TOTAL MAXIMUM DAILY LOAD
FOR THE SANTA FE RIVER
FOR DISSOLVED OXYGEN AND pH

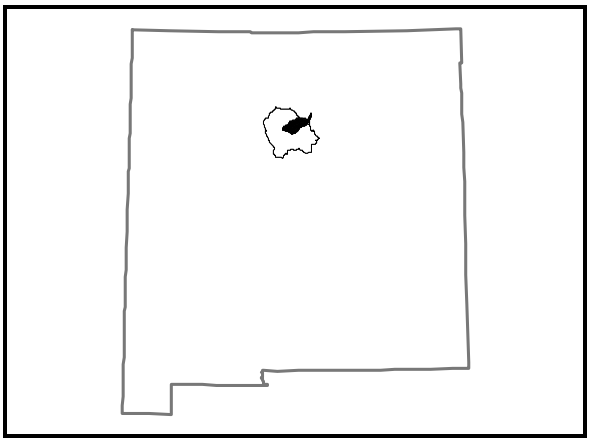

Figure 1. Santa Fe River Watershed, New Mexico

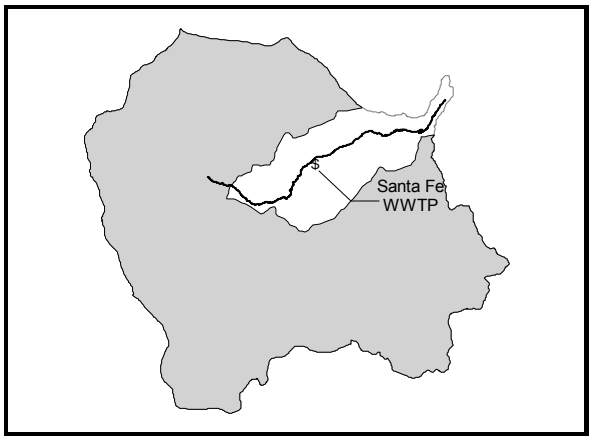

Figure 2. Santa Fe River Study Area

Summary Table

New Mexico Standards Segment	Santa Fe River, (20.6.4.113, formerly 2110)
Waterbody Identifier	Santa Fe River from the Cochiti reservoir upstream to the outfall of the Santa Fe wastewater treatment facility (12.7 mi)
Parameters of Concern	Dissolved oxygen and pH
Uses Affected	Marginal Coldwater Fishery, Warmwater Fishery, Livestock Watering, Irrigation, and Secondary Contact
Geographic Location	Upper Rio Grande Basin, Santa Fe River Watershed, Santa Fe River
Scope/size of Watershed	249 mi^2
Land Type	Ecoregions: Arizona-New Mexico Plateau Southern Rockies
Land Use/Cover	Forest Land (57.7%), Rangeland (28.9%), Urban or Built-up Land (10.0%), Agricultural Land (2.3%), Other (1.2%)
Identified Sources	Municipal point sources
Priority Ranking	6
Threatened and Endangered Species	None
TMDL for: CBOD5 CBODu NH3-N Nitrate+Nitrite DO pH range	WLA + LA + MOS = TMDL 708.9 + 0.00 + 0.00 = 708.9 lbs/day (CBOD5 Conc. of 10 mg/L) 1985.0 + 0.00 + 0.00 = 1985.0 lbs/day (CBODu Conc. of 28 mg/L) 141.78 + 0.00 + 0.00 = 141.78 lbs/day (NH3-N Conc. of 2 mg/L 212.67 + 0.00 + 0.00 = 212.67 lbs/day (Nitrate+Nitrite Conc. of 3 mg/L) In practical applications, the DO and pH limits are expressed in terms of concentrations (DO in mg/L and pH in S.U.) rather than in loads (lbs/day), therefore, the TMDLs for DO and pH are as follows: 5.0 mg/L 6.6 S.U. to 9.0 S.U.

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EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to develop TMDL management plans for water bodies determined to be water quality limited. A TMDL documents the amount of a pollutant a water body can assimilate without violating a state's water quality standards. It also allocates that load capacity to known point sources and nonpoint sources at a given flow. TMDLs are defined in 40 CFR Part 130 as the sum of the individual waste load allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and a margin of safety (MOS).

The Santa Fe River Study Area is a sub-basin of the Upper Rio Grande Basin, located in north central New Mexico. Historically (prior to January 1998), several synoptic surveys were conducted-along the Santa Fe River to evaluate water quality standards. As a result of this information, chlorine, pH, metals, stream bottom deposits (siltation), total ammonia (as a toxic), and gross alpha (radioactivity) were identified as pollutants causing the lack of full support of designated uses in previous 303(d) lists. Numerous changes in the watershed including restoration work at the La Bajada mine, upgrades at the City of Santa Fe WWTP, and additional water quality data collections have led to parameters being removed from this list. For example, the fieldwork associated with the La Bajada mine restoration was completed in 1996. Based on monitoring since completion of restoration activities at the La Bajada mine it has been determined that the Santa Fe River currently meets the numeric water quality standards for gross alpha. In 1998 the Santa Fe WWTP completed treatment upgrades to eliminate the use of chlorine and significantly lower ammonia, BOD, and TSS discharges from the plant. Metals was removed as a cause for non-support in the State 1998 303(d) list based on sampling from this same period. Recent monitoring (Fall 1998 through Summer 1999) has also demonstrated that the Santa Fe River now meets water quality standards for total ammonia. Therefore, TMDLs were not developed for gross alpha, total ammonia, or metals. TMDLs were completed and approved for chlorine and stream bottom deposits in December 1999.

Sampling efforts during 1998-2000 continued to support the 303(d) listings for dissolved oxygen (DO) and pH and the need to develop TMDLs for these parameters. The 303(d) listing for DO and pH is the result of algal growth in response to plant nutrients available from the stream bottom. The excessive algal growth contributes to severe diurnal swings in both DO and pH. These swings have resulted in violations below the existing DO standard of 6.0 mg/l and above the pH standard threshold of 9.0. On August 8, 2000, the New Mexico Water Quality Control Commission adopted the revised language for the dissolved oxygen criteria for segment 20.6.4.113 (formerly 20 NMAC 6.1.2110) of the Santa Fe River in Rio Grande Basin. The segment 20.6.4.113 (formerly 20 NMAC 6.1.2110) includes the Santa Fe River and its tributaries from Cochiti Reservoir upstream to the outfall of the Santa Fe wastewater treatment facility.

This TMDL is being developed to address the revised dissolved oxygen and pH water quality criteria adopted by the New Mexico Water Control Commission. The proposed wasteload allocations for the City of Santa Fe wastewater treatment plant is expected to maintain the revised DO and pH water quality criteria for the Santa Fe River. Once it is demonstrated that the

water quality standards have been achieved, stream segment 20.6.4.113 (formerly 20 NMAC 6.1.2110) will be removed from New Mexico's 303(d) list for DO and pH.

An Implementation Plan was provided by the State of New Mexico Surface Water Quality Bureau (SWQB) for this document. The Implementation Plan is inserted into the text of this document and clearly marked as being contributed by the State. The Implementation Plan also includes Appendix D: Section 319 Projects in the Santa Fe Watershed. The US EPA did not participate in the development of any part of the Implementation Plan.

LIST OF ABBREVIATIONS

BLM	**United States Bureau of Land Management**
BMP	**Best Management Practice**
CBOD5	**Carbonaceous Oxygen Demand (5-day)**
CBODu	**Carbonaceous Oxygen Demand (ultimate)**
cfs	**Cubic Feet per Second**
CWA	**Clean Water Act**
CWAP	**Clean Water Action Plan**
CWF	**Coldwater Fishery**
EPA	**United States Environmental Protection Agency**
FS	**United States Department of Agriculture Forest Service**
LA	**Load Allocation**
LW	**Livestock Watering**
mgd	**Million Gallons per Day**
mg/L	**Milligrams per Liter**
mi^2	**square miles**
MCWF	**Marginal Coldwater Fishery**
MOS	**Margin of Safety**
MOU	**Memorandum of Understanding**
NH3-N	**Ammonia-Nitrogen**
NMAC	**New Mexico Administrative Code**
NMED	**New Mexico Environment Department**
NMSHD	**New Mexico State Highway and Transportation Department**
NO3-NO2	**Nitrate + Nitrite**
NPDES	**National Pollutant Discharge Elimination System**
NPS	**Nonpoint Source**
SBD	**Stream Bottom Deposits**
SU	**Standard Units (unit of measure associated with pH)**
SWQB	**Surface Water Quality Bureau**
TMDL	**Total Maximum Daily Load**
UWA	**Unified Watershed Assessment**
WLA	**Waste Load Allocation**
WQLS	**Water Quality Limited Segment**
WQCC	**Water Quality Control Commission**
WQS	**Water Quality Standards (NMAC 20.6.4)**
WRAS	**Watershed Restoration Action Strategy**
WWF	**Warmwater Fishery**
WWTP	**Wastewater Treatment Plant**
4Q3	**Four-day average low flow occurring once every three years**

BACKGROUND INFORMATION

The Santa Fe River Study Area (249 mi^2) is a sub-basin of the Upper Rio Grande Basin, located in north central New Mexico and is dominated by both forest land (57.7%), range land (28.9%), and urban land (10.0%) (Figure 3). The Santa Fe River originates in the northeast portion of the study area on land managed by the United States Department of Agriculture Forest Service (FS) and flows in a generally southwest direction toward the City of Santa Fe. Upstream of the City of Santa Fe Wastewater Treatment Plant (WWTP), the Santa Fe River is generally a dry arroyo with flow during some snowmelt periods in the spring and after some storm events. Thus, the critical point for application of many numeric water quality standards (e.g., DO and pH) is at the point of discharge into the Santa Fe River. In the 12 months ending in June 1999, the wastewater treatment plant reported an average flow of 5.9 mgd (9.1 cfs) and a maximum daily flow of 7.5 mgd (11.6 cfs) (Appendix A, Table A-1). The draft permit from the EPA (April 17, 1999) indicates a permitted average design flow of 8.5 mgd (13.2 cfs).

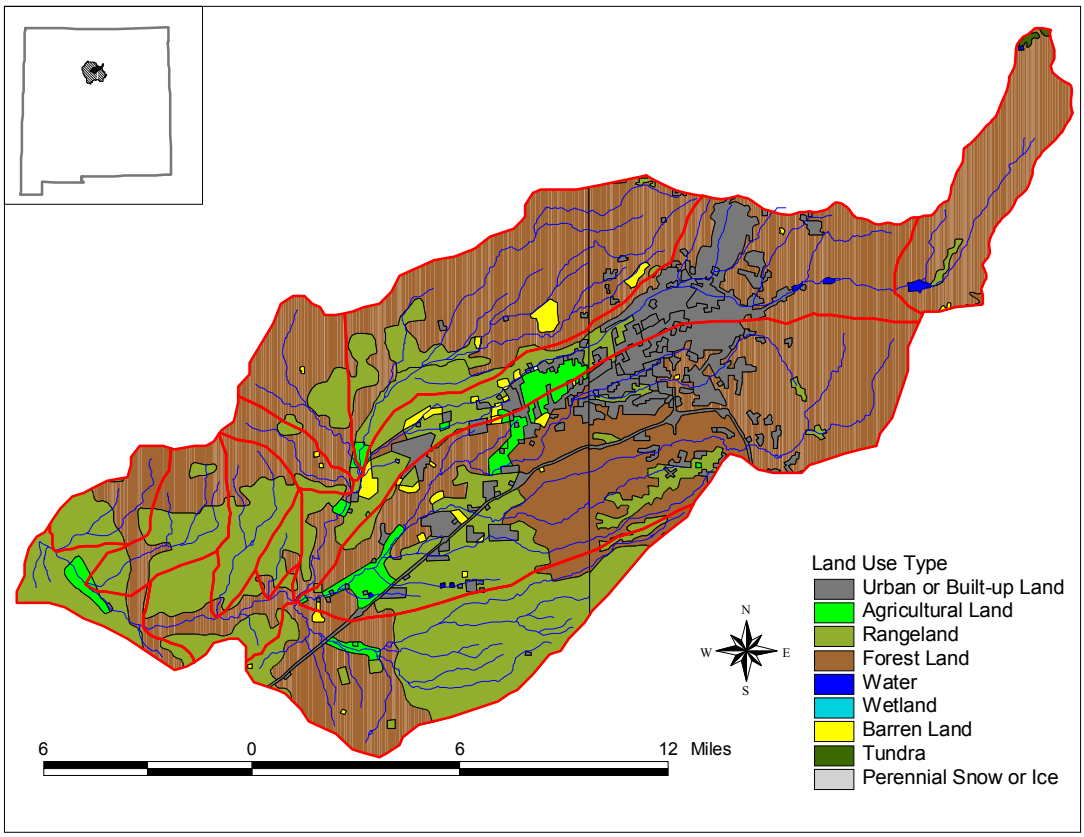


Figure 3. Land Use Classification in Study Area

Around the City of Santa Fe (the central portion of the study area), most of the land along the Santa Fe River is privately held with some interspersed state-managed land. The Bureau of Land Management (BLM) and FS manage much of the land along the Santa Fe River in the southwestern portion (below Cañon, New Mexico) of the study area. Currently, the BLM is considering acquisition of land near the confluence of the Santa Fe River and Cienega Creek, and the FS is considering land trades with Cochiti Pueblo.

Surface water quality monitoring stations were used to characterize water quality of stream reaches (Figure 4). Stations were located to evaluate the impact of the Santa Fe WWTP and Cienega Creek as well as to determine water quality conditions throughout the targeted portion of the Santa Fe River. Historical monitoring (prior to January 1998) indicates that chlorine, stream bottom deposits, metals, total ammonia, and gross alpha were at one time pollutants causing the lack of full support of designated uses. Fieldwork associated with the La Bajada mine restoration, which was a source of radioactive pollutants, was completed in 1996. Based on monitoring since restoration was completed, it has been determined that the Santa Fe River currently meets numeric water quality standards for gross alpha. Monitoring from Fall 1998 through Summer 1999 has also demonstrated that the Santa Fe River now meets water quality standards for total ammonia (related to the previous listing for ammonia toxicity, but not related to DO as covered in this TMDL). Water quality data, both historical and new survey data, did not support the metals (aluminum) listing and it was removed as a cause for non-support in the State 1998 303(d) list. Therefore, no TMDL was developed for gross alpha, total ammonia, or metals.

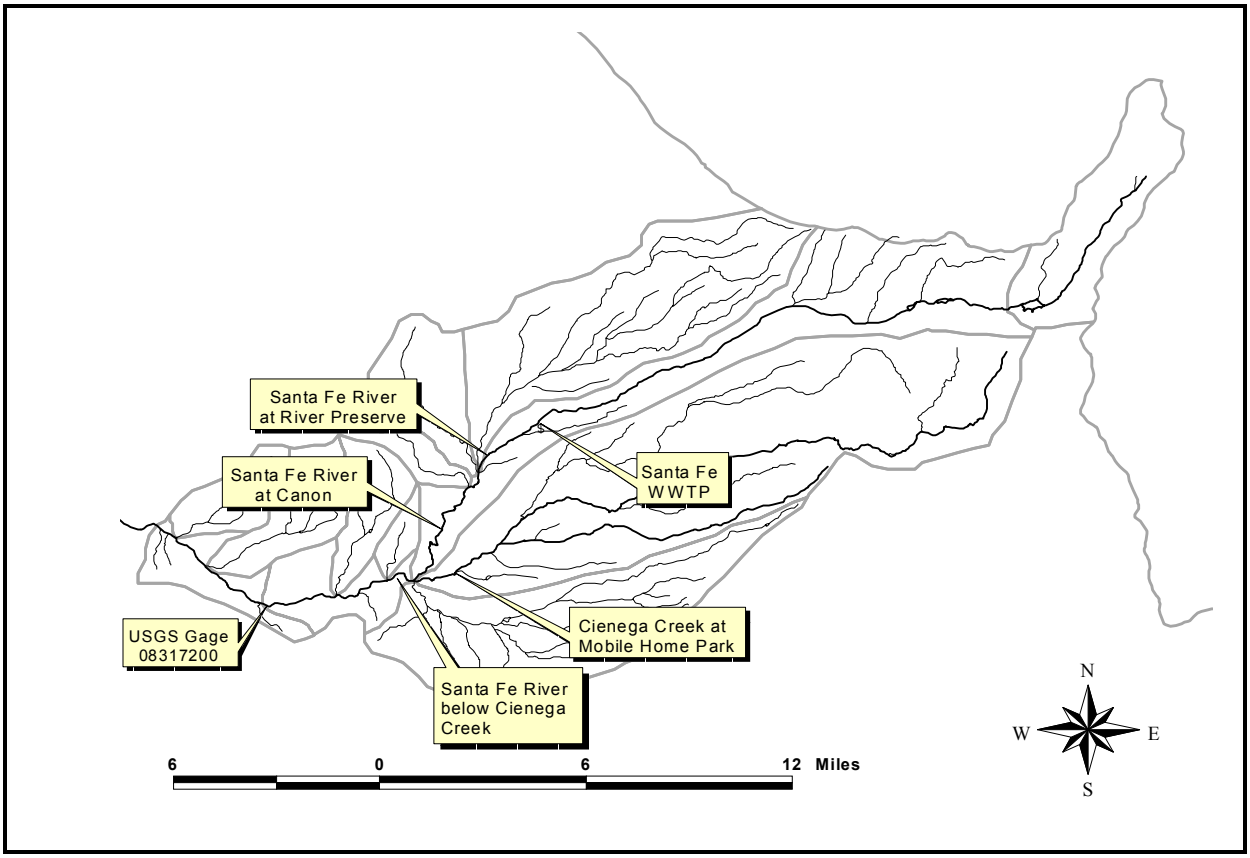


Figure 4. Location of Stream Monitoring Stations in Study Area

Endpoint Identification/Target Loading Capacity

The target value for this TMDL was determined based on 1) the presence of numeric criteria for DO and pH, 2) the degree of experience in applying the target values and 3) the ability to easily monitor and produce quantifiable and reproducible results.

Dissolved Oxygen (DO) and pH

On August 8, 2000, the New Mexico Water Quality Control Commission adopted the revised language for the dissolved oxygen criteria for segment 20.6.4.113 NMAC (formerly 20 NMAC 6.1.2110) of the Santa Fe River in Rio Grande Basin. Segment 20.6.4.113 NMAC includes the Santa Fe River and its tributaries from Cochiti Reservoir upstream to the outfall of the Santa Fe wastewater treatment facility. The revised language is as follows:

A. Designated Uses: irrigation, livestock watering, wildlife habitat, marginal coldwater fishery, secondary contact, and warm water fishery.

B. Standards:

1. In any single sample: pH shall be within the range of 6.6 to 9.0, temperature shall not exceed 30 °C (86 °F), turbidity shall not exceed 50 NTU, <u>and dissolved oxygen shall not be less than 4.0 mg/l. Dissolved oxygen shall not be less than 5.0 mg/l as a 24-hour average. Values used in the calculation of the 24-hour average for dissolved oxygen shall not exceed the dissolved oxygen saturation value. For a measured value above the dissolved oxygen saturation value, the dissolved oxygen saturation value will be used in calculating the 24-hour average. The dissolved oxygen saturation value shall be determined from the table set out in Subsection O of 20.6.4.900 NMAC.</u> The use-specific numeric standards set forth in this Part are applicable to the designated uses listed above in Subsection A of this section.

Flow

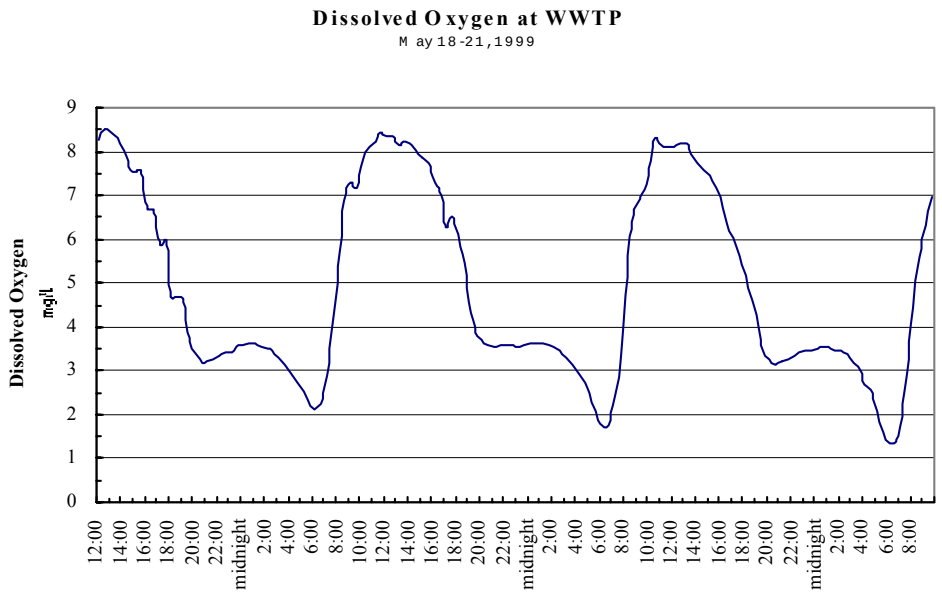
These TMDLs are calculated for a specific flow. In this case, since the upstream flow during most critical conditions at the Santa Fe WWTP is zero, the average design flow (8.5 mgd) from the WWTP was used as the flow for calculating the TMDL. This flow is consistent with the flow that will be used to establish the National Pollutant Discharge Elimination System (NPDES) permit.

