clear,																														9Y-319		
2748	Hughes Street Bridge		29-Nov-99				Turbid							9																							9Y-449		
2749	North Vent		30-Sep-98											200000																							8W-394		
2750	North Vent		14-Oct-98											450																							8X-183		
2751	North Vent		29-Oct-98											36																							8X-387		
2752	North Vent		04-Nov-98											910000																							8Y-87		
2753	North Vent		18-Nov-98											320000																							8Y-285		
2754	North Vent		02-Dec-98											23000																							8Z-33		
2755	North Vent		09-Dec-98											180000																							8Z-110		
2756	North Vent		22-Dec-98											56000																							8Z-254		
2757	North Vent		30-Dec-98											1																							8Z-310		
2758	North Vent		06-Jan-99											1200000	23.9															2.8							9L-57		
2759	North Vent		13-Jan-99											1700000	10.3															1.7							9L-136		
2760	North Vent		02-Feb-99											5400	3.7															0.6							9M-20		
2761	North Vent		09-Feb-99											6700	1.3															1.2							9M-123		
2762	North Vent		16-Feb-99											43000	42.4															0.8							9M-198		
2763	North Vent		23-Feb-99											29000	4.6															0.1							9M-266		
2764	North Vent		02-Mar-99											51000	140.5															0.4							9N-12		
2765	North Vent		09-Mar-99											-999	212.2															0.1							9N-101		
2766	North Vent		16-Mar-99											53000																							9N-178		
2767	North Vent		23-Mar-99											4100	294.4															0.4							9N-251		
2768	North Vent		13-Apr-99											1370000	87.5															0.2							9P-174		
2769	North Vent		25-May-99											21000	40																						9R-255		
2770	North Vent		01-Jun-99											4700	4.2																						9S-5		
2771	North Vent		08-Jun-99											58000	20.7																						9S-128		
2772	North Vent		15-Jun-99											10	25.4																						9S-217		
2773	North Vent		22-Jun-99											27000	3.3																						9S-305		
2774	North Vent		29-Jun-99											9	5.5																						9S-391		
2775	North Vent		13-Jul-99											10000	4																						9T-142		
2776	North Vent		20-Jul-99											7100	2.8																						9T-239		
2777	North Vent		27-Jul-99											15000	10.5																						9T-349		
2778	North Vent		03-Aug-99											33000	6.5																						9U-39		
2779	North Vent		10-Aug-99											9700	2.2																						9U-114		
2780	North Vent		17-Aug-99											55000	14.5																						9U-205		
2781	North Vent		31-Aug-99											80000	9.6																						9U-376		
2782	North Vent		13-Sep-99											340	2.9																						9W-118		
2783	North Vent		20-Sep-99											6000	2.9																						9W-199		
2784	North Vent		27-Sep-99											150	41																						9W-337		
2785	North Vent		29-Nov-99											9																							9Y-450		
2786	South Vent		30-Sep-98											76000																							8W-395		
2787	South Vent		14-Oct-98											4900																							8X-184		
2788	South Vent		29-Oct-98											330																							8X-388		
2789	South Vent		04-Nov-98											12500																							8Y-88		
2790	South Vent		18-Nov-98											3500																							8Y-286		

2791	South Vent		02-Dec-98											9700																							8Z-34		
2792	South Vent		09-Dec-98											31000																							8Z-111		
2793	South Vent		22-Dec-98											620000																							8Z-255		
2794	South Vent		30-Dec-98											76																							8Z-311		
2795	South Vent		06-Jan-99											31000																	0.9							9L-58		
2796	South Vent		13-Jan-99											220000	2.8															1.1							9L-137		
2797	South Vent		02-Feb-99											5700	33.9															1.5							9M-21		
2798	South Vent		09-Feb-99											57000	141.2															1.3							9M-124		
2799	South Vent		16-Feb-99											1900	2.7															1.9							9M-199		
2800	South Vent		23-Feb-99											4800	19.7															0.5							9M-267		
2801	South Vent		02-Mar-99											8600	24.8															0.2							9N-13		
2803	South Vent		16-Mar-99											3500																							9N-179		
2804	South Vent		23-Mar-99											6000	200															0.6							9N-252		
2805	South Vent		13-Apr-99											410000	52.7															0.8							9P-175		
2806	South Vent	Dry	25-May-99																																		N/A		
2807	South Vent	Dry	01-Jun-99																																		N/A		
2808	South Vent	Dry	08-Jun-99																																		N/A		
2809	South Vent	Dry	15-Jun-99																																		N/A		
2810	South Vent	Dry	22-Jun-99																																		N/A		
2811	South Vent	Dry	22-Jun-99																																		N/A		
2812	South Vent	Dry	13-Jul-99																																		N/A		
2813	South Vent	Dry	20-Jul-99																																		N/A		
2814	South Vent	Dry	27-Jul-99																																		N/A		
2815	South Vent	Dry	03-Aug-99																																		N/A		
2816	South Vent	Dry	10-Aug-99																																		N/A		
2817	South Vent	Dry	17-Aug-99																																		N/A		
2818	South Vent	Dry	31-Aug-99																																		N/A		
2819	South Vent	Dry	13-Sep-99																																		N/A		
2820	South Vent	Dry	20-Sep-99																																		N/A		
2821	South Vent	Dry	27-Sep-99																																		N/A		
2822	South Vent	Dry	29-Nov-99																																		N/A		
2823	Evergreen Cemetery		30-Sep-98											200000	27.1															0.6							8W-393		
2824	Evergreen Cemetery		14-Oct-98											20000	4															0.8							8X-178		
2825	Evergreen Cemetery		29-Oct-98																																		8X-382		
2826	Evergreen Cemetery		04-Nov-98											520000	3.9															0.2							8Y-82		
2827	Evergreen Cemetery		18-Nov-98											120000	5.4															0.2							8Y-280		
2828	Evergreen Cemetery		02-Dec-98											13000	5.5															0.2							8Z-28		
2829	Evergreen Cemetery		09-Dec-98											190000	24.7															0.3							8Z-105		
2830	Evergreen Cemetery		22-Dec-98											45000	41															0.1							8Z-249		
2831	Evergreen Cemetery		30-Dec-98											1	2.2															0.7							8Z-305		
2832	Park and Elm N1		22-Sep-98											4600	2.1															0.2							8W-284		
2833	Park and Elm N1		30-Sep-98											45000	44.7															0.1							8W-389		
2834	Park and Elm N1	Rain-N	07-Oct-98																																				
2835	Park and Elm N1		14-Oct-98											5400	4.9															0.3							8X-179		
2836	Park and Elm N1	Rain-N	21-Oct-98																																				
2837	Park and Elm N1		29-Oct-98											22000																							8X-383		
2838	Park and Elm N1		04-Nov-98											11000	1.2															0.1							8Y-83		
2839	Park and Elm N1		18-Nov-98											5800	3.9															0.1							8Y-281		
2840	Park and Elm N1		02-Dec-98											22000	0.8															0.1							8Z-29		
2841	Park and Elm N1		09-Dec-98											40000	23.1															0.1							8Z-106		
2845	Park and Elm N1		13-Jan-99											2300000	11.6															3.4							9L-138		
2846	Park and Elm N1		02-Feb-99											33000	42																					9M-22		
2847	Park and Elm N1		09-Feb-99											42000	39															0.1							9M-125		
2848	Park and Elm N1		16-Feb-99											32000	400															0.5							9M-200		
2849	Park and Elm N1		23-Feb-99											11000	40															0.1							9M-268		
2851	Park and Elm N1		09-Mar-99											-999	44.1															0.4							9N-103		
2852	Park and Elm N1		16-Mar-99											94000																							9N-180		
2853	Park and Elm N1		23-Mar-99											94000	8.8															0.1							9N-253		
2854	Park and Elm N1		13-Apr-99											250000																							9P-176		
2855	Park and Elm N1		25-May-99											260000	44																					9R-256		
2856	Park and Elm N1		01-Jun-99											680	0.9																					9S-6		
2857	Park and Elm N1		08-Jun-99											3000	8.9																					9S-129		
2858	Park and Elm N1		15-Jun-99											4000	3.2																					9S-218		
2859	Park and Elm N1		22-Jun-99											4400	3.6																					9S-306		
2860	Park and Elm N1		29-Jun-99											10	2.1																					9S-392		
2861	Park and Elm N1		13-Jul-99											240	0.7																					9T-143		
2862	Park and Elm N1		20-Jul-99											300	1.1																					9T-240		
2863	Park and Elm N1		27-Jul-99											2600	2.8																					9T-350		
2864	Park and Elm N1		03-Aug-99											2400	2.8																					9U-40		
2865	Park and Elm N1		10-Aug-99											23000	5.4																					9U-115		
2866	Park and Elm N1		17-Aug-99											60000	22.7																					9U-206		
2867	Park and Elm N1		31-Aug-99											3800	2.8																					9U-377		
2868	Park and Elm N1		13-Sep-99											2700	1.4																					9W-119		
2869	Park and Elm N1		20-Sep-99											940	3.5																					9W-200		
2870	Park and Elm N1	Low F	27-Sep-99											720																							9W-338		
2871	Park and Elm N1		29-Nov-99											24000																							9Y-451		
2872	Polk and Elm S1		22-Sep-98											690	4.6															0.6							8W-283		
2873	Polk and Elm S1		30-Sep-98											4300	32.5															0.9							8W-390		
2874	Polk and Elm S1		14-Oct-98											2800	2.3															0.7							8X-180		
2875	Polk and Elm S1		29-Oct-98											72																							8X-384		
2876	Polk and Elm S1		04-Nov-98											7700	4.8															0.5							8Y-84		

2877	Polk and Elm S1		18-Nov-98											340	3															0.2							8Y-282		
2878	Polk and Elm S1		02-Dec-98											24000	3.5															0.2							8Z-30		
2879	Polk and Elm S1		09-Dec-98											14000	5.1															0.5							8Z-107		
2880	Polk and Elm S1		22-Dec-98											7300	10.9																						8Z-251		
2881	Polk and Elm S1		30-Dec-98											3300	3															0.2							8Z-307		
2882	Polk and Elm S1		06-Jan-99											51000	7.2															0.1							9L-60		
2883	Polk and Elm S1		13-Jan-99											4200	3.9															0.6							9L-139		
2884	Polk and Elm S1		02-Feb-99											28000	5.7															0.2							9M-23		
2885	Polk and Elm S1		09-Feb-99											270	11.6															0.9							9M-126		
2886	Polk and Elm S1		16-Feb-99											15000	29.2															0.9							9M-201		
2888	Polk and Elm S1		02-Mar-99											33000	113.4															0.7							9N-15		
2889	Polk and Elm S1		09-Mar-99											-999	136.5															0.6							9N-104		
2890	Polk and Elm S1		16-Mar-99											22000																							9N-181		
2891	Polk and Elm S1		23-Mar-99											21000	125.2															0.2							9N-254		
2892	Polk and Elm S1		13-Apr-99											490	18.4															0.4							9P-177		
2893	Polk and Elm S1		25-May-99											30000	18																						9R-257		
2894	Polk and Elm S1		01-Jun-99											5300	2.6																						9S-9		
2895	Polk and Elm S1		08-Jun-99											11000	37																						9S-132		
2896	Polk and Elm S1		15-Jun-99											20	38.5																						9S-221		
2897	Polk and Elm S1		22-Jun-99											4800	11.9																						9S-309		
2898	Polk and Elm S1		29-Jun-99											820	15.9																						9S-395		
2899	Polk and Elm S1		13-Jul-99											3000	40																						9T-146		
2900	Polk and Elm S1		20-Jul-99											3600	2.8																						9T-243		
2901	Polk and Elm S1		27-Jul-99											4100	4.1																						9T-353		
2902	Polk and Elm S1		03-Aug-99											16000	4.2																						9U-43		
2903	Polk and Elm S1		10-Aug-99											5400	2.1																						9U-118		
2904	Polk and Elm S1		17-Aug-99											340	0.1																						9U-209		
2905	Polk and Elm S1		31-Aug-99											3400	4.7																						9U-380		
2906	Polk and Elm S1		13-Sep-99											10	3.7																						9W-122		
2907	Polk and Elm S1		20-Sep-99											20000	4.4																						9W-203		
2908	Polk and Elm S1		27-Sep-99											2500	25.1																						9W-341		
2909	Polk and Elm S1		29-Nov-99											9																							9Y-454		
2910	Milby and Polk N2		23-Feb-99											93000																							9M-270		
2911	Milby and Polk N2		02-Mar-99											210000																							9N-16		
2912	Milby and Polk N2		09-Mar-99											-999																							9N-105		
2913	Milby and Polk N2		16-Mar-99											27000																							9N-182		
2914	Milby and Polk N2		23-Mar-99											36000																							9N-255		
2915	Milby and Polk N2		13-Apr-99											1490000																							9P-178		
2916	Milby and Polk N2		25-May-99											2000000																							9R-258		
2917	Milby and Polk N2		01-Jun-99											6400																							9S-7		
2918	Milby and Polk N2		08-Jun-99											98000	34.6																						9S-130		
2919	Milby and Polk N2		15-Jun-99											690000	19.9																						9S-219		
2920	Milby and Polk N2		22-Jun-99											60000	24.7																						9S-307		
2921	Milby and Polk N2		29-Jun-99											9																							9S-393		
2922	Milby and Polk N2		13-Jul-99											1300																							9T-144		
2923	Milby and Polk N2		20-Jul-99											380	1.8																						9T-241		
2924	Milby and Polk N2		27-Jul-99											3000																							9T-351		
2925	Milby and Polk N2		03-Aug-99											3800																							9U-41		
2926	Milby and Polk N2		10-Aug-99											5800																							9U-116		
2927	Milby and Polk N2		17-Aug-99											65000																							9U-207		
2928	Milby and Polk N2		31-Aug-99											2500																							9U-378		
2929	Milby and Polk N2		13-Sep-99											5900																							9W-120		
2930	Milby and Polk N2		20-Sep-99											600																							9W-201		
2931	Milby and Polk N2		27-Sep-99											14000																							9W-339		
2932	Milby and Polk N2		29-Nov-99											45																							9Y-452		
2933	Ennis and Lamar N3		22-Sep-98											240000																							8W-286		
2934	Ennis and Lamar N3		30-Sep-98											22000																							8W-391		
2935	Ennis and Lamar N3		14-Oct-98											810																							8X-181		
2936	Ennis and Lamar N3		29-Oct-98											6500																							8X-385		
2937	Ennis and Lamar N3		04-Nov-98											12000																							8Y-85		
2938	Ennis and Lamar N3		18-Nov-98											44000																							8Y-283		
2939	Ennis and Lamar N3		02-Dec-98											3800																							8Z-31		
2940	Ennis and Lamar N3		09-Dec-98											3800																							8Z-108		
2941	Ennis and Lamar N3		22-Dec-98											36000																							8Z-252		
2942	Ennis and Lamar N3		30-Dec-98											1																							8Z-308		
2943	Ennis and Lamar N3		06-Jan-99											48000																							9L-81		
2944	Ennis and Lamar N3		13-Jan-99											4100																							9L-140		
2945	Ennis and Lamar N3		02-Feb-99											19000																							9M-24		
2946	Ennis and Lamar N3		09-Feb-99											130000																							9M-127		
2947	Ennis and Lamar N3		16-Feb-99											44000																							9M-202		
2948	Ennis and Lamar N3		23-Feb-99											12000																							9M-271		
2949	Ennis and Lamar N3		02-Mar-99											74000																							9N-17		
2950	Ennis and Lamar N3		09-Mar-99											-999																							9N-106		
2951	Ennis and Lamar N3		16-Mar-99											10000																							9N-183		
2952	Ennis and Lamar N3		23-Mar-99											1090000																							9N-256		
2953	Ennis and Lamar N3		13-Apr-99											1090000																							9P-179		
2954	Ennis and Lamar N3		25-May-99											14000																							9R-259		
2955	Ennis and Lamar N3		01-Jun-99											950																							9S-8		
2956	Ennis and Lamar N3		08-Jun-99											58000																							9S-131		
2957	Ennis and Lamar N3		15-Jun-99											32000																							9S-220		
2958	Ennis and Lamar N3		22-Jun-99											3600																							9S-308		

2959	Ennis and Lamar N3		29-Jun-99											9																							9S-394		
2960	Ennis and Lamar N3		13-Jul-99											130																							9T-145		
2961	Ennis and Lamar N3		20-Jul-99											870																							9T-242		
2962	Ennis and Lamar N3		27-Jul-99											800																							9T-352		
2963	Ennis and Lamar N3		03-Aug-99											610																							9U-42		
2964	Ennis and Lamar N3		10-Aug-99											14000																							9U-117		
2965	Ennis and Lamar N3		17-Aug-99											60000	149.1																						9U-208		
2966	Ennis and Lamar N3		31-Aug-99											34000																							9U-379		
2967	Ennis and Lamar N3		13-Sep-99											440																							9W-121		
2968	Ennis and Lamar N3		20-Sep-99											400																							9W-202		
2969	Ennis and Lamar N3		27-Sep-99											2100																							9W-340		
2970	Ennis and Lamar N3		29-Nov-99											5500																							9Y-453		
2971	S3		22-Sep-98											55000																							8W-285		
2972	S3		30-Sep-98											400																							8W-392		
2973	S3	Rain-N	07-Oct-98																																				
2974	S3		14-Oct-98											230																							8X-182		
2975	S3	Rain-N	21-Oct-98																																				
2976	S3		29-Oct-98											6000																							8X-386		
2977	S3		04-Nov-98											240																							8Y-86		
2978	S3		18-Nov-98											130																							8Y-284		
2979	S3		02-Dec-98											400																							8Z-32		
2980	S3		09-Dec-98											63																							8Z-109		
2981	S3		22-Dec-98											4500																							8Z-253		
2982	S3		30-Dec-98											1																							8Z-309		
2983	S3		06-Jan-99											1800																							9L-62		
2984	S3		13-Jan-99											2000																							9L-141		
2985	S3		02-Feb-99											540																							9M-25		
2986	S3		09-Feb-99											108																							9M-128		
2987	S3		16-Feb-99											600																							9M-202		
2988	Hussien		17-Aug-99											2200																							8U-211		
2989	Water Department		23-Feb-99											12000																							9M-272		
2990	Water Department		02-Mar-99											23000																							9N-18		
2991	Water Department		09-Mar-99											-999																							9N-107		
2992	Water Department		16-Mar-99											260000																							9N-184		
2993	Water Department		23-Mar-99											24000																							9N-257		
2994	Water Department		13-Apr-99											600																							9P-180		
2995	Water Department	Ingebo	13-Apr-99											35000																							9P-181		
2996	Water Department		01-Jun-99											98000																							9S-10		
2997	Water Department		08-Jun-99											6300																							9S-133		
2998	Water Department	Ingebo	08-Jun-99											14000																							9S-134		
2999	Water Department		15-Jun-99											58000																							9S-222		
3000	Water Department		22-Jun-99											2100																							9S-310		
3001	Water Department		29-Jun-99											57000																							9S-396		
3002	Water Department		03-Aug-99											25000																							9U-44		
3003	Water Department		10-Aug-99											23000																							9U-119		
3004	Water Department		17-Aug-99											4500																							9U-210		
3005	Water Department		31-Aug-99											100000																							9U-381		
3006	Water Department		13-Sep-99											940000																							9W-123		
3007	Water Department		20-Sep-99											19000																							9W-204		
3008	Water Department		27-Sep-99											6300																							9W-342		
3009	Water Department		29-Nov-99											150																							9Y-455		
3010	Austin School		23-Feb-99											28																							9M-273		
3011	Austin School		02-Mar-99											10																							9N-19		
3012	Austin School		09-Mar-99											-999																							9N-108		
3013	Austin School		16-Mar-99											130																							9N-185		
3014	Austin School		23-Mar-99											310																							9N-258		
3015	Railroad (Upstream)		09-Jun-97																																				
3016	Railroad (Upstream)		17-Jun-97																																				
3017	Railroad (Upstream)		26-Jun-97					0.9						45000	5.3		7.5												0.9	0.1							7S-259	1.2	
3018	Railroad (Upstream)		03-Jul-97					0.6						65000	22.8		7.5												0.6	0.3							7T-24	1	
3019	Railroad (Upstream)		11-Jul-97					0.2						500000	5.4		7.9												0.2	0.4							7T-119	1.3	
3020	Railroad (Upstream)		17-Jul-97					-999						21000	63.3		7.1																					7T-209	3.6	
3021	Railroad (Upstream)		22-Jul-97					0.1						1400000	9.8		6.9												0.1	0.1							7T-260	1	
3022	Railroad (Upstream)		30-Jul-97					0.2						2000000	7.2		7.2												0.2	0.1							7T-394	1.9	
3023	Railroad (Upstream)		04-Aug-97					0.3						2000000	19.4		7.5												0.3	1.2							7U-22	3	
3024	Polk @ Railroad (Downs		03-Jul-97					0.5						29000	5.9		7.8												0.5	0.1							7T-25	0.8	
3025	Polk @ Railroad (Downs		11-Jul-97					0.2						22000	3.7		8												0.2	0.4							7T-120	1.3	
3026	Polk @ Railroad (Downs		17-Jul-97					-999							5.8		7.7																					7T-210	2.4	
3027	Polk @ Railroad (Downs		22-Jul-97					0.1						910000	35		7.3												0.1	0.2							7T-261	0.9	
3028	Polk @ Railroad (Downs		30-Jul-97					0.3						2000000	11.9		7.8												0.3	0.1							7T-395	1.6	
3029	Polk @ Railroad (Downs		04-Aug-97					0.3						2000000	6.9		7.5												0.3	0.4							7U-23	1.9	
3036	South Vent		09-Mar-99											-999	11.8															0.7							Dye Te		
3037	Park and Elm N1		22-Dec-98											49000	42																						No Flow		
3038	Park and Elm N1		30-Dec-98												2															0.5							Water L		
3039	Park and Elm N1		06-Jan-99											880000	7.6															2.3							No Flow		
3040	Park and Elm N1		02-Mar-99											7200	700															0.1							Dye Te		
3041	Polk and Elm S1		23-Feb-99											140000	1550															0.9							Dye Te		

Appendix – IV Selected Field Data for Statistical Analysis

Ennis and Lamar (N3)											
	Odor at Hughes						No Odor at Hughes				
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)
29-Oct-98				6500		16-Sep-98	4.8	0.7	28		
25-Nov-98	3.3	1.86	42			22-Sep-98	3	4.12		240000	
25-Nov-98	3.3	1.86	42			22-Sep-98					
2-Dec-98	6.41	1.25	46			30-Sep-98	4.57	5.22	65	22000	
2-Dec-98				3800		30-Sep-98					
23-Dec-98	5.45	1.25	56			7-Oct-98		0.28	35		
30-Dec-98		1.44	52			14-Oct-98	3.3	1.47	24	810	
30-Dec-98				1		14-Oct-98					
6-Jan-99	4.22	2.06	69			21-Oct-98	9.24	0.15	45		
6-Jan-99				48000		28-Oct-98	6.16	0.81	69		
21-Jan-99	4.32	1.59	70			4-Nov-98	9.45	0.64	44		
2-Feb-99	0.95	3.48	56			4-Nov-98				12000	
2-Feb-99				19000		13-Nov-98	9.03	1.06	3		
9-Feb-99	4.38	3.76	70			18-Nov-98	3.84	0.69	74		
9-Feb-99				130000		18-Nov-98				44000	
16-Feb-99	3.12	6.2	61			13-Jan-99	6.92	1.07	73		
16-Feb-99				44000		13-Jan-99				4100	
2-Mar-99	4.44	2.88	82			23-Feb-99	4.36	3.04	63		
2-Mar-99				74000		23-Feb-99				12000	
9-Mar-99	4.43	3.68	60			16-Mar-99	6.85	2.78	55	10000	
9-Mar-99						16-Mar-99					
23-Mar-99	4.74	2.52	68			15-Apr-99	8.79	1.06	51		
23-Mar-99				1090000		11-May-99	8.9	0.72	30		
30-Mar-99	8.15	0.57	22			15-Jun-99	2.42	0.82	35		
5-Apr-99	5.71	2.31	70			15-Jun-99				32000	
23-Apr-99	7.5	3.74	48			22-Jun-99	2.107	0.52	54		
27-Apr-99	7.93	2.08	35			22-Jun-99				3600	
25-May-99	2.7	3.6	70			6-Jul-99	2.93	0.44	45		
25-May-99				14000		15-Jul-99	4.2	4.24	58		
8-Jun-99	2.37	2.56	70			20-Jul-99	3.3	1.77	52		
8-Jun-99				58000		20-Jul-99				870	
29-Jun-99	4.33	1	46			3-Aug-99		3.08	73		
29-Jun-99				9		3-Aug-99				610	
27-Jul-99	5.4	3.68	63			21-Oct-99	3.39	4.22	48		
27-Jul-99				800		1-Nov-99	4.43	0.82	51		
4-Oct-99	3.25	0.24	59								

Mean Values					
	DO	Ammonia	Sulfate	Fecal Coliform	BOD
Odor	4.59	**2.44**	57.14	114,470	
No Odor	5.33	**1.73**	48.86	31,833	

Differences in **Bold** values are statistically significant at p=0.05

Park and Elm (N1)

Odor at Hughes						No Odor at Hughes					
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)
29-Oct-98				22000		22-Sep-98		0.2		4600	2.1
25-Nov-98	4.93	0.1	46			22-Sep-98	2.61	0.45		4600	2.1
25-Nov-98	4.93	0.1	46			30-Sep-98		0.1		45000	44.7
2-Dec-98	6.61	0.24	42			30-Sep-98	2.99	1.13	70	45000	44.7
2-Dec-98		0.1		22000	0.8	7-Oct-98	2.86	1.39	42		
23-Dec-98	7.21	1	66			7-Oct-98					
30-Dec-98	10.59	1.02	44			14-Oct-98		0.3		5400	4.9
30-Dec-98		0.5			2	14-Oct-98	1.25	0.32	30	5400	4.9
6-Jan-99	5.64	2.44	72			21-Oct-98					
6-Jan-99		2.3		880000	7.6	21-Oct-98	8.02	0.15	52		
21-Jan-99	5.38	2.45	59			28-Oct-98	10.29	1.27	88		
2-Feb-99	0.92	0.85	55			4-Nov-98	10.3	0.12	70		
2-Feb-99				33000	42	4-Nov-98		0.1		11000	1.2
9-Feb-99	3.87	1.44	55			13-Nov-98	8.63	0.55	7		
9-Feb-99		0.1		42000	39	18-Nov-98	5.38	0.1	32		
16-Feb-99	2.61	4.1	36			18-Nov-98		0.1		5800	3.9
16-Feb-99		0.5		32000	400	13-Jan-99	8.86	2.66	85		
2-Mar-99	2.52	4.68	51			13-Jan-99		3.4		2300000	11.6
2-Mar-99		0.1		7200	700	23-Feb-99		0.1		11000	40
9-Mar-99	5.89	0.87	54			23-Feb-99	5.01	1.74	55		
9-Mar-99		0.4		-999	44.1	16-Mar-99				94000	
23-Mar-99	6.55	0.32	69			16-Mar-99	6.51	0.4	0.3	94000	
23-Mar-99		0.1		94000	8.8	15-Jun-99	2.83	0.28	42		
30-Mar-99	8.38	0.37	16			15-Jun-99				4000	3.2
5-Apr-99	4.34	1.99	58			22-Jun-99				4400	3.6
25-May-99				260000	44	22-Jun-99					
8-Jun-99	4.33	0	59			6-Jul-99					
8-Jun-99				3000	8.9	15-Jul-99					
29-Jun-99	4.93	1.11	49			20-Jul-99				300	1.1
29-Jun-99				10	2.1	3-Aug-99				2400	2.8
27-Jul-99	6.4	0.17	73			3-Aug-99		0.3	62		
27-Jul-99				2600	2.8						

Mean Values

	DO	Ammonia	Sulfate	Fecal Coliform	BOD
Odor	5.34	1.05	52.78	107,447	100
No Odor	5.81	0.72	48.87	164,806	12

Differences in **Bold** values are statistically significant at p=0.05

Polk and Elm (S1)											
	Odor at Hughes						No Odor at Hughes				
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)
29-Oct-98				72		22-Sep-98	3.54	0.96		690	4.6
25-Nov-98	6.3	0.97	72			22-Sep-98		0.6		690	4.6
25-Nov-98	6.3	0.97	72			30-Sep-98		0.9		4300	32.5
2-Dec-98	4.63	0.26	53			7-Oct-98	2.94	0.55	59		
2-Dec-98		0.2		24000	3.5	14-Oct-98		0.7		2800	2.3
23-Dec-98	7.7	0.11	47			14-Oct-98	4.3	1	71	2800	2.3
30-Dec-98		0.2		3300	3	21-Oct-98	8.39	0.5	60		
30-Dec-98		0.64	74			28-Oct-98	9.27	1.42	64		
6-Jan-99		0.1		51000	7.2	4-Nov-98	5.4	0.79	60		
6-Jan-99	4.49	0.04	74			4-Nov-98		0.5		7700	4.8
21-Jan-99	7.59	0.62	74			13-Nov-98	5.72	0.62	14		
2-Feb-99	0.59	0.27	72			18-Nov-98	7.8	0.58	46		
2-Feb-99		0.2		28000	5.7	18-Nov-98		0.2		340	3
9-Feb-99		0.9		270	11.6	13-Jan-99	13.02	0.49	72		
9-Feb-99	4.53	1.34	59			13-Jan-99		0.6		4200	3.9
16-Feb-99		0.9		15000	29.2	23-Feb-99		0.9		140000	
16-Feb-99	4.4	0.92	76			23-Feb-99	4.59	1.07	73		
2-Mar-99	3.86	1.17	73			16-Mar-99				22000	
2-Mar-99		0.7		33000	113.4	16-Mar-99	4.94	0.82	62	22000	
9-Mar-99	2.82	0.62	61			15-Apr-99	6.62	0	53		
9-Mar-99		0.6			136.5	11-May-99	8.27	0.19	38		
23-Mar-99		0.2		21000	125.2	15-Jun-99	2.96	1.09	55		
23-Mar-99	3.87	0.32	56			15-Jun-99				20	38.5
30-Mar-99	8.15	0	24			22-Jun-99	1.22	0.67	50		
5-Apr-99	1.19	1.17	70			22-Jun-99				4800	11.9
23-Apr-99	7.24	0.43	75			6-Jul-99	1.29	1.37	31		
27-Apr-99	6.14	0.46	42			15-Jul-99	3.3	0.15	64		
25-May-99				30000	18	20-Jul-99	4.5	0.23	51		
25-May-99	7.6	1.03	66			20-Jul-99				3600	2.8
8-Jun-99	6.33	0.53	63			3-Aug-99		0.34	84		
8-Jun-99				11000	37	3-Aug-99				16000	4.2
29-Jun-99				820	15.9	13-Aug-99		0.39	64		
29-Jun-99	2.72	0.82	61			21-Oct-99	3.93	0.48	45		
27-Jul-99	4.8	0.25	65			1-Nov-99	4.87	0.9	51		
27-Jul-99				4100	4.1						
4-Oct-99	2.62	0.01	48								

Mean Values					
	DO	Ammonia	Sulfate	Fecal Coliform	BOD
Odor	4.95	0.55	62.59	17043.23	**39.25**
No Odor	5.34	0.66	55.57	15462.67	**9.62**

Differences in **Bold** values are statistically significant at p=0.05

Evergreen Cemetery; North and South Vents											
	Odor at Hughes						No Odor at Hughes				
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)
2-Apr-98						28-May-98					
28-Apr-98						3-Jun-98					
12-May-98						8-Jun-98					
12-May-98						15-Jun-98					
21-May-98						26-Jun-98					
27-May-98						29-Jun-98					
11-Jun-98						8-Jul-98					
17-Jun-98						20-Jul-98					
22-Jun-98						29-Jul-98	2.7	0.47	53		
13-Jul-98						12-Aug-98	4.08	0.85	53		
26-Aug-98	1.24	0.57	67			19-Aug-98	1.7		41		
29-Oct-98						14-Sep-98	2.76				
29-Oct-98				38		16-Sep-98	4.9	0.28	27		
29-Oct-98				330		30-Sep-98				200000	
25-Nov-98	4.6	1.31	68			30-Sep-98				76000	
25-Nov-98	4.6	1.31	68			30-Sep-98		0.6		200000	27.1
2-Dec-98		0.2		13000	5.5	30-Sep-98		0.82	59	200000	27.1
2-Dec-98	12.76	0.43	20			7-Oct-98	1.28	0.46	50		
2-Dec-98				9700		14-Oct-98	1.76	1.19	65	20000	4
2-Dec-98				23000		14-Oct-98				450	
23-Dec-98	7.23	0.13	72			14-Oct-98				4900	
30-Dec-98				1		14-Oct-98		0.8		20000	4
30-Dec-98				76		21-Oct-98	5.44	0.49	55		
30-Dec-98	8.73	1.21	64			28-Oct-98	8.634	2.13	72		
30-Dec-98		0.7		1	2.2	4-Nov-98				12500	
6-Jan-99		2.8		1200000	23.9	4-Nov-98		0.2		520000	3.9
6-Jan-99	3.25	2.79	74			4-Nov-98				910000	
6-Jan-99	4.25	0.86	48			4-Nov-98	1.7	0.21	63		
6-Jan-99		0.9		31000		13-Nov-98	6.33	0.58	0		
21-Jan-99	5.97	1.41	57			18-Nov-98	8.3	0.57	57		
21-Jan-99	3.33	1.36	60			18-Nov-98		0.2		120000	5.4
2-Feb-99	1.73	1.85	46			18-Nov-98				320000	
2-Feb-99	18.8	0.7	68			18-Nov-98				3500	
2-Feb-99		0.6		5400	3.7	13-Jan-99	9.97	1.95	70		
2-Feb-99		1.5		5700	33.9	13-Jan-99	12.95	0.99	58		
9-Feb-99	3.9	1.34	49			13-Jan-99		1.7		1700000	10.3
9-Feb-99		1.2		6700	1.3	13-Jan-99		1.1		220000	2.8
9-Feb-99	3.52	2.66	49			23-Feb-99		0.1		29000	4.6
9-Feb-99		1.3		57000	141.2	23-Feb-99	2.47	0.6	32		
16-Feb-99	4.79	2.36	57			23-Feb-99	2.63	0.15	65		
16-Feb-99		1.9		1900	2.7	23-Feb-99		0.5		4800	19.7
16-Feb-99	1.28	0.89	68			16-Mar-99				53000	
16-Feb-99		0.8		43000	42.4	16-Mar-99	4.04	0.35	62	53000	
2-Mar-99		0.4		51000	140.5	16-Mar-99	5.49	0.96	47	3500	
2-Mar-99	2.41	0.64	67			16-Mar-99				3500	
2-Mar-99	1.2	0.71	72			15-Apr-99	6.93	0.55	25		
2-Mar-99		0.2		8600	24.8	15-Apr-99	2.63	0.57	31		
9-Mar-99	1.8	0.66	55			11-May-99	7.9	0.21	28		
9-Mar-99		0.7		-999	11.8	11-May-99	7.91	0.45	26		
9-Mar-99		0.1		-999	212.2	15-Jun-99					
9-Mar-99	1.86	1.15	48			15-Jun-99				10	25.4
23-Mar-99		0.4		4100	294.4	15-Jun-99	3.26	0.93	54		
23-Mar-99	3.57	0.69	30			15-Jun-99					
23-Mar-99		0.6		6000	200	22-Jun-99	3	0.73	45		
23-Mar-99	4.78	0.06	73			22-Jun-99					
30-Mar-99	7.66	0.42	20			22-Jun-99					
30-Mar-99	8.05	0.26	26			22-Jun-99					
5-Apr-99	3.93	1.35	50			22-Jun-99				27000	3.3
5-Apr-99	1.38	0.67	64			6-Jul-99	1.84	0.27	15		
23-Apr-99	6.2	2.13	28			6-Jul-99					
23-Apr-99	3.23	0.38	72			15-Jul-99	3.88	0.43	25		
27-Apr-99	4.35	1.61	20			15-Jul-99					
27-Apr-99	5.32	1.33	28			20-Jul-99				7100	2.8
25-May-99						20-Jul-99					
25-May-99	5.8	0.32	60			20-Jul-99	5.8	0.29	32		
25-May-99				21000	40	3-Aug-99					
25-May-99						3-Aug-99					
8-Jun-99				58000	20.7	3-Aug-99				33000	6.5
8-Jun-99						3-Aug-99		0.49	66		
8-Jun-99						13-Aug-99		1.64	67		
8-Jun-99	1.14	0.19	65			21-Oct-99	2.06	1.85	54		
29-Jun-99	4.46	0.95	54			1-Nov-99		0.79	53		
29-Jun-99											
29-Jun-99				9	5.5						
27-Jul-99				15000	10.5						
27-Jul-99											
27-Jul-99	7.15	0.57	51								
27-Jul-99											
4-Oct-99	1.43	0.25	57								
Mean Values											
	DO	Ammonia	Sulfate	Fecal Coliform	BOD						
Odor	4.73	**0.98**	53.57	59,944	**64.06**						
No Odor	4.73	**0.72**	46.77	182,356	**10.49**						
Differences in Bold values are statistically significant at p=0.05											

Hughes Street Bridge											
	Odor Reported in Field Notes						No Odor Reported in Field Notes				
Field Visit Date	DO (ppm)	Ammonia_M6036 (mg/L)	Sulfate_M6051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M6036 (mg/L)	Sulfate_M6051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)
05-Nov-97		3.8		310000	53.4	24-Nov-97				260000	1.6
06-Nov-97		0.2		330000	10	24-Nov-97		1.6		260000	
07-Nov-97		0.2		60000	8	26-Nov-97		1.2		43000	10
10-Nov-97		0.5		155000	16.1	26-Nov-97		1.2		43000	10
12-Nov-97		0.4		86000	19.2	01-Dec-97				57000	
14-Nov-97		1.2		320000	33.7	01-Dec-97		0.1		57000	6.1
17-Nov-97		2.5		2000000	40.6	10-Dec-97		1.3		640000	27
19-Nov-97		5.7		520000	114.9	10-Dec-97				470000	
21-Nov-97		0.6		500000	15.6	30-Dec-97		1.3		780	3.4
21-Nov-97		0.6		500000	15.6	30-Dec-97		1.3		780	3.4
15-Dec-97		1.3		270000	9.4	15-Jan-98		6		8700	0
19-Dec-97		0.7		230000	62.7	15-Jan-98		0		8700	6
21-Jan-98		0.1		1100000	10.7	29-Jan-98				720000	0
25-Mar-98		1.6		200000	16.8	29-Jan-98				15000	57
25-Mar-98		1.6		200000	16.8	12-Feb-98		3.3		38000	0.2
01-Apr-98		1		1400000	27.1	12-Feb-98		0.2		38000	3.3
01-Apr-98		1		1400000	27.1	24-Feb-98		0.2		1400	8.2
02-Apr-98			76			24-Feb-98		0.18		1400	8.2
15-Apr-98		0.2		360000	30.3	03-Mar-98		0.1		120	5.5
15-Apr-98		0.2		360000	30.3	03-Mar-98		0.1		120	5.5
27-Apr-98		0.8		31000	6.3	21-Apr-98		0.5		32000	3.8
27-Apr-98		0.8		31000	6.3	21-Apr-98		0.5		32000	3.8
28-Apr-98	0.6	1.3	69			28-May-98	1.7	0.54	65		
06-May-98		1.1		6200	4.6	03-Jun-98	1.2	0.31	70		
12-May-98		0.6		45000	7.7	09-Jun-98	1	3.96	36		
12-May-98		0.6		45000	7.7	15-Jun-98	2.9	0.57	62		
12-May-98	1.41	0.66				26-Jun-98		0.6		720000	6.8
12-May-98				45000		26-Jun-98	3.1	1.29	64		
12-May-98	1.41	0.66				29-Jun-98	7.9	0.28	16		
12-May-98				45000		08-Jul-98	0.3	0.21	47		
21-May-98	1.2	1.23	61			20-Jul-98	8.1	0.32	24		
27-May-98		0		48000	26.5	29-Jul-98	1.4	0.86	56		
27-May-98	1.1	0.36	63			12-Aug-98	1.9	0.29	32		
11-Jun-98	1.7	2.5	44			19-Aug-98	2.7		26		
17-Jun-98		0.4		200000	22.1	02-Sep-98	3.1	0.16	20		
17-Jun-98	2.74	0.99	56			14-Sep-98	2.8	0.24	35		
22-Jun-98	2.71	0.82	60			16-Sep-98	7.7	0.27	3		
13-Jul-98				27000		22-Sep-98		0.5		370000	8.1
13-Jul-98	2.8	0.65	57			22-Sep-98	1.8	0.35		370000	8.1
26-Aug-98	1.8	0.27	58			30-Sep-98		0.3		83000	4.4
02-Oct-98	1.56	0.39	57			30-Sep-98		0.32	52	83000	4.4
29-Oct-98				25000		07-Oct-98	3	0.33	13		
29-Oct-98	3.11	1.26	76			09-Oct-98	3.3	0.72	75		
25-Nov-98	2.06	0.51	75			12-Oct-98	3.6	1.38	67		
25-Nov-98	2.86	0.27	53			14-Oct-98	3.6	0.79	63	2500	1.5
25-Nov-98	2.06	0.51	75			14-Oct-98		0.7		2500	1.5
26-Nov-98	2.85	0.27	53			21-Oct-98	6.1	0.61	26		
02-Dec-98		0.2		8800	5.4	28-Oct-98	1.1	1.06	70		
02-Dec-98	0.52	0.66	12			02-Nov-98		0.33	3		
23-Dec-98	2.55	0	74			04-Nov-98		0.3		4100	2.1
30-Dec-98		0.8			18.7	04-Nov-98	1.1	0.32			
30-Dec-98	5.4	0.26	40			12-Nov-98	4.6	0.64	45		
06-Jan-99		1		470000	28.8	13-Nov-98	7.9	0	3		
06-Jan-99	3.66	1.26	67			16-Nov-98	9.2	0.69	30		
21-Jan-99	3.93	0.38	66			18-Nov-98	3	0	40		
22-Jan-99	2.04	1.24	68			18-Nov-98		0.3		13000	4.7
26-Jan-99	1.15	2.13	53			13-Jan-99	3.4	0.79	71		
02-Feb-99		0.9		8100	4.5	13-Jan-99		0.9		1200000	11
02-Feb-99	2.54	1.19	58			23-Feb-99	1.6	0.15	36		
04-Feb-99	2.22	1.64	56			23-Feb-99		0.4		1400	3.4
05-Feb-99	0.26	1.49	53			16-Mar-99	7	0.99	49		
09-Feb-99	3.29	0.98	48			16-Mar-99				10	
09-Feb-99		1.4		68000		01-Apr-99	4.6	0.43	37		
12-Feb-99		2.12	47			16-Apr-99	4	0.79	24		
16-Feb-99		2		450	2.5	11-May-99	7.7	0.41	7		
16-Feb-99	5.45	1.55	58			15-Jun-99		0.4		5900	6.1
18-Feb-99	4.58	0.47	9			15-Jun-99	2.9	0.86	54		
26-Feb-99	1.43	0.35	51			22-Jun-99	1.2	0.39	34		
02-Mar-99		0.2		220000	121.7	22-Jun-99		0.2		16000	2.8
02-Mar-99	1.3	0.74	40			06-Jul-99	2.1	0.29	29		
05-Mar-99	1.28	1.41	41			15-Jul-99	3.2	0.52	20		
09-Mar-99		0.6			13.1	20-Jul-99		0.1		4000	2.4
09-Mar-99	1.3	0.73	38			20-Jul-99		0.3	10		
11-Mar-99	0.97	0.83	53			03-Aug-99		0.68	53		
23-Mar-99		0.4		2300	3.9	03-Aug-99		0.5		87000	4.3
23-Mar-99	2.1	0.36	57			13-Aug-99		0.81	69		
25-Mar-99	1.14	0.21	55			21-Oct-99	2.1	1.32	54		
30-Mar-99	7.6	0.19	18			01-Nov-99	4.5	0.63	40		
05-Apr-99	1.44	0.46	62								
07-Apr-99	1.35	0.74	63								
23-Apr-99	3.14	0.89	53								
27-Apr-99	2.82	1.16	27								
25-May-99		0.1		8700							
25-May-99	0.6	1.31	39								
08-Jun-99		0.3		34000	6.8						
08-Jun-99	0.88	0.28	65								
11-Jun-99	1.11	0.56	40								
29-Jun-99		0.8		20	2.6						
29-Jun-99	4.59	0.97	53								
27-Jul-99		0.1		38000	12.7						
27-Jul-99	4.3	0.42	52								
04-Oct-99	0.84	0.42	46								
	DO	Ammonia	Sulfate	Fecal Coliform	BOD						
Odor	**2.29**	0.88	**52.68**	**285,550**	**23.25**						
No Odor	**3.64**	0.71	**39.68**	**149,721**	**6.874**						
Differences in **Bold** values are statistically significant at p=0.05											

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Polk and 66th											
	Odor at Hughes						No Odor at Hughes				
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)
2-Apr-98						28-May-98					
28-Apr-98						3-Jun-98					
12-May-98						8-Jun-98					
12-May-98						15-Jun-98					
21-May-98						26-Jun-98	2.6	1.15	69		
27-May-98						29-Jun-98	7.2	0.37	25		
11-Jun-98						8-Jul-98	0.285	0.11	49		
17-Jun-98	2.17	1.06	50			20-Jul-98	6.1	0.33	29		
13-Jul-98	2.3	1.46	42			29-Jul-98	2.84	1.09	50		
2-Oct-98	3.4	1.27	62			12-Aug-98	2.76	0.53	40		
29-Oct-98	3.52	1.33	78			19-Aug-98	4.08	0.45	26		
25-Nov-98	1.87	0.65	66			14-Sep-98	2.75	0.87	47		
25-Nov-98	1.87	0.65	66			9-Oct-98	5.9	0.09	73	-	
23-Dec-98	5.18	0	57			12-Oct-98	6.3	2.46	48		
30-Dec-98	6.7	0.38	63			2-Nov-98		0.56	7		
6-Jan-99	5.57	1.39	70			12-Nov-98	9.2	0.39	44		
22-Jan-99	3.55	0.88	69			16-Nov-98	7.67	0.54	30		
26-Jan-99	3.33	1.45	61			18-Nov-98		0.2		120000	5.4
2-Feb-99		0.6		5400	3.7	18-Nov-98				320000	
2-Feb-99		1.5		5700	33.9	18-Nov-98				3500	
4-Feb-99	6.34	0.84	69			13-Jan-99	3.55	0.96	75		
5-Feb-99	2.08	1.52	60			13-Jan-99	9.97	1.95	70		
9-Feb-99	3.9	1.34	49			13-Jan-99	12.95	0.99	58		
9-Feb-99		1.2		6700	1.3	13-Jan-99		1.7		1700000	10.3
9-Feb-99	3.52	2.66	49			13-Jan-99		1.1		220000	2.8
9-Feb-99		1.3		57000	141.2	23-Feb-99		0.1		29000	4.6
12-Feb-99		2.64	62			23-Feb-99	2.47	0.6	32		
16-Feb-99	4.79	2.36	57			23-Feb-99	2.63	0.15	65		
16-Feb-99		1.9		1900	2.7	23-Feb-99		0.5		4800	19.7
16-Feb-99	1.28	0.89	68			16-Mar-99	7.41	0.87	55		
16-Feb-99		0.8		43000	42.4	16-Mar-99				53000	
18-Feb-99	4.88	0.47	23			16-Mar-99	4.04	0.35	62	53000	
26-Feb-99	2.38	0.83	52			16-Mar-99	5.49	0.96	47	3500	
2-Mar-99		0.4		51000	140.5	16-Mar-99				3500	
2-Mar-99	2.41	0.64	67			1-Apr-99	6.6	0.61	43		
2-Mar-99	1.2	0.71	72			15-Apr-99	6.26	0.86	26		
2-Mar-99		0.2		8600	24.8	15-Apr-99	6.93	0.55	25		
5-Mar-99	1.11	1.11	35			15-Apr-99	2.63	0.57	31		
9-Mar-99	1.8	0.66	55			11-May-99	7.9	0.21	28		
9-Mar-99		0.7			11.8	11-May-99	7.91	0.45	26		
9-Mar-99		0.1			212.2	15-Jun-99	2.76	0.71	42		
9-Mar-99	1.88	1.15	48			15-Jun-99					
11-Mar-99	1.01	0.85	47			15-Jun-99				10	25.4
23-Mar-99		0.4		4100	294.4	15-Jun-99	3.26	0.93	54		
23-Mar-99	3.57	0.89	30			15-Jun-99					
23-Mar-99		0.6		6000	200	22-Jun-99	2.11	0.49	35		
23-Mar-99	4.78	0.06	73			22-Jun-99	3	0.73	45		
25-Mar-99	5.2	0.59	55			22-Jun-99					
30-Mar-99	7.66	0.42	20			22-Jun-99					
30-Mar-99	8.05	0.26	26			22-Jun-99					
5-Apr-99	3.93	1.35	50			22-Jun-99				27000	3.3
5-Apr-99	1.38	0.67	64			6-Jul-99	1.85	0.97	32		
7-Apr-99	0.72	0.88	55			6-Jul-99	1.84	0.27	15		
23-Apr-99	2.39	0.49	55			6-Jul-99					
23-Apr-99	6.2	2.13	28			15-Jul-99	4.76	0.31	21		
23-Apr-99	3.23	0.36	72			15-Jul-99	3.88	0.43	25		
27-Apr-99	4.56	1.23	28			15-Jul-99					
27-Apr-99	4.35	1.61	20			20-Jul-99	4.1	0.46	16		
27-Apr-99	5.32	1.33	28			20-Jul-99				7100	2.8
25-May-99						20-Jul-99					
25-May-99	5.8	0.32	60			20-Jul-99	5.8	0.29	32		
25-May-99				21000	40	3-Aug-99		0.88	56		
25-May-99						3-Aug-99					
8-Jun-99				58000	20.7	3-Aug-99					
8-Jun-99						3-Aug-99				33000	6.5
8-Jun-99						3-Aug-99		0.49	66		
8-Jun-99	1.14	0.19	65			13-Aug-99		0.62	66		
11-Jun-99	2.91	0.78	39			13-Aug-99		1.64	67		
29-Jun-99	3.5	1.23	51			21-Oct-99	3.28	1.13	49		
29-Jun-99	4.46	0.95	54			21-Oct-99	2.06	1.85	54		
29-Jun-99						1-Nov-99	3.78	0.99	44		
29-Jun-99				9	5.5	1-Nov-99		0.79	53		
27-Jul-99	6.3	0.78	47								
27-Jul-99				15000	10.5						
27-Jul-99											
27-Jul-99	7.15	0.57	51								
27-Jul-99											
4-Oct-99	3.24	0.77	47								
4-Oct-99	1.43	0.25	57								

Mean Values

	DO	Ammonia	Sulfate	Fecal Coli	BOD
Odor	**3.65**	**0.93**	**52.49**	20,244	**74.10**
No Odor	**4.79**	**0.73**	**43.38**	171,827	**8.98**

Differences in **Bold** values are statistically significant at p=0.05

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Wayside											
	Odor at Hughes						No Odor at Hughes				
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)
2-Apr-98						28-May-98					
28-Apr-98						3-Jun-98					
12-May-98						8-Jun-98					
12-May-98						15-Jun-98					
21-May-98						26-Jun-98					
27-May-98						29-Jun-98					
11-Jun-98						8-Jul-98					
17-Jun-98						20-Jul-98					
22-Jun-98						29-Jul-98					
13-Jul-98						12-Aug-98					
2-Oct-98	3.08	1.27	69			19-Aug-98					
29-Oct-98	6.72	1.07	78			14-Sep-98	2.25	0.63	46		
25-Nov-98	1.72	0.79	48			9-Oct-98	5.4	0.94	72		
25-Nov-98	1.72	0.79	48			12-Oct-98	2.51	1.94	74		
23-Dec-98	2.94	0.04	73			2-Nov-98		0.34	10		
30-Dec-98	7.92	0.52	66			12-Nov-98	4.66	0.31	40		
6-Jan-99	9.84	1.02	63			16-Nov-98	6.88	0.58	35		
22-Jan-99	3.86	0.63	64			13-Jan-99	12.66	0.94	71		
26-Jan-99	7.45	1.64	70			16-Mar-99	5.46	0.47	57		
4-Feb-99	7.3					1-Apr-99	5.36	0.56	42		
5-Feb-99	3.02	1.17	69			15-Apr-99	6.61	0.73	32		
12-Feb-99	1.95	2.14	52			15-Jun-99	2.52	0.66	30		
26-Feb-99	2.97	0.5	53			22-Jun-99	2.85	0.55	27		
5-Mar-99	2.34	0.66	46			6-Jul-99	2.23	0	43		
11-Mar-99	1.78	1.2	44			15-Jul-99	3.98	0.86	31		
25-Mar-99	5.38	0.37	54			20-Jul-99	4	0.78	24		
7-Apr-99	1.49	0.71	53			3-Aug-99		0.45	62		
23-Apr-99	6.29	0.49	60			13-Aug-99		0.7	71		
27-Apr-99	4.82	1.25	36			21-Oct-99	4.14	0.61	51		
11-Jun-99	2.19	0.82	35								
29-Jun-99	3.34	1.09	49								
27-Jul-99	4.6	0.61	50								
4-Oct-99	2.71	0.65	42								

Mean Values					
	DO	Ammonia	Sulfate	Fecal Coliform	BOD
Odor	4.15	0.88	**55.55**		
No Odor	4.77	0.67	**45.44**		

Differences in **Bold** values are statistically significant at p=0.05

Yates											
	Odor at Hughes						No Odor at Hughes				
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)
2-Apr-98						28-May-98					
28-Apr-98						3-Jun-98					
12-May-98						8-Jun-98					
12-May-98						15-Jun-98	3.6	1.38	65		
21-May-98						26-Jun-98	3.3	0.8	61		
27-May-98						29-Jun-98	5.6	0.26	32		
11-Jun-98						8-Jul-98	0.537	0.11	62		
17-Jun-98	4.12	1.26	58			20-Jul-98	3.7	0.5	31		
22-Jun-98	4.2	1.06	65			29-Jul-98	4.16	0.03	54		
13-Jul-98	4.5	0.16	59			12-Aug-98	6.32	1.54	44		
2-Oct-98	4.7	0.47	67			19-Aug-98	4.25		45		
29-Oct-98	3.78	0.41	45			14-Sep-98					
25-Nov-98	1.85	1.13	54			9-Oct-98	11.62	1.19	67		
25-Nov-98	1.85	1.13	54			12-Oct-98	3.42	0.21	48		
23-Dec-98	8.76	2.42	47			2-Nov-98		0.3	24		
30-Dec-98	11.6	0.83	68			12-Nov-98	5.08	0.67	54		
6-Jan-99	7.65	1.17	64			16-Nov-98	4.35	0.59	0		
22-Jan-99	3.52	0.37	62			13-Jan-99	4.79	2.17	60		
26-Jan-99	4.93	0.42	58			16-Mar-99	7.55	0.86	61		
4-Feb-99	4.78	1.24	66			1-Apr-99	6.14	1.08	48		
5-Feb-99	3.59	0.32	64			15-Apr-99	7.35	0.31	30		
12-Feb-99		0.56	63			15-Jun-99	2.72	1.84	47		
18-Feb-99	4.61	0.3	41			22-Jun-99	1.38	0.44	25		
26-Feb-99	6.72	0.39	70			6-Jul-99	1.99	2.75	30		
5-Mar-99	2.61	0.43	46			15-Jul-99	1.18	0.31	43		
11-Mar-99	2	0.86	34			20-Jul-99	5.2	0.71	41		
25-Mar-99	2.91	0.52	48			3-Aug-99		0.8	29		
7-Apr-99	9.3	2	34			13-Aug-99		0.1	36		
23-Apr-99	6.65	0.89	49			21-Oct-99	3.13	0.12	36		
27-Apr-99	6.87	0.69	19			1-Nov-99	3.93	0.58	28		
11-Jun-99	4.02	0.67	29								
29-Jun-99	2.14	1	43								
27-Jul-99	4.2	0.74	29								
4-Oct-99	3.33	0.26	51								

Mean Values					
	DO	Ammonia	Sulfate	Fecal Colif	BOD
Odor	4.82	0.80	**51.37**		
No Odor	4.40	0.79	**42.35**		

Differences in **Bold** values are statistically significant at p=0.05

Ennis and Lamar (N3)											
	Filaments at Hughes						No Filaments at Hughes				
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)
22-Sep-98	3	4.12		240000		7-Oct-98		0.28	35		
22-Sep-98				240000		21-Oct-98	9.24	0.15	45		
30-Sep-98				22000		4-Nov-98	9.45	0.64	44		
30-Sep-98	4.57	5.22	65	22000		4-Nov-98				12000	
14-Oct-98				810		13-Nov-98	9.03	1.06	3		
14-Oct-98	3.3	1.47	24	810		30-Dec-98		1.44	52		
28-Oct-98	6.16	0.81	69			30-Dec-98				1	
29-Oct-98				6500		23-Feb-99	4.36	3.04	63		
18-Nov-98	3.84	0.69	74			23-Feb-99				12000	
18-Nov-98				44000		16-Mar-99				10000	
25-Nov-98	3.3	1.86	42			16-Mar-99	6.85	2.78	55	10000	
25-Nov-98	3.3	1.86	42			23-Mar-99	4.74	2.52	68		
2-Dec-98	6.41	1.25	46			23-Mar-99				1090000	
2-Dec-98				3800		30-Mar-99	8.15	0.57	22		
23-Dec-98	5.45	1.25	56			15-Apr-99	8.79	1.06	51		
6-Jan-99	4.22	2.06	69			27-Apr-99	7.93	2.08	35		
6-Jan-99				48000		11-May-99	8.9	0.72	30		
13-Jan-99	6.92	1.07	73								
13-Jan-99				4100							
21-Jan-99	4.32	1.59	70								
2-Feb-99				19000							
2-Feb-99	0.95	3.48	56								
9-Feb-99				130000							
9-Feb-99	4.38	3.76	70								
16-Feb-99	3.12	6.2	61								
16-Feb-99				44000							
2-Mar-99				74000							
2-Mar-99	4.44	2.88	82								
9-Mar-99	4.43	3.68	60								
9-Mar-99											
5-Apr-99	5.71	2.31	70								
23-Apr-99	7.5	3.74	48								

Mean Values					
	DO	Ammonia	Sulfate	Fecal Coliform	BOD
Filaments	**4.49**	**2.59**	**59.83**	59,935	
No Filament	**7.74**	**1.36**	**41.92**	189,000	

Differences in **Bold** values are statistically significant at p=0.05

Park and Elm (N1)											
	Filaments at Hughes						No Filaments at Hughes				
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)
22-Sep-98		0.2		4600	2.1	7-Oct-98	2.86	1.39	42		
22-Sep-98	2.61	0.45		4600	2.1	7-Oct-98					
30-Sep-98		0.1		45000	44.7	21-Oct-98					
30-Sep-98	2.99	1.13	70	45000	44.7	21-Oct-98	8.02	0.15	52		
14-Oct-98		0.3		5400	4.9	4-Nov-98	10.3	0.12	70		
14-Oct-98	1.25	0.32	30	5400	4.9	4-Nov-98		0.1		11000	1.2
28-Oct-98	10.29	1.27	88			13-Nov-98	8.63	0.55	7		
29-Oct-98				22000		30-Dec-98	10.59	1.02	44		
18-Nov-98	5.38	0.1	32			30-Dec-98		0.5			2
18-Nov-98		0.1		5800	3.9	23-Feb-99		0.1		11000	40
25-Nov-98	4.93	0.1	46			23-Feb-99	5.01	1.74	55		
25-Nov-98	4.93	0.1	46			16-Mar-99				94000	
2-Dec-98	6.61	0.24	42			16-Mar-99	6.51	0.4	0.3	94000	
2-Dec-98		0.1		22000	0.8	23-Mar-99	6.55	0.32	69		
23-Dec-98	7.21	1	66			23-Mar-99		0.1		94000	8.8
6-Jan-99	5.64	2.44	72			30-Mar-99	8.38	0.37	16		
6-Jan-99		2.3		880000	7.6						
13-Jan-99	8.86	2.66	85								
13-Jan-99		3.4		2300000	11.6						
21-Jan-99	5.38	2.45	59								
2-Feb-99	0.92	0.85	55								
2-Feb-99				33000	42						
9-Feb-99		0.1		42000	39						
9-Feb-99	3.87	1.44	55								
16-Feb-99		0.5		32000	400						
16-Feb-99	2.61	4.1	36								
2-Mar-99		0.1		7200	700						
2-Mar-99	2.52	4.68	51								
9-Mar-99	5.89	0.87	54								
9-Mar-99		0.4			44.1						
5-Apr-99	4.34	1.99	58								