Problem Definition

Figure 5 below shows the diurnal fluctuations in DO in the Santa Fe River at the site immediately downstream from the WWTP. These fluctuations routinely violate the DO water quality criterion of not less than 4 mg/L. These fluctuations are indicative of nutrient overenrichment in the Santa Fe River. The Santa Fe WWTP discharge to the Santa Fe River contains nutrients that contribute to growth of algae. However, the poor downstream condition of the stream and riparian area are the main contributors to excessive algal growth and violations of water quality standards.The algae reduce the levels of DO in the river during the early hours of the morning as a result of respiration. This reduction in DO can be a limiting factor for

aquatic communities in the Santa Fe River. The algae also increase the DO levels above saturation during warm, sunny afternoons. These super-saturated levels could be harmful to fish in some instances by causing gas-bubble disease in fish. A similar diurnal fluctuation was seen with pH.

Figure 5: Dissolved Oxygen Fluctuations in the Santa Fe River



Linkage of Water Quality and Pollutant Sources

Water quality sampling of the WWTP discharge and the Santa Fe River by the SWQB (1998-2000) provide sufficient evidence to link water quality to the Santa Fe WWTP discharge, since they are the only source of water in this reach of the Santa Fe River. Data collected downstream of the WWTP show violations of DO and pH criterion. The combination of the WWTP effluent, no upstream flow and less than ideal downstream riparian and geomorphic conditions contribute to excessive algal growth and violations of water quality standards.

The Santa Fe WWTP discharges very high quality effluent. The concentrations in the effluent are well within permitted limits and are anticipated to remain within any new permit limits developed subsequent to this TMDL. Updating the permit limits to reflect the loads established in this TMDL document will provide an assurance that future loads associated with the WWTP discharge will not exceed the TMDL waste load allocations. It is a combination of the downstream conditions of the stream and riparian area, lack of shade, and excessive algal growth that are driving the water quality impairment; not solely the quality of the WWTP discharge.

There are two potential contributors to nutrient enrichment, excessive nitrogen and excessive phosphorous. In order to determine which of these two nutrients is limiting an algal growth test was performed. Laboratory analysis of ambient waters showed that the limiting nutrient to the

Santa Fe River system was nitrogen. This means that the level of nitrogen in the river is driving the productivity of the algae. Therefore, nitrogen needs to be controlled to limit the excessive algal growth. The water quality model used in the development of this TMDL predicts the algal growth response to reduced levels of nitrogen. Since DO and pH are dependent on the algal biomass, reductions in algal biomass are expected to maintain DO and pH criterion.

In addition to nutrient loads, the in-stream oxygen level is impacted by the introduction of other oxygen demanding substances. This is expressed as the carbonaceous oxygen demand (5-day-CBOD5 or ultimate - CBODu). These three components, CBOD5, CBODu, NH3-N (ammonia), and nitrite (NO2) plus nitrate (NO3), must be controlled to maintain water quality standards for DO. This solution also predicted that the WWTP discharge must maintain a DO level of 5.0 mg/l.

This following section describes the calculations to compute the TMDL and associated load allocation (LA) and wasteload allocation (WLA). The calculated TMDL for CBOD5, CBODu, NH3-N, Nitrate + Nitrite, will maintain the revised DO and pH water quality standards adopted by the New Mexico Water Quality Control Commission on August 8, 2000.

Documentation of Calibrated Model

The EPA' s WASP/EUTRO modeling framework was selected to develop the water quality modeling for the Santa Fe River. The primary goal of the model is to simulate diurnal dissolved oxygen and pH fluctuations due to benthic (attached) algae in the study area. Since the WASP/EUTRO model was originally developed for suspended plankton in the water column, it was necessary to modify the code to accommodate important features for attached algae. First, the phytoplankton slot in the WASP/EUTRO model code was modified to simulate attached algae with necessary modifications. The WASP/EUTRO modeling framework has a unique feature that is crucial to modeling attached algae. That is, the mass transport functions controlling advective and dispersive flows may be turned on/off for any given system variables. In this case, the attached algae does not move with the transport. Another key feature making this model appropriate for this use is the incorporation of a pH module for estimating pH values in the stream. Additional justifications and discussion of this model are included in Appendix – A1-3 of this report.

Model Discussion and Results

The WASP/EUTRO model was calibrated using June 1999, field data collected by NMED instream at two sites; one immediately below the WWTP and the other approximately one mile downstream. The model was verified using data collected by NMED in July 2000. The calibration of the model requires adjusting several model parameters to mimic the observed DO and pH field datasets. The verification step was to confirm the model calibrated parameters. Both the calibration and verification runs of the model were comparable. The results of the model calibration and verification are presented in Appendix A-5 and A-6 of this report. The model predicted DO and pH profiles matched very closely with the observed data. The model calibration and verification runs used the WWTP effluent concentrations for the pertinent parameters and flow measured during field studies conducted by NMED.

Model Projections

Waste Load Allocations

For waste load allocations projection runs EPA used the calibrated/verified model as discussed above. For input to the model the facility design flow of 8.5 MGD was used. Several iteration of the model were run using a range of concentrations of the critical parameters. The model run with effluent concentrations for CBOD5, CBODu, ammonia nitrogen, nitrate+nitrite, and DO of 10 mg/L, 28 mg/L, 2 mg/L, 3 mg/L, and 5 mg/L respectively, met the dissolved oxygen and pH criteria. The results of the waste load allocation run are included in Appendix A-7 to this report.

Load Allocation

During the critical period, the primary source of water to the Santa Fe River comes from the WWTP, therefore the load allocation is zero.

Total Maximum Daily Load

The TMDL was calculated for the Santa Fe River using the point source design flow and effluent concentrations that will maintain the current DO and pH standards. The TMDL is equal to the wasteload allocation for the City of Santa Fe WWTP because the load allocation has been set to zero and the margin of safety is implicit in the conservative model assumptions. Results are presented in Table 1.

Table 1: Calculation of TMDLs

Parameter	WLA (lbs/day)	LA (lbs/day)	MOS (lbs/day)	TMDL (lbs/day)
CBOD5	708.9	0.00	Implicit	708.9
CBODu	1985.0	0.00	Implicit	1985.0
NH3-N	141.78	0.00	Implicit	141.78
Nitrate + Nitrite	212.67	0.00	Implicit	212.67

Consideration of Seasonal Variation

TMDL calculations are protective of standards at critical flows and will therefore be protective of standards at all flows. Thus, calculations made using the flow described above and using other conservative assumptions as described in the section on MOS, are protective at all times.

Margin of Safety (MOS)

Regulations require that TMDLs reflect a margin of safety based on uncertainty or variability of data, point and nonpoint source load estimates, and/or modeling analysis. For this TMDL, the

margin of safety is implicit in assumptions used in calculating the point source loads. The computer model included conservative assumptions as follows:

- •Using the design flow of the point source discharge rather than the actual flow, which is typically much lower.
- •Applying the critical temperature conditions for all twelve months.
- •Using the conservative re-aeration equation.
- •Using the conservative model decay coefficients.
- •Using a conservative CBODu/CBOD5 ratio.
- •Using site-specific data to calibrate and verify the model.

Allowance for Future Growth

Current flow at the wastewater treatment plant averages 5.9 mgd. The value of 8.5 mgd is the proposed average design flow in the draft permit from the U.S. EPA (April 17, 1999). This flow was used for all calculations in development of this TMDL. There remains sufficient treatment capacity to accommodate an increased flow of 44 percent. Therefore, no specific allowances for future growth will be made.

Other Information

Pollutant load monitoring for DO and pH will be implemented through the NPDES permit to address the link between water quality and the concentrations and loads of the permit.

Pursuant to Section 106(e)(1) of the Federal Clean Water Act, the SWQB has established appropriate monitoring methods, systems and procedures in order to compile and analyze data on the quality of the surface waters of New Mexico. In accordance with the New Mexico Water Quality Act, the SWQB has developed and implemented a comprehensive water quality monitoring strategy for the surface waters of the State. The monitoring strategy establishes the methods of identifying and prioritizing water quality data needs, specifies procedures for acquiring and managing water quality data, and describes how these data are used to progress toward three basic monitoring objectives: to develop water quality-based pollution controls, to evaluate the effectiveness of such controls and to conduct water quality assessments.

The SWQB utilizes a rotating basin system approach to water quality monitoring. In this system, a select number of watersheds are intensively monitored each year with an established return frequency of every five years.

The SWQB maintains current quality assurance and quality control plans to cover all monitoring activities. This document "Quality Assurance Project Plan for Water Quality Management Programs" (QAPP) is updated annually.

Current priorities for monitoring in the SWQB are driven by the 303(d) list of streams requiring TMDLs. Short-term efforts are directed toward those waters which are on the EPA TMDL consent decree (Forest Guardians and Southwest Environmental Center v. Carol Browner, Administrator, US EPA, Civil Action 96-0826 LH/LFG, 1997) list and which are due within the first two years of the monitoring schedule. Once assessment monitoring is completed those

reaches still showing impacts and therefore requiring a TMDL will be targeted for more intensive monitoring. The methods of data acquisition include fixed-station monitoring, intensive surveys of priority water bodies, including biological assessments, and compliance monitoring of industrial, federal and municipal dischargers, and are specified in the Assessment Protocol (SWQB/NMED 1998).

Long term monitoring for assessments will be accomplished through the establishment of sampling sites that are representative of the waterbody and which can be revisited every five years. This gives an unbiased assessment of the waterbody and establishes a long term monitoring record for simple trend analyses. This information will provide time relevant information for use in 305(b) assessments and to support the need for developing TMDLs.

This approach provides:

- a systematic, detailed review of water quality data and allows for efficient use of monitoring resources.
- information at a scale where implementation of corrective activities is feasible.
- an established order of rotation and predictable sampling in each basin, which allows for enhanced coordinated efforts with other programs.
- program efficiency and improves the basis for management decisions.

It should be noted that a basin will not be ignored during its four year sampling hiatus. The rotating basin program will be supplemented with other data collection efforts which will be classified as field studies. This time will be used to analyze the data collected, conduct field studies to further characterize identified problems, and develop and implement TMDLs. Both types of monitoring, long term and field studies, can contribute to the §305(b) and §303(d) listing processes.

The following schedule is for sampling seasons through 2002 and will be done in a consistent manner to support the New Mexico Unified Watershed Assessment (UWA) and the Nonpoint Source Management Program. This sampling regime allows characterization of seasonal variation through sampling in spring, summer, and fall for each of the watersheds.

1998 - Jemez, Chama (above El Vado), Cimarron (above Springer), Santa Fe, San Francisco
1999 - Chama (below El Vado), middle Rio Grande, Gila, Red River
2000 - Mimbres, Dry Cimarron, upper Rio Grande (part1)
2001 - Upper Rio Grande (part 2), upper Pecos (headwaters to Ft. Sumner), lower Pecos (Roswell south), Closed Basins, Zuni
2002 - Canadian Basin, lower Rio Grande, San Juan, Rio Puerco

Public Participation

Public participation was solicited in development of this TMDL. See Appendix B for flow chart of the public participation process. The draft TMDL was made available for a 30-day comment period starting **October 10, 2000**. Response to comments will be attached as Appendix C to this document. The draft document notice of availability was extensively advertised via newsletters,

email distribution lists, webpage postings (http://www.nmenv.state.nm.us), and press releases to area newspapers.

Implementation Plan

Management Measures

Management measures are "economically achievable measures for the control of the addition of pollutants from existing and new categories and classes of nonpoint sources of pollution, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint source pollution control practices, technologies, processes, siting criteria, operating methods, or other alternatives" (EPA, 1993). A combination of best management practices (BMPs) will be used to implement this TMDL.

Several current and past Clean Water Act Section 319(h) projects indirectly address dissolved oxygen and pH problems in the Santa Fe River (see Appendix D). The project which most directly addresses this TMDL is the Santa Fe River Restoration Project being conducted by the Forest Guardians, who are continuing to work on City of Santa Fe land along the Santa Fe River. The purpose of this project is to enhance the riparian zone vegetation (partly to reduce temperatures), remove nutrients from the water, and decrease sediment discharge. The BMPs being implemented include temporary cattle exclusion, revegetating stream banks (*e.g.,* planting of willows and cottonwoods), and removal of a levee (to allow access of high flows to the flood plain). The created wetlands expected to form will directly address pH and DO problems in the river by removing a portion of the nutrient load. This project will also indirectly contribute to stabilized dissolved oxygen concentrations and pH in the Santa Fe River by inhibiting algal growth through decreased solarization, which is expected to result from increased shading by riparian vegetation and a concomitant decreased width to depth ratio of the river channel. With less algal growth, lower pH is expected in the day, because more CO_2 will be left in the water column with less photosynthesis by algae occurring. Higher DO is expected at night with less respiration by algae occurring.

A current Section 319(h) project that will provide important strategic information pertinent to addressing the array of water quality problems in the Santa Fe River is the Upper Santa Fe Watershed Restoration Project. This project includes as a deliverable a watershed restoration action strategy (WRAS) for the whole Santa Fe River watershed, to be provided by the Santa Fe Watershed Association. Delivery of a WRAS is specified as a task in the project work plan (which has been approved by EPA), with subtasks for each critical element identified in EPA guidance.

Stakeholder and public outreach and involvement in the implementation of this TMDL will be ongoing. The main vehicle of stakeholder involvement will be the WRAS, which includes components for public outreach, monitoring and evaluation, defining specific water quality problems, defining necessary actions to attain water quality goals, preparing an implementation schedule, and identifying funding sources to support implementation. Stakeholder participation will include choosing and installing BMPs, as well as potential volunteer monitoring. Stakeholders in this process will include: SWQB, FS, BLM, the NMSHD, local government, private landowners, environmental groups, and the general public. SWQB will work with the other stakeholders to refine and fund (where applicable, using CWA Section 319 grant funds) the BMPs identified in the WRAS.

Assurances

Permits (NPDES) issued under Section 402 of the CWA contain specific and legally enforceable effluent limitations and self-monitoring requirements. The EPA Region 6 Permits Branch is beginning the process of designing a new permit for discharge by the WWTP, and it is expected that the WWTP will be required to meet the limits specified in this TMDL. The customary timeframe for achieving compliance with new NPDES permit limits is three years with compliance being reached in the fourth year.

New Mexico's Water Quality Act does not contain enforceable prohibitions directly applicable to nonpoint sources of pollution. The Act does authorize the Water Quality Control Commission to "promulgate and publish regulations to prevent or abate water pollution in the state" and to require permits. The Water Quality Act (NMSA, 1978) also states in §74-6-12(a):

> *The Water Quality Act (this article) does not grant to the commission or to any other entity the power to take away or modify the property rights in water, nor is it the intention of the Water Quality Act to take away or modify such rights.*

In addition, The State of New Mexico water quality standards (Subsection C of 20.6.4.6 NMAC and Subsection C of 20.6.4.10 NMAC) states:

> *These water quality standards do not grant the Commission or any other entity the power to create, take away or modify property rights in water.*

New Mexico policies are in accordance with the federal Clean Water Act §101(g):

> *It is the policy of Congress that the authority of each state to allocate quantities of water within its jurisdiction shall not be superseded, abrogated or otherwise impaired by this Act. It is the further policy of Congress that nothing in this Act shall be construed to supersede or abrogate rights to quantities of water which have been established by any State. Federal agencies shall co-operate with State and local agencies to develop comprehensive solutions to prevent, reduce, and eliminate pollution in concert with programs for managing water resources.*

Milestones

Milestones will be used to determine if control actions are being implemented and standards attained. For this TMDL, initial milestones to be established are listed below.
Milestones will be reevaluated periodically. Further implementation of this TMDL will be revised based on this reevaluation.

- Modify NPDES permit to include monitoring for parameters in this TMDL
- Track effectiveness of controls.
- Assess ambient water quality trends.
- Reevaluate TMDL for attainment of water quality standards.

References Cited

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APPENDICES

APPENDIX - A: Santa Fe River Model for DO and pH

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APPENDIX - A: Santa Fe River Model for DO and pH (continue ...)

A-1. Development of the Santa Fe River Water Quality Model to Simulate Diurnal DO and pH Fluctuations, prepared by Tetra Tech, Inc., November 23, 1999 (5 pages).

Development of the Santa Fe River Water Quality Model to Simulate Diurnal DO and pH Fluctuations
(Prepared by Tetra Tech, Inc., November 23, 1999)

1. Introduction

The EPA's WASP/EUTRO modeling framework has been selected to develop a water quality model for the Santa Fe River. The primary goal of the model is to simulate diurnal dissolved oxygen and pH fluctuations due to benthic (attached) algae in the study area. Since the WASP/EUTRO was originally developed for suspended plankton in the water column, it is necessary to modify the code to accommodate important features for attached algae. First, the phytoplankton slot in the WASP/EUTRO model code will be used for the attached algae with necessary modifications. The WASP/EUTRO modeling framework has a unique feature that is crucial to modeling the attached algae. In WASP, mass transport such as advective and dispersive flows may be turned off for any given system variables. In this case, the attached algae is not moving with the river flow and therefore it transport can be set to zero. Another key feature of the water quality is the incorporation of pH calculations in the river.

The observed data from June 7 to June 10, 1999 was used to configure and calibrate the water quality model. This technical memo serves to document the model design, code modifications, and model calibration results.

2. Model Segmentation and Mass Transport

A 3-mile reach of the Santa Fe River from the discharge of the wastewater treatment plant to about 1¼ miles below Preserve is divided into 12 segments, each of which is ¼ miles long. Because the attached algae reside at the bottom of the water column, another 12 segments are configured as a second layer below the water column. This second layer has a depth of 0.324 ft (0.1 m). A total of 24 segments are therefore configured for the Santa Fe River.

The water column depth ranges from 0.67 ft to 0.77 ft and the advective velocity associated with the river flow (essentially 100% wastewater flow, about 6.5 cfs during the period from June 7 to June 10, 1999) ranges from 0.42 ft/s to 0.55 ft/s along the study area. The water column is shallow and moves at a moderate speed. A vertical dispersion coefficient of 2.1×10^{-5} ft^2/s (or 0.02 cm^2/s) is used between the two water column layers. This value is relatively small, yet large enough to generate sufficient mixing between the two layers, making the thin, second layer a virtual layer. Note that this model design is not feasible with the QUAL2E modeling framework because QUAL2E cannot have a mutli-layer structure in the water column.

3. **Attached Algae Growth Kinetics**

As mentioned earlier, the phytoplankton slot in the WASP/EUTRO modeling framework is used for the attached algae. Since the attached algae are in the bottom of the river channel, it is not simulated in the surface layer of the water column. Thus, the algal concentration and growth rate in the surface layer are set to zero throughout the simulation. Since the mass transport is turned off for this system variable, no attached algae will be transport from the thin, second layer to the surface layer. Other system variables such as nutrients are freely transported between the two layers via the vertical dispersion coefficient, thereby making nutrients from the water column readily available for the attached algae in the second layer. Since the attached algae reside at the river bottom, its settling velocity is set to zero.

The key feature of this modeling analysis is diurnal simulations of DO and pH. To simulate them requires small time-step calculations of algal growth. In the EUTRO module, the algal growth rate as a function of light is evaluated on a daily average and depth average basis. This must be modified for instantaneous simulations of algal growth. Thus, the light reduction on algal growth should not integrate over time and depth. Instead, the following light reduction equation is used:

$$r = \frac{I}{Is} e^{[-\frac{I}{Is}+1]}$$

where

r = light reduction factor for algal growth rate (dimensionless number),

I = instantaneous light intensity (langley/day) reaching the surface of the second layer, and

I_s = saturated light intensity for optimum algal growth (set at 525 langley/day).

Note that the EUTRO model identifies the proper segment numbers in the second layer to calculate the correct light attenuation through the water column, i.e., the surface layer. Since the attached algae is located at the bottom of the water column and no suspended algae in the water column, the self-shading effect of algae as specified in the original EUTRO model code must be turned off.