Mean Values					
	DO	Ammonia	Sulfate	Fecal Coliform	BOD
Filaments	**4.79**	**1.17**	55.59	230,267	90
No Filament	**7.43**	**0.53**	39.48	60,800	13

Differences in **Bold** values are statistically significant at $p=0.05$

Polk and Elm (S1)

Filaments at Hughes						No Filaments at Hughes					
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)
22-Sep-98	3.54	0.96		690	4.6	7-Oct-98	2.94	0.55	59		
22-Sep-98		0.6		690	4.6	21-Oct-98	8.39	0.5	60		
30-Sep-98		0.9		4300	32.5	4-Nov-98	5.4	0.79	60		
14-Oct-98		0.7		2800	2.3	4-Nov-98		0.5		7700	4.8
14-Oct-98	4.3	1	71	2800	2.3	13-Nov-98	5.72	0.62	14		
28-Oct-98	9.27	1.42	64			30-Dec-98		0.2		3300	3
29-Oct-98				72		30-Dec-98		0.64	74		
18-Nov-98	7.8	0.58	46			23-Feb-99		0.9		140000	***1550***
18-Nov-98		0.2		340	3	23-Feb-99	4.59	1.07	73		
25-Nov-98	6.3	0.97	72			16-Mar-99				22000	
25-Nov-98	6.3	0.97	72			16-Mar-99	4.94	0.82	62	22000	
2-Dec-98	4.63	0.26	53			23-Mar-99		0.2		21000	125.2
2-Dec-98		0.2		24000	3.5	23-Mar-99	3.87	0.32	56		
23-Dec-98	7.7	0.11	47			30-Mar-99	8.15	0	24		
6-Jan-99		0.1		51000	7.2	15-Apr-99	6.62	0	53		
6-Jan-99	4.49	0.04	74			27-Apr-99	6.14	0.46	42		
13-Jan-99	13.02	0.49	72			11-May-99	8.27	0.19	38		
13-Jan-99		0.6		4200	3.9						
21-Jan-99	7.59	0.62	74								
2-Feb-99	0.59	0.27	72								
2-Feb-99		0.2		28000	5.7						
9-Feb-99		0.9		270	11.6						
9-Feb-99	4.53	1.34	59								
16-Feb-99		0.9		15000	29.2						
16-Feb-99	4.4	0.92	76								
2-Mar-99	3.86	1.17	73								
2-Mar-99		0.7		33000	113.4						
9-Mar-99	2.82	0.62	61								
9-Mar-99		0.6			136.5						
5-Apr-99	1.19	1.17	70								
23-Apr-99	7.24	0.43	75								

Mean Values

	DO	Ammonia	Sulfate	Fecal Coliform	BOD
Filaments	5.53	**0.66**	**66.53**	11940.14	25.74
No Filament	5.91	**0.49**	**51.25**	36000.00	420.75

Differences in **Bold** values are statistically significant at p=0.05

Evergreen Cemetery; North and South Vents											
	Filaments at Hughes						No Filaments at Hughes				
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100m	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100m	BOD (mg/L)
2-Apr-98						27-May-98					
28-Apr-98						14-Sep-98	2.76				
12-May-98						7-Oct-98	1.28	0.46	50		
21-May-98						21-Oct-98	5.44	0.49	55		
28-May-98						4-Nov-98				12500	
3-Jun-98						4-Nov-98		0.2		520000	3.9
8-Jul-98						4-Nov-98				910000	
30-Sep-98				200000		4-Nov-98	1.7	0.21	63		
30-Sep-98				76000		13-Nov-98	6.33	0.58	0		
30-Sep-98		0.6		200000	27.1	30-Dec-98				1	
30-Sep-98		0.82	59	200000	27.1	30-Dec-98				76	
14-Oct-98	1.76	1.19	65	20000	4	30-Dec-98	8.73	1.21	64		
14-Oct-98				450		30-Dec-98		0.7		1	2.2
14-Oct-98				4900		23-Feb-99		0.1		29000	4.6
14-Oct-98		0.8		20000	4	23-Feb-99	2.47	0.6	32		
28-Oct-98	8.634	2.13	72			23-Feb-99	2.63	0.15	65		
29-Oct-98						23-Feb-99		0.5		4800	19.7
29-Oct-98				36		16-Mar-99				53000	
29-Oct-98				330		16-Mar-99	4.04	0.35	62	53000	
18-Nov-98	8.3	0.57	57			16-Mar-99	5.49	0.96	47	3500	
18-Nov-98		0.2		120000	5.4	16-Mar-99				3500	
18-Nov-98				320000		23-Mar-99		0.4		4100	294.4
18-Nov-98				3500		23-Mar-99	3.57	0.69	30		
25-Nov-98	4.6	1.31	68			23-Mar-99		0.6		6000	200
25-Nov-98	4.6	1.31	68			23-Mar-99	4.78	0.06	73		
2-Dec-98		0.2		13000	5.5	30-Mar-99	7.66	0.42	20		
2-Dec-98	12.76	0.43	20			30-Mar-99	8.05	0.26	26		
2-Dec-98				9700		15-Apr-99	6.93	0.55	25		
2-Dec-98				23000		15-Apr-99	2.63	0.57	31		
23-Dec-98	7.23	0.13	72			27-Apr-99	4.35	1.61	20		
6-Jan-99		2.8		1200000	23.9	27-Apr-99	5.32	1.33	28		
6-Jan-99	3.25	2.79	74			11-May-99	7.9	0.21	28		
6-Jan-99	4.25	0.86	48			11-May-99	7.91	0.45	26		
6-Jan-99		0.9		31000							
13-Jan-99	9.97	1.95	70								
13-Jan-99	12.95	0.99	58								
13-Jan-99		1.7		1700000	10.3						
13-Jan-99		1.1		220000	2.8						
21-Jan-99	5.97	1.41	57								
21-Jan-99	3.33	1.36	60								
2-Feb-99	1.73	1.85	46								
2-Feb-99	18.8	0.7	68								
2-Feb-99		0.6		5400	3.7						
2-Feb-99		1.5		5700	33.9						
9-Feb-99	3.9	1.34	49								
9-Feb-99		1.2		6700	1.3						
9-Feb-99	3.52	2.66	49								
9-Feb-99		1.3		57000	141.2						
16-Feb-99	4.79	2.36	57								
16-Feb-99		1.9		1900	2.7						
16-Feb-99	1.28	0.89	68								
16-Feb-99		0.8		43000	42.4						
2-Mar-99		0.4		51000	140.5						
2-Mar-99	2.41	0.64	67								
2-Mar-99	1.2	0.71	72								
2-Mar-99		0.2		8600	24.8						
9-Mar-99	1.8	0.66	55								
9-Mar-99		0.7			11.8						
9-Mar-99		0.1			212.2						
9-Mar-99	1.88	1.15	48								
5-Apr-99	3.93	1.35	50								
5-Apr-99	1.38	0.67	64								
23-Apr-99	6.2	2.13	28								
23-Apr-99	3.23	0.36	72								

Mean Values

	DO	Ammonia	Sulfate	Fecal Coliform	BOD
Filament	5.32	1.12	**58.61**	162,186	38.14
No Filamer	5.00	0.55	**39.21**	114,248	87.47

Differences in **Bold** values are statistically significant at p=0.05

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Hughes Street Bridge

	Filaments Reported in Field Notes					No Filaments Reported in Field Notes					
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100m	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100m	BOD (mg/L)
10-Dec-97		1.3		640000	26.6	27-May-98	1.1	0.36	63		
10-Dec-97				470000		27-May-98		0		48000	26.5
19-Dec-97		0.7		230000	62.7	14-Sep-98	2.76	0.24	35		
30-Dec-97		1.3		780	3.4	7-Oct-98	2.95	0.33	13		
30-Dec-97		1.3		780	3.4	21-Oct-98	6.05	0.61	25		
21-Jan-98		0.1		1100000	10.7	2-Nov-98		0.33	3		
21-Jan-98		10.7		1100000	0.1	4-Nov-98	1.12	0.32			
25-Mar-98		1.6		200000	16.8	4-Nov-98		0.3		4100	2.1
25-Mar-98		1.6		200000	16.8	13-Nov-98	7.92	0	3		
1-Apr-98		1		1400000	27.1	30-Dec-98	5.4	0.26	40		
1-Apr-98		1		1400000	27.1	30-Dec-98		0.8			18.7
2-Apr-98			75			26-Jan-99	1.15	2.13	53		
15-Apr-98		0.2		360000	30.3	18-Feb-99	4.58	0.47	9		
15-Apr-98		0.2		360000	30.3	23-Feb-99	1.63	0.15	36		
21-Apr-98		0.5		32000	3.8	23-Feb-99		0.4		1400	3.4
21-Apr-98		0.5		32000	3.8	11-Mar-99	0.97	0.83	53		
27-Apr-98		0.8		31000	6.3	16-Mar-99	7	0.99	49		
27-Apr-98		0.8		31000	6.3	16-Mar-99				10	
28-Apr-98	0.6	1.3	59			23-Mar-99	2.1	0.36	57		
6-May-98		1.1		6200	4.6	23-Mar-99		0.4		2300	3.9
12-May-98	1.41	0.66				30-Mar-99	7.6	0.19	18		
12-May-98		0.6		45000	7.7	15-Apr-99	4.03	0.79	24		
12-May-98				45000		27-Apr-99	2.82	1.16	27		
21-May-98	1.2	1.23	61			11-May-99	7.72	0.41	7		
28-May-98	1.7	0.54	65								
3-Jun-98	1.2	0.31	70								
8-Jul-98	0.28	0.21	47								
2-Sep-98	3.1	0.16	20								
22-Sep-98		0.5		370000	8.1						
22-Sep-98	1.78	0.35		370000	8.1						
30-Sep-98		0.3		83000	4.4						
30-Sep-98		0.32	52	83000	4.4						
2-Oct-98	1.56	0.39	57								
9-Oct-98	3.32	0.72	75								
12-Oct-98	3.56	1.38	67								
14-Oct-98	3.55	0.79	63	2500	1.5						
14-Oct-98		0.7		2500	1.5						
28-Oct-98	1.14	1.06	70								
29-Oct-98				25000							
29-Oct-98	3.11	1.26	76								
12-Nov-98	4.62	0.64	45								
16-Nov-98	9.24	0.69	30								
18-Nov-98	3.01	0	40								
18-Nov-98		0.3		13000	4.7						
25-Nov-98	2.06	0.51	75								
25-Nov-98	2.85	0.27	53								
25-Nov-98	2.06	0.51	75								
25-Nov-98	2.85	0.27	53								
2-Dec-98		0.2		8800	5.4						
2-Dec-98	0.52	0.66	12								
23-Dec-98	2.55	0	74								
6-Jan-99	3.66	1.26	67								
6-Jan-99		1		470000	28.8						
13-Jan-99	3.42	0.79	71								
13-Jan-99		0.9		1200000	10.9						
21-Jan-99	3.93	0.38	66								
22-Jan-99	2.04	1.24	68								
2-Feb-99	2.54	1.19	58								
2-Feb-99		0.9		8100	4.5						
4-Feb-99	2.22	1.64	58								
5-Feb-99	0.26	1.49	53								
9-Feb-99	3.29	0.98	48								
9-Feb-99		1.4		68000							
12-Feb-99		2.12	47								
16-Feb-99	5.45	1.55	58								
16-Feb-99		2		450	2.5						
26-Feb-99	1.43	0.35	51								
2-Mar-99		0.2		220000	121.7						
2-Mar-99	1.3	0.74	40								
5-Mar-99	1.28	1.41	41								
9-Mar-99	1.3	0.73	38								
9-Mar-99		0.6			13.1						
25-Mar-99	1.14	0.21	55								
1-Apr-99	4.62	0.43	37								
5-Apr-99	1.44	0.46	62								
7-Apr-99	1.35	0.74	53								
23-Apr-99	3.14	0.89	53								

	DO	Ammonia	Sulfate	Fecal Coliform	BOD
Filaments	**2.4654**	**0.92**	**55.667**	**303,089**	15.8563
No Filaments	**3.9352**	**0.514**	**30.294**	**11,162**	10.92

Differences in **Bold** values are statistically significant at p=0.05

Polk and 66th											
	Filaments at Hughes						No Filaments at Hughes				
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)
2-Apr-98						27-May-98					
28-Apr-98						14-Sep-98	2.75	0.87	47		
12-May-98						2-Nov-98		0.56	7		
21-May-98						30-Dec-98	6.7	0.38	63		
28-May-98						26-Jan-99	3.33	1.45	61		
3-Jun-98						18-Feb-99	4.88	0.47	23		
8-Jul-98	0.285	0.11	49			11-Mar-99	1.01	0.85	47		
2-Oct-98	3.4	1.27	62			16-Mar-99	7.41	0.87	55		
9-Oct-98	5.9	0.09	73			15-Apr-99	6.26	0.86	26		
12-Oct-98	6.3	2.46	48			27-Apr-99	4.56	1.23	28		
29-Oct-98	3.52	1.33	78								
12-Nov-98	9.2	0.39	44								
16-Nov-98	7.67	0.54	30								
25-Nov-98	1.87	0.65	66								
25-Nov-98	1.87	0.65	66								
23-Dec-98	5.18	0	57								
6-Jan-99	5.57	1.39	70								
13-Jan-99	3.55	0.96	75								
22-Jan-99	3.55	0.88	69								
4-Feb-99	6.34	0.84	69								
5-Feb-99	2.08	1.52	60								
12-Feb-99		2.64	62								
26-Feb-99	2.38	0.83	52								
5-Mar-99	1.11	1.11	35								
25-Mar-99	5.2	0.59	55								
1-Apr-99	6.6	0.61	43								
7-Apr-99	0.72	0.88	55								
23-Apr-99	2.39	0.49	55								

Mean Values

	DO	Ammonia	Sulfate	Fecal Colif	BOD
Filaments	4.03	0.92	**57.86**		
No Filament	4.61	0.84	**39.67**		

Differences in **Bold** values are statistically significant at p=0.05

Yates											
	Filaments at Hughes						No Filaments at Hughes				
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)
2-Apr-98						27-May-98					
28-Apr-98						14-Sep-98					
12-May-98						2-Nov-98		0.3	24		
21-May-98						30-Dec-98	11.6	0.83	68		
28-May-98						26-Jan-99	4.93	0.42	58		
3-Jun-98						18-Feb-99	4.61	0.3	41		
8-Jul-98	0.537	0.11	62			11-Mar-99	2	0.86	34		
2-Oct-98	4.7	0.47	67			16-Mar-99	7.55	0.86	61		
9-Oct-98	11.62	1.19	67			15-Apr-99	7.35	0.31	30		
12-Oct-98	3.42	0.21	48			27-Apr-99	6.87	0.69	19		
29-Oct-98	3.78	0.41	45								
12-Nov-98	5.08	0.67	54								
16-Nov-98	4.35	0.59	0								
25-Nov-98	1.85	1.13	54								
25-Nov-98	1.85	1.13	54								
23-Dec-98	8.76	2.42	47								
6-Jan-99	7.65	1.17	64								
13-Jan-99	4.79	2.17	60								
22-Jan-99	3.52	0.37	62								
4-Feb-99	4.78	1.24	66								
5-Feb-99	3.59	0.32	64								
12-Feb-99		0.56	63								
26-Feb-99	6.72	0.39	70								
5-Mar-99	2.61	0.43	46								
25-Mar-99	2.91	0.52	48								
1-Apr-99	6.14	1.08	48								
7-Apr-99	9.3	2	34								
23-Apr-99	6.65	0.89	49								

Mean Values					
	DO	Ammonia	Sulfate	Fecal Coliform	BOD
Filaments	4.98	0.89	53.27		
No Filament	6.42	0.57	41.88		

Differences in **Bold** values are statistically significant at p=0.05

Wayside											
	Filaments at Hughes						No Filaments at Hughes				
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)
2-Apr-98						27-May-98					
28-Apr-98						14-Sep-98	2.25	0.63	46		
12-May-98						2-Nov-98		0.34	10		
21-May-98						30-Dec-98	7.92	0.52	66		
28-May-98						26-Jan-99	7.45	1.64	70		
3-Jun-98						11-Mar-99	1.78	1.2	44		
8-Jul-98						16-Mar-99	5.46	0.47	57		
2-Oct-98	3.08	1.27	69			15-Apr-99	6.61	0.73	32		
9-Oct-98	5.4	0.94	72			27-Apr-99	4.82	1.25	36		
12-Oct-98	2.51	1.94	74								
29-Oct-98	6.72	1.07	78								
12-Nov-98	4.66	0.31	40								
16-Nov-98	6.88	0.58	35								
25-Nov-98	1.72	0.79	48								
25-Nov-98	1.72	0.79	48								
23-Dec-98	2.94	0.04	73								
6-Jan-99	9.84	1.02	63								
13-Jan-99	12.66	0.94	71								
22-Jan-99	3.86	0.63	64								
4-Feb-99	7.3										
5-Feb-99	3.02	1.17	69								
12-Feb-99	1.95	2.14	52								
26-Feb-99	2.97	0.5	53								
5-Mar-99	2.34	0.66	46								
25-Mar-99	5.38	0.37	54								
1-Apr-99	5.36	0.56	42								
7-Apr-99	1.49	0.71	53								
23-Apr-99	6.29	0.49	60								

Mean Values

	DO	Ammonia	Sulfate	Fecal Coliform	BOD
Filaments	4.67	0.85	**58.20**		
No Filaments	5.18	0.85	**45.13**		

Differences in **Bold** values are statistically significant at p=0.05

Ennis and Lamar (N3)

Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)
16-Sep-98	4.8	0.7	28			6-Jan-99	4.22	2.06	69		
22-Sep-98	3	4.12		240000		6-Jan-99				48000	
22-Sep-98				240000		13-Jan-99	6.92	1.07	73		
30-Sep-98	4.57	5.22	65	22000		13-Jan-99				4100	
30-Sep-98				22000		21-Jan-99	4.32	1.59	70		
7-Oct-98		0.28	35			2-Feb-99	0.95	3.48	56		
14-Oct-98	3.3	1.47	24	810		2-Feb-99				19000	
14-Oct-98				810		9-Feb-99	4.38	3.76	70		
21-Oct-98	9.24	0.15	45			9-Feb-99				130000	
28-Oct-98	6.16	0.81	69			16-Feb-99	3.12	6.2	61		
29-Oct-98				6500		16-Feb-99				44000	
4-Nov-98	9.45	0.64	44			23-Feb-99	4.36	3.04	63		
4-Nov-98				12000		23-Feb-99				12000	
13-Nov-98	9.03	1.06	3			2-Mar-99	4.44	2.88	82		
18-Nov-98	3.84	0.69	74			2-Mar-99				74000	
18-Nov-98				44000		9-Mar-99	4.43	3.68	60		
25-Nov-98	3.3	1.86	42			9-Mar-99					
2-Dec-98	6.41	1.25	46			16-Mar-99	6.85	2.78	55	10000	
2-Dec-98				3800		16-Mar-99				10000	
9-Dec-98				3800		23-Mar-99	4.74	2.52	68		
17-Dec-98		0.88	40			23-Mar-99				1090000	
22-Dec-98				36000		30-Mar-99	8.15	0.57	22		
23-Dec-98	5.45	1.25	56			5-Apr-99	5.71	2.31	70		
30-Dec-98		1.44	52			13-Apr-99				1090000	
30-Dec-98				1		15-Apr-99	8.79	1.06	51		
Mean 98	5.7125	1.454667	44.5	48593.92	#DIV/0!	23-Apr-99	7.5	3.74	48		
						27-Apr-99	7.93	2.08	35		
						11-May-99	8.9	0.72	30		
						25-May-99	2.7	3.6	70		
						25-May-99				14000	
						1-Jun-99				950	
						8-Jun-99	2.37	2.56	70		
						8-Jun-99				58000	
						15-Jun-99	2.42	0.82	35		
						15-Jun-99				32000	
						22-Jun-99	2.107	0.52	54		
						22-Jun-99				3600	
						29-Jun-99	4.33	1	46		
						29-Jun-99				9	
						6-Jul-99	2.93	0.44	45		
						13-Jul-99				130	
						15-Jul-99	4.2	4.24	58		
						20-Jul-99	3.3	1.77	52		
						20-Jul-99				870	
						27-Jul-99	5.4	3.68	63		
						27-Jul-99				800	
						3-Aug-99		3.08	73		
						3-Aug-99				610	
						10-Aug-99				14000	
						17-Aug-99				60000	149.1
						31-Aug-99				34000	
						13-Sep-99				440	
						20-Sep-99				400	
						27-Sep-99				2100	
						4-Oct-99	3.25	0.24	59		
						21-Oct-99	3.39	4.22	48		
						1-Nov-99	4.43	0.82	51		
						29-Nov-99				5500	
						Mean 99	4.708172	2.351	56.9	98518.18	149.1

Park and Elm N1											
Field Visit Dat	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)	Field Visit Da	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)
22-Sep-98		0.2		4600	2.1	6-Jan-99	5.64	2.44	72		
22-Sep-98	2.61	0.45		4600	2.1	6-Jan-99		2.3		880000	7.6
30-Sep-98		0.1		45000	44.7	13-Jan-99	8.86	2.66	85		
30-Sep-98	2.99	1.13	70	45000	44.7	13-Jan-99		3.4		2300000	11.6
7-Oct-98	2.86	1.39	42			21-Jan-99	5.38	2.45	59		
7-Oct-98						2-Feb-99	0.92	0.85	55		
14-Oct-98		0.3		5400	4.9	2-Feb-99				33000	42
14-Oct-98	1.25	0.32	30	5400	4.9	9-Feb-99		0.1		42000	39
21-Oct-98						9-Feb-99	3.87	1.44	55		
21-Oct-98	8.02	0.15	52			16-Feb-99		0.5		32000	400
28-Oct-98	10.29	1.27	88			16-Feb-99	2.61	4.1	36		
29-Oct-98				22000		23-Feb-99		0.1		11000	40
4-Nov-98	10.3	0.12	70			23-Feb-99	5.01	1.74	55		
4-Nov-98		0.1		11000	1.2	2-Mar-99		0.1		7200	700
13-Nov-98	8.63	0.55	7			2-Mar-99	2.52	4.68	51		
18-Nov-98	5.38	0.1	32			9-Mar-99	5.89	0.87	54		
18-Nov-98		0.1		5800	3.9	9-Mar-99		0.4		-999	44.1
25-Nov-98	4.93	0.1	46			16-Mar-99				94000	
2-Dec-98	6.61	0.24	42			16-Mar-99	6.51	0.4	0.3	94000	
2-Dec-98		0.1		22000	0.8	23-Mar-99	6.55	0.32	69		
9-Dec-98		0.1		40000	23.1	23-Mar-99		0.1		94000	8.8
17-Dec-98	7.14	0.39	66			30-Mar-99	8.38	0.37	16		
22-Dec-98				49000	42	5-Apr-99	4.34	1.99	58		
23-Dec-98	7.21	1	66			13-Apr-99				250000	
30-Dec-98	10.59	1.02	44			25-May-99				260000	44
30-Dec-98		0.5			2	1-Jun-99				680	0.9
						8-Jun-99	4.33	0	59		
						8-Jun-99				3000	8.9
						15-Jun-99	2.83	0.28	42		
						15-Jun-99				4000	3.2
						22-Jun-99				4400	3.6
						22-Jun-99					
						29-Jun-99	4.93	1.11	49		
						29-Jun-99				10	2.1
						6-Jul-99					
						13-Jul-99				240	0.7
						15-Jul-99					
						20-Jul-99				300	1.1
						27-Jul-99	6.4	0.17	73		
						27-Jul-99				2600	2.8
						3-Aug-99				2400	2.8
						3-Aug-99		0.3	62		
						10-Aug-99				23000	5.4
						17-Aug-99				60000	22.7
						31-Aug-99				3800	2.8
						13-Sep-99				2700	1.4
						20-Sep-99				940	3.5
						27-Sep-99				720	
						29-Nov-99				24000	
Mean 1998	6.34	0.44	50.38	21,650	14.70						
Mean 1999	5.00	1.28	52.79	145,827	58.29						

Polk and Elm (S1)											
	1998						1999				
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)
22-Sep-98	3.54	0.96		690	4.6	6-Jan-99	4.49	0.04	74		
22-Sep-98		0.6		690	4.6	6-Jan-99		0.1		51000	7.2
29-Sep-98		1.24	71	4300	32.5	13-Jan-99	13.02	0.49	72		
30-Sep-98		0.9		4300	32.5	13-Jan-99		0.6		4200	3.9
7-Oct-98	2.94	0.55	59			21-Jan-99	7.59	0.62	74		
14-Oct-98	4.3	1	71	2800	2.3	2-Feb-99	0.59	0.27	72		
14-Oct-98		0.7		2800	2.3	2-Feb-99		0.2		28000	5.7
21-Oct-98	8.39	0.5	60			9-Feb-99	4.53	1.34	59		
28-Oct-98	9.27	1.42	64			9-Feb-99		0.9		270	11.6
29-Oct-98				72		16-Feb-99	4.4	0.92	76		
4-Nov-98	5.4	0.79	60			16-Feb-99		0.9		15000	29.2
4-Nov-98		0.5		7700	4.8	23-Feb-99	4.59	1.07	73		
13-Nov-98	5.72	0.62	14			23-Feb-99		0.9		140000	1550
18-Nov-98	7.8	0.58	46			2-Mar-99	3.86	1.17	73		
18-Nov-98		0.2		340	3	2-Mar-99		0.7		33000	113.4
25-Nov-98	6.3	0.97	72			9-Mar-99	2.82	0.62	61		
2-Dec-98	4.63	0.26	53			9-Mar-99		0.6		-999	136.5
2-Dec-98		0.2		24000	3.5	16-Mar-99	4.94	0.82	62	22000	
9-Dec-98		0.5		14000	5.1	16-Mar-99				22000	
17-Dec-98		0.25	66			23-Mar-99	3.87	0.32	56		
22-Dec-98				7300	10.9	23-Mar-99		0.2		21000	125.2
23-Dec-98	7.7	0.11	47			30-Mar-99	8.15	0	24		
30-Dec-98		0.64	74			5-Apr-99	1.19	1.17	70		
30-Dec-98		0.2		3300	3	13-Apr-99		0.4		490	18.4
						15-Apr-99	6.62	0	53		
						23-Apr-99	7.24	0.43	75		
						27-Apr-99	6.14	0.46	42		
						11-May-99	8.27	0.19	38		
						18-May-99					
						25-May-99	7.6	1.03	66		
						25-May-99				30000	18
						1-Jun-99				5300	2.6
						8-Jun-99	6.33	0.53	63		
						8-Jun-99				11000	37
						15-Jun-99	2.96	1.09	55		
						15-Jun-99				20	38.5
						22-Jun-99	1.22	0.67	50		
						22-Jun-99				4800	11.9
						29-Jun-99	2.72	0.82	61		
						29-Jun-99				820	15.9
						6-Jul-99	1.29	1.37	31		
						13-Jul-99				3000	40
						15-Jul-99	3.3	0.15	64		
						20-Jul-99	4.5	0.23	51		
						20-Jul-99				3600	2.8
						27-Jul-99	4.8	0.25	65		
						27-Jul-99				4100	4.1
						3-Aug-99		0.34	84		
						3-Aug-99				16000	4.2
						10-Aug-99				5400	2.1
						13-Aug-99		0.39	64		
						17-Aug-99				340	0.1
						31-Aug-99				3400	4.7
						13-Sep-99				10	3.7
						20-Sep-99				20000	4.4
						27-Sep-99				2500	25.1
						4-Oct-99	2.62	0.01	48		
						21-Oct-99	3.93	0.48	45		
						1-Nov-99	4.87	0.9	51		
						29-Nov-99				9	
Mean 1998	6.00	0.62	58.23	5,561	9.09						
Mean 1999	4.77	0.58	59.74	15,388	85.24						