Attached algal growth can also be limited by the availability of substrate. To mimic this effect, a form of Michaelis-Menton kinetics is employed. The biomass level at which half the maximum growth rate occurs is 5.0 gm-C/m^2 (Warwick et al., 1997). This mechanism allows maximum rates of primary productivity at low levels of biomass with decreasing rates of primary productivity as the benthic community expands.

4. **pH – Alkalinity Kinetics in the Water Column**

The pH-alkalinity kinetics is based on the carbonate equilibrium in the water column as developed by Lung (1986) for a lake acidification model. In general, two system variables: CO_2 acidity and alkalinity are needed for the kinetics. However, algal photosynthesis and respiration do not alter alkalinity. In addition, a review of the field data shows that the alkalinity levels in the Santa Fe River remain relatively constant. It is therefore, justified to assume a constant alkalinity level in the water column and not to include alkalinity as a system variable in the model. Thus, CO_2 acidity is only the system variable to be added in the EUTRO code. The pH-alkalinity kinetics incorporated into the model is outlined below.

Algal photosynthesis can be represented by the following chemical equilibrium equation:

$$6\,CO_2 + 6\,H_2O \rightarrow C_6H_{12}O_6 + 6\,O_2$$

Note that this reaction will increase the pH level but will have no effect on alkalinity. The stoichiometry of this reaction is that generating one mg of algal biomass requires 3.666 mg of CO_2. Since it is mathematically attractive to express CO_2 acidity as $CaCO_3$, another ratio of 50/44 is needed to convert the CO_2 mass to $CaCO_3$ mass using the equivalent weights of these compounds. Therefore, the attached algal growth rate (in mg/L of algal carbon) is multiplied by 3.666 x 50 / 44 to determine the decrease rate of CO_2 acidity. The attached algal growth rate will be evaluated in the phytoplankton subroutine prior to the CO_2 acidity subroutine.

The above reaction is reversed during algal respiration as follows:

$$C_6H_{12}O_6 + 6\,O_2 \rightarrow 6\,CO_2 + 6\,H_2O$$

Again, this reaction has no effect on the alkalinity level but will decrease the pH. The time rate of increase of the CO_2 acidity concentration during algal respiration is evaluated by multiplying the respiration rate by 3.666 x 50 /44.

Another key process in the CO_2 budget in the water column is the mass transfer across the air-water interface, which is similar to the oxygen reaeration process in the EUTRO model. Therefore, the reaeration coefficient values evaluated for oxygen transfer will be used for CO_2 transfer. This process is important as it supplies CO_2 from the atmosphere to the water column. An extra step is involved in this calculation, i.e., relating CO_2 to CO_2 acidity.

Another source of CO_2 acidity is the recycled carbon from dead attached algae via CBOD, which must be included in the model. Once the CO_2 acidity and alkalinity concentrations are determined, the hydronium ion concentration can be calculated using the following equation (Lung, 1986):

$$H = K_1[CO_2 acy - K_2 - \frac{K_w}{K_1}]/(Alk + K_1)$$

Where

H = hydronium ion molar concentration

$CO_2\ acy$ = CO_2 acidity concentration

K_1, K_2, K_w = equilibrium constants

The pH value is then equal to $-\log_{10}(H)$.

5. Modifications of the WASP/EUTRO Code

A new subroutine called CO_2 Acid is added at the end of the EUTRO code. In the beginning of the EUTRO code, the new variable CO_2 acy is introduced by storing the value of C(ISEG,9), identifying it as the 9th system variable in the WASP/EUTRO model. The CO_2 Acid subroutine is called after the dissolved oxygen subroutine is called.

The light attenuation and light reduction effect on algal growth as described above are incorporated in the DITORO subroutine.

The COMMON block WASP.CMN is modified by changing the number of system variable from 8 to 9. Additional changes are also made in the WASP.FOR code to add the 9th variable in the screen display during the course of simulation. The ambient light intensity levels are updated every hour, therefore requiring 25 time breaks each day. Since the temperature levels are updated in the input data file on every 15-min., requiring 193 time breaks, the maximum number of time breaks, MB, in the WASP.CMN file must be increased to 193. [Other entries such as mass transport flows, volumes, boundary conditions, and loading rates are entered with two values: one at time 0.0 and the second one at time 365 day, indicating constant values throughout the

simulation.] In the EUTRO.CMN file, new variables such as CO_2 acy and pH are added in the COMMON block EUTRO8 to allow free transfer of information between subroutines.

6. Recompilation and Linking of the WASP/EUTRO Model

The WASP.FOR and EUTRO.FOR programs are recompiled and their object code is linked with a graphics library which provides on-screen real-time display of the simulation for any given 6 segments. The display shows the time-variable concentrations of ammonia, nitrite/nitrate, orthophosphate, phytoplankton carbon, CBOD, dissolved oxygen, and organic nitrogen, organic phosphorus, and CO_2 acidity. The model is run for 16 days until the results reach a dynamic steady state. While the results show diurnal changes of the water quality constituents, the diurnal cycle does not change from one day to the next. The maximum time-step used in the calculation is 0.002 day.

7. Model Calibration Results

Figure 1 shows the model calibration results for chlorophyll *a*, dissolved oxygen, pH, and CO_2 acidity at two locations: immediately below the treatment plant and Preserve. The hourly dissolved oxygen and pH measurements at these two sites during the period from June 7 to June 10, 1999 are also shown for comparison with the model results. While the maximum and minimum dissolved oxygen concentrations are slightly off from the data, the timing of diurnal changes match well with that from the data. The diurnal timing of the attached algal biomass, i.e., chlorophyll *a* is determined by the diurnal fluctuations of temperature and light intensity levels.

Note that the attached algae in the Santa Fe River reach a very high level of biomass of 1,200 μg/L chlorophyll *a*. Their growth is primarily limited by the inorganic nitrogen concentrations in the water column and to an extent by the CO_2 concentrations. The ambient orthophosphate concentrations are high, much higher than the Michaelis-Menton constant for inorganic phosphorus and therefore not a factor limiting growth.

The model also calculates Algal photosynthesis and respiration rates. The maximum calculated oxygen production rate during algal growth and respiration reaches about 10 mg/L/hr or 240 mg/L/day, which is supported by the dissolved oxygen gradients measured in the field at sampling sites, thereby further substantiating the validity of the model results.

APPENDIX - A: Santa Fe River Model for DO and pH (continue ...)

A-2. Calibrating Santa Fe River Water Quality Model, prepared by Tetra Tech, Inc., February 23, 2000 (10 pages).

(Prepared by Tetra Tech, Inc., February 23, 2000)

CALIBRATING THE SANTA FE RIVER WATER QUALITY MODEL

Data to Support Model Calibration

The receiving water data used to support the model calibration was collected during a survey from June 7 to June 10, 1999. Dissolved oxygen and pH levels were measured at two locations at 15-min intervals: immediately below the Santa Fe Plant and at Preserve. These values are available for comparison with the model results.

Measured hydraulic geometry of the Santa Fe River in the study area such as average velocity and water column depth is used to calculate the model segment volumes.

On-site measurements of key environmental parameters such as water temperature and solar radiation are incorporated into the model every 15 minutes for two days. That is, this data is recycled in the model computations when the total simulation time is longer than two days. Since observed solar radiation data were not available for Santa Fe, hourly historical data measured at Albuquerque, NM for the period 1961-1990 were used. The following procedure was used to estimate the solar radiation for Santa Fe:

1. Using hourly data for Albuquerque, the maximum solar radiation for each hour of each day of the year is determined by searching through the 1961-1990 period.
2. An assumption is made that given the 30-year period, clear-sky conditions would have occurred at least once each hour of each day during that period. The clear-sky solar radiation is taken as the maximum value found in step 1.
3. The clear-sky solar radiation values are then adjusted using the hourly cloud cover conditions recorded for Santa Fe in the climatology data set downloaded from NOAA/NCDC. The equation for adjusting solar radiation due to cloud cover is:

$$SR_{adj} = (1.0 - 0.65\, CC^2)\, SR_{clear}$$

where

SR_{adj} = adjusted solar radiation

CC = cloud cover fraction (0.0 = clear; 1.0 = overcast)

SR_{clear} = clear-sky solar radiation

4. The SR values are then corrected to photosynthetically active radiation (PAR) by multiplying total solar radiation by 0.43 for model input.

Since the wastewater flow is the total river flow during the June 1999 survey, the measured treatment plant effluent concentrations are used as upstream boundary conditions for the model input. No other point or nonpoint source loads are included in the model.

Key Model Coefficients

One of the key model parameters is reaeration coefficient, k_a. At large values of the reaeration coefficient, the time-variable dissolved oxygen curve does not diverge much from the saturation level. Also the shape of the curve is similar to that of the forcing function (in this case, the time-variable water temperature and light intensity levels), with the maximum oxygen concentration (minimum deficit) occurring shortly after solar noon. However, as k_a decreases, the solution moves farther from saturation. In addition the shape departs from that of the forcing function and becomes more sinusoidal. The maximum concentration occurs later in the afternoon, and a clearly defined minimum occurs just after dawn. Thus, the model accurately depicts what is observed in the study area. The small k_a retards the rate of reaeration transfer, allowing the effect of the previous day to carry over into the present day. This condition accounts for the minimum dissolved oxygen concentration (maximum deficit) occurring slightly after dawn.

Quantifying the reaeration coefficient, particularly for small streams at low flow rates, is extremely difficult. The WASP/EUTRO model offers three empirical equations to calculate the reaeration coefficient: Owens et al. (1964), Churchill et al. (1962) and O'Connor and Dobbins (1958). Yet, these equations are unsuitable for the Santa Fe River because they tend to overestimate k_a rates for the extremely small flow rates and shallow waters found in the study area. A more reasonable equation is from Moog and Jirka (1998):

$$k_a = 1.740\ V^{0.46}\ S^{0.79}\ H0.76 \tag{1}$$

for the stream channel slope, $S > 0.0004$ and

$$k_a = 5.59\ S^{0.16}\ H^{0.73} \tag{2}$$

for $S < 0.0004$. An examination of the topographical map of the study area reveals that the average channel slope is approximately 0.005. Using Eq. 1 with an average velocity of 0.128 m/s and a depth of 0.235 m for the study area, one can calculate an average k_a = 3.52 day^{-1} at 20°C. Subsequent model calibration analyses result in a value of 2.50 day^{-1}. A constant reaeration coefficient value of 2.50 day^{-1} is used in the model. Note that the same reaeration coefficient value is used for the exchange of CO_2 across the air-water interface.

Another key model parameter is the saturated dissolved oxygen level, which is calculated as a function of temperature as follows:

$$C_s = \frac{468}{31.6 + T} \tag{3}$$

where C_s is saturated dissolved oxygen concentration in mg/L and T is temperature in °C. Values generated by Eq. 3 must be multiplied by a factor of 0.78 to account for the thin air at the high elevation of the study area, 6,200 ft above the sea level. At 20°C, the saturated dissolved oxygen level in the Santa Fe River is only 7.07 mg/L.

The following equation by Kelly et al. (1974) is used to quantify the saturation concentration of CO_2 in the water column:

$$CO_{2(s)} = 50000\ x\ 10^{[\frac{2385.73}{T+273} - 17.5184 + 0.015164\ (T+273)]} \tag{4}$$

where $CO_{2(s)}$ is saturated CO_2 concentration in mg/L and T is water temperature in °C. Again, the value calculated by Eq. 4 is then multiplied by a factor of 0.78 to account for the high altitude of the study area.

Model Calibration

An important gage to calibrate the model is the sharp rising and declining rates of dissolved oxygen levels in the water column, with a maximum increase rate at over 240 mg O_2/L/day! Two factors contribute to this sharp daily swing of dissolved oxygen concentrations: the high benthic algal biomass and the carbon to chlorophyll *a* ratio in the algal biomass. The high algal biomass calculated by the model is about 1,000 μg/L, a level has been reported for the benthic algae in the east branch of Brandywine Creek in Pennsylvania (Knorr and Fairchild, 1987).

A series of model calibration runs have revealed that a high carbon to chlorophyll *a* ratio is needed to match the significant daily fluctuation of dissolved oxygen levels. The ratio used in the model is 266 μg C/μg chlorophyll *a*.

Values of other kinetic coefficients related to benthic algal growth and nutrient recycling are taken from a recent modeling study of Carson River, NV by Warwick et al. (1997) and further refined in model calibration. Table 1 lists these coefficient values used in the Santa Fe River model.

Model Results

Figure 1 shows the results for the 4-day period of June 7 - June 10 in benthic algal biomass (chlorophyll *a*), CO_2 acidity, dissolved oxygen, and pH at the location immediately below the Santa Fe Plant. The model has reached a steady-state condition with repeated daily pattern for these water quality constituents. As stated earlier, the calculated chlorophyll *a* level of 1,000 μg/L is considered reasonable for the benthic algae as similar levels have been reported elsewhere (Knorr and Fairchild, 1987). While the benthic algal biomass is rising in the middle of the day, CO_2 acidity is declining. The rising benthic algal biomass results in the dissolved oxygen maximum in the afternoon. The subsequent decline in the algal biomass in the later part of the day produces a minimum dissolved oxygen by mid-night and early morning of the next day. The model calculated dissolved oxygen fluctuation (i.e., phase) follows the observed pattern closely. The calculated pH pattern also follows the temporal trend of CO_2 acidity concentrations, with lower pH levels matching higher CO_2 acidity concentrations.

Model results from segment 14 are compared with the data observed at Preserve (Figure 2). The calculated benthic algal chlorophyll *a* levels are slightly lower than those shown in Figure 1. The temporal trend of CO_2 acidity, dissolved oxygen, and pH is very similar to that at the location immediately below the Santa Fe Plant. The significant daily fluctuation of dissolved oxygen is also reproduced. Note the timing of minimum CO_2 concentrations match the time of the day for maximum dissolved oxygen levels. The slightly pronounced daily fluctuations of CO_2 acidity, dissolved oxygen, and pH at Preserve is due to the more significant fluctuation of water temperature at this location.

While the model results match the observed trend of dissolved oxygen and pH at both locations, there are differences between the calculated maximum/minimum values and the observed data. Because the model produces equilibrium values while the Santa Fe River may not reach a steady-state condition, the graph shows some day to day variations in dissolved oxygen and pH.

As previously mentioned, the reaeration coefficient, k_a is a key model parameter. Figure 3 presents the comparison of model results (at Preserve) between $k_a = 2.50$ day^{-1} and 3.50 day^{-1}. As expected, the higher k_a yields lower CO_2 acidity concentrations in the water column by increasing its flux across the air-water interface because the CO_2 levels in the water column are considerably greater than its saturation level, particularly at mid-day when the water temperature is reaching its maximum. The higher k_a value also raises the pH levels in the water column, responding to the lowered CO_2 acidity concentration. The higher k_a value increases the minimum dissolved oxygen concentration slightly, thereby reducing the daily fluctuation by a small amount, i.e., less than 0.5 mg/L.

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Table 1. EUTRO5 Model Kinetic Coefficients

GLOBALS	0				
NH3	1				
nitrificat	2				
K12C	11	0.20	K12T	12	1.08
NO3	1				
denitrif	2				
K20C	21	0.10	K20T	22	1.045
PO4	0				
PHYT	4				
growth	2				
K1C	41	2.45	K1T	42	1.055
light	3				
LGHTS	43	1.0	CCHL	46	266.
IS1	47	525.			
nutrients	4				
KMNG1	48	0.025	KMPG1	49	0.005
NCRB	58	0.18	PCRB	57	0.025
death	4				
K1RC	50	0.600	K1RT	51	1.069
K1D	52	0.10	KPZDC	55	0.00
CBOD	1				
deoxygent	2				
KDC	71	0.07	KDT	72	1.05
DO	1				
ratio	2				
OCRB	81	2.67	K2	82	2.50
ON	1				
mineralize	3				
K71C	91	0.500	K71T	92	1.08
FON	95	0.15			
OP	1				
mineralize	3				
K83C	100	0.75	K83T	101	1.08
FOP	104	0.50			
CO2acy	0				

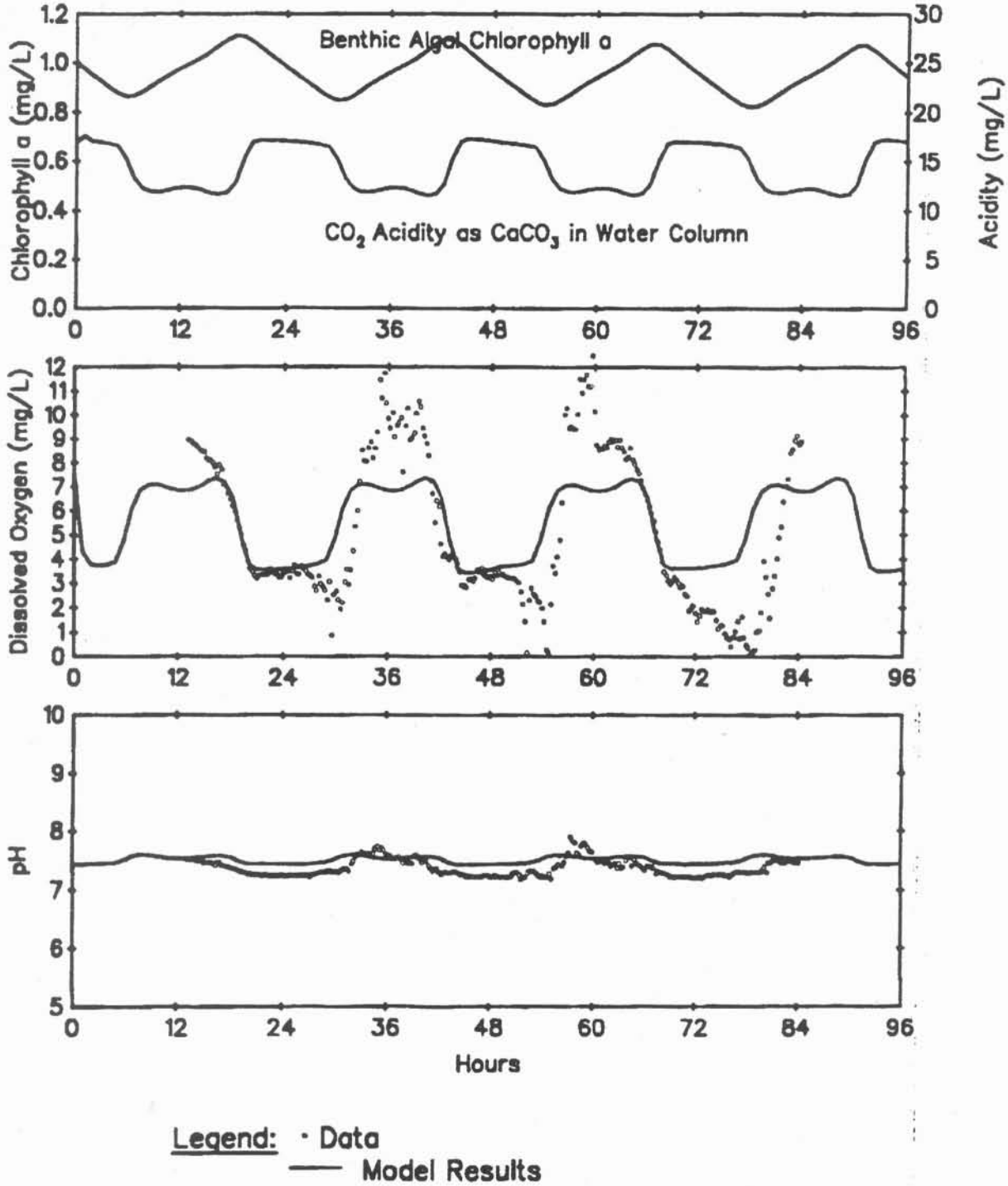

Figure 1. Model Results vs. Observed Data Immediately Below the Santa Fe Plant (June 7-June 10, 1999)

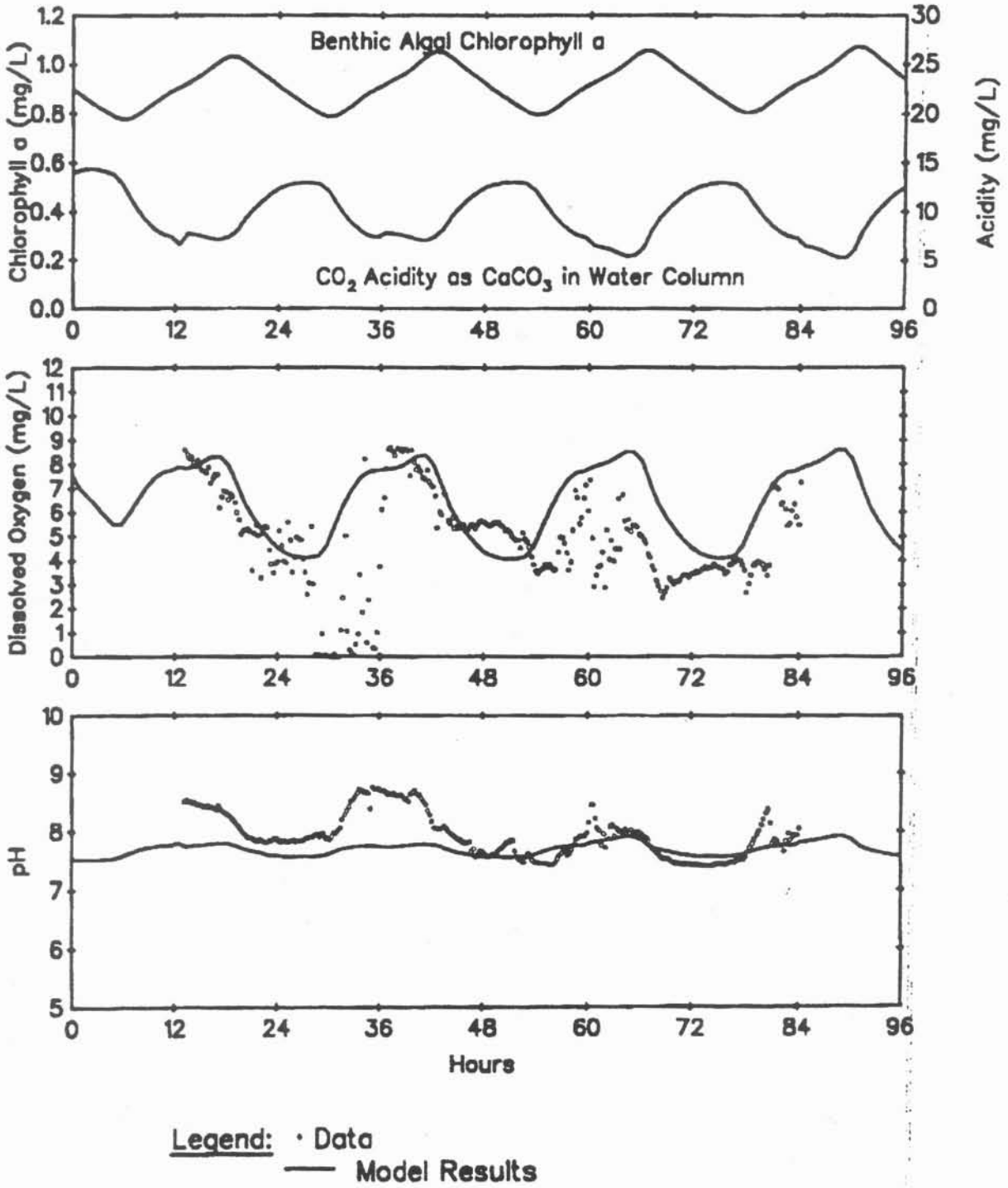

Figure 2. Model Results vs. Observed Data at Preserve (June 7-June 10, 1999)

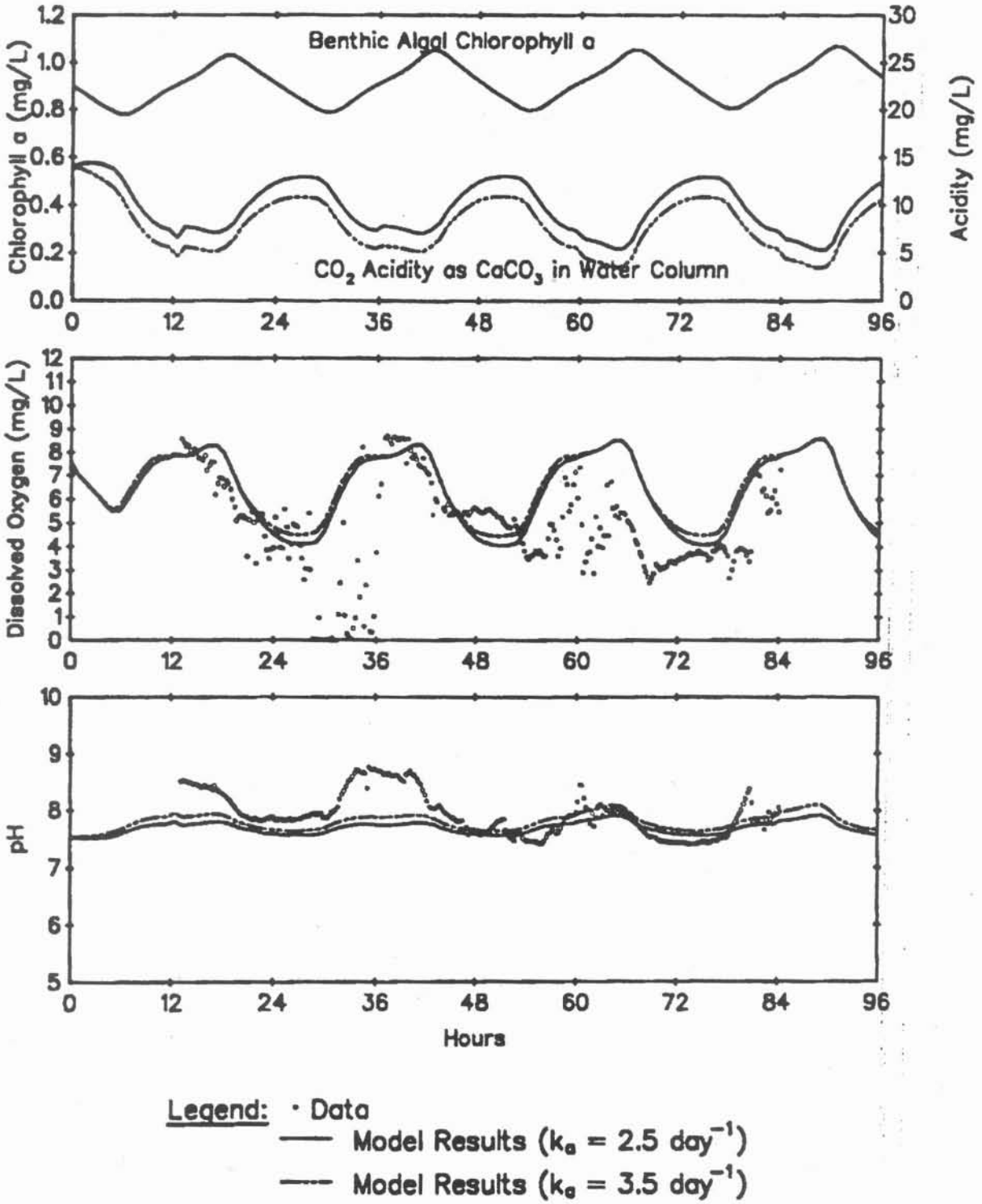

Figure 3. Model Sensitivity Analysis Results vs. Observed Data at Preserve (June 7-June 10, 1999)

APPENDIX - A: Santa Fe River Model for DO and pH (continue ...)

A-3. Technical Approach - Modeling Diurnal Fluctuations of pH and DO in the Santa Fe River, prepared by Tetra Tech, Inc., September 22, 1999 (1 page).

Technical Approach – Modeling Diurnal Fluctuations of pH and DO in the Santa Fe River
(Prepared by Tetra Tech, Inc., September 22, 1999)
Wu-Seng Lung, PhD, PE

The QUAL2E model was initially selected for this modeling study for the following reasons:

1. It has the capability to simulate diurnal temperature and DO fluctuations under the dynamic simulation mode.
2. It is easy to set up for shallow streams such as the portion of the Santa Fe River being studied.
3. It is an EPA model that has been widely accepted by the modeling profession and regulatory agencies.

Following the configuration of the modeling framework and a series of model runs, it was found that the chlorophyll *a* results from the model are not satisfactory when compared with the data. A careful review of the model applications indicated that while the attached algae remain stationary in the river channel, they are transported downstream with nutrients in the water column in the model. In addition, the growth rate of attached algae depends on the velocity in the water column, which is not accounted for in the QUAL2E model. The light intensity level for the QUAL2E model is used for the entire water column depth. However, the attached algae reside at the bottom. Although the Santa Fe River is quite shallow, this light intensity would still generate some inaccurate light readings for the attached algae at the bottom.

The surface light intensity level cannot be easily modified prior to input to the QUAL2E model because it is used to calculate a depth-average light level for algal growth. In addition, maintaining the attached algae stationary and incorporating velocity-dependent growth rate for attached algae are even more difficult to accommodate in the QUAL2E model, requiring a significant level of effort to revise the code.

On the other hand, it is much easier to use the EPA's WASP/EUTRO model to address the above difficulties. First, the WASP model has a unique feature of turning off mass transport, i.e., advective and dispersive flows for any given system variable(s). This is accomplished by exercising the transport by-pass option for the algal system, while maintaining mass transport for the nutrients. No code change is needed to accommodate this.

The velocity-dependent growth rate of algae can be accounted for by calling for the advective velocity in the EUTRO code. The correct light intensity for the attached algae can be quantified by configuring a second, thin layer in the EUTRO model for attached algae. As such, the correct light levels will be determined via attenuation through the first layer. [Note that the QUAL2E model cannot have multiple vertical layers in the water column.]

Diurnal fluctuations of pH and DO will be calculated in the EUTRO model. To accomplish this task, hourly or by-hourly light intensity levels will be incorporated into the input data file for a 24-hour input. The WASP/EUTRO model will be run time variably to a dynamic steady-state condition while the light intensity and temperature time functions will be recycled day after day in the calculation until the system reaches an equilibrium. That is, the diurnal fluctuations of pH and DO remain the same from one day to the next. In this model configuration for EUTRO, the Di Toro light option should be used and the f (fraction of day with daylight) value will be set to 1.0. The QUAL2E model runs will provide diurnal fluctuation of water temperature as a key input for the EUTRO model.

APPENDIX - A: Santa Fe River Model for DO and pH (continue ...)

A-4. Santa Fe River - Preliminary Reconnaissance, prepared by Tetra Tech, Inc., September 18, 1998 (3 pages).

Santa Fe River-Preliminary Reconnaissance
September 18, 1998

Tetra Tech staff (Jon Harcum) met with NMED (David Hogge, Peter Monihan, and Mike Coleman) and IPA (Kristen Martin, Willie Lane) staff on September 18, 1998 to discuss TMDL development for the Santa Fe River and related tributaries (Cienega and Alamo Creeks). David Hogge, Kristen Martin, Willie Lane, and Jon Harcum participated in a preliminary reconnaissance of the Santa Fe River and related tributaries. The Santa Fe River is currently on the 303(d) list for chlorine, pH, total ammonia, gross alpha, and stream bottom deposits. Cienega Creek is listed for fecal coliform, chlorine, and total ammonia. Alamo Creek is listed for metals. During the meeting NMED described their reclamation of the La Bajada mine site along the Santa Fe River that was completed during 1996 as well as general background information related to the other 303(d) stressors. Notably, there are no monitoring data for metals on Alamo Creek or stream bottom deposits. NMED confirmed that all monitoring for this project would be performed by NMED.

Locations Visited During Preliminary Reconnaissance

1. The preliminary reconnaissance started at the discharge point of the Santa Fe WWTP (T16N R8E Sec. 10 NWSW, elevation: 6270'). The flow from the discharge ditch was estimated as ~7 million gallons per day. Upstream of the discharge point, the Santa Fe River is a dry arroyo which will flow during snow melt and after rain events. The wetted portion of the streambed had noticeable algal growth suggesting nutrient enrichment. (The permit for the WWTP expired in 1991 and does not include ammonia limits or toxicity testing. It is believed that the discharger might have data related to these parameters. The discharger does have nitrates limits in their permit and does report total Kjeldahl nitrogen.) The pH of the discharge was measured as 7.7 using a pH meter with only one point of calibration. Total residual chlorine was measured as 0.12 milligrams per liter (mg/L), but was believed to be inaccurate due to interference and the WWTP no longer used chlorine for disinfection.

2. At the second stop (T16N R8E Sec. 16 NW, elevation: 6200'), approximately one mile downstream of the WWTP discharge, is a recently installed cattle exclosure. The left stream bank is unstable with some vertical facing walls as high as 10 to 15 feet in height above the streambed. This location also had noticeable algal growth. The pH at this site was 8.81. Downstream from this site, there are a few houses that, if on septic systems, might contribute to the nutrient loading. (Ground water inputs might also have an impact in this portion of the Santa Fe River.)

3. The third stop (T16N R8E Sec. 31 NWNW, elevation: 6000') is the last readily accessible location before the Santa Fe River enters the Cañada de Santa Fe.

4. A small animal operation exists at the confluence of Cienega Creek and the Santa Fe River (T15N R7E Sec. 1 NESW, elevation: 5900'). The sheep pens (less than 20 animals), located on the Santa Fe River right bank above the confluence appear to have an earthen berm limiting overland flow from the pens. The earth berms might have been installed to prevent flooding from the Santa Fe River. Hogs and chickens, located on the Cienega Creek right bank appear to have access to Cienega Creek with little apparent berming to prevent direct run-off from the lots. This might be contributing to the coliform source. Housing units located further up Cienega Creek might also contribute to the coliform source. It is not clear whether Cienega Creek is contributing to the nutrient enrichment of the Santa Fe River.

   Alamo Creek is believed to flow into Cienega Creek just upstream of the Cienega Creek/Santa Fe River confluence. Historically, a smelter was located on Alamo Creek and is the basis for listing Alamo Creek for metals.

5. At the reclamed La Bajada mine site (T15N R7E Sec. 9 NW, elevation: 5600'), a substantial effort was performed to grade, vegetate, and armor the site from further erosion that might lead to elevated gross alpha levels in the surface water. Minnows were sited in the stream at this point. Vegetation in some areas is poor, but would likely recover if not grazed. (Note: The U.S. Forest Service is in the process of building cattle

exclosures from the reclamation area.) It is likely that continued mid channel bank erosion at the upper end of the mine site will continue before stabilizing. Based on conversations with Peter Monihan, there is a remaining natural spring that might contribute to gross alpha levels. Qualitatively, the radiation levels have dropped dramatically from the pre-reclamation levels.

6. Finally, a USGS station (T15N R7E Sec. 8 SWNW, elevation: 5500') is located about 1.3 river miles downstream from the La Bajada mine.

Issues/Discussion

1. **Alamo Creek/Metals.** No data were collected to list this stream for metals according to NMED and IPA staff. Thus, metals monitoring on this stream is needed to confirm actual water quality standard violations. It is recommended to find the smelter site and develop a photo record of the site (documenting areas with high run-off potential that might contribute to elevated in-stream metal concentrations). If viable, the smelter site should be bracketed with an up and downstream station. Alternatively, a site downstream could be selected recognizing that if significant metals were detected, then additional monitoring would be necessary to bracket the source of the metals. Given the concerns related to sample contamination, some consideration for ultra-clean sampling should be considered. (Note that dissolved aluminum results along the Middle Rio Grande by NMED during 1994-1995 were noticeably greater than the results by USGS from 1994-1997.) Depending on the characteristics of the smelter site, NMED should consider both low flow and high flow periods of the year. Given likely site access and safety considerations, storm sampling is not recommended at this time. At this time it is unclear whether a TMDL is needed for this stressor. Note, that access to the downstream Alamo Creek site might be dependent on private property access. It is currently unknown whether Alamo Creek would have to be monitored for coliform or nutrients to differentiate it from Cienega Creek.

2. **Cienega Creek/Fecal Coliform.** Sampling near the confluence of Cienega Creek and the Santa Fe River might pose an access question due to private land holdings. To minimize private land owner sensitivity to sampling, it is likely that sampling will need to occur 1) below the confluence of Cienega Creek and the Santa Fe River, 2) at a bridge located upstream on Cienega Creek, and 3) above the confluence (above the sheep operations) on the Santa Fe River. A third station on Cienega Creek might be necessary to characterize coliform sources. Possible sources of coliform might include the animal operation at the confluence, housing units located further up Cienega Creek, and/or the Valle Visa Sewer Company; however, a more detailed survey of Cienega Creek should be done. The results of a more detailed survey might suggest it would be necessary to sample under both low and high flow conditions to characterize coliform sources. Monitoring should include fecal coliform (FC) and fecal streptococci (FS) to facilitate source identification. (FC/FS is generally above 4 for humans and below 1 for domestic animals.) According to NMED and IPA staff, BLM is pursuing acquisition of the land near the confluence. Pending resolution of land acquisition, a TMDL implementation plan might not be tractable (assuming that a TMDL is required).

3. **Cienega Creek/Chlorine.** As demonstrated on the Lower Rio Grande, the Jemez River, and on this preliminary reconnaissance, monitoring for total residual chlorine using portable kits is tenuous. Valle Visa mobile home park is located well upstream on Cienega Creek, but excess chlorine is not likely an issue, chlorine is not a reportable characteristic but evaluations will be conducted by NMED staff.

4. **Santa Fe River/Chlorine.** As demonstrated on the Lower Rio Grande, the Jemez River, and on this preliminary reconnaissance, monitoring for total residual chlorine using portable kits is tenuous. It is recommended to delete chlorine as a stressor to Santa Fe River although it might be appropriate to include a "no measurable total residual chlorine" statement in the Santa Fe WWTP permit.

5. **Santa Fe River/pH.** As demonstrated on this field reconnaissance, pH quickly increases (less than one mile) downstream of the WWTP effluent. The change is likely due to natural sources of bicarbonate material. However, a pH profile should be developed to demonstrate the increase along with a survey to document no other likely sources. Tetra Tech plans to review the long-term pH in more detail (in particular at the

downstream USGS station), but anticipates that the pH profile will be sufficient to demonstrate that higher pH values are due to natural background and no TMDL will be necessary.

6. **Santa Fe River/Total Ammonia.** According to IPA staff, there is sufficient data to document that total ammonia water quality standards are not being met in the river. Probable sources are the WWTP and animal operations on Cienega Creek. It would seem apparent that their permit might need to be updated to include an ammonia discharge limit and/or toxicity testing requirement. Nevertheless, it is recommended that NMED pursue effluent sampling for typical physical/chemical parameters as well as toxicity testing as it will support this issue and nutrient enrichment discussed later.

7. **Santa Fe River/Gross Alpha.** As stated earlier, substantial remediation has been completed at the La Bajada Mine. Tetra Tech has not reviewed the post remediation data at this time. If gross alpha levels are still above water quality standards, it would be necessary to determine the location of the radiation source. If the source can be narrowed to the natural spring described earlier, then a TMDL might not be warranted. If additional monitoring is warranted, NMED should consider sampling during low and high flow periods to better document gross alpha levels because of the likely variability in the natural spring's flow. It is also recommended that NMED develop permanent photo points to document the continued recovery and stability of stream banks as head cuts into the reclamed area could re–expose contaminated material.

8. **Santa Fe River/Stream Bottom Deposits.** During the last revision to New Mexico's 303(d) list, sediment was deleted as a stressor from numerous warm water fisheries due to a consultation from the FWS indicating that sediment is not a concern to warm water species in New Mexico. However, the Santa Fe River is listed as a limited cold water fishery. A recent study prepared for the City of Santa Fe requesting the river be listed as a warm water fishery was turned down. (During the fish survey, the consultant found some cold water species in the river.) The approach used to address sediment here is likely to have a dramatic effect on TMDL development throughout New Mexico even though this river is effluent dominated (unlike most cold water fisheries in New Mexico). Based on visual observation during the preliminary reconnaissance, it is likely that most of the sediment in the stream is derived from unstable streambanks. It should also be noted that at each site visited during the preliminary reconnaissance, the stream bed was sandy with some cobbles and not uncharacteristic of lower gradient streams in New Mexico. In other work, NMED does not currently have sufficient data to correlate stream embeddedness with stream health, suggesting that other measures might be necessary such as particle-size distribution or interstitial dissolved oxygen. NMED might need to consider the reference sites in biological studies performed by NMED or the City of Santa Fe for comparitive purposes. At this time a clear path for monitoring and TMDL development needs further evaluation. However, it is recommended that NMED establish permanent photo points along the Santa Fe River to compare streambank stabilization over time in grazed and ungrazed (recently fenced) areas. This comparison would provide a basis for determining whether exclosures are effective measures in improving streambank stabilization on the Santa Fe River.

9. **Santa Fe River/Nutrient Enrichment.** At each site visited along the Santa Fe River during the field reconnaissance, noticeable algal growth was observed in the wetted portion of the streambed although it is not identified on the 303(d) list. Biological sampling by NMED and the City of Santa Fe suggest nutrient enrichment. In an effluent dominated stream, this condition is not surprising at the upper end of the stream. It is somewhat surprising to see continued signs of algal growth nearly 12 miles downstream at the USGS station. The contribution of nutrients from Cienega Creek (6.7 miles downstream of the Santa Fe WWTP) to nutrient enrichment in the Santa Fe River is unknown. Because of the algal growth, NMED should confirm that the nutrient enrichment is not causing a dissolved oxygen problem below the WWTP. This would entail monitoring the diurnal fluctuation in dissolved oxygen together with the nutrient loading information from the WWTP suggested earlier.