Evergreen Cemetery; North and South Vents											
	1998						1999				
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)
8-Sep-97						6-Jan-99		2.8		1200000	23.9
2-Apr-98						6-Jan-99	3.25	2.79	74		
28-Apr-98						6-Jan-99	4.25	0.86	48		
12-May-98						6-Jan-99		0.9		31000	
21-May-98						13-Jan-99	9.97	1.95	70		
27-May-98						13-Jan-99	12.95	0.99	58		
28-May-98						13-Jan-99		1.7		1700000	10.3
3-Jun-98						13-Jan-99		1.1		220000	2.8
8-Jun-98						21-Jan-99	5.97	1.41	57		
11-Jun-98						21-Jan-99	3.33	1.36	60		
15-Jun-98						2-Feb-99	1.73	1.85	46		
17-Jun-98						2-Feb-99	18.8	0.7	68		
22-Jun-98						2-Feb-99		0.6		5400	3.7
26-Jun-98						2-Feb-99		1.5		5700	33.9
29-Jun-98						9-Feb-99	3.9	1.34	49		
8-Jul-98						9-Feb-99		1.2		6700	1.3
13-Jul-98						9-Feb-99	3.52	2.66	49		
20-Jul-98						9-Feb-99		1.3		57000	141.2
29-Jul-98	2.7	0.47	53			16-Feb-99	4.79	2.36	57		
12-Aug-98	4.08	0.85	53			16-Feb-99		1.9		1900	2.7
19-Aug-98	1.7		41			16-Feb-99	1.26	0.89	68		
26-Aug-98	1.24	0.57	67			16-Feb-99		0.8		43000	42.4
9-Sep-98	3.96	0.4	30			23-Feb-99		0.1		29000	4.6
14-Sep-98	2.76					23-Feb-99	2.47	0.6	32		
16-Sep-98	4.9	0.28	27			23-Feb-99	2.63	0.15	65		
23-Sep-98	1.64	0.53	73			23-Feb-99		0.5		4600	19.7
30-Sep-98				200000		2-Mar-99		0.4		51000	140.5
30-Sep-98				76000		2-Mar-99	2.41	0.64	67		
30-Sep-98		0.6		200000	27.1	2-Mar-99	1.2	0.71	72		
30-Sep-98		0.82	59	200000	27.1	2-Mar-99		0.2		8600	24.8
7-Oct-98	1.28	0.46	50			9-Mar-99	1.8	0.66	55		
14-Oct-98	1.76	1.19	65	20000	4	9-Mar-99		0.7		-999	11.8
14-Oct-98				450		9-Mar-99		0.1		-999	212.2
14-Oct-98				4900		9-Mar-99	1.88	1.15	48		
14-Oct-98		0.8		20000	4	16-Mar-99				53000	
21-Oct-98	5.44	0.49	55			16-Mar-99	4.04	0.35	62	53000	
28-Oct-98	8.634	2.13	72			16-Mar-99	5.49	0.96	47	3500	
29-Oct-98						16-Mar-99				3500	
29-Oct-98				36		23-Mar-99		0.4		4100	294.4
29-Oct-98				330		23-Mar-99	3.57	0.69	30		
4-Nov-98				12500		23-Mar-99		0.6		6000	200
4-Nov-98		0.2		520000	3.9	23-Mar-99	4.78	0.06	73		
4-Nov-98				910000		30-Mar-99	7.66	0.42	20		
4-Nov-98	1.7	0.21	63			30-Mar-99	8.05	0.26	26		
13-Nov-98	6.33	0.58	0			5-Apr-99	3.93	1.35	50		
18-Nov-98	8.3	0.57	57			5-Apr-99	1.38	0.67	64		
18-Nov-98		0.2		120000	5.4	13-Apr-99		0.2		1370000	87.5
18-Nov-98				320000		13-Apr-99		0.8		410000	52.7
18-Nov-98				3500		15-Apr-99	6.93	0.55	25		
25-Nov-98	4.6	1.31	68			15-Apr-99	2.63	0.57	31		
2-Dec-98		0.2		13000	5.5	23-Apr-99	6.2	2.13	28		
2-Dec-98	12.76	0.43	20			23-Apr-99	3.23	0.36	72		
2-Dec-98				9700		27-Apr-99	4.95	1.61	20		
2-Dec-98				23000		27-Apr-99	5.32	1.33	28		
9-Dec-98				180000		11-May-99	7.9	0.21	28		
9-Dec-98		0.3		190000	24.7	11-May-99	7.91	0.45	26		
9-Dec-98				31000		18-May-99					
17-Dec-98	5.58	0.37	69			25-May-99					
22-Dec-98		0.1		45000	41	25-May-99	5.8	0.32	60		
22-Dec-98				56000		25-May-99				21000	40
22-Dec-98				620000		25-May-99					
23-Dec-98	7.23	0.13	72			1-Jun-99					
30-Dec-98				1		1-Jun-99				4700	4.2
30-Dec-98				76		8-Jun-99				58000	20.7
30-Dec-98	8.73	1.21	64			8-Jun-99					
30-Dec-98		0.7		1	2.2	8-Jun-99					
						8-Jun-99	1.14	0.19	65		
						15-Jun-99					
						15-Jun-99				10	25.4
						15-Jun-99	3.26	0.93	54		
						15-Jun-99					
						22-Jun-99	3	0.73	45		
						22-Jun-99					
						22-Jun-99					
						22-Jun-99					
						22-Jun-99				27000	3.3
						29-Jun-99	4.46	0.95	54		
						29-Jun-99					
						29-Jun-99				9	5.5
						6-Jul-99	1.84	0.27	15		
						6-Jul-99					
						13-Jul-99				10000	4
						13-Jul-99					
						15-Jul-99	3.88	0.43	25		
						15-Jul-99					
						20-Jul-99				7100	2.8
						20-Jul-99					
						20-Jul-99	5.8	0.29	32		
						27-Jul-99				15000	10.5
						27-Jul-99					
						27-Jul-99	7.15	0.57	51		
						27-Jul-99					
						3-Aug-99					
						3-Aug-99					
						3-Aug-99				33000	6.5
						3-Aug-99		0.49	66		
						10-Aug-99					
						10-Aug-99				9700	2.2
						13-Aug-99		1.64	67		
						17-Aug-99					
						17-Aug-99				55000	14.5
						31-Aug-99					
						31-Aug-99				80000	9.6
						13-Sep-99				340	2.9
						13-Sep-99					
						20-Sep-99				6000	2.9
						20-Sep-99					
						27-Sep-99				150	41
						27-Sep-99					
						4-Oct-99	1.43	0.25	57		
						21-Oct-99	2.06	1.85	54		
						1-Nov-99		0.79	53		
						29-Nov-99				9	
						29-Nov-99					
Mean 1998	4.77	0.60	52.90	134,839	**14.49**						
Mean 1999	4.65	0.92	49.40	136,396	**43.04**						

Hughes Street

Field Visit Date	DO (ppm)	Ammonia_M6038 (mg/L)	Sulfate_M6051 (mg/L)	Fecal Coliform (cfu/100ml)	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M6038 (mg/L)	Sulfate_M6051 (mg/L)	Fecal Coliform (cfu/100ml)	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M6038 (mg/L)	Sulfate_M6051 (mg/L)	Fecal Coliform (cfu/100ml)	BOD (mg/L)
16-Feb-90				160000		15-Jan-98		6		8700	0	6-Jan-99	3.86	1.26	67		
30-May-90				160000		15-Jan-98		0		8700	6	6-Jan-99		1		470000	28.8
15-Jun-90				160000		21-Jan-98		0.1		1100000	10.7	13-Jan-99	3.42	0.79	71		
28-Sep-92				160000		21-Jan-98		10.7		1100000	0.1	13-Jan-99		0.9		1200000	10.9
24-Feb-93		0.7		170	1.6	29-Jan-98		57		720000	0.09	21-Jan-99	3.93	0.39	66		
16-Apr-93				160000		29-Jan-98				15000	57.4	22-Jan-99	2.04	1.24	89		
22-Apr-93		0.2		12000	2	12-Feb-98		3.3		36000	0.2	28-Jan-99	1.15	2.13	53		
29-Jun-93				160000		12-Feb-98		0.2		36000	3.3	2-Feb-99	2.54	1.19	56		
15-Jul-93				690000		24-Feb-98		0.2		1400	8.2	2-Feb-99		0.9		8100	4.5
22-Jul-93				1300000		24-Feb-98		0.18		1400	8.2	4-Feb-99	2.22	1.64	56		
4-Aug-93				160000		3-Mar-98		0.1		120	5.5	5-Feb-99	0.28	1.49	53		
17-Aug-93		0.9		660000	4.4	3-Mar-98		0.1		120	5.5	9-Feb-99	3.29	0.99	48		
26-Oct-93		1		9	1.6	25-Mar-98		1.6		200000	16.8	9-Feb-99		1.4		86000	
28-Oct-93				80000		25-Mar-98		1.6		200000	16.8	12-Feb-99		2.12	47		
17-Feb-94				200		1-Apr-98		1		1400000	27.1	16-Feb-99	5.45	1.55	58		
31-Mar-94		1.6		7700	2.4	1-Apr-98		1		1400000	27.1	16-Feb-99		2		450	2.5
12-Apr-94				160000		2-Apr-98			75			19-Feb-99	4.59	0.47	9		
27-Sep-94		1		3300	1.9	15-Apr-98		0.2		380000	30.3	23-Feb-99	1.83	0.15	36		
2-Nov-94		1.2		485000	2.7	15-Apr-98		0.2		380000	30.9	23-Feb-99		0.4		1400	3.4
13-Dec-94				160000		21-Apr-98		0.5		32000	3.8	26-Feb-99	1.43	0.35	51		
26-Jan-95				22000		21-Apr-98		0.5		32000	3.9	2-Mar-99		0.2		220000	121.7
8-Feb-95		1.4		100000	5.4	27-Apr-98		0.8		31000	8.3	2-Mar-99	1.3	0.74	40		
23-Mar-95				160000		27-Apr-98		0.8		31000	8.3	5-Mar-99	1.28	1.41	41		
1-May-95		2.5		1415000	5.5	28-Apr-98	0.8	1.3	59			9-Mar-99	1.3	0.73	39		
13-May-95				2000000		5-May-98		1.1		6200	4.6	9-Mar-99		0.8			13.1
23-May-95				160000		6-May-98		1.1		6200	4.6	11-Mar-99	0.97	0.83	53		
15-Jun-95				2000000		12-May-98	1.41	0.68				16-Mar-99	7	0.98	49		
20-Jul-95				160000		12-May-98		0.6		45000	7.7	16-Mar-99				10	
8-Aug-95		0.2		150000	3.3	12-May-98				45000		23-Mar-99		0.4		2300	3.8
22-Aug-95				950000		20-May-98		0.4		100000	9.3	23-Mar-99	2.1	0.36	57		
20-Sep-95				2300		21-May-98	1.2	1.23	61			26-Mar-99	1.14	0.21	55		
5-Oct-95				160000		27-May-98	1.1	0.36	83			30-Mar-99	7.6	0.19	18		
17-Oct-95		2		200000	8.7	27-May-98		0		48000	28.5	1-Apr-99	4.62	0.43	37		
15-Nov-95		3.2		160000		28-May-98	1.7	0.54	65			5-Apr-99	1.44	0.46	62		
13-Dec-95				160000		2-Jun-98		0.5		80000	3.3	7-Apr-99	1.35	0.74	53		
13-Dec-95				210000		3-Jun-98	1.2	0.31	70			13-Apr-99		0.8		4700	2.3
4-Jan-96				160000		8-Jun-98	1	3.96	39			15-Apr-99	4.03	0.79	24		
7-Feb-96		2.06		160000		8-Jun-98		1.6		370000		23-Apr-99	3.14	0.89	53		
5-Mar-96		0.73		6500	4.4	11-Jun-98	1.7	2.5	44			27-Apr-99	2.82	1.16	27		
2-Apr-96		3.24		50000		15-Jun-98	2.9	0.57	62			11-May-99	7.72	0.41	7		
24-Apr-96				17000		17-Jun-98	2.74	0.99	56			19-May-99					
7-May-96		0.32		160000	16	17-Jun-98		0.4		200000	22.1	25-May-99		0.1		8700	
6-Jun-96		0.33		160000	8	22-Jun-98	2.71	0.82	60			25-May-99	0.6	1.31	39		
18-Jun-96		1.1		28000	8.1	26-Jun-98		0.6		720000	6.8	1-Jun-99		0.1		5600	2.5
3-Jul-96				160000		26-Jun-98	3.1	1.29	64			8-Jun-99		0.3		34000	6.9
5-Aug-96				90000		29-Jun-98	7.9	0.28	16			8-Jun-99	0.88	0.28	65		
11-Sep-96				160000		30-Jun-98		0.8		14	4.3	11-Jun-99	1.11	0.58	40		
12-Sep-96				110000		8-Jul-98	0.28	0.21	47			15-Jun-99		0.4		5900	6.1
8-Oct-96				7000		13-Jul-98				27000		15-Jun-99	2.91	0.88	54		
24-Oct-96		0.9		72000	10.2	13-Jul-98	2.8	0.65	57			22-Jun-99	1.16	0.39	34		
20-Nov-96				200		20-Jul-98	8.1	0.32	24			22-Jun-99		0.2		16000	2.8
2-Jan-97				160000		23-Jul-98		0.1		710000	13.2	29-Jun-99	4.59	0.97	53		
5-Feb-97				160000		29-Jul-98		0.2		550000	21.6	29-Jun-99		0.8		20	2.6
5-Feb-97		1.4		65000	20.9	29-Jul-98	1.37	0.85	55			6-Jul-99	2.1	0.29	29		
14-May-97		4.2		1900000	35.1	4-Aug-98		0.6		300000	7.8	13-Jul-99		0.3		540	4.6
9-Sep-97		1		160000	40.2	12-Aug-98	1.86	0.29	32			15-Jul-99	3.19	0.52	20		
5-Nov-97		3.8		310000	53.4	17-Aug-98		1			0.9	20-Jul-99		0.1		4000	2.4
6-Nov-97		0.2		330000	10	19-Aug-98	2.72		25			20-Jul-99		0.3	10		
7-Nov-97		0.2		60000	8	25-Aug-98		0.6		210000	8	27-Jul-99		0.1		38000	12.7
10-Nov-97		0.5		155000	16.1	26-Aug-98	1.8	0.27	58			27-Jul-99	4.3	0.42	52		
12-Nov-97		0.4		86000	19.2	1-Sep-98		0.1		230000	4	3-Aug-99		0.68	53		
14-Nov-97		1.2		320000	33.7	2-Sep-98	3.1	0.16	20			3-Aug-99		0.5		87000	4.3
17-Nov-97				2000000		3-Sep-98				16000		10-Aug-99		0.9		5900	8.8
17-Nov-97		2.5		2000000	40.8	14-Sep-98	2.76	0.24	35			13-Aug-99		0.81	69		
19-Nov-97				920000		18-Sep-98	7.65	0.27	3			17-Aug-99		0.6		8700	3.3
19-Nov-97		5.7		520000	114.9	22-Sep-98		0.5		370000	8.1	31-Aug-99		1.1		130000	39
21-Nov-97		0.6		500000	15.6	22-Sep-98	1.78	0.35		370000	8.1	13-Sep-99		0.3		20000	4.1
21-Nov-97		0.6		500000	15.6	30-Sep-98		0.3		83000	4.4	20-Sep-99		2.2		7600	3.2
24-Nov-97				260000	1.8	30-Sep-98		0.32	52	83000	4.4	27-Sep-99		0.9		380	2.9
24-Nov-97		1.6		260000		2-Oct-98	1.56	0.39	57			4-Oct-99	0.84	0.42	46		
26-Nov-97		1.2		43000	10.1	7-Oct-98	2.95	0.33	13			21-Oct-99	2.08	1.37	54		
26-Nov-97		1.2		43000	10.1	9-Oct-98	3.32	0.72	75			1-Nov-99	4.54	0.83	40		
1-Dec-97				57000		12-Oct-98	3.56	1.38	67			2-Nov-99				2400	
1-Dec-97		0.1		57000	5.1	14-Oct-98	3.55	0.79	83	2500	1.5	16-Nov-99					
10-Dec-97		1.3		640000	26.8	14-Oct-98		0.7		2500	1.5	29-Nov-99				9	
10-Dec-97				470000		21-Oct-98	6.05	0.81	25								
15-Dec-97				270000		26-Oct-98	1.14	1.06	70								
15-Dec-97		1.3		270000	9.4	29-Oct-98				25000							
19-Dec-97		0.7		230000	62.7	29-Oct-98	3.11	1.28	78								
30-Dec-97		1.3		790	3.4	2-Nov-98		0.33	3								
30-Dec-97		1.3		790	3.4	4-Nov-98		0.3		4100	2.1						
						4-Nov-98	1.118	0.32									
						12-Nov-98	4.62	0.64	45								
						13-Nov-98	7.92	0	3								
						16-Nov-98	9.24	0.69	30								
						19-Nov-98	3.01	0	40								
						19-Nov-98		0.3		13000	4.7						
						25-Nov-98	2.06	0.51	75								
						25-Nov-98	2.85	0.27	53								
						2-Dec-98		0.2		6800	5.4						
						2-Dec-98	0.52	0.88	12								
						9-Dec-98		0.2		560000	4.1						
						22-Dec-98		0.5		79000	4.6						
						23-Dec-98	2.55	0	74								
						30-Dec-98		0.8			18.7						
						30-Dec-98	5.4	0.26	40								
Mean Values																	
< 1997		1.39		**329,703**	**16.84**												
All 1998	3.05	1.45	46.67	**236,996**	**9.81**												
All 1998	3.05	1.45	46.67	**236,996**	9.81												
All 1999	2.79	0.78	45.80	**83,919**	12.38												
<1997		1.39		**329,703**	16.84												
All 1999	2.79	0.78	45.80	**83,919**	12.38												

Polk and 66th											
	1998						1999				
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)
8-Sep-97						6-Jan-99	5.57	1.39	70		
2-Apr-98						13-Jan-99	3.55	0.96	75		
28-Apr-98						22-Jan-99	3.55	0.88	69		
12-May-98						26-Jan-99	3.33	1.45	61		
21-May-98						4-Feb-99	6.34	0.84	69		
27-May-98						5-Feb-99	2.08	1.52	60		
28-May-98						12-Feb-99		2.64	62		
3-Jun-98						18-Feb-99	4.88	0.47	23		
8-Jun-98						26-Feb-99	2.38	0.83	52		
11-Jun-98						5-Mar-99	1.11	1.11	35		
15-Jun-98						11-Mar-99	1.01	0.85	47		
17-Jun-98	2.17	1.06	50			16-Mar-99	7.41	0.87	55		
23-Jun-98	2.4	0.76	62			25-Mar-99	5.2	0.59	55		
26-Jun-98	2.6	1.15	69			1-Apr-99	6.6	0.61	43		
29-Jun-98	7.2	0.37	25			7-Apr-99	0.72	0.88	55		
8-Jul-98	0.285	0.11	49			15-Apr-99	6.26	0.86	26		
13-Jul-98	2.3	1.46	42			23-Apr-99	2.39	0.49	55		
20-Jul-98	6.1	0.33	29			27-Apr-99	4.56	1.23	28		
29-Jul-98	2.84	1.09	50			18-May-99	4.57	0.96	55		
12-Aug-98	2.76	0.53	40			11-Jun-99	2.91	0.78	39		
19-Aug-98	4.08	0.45	26			15-Jun-99	2.76	0.71	42		
28-Aug-98	2.04	1.46	14			22-Jun-99	2.11	0.49	35		
31-Aug-98	2.42	1.82	55			29-Jun-99	3.5	1.23	51		
14-Sep-98	2.75	0.87	47			6-Jul-99	1.85	0.97	32		
18-Sep-98	1.6	1.85	57			15-Jul-99	4.76	0.31	21		
23-Sep-98	1.95	1.74				20-Jul-99	4.1	0.46	16		
2-Oct-98	3.4	1.27	62			27-Jul-99	6.3	0.78	47		
9-Oct-98	5.9	0.09	73			3-Aug-99		0.88	56		
12-Oct-98	6.3	2.46	48			13-Aug-99		0.62	66		
29-Oct-98	3.52	1.33	78			4-Oct-99	3.24	0.77	47		
2-Nov-98		0.56	7			21-Oct-99	3.28	1.13	49		
12-Nov-98	9.2	0.39	44			1-Nov-99	3.78	0.99	44		
16-Nov-98	7.67	0.54	30								
25-Nov-98	1.87	0.65	66								
23-Dec-98	5.18	0	57								
30-Dec-98	6.7	0.38	63								
Mean 1998	3.88	0.91	47.63								
Mean 1999	3.80	0.92	48.13								

Yates											
	1998						1999				
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)
8-Sep-97						6-Jan-99	7.65	1.17	64		
2-Apr-98						13-Jan-99	4.79	2.17	60		
28-Apr-98						22-Jan-99	3.52	0.37	62		
12-May-98						26-Jan-99	4.93	0.42	58		
21-May-98						4-Feb-99	4.78	1.24	66		
27-May-98						5-Feb-99	3.59	0.32	64		
28-May-98						12-Feb-99		0.56	63		
3-Jun-98						18-Feb-99	4.61	0.3	41		
8-Jun-98						26-Feb-99	6.72	0.39	70		
11-Jun-98						5-Mar-99	2.61	0.43	46		
15-Jun-98	3.6	1.38	65			11-Mar-99	2	0.86	34		
17-Jun-98	4.12	1.26	58			16-Mar-99	7.55	0.86	61		
22-Jun-98	4.2	1.06	65			25-Mar-99	2.91	0.52	48		
26-Jun-98	3.3	0.8	61			1-Apr-99	6.14	1.08	48		
29-Jun-98	5.6	0.26	32			7-Apr-99	9.3	2	34		
8-Jul-98	0.537	0.11	62			15-Apr-99	7.35	0.31	30		
13-Jul-98	4.5	0.16	59			23-Apr-99	6.65	0.89	49		
20-Jul-98	3.7	0.5	31			27-Apr-99	6.87	0.69	19		
29-Jul-98	4.16	0.03	54			18-May-99	7.74	0.28	55		
12-Aug-98	6.32	1.54	44			11-Jun-99	4.02	0.67	29		
19-Aug-98	4.25		45			15-Jun-99	2.72	1.84	47		
28-Aug-98	3.76	0.23	47			22-Jun-99	1.38	0.44	25		
31-Aug-98	1.78	0.25	49			29-Jun-99	2.14	1	43		
14-Sep-98						6-Jul-99	1.99	2.75	30		
18-Sep-98	4.25	0.51	60			15-Jul-99	1.18	0.31	43		
23-Sep-98	4	0.7				20-Jul-99	5.2	0.71	41		
2-Oct-98	4.7	0.47	67			27-Jul-99	4.2	0.74	29		
9-Oct-98	11.62	1.19	67			3-Aug-99		0.8	29		
12-Oct-98	3.42	0.21	48			13-Aug-99		0.1	36		
29-Oct-98	3.78	0.41	45			4-Oct-99	3.33	0.26	51		
2-Nov-98		0.3	24			21-Oct-99	3.13	0.12	36		
12-Nov-98	5.08	0.67	54			1-Nov-99	3.93	0.58	28		
16-Nov-98	4.35	0.59	0								
25-Nov-98	1.85	1.13	54								
23-Dec-98	8.76	2.42	47								
30-Dec-98	11.6	0.83	68								
Mean 1998	4.72	0.71	50.25								
Mean 1999	4.58	0.79	44.97								

Wayside											
	1998						1999				
Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)
8-Sep-97						6-Jan-99	9.84	1.02	63		
2-Apr-98						13-Jan-99	12.66	0.94	71		
28-Apr-98						22-Jan-99	3.86	0.63	64		
12-May-98						26-Jan-99	7.45	1.64	70		
21-May-98						4-Feb-99	7.3				
27-May-98						5-Feb-99	3.02	1.17	69		
28-May-98						12-Feb-99	1.95	2.14	52		
3-Jun-98						26-Feb-99	2.97	0.5	53		
8-Jun-98						5-Mar-99	2.34	0.66	46		
11-Jun-98						11-Mar-99	1.78	1.2	44		
15-Jun-98						16-Mar-99	5.46	0.47	57		
17-Jun-98						25-Mar-99	5.38	0.37	54		
22-Jun-98						1-Apr-99	5.36	0.56	42		
26-Jun-98						7-Apr-99	1.49	0.71	53		
29-Jun-98						15-Apr-99	6.61	0.73	32		
8-Jul-98						23-Apr-99	6.29	0.49	60		
13-Jul-98						27-Apr-99	4.82	1.25	36		
20-Jul-98						18-May-99	4.09	0.29	60		
29-Jul-98						11-Jun-99	2.19	0.82	35		
12-Aug-98						15-Jun-99	2.52	0.66	30		
19-Aug-98						22-Jun-99	2.85	0.55	27		
28-Aug-98	2.18	1.56	60			29-Jun-99	3.34	1.09	49		
31-Aug-98	1.53	1.89	56			6-Jul-99	2.23	0	43		
14-Sep-98	2.25	0.63	46			15-Jul-99	3.98	0.86	31		
18-Sep-98	1.25	1.22	56			20-Jul-99	4	0.78	24		
23-Sep-98	2.2	1.37				27-Jul-99	4.6	0.61	50		
2-Oct-98	3.08	1.27	69			3-Aug-99		0.45	62		
9-Oct-98	5.4	0.94	72			13-Aug-99		0.7	71		
12-Oct-98	2.51	1.94	74			4-Oct-99	2.71	0.65	42		
29-Oct-98	6.72	1.07	78			21-Oct-99	4.14	0.61	51		
2-Nov-98		0.34	10								
12-Nov-98	4.66	0.31	40								
16-Nov-98	6.88	0.58	35								
25-Nov-98	1.72	0.79	48								
23-Dec-98	2.94	0.04	73								
30-Dec-98	7.92	0.52	66								
Mean 1998	3.66	0.96	55.93								
Mean 1999	4.47	0.78	49.69								

Upstream Locations - All Upstream													
Location	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8061 (mg/L)	Fecal Coliform (cfu/100ml	BOD (mg/L)	Location	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8061 (mg/L)	Fecal Coliform (cfu/100ml	BOD (mg/L)
Evergreen Cemetery	8-Sep-97						Park and Elm N1	6-Jan-99	5.64	2.44	72		
Evergreen Cemetery	2-Apr-98						Polk and Elm S1	6-Jan-99	4.49	0.04	74		
Evergreen Cemetery	28-Apr-98						Polk and Elm S1	6-Jan-99		0.1		51000	7.2
Evergreen Cemetery	12-May-98						Park and Elm N1	6-Jan-99		2.3		890000	7.6
Evergreen Cemetery	21-May-98						Park and Elm N1	13-Jan-99	8.86	2.66	85		
Evergreen Cemetery	27-May-98						Polk and Elm S1	13-Jan-99	13.02	0.49	72		
Evergreen Cemetery	28-May-98						Park and Elm N1	13-Jan-99		3.4		2300000	11.6
Evergreen Cemetery	3-Jun-98						Polk and Elm S1	13-Jan-99		0.6		4200	3.9
Evergreen Cemetery	8-Jun-98						Park and Elm N1	21-Jan-99	5.38	2.45	59		
Evergreen Cemetery	11-Jun-98						Polk and Elm S1	21-Jan-99	7.59	0.62	74		
Evergreen Cemetery	15-Jun-98						Park and Elm N1	2-Feb-99	0.92	0.85	56		
Evergreen Cemetery	17-Jun-98						Polk and Elm S1	2-Feb-99	0.59	0.27	72		
Evergreen Cemetery	22-Jun-98						Park and Elm N1	2-Feb-99				33000	42
Evergreen Cemetery	26-Jun-98						Polk and Elm S1	2-Feb-99		0.2		28000	5.7
Evergreen Cemetery	29-Jun-98						Park and Elm N1	9-Feb-99	3.87	1.44	66		
Evergreen Cemetery	8-Jul-98						Polk and Elm S1	9-Feb-99	4.53	1.34	59		
Evergreen Cemetery	13-Jul-98						Park and Elm N1	9-Feb-99		0.1		42000	39
Evergreen Cemetery	20-Jul-98						Polk and Elm S1	9-Feb-99		0.9		270	11.6
Evergreen Cemetery	29-Jul-98	2.7	0.47	53			Park and Elm N1	16-Feb-99	2.61	4.1	36		
Evergreen Cemetery	12-Aug-98	4.08	0.85	53			Polk and Elm S1	16-Feb-99	4.4	0.92	76		
Evergreen Cemetery	19-Aug-98	1.7		41			Park and Elm N1	16-Feb-99		0.5		32000	400
Evergreen Cemetery	26-Aug-98	1.24	0.57	67			Polk and Elm S1	16-Feb-99		0.9		15000	29.2
Evergreen Cemetery	9-Sep-98	3.98	0.4	30			Park and Elm N1	23-Feb-99	5.01	1.74	56		
Evergreen Cemetery	14-Sep-98	2.76					Polk and Elm S1	23-Feb-99	4.59	1.07	73		
Evergreen Cemetery	16-Sep-98	4.9	0.28	27			Park and Elm N1	23-Feb-99		0.1		11000	40
Park and Elm N1	22-Sep-98	2.61	0.45		4600	2.1	Polk and Elm S1	23-Feb-99		0.9		140000	1560
Polk and Elm S1	22-Sep-98	3.54	0.96		690	4.6	Park and Elm N1	2-Mar-99	2.52	4.68	51		
Park and Elm N1	22-Sep-98		0.2		4600	2.1	Polk and Elm S1	2-Mar-99	3.86	1.17	73		
Polk and Elm S1	22-Sep-98		0.6		690	4.6	Polk and Elm S1	2-Mar-99		0.7		33000	113.4
Evergreen Cemetery	23-Sep-98	1.64	0.53	73			Park and Elm N1	2-Mar-99		0.1		7200	700
Polk and Elm S1	29-Sep-98		1.24	71	4300	32.5	Park and Elm N1	9-Mar-99	5.89	0.87	54		
Evergreen Cemetery	30-Sep-98		0.82	59	200000	27.1	Polk and Elm S1	9-Mar-99	2.82	0.62	61		
Park and Elm N1	30-Sep-98	2.99	1.13	70	45000	44.7	Park and Elm N1	9-Mar-99		0.4		-999	44.1
Evergreen Cemetery	30-Sep-98		0.6		200000	27.1	Polk and Elm S1	9-Mar-99		0.6		-999	136.5
Park and Elm N1	30-Sep-98		0.1		45000	44.7	Park and Elm N1	16-Mar-99	6.51	0.4	0.3	94000	
Polk and Elm S1	30-Sep-98		0.9		4300	32.5	Polk and Elm S1	16-Mar-99	4.94	0.82	62	22000	
Evergreen Cemetery	7-Oct-98	1.28	0.46	50			Park and Elm N1	16-Mar-99				94000	
Park and Elm N1	7-Oct-98	2.86	1.39	42			Polk and Elm S1	16-Mar-99				22000	
Polk and Elm S1	7-Oct-98	2.94	0.55	59			Park and Elm N1	23-Mar-99	6.55	0.32	69		
Park and Elm N1	7-Oct-98						Polk and Elm S1	23-Mar-99	3.87	0.32	56		
Evergreen Cemetery	14-Oct-98	1.76	1.19	65	20000	4	Park and Elm N1	23-Mar-99		0.1		94000	8.8
Park and Elm N1	14-Oct-98	1.25	0.32	30	5400	4.9	Polk and Elm S1	23-Mar-99		0.2		21000	125.2
Polk and Elm S1	14-Oct-98	4.3	1	71	2800	2.3	Park and Elm N1	30-Mar-99	8.38	0.37	16		
Evergreen Cemetery	14-Oct-98		0.8		20000	4	Polk and Elm S1	30-Mar-99	8.15	0	24		
Park and Elm N1	14-Oct-98		0.3		5400	4.9	Park and Elm N1	5-Apr-99	4.34	1.99	58		
Polk and Elm S1	14-Oct-98		0.7		2800	2.3	Polk and Elm S1	5-Apr-99	1.19	1.17	70		
Evergreen Cemetery	21-Oct-98	5.44	0.49	55			Park and Elm N1	13-Apr-99				250000	
Park and Elm N1	21-Oct-98	8.02	0.15	52			Polk and Elm S1	13-Apr-99		0.4		490	18.4
Polk and Elm S1	21-Oct-98	8.39	0.5	60			Polk and Elm S1	15-Apr-99	6.62	0	53		
Park and Elm N1	21-Oct-98						Polk and Elm S1	23-Apr-99	7.24	0.43	75		
Evergreen Cemetery	28-Oct-98	8.634	2.13	72			Polk and Elm S1	27-Apr-99	6.14	0.46	42		
Park and Elm N1	28-Oct-98	10.29	1.27	88			Polk and Elm S1	11-May-99	8.27	0.19	38		
Polk and Elm S1	28-Oct-98	9.27	1.42	64			Polk and Elm S1	18-May-99					
Evergreen Cemetery	29-Oct-98						Polk and Elm S1	25-May-99	7.6	1.03	66		
Park and Elm N1	29-Oct-98				22000		Park and Elm N1	25-May-99				260000	44
Polk and Elm S1	29-Oct-98				72		Polk and Elm S1	25-May-99				30000	18
Evergreen Cemetery	4-Nov-98	1.7	0.21	63			Park and Elm N1	1-Jun-99				680	0.9
Park and Elm N1	4-Nov-98	10.3	0.12	70			Polk and Elm S1	1-Jun-99				5300	2.6
Polk and Elm S1	4-Nov-98	5.4	0.79	60			Park and Elm N1	8-Jun-99	4.33	0	59		
Evergreen Cemetery	4-Nov-98		0.2		520000	3.9	Polk and Elm S1	8-Jun-99	6.33	0.53	63		
Park and Elm N1	4-Nov-98		0.1		11000	1.2	Park and Elm N1	8-Jun-99				3000	8.9
Polk and Elm S1	4-Nov-98		0.5		7700	4.8	Polk and Elm S1	8-Jun-99				11000	37
Evergreen Cemetery	13-Nov-98	6.33	0.58	0			Park and Elm N1	15-Jun-99	2.83	0.28	42		
Park and Elm N1	13-Nov-98	8.63	0.55	7			Polk and Elm S1	15-Jun-99	2.96	1.09	55		
Polk and Elm S1	13-Nov-98	5.72	0.62	14			Park and Elm N1	15-Jun-99				4000	3.2
Evergreen Cemetery	18-Nov-98	8.3	0.57	57			Polk and Elm S1	15-Jun-99				20	38.5
Park and Elm N1	18-Nov-98	5.38	0.1	32			Park and Elm N1	22-Jun-99					
Polk and Elm S1	18-Nov-98	7.8	0.58	46			Polk and Elm S1	22-Jun-99	1.22	0.67	50		
Evergreen Cemetery	18-Nov-98		0.2		120000	5.4	Park and Elm N1	22-Jun-99				4400	3.6
Park and Elm N1	18-Nov-98		0.1		5800	3.9	Polk and Elm S1	22-Jun-99				4800	11.9
Polk and Elm S1	18-Nov-98		0.2		340	3	Park and Elm N1	29-Jun-99	4.93	1.11	49		
Evergreen Cemetery	25-Nov-98	4.6	1.31	68			Polk and Elm S1	29-Jun-99	2.72	0.82	61		
Park and Elm N1	25-Nov-98	4.93	0.1	46			Park and Elm N1	29-Jun-99				10	2.1
Polk and Elm S1	25-Nov-98	6.3	0.97	72			Polk and Elm S1	29-Jun-99				820	15.9
Evergreen Cemetery	2-Dec-98	12.76	0.43	20			Park and Elm N1	6-Jul-99					
Park and Elm N1	2-Dec-98	6.61	0.24	42			Polk and Elm S1	6-Jul-99	1.29	1.37	31		
Polk and Elm S1	2-Dec-98	4.63	0.26	53			Park and Elm N1	13-Jul-99				240	0.7
Evergreen Cemetery	2-Dec-98		0.2		13000	5.5	Polk and Elm S1	13-Jul-99				3000	40
Park and Elm N1	2-Dec-98		0.1		22000	0.8	Park and Elm N1	15-Jul-99					
Polk and Elm S1	2-Dec-98		0.2		24000	3.5	Polk and Elm S1	15-Jul-99	3.3	0.15	64		
Evergreen Cemetery	9-Dec-98		0.3		190000	24.7	Polk and Elm S1	20-Jul-99	4.5	0.23	51		
Park and Elm N1	9-Dec-98		0.1		40000	23.1	Park and Elm N1	20-Jul-99				300	1.1
Polk and Elm S1	9-Dec-98		0.5		14000	5.1	Polk and Elm S1	20-Jul-99				3600	2.8
Evergreen Cemetery	17-Dec-98	5.58	0.37	69			Park and Elm N1	27-Jul-99	6.4	0.17	73		
Park and Elm N1	17-Dec-98	7.14	0.39	66			Polk and Elm S1	27-Jul-99	4.8	0.25	65		
Polk and Elm S1	17-Dec-98		0.25	66			Park and Elm N1	27-Jul-99				2600	2.8
Evergreen Cemetery	22-Dec-98		0.1		45000	41	Polk and Elm S1	27-Jul-99				4100	4.1
Polk and Elm S1	22-Dec-98				7300	10.9	Park and Elm N1	3-Aug-99		0.3	62		
Park and Elm N1	22-Dec-98				49000	42	Polk and Elm S1	3-Aug-99		0.34	84		
Evergreen Cemetery	23-Dec-98	7.23	0.13	72			Park and Elm N1	3-Aug-99				2400	2.8
Park and Elm N1	23-Dec-98	7.21	1	66			Polk and Elm S1	3-Aug-99				16000	4.2
Polk and Elm S1	23-Dec-98	7.7	0.11	47			Park and Elm N1	10-Aug-99				23000	5.4
Evergreen Cemetery	30-Dec-98	8.73	1.21	64			Polk and Elm S1	10-Aug-99				5400	2.1
Park and Elm N1	30-Dec-98	10.59	1.02	44			Polk and Elm S1	13-Aug-99		0.39	64		
Polk and Elm S1	30-Dec-98		0.64	74			Park and Elm N1	17-Aug-99				60000	22.7
Evergreen Cemetery	30-Dec-98		0.7		1	2.2	Polk and Elm S1	17-Aug-99				340	0.1
Polk and Elm S1	30-Dec-98		0.2		3300	3	Park and Elm N1	31-Aug-99				3800	2.8
Park and Elm N1	30-Dec-98		0.5			2	Polk and Elm S1	31-Aug-99				3400	4.7
							Park and Elm N1	13-Sep-99				2700	1.4
							Polk and Elm S1	13-Sep-99				10	3.7
							Park and Elm N1	20-Sep-99				940	3.5
							Polk and Elm S1	20-Sep-99				20000	4.4
							Park and Elm N1	27-Sep-99				720	
							Polk and Elm S1	27-Sep-99				2500	25.1
							Polk and Elm S1	4-Oct-99	2.62	0.01	48		
							Polk and Elm S1	21-Oct-99	3.93	0.48	45		
							Polk and Elm S1	1-Nov-99	4.87	0.9	51		
							Park and Elm N1	29-Nov-99				24000	
							Polk and Elm S1	29-Nov-99				9	
Mean Values 1998		5.56	0.56	53.70	47,431	12.66							
Mean Values 1999		4.86	0.85	57.19	80,608	72.30							

Upstream Odor							Upstream No Odor						
Location	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)	Location	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100mL	BOD (mg/L)
Evergreen Cemetery	2-Apr-98						Polk and Elm S1	1-Nov-99	4.87	0.9	51		
Evergreen Cemetery	28-Apr-98						Evergreen Cemetery	28-May-98					
Evergreen Cemetery	12-May-98						Evergreen Cemetery	3-Jun-98					
Evergreen Cemetery	12-May-98						Evergreen Cemetery	8-Jun-98					
Evergreen Cemetery	21-May-98						Evergreen Cemetery	15-Jun-98					
Evergreen Cemetery	27-May-98						Evergreen Cemetery	26-Jun-98					
Evergreen Cemetery	11-Jun-98						Evergreen Cemetery	29-Jun-98					
Evergreen Cemetery	17-Jun-98						Evergreen Cemetery	8-Jul-98					
Evergreen Cemetery	22-Jun-98						Evergreen Cemetery	20-Jul-98					
Evergreen Cemetery	13-Jul-98						Evergreen Cemetery	29-Jul-98	2.7	0.47	53		
Evergreen Cemetery	26-Aug-98	1.24	0.57	67			Evergreen Cemetery	12-Aug-98	4.08	0.85	53		
Evergreen Cemetery	25-Nov-98	4.6	1.31	68			Evergreen Cemetery	19-Aug-98	1.7		41		
Evergreen Cemetery	25-Nov-98	4.6	1.31	68			Evergreen Cemetery	14-Sep-98	2.76				
Evergreen Cemetery	2-Dec-98	12.76	0.43	20			Evergreen Cemetery	16-Sep-98	4.9	0.28	27		
Evergreen Cemetery	23-Dec-98	7.23	0.13	72			Park and Elm N1	22-Sep-98		0.2		4600	2.1
Evergreen Cemetery	30-Dec-98	8.73	1.21	64			Polk and Elm S1	22-Sep-98		0.6		690	4.6
Park and Elm N1	25-Nov-98	4.93	0.1	46			Park and Elm N1	22-Sep-98	2.61	0.45		4600	2.1
Park and Elm N1	25-Nov-98	4.93	0.1	46			Polk and Elm S1	22-Sep-98	3.54	0.96		690	4.6
Park and Elm N1	2-Dec-98	6.61	0.24	42			Evergreen Cemetery	30-Sep-98		0.6		200000	27.1
Park and Elm N1	23-Dec-98	7.21	1	66			Park and Elm N1	30-Sep-98		0.1		45000	44.7
Park and Elm N1	30-Dec-98	10.59	1.02	44			Park and Elm N1	30-Sep-98	2.99	1.13	70	45000	44.7
Park and Elm N1	6-Jan-99	5.64	2.44	72			Polk and Elm S1	30-Sep-98		0.9		4300	32.5
Park and Elm N1	21-Jan-99	5.38	2.45	59			Evergreen Cemetery	30-Sep-98		0.82	59	200000	27.1
Park and Elm N1	2-Feb-99	0.92	0.85	55			Evergreen Cemetery	7-Oct-98	1.28	0.46	50		
Park and Elm N1	9-Feb-99	3.87	1.44	55			Park and Elm N1	7-Oct-98	2.86	1.39	42		
Park and Elm N1	16-Feb-99	2.61	4.1	36			Park and Elm N1	7-Oct-98					
Park and Elm N1	2-Mar-99	2.52	4.66	51			Polk and Elm S1	7-Oct-98	2.94	0.55	59		
Park and Elm N1	9-Mar-99	5.89	0.87	54			Park and Elm N1	14-Oct-98	1.25	0.32	30	5400	4.9
Park and Elm N1	23-Mar-99	6.55	0.32	69			Park and Elm N1	14-Oct-98		0.3		5400	4.9
Park and Elm N1	30-Mar-99	8.38	0.37	16			Polk and Elm S1	14-Oct-98	4.3	1	71	2800	2.3
Park and Elm N1	5-Apr-99	4.34	1.99	58			Evergreen Cemetery	14-Oct-98		0.8		20000	4
Park and Elm N1	8-Jun-99	4.33	0	59			Evergreen Cemetery	14-Oct-98	1.76	1.19	65	20000	4
Park and Elm N1	29-Jun-99	4.93	1.11	49			Polk and Elm S1	14-Oct-98		0.7		2800	2.3
Park and Elm N1	27-Jul-99	6.4	0.17	73			Park and Elm N1	21-Oct-98	8.02	0.15	52		
Polk and Elm S1	25-Nov-98	6.3	0.97	72			Polk and Elm S1	21-Oct-98	8.39	0.5	60		
Polk and Elm S1	25-Nov-98	6.3	0.97	72			Park and Elm N1	21-Oct-98					
Polk and Elm S1	2-Dec-98	4.63	0.26	53			Evergreen Cemetery	21-Oct-98	5.44	0.49	55		
Polk and Elm S1	23-Dec-98	7.7	0.11	47			Polk and Elm S1	28-Oct-98	9.27	1.42	64		
Polk and Elm S1	30-Dec-98		0.64	74			Park and Elm N1	28-Oct-98	10.29	1.27	88		
Polk and Elm S1	6-Jan-99	4.49	0.04	74			Evergreen Cemetery	28-Oct-98	8.634	2.13	72		
Polk and Elm S1	21-Jan-99	7.59	0.62	74			Park and Elm N1	4-Nov-98		0.1		11000	1.2
Polk and Elm S1	2-Feb-99	0.59	0.27	72			Evergreen Cemetery	4-Nov-98	1.7	0.21	63		
Polk and Elm S1	9-Feb-99	4.53	1.34	59			Polk and Elm S1	4-Nov-98		0.5		7700	4.8
Polk and Elm S1	16-Feb-99	4.4	0.92	76			Polk and Elm S1	4-Nov-98	5.4	0.79	60		
Polk and Elm S1	2-Mar-99	3.86	1.17	73			Park and Elm N1	4-Nov-98	10.3	0.12	70		
Polk and Elm S1	9-Mar-99	2.82	0.62	61			Evergreen Cemetery	4-Nov-98		0.2		520000	3.9
Polk and Elm S1	23-Mar-99	3.87	0.32	56			Evergreen Cemetery	13-Nov-98	6.33	0.58	0		
Polk and Elm S1	30-Mar-99	8.15	0	24			Polk and Elm S1	13-Nov-98	5.72	0.62	14		
Polk and Elm S1	5-Apr-99	1.19	1.17	70			Park and Elm N1	13-Nov-98	8.63	0.55	7		
Polk and Elm S1	23-Apr-99	7.24	0.43	75			Evergreen Cemetery	18-Nov-98		0.2		120000	5.4
Polk and Elm S1	27-Apr-99	6.14	0.46	42			Polk and Elm S1	18-Nov-98		0.2		340	3
Polk and Elm S1	25-May-99	7.6	1.03	66			Park and Elm N1	18-Nov-98		0.1		5800	3.9
Polk and Elm S1	8-Jun-99	6.33	0.53	63			Polk and Elm S1	18-Nov-98	7.8	0.58	46		
Polk and Elm S1	29-Jun-99	2.72	0.82	61			Evergreen Cemetery	18-Nov-98	8.3	0.57	57		
Polk and Elm S1	27-Jul-99	4.8	0.25	65			Park and Elm N1	18-Nov-98	5.38	0.1	32		
Polk and Elm S1	4-Oct-99	2.62	0.01	48			Polk and Elm S1	13-Jan-99	13.02	0.49	72		
Evergreen Cemetery	29-Oct-98						Park and Elm N1	13-Jan-99		3.4		2300000	11.6
Evergreen Cemetery	2-Dec-98		0.2		13000	5.5	Polk and Elm S1	13-Jan-99		0.6		4200	3.9
Evergreen Cemetery	30-Dec-98		0.7		1	2.2	Park and Elm N1	13-Jan-99	8.86	2.66	85		
Park and Elm N1	29-Oct-98				22000		Polk and Elm S1	23-Feb-99	4.59	1.07	73		
Park and Elm N1	2-Dec-98		0.1		22000	0.8	Park and Elm N1	23-Feb-99		0.1		11000	40
Park and Elm N1	2-Feb-99				33000	42	Park and Elm N1	23-Feb-99	5.01	1.74	55		
Park and Elm N1	9-Feb-99		0.1		42000	39	Polk and Elm S1	23-Feb-99		0.9		140000	1550
Park and Elm N1	16-Feb-99		0.5		32000	400	Park and Elm N1	16-Mar-99				94000	
Park and Elm N1	9-Mar-99		0.4			44.1	Polk and Elm S1	16-Mar-99				22000	
Park and Elm N1	23-Mar-99		0.1		94000	8.8	Park and Elm N1	16-Mar-99	6.51	0.4	0.3	94000	
Park and Elm N1	25-May-99				260000	44	Polk and Elm S1	16-Mar-99	4.94	0.82	62	22000	
Park and Elm N1	8-Jun-99				3000	8.9	Polk and Elm S1	15-Apr-99	6.62	0	53		
Park and Elm N1	29-Jun-99				10	2.1	Polk and Elm S1	11-May-99	8.27	0.19	38		
Park and Elm N1	27-Jul-99				2600	2.8	Polk and Elm S1	15-Jun-99				20	38.5
Polk and Elm S1	29-Oct-98				72		Park and Elm N1	15-Jun-99				4000	3.2
Polk and Elm S1	2-Dec-98		0.2		24000	3.5	Park and Elm N1	15-Jun-99	2.83	0.28	42		
Polk and Elm S1	30-Dec-98		0.2		3300	3	Polk and Elm S1	15-Jun-99	2.96	1.09	55		
Polk and Elm S1	6-Jan-99		0.1		51000	7.2	Park and Elm N1	22-Jun-99				4400	3.6
Polk and Elm S1	2-Feb-99		0.2		28000	5.7	Polk and Elm S1	22-Jun-99	1.22	0.67	50		
Polk and Elm S1	9-Feb-99		0.9		270	11.6	Polk and Elm S1	22-Jun-99				4800	11.9
Polk and Elm S1	16-Feb-99		0.9		15000	29.2	Park and Elm N1	22-Jun-99					
Polk and Elm S1	2-Mar-99		0.7		33000	113.4	Polk and Elm S1	6-Jul-99	1.29	1.37	31		
Polk and Elm S1	9-Mar-99		0.6			136.5	Park and Elm N1	6-Jul-99					
Polk and Elm S1	23-Mar-99		0.2		21000	125.2	Park and Elm N1	15-Jul-99					
Polk and Elm S1	25-May-99				30000	18	Polk and Elm S1	15-Jul-99	3.3	0.15	64		
Polk and Elm S1	8-Jun-99				11000	37	Polk and Elm S1	20-Jul-99				3600	2.8
Polk and Elm S1	29-Jun-99				820	15.9	Park and Elm N1	20-Jul-99				300	1.1
Polk and Elm S1	27-Jul-99				4100	4.1	Polk and Elm S1	20-Jul-99	4.5	0.23	51		
Park and Elm N1	30-Dec-98		0.5			2	Park and Elm N1	3-Aug-99				2400	2.8
Park and Elm N1	6-Jan-99		2.3		880000	7.6	Polk and Elm S1	3-Aug-99		0.34	84		
Park and Elm N1	2-Mar-99		0.1		7200	700	Park and Elm N1	3-Aug-99		0.3	62		
							Polk and Elm S1	3-Aug-99				16000	4.2
							Polk and Elm S1	13-Aug-99		0.39	64		
							Polk and Elm S1	21-Oct-99	3.93	0.48	45		
Upstream Odor		5.31	0.77	58.39	60,458	65.00							
Upstream No Odor		5.16	0.68	52.12	106,725	57.81							

Downstream Locations - All [redacted]

Location	Field Visit Date	DO (ppm)	Ammonia_M6038 (mg/L)	Sulfate_M6051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)	Location	Field Visit Date	DO (ppm)	Ammonia_M6038 (mg/L)	Sulfate_M6051 (mg/L)	Fecal Coliform (cfu/100mL)	BOD (mg/L)
Hughes Street Bridge	16-Feb-90				160000		Hughes Street Bridge	6-Jan-99	3.66	1.26	67		
Hughes Street Bridge	30-May-90				160000		Polk and 66th	6-Jan-99	5.67	1.39	70		
Hughes Street Bridge	15-Jun-90				160000		Hughes Street Bridge	6-Jan-99		1		470000	28.8
Hughes Street Bridge	28-Sep-92				160000		Hughes Street Bridge	13-Jan-99	3.42	0.79	71		
Hughes Street Bridge	24-Feb-93		0.7		170	1.6	Polk and 66th	13-Jan-99	3.56	0.96	76		
Hughes Street Bridge	16-Apr-93				160000		Hughes Street Bridge	13-Jan-99		0.9		1200000	10.9
Hughes Street Bridge	22-Apr-93		0.2		12000	2	Hughes Street Bridge	21-Jan-99	3.93	0.38	66		
Hughes Street Bridge	29-Jun-93				160000		Hughes Street Bridge	22-Jan-99	2.04	1.24	68		
Hughes Street Bridge	15-Jul-93				690000		Polk and 66th	22-Jan-99	3.56	0.86	69		
Hughes Street Bridge	22-Jul-93				1300000		Hughes Street Bridge	26-Jan-99	1.16	2.13	53		
Hughes Street Bridge	4-Aug-93				160000		Polk and 66th	26-Jan-99	3.33	1.45	61		
Hughes Street Bridge	17-Aug-93		0.9		660000	4.4	Hughes Street Bridge	2-Feb-99	2.54	1.19	58		
Hughes Street Bridge	26-Oct-93		1		9	1.6	Hughes Street Bridge	2-Feb-99		0.9		8100	4.5
Hughes Street Bridge	28-Oct-93				90000		Hughes Street Bridge	4-Feb-99	2.22	1.64	58		
Hughes Street Bridge	17-Feb-94				200		Polk and 66th	4-Feb-99	6.34	0.84	69		
Hughes Street Bridge	31-Mar-94		1.6		7700	2.4	Hughes Street Bridge	5-Feb-99	0.26	1.49	53		
Hughes Street Bridge	12-Apr-94				160000		Polk and 66th	5-Feb-99	2.06	1.52	60		
Hughes Street Bridge	27-Sep-94		1		3300	1.9	Hughes Street Bridge	9-Feb-99	3.29	0.96	48		
Hughes Street Bridge	2-Nov-94		1.2		486000	2.7	Hughes Street Bridge	9-Feb-99		1.4		68000	
Hughes Street Bridge	13-Dec-94				160000		Hughes Street Bridge	12-Feb-99		2.12	47		
Hughes Street Bridge	25-Jan-95				22000		Polk and 66th	12-Feb-99		2.64	62		
Hughes Street Bridge	6-Feb-95		1.4		100000	5.4	Hughes Street Bridge	16-Feb-99	5.45	1.56	58		
Hughes Street Bridge	23-Mar-95				160000		Hughes Street Bridge	16-Feb-99		2		450	2.5
Hughes Street Bridge	1-May-95		2.5		1415000	5.5	Hughes Street Bridge	18-Feb-99	4.58	0.47	9		
Hughes Street Bridge	13-May-95				2000000		Polk and 66th	18-Feb-99	4.88	0.47	23		
Hughes Street Bridge	23-May-95				160000		Hughes Street Bridge	23-Feb-99	1.63	0.15	36		
Hughes Street Bridge	15-Jun-95				2000000		Hughes Street Bridge	23-Feb-99		0.4		1400	3.4
Hughes Street Bridge	20-Jul-95				160000		Hughes Street Bridge	26-Feb-99	1.43	0.35	51		
Hughes Street Bridge	8-Aug-95		0.2		150000	3.3	Polk and 66th	26-Feb-99	2.38	0.83	52		
Hughes Street Bridge	22-Aug-95				850000		Hughes Street Bridge	2-Mar-99	1.3	0.74	40		
Hughes Street Bridge	20-Sep-95				2300		Hughes Street Bridge	2-Mar-99		0.2		220000	121.7
Hughes Street Bridge	5-Oct-95				160000		Hughes Street Bridge	5-Mar-99	1.28	1.41	41		
Hughes Street Bridge	17-Oct-95		2		200000	6.7	Polk and 66th	5-Mar-99	1.11	1.11	35		
Hughes Street Bridge	15-Nov-95		3.2		160000		Hughes Street Bridge	9-Mar-99	1.3	0.73	38		
Hughes Street Bridge	13-Dec-95				160000		Hughes Street Bridge	9-Mar-99		0.6			13.1
Hughes Street Bridge	13-Dec-95				210000		Hughes Street Bridge	11-Mar-99	0.97	0.83	53		
Hughes Street Bridge	4-Jan-96				160000		Polk and 66th	11-Mar-99	1.01	0.86	47		
Hughes Street Bridge	7-Feb-96		2.06		160000		Hughes Street Bridge	16-Mar-99	7	0.99	49		
Hughes Street Bridge	5-Mar-96		0.73		6500	4.4	Polk and 66th	16-Mar-99	7.41	0.87	56		
Hughes Street Bridge	2-Apr-96		3.24		50000		Hughes Street Bridge	16-Mar-99				10	
Hughes Street Bridge	24-Apr-96				17000		Hughes Street Bridge	23-Mar-99	2.1	0.36	57		
Hughes Street Bridge	7-May-96		0.32		160000	18	Hughes Street Bridge	23-Mar-99		0.4		2300	3.9
Hughes Street Bridge	5-Jun-96		0.33		160000	8	Hughes Street Bridge	25-Mar-99	1.14	0.21	56		
Hughes Street Bridge	18-Jun-96		1.1		28000	6.1	Polk and 66th	25-Mar-99	5.2	0.59	55		
Hughes Street Bridge	3-Jul-96				160000		Hughes Street Bridge	30-Mar-99	7.6	0.19	18		
Hughes Street Bridge	5-Aug-96				90000		Hughes Street Bridge	1-Apr-99	4.62	0.43	37		
Hughes Street Bridge	11-Sep-96				160000		Polk and 66th	1-Apr-99	6.6	0.61	43		
Hughes Street Bridge	12-Sep-96				110000		Hughes Street Bridge	5-Apr-99	1.44	0.46	62		
Hughes Street Bridge	8-Oct-96				7000		Hughes Street Bridge	7-Apr-99	1.35	0.74	53		
Hughes Street Bridge	24-Oct-96		0.9		72000	10.2	Polk and 66th	7-Apr-99	0.72	0.88	55		
Hughes Street Bridge	20-Nov-96				200		Hughes Street Bridge	13-Apr-99		0.6		4700	2.3
Hughes Street Bridge	2-Jan-97				160000		Hughes Street Bridge	15-Apr-99	4.03	0.79	24		
Hughes Street Bridge	5-Feb-97		1.4		65000	20.9	Polk and 66th	15-Apr-99	6.26	0.86	26		
Hughes Street Bridge	5-Feb-97				160000		Hughes Street Bridge	23-Apr-99	3.14	0.89	53		
Hughes Street Bridge	14-May-97		4.2		1900000	35.1	Polk and 66th	23-Apr-99	2.39	0.49	55		
Polk and 66th	8-Sep-97						Hughes Street Bridge	27-Apr-99	2.82	1.16	27		
Hughes Street Bridge	9-Sep-97		1		180000	40.2	Polk and 66th	27-Apr-99	4.56	1.23	28		
Hughes Street Bridge	5-Nov-97		3.8		310000	53.4	Hughes Street Bridge	11-May-99	7.72	0.41	7		
Hughes Street Bridge	6-Nov-97		0.2		330000	10	Hughes Street Bridge	18-May-99					
Hughes Street Bridge	7-Nov-97		0.2		60000	8	Polk and 66th	18-May-99	4.57	0.96	55		
Hughes Street Bridge	10-Nov-97		0.5		155000	16.1	Hughes Street Bridge	25-May-99	0.6	1.31	39		
Hughes Street Bridge	12-Nov-97		0.4		86000	19.2	Hughes Street Bridge	25-May-99		0.1		8700	
Hughes Street Bridge	14-Nov-97		1.2		320000	33.7	Hughes Street Bridge	1-Jun-99		0.1		5600	2.5
Hughes Street Bridge	17-Nov-97		2.5		2000000	40.6	Hughes Street Bridge	8-Jun-99	0.88	0.28	65		
Hughes Street Bridge	17-Nov-97				2000000		Hughes Street Bridge	8-Jun-99		0.3		34000	6.8
Hughes Street Bridge	19-Nov-97		5.7		520000	114.9	Hughes Street Bridge	11-Jun-99	1.11	0.58	40		
Hughes Street Bridge	19-Nov-97				920000		Polk and 66th	11-Jun-99	2.91	0.78	39		
Hughes Street Bridge	21-Nov-97		0.6		500000	15.6	Hughes Street Bridge	15-Jun-99	2.91	0.88	54		
Hughes Street Bridge	21-Nov-97		0.6		500000	15.6	Polk and 66th	15-Jun-99	2.76	0.71	42		
Hughes Street Bridge	24-Nov-97				260000	1.6	Hughes Street Bridge	15-Jun-99		0.4		5900	6.1
Hughes Street Bridge	24-Nov-97		1.6		260000		Hughes Street Bridge	22-Jun-99	1.16	0.39	34		
Hughes Street Bridge	26-Nov-97		1.2		43000	10.1	Polk and 66th	22-Jun-99	2.11	0.49	35		
Hughes Street Bridge	26-Nov-97		1.2		43000	10.1	Hughes Street Bridge	22-Jun-99		0.2		16000	2.8
Hughes Street Bridge	1-Dec-97		0.1		57000	5.1	Hughes Street Bridge	29-Jun-99	4.59	0.97	53		
Hughes Street Bridge	1-Dec-97				57000		Polk and 66th	29-Jun-99	3.5	1.23	51		
Hughes Street Bridge	10-Dec-97		1.3		640000	26.6	Hughes Street Bridge	29-Jun-99		0.8		20	2.6
Hughes Street Bridge	10-Dec-97				470000		Hughes Street Bridge	6-Jul-99	2.1	0.29	29		
Hughes Street Bridge	15-Dec-97		1.3		270000	9.4	Polk and 66th	6-Jul-99	1.85	0.97	32		
Hughes Street Bridge	16-Dec-97				270000		Hughes Street Bridge	13-Jul-99		0.3		540	4.6
Hughes Street Bridge	19-Dec-97		0.7		230000	62.7	Hughes Street Bridge	15-Jul-99	3.19	0.52	20		
Hughes Street Bridge	30-Dec-97		1.3		780	3.4	Polk and 66th	15-Jul-99	4.76	0.31	21		
Hughes Street Bridge	30-Dec-97		1.3		780	3.4	Hughes Street Bridge	20-Jul-99		0.3	10		
Hughes Street Bridge	15-Jan-98		6		8700	0	Polk and 66th	20-Jul-99	4.1	0.46	16		
Hughes Street Bridge	15-Jan-98		0		8700	6	Hughes Street Bridge	20-Jul-99		0.1		4000	2.4
Hughes Street Bridge	21-Jan-98		10.7		1100000	0.1	Hughes Street Bridge	27-Jul-99	4.3	0.42	52		
Hughes Street Bridge	21-Jan-98		0.1		1100000	10.7	Polk and 66th	27-Jul-99	6.3	0.76	47		
Hughes Street Bridge	29-Jan-98		57		720000	0.03	Hughes Street Bridge	27-Jul-99		0.1		38000	12.7
Hughes Street Bridge	29-Jan-98				15000	57.4	Hughes Street Bridge	3-Aug-99		0.68	53		
Hughes Street Bridge	12-Feb-98		3.3		38000	0.2	Polk and 66th	3-Aug-99		0.88	56		
Hughes Street Bridge	12-Feb-98		0.2		38000	3.3	Hughes Street Bridge	3-Aug-99		0.5		87000	4.3
Hughes Street Bridge	24-Feb-98		0.18		1400	8.2	Hughes Street Bridge	10-Aug-99		0.8		5900	8.8
Hughes Street Bridge	24-Feb-98		0.2		1400	8.2	Hughes Street Bridge	13-Aug-99		0.81	69		
Hughes Street Bridge	3-Mar-98		0.1		120	5.5	Polk and 66th	13-Aug-99		0.62	66		
Hughes Street Bridge	3-Mar-98		0.1		120	5.5	Hughes Street Bridge	17-Aug-99		0.6		8700	3.3
Hughes Street Bridge	25-Mar-98		1.6		200000	16.8	Hughes Street Bridge	31-Aug-99		1.1		130000	39
Hughes Street Bridge	25-Mar-98		1.6		200000	16.8	Hughes Street Bridge	13-Sep-99		0.3		20000	4.1
Hughes Street Bridge	1-Apr-98		1		1400000	27.1	Hughes Street Bridge	20-Sep-99		2.2		7600	3.2
Hughes Street Bridge	1-Apr-98		1		1400000	27.1	Hughes Street Bridge	27-Sep-99		0.9		380	2.9
Hughes Street Bridge	2-Apr-98			75			Hughes Street Bridge	4-Oct-99	0.84	0.42	46		
Polk and 66th	2-Apr-98						Polk and 66th	4-Oct-99	3.24	0.77	47		
Hughes Street Bridge	15-Apr-98		0.2		360000	30.3	Hughes Street Bridge	21-Oct-99	2.06	1.32	54		
Hughes Street Bridge	15-Apr-98		0.2		360000	30.3	Polk and 66th	21-Oct-99	3.28	1.13	49		
Hughes Street Bridge	21-Apr-98		0.5		32000	3.8	Hughes Street Bridge	1-Nov-99	4.54	0.63	40		
Hughes Street Bridge	21-Apr-98		0.5		32000	3.8	Polk and 66th	1-Nov-99	3.78	0.99	44		
Hughes Street Bridge	27-Apr-98		0.8		31000	6.3	Hughes Street Bridge	2-Nov-99				2400	
Hughes Street Bridge	27-Apr-98		0.8		31000	6.3	Hughes Street Bridge	16-Nov-99					