APPENDIX - A: Santa Fe River Model for DO and pH (continue ...)

A-5. Santa Fe River Water Quality Model Calibration using June 1999 data, prepared by Tetra Tech, Inc., Model Input/Output files (45 pages).

```
Santa Fe River Water Quality Model (June 1999 Data)
WASP5pH  V5.1
 NSEG NSYS ICRD MFLG IDMP NSLN INTY ADFC   DD HHMM                A: MODEL
OPTIONS
   24    9    0    0    1    0    0    0    1 0000
   11   12   13   14   15   16
    1
    0.0020       4.0
    1
    0.040      120.0
    0    0    0    0    0    0    0    0    0
    1    0    +    *    +    *    +    *    +    *    +    *
B:EXCHANGES
    1     1.e-4      1.00                    (surface water)
   12
     2210.      0.10    1    2
     2210.      0.10    3    4
     2298.      0.10    5    6
     2386.      0.10    7    8
     2474.      0.10    9   10
     2562.      0.10   11   12
     2610.      0.10   13   14
     2650.      0.11   15   16
     2650.      0.11   17   18
     2650.      0.11   19   20
     2650.      0.11   21   22
     2650.      0.11   23   24
    2
      0.02       0.0      0.02     365.0
    0    0    0    1    0    0    0    0    0
    1    0              *    +    *    +    *    +    *    +    C:
VOLUMES
       1.0   0.02832    million cubic feet to cubic meters
         1         2         1    15920.     0.168       0.0    0.2350
0.0
         2        73         2      433.     0.168       0.0      0.01
0.0
         3         4         1    18324.     0.163       0.0    0.2350
0.0
         4        73         2      433.     0.163       0.0      0.01
0.0
         5         6         1    20732.     0.158       0.0    0.2350
0.0
         6        73         2      433.     0.158       0.0      0.01
0.0
         7         8         1    21938.     0.153       0.0    0.2350
0.0
         8        73         2      433.     0.153       0.0      0.01
0.0
         9        10         1    21938.     0.148       0.0    0.2350
0.0
        10        73         2      433.     0.148       0.0      0.01
0.0
        11        12         1    21938.     0.143       0.0    0.2350
0.0
        12        73         2      433.     0.143       0.0      0.01
0.0
        13        14         1    21938.     0.128       0.0    0.2350
0.0
        14        73         2      433.     0.128       0.0      0.01
0.0
        15        16         1    21938.     0.128       0.0    0.2350
0.0
        16        73         2      433.     0.128       0.0      0.01
0.0
```

TTCAL1.INP

```
        17        18         1    21938.     0.128       0.0    0.2350
0.0
        18        73         2      433.     0.128       0.0      0.01
0.0
        19        20         1    21938.     0.128       0.0    0.2350
0.0
        20        73         2      433.     0.128       0.0      0.01
0.0
        21        22         1    21938.     0.128       0.0    0.2350
0.0
        22        73         2      433.     0.128       0.0      0.01
0.0
        23        24         1    21938.     0.128       0.0    0.2350
0.0
        24        73         2      433.     0.128       0.0      0.01
0.0
    1    5    *    +    *    +    *    *    *    +    *    +    D: FLOWS
    2       1.0   0.02832    cubic feet/second to cubic meters/second
   13                     Headwater above Santa Fe Plant
       1.0    0    1       1.0    1    3       1.0    3    5       1.0
5    7
       1.0    7    9       1.0    9   11       1.0   11   13       1.0
13   15
       1.0   15   17       1.0   17   19       1.0   19   21       1.0
21   23
       1.0   23    0
    2
     13.15        0.     13.15      365.
   13                     Headwater above Santa Fe Plant
       1.0    0    2       1.0    2    4       1.0    4    6       1.0
6    8
       1.0    8   10       1.0   10   12       1.0   12   14       1.0
14   16
       1.0   16   18       1.0   18   20       1.0   20   22       1.0
22   24
       1.0   24    0
    2
      0.00        0.      0.00      365.
    0                                     Field 2: pore water
    1       1.0       1.0                 Field 3: (Solids 1: organic
matter)
   24
     2210.    1    2     2210.    2   73     2210.    3    4     2210.
4   73
     2298.    5    6     2298.    6   73     2386.    7    8     2386.
8   73
     2472.    9   10     2474.   10   73     2562.   11   12     2562.
12   73
     2610.   13   14     2650.   14   73     2650.   15   16     2650.
16   73
     2650.   17   18     2650.   18   73     2650.   19   20     2650.
20   73
     2650.   21   22     2650.   22   73     2650.   23   24     2650.
24   73
    2
   3.0E-06        0.   3.0E-06      365.
    1       0.1      .0929 sq ft to sq m    Field 4: (Solids 2:
Phytoplankton)
   24
     2210.    1    2     2210.    2   73     2210.    3    4     2210.
4   73
     2298.    5    6     2298.    6   73     2386.    7    8     2386.
8   73
     2472.    9   10     2474.   10   73     2562.   11   12     2562.
12   73
```

```
     2610.   13   14     2650.   14   73     2650.   15   16     2650.
16   73
     2650.   17   18     2650.   18   73     2650.   19   20     2650.
20   73
     2650.   21   22     2650.   22   73     2650.   23   24     2650.
24   73
    2
   0.0e-05        0.   0.0e-05      365.
    1       1.0     .0929 sq ft to sq m    Field 5: (Solids 3: Inorganic
matter)
   24
     2210.    1    2     2210.    2   73     2210.    3    4     2210.
4   73
     2298.    5    6     2298.    6   73     2386.    7    8     2386.
8   73
     2472.    9   10     2474.   10   73     2562.   11   12     2562.
12   73
     2610.   13   14     2650.   14   73     2650.   15   16     2650.
16   73
     2650.   17   18     2650.   18   73     2650.   19   20     2650.
20   73
     2650.   21   22     2650.   22   73     2650.   23   24     2650.
24   73
    2
   1.0E-06        0.   1.0E-06      365.
    0    0    0    1    0    0    0    0    0
         4    *    +    *    +    *    +    System 1 - Ammonia  E:
BOUNDARIES
       1.0       1.0                         mg/L (total)
    1    2                                   Santa Fe WWTP Input
     2.000        0.     2.000      365.
    2    2
     0.000        0.     0.000      365.
   23    2
     0.001        0.     0.001      365.
   24    2
     0.001        0.     0.001      365.
         4    *    +    *    +    *    +    System 2 - Nitrite/Nitrate
       1.0       1.0                         mg/L (total)
    1    2                                   Santa Fe WWTP Input
       3.0        0.       3.0      365.
    2    2
       0.0        0.       0.0      365.
   23    2
     0.150        0.     0.150      365.
   24    2
     0.150        0.     0.150      365.
         4    *    +    *    +    *    +    System 3 - Orthophosphate
       1.0       1.0                         mg/L (dissolved)
    1    2                                   Santa Fe WWTP Input
      0.40        0.      0.40      365.
    2    2
     0.000        0.     0.000      365.
   23    2
     0.010        0.     0.010      365.
   24    2
     0.010        0.     0.010      365.
         4    *    +    *    +    *    +    System 4 - Periphyton
       1.0       1.0                         ug/L  (viable chlorophyll-a)
    1    2                                   Santa Fe WWTP Input
       0.0        0.       0.0      365.
    2    2
       0.0        0.       0.0      365.
   23    2
      2.00        0.      2.00      365.
```

```
   24     2
      2.00          0.       2.00       365.
         4     *    +    *    +    *    +    System 5 - CBOD
       1.0        1.0                        mg/L (ultimate less algal
component)
    1     2                                   Santa Fe WWTP Input
     14.00          0.      14.00       365.
    2     2
      0.00          0.       0.00       365.
   23     2
      1.00          0.       1.00       365.
   24     2
      1.00          0.       1.00       365.
         4     *    +    *    +    *    +    System 6 - Dissolved Oxygen
       1.0        1.0                        mg/L
    1     2                                   Santa Fe WWTP Input
       5.0        0.0        5.0       365.
    2     2
      0.00          0.       0.00       365.
   23     2
      8.00          0.       8.00       365.
   24     2
      8.00          0.       8.00       365.
         4     *    +    *    +    *    +    System 7 - Nonliving Organic
N
       1.0        1.0                        mg/L (TKN - NH3 - algal N)
    1     2                                   Santa Fe WWTP Input
      0.80          0.       0.80       365.
    2     2
      0.00          0.       0.00       365.
   23     2
      0.40          0.       0.40       365.
   24     2
      0.40          0.       0.40       365.
         4     *    +    *    +    *    +    System 8 - Nonliving Organic
P
       1.0        1.0                        mg/L (TP - PO4 - algal P)
    1     2                                   Santa Fe WWTP Input
      0.10          0.       0.10       365.
    2     2
      0.00          0.       0.00       365.
   23     2
      0.04          0.       0.04       365.
   24     2
      0.04          0.       0.04       365.
         4     *    +    *    +    *    +    System 9 - CO2 Acidity
       1.0        1.0                        mg/L as CaCO3
    1     2                                   Santa Fe WWTP Input
      15.0          0.      15.0       365.
    2     2
       0.0          0.       0.0       365.
   23     2
      10.0          0.      10.0       365.
   24     2
      10.0          0.      10.0       365.
         0     *    +    *    +    *    +    System 1 - Ammonia F: PS
loads
         0     *    +    *    +    *    +    System 2 - Nitrite + Nitrate
         0     *    +    *    +    *    +    System 3 - Dissolved
Orthophosphate
         0     *    +    *    +    *    +    System 4 - Viable
chlorophylla-a
         0     *    +    *    +    *    +    System 5 - Ultimate CBOD (-
algae)
         0     *    +    *    +    *    +    System 6 - Dissolved Oxygen
```

```
          0    *    +    *    +    *    +    System 7 - Nonliving Organic
N
          0    *    +    *    +    *    +    System 8 - Nonliving Organic
P
          0    *    +    *    +    *    +    System 9 - CO2 Acidity
          0                                   No NPS Loads
          8    *    +    *    +    *    +    *    +    *    +    G:
PARAMETERS
TMPSG     3         1.0 KESG    5         1.0 SOD1D    9         1.0SODTA   12
1.0
FNH4      7         0.0 FPO4    8         0.0 ITOTL   13         1.0TMPFN    4
1.0
          1
TMPSG     3         1.0 KESG    5         0.15SOD1D    9         0.0SODTA   12
1.0
FNH4      7         0.0 FPO4    8         0.0 ITOTL   13         1.0TMPFN    4
1.0
          2
TMPSG     3         1.0 KESG    5         0.15SOD1D    9         0.0SODTA   12
1.0
FNH4      7         0.0 FPO4    8         0.0 ITOTL   13         1.0TMPFN    4
1.0
          3
TMPSG     3         1.0 KESG    5         0.15SOD1D    9         0.0SODTA   12
1.0
FNH4      7         0.0 FPO4    8         0.0 ITOTL   13         1.0TMPFN    4
1.0
          4
TMPSG     3         1.0 KESG    5         0.15SOD1D    9         0.0SODTA   12
1.0
FNH4      7         0.0 FPO4    8         0.0 ITOTL   13         1.0TMPFN    4
1.0
          5
TMPSG     3         1.0 KESG    5         0.15SOD1D    9         0.0SODTA   12
1.0
FNH4      7         0.0 FPO4    8         0.0 ITOTL   13         1.0TMPFN    4
1.0
          6
TMPSG     3         1.0 KESG    5         0.15SOD1D    9         0.0SODTA   12
1.0
FNH4      7         0.0 FPO4    8         0.0 ITOTL   13         1.0TMPFN    4
1.0
          7
TMPSG     3         1.0 KESG    5         0.20SOD1D    9         0.0SODTA   12
1.0
FNH4      7         0.0 FPO4    8         0.0 ITOTL   13         1.0TMPFN    4
1.0
          8
TMPSG     3         1.0 KESG    5         0.20SOD1D    9         0.0SODTA   12
1.0
FNH4      7         0.0 FPO4    8         0.0 ITOTL   13         1.0TMPFN    4
1.0
          9
TMPSG     3         1.0 KESG    5         0.20SOD1D    9         0.0SODTA   12
1.0
FNH4      7         0.0 FPO4    8         0.0 ITOTL   13         1.0TMPFN    4
1.0
         10
TMPSG     3         1.0 KESG    5         0.20SOD1D    9         0.0SODTA   12
1.0
FNH4      7         0.0 FPO4    8         0.0 ITOTL   13         1.0TMPFN    4
1.0
         11
TMPSG     3         1.0 KESG    5         0.20SOD1D    9         0.0SODTA   12
1.0
```

```
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
1.0
          12
TMPSG     3        1.0 KESG     5       0.20SOD1D     9       0.0SODTA     12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
1.0
          13
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA     12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          14
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA     12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          15
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA     12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          16
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA     12
1.0
FNH4      7        7.1 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          17
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA     12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          18
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA     12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          19
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA     12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          20
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA     12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          21
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA     12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          22
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA     12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          23
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA     12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          24
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA     12
1.0
```

```
FNH4      7        0.0 FPO4     8       0.0 ITOTL   13        1.0TMPFN     4
2.0
    +    *    +    *    +    *    +    *    +    *    +    *    H:
CONSTANTS
   GLOBALS          0
       NH3          1
nitrificat          2
      K12C         11       0.20       K12T        12       1.08
       NO3          1
  denitrif          2
      K20C         21       0.10       K20T        22      1.045
       PO4          0
      PHYT          4
    growth          2
       K1C         41       2.45        K1T        42      1.055
     light          3
     LGHTS         43        1.0       CCHL        46       133.
       IS1         47       525.
 nutrients          4
     KMNG1         48      0.025      KMPG1        49      0.005
      NCRB         58       0.18       PCRB        57      0.025
     death          4
      K1RC         50      0.600       K1RT        51      1.069
       K1D         52       0.30      KPZDC        55       0.00
      CBOD          1
 deoxygent          2
       KDC         71       0.07        KDT        72       1.05
        DO          1
     ratio          2
      OCRB         81       2.67         K2        82       4.50
        ON          1
mineralize          3
      K71C         91      0.500       K71T        92       1.08
       FON         95       0.15
        OP          1
mineralize          3
      K83C        100       0.75       K83T       101       1.08
       FOP        104       0.50
    CO2acy          0
         4    *    +    *    +    *    +    *    +    *    +    I: TIME
FUNCTION
TEMP1  193    1            River Water Temperature (C) below WWTP
     18.70   0.00000     18.80   0.01042     18.92   0.02083     18.94
0.03125
     18.82   0.04167     18.87   0.05208     18.92   0.06250     18.84
0.07292
     18.80   0.08333     18.85   0.09375     18.90   0.10417     18.87
0.11458
     18.83   0.12500     18.80   0.13542     18.74   0.14583     18.57
0.15625
     18.47   0.16667     18.45   0.17708     18.30   0.18750     18.09
0.19792
     17.87   0.20833     17.67   0.21875     17.62   0.22917     17.68
0.23958
     17.70   0.25000     17.72   0.26042     17.70   0.27083     17.62
0.28125
     17.55   0.29167     17.61   0.30208     17.70   0.31250     17.86
0.32292
     18.12   0.33333     18.45   0.34375     18.85   0.35417     19.40
0.36458
     20.00   0.37500     20.74   0.38542     21.51   0.39583     22.38
0.40625
     22.84   0.41667     23.33   0.42708     23.54   0.43750     23.81
0.44792
     24.25   0.45833     24.68   0.46875     24.86   0.47917     24.99
```

0.48958
25.14 0.50000 25.19 0.51042 25.18 0.52083 25.13
0.53125
24.95 0.54167 24.84 0.55208 24.64 0.56250 24.13
0.57292
23.74 0.58333 23.90 0.59375 23.95 0.60417 24.03
0.61458
23.96 0.62500 24.06 0.63542 24.09 0.64583 23.98
0.65625
23.84 0.66667 23.55 0.67708 23.22 0.68750 23.04
0.69792
22.30 0.70833 22.04 0.71875 21.78 0.72917 21.00
0.73958
20.57 0.75000 20.20 0.76042 19.87 0.77083 19.72
0.78125
19.70 0.79167 19.62 0.80208 19.47 0.81250 19.30
0.82292
19.12 0.83333 18.97 0.84375 18.72 0.85417 18.52
0.86458
18.51 0.87500 18.47 0.88542 18.45 0.89583 18.45
0.90625
18.39 0.91667 18.36 0.92708 18.50 0.93750 18.77
0.94792
18.99 0.95833 19.00 0.96875 18.91 0.97917 18.86
0.98958
18.92 1.00000 18.93 1.01042 19.07 1.02083 19.05
1.03125
19.05 1.04167 19.03 1.05208 18.99 1.06250 18.95
1.07292
18.97 1.08333 18.94 1.09375 18.91 1.10417 18.83
1.11458
18.72 1.12500 18.61 1.13542 18.45 1.14583 18.30
1.15625
18.11 1.16667 17.92 1.17708 17.70 1.18750 17.55
1.19792
17.55 1.20833 17.59 1.21875 17.58 1.22917 17.53
1.23958
17.43 1.25000 17.35 1.26042 17.29 1.27083 17.34
1.28125
17.47 1.29167 17.62 1.30208 17.80 1.31250 17.99
1.32292
18.32 1.33333 18.74 1.34375 19.24 1.35417 19.77
1.36458
20.39 1.37500 21.08 1.38542 21.87 1.39583 22.56
1.40625
23.17 1.41667 23.79 1.42708 24.18 1.43750 24.44
1.44792
24.78 1.45833 25.09 1.46875 25.36 1.47917 25.52
1.48958
25.52 1.50000 25.32 1.51042 25.06 1.52083 24.76
1.53125
24.74 1.54167 24.64 1.55208 24.65 1.56250 24.57
1.57292
24.47 1.58333 24.49 1.59375 24.39 1.60417 24.52
1.61458
24.60 1.62500 24.62 1.63541 24.58 1.64583 24.42
1.65625
24.30 1.66666 24.24 1.67708 24.16 1.68750 24.02
1.69791
23.71 1.70833 23.51 1.71875 23.20 1.72916 22.84
1.73958
22.54 1.75000 22.23 1.76041 21.83 1.77083 21.48
1.78125
21.20 1.79166 20.89 1.80208 20.57 1.81250 20.32
1.82291

```
     20.15    1.83333      20.02    1.84375      19.89    1.85416      19.76
1.86458
     19.62    1.87500      19.58    1.88541      19.55    1.89583      19.65
1.90625
     19.72    1.91666      19.74    1.92708      19.70    1.93750      19.66
1.94791
     19.61    1.95833      19.57    1.96875      19.55    1.97916      19.51
1.98958
     19.47    2.00000
TEMP2  193     2            River Temperature at Preserve
     18.70    0.00000      18.80    0.01042      18.92    0.02083      18.94
0.03125
     18.82    0.04167      18.87    0.05208      18.92    0.06250      18.84
0.07292
     18.80    0.08333      18.85    0.09375      18.90    0.10417      18.87
0.11458
     18.83    0.12500      18.80    0.13542      18.74    0.14583      18.57
0.15625
     18.47    0.16667      18.45    0.17708      18.30    0.18750      18.09
0.19792
     17.87    0.20833      17.67    0.21875      17.62    0.22917      17.68
0.23958
     17.70    0.25000      17.72    0.26042      17.70    0.27083      17.62
0.28125
     17.55    0.29167      17.61    0.30208      17.70    0.31250      17.86
0.32292
     18.12    0.33333      18.45    0.34375      18.85    0.35417      19.40
0.36458
     20.00    0.37500      20.74    0.38542      21.51    0.39583      22.38
0.40625
     22.84    0.41667      23.33    0.42708      23.54    0.43750      23.81
0.44792
     24.25    0.45833      24.68    0.46875      24.86    0.47917      24.99
0.48958
     25.14    0.50000      25.19    0.51042      25.18    0.52083      25.13
0.53125
     24.95    0.54167      24.84    0.55208      24.64    0.56250      24.13
0.57292
     23.74    0.58333      23.90    0.59375      23.95    0.60417      24.03
0.61458
     23.96    0.62500      24.06    0.63542      24.09    0.64583      23.98
0.65625
     23.84    0.66667      23.55    0.67708      23.22    0.68750      23.04
0.69792
     22.30    0.70833      22.04    0.71875      21.78    0.72917      21.00
0.73958
     20.57    0.75000      20.20    0.76042      19.87    0.77083      19.72
0.78125
     19.70    0.79167      19.62    0.80208      19.47    0.81250      19.30
0.82292
     19.12    0.83333      18.97    0.84375      18.72    0.85417      18.52
0.86458
     18.51    0.87500      18.47    0.88542      18.45    0.89583      18.45
0.90625
     18.39    0.91667      18.36    0.92708      18.50    0.93750      18.77
0.94792
     18.99    0.95833      19.00    0.96875      18.91    0.97917      18.86
0.98958
     18.92    1.00000      18.93    1.01042      19.07    1.02083      19.05
1.03125
     19.05    1.04167      19.03    1.05208      18.99    1.06250      18.95
1.07292
     18.97    1.08333      18.94    1.09375      18.91    1.10417      18.83
1.11458
     18.72    1.12500      18.61    1.13542      18.45    1.14583      18.30
```

```
1.15625
     18.11   1.16667     17.92   1.17708     17.70   1.18750     17.55
1.19792
     17.55   1.20833     17.59   1.21875     17.58   1.22917     17.53
1.23958
     17.43   1.25000     17.35   1.26042     17.29   1.27083     17.34
1.28125
     17.47   1.29167     17.62   1.30208     17.80   1.31250     17.99
1.32292
     18.32   1.33333     18.74   1.34375     19.24   1.35417     19.77
1.36458
     20.39   1.37500     21.08   1.38542     21.87   1.39583     22.56
1.40625
     23.17   1.41667     23.79   1.42708     24.18   1.43750     24.44
1.44792
     24.78   1.45833     25.09   1.46875     25.36   1.47917     25.52
1.48958
     25.52   1.50000     25.32   1.51042     25.06   1.52083     24.76
1.53125
     24.74   1.54167     24.64   1.55208     24.65   1.56250     24.57
1.57292
     24.47   1.58333     24.49   1.59375     24.39   1.60417     24.52
1.61458
     24.60   1.62500     24.62   1.63541     24.58   1.64583     24.42
1.65625
     24.30   1.66666     24.24   1.67708     24.16   1.68750     24.02
1.69791
     23.71   1.70833     23.51   1.71875     23.20   1.72916     22.84
1.73958
     22.54   1.75000     22.23   1.76041     21.83   1.77083     21.48
1.78125
     21.20   1.79166     20.89   1.80208     20.57   1.81250     20.32
1.82291
     20.15   1.83333     20.02   1.84375     19.89   1.85416     19.76
1.86458
     19.62   1.87500     19.58   1.88541     19.55   1.89583     19.65
1.90625
     19.72   1.91666     19.74   1.92708     19.70   1.93750     19.66
1.94791
     19.61   1.95833     19.57   1.96875     19.55   1.97916     19.51
1.98958
     19.47   2.00000
ITOT    26     5           Solar radiation (ly/day)
       0.0       0.0        0.0   0.03681       0.0   0.07847       0.0
0.12014
       0.0   0.16181       4.41   0.20347     78.51   0.24514    254.94
0.28681
    453.43   0.32874     626.33   0.37014    798.36   0.41181    924.50
0.45347
    984.49   0.49514     988.02   0.53681    935.97   0.57847    820.41
0.62014
    668.68   0.66181     486.95   0.70000    285.82   0.74514     94.39
0.78681
     10.59   0.82847        0.0   0.87014       0.0   0.91181       0.0
0.95347
       0.0   0.99514        0.0       1.0
F        2     6           Photoperiod (fraction of day)
      1.00        0.       1.00     365.0
Ammonia                                        3 0.00       10.    J:
INITIAL
    1      0.02       1.0    2      0.02       1.0    3      0.02
1.0
    4      0.02       1.0    5      0.02       1.0    6      0.02
1.0
    7      0.02       1.0    8      0.02       1.0    9      0.02
```

```
1.0
   10      0.02        1.0   11       0.02        1.0   12       0.02
1.0
   13      0.02        1.0   14       0.02        1.0   15       0.02
1.0
   16      0.02        1.0   17       0.02        1.0   18       0.02
1.0
   19      0.02        1.0   20       0.02        1.0   21       0.02
1.0
   22      0.02        1.0   23       0.02        1.0   24       0.02
1.0
Nitrite + Nitrate                                 3 0.00        10.    J:
INITIAL
    1      0.09        1.0    2       0.09        1.0    3       0.09
1.0
    4      0.09        1.0    5       0.09        1.0    6       0.09
1.0
    7      0.09        1.0    8       0.09        1.0    9       0.09
1.0
   10      0.09        1.0   11       0.09        1.0   12       0.09
1.0
   13      0.09        1.0   14       0.09        1.0   15       0.09
1.0
   16      0.09        1.0   17       0.09        1.0   18       0.09
1.0
   19      0.09        1.0   20       0.09        1.0   21       0.09
1.0
   22      0.09        1.0   23       0.09        1.0   24       0.09
1.0
Dissolved Orthophosphate                          3 0.00         5.    J:
INITIAL
    1     1.010        1.0    2      1.010        1.0    3      1.010
1.0
    4     1.010        1.0    5      1.010        1.0    6      1.010
1.0
    7     1.010        1.0    8      1.010        1.0    9      1.010
1.0
   10     1.010        1.0   11      1.010        1.0   12      1.010
1.0
   13     1.010        1.0   14      1.010        1.0   15      1.010
1.0
   16     1.010        1.0   17      1.010        1.0   18      1.010
1.0
   19     1.010        1.0   20      1.010        1.0   21      1.010
1.0
   22     1.010        1.0   23      1.010        1.0   24      1.010
1.0
Viable Chlorophyll-a (ug/l)                       4 0.00       500.    J:
INITIAL
    1        0.        0.0    2     1000.        0.0    3        0.
0.0
    4     1000.        0.0    5        0.        0.0    6     1000.
0.0
    7        0.        0.0    8      975.        0.0    9        0.
0.0
   10      950.        0.0   11        0.        0.0   12      925.
0.0
   13        0.        0.0   14      900.        0.0   15        0.
0.0
   16      900.        0.0   17        0.        0.0   18      900.
0.0
   19        0.        0.0   20      900.        0.0   21        0.
0.0
   22      900.        0.0   23        0.        0.0   24      900.
0.0
```

```
Carbonaceous BOD (ultimate - algae)          3 0.00      100.    J:
INITIAL
    1       5.0       1.0    2       5.0       1.0    3       5.0
1.0
    4       5.0       1.0    5       5.0       1.0    6       5.0
1.0
    7       5.0       1.0    8       5.0       1.0    9       5.0
1.0
   10       5.0       1.0   11       5.0       1.0   12       5.0
1.0
   13       5.0       1.0   14       5.0       1.0   15       5.0
1.0
   16       5.0       1.0   17       5.0       1.0   18       5.0
1.0
   19       5.0       1.0   20       5.0       1.0   21       5.0
1.0
   22       5.0       1.0   23       5.0       1.0   24       5.0
1.0
Dissolved Oxygen                             3 0.00       20.    J:
INITIAL
    1      7.99       1.0    2      7.59       1.0    3      7.59
1.0
    4      7.99       1.0    5      7.59       1.0    6      7.59
1.0
    7      7.99       1.0    8      7.59       1.0    9      7.59
1.0
   10      7.99       1.0   11      7.59       1.0   12      7.59
1.0
   13      7.99       1.0   14      7.59       1.0   15      7.59
1.0
   16      7.99       1.0   17      7.59       1.0   18      7.59
1.0
   19      7.99       1.0   20      7.59       1.0   21      7.59
1.0
   22      7.99       1.0   23      7.59       1.0   24      7.59
1.0
Nonliving Organic Nitrogen                   3 0.00       10.    J:
INITIAL
    1      1.02       0.7    2      1.02       0.7    3      1.02
0.7
    4      1.02       0.7    5      1.02       0.7    6      1.02
0.7
    7      1.02       0.7    8      1.02       0.7    9      1.02
0.7
   10      1.02       0.7   11      1.02       0.7   12      1.02
0.7
   13      1.02       0.7   14      1.02       0.7   15      1.02
0.7
   16      1.02       0.7   17      1.02       0.7   18      1.02
0.7
   19      1.02       0.7   20      1.02       0.7   21      1.02
0.7
   22      1.02       0.7   23      1.02       0.7   24      1.02
0.7
Nonliving Organic Phosphorus                 3 0.00        5.    J:
INITIAL
    1      0.10       1.0    2      0.10       1.0    3      0.10
1.0
    4      0.10       1.0    5      0.10       1.0    6      0.10
1.0
    7      0.10       1.0    8      0.10       1.0    9      0.10
1.0
   10      0.10       1.0   11      0.10       1.0   12      0.10
1.0
   13      0.10       1.0   14      0.10       1.0   15      0.10
```

```
1.0
   16       0.10        1.0   17       0.10        1.0   18       0.10
1.0
   19       0.10        1.0   20       0.10        1.0   21       0.10
1.0
   22       0.10        1.0   23       0.10        1.0   24       0.10
1.0
CO2 Acidity (mg/L as CaCO3)                    3 0.00     5000.     J:
INITIAL
    1       4.0         1.0    2       4.0        1.0    3        4.0
1.0
    4       4.0         1.0    5       4.0        1.0    6        4.0
1.0
    7       4.0         1.0    8       4.0        1.0    9        4.0
1.0
   10       4.0         1.0   11       4.0        1.0   12        4.0
1.0
   13       6.0         1.0   14       6.0        1.0   15        6.0
1.0
   16       6.0         1.0   17       6.0        1.0   18        6.0
1.0
   19       6.0         1.0   20       6.0        1.0   21        6.0
1.0
   22       6.0         1.0   23       6.0        1.0   24        6.0
1.0
```

```
*********************************************************************

            WASP  - - WATER QUALITY ANALYSIS SIMULATION PROGRAM

*********************************************************************

                        Supported by
                 Center for Exposure Assessment Modeling
                              (CEAM)
                 Athens Environmental Research Laboratory
                          College Station Road
                        Athens, Georgia  30613
                    FTS 250-3491 or (404) 546-3491

                        Version 4.32 pH
                 Compiled on: Date: Tuesday, 26 Oct 1999,

                    Maximum Parameters for this Model

            Systems:    9          Segments:  100     Break Points:
193
         Parameters:   15         Constants:  104    Boundary Cond:
35
        Waste Loads:    9    Print Interval:    5    Time Function:
23

*********************************************************************

     No. Segments --->    24        No. Systems --->     9

*********************************************************************
TIME VARIABLE SOLUTION TECHNIQUE

*********************************************************************
            System Bypass Options for System  1 TO  9 are 0 0 0 0 0 0 0
0 0
```

```
**********************************************************************
1
```

Simulation Time Steps
Option 0 Selected
Advection Factor = 0.000

DT	T	DT	T	DT	T
0.00200	4.00000				

Print Intervals

PRINT INTERVAL	ELAPSED TIME	PRINT INTERVAL	ELAPSED TIME	PRINT INTERVAL	ELAPSED TIME
0.040	120.00				

1

Exchange Coefficients

Number of Exchange Fields = 1

FIELD 1 has 1 Time Functions

SCALR = 0.100E-03 CONVR = 0.100E+01

Time Function 1 has 12 Exchanges

A	EL	From	To
0.221E+04	0.100E+00	1	2
0.221E+04	0.100E+00	3	4
0.230E+04	0.100E+00	5	6
0.239E+04	0.100E+00	7	8
0.247E+04	0.100E+00	9	10
0.256E+04	0.100E+00	11	12
0.261E+04	0.100E+00	13	14
0.265E+04	0.110E+00	15	16

0.265E+04	0.110E+00	17	18
0.265E+04	0.110E+00	19	20
0.265E+04	0.110E+00	21	22
0.265E+04	0.110E+00	23	24

Number of Breaks in Time Function = 2

Dispersion	Time	Dispersion	Time	Dispersion	Time
0.200E-01	0.000E+00	0.200E-01	0.365E+03		

R Bypass Options for Systems 1 to 9 are 0 0 0 1 0 0 0 0 0
1

VOLUMES

Bed Volume Option = 0 Bed Time Step = 0.000E+00

Scale Factor = 0.1000E+01 Conversion Factor = 0.2832E-01

Seg #	BOTSG	Type	Volume	V mult	V exp	D mult	D exp
1	2	1	15920.000	0.168	0.000	0.235	0.000
2	73	2	433.000	0.168	0.000	0.010	0.000
3	4	1	18324.000	0.163	0.000	0.235	0.000
4	73	2	433.000	0.163	0.000	0.010	0.000
5	6	1	20732.000	0.158	0.000	0.235	0.000
6	73	2	433.000	0.158	0.000	0.010	0.000
7	8	1	21938.000	0.153	0.000	0.235	0.000
8	73	2	433.000	0.153	0.000	0.010	0.000
9	10	1	21938.000	0.148	0.000	0.235	0.000
10	73	2	433.000	0.148	0.000	0.010	0.000
11	12	1	21938.000	0.143	0.000	0.235	0.000
12	73	2	433.000	0.143	0.000	0.010	0.000
13	14	1	21938.000	0.128	0.000	0.235	0.000
14	73	2	433.000	0.128	0.000	0.010	0.000

15	16	1	21938.000	0.128	0.000	0.235	0.000
16	73	2	433.000	0.128	0.000	0.010	0.000
17	18	1	21938.000	0.128	0.000	0.235	0.000
18	73	2	433.000	0.128	0.000	0.010	0.000
19	20	1	21938.000	0.128	0.000	0.235	0.000
20	73	2	433.000	0.128	0.000	0.010	0.000
21	22	1	21938.000	0.128	0.000	0.235	0.000
22	73	2	433.000	0.128	0.000	0.010	0.000
23	24	1	21938.000	0.128	0.000	0.235	0.000
24	73	2	433.000	0.128	0.000	0.010	0.000

1

FLOWS

Flow Option 1 Used
Number of Flow Fields = 5

Field 1 has 2 Inflows
SCALQ = 0.100E+01 CONVQ = 0.283E-01

Inflow Number 1

Continuity Array:

Flow	From	To	Flow	From	To	Flow	From	To
0.100E+01	0	1	0.100E+01	1	3	0.100E+01	3	5
0.100E+01	5	7	0.100E+01	7	9	0.100E+01	9	11
0.100E+01	11	13	0.100E+01	13	15	0.100E+01	15	17
0.100E+01	17	19	0.100E+01	19	21	0.100E+01	21	23
0.100E+01	23	0						

Number of Breaks in Time Function = 2

Flow	Time	Flow	Time	Flow	Time

0.131E+02	0.000E+00	0.131E+02	0.365E+03

Inflow Number 2

Continuity Array:

Flow	From	To	Flow	From	To	Flow	From	To
0.100E+01	0	2	0.100E+01	2	4	0.100E+01	4	6
0.100E+01	6	8	0.100E+01	8	10	0.100E+01	10	12
0.100E+01	12	14	0.100E+01	14	16	0.100E+01	16	18
0.100E+01	18	20	0.100E+01	20	22	0.100E+01	22	24
0.100E+01	24	0						

Number of Breaks in Time Function = 2

Flow	Time	Flow	Time	Flow	Time
0.000E+00	0.000E+00	0.000E+00	0.365E+03		

Field 2 has 0 Inflows
SCALQ = 0.000E+00 CONVQ = 0.000E+00

Field 3 has 1 Inflows
SCALQ = 0.100E+01 CONVQ = 0.100E+01

Inflow Number 1

Solids Transport:

Area	From	To	Area	From	To	Area	From	To
0.221E+04	1	2	0.221E+04	2	73	0.221E+04	3	4
0.221E+04	4	73	0.230E+04	5	6	0.230E+04	6	73
0.239E+04	7	8	0.239E+04	8	73	0.247E+04	9	10
0.247E+04	10	73	0.256E+04	11	12	0.256E+04	12	73
0.261E+04	13	14	0.265E+04	14	73	0.265E+04	15	16

0.265E+04	16	73	0.265E+04	17	18	0.265E+04	18	73
0.265E+04	19	20	0.265E+04	20	73	0.265E+04	21	22
0.265E+04	22	73	0.265E+04	23	24	0.265E+04	24	73

Number of Breaks in Time Function = 2

Velocity	Time	Velocity	Time	Velocity	Time
0.300E-05	0.000E+00	0.300E-05	0.365E+03		

Field 4 has 1 Inflows
SCALQ = 0.100E+00 CONVQ = 0.929E-01

Inflow Number 1

Solids Transport:

Area	From	To	Area	From	To	Area	From	To
0.221E+04	1	2	0.221E+04	2	73	0.221E+04	3	4
0.221E+04	4	73	0.230E+04	5	6	0.230E+04	6	73
0.239E+04	7	8	0.239E+04	8	73	0.247E+04	9	10
0.247E+04	10	73	0.256E+04	11	12	0.256E+04	12	73
0.261E+04	13	14	0.265E+04	14	73	0.265E+04	15	16
0.265E+04	16	73	0.265E+04	17	18	0.265E+04	18	73
0.265E+04	19	20	0.265E+04	20	73	0.265E+04	21	22
0.265E+04	22	73	0.265E+04	23	24	0.265E+04	24	73

Number of Breaks in Time Function = 2

Velocity	Time	Velocity	Time	Velocity	Time
0.000E+00	0.000E+00	0.000E+00	0.365E+03		

Field 5 has 1 Inflows

SCALQ = 0.100E+01 CONVQ = 0.929E-01

Inflow Number 1

Solids Transport:

Area	From	To	Area	From	To	Area	From	To
0.221E+04	1	2	0.221E+04	2	73	0.221E+04	3	4
0.221E+04	4	73	0.230E+04	5	6	0.230E+04	6	73
0.239E+04	7	8	0.239E+04	8	73	0.247E+04	9	10
0.247E+04	10	73	0.256E+04	11	12	0.256E+04	12	73
0.261E+04	13	14	0.265E+04	14	73	0.265E+04	15	16
0.265E+04	16	73	0.265E+04	17	18	0.265E+04	18	73
0.265E+04	19	20	0.265E+04	20	73	0.265E+04	21	22
0.265E+04	22	73	0.265E+04	23	24	0.265E+04	24	73

Number of Breaks in Time Function = 2

Velocity	Time	Velocity	Time	Velocity	Time
0.100E-05	0.000E+00	0.100E-05	0.365E+03		

QSUMX= 0.000
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```

Q Bypass Options for Systems 1 to 9 are 0 0 0 1 0 0 0 0 0
1

Boundary Conditions

Boundary Concentrations for System 1

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.2000000E+01	0.00	0.2000000E+01	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.1000000E-02	0.00	0.1000000E-02	365.00
24	2	0.1000000E-02	0.00	0.1000000E-02	365.00

Boundary Concentrations for System 2

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+
01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.3000000E+01	0.00	0.3000000E+01	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.1500000E+00	0.00	0.1500000E+00	365.00
24	2	0.1500000E+00	0.00	0.1500000E+00	365.00

Boundary Concentrations for System 3

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+
01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.4000000E+00	0.00	0.4000000E+00	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.1000000E-01	0.00	0.1000000E-01	365.00
24	2	0.1000000E-01	0.00	0.1000000E-01	365.00

Boundary Concentrations for System 4

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+
01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.0000000E+00	0.00	0.0000000E+00	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.2000000E+01	0.00	0.2000000E+01	365.00
24	2	0.2000000E+01	0.00	0.2000000E+01	365.00

Boundary Concentrations for System 5

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.1400000E+02	0.00	0.1400000E+02	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.1000000E+01	0.00	0.1000000E+01	365.00
24	2	0.1000000E+01	0.00	0.1000000E+01	365.00

Boundary Concentrations for System 6

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.5000000E+01	0.00	0.5000000E+01	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00

```
            23      2      0.8000000E+01      0.00   0.8000000E+01
365.00

            24      2      0.8000000E+01      0.00   0.8000000E+01
365.00


                        Boundary Concentrations for System  7

                   BC Option  0 Used     No.Of BC'S Read    4

             Scale Factor =  0.1000E+01  Conversion Factor =  0.1000E+
01


        Segment  No.Brk.      BC(T)           T           BC(T)
T
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
            1      2      0.8000000E+00      0.00   0.8000000E+00
365.00

            2      2      0.0000000E+00      0.00   0.0000000E+00
365.00

           23      2      0.4000000E+00      0.00   0.4000000E+00
365.00

           24      2      0.4000000E+00      0.00   0.4000000E+00
365.00


                        Boundary Concentrations for System  8

                   BC Option  0 Used     No.Of BC'S Read    4

             Scale Factor =  0.1000E+01  Conversion Factor =  0.1000E+
01


        Segment  No.Brk.      BC(T)           T           BC(T)
T
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
            1      2      0.1000000E+00      0.00   0.1000000E+00
365.00

            2      2      0.0000000E+00      0.00   0.0000000E+00
365.00

           23      2      0.4000000E-01      0.00   0.4000000E-01
365.00

           24      2      0.4000000E-01      0.00   0.4000000E-01
365.00
```