Hughes Street Bridge	28-Apr-98	0.6	1.3	59			Hughes Street Bridge	29-Nov-99				9	
Polk and 66th	28-Apr-98												
Hughes Street Bridge	5-May-98		1.1		6200	4.6							
Hughes Street Bridge	6-May-98		1.1		6200	4.6							
Hughes Street Bridge	12-May-98				45000								
Hughes Street Bridge	12-May-98	1.41	0.86										
Polk and 66th	12-May-98												
Hughes Street Bridge	12-May-98		0.6		46000	7.7							
Hughes Street Bridge	20-May-98		0.4		100000	9.3							
Hughes Street Bridge	21-May-98	1.2	1.23	61									
Polk and 66th	21-May-98												
Hughes Street Bridge	27-May-98	1.1	0.36	63									
Polk and 66th	27-May-98												
Hughes Street Bridge	27-May-98		0		48000	26.5							
Hughes Street Bridge	28-May-98	1.7	0.54	65									
Polk and 66th	28-May-98												
Hughes Street Bridge	2-Jun-98		0.5		60000	3.3							
Hughes Street Bridge	3-Jun-98	1.2	0.31	70									
Polk and 66th	3-Jun-98												
Hughes Street Bridge	8-Jun-98	1	3.96	36									
Polk and 66th	8-Jun-98												
Hughes Street Bridge	9-Jun-98		1.8		370000								
Hughes Street Bridge	11-Jun-98	1.7	2.5	44									
Polk and 66th	11-Jun-98												
Hughes Street Bridge	15-Jun-98	2.9	0.57	62									
Polk and 66th	15-Jun-98												
Hughes Street Bridge	17-Jun-98	2.74	0.99	56									
Polk and 66th	17-Jun-98	2.17	1.06	50									
Hughes Street Bridge	17-Jun-98		0.4		200000	22.1							
Hughes Street Bridge	22-Jun-98	2.71	0.82	60									
Polk and 66th	23-Jun-98	2.4	0.76	62									
Hughes Street Bridge	26-Jun-98	3.1	1.29	64									
Polk and 66th	26-Jun-98	2.6	1.16	69									
Hughes Street Bridge	26-Jun-98		0.6		720000	6.8							
Hughes Street Bridge	29-Jun-98	7.9	0.28	16									
Polk and 66th	29-Jun-98	7.2	0.37	25									
Hughes Street Bridge	30-Jun-98		0.8		14	4.3							
Hughes Street Bridge	8-Jul-98	0.28	0.21	47									
Polk and 66th	8-Jul-98	0.266	0.11	49									
Hughes Street Bridge	13-Jul-98	2.8	0.65	57									
Polk and 66th	13-Jul-98	2.3	1.46	42									
Hughes Street Bridge	13-Jul-98				27000								
Hughes Street Bridge	20-Jul-98	8.1	0.32	24									
Polk and 66th	20-Jul-98	6.1	0.33	29									
Hughes Street Bridge	23-Jul-98		0.1		710000	13.2							
Hughes Street Bridge	28-Jul-98		0.2		650000	21.6							
Hughes Street Bridge	29-Jul-98	1.37	0.85	55									
Polk and 66th	29-Jul-98	2.84	1.09	50									
Hughes Street Bridge	4-Aug-98		0.6		300000	7.6							
Hughes Street Bridge	12-Aug-98	1.88	0.29	32									
Polk and 66th	12-Aug-98	2.76	0.53	40									
Hughes Street Bridge	17-Aug-98		1			0.8							
Hughes Street Bridge	19-Aug-98	2.72		25									
Polk and 66th	19-Aug-98	4.08	0.45	26									
Hughes Street Bridge	25-Aug-98		0.6		210000	3							
Hughes Street Bridge	26-Aug-98	1.8	0.27	58									
Polk and 66th	28-Aug-98	2.04	1.46	14									
Polk and 66th	31-Aug-98	2.42	1.82	55									
Hughes Street Bridge	1-Sep-98		0.1		230000	4							
Hughes Street Bridge	2-Sep-98	3.1	0.16	20									
Hughes Street Bridge	3-Sep-98				18000								
Hughes Street Bridge	14-Sep-98	2.76	0.24	35									
Polk and 66th	14-Sep-98	2.75	0.87	47									
Hughes Street Bridge	16-Sep-98	7.65	0.27	3									
Polk and 66th	18-Sep-98	1.6	1.85	57									
Hughes Street Bridge	22-Sep-98	1.78	0.35		370000	8.1							
Hughes Street Bridge	22-Sep-98		0.5		370000	8.1							
Polk and 66th	23-Sep-98	1.95	1.74										
Hughes Street Bridge	30-Sep-98		0.32	52	83000	4.4							
Hughes Street Bridge	30-Sep-98		0.3		83000	4.4							
Hughes Street Bridge	2-Oct-98	1.56	0.39	57									
Polk and 66th	2-Oct-98	3.4	1.27	62									
Hughes Street Bridge	7-Oct-98	2.95	0.33	13									
Hughes Street Bridge	9-Oct-98	3.32	0.72	75									
Polk and 66th	9-Oct-98	5.9	0.09	73									
Hughes Street Bridge	12-Oct-98	3.56	1.38	67									
Polk and 66th	12-Oct-98	6.3	2.46	48									
Hughes Street Bridge	14-Oct-98	3.55	0.79	63	2500	1.5							
Hughes Street Bridge	14-Oct-98		0.7		2500	1.5							
Hughes Street Bridge	21-Oct-98	6.05	0.61	25									
Hughes Street Bridge	28-Oct-98	1.14	1.06	70									
Hughes Street Bridge	29-Oct-98	3.11	1.26	76									
Polk and 66th	29-Oct-98	3.52	1.33	78									
Hughes Street Bridge	29-Oct-98				25000								
Hughes Street Bridge	2-Nov-98		0.33	3									
Polk and 66th	2-Nov-98		0.56	7									
Hughes Street Bridge	4-Nov-98	1.118	0.32										
Hughes Street Bridge	4-Nov-98		0.3		4100	2.1							
Hughes Street Bridge	12-Nov-98	4.62	0.64	45									
Polk and 66th	12-Nov-98	9.2	0.39	44									
Hughes Street Bridge	13-Nov-98	7.92	0	3									
Hughes Street Bridge	16-Nov-98	9.24	0.69	30									
Polk and 66th	16-Nov-98	7.67	0.54	30									
Hughes Street Bridge	18-Nov-98	3.01	0	40									
Hughes Street Bridge	18-Nov-98		0.3		13000	4.7							
Hughes Street Bridge	25-Nov-98	2.06	0.51	75									
Hughes Street Bridge	25-Nov-98	2.85	0.27	53									
Polk and 66th	25-Nov-98	1.87	0.65	66									
Hughes Street Bridge	2-Dec-98	0.52	0.66	12									
Hughes Street Bridge	2-Dec-98		0.2		8800	5.4							
Hughes Street Bridge	9-Dec-98		0.2		560000	4.1							
Hughes Street Bridge	22-Dec-98		0.5		79000	4.6							
Hughes Street Bridge	23-Dec-98	2.56	0	74									
Polk and 66th	23-Dec-98	5.18	0	57									
Hughes Street Bridge	30-Dec-98	5.4	0.26	40									
Polk and 66th	30-Dec-98	6.7	0.38	63									
Hughes Street Bridge	30-Dec-98		0.8			18.7							
		3.35	1.34	47.02	293,456	12.86			3.21	0.81	46.78	83,916	12.38

Downstream Odor							Downstream No Odor						
Location	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100ml	BOD (mg/L)	Location	Field Visit Date	DO (ppm)	Ammonia_M8038 (mg/L)	Sulfate_M8051 (mg/L)	Fecal Coliform (cfu/100ml	BOD (mg/L)
Hughes Street Bridge	5-Nov-97		3.8		310000	53.4	Hughes Street Bridge	1-Nov-99	4.54	0.63	40		
Hughes Street Bridge	6-Nov-97		0.2		330000	10	Polk and 66th	1-Nov-99	3.78	0.99	44		
Hughes Street Bridge	7-Nov-97		0.2		60000	8	Hughes Street Bridge	24-Nov-97				260000	1.6
Hughes Street Bridge	10-Nov-97		0.5		155000	16.1	Hughes Street Bridge	24-Nov-97		1.6		260000	
Hughes Street Bridge	12-Nov-97		0.4		86000	19.2	Hughes Street Bridge	26-Nov-97		1.2		43000	10.1
Hughes Street Bridge	14-Nov-97		1.2		320000	33.7	Hughes Street Bridge	26-Nov-97		1.2		43000	10.1
Hughes Street Bridge	17-Nov-97		2.5		2000000	40.6	Hughes Street Bridge	1-Dec-97				57000	
Hughes Street Bridge	19-Nov-97		5.7		520000	114.9	Hughes Street Bridge	1-Dec-97		0.1		57000	5.1
Hughes Street Bridge	21-Nov-97		0.6		500000	15.6	Hughes Street Bridge	10-Dec-97				470000	
Hughes Street Bridge	15-Dec-97		1.3		270000	9.4	Hughes Street Bridge	10-Dec-97		1.3		640000	26.6
Hughes Street Bridge	19-Dec-97		0.7		230000	62.7	Hughes Street Bridge	30-Dec-97		1.3		780	3.4
Hughes Street Bridge	21-Jan-98		10.7		1100000	0.1	Hughes Street Bridge	30-Dec-97		1.3		780	3.4
Hughes Street Bridge	25-Mar-98		1.6		200000	16.8	Hughes Street Bridge	15-Jan-98		6		8700	0
Hughes Street Bridge	1-Apr-98		1		1400000	27.1	Hughes Street Bridge	15-Jan-98		0		8700	6
Hughes Street Bridge	2-Apr-98			75			Hughes Street Bridge	29-Jan-98				15000	57.4
Hughes Street Bridge	15-Apr-98		0.2		360000	30.3	Hughes Street Bridge	29-Jan-98		57		720000	0.03
Hughes Street Bridge	27-Apr-98		0.8		31000	6.3	Hughes Street Bridge	12-Feb-98		0.2		38000	3.3
Hughes Street Bridge	28-Apr-98	0.6	1.3	59			Hughes Street Bridge	12-Feb-98		3.3		38000	0.2
Hughes Street Bridge	6-May-98		1.1		6200	4.6	Hughes Street Bridge	24-Feb-98		0.2		1400	8.2
Hughes Street Bridge	12-May-98				45000		Hughes Street Bridge	24-Feb-98		0.18		1400	8.2
Hughes Street Bridge	12-May-98				45000		Hughes Street Bridge	3-Mar-98		0.1		120	5.5
Hughes Street Bridge	12-May-98	1.41	0.66				Hughes Street Bridge	3-Mar-98		0.1		120	5.5
Hughes Street Bridge	12-May-98	1.41	0.66				Hughes Street Bridge	21-Apr-98		0.5		32000	3.8
Hughes Street Bridge	21-May-98	1.2	1.23	61			Hughes Street Bridge	21-Apr-98		0.5		32000	3.8
Hughes Street Bridge	27-May-98	1.1	0.36	63			Polk and 66th	28-May-98					
Hughes Street Bridge	11-Jun-98	1.7	2.5	44			Hughes Street Bridge	28-May-98	1.7	0.54	65		
Hughes Street Bridge	17-Jun-98	2.74	0.99	56			Hughes Street Bridge	3-Jun-98	1.2	0.31	70		
Hughes Street Bridge	22-Jun-98	2.71	0.82	60			Polk and 66th	3-Jun-98					
Hughes Street Bridge	13-Jul-98	2.8	0.65	57			Polk and 66th	8-Jun-98					
Hughes Street Bridge	26-Aug-98	1.8	0.27	58			Hughes Street Bridge	8-Jun-98	1	3.96	36		
Hughes Street Bridge	2-Oct-98	1.56	0.39	57			Hughes Street Bridge	15-Jun-98	2.9	0.57	62		
Hughes Street Bridge	29-Oct-98	3.11	1.26	76			Polk and 66th	15-Jun-98					
Hughes Street Bridge	25-Nov-98	2.06	0.51	75			Hughes Street Bridge	26-Jun-98	3.1	1.29	64		
Hughes Street Bridge	25-Nov-98	2.06	0.51	75			Hughes Street Bridge	26-Jun-98		0.6		720000	6.8
Hughes Street Bridge	25-Nov-98	2.85	0.27	53			Polk and 66th	26-Jun-98	2.6	1.15	69		
Hughes Street Bridge	25-Nov-98	2.85	0.27	53			Polk and 66th	29-Jun-98	7.2	0.37	25		
Hughes Street Bridge	2-Dec-98	0.52	0.66	12			Hughes Street Bridge	29-Jun-98	7.9	0.28	16		
Hughes Street Bridge	4-Oct-99	0.84	0.42	46			Hughes Street Bridge	8-Jul-98	0.28	0.21	47		
Hughes Street Bridge	23-Dec-98	2.55	0	74			Polk and 66th	8-Jul-98	0.285	0.11	49		
Hughes Street Bridge	30-Dec-98	5.4	0.26	40			Hughes Street Bridge	20-Jul-98	8.1	0.32	24		
Hughes Street Bridge	6-Jan-99	3.66	1.26	67			Polk and 66th	20-Jul-98	6.1	0.33	29		
Hughes Street Bridge	21-Jan-99	3.93	0.38	66			Polk and 66th	29-Jul-98	2.84	1.09	50		
Hughes Street Bridge	22-Jan-99	2.04	1.24	68			Hughes Street Bridge	29-Jul-98	1.37	0.85	55		
Hughes Street Bridge	26-Jan-99	1.15	2.13	53			Hughes Street Bridge	12-Aug-98	1.88	0.29	32		
Hughes Street Bridge	2-Feb-99	2.54	1.19	58			Polk and 66th	12-Aug-98	2.76	0.53	40		
Hughes Street Bridge	4-Feb-99	2.22	1.64	58			Hughes Street Bridge	19-Aug-98	2.72		25		
Hughes Street Bridge	5-Feb-99	0.26	1.49	53			Polk and 66th	19-Aug-98	4.08	0.45	26		
Hughes Street Bridge	9-Feb-99	3.29	0.98	48			Hughes Street Bridge	2-Sep-98	3.1	0.16	20		
Hughes Street Bridge	12-Feb-99		2.12	47			Hughes Street Bridge	14-Sep-98	2.76	0.24	35		
Hughes Street Bridge	16-Feb-99	5.45	1.55	58			Polk and 66th	14-Sep-98	2.75	0.87	47		
Hughes Street Bridge	18-Feb-99	4.58	0.47	9			Hughes Street Bridge	16-Sep-98	7.65	0.27	3		
Hughes Street Bridge	26-Feb-99	1.43	0.35	51			Hughes Street Bridge	22-Sep-98		0.5		370000	8.1
Hughes Street Bridge	2-Mar-99	1.3	0.74	40			Hughes Street Bridge	22-Sep-98	1.78	0.35		370000	8.1
Hughes Street Bridge	5-Mar-99	1.28	1.41	41			Hughes Street Bridge	30-Sep-98		0.3		83000	4.4
Hughes Street Bridge	9-Mar-99	1.3	0.73	38			Hughes Street Bridge	30-Sep-98		0.32	52	83000	4.4
Hughes Street Bridge	11-Mar-99	0.97	0.83	53			Hughes Street Bridge	7-Oct-98	2.95	0.33	13		
Hughes Street Bridge	23-Mar-99	2.1	0.38	57			Hughes Street Bridge	9-Oct-98	3.32	0.72	75		
Hughes Street Bridge	25-Mar-99	1.14	0.21	55			Polk and 66th	9-Oct-98	5.9	0.09	73		
Hughes Street Bridge	30-Mar-99	7.6	0.19	18			Hughes Street Bridge	12-Oct-98	3.56	1.38	67		
Hughes Street Bridge	5-Apr-99	1.44	0.46	62			Polk and 66th	12-Oct-98	6.3	2.46	48		
Hughes Street Bridge	7-Apr-99	1.35	0.74	53			Hughes Street Bridge	14-Oct-98	3.55	0.79	63	2500	1.5
Hughes Street Bridge	23-Apr-99	3.14	0.89	53			Hughes Street Bridge	14-Oct-98		0.7		2500	1.5
Hughes Street Bridge	27-Apr-99	2.82	1.16	27			Hughes Street Bridge	21-Oct-98	6.05	0.61	25		
Hughes Street Bridge	25-May-99	0.6	1.31	39			Hughes Street Bridge	28-Oct-98	1.14	1.06	70		
Hughes Street Bridge	8-Jun-99	0.88	0.28	65			Hughes Street Bridge	2-Nov-98		0.33	3		
Hughes Street Bridge	11-Jun-99	1.11	0.58	40			Polk and 66th	2-Nov-98		0.56	7		
Hughes Street Bridge	29-Jun-99	4.59	0.97	53			Hughes Street Bridge	4-Nov-98	1.118	0.32			
Hughes Street Bridge	27-Jul-99	4.3	0.42	52			Hughes Street Bridge	4-Nov-98		0.3		4100	2.1
Polk and 66th	2-Apr-98						Hughes Street Bridge	12-Nov-98	4.62	0.64	45		
Polk and 66th	28-Apr-98						Polk and 66th	12-Nov-98	9.2	0.39	44		
Polk and 66th	12-May-98						Hughes Street Bridge	13-Nov-98	7.92	0	3		
Polk and 66th	12-May-98						Hughes Street Bridge	16-Nov-98	9.24	0.69	30		
Polk and 66th	21-May-98						Polk and 66th	16-Nov-98	7.67	0.54	30		
Polk and 66th	27-May-98						Hughes Street Bridge	18-Nov-98	3.01	0	40		
Polk and 66th	11-Jun-98						Hughes Street Bridge	18-Nov-98		0.3		13000	4.7
Polk and 66th	17-Jun-98	2.17	1.06	50			Hughes Street Bridge	13-Jan-99	3.42	0.79	71		

Polk and 66th	13-Jul-98	2.3	1.46	42			Polk and 66th	13-Jan-99	3.55	0.96	75		
Polk and 66th	2-Oct-98	3.4	1.27	62			Hughes Street Bridge	13-Jan-99		0.9		1200000	10.9
Polk and 66th	29-Oct-98	3.52	1.33	78			Hughes Street Bridge	23-Feb-99	1.63	0.15	36		
Polk and 66th	25-Nov-98	1.87	0.65	66			Hughes Street Bridge	23-Feb-99		0.4		1400	3.4
Polk and 66th	25-Nov-98	1.87	0.65	66			Polk and 66th	16-Mar-99	7.41	0.87	55		
Polk and 66th	23-Dec-98	5.18	0	57			Hughes Street Bridge	16-Mar-99				10	
Polk and 66th	30-Dec-98	6.7	0.38	63			Hughes Street Bridge	16-Mar-99	7	0.99	49		
Polk and 66th	6-Jan-99	5.57	1.39	70			Polk and 66th	1-Apr-99	6.6	0.61	43		
Polk and 66th	22-Jan-99	3.55	0.88	69			Hughes Street Bridge	1-Apr-99	4.62	0.43	37		
Polk and 66th	26-Jan-99	3.33	1.45	61			Polk and 66th	15-Apr-99	6.26	0.86	26		
Polk and 66th	4-Feb-99	6.34	0.84	69			Hughes Street Bridge	15-Apr-99	4.03	0.79	24		
Polk and 66th	5-Feb-99	2.08	1.52	60			Hughes Street Bridge	11-May-99	7.72	0.41	7		
Polk and 66th	12-Feb-99		2.64	62			Polk and 66th	15-Jun-99	2.76	0.71	42		
Polk and 66th	18-Feb-99	4.88	0.47	23			Hughes Street Bridge	15-Jun-99		0.4		5900	6.1
Polk and 66th	26-Feb-99	2.38	0.83	52			Hughes Street Bridge	15-Jun-99	2.91	0.88	54		
Polk and 66th	5-Mar-99	1.11	1.11	35			Polk and 66th	22-Jun-99	2.11	0.49	35		
Polk and 66th	11-Mar-99	1.01	0.85	47			Hughes Street Bridge	22-Jun-99		0.2		16000	2.8
Polk and 66th	25-Mar-99	5.2	0.59	55			Hughes Street Bridge	22-Jun-99	1.16	0.39	34		
Polk and 66th	7-Apr-99	0.72	0.88	55			Polk and 66th	6-Jul-99	1.85	0.97	32		
Polk and 66th	23-Apr-99	2.39	0.49	55			Hughes Street Bridge	6-Jul-99	2.1	0.29	29		
Polk and 66th	27-Apr-99	4.56	1.23	28			Polk and 66th	15-Jul-99	4.76	0.31	21		
Polk and 66th	11-Jun-99	2.91	0.78	39			Hughes Street Bridge	15-Jul-99	3.19	0.52	20		
Polk and 66th	29-Jun-99	3.5	1.23	51			Polk and 66th	20-Jul-99	4.1	0.46	16		
Polk and 66th	27-Jul-99	6.3	0.78	47			Hughes Street Bridge	20-Jul-99		0.1		4000	2.4
Polk and 66th	4-Oct-99	3.24	0.77	47			Hughes Street Bridge	20-Jul-99		0.3	10		
Hughes Street Bridge	25-May-99		0.1		8700		Polk and 66th	3-Aug-99		0.88	56		
Hughes Street Bridge	8-Jun-99		0.3		34000	6.8	Hughes Street Bridge	3-Aug-99		0.5		87000	4.3
Hughes Street Bridge	29-Jun-99		0.8		20	2.6	Hughes Street Bridge	3-Aug-99		0.68	53		
Hughes Street Bridge	27-Jul-99		0.1		38000	12.7	Polk and 66th	13-Aug-99		0.62	66		
Hughes Street Bridge	2-Dec-98		0.2		8800	5.4	Hughes Street Bridge	13-Aug-99		0.81	69		
Hughes Street Bridge	30-Dec-98		0.8			18.7	Polk and 66th	21-Oct-99	3.28	1.13	49		
Hughes Street Bridge	6-Jan-99		1		470000	28.8	Hughes Street Bridge	21-Oct-99	2.06	1.32	54		
Hughes Street Bridge	2-Feb-99		0.9		8100	4.5							
Hughes Street Bridge	9-Feb-99		1.4		68000								
Hughes Street Bridge	16-Feb-99		2		450	2.5							
Hughes Street Bridge	2-Mar-99		0.2		220000	121.7							
Hughes Street Bridge	9-Mar-99		0.6			13.1							
Hughes Street Bridge	23-Mar-99		0.4		2300	3.9							
Hughes Street Bridge	17-Nov-97				2000000								
Hughes Street Bridge	19-Nov-97				920000								
Hughes Street Bridge	21-Nov-97		0.6		500000	15.6							
Hughes Street Bridge	15-Dec-97				270000								
Hughes Street Bridge	21-Jan-98		0.1		1100000	10.7							
Hughes Street Bridge	25-Mar-98		1.6		200000	16.8							
Hughes Street Bridge	1-Apr-98		1		1400000	27.1							
Hughes Street Bridge	15-Apr-98		0.2		360000	30.3							
Hughes Street Bridge	27-Apr-98		0.8		31000	6.3							
Hughes Street Bridge	12-May-98		0.6		45000	7.7							
Hughes Street Bridge	12-May-98		0.6		45000	7.7							
Hughes Street Bridge	27-May-98		0		48000	26.5							
Hughes Street Bridge	17-Jun-98		0.4		200000	22.1							
Hughes Street Bridge	13-Jul-98				27000								
Hughes Street Bridge	29-Oct-98				25000								
	Odor	2.69	0.99	53.22	355,502	22.64							
	NoOdor	3.97	1.29	40.66	149,721	6.87							

Appendix – V Map and Cross Sections for Open Portion Hydraulic Model

The channel distances are measured from the confluence of Braes Bayou and Country Club Bayou and this location is shown as the Eastern reference mark on the map. The section geometry 400 feet upstream was chosen as representative of the geometry through the wide portion of the country club, while the geometry 1300 feet upstream was chosen as representative of the geometry from that location to Wayside Drive. Sections 3000 and 3800 feet were selected to model the portion from Polk St. to Wayside Drive. Section 4900 represents the approach to the Polk Street culvert, and section 0600 represents the upper portion of the bayou. The sections are referenced to the centerline of the channel depicted on the map for the area calculations.

Figure V.1 is an excerpt from a USGS topographic map that displays the sections analyzed to develop the hydraulic model of the open portion.

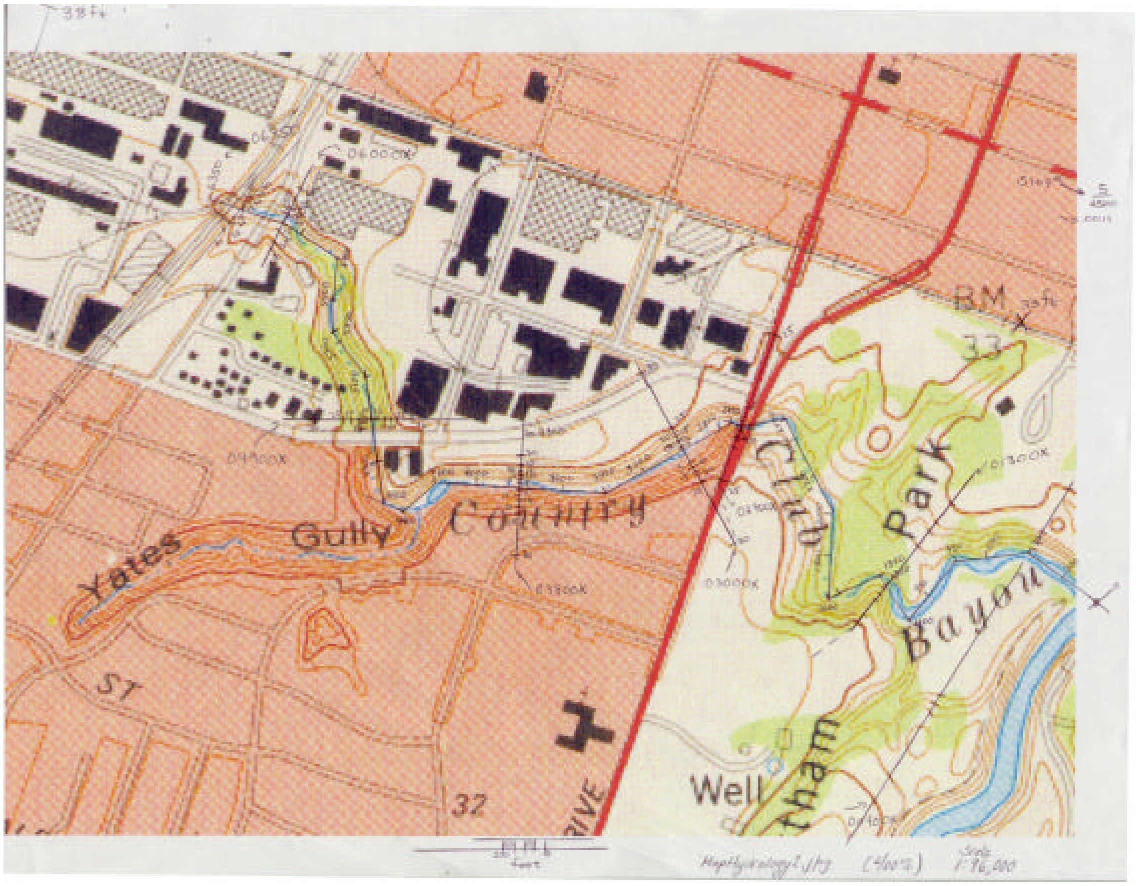

Figure V.1. Topographic map of Country Club showing cross section location

Figures V.2-V.9 show the geometry of the cross sections.