Boundary Concentrations for System 9

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+
01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.1500000E+02	0.00	0.1500000E+02	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.1000000E+02	0.00	0.1000000E+02	365.00
24	2	0.1000000E+02	0.00	0.1000000E+02	365.00

Waste Loads

Forcing Functions For System 1

Wk Option 3 Used No.of WK'S Read 0

No Forcing Function for System 1
1

Forcing Functions For System 2

Wk Option 3 Used No.of WK'S Read 0

No Forcing Function for System 2
1

Forcing Functions For System 3

Wk Option 3 Used No.of WK'S Read 0

No Forcing Function for System 3
1

```
      Forcing Functions For System  4
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Wk Option  3 Used     No.of WK'S Read    0


   No Forcing Function for System  4
1

      Forcing Functions For System  5
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Wk Option  3 Used     No.of WK'S Read    0


   No Forcing Function for System  5
1

      Forcing Functions For System  6
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Wk Option  3 Used     No.of WK'S Read    0


   No Forcing Function for System  6
1

      Forcing Functions For System  7
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Wk Option  3 Used     No.of WK'S Read    0


   No Forcing Function for System  7
1

      Forcing Functions For System  8
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Wk Option  3 Used     No.of WK'S Read    0


   No Forcing Function for System  8
1

      Forcing Functions For System  9
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

```
                    Wk Option  3 Used     No.of WK'S Read     0


                     No Forcing Function for System  9
1
                           Segment Parameters
                           ~~~~~~~~~~~~~~~~~~~

 PARM     SCALE        PARM     SCALE        PARM     SCALE        PARM
SCALE

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
~~~~~~~
 TMPSG   0.100E+01    KESG   0.100E+01   SOD1D   0.100E+01   SODTA
0.100E+01
 FNH4    0.000E+00    FPO4   0.000E+00   ITOTL   0.100E+01   TMPFN
0.100E+01


 Segment #    1
 TMPSG    3 0.100E+01  KESG    5 0.150E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #    2
 TMPSG    3 0.100E+01  KESG    5 0.150E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #    3
 TMPSG    3 0.100E+01  KESG    5 0.150E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #    4
 TMPSG    3 0.100E+01  KESG    5 0.150E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #    5
 TMPSG    3 0.100E+01  KESG    5 0.150E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #    6
 TMPSG    3 0.100E+01  KESG    5 0.150E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #    7
```

```
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01

 Segment #    8
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01

 Segment #    9
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01

 Segment #   10
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01

 Segment #   11
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01

 Segment #   12
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01

 Segment #   13
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.200E+01

 Segment #   14
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.200E+01

 Segment #   15
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.200E+01

 Segment #   16
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
```

```
 FNH4     7 0.710E+01  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

 Segment #  17
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

 Segment #  18
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

 Segment #  19
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

 Segment #  20
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

 Segment #  21
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

 Segment #  22
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

 Segment #  23
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

 Segment #  24
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

1
                    Environmental and Chemical Constants
                    ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

                 No Constants Enter for System  1:     GLOBALS
```

NH3 Constants for System 2

Number of Constants for System 2; Group nitrificat is 2

Constant	Const. #	K Value	Constant	Const. #	K Value
K12C	11	0.200E+00	K12T	12	0.108E+01

NO3 Constants for System 3

Number of Constants for System 3; Group denitrif is 2

Constant	Const. #	K Value	Constant	Const. #	K Value
K20C	21	0.100E+00	K20T	22	0.104E+01

No Constants Enter for System 4: PO4

PHYT Constants for System 5

Number of Constants for System 5; Group growth is 2

Constant	Const. #	K Value	Constant	Const. #	K Value
K1C	41	0.245E+01	K1T	42	0.105E+01

Number of Constants for System 5; Group light is 3

Constant	Const. #	K Value	Constant	Const. #	K Value
LGHTS	43	0.100E+01	CCHL	46	0.133E+03
IS1	47	0.525E+03		0	0.000E+00

Number of Constants for System 5; Group nutrients is 4

Constant	Const. #	K Value	Constant	Const. #	K Value
KMNG1	48	0.250E-01	KMPG1	49	0.500E-02
NCRB	58	0.180E+00	PCRB	57	0.250E-01

Number of Constants for System 5; Group death is 4

Constant	Const. #	K Value	Constant	Const. #	K Value
K1RC	50	0.600E+00	K1RT	51	0.107E+01
K1D	52	0.300E+00	KPZDC	55	0.000E+00

CBOD Constants for System 6

Number of Constants for System 6; Group deoxygent is 2

Constant	Const. #	K Value	Constant	Const. #	K Value
KDC	71	0.700E-01	KDT	72	0.105E+01

DO Constants for System 7

Number of Constants for System 7; Group ratio is 2

Constant	Const. #	K Value	Constant	Const. #	K Value
OCRB	81	0.267E+01	K2	82	0.450E+01

ON Constants for System 8

Number of Constants for System 8; Group mineralize is 3

Constant	Const. #	K Value	Constant	Const. #	K Value
K71C	91	0.500E+00	K71T	92	0.108E+01
FON	95	0.150E+00		0	0.000E+00

OP Constants for System 9

Number of Constants for System 9; Group mineralize is 3

Constant	Const. #	K Value	Constant	Const. #	K Value
K83C	100	0.750E+00	K83T	101	0.108E+01
FOP	104	0.500E+00		0	0.000E+00

No Constants Enter for System 10: CO2acy

Environmental Time Functions

Piecewise Linear Functions

	VAL(T)	T	VAL(T)	T	VAL(T)	T
TEMP1	0.18700E+02	0.00	0.18800E+02	0.01	0.18920E+02	0.02
	0.18940E+02	0.03	0.18820E+02	0.04	0.18870E+02	0.05
	0.18920E+02	0.06	0.18840E+02	0.07	0.18800E+02	0.08
	0.18850E+02	0.09	0.18900E+02	0.10	0.18870E+02	0.11
	0.18830E+02	0.13	0.18800E+02	0.14	0.18740E+02	0.15
	0.18570E+02	0.16	0.18470E+02	0.17	0.18450E+02	0.18
	0.18300E+02	0.19	0.18090E+02	0.20	0.17870E+02	0.21
	0.17670E+02	0.22	0.17620E+02	0.23	0.17680E+02	0.24
	0.17700E+02	0.25	0.17720E+02	0.26	0.17700E+02	0.27
	0.17620E+02	0.28	0.17550E+02	0.29	0.17610E+02	0.30
	0.17700E+02	0.31	0.17860E+02	0.32	0.18120E+02	0.33
	0.18450E+02	0.34	0.18850E+02	0.35	0.19400E+02	0.36
	0.20000E+02	0.38	0.20740E+02	0.39	0.21510E+02	0.40
	0.22380E+02	0.41	0.22840E+02	0.42	0.23330E+02	0.43
	0.23540E+02	0.44	0.23810E+02	0.45	0.24250E+02	0.46
	0.24680E+02	0.47	0.24860E+02	0.48	0.24990E+02	0.49
	0.25140E+02	0.50	0.25190E+02	0.51	0.25180E+02	0.52
	0.25130E+02	0.53	0.24950E+02	0.54	0.24840E+02	0.55
	0.24640E+02	0.56	0.24130E+02	0.57	0.23740E+02	0.58
	0.23900E+02	0.59	0.23950E+02	0.60	0.24030E+02	0.61
	0.23960E+02	0.63	0.24060E+02	0.64	0.24090E+02	0.65
	0.23980E+02	0.66	0.23840E+02	0.67	0.23550E+02	0.68
	0.23220E+02	0.69	0.23040E+02	0.70	0.22300E+02	0.71
	0.22040E+02	0.72	0.21780E+02	0.73	0.21000E+02	0.74
	0.20570E+02	0.75	0.20200E+02	0.76	0.19870E+02	0.77
	0.19720E+02	0.78	0.19700E+02	0.79	0.19620E+02	0.80
	0.19470E+02	0.81	0.19300E+02	0.82	0.19120E+02	0.83
	0.18970E+02	0.84	0.18720E+02	0.85	0.18520E+02	0.86
	0.18510E+02	0.88	0.18470E+02	0.89	0.18450E+02	0.90
	0.18450E+02	0.91	0.18390E+02	0.92	0.18360E+02	0.93
	0.18500E+02	0.94	0.18770E+02	0.95	0.18990E+02	0.96
	0.19000E+02	0.97	0.18910E+02	0.98	0.18860E+02	0.99
	0.18920E+02	1.00	0.18930E+02	1.01	0.19070E+02	1.02
	0.19050E+02	1.03	0.19050E+02	1.04	0.19030E+02	1.05
	0.18990E+02	1.06	0.18950E+02	1.07	0.18970E+02	1.08
	0.18940E+02	1.09	0.18910E+02	1.10	0.18830E+02	1.11
	0.18720E+02	1.13	0.18610E+02	1.14	0.18450E+02	1.15
	0.18300E+02	1.16	0.18110E+02	1.17	0.17920E+02	1.18
	0.17700E+02	1.19	0.17550E+02	1.20	0.17550E+02	1.21
	0.17590E+02	1.22	0.17580E+02	1.23	0.17530E+02	1.24
	0.17430E+02	1.25	0.17350E+02	1.26	0.17290E+02	1.27
	0.17340E+02	1.28	0.17470E+02	1.29	0.17620E+02	1.30
	0.17800E+02	1.31	0.17990E+02	1.32	0.18320E+02	1.33
	0.18740E+02	1.34	0.19240E+02	1.35	0.19770E+02	1.36
	0.20390E+02	1.38	0.21080E+02	1.39	0.21870E+02	1.40
	0.22560E+02	1.41	0.23170E+02	1.42	0.23790E+02	1.43
	0.24180E+02	1.44	0.24440E+02	1.45	0.24780E+02	1.46
	0.25090E+02	1.47	0.25360E+02	1.48	0.25520E+02	1.49
	0.25520E+02	1.50	0.25320E+02	1.51	0.25060E+02	1.52
	0.24760E+02	1.53	0.24740E+02	1.54	0.24640E+02	1.55
	0.24650E+02	1.56	0.24570E+02	1.57	0.24470E+02	1.58
	0.24490E+02	1.59	0.24390E+02	1.60	0.24520E+02	1.61
	0.24600E+02	1.63	0.24620E+02	1.64	0.24580E+02	1.65
	0.24420E+02	1.66	0.24300E+02	1.67	0.24240E+02	1.68
	0.24160E+02	1.69	0.24020E+02	1.70	0.23710E+02	1.71
	0.23510E+02	1.72	0.23200E+02	1.73	0.22840E+02	1.74
	0.22540E+02	1.75	0.22230E+02	1.76	0.21830E+02	1.77

	0.21480E+02	1.78	0.21200E+02	1.79	0.20890E+02	1.80
	0.20570E+02	1.81	0.20320E+02	1.82	0.20150E+02	1.83
	0.20020E+02	1.84	0.19890E+02	1.85	0.19760E+02	1.86
	0.19620E+02	1.88	0.19580E+02	1.89	0.19550E+02	1.90
	0.19650E+02	1.91	0.19720E+02	1.92	0.19740E+02	1.93
	0.19700E+02	1.94	0.19660E+02	1.95	0.19610E+02	1.96
	0.19570E+02	1.97	0.19550E+02	1.98	0.19510E+02	1.99
	0.19470E+02	2.00				
TEMP2	0.18700E+02	0.00	0.18800E+02	0.01	0.18920E+02	0.02
	0.18940E+02	0.03	0.18820E+02	0.04	0.18870E+02	0.05
	0.18920E+02	0.06	0.18840E+02	0.07	0.18800E+02	0.08
	0.18850E+02	0.09	0.18900E+02	0.10	0.18870E+02	0.11
	0.18830E+02	0.13	0.18800E+02	0.14	0.18740E+02	0.15
	0.18570E+02	0.16	0.18470E+02	0.17	0.18450E+02	0.18
	0.18300E+02	0.19	0.18090E+02	0.20	0.17870E+02	0.21
	0.17670E+02	0.22	0.17620E+02	0.23	0.17680E+02	0.24
	0.17700E+02	0.25	0.17720E+02	0.26	0.17700E+02	0.27
	0.17620E+02	0.28	0.17550E+02	0.29	0.17610E+02	0.30
	0.17700E+02	0.31	0.17860E+02	0.32	0.18120E+02	0.33
	0.18450E+02	0.34	0.18850E+02	0.35	0.19400E+02	0.36
	0.20000E+02	0.38	0.20740E+02	0.39	0.21510E+02	0.40
	0.22380E+02	0.41	0.22840E+02	0.42	0.23330E+02	0.43
	0.23540E+02	0.44	0.23810E+02	0.45	0.24250E+02	0.46
	0.24680E+02	0.47	0.24860E+02	0.48	0.24990E+02	0.49
	0.25140E+02	0.50	0.25190E+02	0.51	0.25180E+02	0.52
	0.25130E+02	0.53	0.24950E+02	0.54	0.24840E+02	0.55
	0.24640E+02	0.56	0.24130E+02	0.57	0.23740E+02	0.58
	0.23900E+02	0.59	0.23950E+02	0.60	0.24030E+02	0.61
	0.23960E+02	0.63	0.24060E+02	0.64	0.24090E+02	0.65
	0.23980E+02	0.66	0.23840E+02	0.67	0.23550E+02	0.68
	0.23220E+02	0.69	0.23040E+02	0.70	0.22300E+02	0.71
	0.22040E+02	0.72	0.21780E+02	0.73	0.21000E+02	0.74
	0.20570E+02	0.75	0.20200E+02	0.76	0.19870E+02	0.77
	0.19720E+02	0.78	0.19700E+02	0.79	0.19620E+02	0.80
	0.19470E+02	0.81	0.19300E+02	0.82	0.19120E+02	0.83
	0.18970E+02	0.84	0.18720E+02	0.85	0.18520E+02	0.86
	0.18510E+02	0.88	0.18470E+02	0.89	0.18450E+02	0.90
	0.18450E+02	0.91	0.18390E+02	0.92	0.18360E+02	0.93
	0.18500E+02	0.94	0.18770E+02	0.95	0.18990E+02	0.96
	0.19000E+02	0.97	0.18910E+02	0.98	0.18860E+02	0.99
	0.18920E+02	1.00	0.18930E+02	1.01	0.19070E+02	1.02
	0.19050E+02	1.03	0.19050E+02	1.04	0.19030E+02	1.05
	0.18990E+02	1.06	0.18950E+02	1.07	0.18970E+02	1.08
	0.18940E+02	1.09	0.18910E+02	1.10	0.18830E+02	1.11
	0.18720E+02	1.13	0.18610E+02	1.14	0.18450E+02	1.15
	0.18300E+02	1.16	0.18110E+02	1.17	0.17920E+02	1.18
	0.17700E+02	1.19	0.17550E+02	1.20	0.17550E+02	1.21
	0.17590E+02	1.22	0.17580E+02	1.23	0.17530E+02	1.24
	0.17430E+02	1.25	0.17350E+02	1.26	0.17290E+02	1.27
	0.17340E+02	1.28	0.17470E+02	1.29	0.17620E+02	1.30
	0.17800E+02	1.31	0.17990E+02	1.32	0.18320E+02	1.33
	0.18740E+02	1.34	0.19240E+02	1.35	0.19770E+02	1.36
	0.20390E+02	1.38	0.21080E+02	1.39	0.21870E+02	1.40
	0.22560E+02	1.41	0.23170E+02	1.42	0.23790E+02	1.43
	0.24180E+02	1.44	0.24440E+02	1.45	0.24780E+02	1.46
	0.25090E+02	1.47	0.25360E+02	1.48	0.25520E+02	1.49
	0.25520E+02	1.50	0.25320E+02	1.51	0.25060E+02	1.52
	0.24760E+02	1.53	0.24740E+02	1.54	0.24640E+02	1.55
	0.24650E+02	1.56	0.24570E+02	1.57	0.24470E+02	1.58
	0.24490E+02	1.59	0.24390E+02	1.60	0.24520E+02	1.61
	0.24600E+02	1.63	0.24620E+02	1.64	0.24580E+02	1.65
	0.24420E+02	1.66	0.24300E+02	1.67	0.24240E+02	1.68
	0.24160E+02	1.69	0.24020E+02	1.70	0.23710E+02	1.71
	0.23510E+02	1.72	0.23200E+02	1.73	0.22840E+02	1.74
	0.22540E+02	1.75	0.22230E+02	1.76	0.21830E+02	1.77

```
          0.21480E+02   1.78    0.21200E+02   1.79    0.20890E+02   1.80
          0.20570E+02   1.81    0.20320E+02   1.82    0.20150E+02   1.83
          0.20020E+02   1.84    0.19890E+02   1.85    0.19760E+02   1.86
          0.19620E+02   1.88    0.19580E+02   1.89    0.19550E+02   1.90
          0.19650E+02   1.91    0.19720E+02   1.92    0.19740E+02   1.93
          0.19700E+02   1.94    0.19660E+02   1.95    0.19610E+02   1.96
          0.19570E+02   1.97    0.19550E+02   1.98    0.19510E+02   1.99
          0.19470E+02   2.00
 ITOT     0.00000E+00   0.00    0.00000E+00   0.04    0.00000E+00   0.08
          0.00000E+00   0.12    0.00000E+00   0.16    0.44100E+01   0.20
          0.78510E+02   0.25    0.25494E+03   0.29    0.45343E+03   0.33
          0.62633E+03   0.37    0.79836E+03   0.41    0.92450E+03   0.45
          0.98449E+03   0.50    0.98802E+03   0.54    0.93597E+03   0.58
          0.82041E+03   0.62    0.66868E+03   0.66    0.48695E+03   0.70
          0.28582E+03   0.75    0.94390E+02   0.79    0.10590E+02   0.83
          0.00000E+00   0.87    0.00000E+00   0.91    0.00000E+00   0.95
          0.00000E+00   1.00    0.00000E+00   1.00
 F        0.10000E+01   0.00    0.10000E+01 365.00
1
```

Initial Conditions
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Initial Conditions for System 1
Particulate Fraction of System is Transported by Solids Field 3
Density of System = 0.100E+01

```
      1 0.2000E-01 0.1000E+01      2 0.2000E-01 0.1000E+01      3
0.2000E-01 0.1000E+01
      4 0.2000E-01 0.1000E+01      5 0.2000E-01 0.1000E+01      6
0.2000E-01 0.1000E+01
      7 0.2000E-01 0.1000E+01      8 0.2000E-01 0.1000E+01      9
0.2000E-01 0.1000E+01
     10 0.2000E-01 0.1000E+01     11 0.2000E-01 0.1000E+01     12
0.2000E-01 0.1000E+01
     13 0.2000E-01 0.1000E+01     14 0.2000E-01 0.1000E+01     15
0.2000E-01 0.1000E+01
     16 0.2000E-01 0.1000E+01     17 0.2000E-01 0.1000E+01     18
0.2000E-01 0.1000E+01
     19 0.2000E-01 0.1000E+01     20 0.2000E-01 0.1000E+01     21
0.2000E-01 0.1000E+01
     22 0.2000E-01 0.1000E+01     23 0.2000E-01 0.1000E+01     24
0.2000E-01 0.1000E+01
```

Initial Conditions for System 2
Particulate Fraction of System is Transported by Solids Field 3
Density of System = 0.100E+01

```
      1 0.9000E-01 0.1000E+01      2 0.9000E-01 0.1000E+01      3
0.9000E-01 0.1000E+01
      4 0.9000E-01 0.1000E+01      5 0.9000E-01 0.1000E+01      6
0.9000E-01 0.1000E+01
      7 0.9000E-01 0.1000E+01      8 0.9000E-01 0.1000E+01      9
0.9000E-01 0.1000E+01
     10 0.9000E-01 0.1000E+01     11 0.9000E-01 0.1000E+01     12
0.9000E-01 0.1000E+01
     13 0.9000E-01 0.1000E+01     14 0.9000E-01 0.1000E+01     15
0.9000E-01 0.1000E+01
     16 0.9000E-01 0.1000E+01     17 0.9000E-01 0.1000E+01     18
0.9000E-01 0.1000E+01
```
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```
      19 0.9000E-01 0.1000E+01      20 0.9000E-01 0.1000E+01      21
0.9000E-01 0.1000E+01
      22 0.9000E-01 0.1000E+01      23 0.9000E-01 0.1000E+01      24
0.9000E-01 0.1000E+01

                    Initial Conditions for System 3
    Particulate Fraction of System is Transported by Solids Field    3
                      Density of System =  0.100E+01