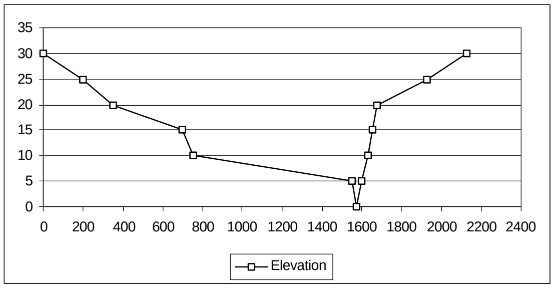

Figure V.2 Section 00400
(400 ft upstream of Country Club Bayou - Braes Bayou Confluence)

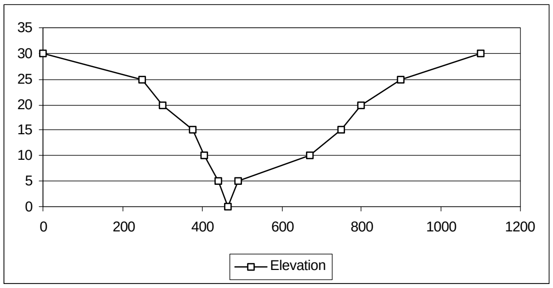

Figure V.3 Section 01300
(1300 ft upstream of Country Club Bayou - Braes Bayou Confluence)

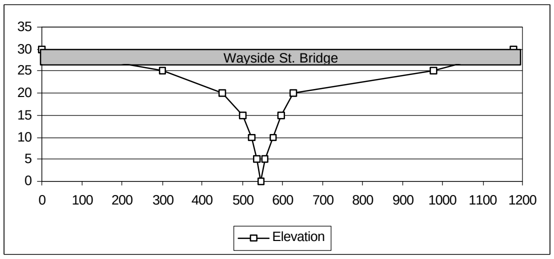

Figure V.4 Section 02700
(2700 ft upstream of Country Club Bayou - Braes Bayou Confluence-Upstream of Wayside)

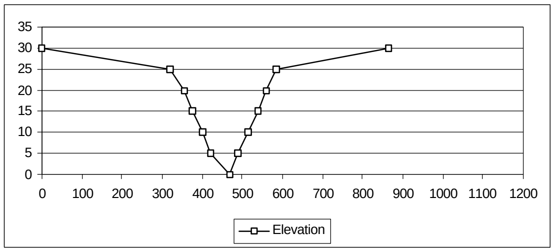

Figure V.5 Section 03000
(2700 ft upstream of Country Club Bayou - Braes Bayou Confluence)

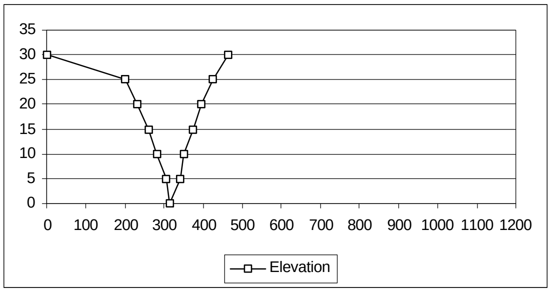

Figure V.6 Section 03800
(2700 ft upstream of Country Club Bayou - Braes Bayou Confluence)

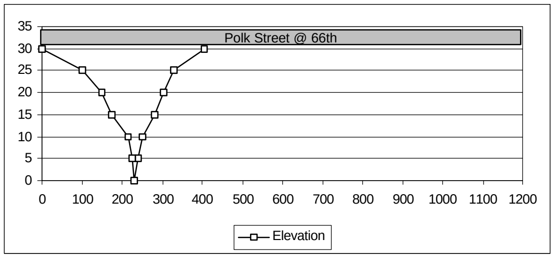

Figure V.7 Section 04900
(2700 ft upstream of Country Club Bayou - Braes Bayou Confluence @ Polk Street)

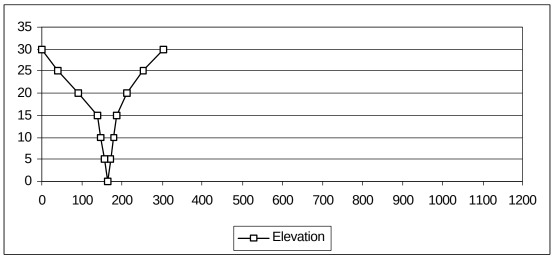

Figure V.8 Section 06000
(6000 ft upstream of Country Club Bayou - Braes Bayou Confluence ~ East of Hughes Street)

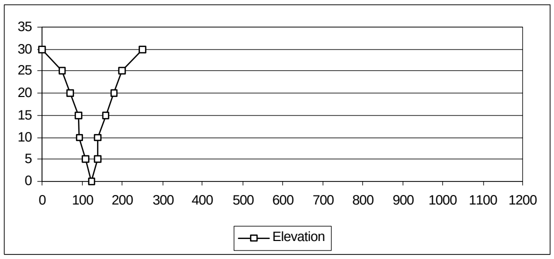

Figure V.9 Section 06400
(6400 ft upstream of Country Club Bayou - Braes Bayou Confluence ~ Under RR Bridge)

Appendix – VII Representative QUAL2EU Input and Output Files

C855D.dat

```
TITLE01              COUNTRY CLUB BAYOU -- 855GPM; 10-14-1999
TITLE02              NO ODOR HSB=DO(3.24,3.96);BOD(5.04,6.16); WAYSIDE=DO(4.32,5,28)
TITLE03   NO         CONSERVATIVE MINERAL   I    TDS IN MG/L
TITLE04   NO         CONSERVATIVE MINERAL  II
TITLE05   NO         CONSERVATIVE MINERAL III
TITLE06  YES         TEMPERATURE
TITLE07  YES         5-DAY BIOCHEMICAL OXYGEN DEMAND
TITLE08   NO         ALGAE AS CHL-A IN UG/L
TITLE09   NO         PHOSPHORUS CYCLE AS P IN MG/L
TITLE10                (ORGANIC-P; DISSOLVED-P)
TITLE11   NO         NITROGEN CYCLE AS N IN MG/L
TITLE12                (ORGANIC-N; AMMONIA-N; NITRITE-N;' NITRATE-N)
TITLE13  YES         DISSOLVED OXYGEN IN MG/L
TITLE14   NO         FECAL COLIFORM IN NO./100 ML
TITLE15   NO         ARBITRARY NON-CONSERVATIVE
ENDTITLE
LIST DATA INPUT
NOWRITE OPTIONAL SUMMARY
NO FLOW AUGMENTATION
STEADY STATE
NO TRAP CHANNELS
PRINT LCD/SOLAR DATA
PLOT DO AND BOD
FIXED DNSTM CONC (YES=1)=        0.          5D-ULT BOD CONV K COEF  =      0.25
INPUT METRIC            =        1.          OUTPUT METRIC           =        1.
NUMBER OF REACHES       =        5.          NUMBER OF JUNCTIONS     =        1.
NUM OF HEADWATERS       =        2.          NUMBER OF POINT LOADS   =        4.
TIME STEP (HOURS)       =                    LNTH. COMP. ELEMENT (KM)=     0.121
MAXIMUM ROUTE TIME (HRS)=       30.          TIME INC. FOR RPT2 (HRS)=
LATITUDE OF BASIN (DEG) =      42.5          LONGITUDE OF BASIN (DEG)=      83.3
STANDARD MERIDIAN (DEG) =       75.          DAY OF YEAR START TIME  =      196.
EVAP. COEF.,(AE)        =       0.0          EVAP. COEF.,(BE)        =  .0000056
ELEV. OF BASIN (METERS) =      150.          DUST ATTENUATION COEF.  =      0.13
ENDATA1
ENDATA1A
THETA    OXY TRAN   1.0159
ENDATA1B
STREAM REACH     1. RCH= ENNIS TO ALTIC    FROM         5.56    TO          4.35
STREAM REACH    1.1 RCH= ALTIC-EVERGRN     FROM         4.35    TO          3.14
STREAM REACH     2. RCH= S2-EVERGRN        FROM         3.51    TO          3.14
STREAM REACH     3. RCH= EVERGRN-HUGHES    FROM         3.14    TO          1.93
STREAM REACH     4. RCH= HUGHES-BRAES      FROM         1.81    TO           0.0
ENDATA2
ENDATA3
FLAG FIELD RCH=  1.        10.          1.2.2.2.2.2.2.2.2.2.
FLAG FIELD RCH= 1.1        10.          2.2.6.2.2.2.2.2.6.3.
FLAG FIELD RCH=  2.         3.          1.6.2.
FLAG FIELD RCH=  3.        10.          4.6.2.2.2.2.2.2.2.2.
FLAG FIELD RCH=  4.        16.          2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.5.
ENDATA4
HYDRAULICS RCH=  1.       3.8     0.170     0.995      0.734      .0041      .020
HYDRAULICS RCH= 1.1       3.8     0.170     0.995      0.734      .0041      .020
HYDRAULICS RCH=  2.       3.8     0.170     0.995      0.734      .0041      .020
HYDRAULICS RCH=  3.       3.8     0.170     0.985      0.734      .0041      .020
HYDRAULICS RCH=  4.       7.6     0.14      1.004      1.184      .0005      .020
ENDATA5
REACT COEF RCH=   1.   0.050   0.000   0.900  1.   0.500  0.0000  0.0000
REACT COEF RCH=  1.1   0.050   0.000   0.900  1.   0.500  0.0000  0.0000
REACT COEF RCH=   2.   0.050   0.000   0.900  1.   0.500  0.0000  0.0000
REACT COEF RCH=   3.   0.050   0.000   0.900  1.   0.500  0.0000  0.0000
REACT COEF RCH=   4.   0.050   0.000   0.900  1.   1.000  0.0000  0.0000
ENDATA6
ENDATA6A
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ALG/OTHER COEF RCH=   1.   50.0   0.15   3.80   1.50
ALG/OTHER COEF RCH=  1.1   50.0   0.15   3.80   1.50
ALG/OTHER COEF RCH=   2.   50.0   0.15   0.38   1.50
ALG/OTHER COEF RCH=   3.   50.0   0.15   0.38   1.50
ALG/OTHER COEF RCH=   4.   50.0   0.15   3.80   1.50
ENDATA6B
INITIAL COND-1 RCH=   1.  20.00   0.00   0.00   0.00   0.00   0.00  0.000    0.0
INITIAL COND-1 RCH=  1.1  20.00   0.00   0.00   0.00   0.00   0.00  0.000    0.0
INITIAL COND-1 RCH=   2.  20.00   0.00   0.00   0.00   0.00   0.00  0.000    0.0
INITIAL COND-1 RCH=   3.  20.00   0.00   0.00   0.00   0.00   0.00  0.000    0.0
INITIAL COND-1 RCH=   4.  20.00   0.00   0.00   0.00   0.00   0.00  0.000    0.0
ENDATA7
ENDATA7A
INCR INFLOW-1  RCH=   1.  0.000  20.00   0.0   0.0   0.0   0.0   0.0   0.0   0.0
INCR INFLOW-1  RCH=  1.1  0.000  20.00   0.0   0.0   0.0   0.0   0.0   0.0   0.0
INCR INFLOW-1  RCH=   2.  0.000  20.00   0.0   0.0   0.0   0.0   0.0   0.0   0.0
INCR INFLOW-1  RCH=   3.  0.000  20.00   0.0   0.0   0.0   0.0   0.0   0.0   0.0
INCR INFLOW-1  RCH=   4.  0.000  20.00   0.0   0.0   0.0   0.0   0.0   0.0   0.0
ENDATA8
ENDATA8A
STREAM JUNCTION       1.      JNC=S2-EVERGRN           20.       24.       23.
ENDATA9
HEADWTR-1 HDW=   1.ENNIS             0.025    20.0   3.0   09.5   0.0   0.0   0.0
HEADWTR-1 HDW=   2.S2                0.023    20.0   3.0   09.5   0.0   0.0   0.0
ENDATA10
ENDATA10A
POINTLD-1 PTL=   1.SWEETEX      0.00   0.006  20.0   0.1  99.0   0.0   0.0   0.0
POINTLD-1 PTL=   2.ALTIC        0.00  -0.000  20.0   5.5   0.0   0.0   0.0   0.0
POINTLD-1 PTL=   3.SOUTH        0.00   0.000  20.0   6.5  50.0   0.0   0.0   0.0
POINTLD-1 PTL=   4.VENTS        0.00  -0.000  20.0   5.5   0.0   0.0   0.0   0.0
ENDATA11
ENDATA11A
ENDATA12
ENDATA13
ENDATA13A
LOCAL CLIMATOLOGY                            .25     25.     20.  980.      2.5
BEGIN  RCH    1
PLOT   RCH    1    0    0    0    0
BEGIN  RCH    3
PLOT   RCH    0    0    3    0    0
BEGIN  RCH    1
PLOT   RCH    1    2    0    3    4
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C855D.out

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                                     * * * QUAL-2E  STREAM QUALITY ROUTING MODEL * * *
                                                  Version 3.22  --  May 1996

 $$$ (PROBLEM TITLES) $$$

CARD TYPE                             QUAL-2E PROGRAM TITLES
TITLE01              COUNTRY CLUB BAYOU -- 855GPM; 10-14-1999
TITLE02              NO ODOR HSB=DO(3.24,3.96);BOD(5.04,6.16); WAYSIDE=DO(4.32,5
TITLE03   NO         CONSERVATIVE MINERAL   I    TDS IN MG/L
TITLE04   NO         CONSERVATIVE MINERAL  II
TITLE05   NO         CONSERVATIVE MINERAL III
TITLE06  YES         TEMPERATURE
TITLE07  YES         5-DAY BIOCHEMICAL OXYGEN DEMAND
TITLE08   NO         ALGAE AS CHL-A IN UG/L
TITLE09   NO         PHOSPHORUS CYCLE AS P IN MG/L
TITLE10                (ORGANIC-P; DISSOLVED-P)
TITLE11   NO         NITROGEN CYCLE AS N IN MG/L
TITLE12                (ORGANIC-N; AMMONIA-N; NITRITE-N;' NITRATE-N)
TITLE13  YES         DISSOLVED OXYGEN IN MG/L
TITLE14   NO         FECAL COLIFORM IN NO./100 ML
TITLE15   NO         ARBITRARY NON-CONSERVATIVE
ENDTITLE

 $$$ DATA TYPE 1 (CONTROL DATA) $$$

CARD TYPE                                    CARD TYPE
LIST DATA INPUT             0.00000                                      0.00000
NOWRITE OPTIONAL SUMMARY    0.00000                                      0.00000
NO FLOW AUGMENTATION        0.00000                                      0.00000
STEADY STATE                0.00000                                      0.00000
NO TRAP CHANNELS            0.00000                                      0.00000
PRINT LCD/SOLAR DATA        0.00000                                      0.00000
PLOT DO AND BOD             0.00000                                      0.00000
FIXED DNSTM CONC (YES=1)=   0.00000          5D-ULT BOD CONV K COEF  =   0.25000
INPUT METRIC            =   1.00000          OUTPUT METRIC           =   1.00000
NUMBER OF REACHES       =   5.00000          NUMBER OF JUNCTIONS     =   1.00000
NUM OF HEADWATERS       =   2.00000          NUMBER OF POINT LOADS   =   4.00000
TIME STEP (HOURS)       =   0.00000          LNTH. COMP. ELEMENT (KM)=   0.12100
MAXIMUM ROUTE TIME (HRS)=  30.00000          TIME INC. FOR RPT2 (HRS)=   0.00000
LATITUDE OF BASIN (DEG) =  42.50000          LONGITUDE OF BASIN (DEG)=  83.30000
STANDARD MERIDIAN (DEG) =  75.00000          DAY OF YEAR START TIME  = 196.00000
EVAP. COEF.,(AE)        =   0.00000          EVAP. COEF.,(BE)        =   0.00001
ELEV. OF BASIN (METERS) = 150.00000          DUST ATTENUATION COEF.  =   0.13000
ENDATA1                     0.00000                                      0.00000
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 $$$ DATA TYPE 1A (ALGAE PRODUCTION AND NITROGEN OXIDATION CONSTANTS) $$$

CARD TYPE                                           CARD TYPE
ENDATA1A                            0.0000                                              0.0000

 $$$ DATA TYPE 1B (TEMPERATURE CORRECTION CONSTANTS FOR RATE COEFFICIENTS) $$$

CARD TYPE     RATE CODE     THETA VALUE

THETA( 1)      BOD DECA        1.047     DFLT
THETA( 2)      BOD SETT        1.024     DFLT
THETA( 3)      OXY TRAN        1.016     USER
THETA( 4)      SOD RATE        1.060     DFLT
THETA( 5)      ORGN DEC        1.047     DFLT
THETA( 6)      ORGN SET        1.024     DFLT
THETA( 7)      NH3 DECA        1.083     DFLT
THETA( 8)      NH3 SRCE        1.074     DFLT
THETA( 9)      NO2 DECA        1.047     DFLT
THETA(10)      PORG DEC        1.047     DFLT
THETA(11)      PORG SET        1.024     DFLT
THETA(12)      DISP SRC        1.074     DFLT
THETA(13)      ALG GROW        1.047     DFLT
THETA(14)      ALG RESP        1.047     DFLT
THETA(15)      ALG SETT        1.024     DFLT
THETA(16)      COLI DEC        1.047     DFLT
THETA(17)      ANC DECA        1.000     DFLT
THETA(18)      ANC SETT        1.024     DFLT
THETA(19)      ANC SRCE        1.000     DFLT
ENDATA1B

 $$$ DATA TYPE 2 (REACH IDENTIFICATION) $$$

CARD TYPE           REACH ORDER AND IDENT               R. MI/KM            R. MI/KM
STREAM REACH     1.0  RCH= ENNIS TO ALTIC    FROM          5.6    TO           4.3
STREAM REACH     1.1  RCH= ALTIC-EVERGRN     FROM          4.3    TO           3.1
STREAM REACH     2.0  RCH= S2-EVERGRN        FROM          3.5    TO           3.1
STREAM REACH     3.0  RCH= EVERGRN-HUGHES    FROM          3.1    TO           1.9
STREAM REACH     4.0  RCH= HUGHES-BRAES      FROM          1.8    TO           0.0
ENDATA2          0.0                                       0.0                 0.0

 $$$ DATA TYPE 3 (TARGET LEVEL DO AND FLOW AUGMENTATION SOURCES) $$$

CARD TYPE                  REACH  AVAIL HDWS TARGET     ORDER OF AVAIL SOURCES
ENDATA3                     0.        0.       0.0   0.   0.   0.   0.   0.   0.

 $$$ DATA TYPE 4 (COMPUTATIONAL REACH FLAG FIELD) $$$
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CARD TYPE        REACH ELEMENTS/REACH             COMPUTATIONAL FLAGS
FLAG FIELD        1.       10.          1.2.2.2.2.2.2.2.2.2.0.0.0.0.0.0.0.0.0.0.
FLAG FIELD        1.       10.          2.2.6.2.2.2.2.2.6.3.0.0.0.0.0.0.0.0.0.0.
FLAG FIELD        2.        3.          1.6.2.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
FLAG FIELD        3.       10.          4.6.2.2.2.2.2.2.2.2.0.0.0.0.0.0.0.0.0.0.
FLAG FIELD        4.       16.          2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.5.0.0.0.0.
ENDATA4           0.        0.          0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.

 $$$ DATA TYPE 5 (HYDRAULIC DATA FOR DETERMINING VELOCITY AND DEPTH) $$$

CARD TYPE        REACH  COEF-DSPN  COEFQV    EXPOQV    COEFQH   EXPOQH     CMANN
HYDRAULICS        1.      3.80     0.170     0.995     0.734     0.004     1.020
HYDRAULICS        1.      3.80     0.170     0.995     0.734     0.004     1.020
HYDRAULICS        2.      3.80     0.170     0.995     0.734     0.004     1.020
HYDRAULICS        3.      3.80     0.170     0.985     0.734     0.004     1.020
HYDRAULICS        4.      7.60     0.140     1.004     1.184     0.000     5.020
ENDATA5           0.      0.00     0.000     0.000     0.000     0.000     0.000

 $$$ DATA TYPE 5A (STEADY STATE TEMPERATURE AND CLIMATOLOGY DATA) $$$

CARD TYPE                             DUST     CLOUD   DRY BULB  WET BULB     ATM               SOLAR RAD
                REACH   ELEVATION     COEF     COVER     TEMP      TEMP    PRESSURE     WIND   ATTENUATION
TEMP/LCD          1.      150.00      0.13      0.25   25.00       20.00    980.00      2.50      1.00
TEMP/LCD          1.      150.00      0.13      0.25   25.00       20.00    980.00      2.50      1.00
TEMP/LCD          2.      150.00      0.13      0.25   25.00       20.00    980.00      2.50      1.00
TEMP/LCD          3.      150.00      0.13      0.25   25.00       20.00    980.00      2.50      1.00
TEMP/LCD          4.      150.00      0.13      0.25   25.00       20.00    980.00      2.50      1.00
ENDATA5A          0.        0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

 $$$ DATA TYPE 6 (REACTION COEFFICIENTS FOR DEOXYGENATION AND REAERATION) $$$

CARD TYPE        REACH     K1        K3       SOD         K2OPT     K2      COEQK2    OR   EXPQK2
                                              RATE                         TSIV COEF  OR    SLOPE
                                                                           FOR OPT 8      FOR OPT 8
REACT COEF        1.      0.05      0.00      0.900        1.      0.50      0.000        0.00000
REACT COEF        1.      0.05      0.00      0.900        1.      0.50      0.000        0.00000
REACT COEF        2.      0.05      0.00      0.900        1.      0.50      0.000        0.00000
REACT COEF        3.      0.05      0.00      0.900        1.      0.50      0.000        0.00000
REACT COEF        4.      0.05      0.00      0.900        1.      1.00      0.000        0.00000
ENDATA6           0.      0.00      0.00      0.000        0.      0.00      0.000        0.00000

  $$$ DATA TYPE 6A (NITROGEN AND PHOSPHORUS CONSTANTS) $$$

CARD TYPE           REACH    CKNH2    SETNH2     CKNH3      SNH3     CKNO2     CKPORG   SETPORG     SPO4
ENDATA6A              0.      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
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 $$$ DATA TYPE 6B (ALGAE/OTHER COEFFICIENTS) $$$

CARD TYPE           REACH    ALPHAO    ALGSET    EXCOEF      CK5     CKANC    SETANC    SRCANC
                                                           CKCOLI
ALG/OTHER COEF        1.     50.00      0.15      3.80      1.50      0.00      0.00      0.00
ALG/OTHER COEF        1.     50.00      0.15      3.80      1.50      0.00      0.00      0.00
ALG/OTHER COEF        2.     50.00      0.15      0.38      1.50      0.00      0.00      0.00
ALG/OTHER COEF        3.     50.00      0.15      0.38      1.50      0.00      0.00      0.00
ALG/OTHER COEF        4.     50.00      0.15      3.80      1.50      0.00      0.00      0.00
ENDATA6B              0.      0.00      0.00      0.00      0.00      0.00      0.00      0.00

 $$$ DATA TYPE 7 (INITIAL CONDITIONS) $$$

CARD TYPE           REACH    TEMP       D.O.      BOD       CM-1      CM-2      CM-3       ANC      COLI
INITIAL COND-1        1.     20.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
INITIAL COND-1        1.     20.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
INITIAL COND-1        2.     20.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
INITIAL COND-1        3.     20.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
INITIAL COND-1        4.     20.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
ENDATA7               0.      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

 $$$ DATA TYPE 7A (INITIAL CONDITIONS FOR CHOROPHYLL A, NITROGEN, AND PHOSPHORUS) $$$

CARD TYPE           REACH    CHL-A     ORG-N     NH3-N     NO2-N     NO3-N     ORG-P     DIS-P
ENDATA7A              0.      0.00      0.00      0.00      0.00      0.00      0.00      0.00

 $$$ DATA TYPE 8 (INCREMENTAL INFLOW CONDITIONS) $$$

CARD TYPE           REACH     FLOW      TEMP      D.O.       BOD      CM-1      CM-2      CM-3       ANC      COLI
INCR INFLOW-1         1.     0.000     20.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
INCR INFLOW-1         1.     0.000     20.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
INCR INFLOW-1         2.     0.000     20.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
INCR INFLOW-1         3.     0.000     20.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
INCR INFLOW-1         4.     0.000     20.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
ENDATA8               0.     0.000      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

 $$$ DATA TYPE 8A (INCREMENTAL INFLOW CONDITIONS FOR CHLOROPHYLL A, NITROGEN, AND PHOSPHORUS) $$$

CARD TYPE           REACH    CHL-A     ORG-N     NH3-N     NO2-N     NO3-N     ORG-P     DIS-P
ENDATA8A              0.      0.00      0.00      0.00      0.00      0.00      0.00      0.00

 $$$ DATA TYPE 9 (STREAM JUNCTIONS) $$$

CARD TYPE              JUNCTION ORDER AND IDENT         UPSTRM   JUNCTION    TRIB
STREAM JUNCTION        1.     JNC=S2-EVERGRN             20.       24.       23.
ENDATA9                0.                                 0.        0.        0.
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```
 $$$ DATA TYPE 10 (HEADWATER SOURCES) $$$

CARD TYPE    HDWTR     NAME              FLOW      TEMP      D.O.       BOD      CM-1      CM-2      CM-3
             ORDER
HEADWTR-1      1.  ENNIS                 0.03     20.00      3.00      9.00     50.00      0.00      0.00
HEADWTR-1      2.  S2                    0.02     20.00      3.00      9.00     50.00      0.00      0.00
ENDATA10       0.                        0.00      0.00      0.00      0.00      0.00      0.00      0.00

 $$$ DATA TYPE 10A (HEADWATER CONDITIONS FOR CHLOROPHYLL, NITROGEN, PHOSPHORUS,
                    COLIFORM AND SELECTED NON-CONSERVATIVE CONSTITUENT) $$$

CARD TYPE     HDWTR     ANC     COLI    CHL-A    ORG-N    NH3-N    NO2-N    NO3-N    ORG-P    DIS-P
              ORDER
ENDATA10A       0.     0.00 0.00E+00     0.00     0.00     0.00     0.00     0.00     0.00     0.00

 $$$ DATA TYPE 11 (POINT SOURCE / POINT SOURCE CHARACTERISTICS) $$$

              POINT
CARD TYPE      LOAD    NAME              EFF     FLOW     TEMP     D.O.      BOD     CM-1     CM-2     CM-3
              ORDER
POINTLD-1      1.  SWEETEX              0.00     0.01    20.00     0.10    99.00     0.00     0.00     0.00
POINTLD-1      2.  ALTIC                0.00     0.00    20.00     5.50     0.00     0.00     0.00     0.00
POINTLD-1      3.  SOUTH                0.00     0.00    20.00     6.50    50.00     0.00     0.00     0.00
POINTLD-1      4.  VENTS                0.00     0.00    20.00     5.50     0.00     0.00     0.00     0.00
ENDATA11       0.                       0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00

 $$$ DATA TYPE 11A (POINT SOURCE CHARACTERISTICS - CHLOROPHYLL A, NITROGEN, PHOSPHORUS,
                    COLIFORMS AND SELECTED NON-CONSERVATIVE CONSTITUENT) $$$

              POINT
CARD TYPE      LOAD     ANC     COLI    CHL-A    ORG-N    NH3-N    NO2-N    N03-N    ORG-P    DIS-P
              ORDER
ENDATA11A       0.     0.00 0.00E+00     0.00     0.00     0.00     0.00     0.00     0.00     0.00

 $$$ DATA TYPE 12 (DAM CHARACTERISTICS) $$$

                      DAM   RCH   ELE    ADAM    BDAM    FDAM    HDAM

ENDATA12                 0.    0.    0.    0.00    0.00    0.00    0.00

 $$$ DATA TYPE 13 (DOWNSTREAM BOUNDARY CONDITIONS-1) $$$

     CARD TYPE               TEMP       D.O.      BOD       CM-1      CM-2      CM-3       ANC      COLI

ENDATA13                     DOWNSTREAM BOUNDARY CONCENTRATIONS ARE UNCONSTRAINED

 $$$ DATA TYPE 13A (DOWNSTREAM BOUNDARY CONDITIONS-2) $$$
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              CARD TYPE              CHL-A     ORG-N     NH3-N     NO2-N     NH3-N     ORG-P     DIS-P

         ENDATA13A                   DOWNSTREAM BOUNDARY CONCENTRATIONS ARE UNCONSTRAINED

 STEADY STATE TEMPERATURE SIMULATION; CONVERGENCE SUMMARY:
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                      NUMBER OF
         ITERATION   NONCONVERGENT
                      ELEMENTS

              1            49
              2            11
              3             0


 SUMMARY OF VALUES FOR STEADY STATE TEMPERATURE CALCULATIONS (SUBROUTINE HEATER):
 -------------------------------------------------------------------------------

       DAILY NET SOLAR RADIATION =    2630.436 BTU/FT-2   (  713.822 LANGLEYS)
       NUMBER OF DAYLIGHT HOURS =  14.8


       HOURLY VALUES OF SOLAR RADIATION (BTU/FT-2)

             1     0.00         9   170.88        17   186.71
             2     0.00        10   221.98        18   130.99
             3     0.00        11   262.87        19    72.70
             4     0.00        12   290.07        20    16.40
             5     0.00        13   301.19        21     0.00
             6     4.32        14   295.09        22     0.00
             7    55.66        15   272.41        23     0.00
             8   113.93        16   235.23        24     0.00
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         STREAM QUALITY SIMULATION                                                                     OUTPUT PAGE NUMBER     1
         QUAL-2E STREAM QUALITY ROUTING MODEL                                                  Version 3.22  --  May 1996
                                                 ***** STEADY STATE SIMULATION *****

                                                      ** HYDRAULICS SUMMARY **

ELE RCH ELE   BEGIN     END            POINT    INCR            TRVL                                        BOTTOM      X-SECT   DSPRSN
ORD NUM NUM     LOC     LOC    FLOW    SRCE    FLOW     VEL    TIME    DEPTH    WIDTH      VOLUME        AREA        AREA     COEF
               KILO    KILO     CMS     CMS     CMS     MPS     DAY        M        M      K-CU-M      K-SQ-M        SQ-M   SQ-M/S

  1   1   1    5.56    5.44    0.03    0.00    0.00   0.004   0.324    0.723    7.985        0.70        1.14        5.77     0.04
  2   1   2    5.44    5.32    0.03    0.00    0.00   0.004   0.324    0.723    7.985        0.70        1.14        5.77     0.04
  3   1   3    5.32    5.20    0.03    0.00    0.00   0.004   0.324    0.723    7.985        0.70        1.14        5.77     0.04
  4   1   4    5.20    5.08    0.03    0.00    0.00   0.004   0.324    0.723    7.985        0.70        1.14        5.77     0.04
  5   1   5    5.08    4.95    0.03    0.00    0.00   0.004   0.324    0.723    7.985        0.70        1.14        5.77     0.04
  6   1   6    4.95    4.83    0.03    0.00    0.00   0.004   0.324    0.723    7.985        0.70        1.14        5.77     0.04
  7   1   7    4.83    4.71    0.03    0.00    0.00   0.004   0.324    0.723    7.985        0.70        1.14        5.77     0.04
  8   1   8    4.71    4.59    0.03    0.00    0.00   0.004   0.324    0.723    7.985        0.70        1.14        5.77     0.04
  9   1   9    4.59    4.47    0.03    0.00    0.00   0.004   0.324    0.723    7.985        0.70        1.14        5.77     0.04
 10   1  10    4.47    4.35    0.03    0.00    0.00   0.004   0.324    0.723    7.985        0.70        1.14        5.77     0.04


 11   2   1    4.35    4.23    0.03    0.00    0.00   0.004   0.324    0.723    7.985        0.70        1.14        5.77     0.04
 12   2   2    4.23    4.11    0.03    0.00    0.00   0.004   0.324    0.723    7.985        0.70        1.14        5.77     0.04
 13   2   3    4.11    3.99    0.03    0.01    0.00   0.005   0.261    0.724    7.986        0.70        1.14        5.78     0.05
 14   2   4    3.99    3.87    0.03    0.00    0.00   0.005   0.261    0.724    7.986        0.70        1.14        5.78     0.05
 15   2   5    3.87    3.74    0.03    0.00    0.00   0.005   0.261    0.724    7.986        0.70        1.14        5.78     0.05
 16   2   6    3.74    3.62    0.03    0.00    0.00   0.005   0.261    0.724    7.986        0.70        1.14        5.78     0.05
 17   2   7    3.62    3.50    0.03    0.00    0.00   0.005   0.261    0.724    7.986        0.70        1.14        5.78     0.05
 18   2   8    3.50    3.38    0.03    0.00    0.00   0.005   0.261    0.724    7.986        0.70        1.14        5.78     0.05
 19   2   9    3.38    3.26    0.03    0.00    0.00   0.005   0.261    0.724    7.986        0.70        1.14        5.78     0.05
 20   2  10    3.26    3.14    0.03    0.00    0.00   0.005   0.261    0.724    7.986        0.70        1.14        5.78     0.05


 21   3   1    3.51    3.39    0.02    0.00    0.00   0.004   0.352    0.723    7.984        0.70        1.14        5.77     0.04
 22   3   2    3.39    3.27    0.02    0.00    0.00   0.004   0.352    0.723    7.984        0.70        1.14        5.77     0.04
 23   3   3    3.27    3.15    0.02    0.00    0.00   0.004   0.352    0.723    7.984        0.70        1.14        5.77     0.04


 24   4   1    3.14    3.02    0.05    0.00    0.00   0.010   0.146    0.725    7.761        0.68        1.11        5.63     0.09
 25   4   2    3.02    2.90    0.05    0.00    0.00   0.010   0.146    0.725    7.761        0.68        1.11        5.63     0.09
 26   4   3    2.90    2.78    0.05    0.00    0.00   0.010   0.146    0.725    7.761        0.68        1.11        5.63     0.09
 27   4   4    2.78    2.66    0.05    0.00    0.00   0.010   0.146    0.725    7.761        0.68        1.11        5.63     0.09
 28   4   5    2.66    2.54    0.05    0.00    0.00   0.010   0.146    0.725    7.761        0.68        1.11        5.63     0.09
 29   4   6    2.54    2.41    0.05    0.00    0.00   0.010   0.146    0.725    7.761        0.68        1.11        5.63     0.09
 30   4   7    2.41    2.29    0.05    0.00    0.00   0.010   0.146    0.725    7.761        0.68        1.11        5.63     0.09
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 31   4   8    2.29    2.17    0.05    0.00    0.00   0.010   0.146    0.725    7.761         0.68         1.11         5.63     0.09
 32   4   9    2.17    2.05    0.05    0.00    0.00   0.010   0.146    0.725    7.761         0.68         1.11         5.63     0.09
 33   4  10    2.05    1.93    0.05    0.00    0.00   0.010   0.146    0.725    7.761         0.68         1.11         5.63     0.09


 34   5   1    1.81    1.69    0.05    0.00    0.00   0.007   0.187    1.184    6.104         0.87         1.03         7.23     1.03
 35   5   2    1.69    1.57    0.05    0.00    0.00   0.007   0.187    1.184    6.104         0.87         1.03         7.23     1.03
 36   5   3    1.57    1.45    0.05    0.00    0.00   0.007   0.187    1.184    6.104         0.87         1.03         7.23     1.03
 37   5   4    1.45    1.33    0.05    0.00    0.00   0.007   0.187    1.184    6.104         0.87         1.03         7.23     1.03
 38   5   5    1.33    1.20    0.05    0.00    0.00   0.007   0.187    1.184    6.104         0.87         1.03         7.23     1.03

         STREAM QUALITY SIMULATION                                                                    OUTPUT PAGE NUMBER     2
         QUAL-2E STREAM QUALITY ROUTING MODEL                                                      Version 3.22  --  May 1996
                                          ***** STEADY STATE SIMULATION *****

                                               ** HYDRAULICS SUMMARY **

ELE RCH ELE   BEGIN     END            POINT    INCR            TRVL                                            BOTTOM       X-SECT   DSPRSN
ORD NUM NUM     LOC     LOC    FLOW    SRCE    FLOW     VEL    TIME    DEPTH    WIDTH       VOLUME         AREA         AREA     COEF
               KILO    KILO     CMS     CMS     CMS     MPS     DAY        M        M       K-CU-M       K-SQ-M         SQ-M   SQ-M/S

 39   5   6    1.20    1.08    0.05    0.00    0.00   0.007   0.187    1.184    6.104         0.87         1.03         7.23     1.03
 40   5   7    1.08    0.96    0.05    0.00    0.00   0.007   0.187    1.184    6.104         0.87         1.03         7.23     1.03
 41   5   8    0.96    0.84    0.05    0.00    0.00   0.007   0.187    1.184    6.104         0.87         1.03         7.23     1.03
 42   5   9    0.84    0.72    0.05    0.00    0.00   0.007   0.187    1.184    6.104         0.87         1.03         7.23     1.03
 43   5  10    0.72    0.60    0.05    0.00    0.00   0.007   0.187    1.184    6.104         0.87         1.03         7.23     1.03
 44   5  11    0.60    0.48    0.05    0.00    0.00   0.007   0.187    1.184    6.104         0.87         1.03         7.23     1.03
 45   5  12    0.48    0.36    0.05    0.00    0.00   0.007   0.187    1.184    6.104         0.87         1.03         7.23     1.03
 46   5  13    0.36    0.24    0.05    0.00    0.00   0.007   0.187    1.184    6.104         0.87         1.03         7.23     1.03
 47   5  14    0.24    0.12    0.05    0.00    0.00   0.007   0.187    1.184    6.104         0.87         1.03         7.23     1.03
 48   5  15    0.12   -0.01    0.05    0.00    0.00   0.007   0.187    1.184    6.104         0.87         1.03         7.23     1.03
 49   5  16   -0.01   -0.13    0.05    0.00    0.00   0.007   0.187    1.184    6.104         0.87         1.03         7.23     1.03
```

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         STREAM QUALITY SIMULATION                                                      OUTPUT PAGE NUMBER     3
         QUAL-2E STREAM QUALITY ROUTING MODEL                                   Version 3.22  --  May 1996
                                                 ***** STEADY STATE SIMULATION *****

                                                 ** REACTION COEFFICIENT SUMMARY **

RCH ELE     DO  K2  OXYGN    BOD    BOD    SOD   ORGN   ORGN    NH3    NH3    NO2   ORGP   ORGP   DISP   COLI    ANC    ANC    ANC
NUM NUM    SAT OPT  REAIR  DECAY   SETT   RATE  DECAY   SETT  DECAY   SRCE  DECAY  DECAY   SETT   SRCE  DECAY  DECAY   SETT   SRCE
          MG/L      1/DAY  1/DAY  1/DAY  G/M2D  1/DAY  1/DAY  1/DAY MG/M2D  1/DAY  1/DAY  1/DAY MG/M2D  1/DAY  1/DAY  1/DAY MG/M2D

  1   1   8.53   1   0.52   0.06   0.00   1.03   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  1   2   8.24   1   0.53   0.06   0.00   1.14   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  1   3   8.03   1   0.54   0.06   0.00   1.24   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  1   4   7.87   1   0.55   0.07   0.00   1.32   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  1   5   7.74   1   0.56   0.07   0.00   1.39   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  1   6   7.65   1   0.57   0.07   0.00   1.44   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  1   7   7.58   1   0.57   0.07   0.00   1.49   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  1   8   7.53   1   0.58   0.08   0.00   1.52   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  1   9   7.49   1   0.58   0.08   0.00   1.55   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  1  10   7.46   1   0.58   0.08   0.00   1.57   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00


  2   1   7.43   1   0.58   0.08   0.00   1.59   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  2   2   7.43   1   0.58   0.08   0.00   1.59   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  2   3   7.60   1   0.57   0.07   0.00   1.48   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  2   4   7.55   1   0.57   0.08   0.00   1.51   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  2   5   7.51   1   0.58   0.08   0.00   1.53   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  2   6   7.48   1   0.58   0.08   0.00   1.56   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  2   7   7.46   1   0.58   0.08   0.00   1.57   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  2   8   7.44   1   0.58   0.08   0.00   1.59   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  2   9   7.42   1   0.58   0.08   0.00   1.60   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  2  10   7.42   1   0.58   0.08   0.00   1.60   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00


  3   1   8.50   1   0.52   0.06   0.00   1.03   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  3   2   8.20   1   0.53   0.06   0.00   1.15   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  3   3   7.98   1   0.55   0.07   0.00   1.26   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00


  4   1   7.61   1   0.57   0.07   0.00   1.47   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  4   2   7.58   1   0.57   0.07   0.00   1.49   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  4   3   7.55   1   0.57   0.08   0.00   1.51   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  4   4   7.53   1   0.58   0.08   0.00   1.52   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  4   5   7.51   1   0.58   0.08   0.00   1.54   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  4   6   7.49   1   0.58   0.08   0.00   1.55   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  4   7   7.47   1   0.58   0.08   0.00   1.56   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
```

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  4   8   7.46   1   0.58   0.08   0.00   1.57   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  4   9   7.44   1   0.58   0.08   0.00   1.58   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  4  10   7.43   1   0.58   0.08   0.00   1.59   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00


  5   1   7.42   1   0.88   0.08   0.00   1.60   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  5   2   7.42   1   1.17   0.08   0.00   1.60   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  5   3   7.41   1   1.17   0.08   0.00   1.61   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  5   4   7.40   1   1.17   0.08   0.00   1.61   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  5   5   7.40   1   1.17   0.08   0.00   1.61   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00

         STREAM QUALITY SIMULATION                                                              OUTPUT PAGE NUMBER     4
         QUAL-2E STREAM QUALITY ROUTING MODEL                                           Version 3.22  --  May 1996
                                                 ***** STEADY STATE SIMULATION *****

                                                 ** REACTION COEFFICIENT SUMMARY **

RCH ELE     DO  K2  OXYGN    BOD    BOD    SOD   ORGN   ORGN    NH3    NH3    NO2   ORGP   ORGP   DISP   COLI    ANC    ANC    ANC
NUM NUM    SAT OPT  REAIR  DECAY   SETT   RATE  DECAY   SETT  DECAY   SRCE  DECAY  DECAY   SETT   SRCE  DECAY  DECAY   SETT   SRCE
          MG/L      1/DAY  1/DAY  1/DAY  G/M2D  1/DAY  1/DAY  1/DAY MG/M2D  1/DAY  1/DAY  1/DAY MG/M2D  1/DAY  1/DAY  1/DAY MG/M2D

  5   6   7.40   1   1.17   0.08   0.00   1.62   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  5   7   7.39   1   1.17   0.08   0.00   1.62   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  5   8   7.39   1   1.17   0.08   0.00   1.62   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  5   9   7.39   1   1.17   0.08   0.00   1.62   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  5  10   7.38   1   1.17   0.08   0.00   1.62   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  5  11   7.38   1   1.17   0.08   0.00   1.63   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  5  12   7.38   1   1.17   0.08   0.00   1.63   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  5  13   7.38   1   1.17   0.08   0.00   1.63   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  5  14   7.38   1   1.17   0.08   0.00   1.63   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  5  15   7.38   1   1.17   0.08   0.00   1.63   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  5  16   7.38   1   1.17   0.08   0.00   1.63   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
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         STREAM QUALITY SIMULATION                                                              OUTPUT PAGE NUMBER      5
         QUAL-2E STREAM QUALITY ROUTING MODEL                                                Version 3.22  --  May 1996
                                                 ***** STEADY STATE SIMULATION *****

                                                    ** WATER QUALITY VARIABLES **

RCH ELE              CM-1   CM-2   CM-3                                                                                 ANC
NUM NUM       TEMP    TDS                   DO    BOD   ORGN   NH3N   NO2N   NO3N  SUM-N   ORGP  DIS-P  SUM-P   COLI          CHLA
             DEG-C   MG/L                 MG/L   MG/L   MG/L   MG/L   MG/L   MG/L   MG/L   MG/L   MG/L   MG/L #/100ML         UG/L

  1   1      22.23   0.00   0.00   0.00   3.13   8.84   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  1   2      24.02   0.00   0.00   0.00   3.16   8.67   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  1   3      25.44   0.00   0.00   0.00   3.12   8.49   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  1   4      26.55   0.00   0.00   0.00   3.04   8.31   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  1   5      27.42   0.00   0.00   0.00   2.92   8.13   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  1   6      28.09   0.00   0.00   0.00   2.79   7.94   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  1   7      28.62   0.00   0.00   0.00   2.66   7.75   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  1   8      29.02   0.00   0.00   0.00   2.52   7.57   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  1   9      29.33   0.00   0.00   0.00   2.40   7.39   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  1  10      29.57   0.00   0.00   0.00   2.29   7.21   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00


  2   1      29.75   0.00   0.00   0.00   2.18   7.11   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  2   2      29.81   0.00   0.00   0.00   2.03   8.07   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  2   3      28.48   0.00   0.00   0.00   1.33  24.17   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  2   4      28.85   0.00   0.00   0.00   1.02  23.71   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  2   5      29.15   0.00   0.00   0.00   0.74  23.24   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  2   6      29.39   0.00   0.00   0.00   0.49  22.79   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  2   7      29.58   0.00   0.00   0.00   0.28  22.33   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  2   8      29.73   0.00   0.00   0.00   0.10  21.88   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  2   9      29.85   0.00   0.00   0.00   0.00  21.42   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  2  10      29.86   0.00   0.00   0.00   0.00  20.66   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00


  3   1      22.38   0.00   0.00   0.00   3.13   8.83   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  3   2      24.26   0.00   0.00   0.00   3.15   8.68   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  3   3      25.80   0.00   0.00   0.00   2.97   8.95   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00


  4   1      28.40   0.00   0.00   0.00   1.17  15.50   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  4   2      28.63   0.00   0.00   0.00   1.12  15.34   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  4   3      28.84   0.00   0.00   0.00   1.07  15.17   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  4   4      29.02   0.00   0.00   0.00   1.03  15.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  4   5      29.19   0.00   0.00   0.00   0.98  14.84   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  4   6      29.33   0.00   0.00   0.00   0.93  14.67   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  4   7      29.46   0.00   0.00   0.00   0.89  14.51   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
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  4   8      29.57   0.00   0.00   0.00   0.84  14.35   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  4   9      29.66   0.00   0.00   0.00   0.81  14.19   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  4  10      29.75   0.00   0.00   0.00   0.82  14.01   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00


  5   1      29.85   0.00   0.00   0.00   1.50  13.67   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  5   2      29.89   0.00   0.00   0.00   1.98  13.47   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  5   3      29.93   0.00   0.00   0.00   2.38  13.28   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  5   4      29.97   0.00   0.00   0.00   2.73  13.09   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  5   5      30.00   0.00   0.00   0.00   3.02  12.90   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00

         STREAM QUALITY SIMULATION                                                                      OUTPUT PAGE NUMBER     6
         QUAL-2E STREAM QUALITY ROUTING MODEL                                                   Version 3.22  --  May 1996
                                         ***** STEADY STATE SIMULATION *****

                                            ** WATER QUALITY VARIABLES **

RCH ELE               CM-1   CM-2   CM-3                                                                                  ANC
NUM NUM        TEMP    TDS                      DO    BOD   ORGN   NH3N   NO2N   NO3N  SUM-N   ORGP  DIS-P  SUM-P   COLI            CHLA
              DEG-C   MG/L                    MG/L   MG/L   MG/L   MG/L   MG/L   MG/L   MG/L   MG/L   MG/L   MG/L #/100ML           UG/L

  5   6      30.03   0.00   0.00   0.00   3.26  12.71   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  5   7      30.06   0.00   0.00   0.00   3.47  12.53   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  5   8      30.09   0.00   0.00   0.00   3.65  12.35   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  5   9      30.11   0.00   0.00   0.00   3.80  12.17   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  5  10      30.13   0.00   0.00   0.00   3.93  12.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  5  11      30.15   0.00   0.00   0.00   4.04  11.83   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  5  12      30.16   0.00   0.00   0.00   4.14  11.66   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  5  13      30.18   0.00   0.00   0.00   4.22  11.51   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  5  14      30.19   0.00   0.00   0.00   4.28  11.37   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  5  15      30.20   0.00   0.00   0.00   4.33  11.27   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
  5  16      30.20   0.00   0.00   0.00   4.35  11.22   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00.00E+00   0.00   0.00
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         STREAM QUALITY SIMULATION                                                                OUTPUT PAGE NUMBER     7
         QUAL-2E STREAM QUALITY ROUTING MODEL                                                   Version 3.22  --  May 1996
                                                 ***** STEADY STATE SIMULATION *****

                                                     ** DISSOLVED OXYGEN DATA **

                                                                  COMPONENTS OF DISSOLVED OXYGEN MASS BALANCE (MG/L-DAY)
ELE RCH ELE               DO              DO     DAM     NIT
ORD NUM NUM    TEMP      SAT      DO     DEF   INPUT   INHIB      F-FNCTN   OXYGN                     NET
              DEG-C     MG/L    MG/L    MG/L    MG/L    FACT        INPUT   REAIR   C-BOD     SOD     P-R   NH3-N   NO2-N

  1   1   1   22.23    8.53    3.13    5.39    0.00    0.00         9.27    2.79   -0.49   -1.42    0.00    0.00    0.00
  2   1   2   24.02    8.24    3.16    5.08    0.00    0.00         0.00    2.71   -0.52   -1.57    0.00    0.00    0.00
  3   1   3   25.44    8.03    3.12    4.90    0.00    0.00         0.00    2.67   -0.55   -1.71    0.00    0.00    0.00
  4   1   4   26.55    7.87    3.04    4.83    0.00    0.00         0.00    2.68   -0.56   -1.82    0.00    0.00    0.00
  5   1   5   27.42    7.74    2.92    4.82    0.00    0.00         0.00    2.71   -0.57   -1.92    0.00    0.00    0.00
  6   1   6   28.09    7.65    2.79    4.86    0.00    0.00         0.00    2.76   -0.58   -2.00    0.00    0.00    0.00
  7   1   7   28.62    7.58    2.66    4.93    0.00    0.00         0.00    2.82   -0.58   -2.06    0.00    0.00    0.00
  8   1   8   29.02    7.53    2.52    5.00    0.00    0.00         0.00    2.88   -0.57   -2.11    0.00    0.00    0.00
  9   1   9   29.33    7.49    2.40    5.09    0.00    0.00         0.00    2.95   -0.57   -2.14    0.00    0.00    0.00
 10   1  10   29.57    7.46    2.29    5.17    0.00    0.00         0.00    3.01   -0.56   -2.17    0.00    0.00    0.00


 11   2   1   29.75    7.43    2.18    5.25    0.00    0.00         0.00    3.06   -0.56   -2.20    0.00    0.00    0.00
 12   2   2   29.81    7.43    2.03    5.40    0.00    0.00         0.00    3.15   -0.63   -2.21    0.00    0.00    0.00
 13   2   3   28.48    7.60    1.33    6.27    0.00    0.00         0.07    3.58   -1.78   -2.04    0.00    0.00    0.00
 14   2   4   28.85    7.55    1.02    6.53    0.00    0.00         0.00    3.76   -1.78   -2.08    0.00    0.00    0.00
 15   2   5   29.15    7.51    0.74    6.77    0.00    0.00         0.00    3.91   -1.77   -2.12    0.00    0.00    0.00
 16   2   6   29.39    7.48    0.49    6.99    0.00    0.00         0.00    4.05   -1.75   -2.15    0.00    0.00    0.00
 17   2   7   29.58    7.46    0.28    7.17    0.00    0.00         0.00    4.17   -1.73   -2.17    0.00    0.00    0.00
 18   2   8   29.73    7.44    0.10    7.34    0.00    0.00         0.00    4.28   -1.71   -2.19    0.00    0.00    0.00
 19   2   9   29.85    7.42    0.00    7.42    0.00    0.00         0.00    4.33   -1.68   -2.21    0.00    0.00    0.00
 20   2  10   29.86    7.42    0.00    7.42    0.00    0.00         0.00    4.33   -1.63   -2.21    0.00    0.00    0.00


 21   3   1   22.38    8.50    3.13    5.37    0.00    0.00         8.53    2.79   -0.49   -1.43    0.00    0.00    0.00
 22   3   2   24.26    8.20    3.15    5.06    0.00    0.00         0.00    2.70   -0.53   -1.60    0.00    0.00    0.00
 23   3   3   25.80    7.98    2.97    5.00    0.00    0.00         0.00    2.74   -0.58   -1.75    0.00    0.00    0.00


 24   4   1   28.40    7.61    1.17    6.44    0.00    0.00         0.00    3.67   -1.14   -2.02    0.00    0.00    0.00
 25   4   2   28.63    7.58    1.12    6.45    0.00    0.00         0.00    3.70   -1.14   -2.05    0.00    0.00    0.00
 26   4   3   28.84    7.55    1.07    6.48    0.00    0.00         0.00    3.72   -1.14   -2.08    0.00    0.00    0.00
 27   4   4   29.02    7.53    1.03    6.50    0.00    0.00         0.00    3.75   -1.14   -2.10    0.00    0.00    0.00
 28   4   5   29.19    7.51    0.98    6.53    0.00    0.00         0.00    3.77   -1.13   -2.12    0.00    0.00    0.00
 29   4   6   29.33    7.49    0.93    6.56    0.00    0.00         0.00    3.80   -1.13   -2.14    0.00    0.00    0.00
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 30   4   7   29.46    7.47    0.89    6.58    0.00    0.00         0.00    3.82   -1.12   -2.15    0.00    0.00    0.00
 31   4   8   29.57    7.46    0.84    6.61    0.00    0.00         0.00    3.84   -1.11   -2.17    0.00    0.00    0.00
 32   4   9   29.66    7.44    0.81    6.64    0.00    0.00         0.00    3.86   -1.11   -2.18    0.00    0.00    0.00
 33   4  10   29.75    7.43    0.82    6.61    0.00    0.00         0.00    3.86   -1.10   -2.19    0.00    0.00    0.00


 34   5   1   29.85    7.42    1.50    5.92    0.00    0.00         0.00    5.18   -1.07   -1.35    0.00    0.00    0.00
 35   5   2   29.89    7.42    1.98    5.43    0.00    0.00         0.00    6.35   -1.06   -1.35    0.00    0.00    0.00
 36   5   3   29.93    7.41    2.38    5.03    0.00    0.00         0.00    5.88   -1.05   -1.36    0.00    0.00    0.00
 37   5   4   29.97    7.40    2.73    4.68    0.00    0.00         0.00    5.48   -1.03   -1.36    0.00    0.00    0.00
 38   5   5   30.00    7.40    3.02    4.39    0.00    0.00         0.00    5.14   -1.02   -1.36    0.00    0.00    0.00
         STREAM QUALITY SIMULATION                                                      OUTPUT PAGE NUMBER      8
         QUAL-2E STREAM QUALITY ROUTING MODEL                                   Version 3.22  --  May 1996
                                                 ***** STEADY STATE SIMULATION *****

                                                     ** DISSOLVED OXYGEN DATA **

                                                                  COMPONENTS OF DISSOLVED OXYGEN MASS BALANCE (MG/L-DAY)
ELE RCH ELE              DO              DO     DAM     NIT
ORD NUM NUM    TEMP     SAT      DO     DEF   INPUT   INHIB      F-FNCTN   OXYGN                     NET
              DEG-C    MG/L    MG/L    MG/L    MG/L    FACT        INPUT   REAIR   C-BOD     SOD     P-R   NH3-N   NO2-N

 39   5   6   30.03    7.40    3.26    4.14    0.00    0.00         0.00    4.84   -1.01   -1.36    0.00    0.00    0.00
 40   5   7   30.06    7.39    3.47    3.92    0.00    0.00         0.00    4.60   -0.99   -1.37    0.00    0.00    0.00
 41   5   8   30.09    7.39    3.65    3.74    0.00    0.00         0.00    4.39   -0.98   -1.37    0.00    0.00    0.00
 42   5   9   30.11    7.39    3.80    3.59    0.00    0.00         0.00    4.21   -0.97   -1.37    0.00    0.00    0.00
 43   5  10   30.13    7.38    3.93    3.45    0.00    0.00         0.00    4.05   -0.96   -1.37    0.00    0.00    0.00
 44   5  11   30.15    7.38    4.04    3.34    0.00    0.00         0.00    3.92   -0.94   -1.37    0.00    0.00    0.00
 45   5  12   30.16    7.38    4.14    3.24    0.00    0.00         0.00    3.81   -0.93   -1.38    0.00    0.00    0.00
 46   5  13   30.18    7.38    4.22    3.16    0.00    0.00         0.00    3.71   -0.92   -1.38    0.00    0.00    0.00
 47   5  14   30.19    7.38    4.28    3.10    0.00    0.00         0.00    3.64   -0.91   -1.38    0.00    0.00    0.00
 48   5  15   30.20    7.38    4.33    3.05    0.00    0.00         0.00    3.58   -0.90   -1.38    0.00    0.00    0.00
 49   5  16   30.20    7.38    4.35    3.03    0.00    0.00         0.00    3.55   -0.90   -1.38    0.00    0.00    0.00
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                            D I S S O L V E D  O X Y G E N  ( M G / L )
       0.0     1.0     2.0     3.0     4.0     5.0     6.0     7.0     8.0     9.0    10.0
R   5.6 ++++++++++++++.++++++++++*+++++++++++++++++++++++++++++++++++++++++++++++++++++++
        +       +    .  +       +*      +       +       +       +       +       +       +
I       +       +    .  +       *       +       +       +       +       +       +       +
        +       +    .  +       *       +       +       +       +       +       +       +
V       +            .         *                                                        +
        +           .         *                                                         +
E       +       +   .   +    *  +       +       +       +       +       +       +       +
        +       +   .   +   *   +       +       +       +       +       +       +       +
R       +       +  .    +  *    +       +       +       +       +       +       +       +
    4.5 +++++++++++.++++++*++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
       0.0     5.0    10.0    15.0    20.0    25.0    30.0    35.0    40.0    45.0    50.0
                    B I O C H E M I C A L  O X Y G E N  D E M A N D  ( M G / L )


                DISSOLVED OXYGEN          = * * * *

                 BIOCHEMICAL OXYGEN DEMAND = . . . .

                            D I S S O L V E D  O X Y G E N  ( M G / L )
       0.0     1.0     2.0     3.0     4.0     5.0     6.0     7.0     8.0     9.0    10.0
R   3.5 ++++++++++++++.++++++++++*+++++++++++++++++++++++++++++++++++++++++++++++++++++++
        +       +    .  +       +*      +       +       +       +       +       +       +
I   3.3 ++++++++++++++.++++++++*+++++++++++++++++++++++++++++++++++++++++++++++++++++++++
       0.0     5.0    10.0    15.0    20.0    25.0    30.0    35.0    40.0    45.0    50.0
                    B I O C H E M I C A L  O X Y G E N  D E M A N D  ( M G / L )


                DISSOLVED OXYGEN          = * * * *

                 BIOCHEMICAL OXYGEN DEMAND = . . . .
                            D I S S O L V E D  O X Y G E N  ( M G / L )
       0.0     1.0     2.0     3.0     4.0     5.0     6.0     7.0     8.0     9.0    10.0
    5.6 ++++++++++++++.++++++++++*+++++++++++++++++++++++++++++++++++++++++++++++++++++++
        +       +    .  +       +*      +       +       +       +       +       +       +
        +       +    .  +       *       +       +       +       +       +       +       +
        +       +    .  +       *       +       +       +       +       +       +       +
        +            .         *                                                        +
        +           .         *                                                         +
        +           .        *                                                          +
        +           .       *                                                           +
R       +          .       *                                                            +
        +          .      *                                                             +
I   4.4 +++++      .     *                                                          +++++
        +           .   *                                                               +
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V       +         *                           .                                         +
        +       *                            .                                          +
E       +    *                               .                                          +
        +  *                                .                                           +
R       + *                                .                                            +
        *                                  .                                            +
        *                                 .                                             +
        *                                .                                              +
K   3.1 +++++    *              .                                                   +++++
        +       *               .                                                       +
I       +       *               .                                                       +
        +       *               .                                                       +
L       +      *               .                                                        +
        +      *               .                                                        +
O       +      *               .                                                        +
        +     *               .                                                         +
M       +     *               .                                                         +
        +     *               .                                                         +
E   1.9 +++++       *        .                                                      +++++
        +              *     .                                                          +
T       +                  * .                                                          +
        +                   .*                                                          +
E       +                   .   *                                                       +
        +                   .     *                                                     +
R       +                   .      *                                                    +
R       +                  .         *                                                  +
        +                  .          *                                                 +
        +                  .           *                                                +
    0.7 +++++             .             *                                           +++++
        +                 .              *                                              +
        +       +       + .     +       +*      +       +       +       +       +       +
        +       +       + .     +       + *     +       +       +       +       +       +
        +       +       + .     +       + *     +       +       +       +       +       +
    0.1 +++++++++++++++++.++++++++++++++++*++++++++++++++++++++++++++++++++++++++++++++++
       0.0     5.0    10.0    15.0    20.0    25.0    30.0    35.0    40.0    45.0    50.0
                    B I O C H E M I C A L   O X Y G E N   D E M A N D   ( M G / L )




               DISSOLVED OXYGEN          = * * * *

                BIOCHEMICAL OXYGEN DEMAND = . . . .
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