       1 0.1010E+01 0.1000E+01       2 0.1010E+01 0.1000E+01       3
0.1010E+01 0.1000E+01
       4 0.1010E+01 0.1000E+01       5 0.1010E+01 0.1000E+01       6
0.1010E+01 0.1000E+01
       7 0.1010E+01 0.1000E+01       8 0.1010E+01 0.1000E+01       9
0.1010E+01 0.1000E+01
      10 0.1010E+01 0.1000E+01      11 0.1010E+01 0.1000E+01      12
0.1010E+01 0.1000E+01
      13 0.1010E+01 0.1000E+01      14 0.1010E+01 0.1000E+01      15
0.1010E+01 0.1000E+01
      16 0.1010E+01 0.1000E+01      17 0.1010E+01 0.1000E+01      18
0.1010E+01 0.1000E+01
      19 0.1010E+01 0.1000E+01      20 0.1010E+01 0.1000E+01      21
0.1010E+01 0.1000E+01
      22 0.1010E+01 0.1000E+01      23 0.1010E+01 0.1000E+01      24
0.1010E+01 0.1000E+01

                    Initial Conditions for System 4
    Particulate Fraction of System is Transported by Solids Field    4
                      Density of System =  0.100E+01

       1 0.1000E-23 0.0000E+00       2 0.1000E+04 0.0000E+00       3
0.1000E-23 0.0000E+00
       4 0.1000E+04 0.0000E+00       5 0.1000E-23 0.0000E+00       6
0.1000E+04 0.0000E+00
       7 0.1000E-23 0.0000E+00       8 0.9750E+03 0.0000E+00       9
0.1000E-23 0.0000E+00
      10 0.9500E+03 0.0000E+00      11 0.1000E-23 0.0000E+00      12
0.9250E+03 0.0000E+00
      13 0.1000E-23 0.0000E+00      14 0.9000E+03 0.0000E+00      15
0.1000E-23 0.0000E+00
      16 0.9000E+03 0.0000E+00      17 0.1000E-23 0.0000E+00      18
0.9000E+03 0.0000E+00
      19 0.1000E-23 0.0000E+00      20 0.9000E+03 0.0000E+00      21
0.1000E-23 0.0000E+00
      22 0.9000E+03 0.0000E+00      23 0.1000E-23 0.0000E+00      24
0.9000E+03 0.0000E+00

                    Initial Conditions for System 5
    Particulate Fraction of System is Transported by Solids Field    3
                      Density of System =  0.100E+01

       1 0.5000E+01 0.1000E+01       2 0.5000E+01 0.1000E+01       3
0.5000E+01 0.1000E+01
       4 0.5000E+01 0.1000E+01       5 0.5000E+01 0.1000E+01       6
0.5000E+01 0.1000E+01
       7 0.5000E+01 0.1000E+01       8 0.5000E+01 0.1000E+01       9
0.5000E+01 0.1000E+01
      10 0.5000E+01 0.1000E+01      11 0.5000E+01 0.1000E+01      12
0.5000E+01 0.1000E+01
      13 0.5000E+01 0.1000E+01      14 0.5000E+01 0.1000E+01      15
0.5000E+01 0.1000E+01
      16 0.5000E+01 0.1000E+01      17 0.5000E+01 0.1000E+01      18
```

```
0.5000E+01 0.1000E+01
      19 0.5000E+01 0.1000E+01      20 0.5000E+01 0.1000E+01      21
0.5000E+01 0.1000E+01
      22 0.5000E+01 0.1000E+01      23 0.5000E+01 0.1000E+01      24
0.5000E+01 0.1000E+01

                    Initial Conditions for System 6
    Particulate Fraction of System is Transported by Solids Field    3
                        Density of System =  0.100E+01

       1 0.7990E+01 0.1000E+01       2 0.7590E+01 0.1000E+01       3
0.7590E+01 0.1000E+01
       4 0.7990E+01 0.1000E+01       5 0.7590E+01 0.1000E+01       6
0.7590E+01 0.1000E+01
       7 0.7990E+01 0.1000E+01       8 0.7590E+01 0.1000E+01       9
0.7590E+01 0.1000E+01
      10 0.7990E+01 0.1000E+01      11 0.7590E+01 0.1000E+01      12
0.7590E+01 0.1000E+01
      13 0.7990E+01 0.1000E+01      14 0.7590E+01 0.1000E+01      15
0.7590E+01 0.1000E+01
      16 0.7990E+01 0.1000E+01      17 0.7590E+01 0.1000E+01      18
0.7590E+01 0.1000E+01
      19 0.7990E+01 0.1000E+01      20 0.7590E+01 0.1000E+01      21
0.7590E+01 0.1000E+01
      22 0.7990E+01 0.1000E+01      23 0.7590E+01 0.1000E+01      24
0.7590E+01 0.1000E+01

                    Initial Conditions for System 7
    Particulate Fraction of System is Transported by Solids Field    3
                        Density of System =  0.100E+01

       1 0.1020E+01 0.7000E+00       2 0.1020E+01 0.7000E+00       3
0.1020E+01 0.7000E+00
       4 0.1020E+01 0.7000E+00       5 0.1020E+01 0.7000E+00       6
0.1020E+01 0.7000E+00
       7 0.1020E+01 0.7000E+00       8 0.1020E+01 0.7000E+00       9
0.1020E+01 0.7000E+00
      10 0.1020E+01 0.7000E+00      11 0.1020E+01 0.7000E+00      12
0.1020E+01 0.7000E+00
      13 0.1020E+01 0.7000E+00      14 0.1020E+01 0.7000E+00      15
0.1020E+01 0.7000E+00
      16 0.1020E+01 0.7000E+00      17 0.1020E+01 0.7000E+00      18
0.1020E+01 0.7000E+00
      19 0.1020E+01 0.7000E+00      20 0.1020E+01 0.7000E+00      21
0.1020E+01 0.7000E+00
      22 0.1020E+01 0.7000E+00      23 0.1020E+01 0.7000E+00      24
0.1020E+01 0.7000E+00

                    Initial Conditions for System 8
    Particulate Fraction of System is Transported by Solids Field    3
                        Density of System =  0.100E+01

       1 0.1000E+00 0.1000E+01       2 0.1000E+00 0.1000E+01       3
0.1000E+00 0.1000E+01
       4 0.1000E+00 0.1000E+01       5 0.1000E+00 0.1000E+01       6
0.1000E+00 0.1000E+01
       7 0.1000E+00 0.1000E+01       8 0.1000E+00 0.1000E+01       9
0.1000E+00 0.1000E+01
      10 0.1000E+00 0.1000E+01      11 0.1000E+00 0.1000E+01      12
0.1000E+00 0.1000E+01
      13 0.1000E+00 0.1000E+01      14 0.1000E+00 0.1000E+01      15
0.1000E+00 0.1000E+01
```

```
      16 0.1000E+00 0.1000E+01      17 0.1000E+00 0.1000E+01      18
0.1000E+00 0.1000E+01
      19 0.1000E+00 0.1000E+01      20 0.1000E+00 0.1000E+01      21
0.1000E+00 0.1000E+01
      22 0.1000E+00 0.1000E+01      23 0.1000E+00 0.1000E+01      24
0.1000E+00 0.1000E+01
```

Initial Conditions for System 9
Particulate Fraction of System is Transported by Solids Field 3
Density of System = 0.100E+01

```
       1 0.4000E+01 0.1000E+01       2 0.4000E+01 0.1000E+01       3
0.4000E+01 0.1000E+01
       4 0.4000E+01 0.1000E+01       5 0.4000E+01 0.1000E+01       6
0.4000E+01 0.1000E+01
       7 0.4000E+01 0.1000E+01       8 0.4000E+01 0.1000E+01       9
0.4000E+01 0.1000E+01
      10 0.4000E+01 0.1000E+01      11 0.4000E+01 0.1000E+01      12
0.4000E+01 0.1000E+01
      13 0.6000E+01 0.1000E+01      14 0.6000E+01 0.1000E+01      15
0.6000E+01 0.1000E+01
      16 0.6000E+01 0.1000E+01      17 0.6000E+01 0.1000E+01      18
0.6000E+01 0.1000E+01
      19 0.6000E+01 0.1000E+01      20 0.6000E+01 0.1000E+01      21
0.6000E+01 0.1000E+01
      22 0.6000E+01 0.1000E+01      23 0.6000E+01 0.1000E+01      24
0.6000E+01 0.1000E+01
```

Stability Criteria for Numerical Integration

System	Maximum Concentration
1	10.00
2	10.00
3	5.00
4	500.00
5	100.00
6	20.00
7	10.00
8	5.00
9	5000.00

Completed

```
# WASP5pH EDF dump file
#
# Seg    = model segment number
# Time   = simulation time in days
# Tchlax = total chlorophyll-a [periphyton] (ug/L)
# DO     = dissolved oxygen (mg/L)
# CO2acy = carbon dioxide acidity (mg/L)
# pH     = pH (standard units)
# CO2sat = saturated CO2 concentration (mg/L)
# Nlim   = Michaelis Nitrogen limitation factor
# Plim   = Michaelis Phosphorus limitation factor
#
# Seg    Time Tchlax     DO CO2acy     pH  CO2sat    Nlim    Plim
    2    0.00 1000.0   7.59   4.00   8.08    0.61    0.81    1.00
   14    0.00  900.0   7.59   6.00   7.90    0.61    0.81    1.00
    2    0.04  966.3   4.57  15.30   7.49    0.60    0.99    0.99
   14    0.04  869.7   7.05   5.19   7.96    0.60    0.88    1.00
    2    0.08  932.2   4.43  15.80   7.48    0.60    1.00    0.99
   14    0.08  838.9   6.58   5.98   7.90    0.60    0.97    0.99
    2    0.12  900.8   4.45  15.77   7.48    0.60    1.00    0.99
   14    0.12  810.7   5.80   8.41   7.75    0.60    0.99    0.99
    2    0.16  870.6   4.48  15.70   7.48    0.61    1.00    0.99
   14    0.16  783.5   5.26  10.21   7.67    0.61    0.99    0.99
    2    0.20  843.8   4.55  15.58   7.49    0.62    1.00    0.99
   14    0.20  759.4   5.09  10.86   7.65    0.62    0.99    0.99
    2    0.24  825.3   5.05  14.79   7.52    0.62    1.00    0.99
   14    0.24  742.7   5.44  10.46   7.67    0.62    0.99    0.99
    2    0.28  828.7   5.84  13.56   7.56    0.63    0.99    0.99
   14    0.28  745.8   6.16   9.39   7.72    0.63    0.99    0.99
    2    0.32  852.2   6.33  12.82   7.58    0.62    0.99    0.99
   14    0.32  767.4   6.76   8.47   7.76    0.62    0.99    0.99
    2    0.36  885.0   6.53  12.51   7.58    0.60    0.99    0.99
   14    0.36  797.9   7.17   7.83   7.78    0.60    0.99    0.99
    2    0.40  922.1   6.64  12.34   7.56    0.55    0.99    0.99
   14    0.40  832.9   7.42   7.37   7.79    0.55    0.99    0.99
    2    0.44  960.5   6.61  12.37   7.55    0.53    0.99    0.99
   14    0.44  869.8   7.44   7.18   7.78    0.53    0.99    0.99
    2    0.48  996.9   6.57  12.29   7.54    0.51    0.99    0.99
   14    0.48  905.4   7.37   6.90   7.79    0.51    0.99    0.99
    2    0.52 1032.5   6.56  12.29   7.54    0.50    0.99    0.99
   14    0.52  940.6   7.30   6.58   7.81    0.50    0.99    0.99
    2    0.56 1070.4   6.62  12.22   7.54    0.51    0.99    0.99
   14    0.56  978.2   7.31   6.29   7.83    0.51    0.99    0.99
    2    0.60 1108.8   6.77  12.07   7.56    0.52    0.99    0.99
   14    0.60 1016.1   7.43   6.08   7.85    0.52    0.99    0.99
    2    0.64 1154.6   7.05  11.61   7.57    0.52    0.99    0.99
   14    0.64 1060.9   7.71   5.67   7.88    0.52    0.99    0.99
    2    0.68 1208.0   7.25  11.44   7.58    0.53    0.99    0.99
   14    0.68 1112.3   7.94   5.42   7.91    0.53    0.99    0.99
    2    0.72 1260.4   7.07  11.84   7.58    0.55    0.99    0.99
   14    0.72 1162.2   7.89   5.86   7.88    0.55    0.99    0.99
    2    0.76 1296.1   6.33  13.05   7.55    0.58    0.99    0.99
   14    0.76 1195.8   7.34   7.12   7.82    0.58    0.99    0.99
    2    0.80 1295.3   5.06  15.04   7.49    0.59    1.00    0.99
   14    0.80 1195.2   6.25   9.13   7.71    0.59    0.99    0.99
    2    0.84 1262.6   4.31  16.20   7.47    0.60    1.00    0.99
   14    0.84 1165.0   5.38  10.67   7.65    0.60    1.00    0.99
    2    0.88 1221.6   4.25  16.28   7.47    0.61    1.00    0.99
   14    0.88 1127.1   5.00  11.35   7.63    0.61    1.00    0.99
    2    0.92 1181.1   4.28  16.21   7.47    0.61    1.00    0.99
   14    0.92 1089.8   4.81  11.69   7.61    0.61    1.00    0.99
    2    0.96 1141.7   4.27  16.19   7.47    0.60    1.00    0.99
   14    0.96 1053.4   4.71  11.85   7.60    0.60    1.00    0.99
    2    1.00 1103.2   4.30  16.12   7.47    0.60    1.00    0.99
   14    1.00 1017.8   4.69  11.84   7.60    0.60    1.00    0.99
```

2	1.04	1065.7	4.32	16.07	7.47	0.60	1.00	0.99
14	1.04	983.3	4.70	11.79	7.60	0.60	1.00	0.99
2	1.08	1029.6	4.35	16.00	7.47	0.60	1.00	0.99
14	1.08	950.0	4.72	11.72	7.61	0.60	1.00	0.99
2	1.12	994.9	4.38	15.93	7.48	0.61	1.00	0.99
14	1.12	917.9	4.76	11.64	7.61	0.61	1.00	0.99
2	1.16	961.9	4.43	15.83	7.48	0.62	1.00	0.99
14	1.16	887.5	4.82	11.53	7.62	0.62	1.00	0.99
2	1.20	931.4	4.53	15.68	7.49	0.63	1.00	0.99
14	1.20	859.4	4.93	11.38	7.63	0.63	1.00	0.99
2	1.24	911.9	5.07	14.82	7.52	0.63	1.00	0.99
14	1.24	841.3	5.41	10.63	7.66	0.63	1.00	0.99
2	1.28	916.1	5.92	13.50	7.56	0.63	0.99	0.99
14	1.28	845.2	6.23	9.38	7.72	0.63	1.00	0.99
2	1.32	941.8	6.44	12.70	7.58	0.62	0.99	0.99
14	1.32	869.2	6.90	8.36	7.76	0.62	0.99	0.99
2	1.36	977.6	6.67	12.35	7.58	0.59	0.99	0.99
14	1.36	903.1	7.34	7.64	7.79	0.59	0.99	0.99
2	1.40	1018.0	6.77	12.18	7.56	0.55	0.99	0.99
14	1.40	942.0	7.59	7.15	7.80	0.55	0.99	0.99
2	1.44	1059.5	6.75	12.10	7.55	0.52	0.99	0.99
14	1.44	982.6	7.62	6.85	7.80	0.52	0.99	0.99
2	1.48	1098.9	6.69	12.13	7.54	0.50	0.99	0.99
14	1.48	1021.9	7.53	6.49	7.81	0.50	0.99	0.99
2	1.52	1136.8	6.65	12.21	7.54	0.51	0.99	0.99
14	1.52	1060.1	7.43	6.26	7.83	0.51	0.99	0.99
2	1.56	1174.1	6.71	12.15	7.55	0.51	0.99	0.99
14	1.56	1097.7	7.45	6.07	7.85	0.51	0.99	0.99
2	1.60	1215.3	6.90	11.87	7.56	0.52	0.99	0.99
14	1.60	1139.2	7.61	5.78	7.87	0.52	0.99	0.99
2	1.64	1264.9	7.22	11.41	7.57	0.51	0.99	0.99
14	1.64	1188.2	7.91	5.34	7.90	0.51	0.99	0.99
2	1.68	1322.5	7.45	11.09	7.59	0.52	0.99	0.99
14	1.68	1244.7	8.18	4.98	7.94	0.52	0.99	0.99
2	1.72	1381.2	7.32	11.45	7.58	0.53	0.99	0.99
14	1.72	1301.2	8.15	5.18	7.93	0.53	0.99	0.99
2	1.76	1422.5	6.49	12.85	7.54	0.55	0.99	0.99
14	1.76	1340.6	7.51	6.56	7.83	0.55	0.99	0.99
2	1.80	1421.1	5.00	15.19	7.48	0.57	1.00	0.99
14	1.80	1339.2	6.19	9.00	7.71	0.57	0.99	0.99
2	1.84	1383.4	4.16	16.49	7.45	0.58	1.00	0.99
14	1.84	1303.6	5.20	10.83	7.63	0.58	1.00	0.99
2	1.88	1336.1	4.09	16.58	7.45	0.59	1.00	0.99
14	1.88	1259.0	4.78	11.65	7.61	0.59	1.00	0.99
2	1.92	1289.6	4.11	16.51	7.45	0.59	1.00	0.99
14	1.92	1215.2	4.56	12.07	7.59	0.59	1.00	0.99
2	1.96	1244.6	4.15	16.43	7.46	0.59	1.00	0.99
14	1.96	1172.8	4.48	12.20	7.59	0.59	1.00	0.99
2	2.00	1201.4	4.19	16.34	7.47	0.61	1.00	0.99
14	2.00	1132.1	4.49	12.17	7.59	0.61	1.00	0.99
2	2.04	1160.9	4.26	16.21	7.47	0.60	1.00	0.99
14	2.04	1094.0	4.56	12.05	7.60	0.60	1.00	0.99
2	2.08	1121.8	4.29	16.14	7.47	0.60	1.00	0.99
14	2.08	1057.1	4.62	11.96	7.60	0.60	1.00	0.99
2	2.12	1084.0	4.32	16.08	7.47	0.60	1.00	0.99
14	2.12	1021.5	4.66	11.87	7.60	0.60	1.00	0.99
2	2.16	1047.7	4.36	16.00	7.48	0.61	1.00	0.99
14	2.16	987.3	4.71	11.77	7.61	0.61	1.00	0.99
2	2.20	1013.9	4.45	15.84	7.48	0.62	1.00	0.99
14	2.20	955.4	4.81	11.61	7.62	0.62	1.00	0.99
2	2.24	992.2	5.05	14.89	7.51	0.62	1.00	0.99
14	2.24	934.9	5.35	10.78	7.65	0.62	1.00	0.99
2	2.28	996.4	5.98	13.45	7.56	0.63	0.99	0.99
14	2.28	938.7	6.25	9.39	7.72	0.63	1.00	0.99
2	2.32	1023.4	6.52	12.63	7.58	0.62	0.99	0.99

14	2.32	964.2	6.97	8.31	7.77	0.62	0.99	0.99
2	2.36	1060.3	6.73	12.30	7.58	0.60	0.99	0.99
14	2.36	999.8	7.43	7.57	7.80	0.60	0.99	0.99
2	2.40	1099.5	6.84	12.14	7.57	0.55	0.99	0.99
14	2.40	1038.1	7.70	7.08	7.80	0.55	0.99	0.99
2	2.44	1141.9	6.80	12.19	7.55	0.53	0.99	0.99
14	2.44	1080.1	7.73	6.88	7.80	0.53	0.99	0.99
2	2.48	1181.6	6.74	12.13	7.55	0.51	0.99	0.99
14	2.48	1120.2	7.65	6.63	7.81	0.51	0.99	0.99
2	2.52	1220.1	6.72	12.15	7.54	0.50	0.99	0.99
14	2.52	1159.5	7.57	6.33	7.83	0.50	0.99	0.99
2	2.56	1258.9	6.77	12.09	7.55	0.51	0.99	0.99
14	2.56	1199.1	7.56	6.06	7.85	0.51	0.99	0.99
2	2.60	1299.9	6.93	11.94	7.56	0.52	0.99	0.99
14	2.60	1240.9	7.69	5.84	7.87	0.52	0.99	0.99
2	2.64	1348.9	7.24	11.44	7.58	0.52	0.99	0.99
14	2.64	1290.1	7.99	5.39	7.90	0.52	0.99	0.99
2	2.68	1406.4	7.46	11.21	7.59	0.53	0.99	0.99
14	2.68	1346.9	8.25	5.09	7.93	0.53	0.99	0.99
2	2.72	1463.1	7.28	11.64	7.59	0.55	0.99	0.99
14	2.72	1402.2	8.19	5.55	7.91	0.55	0.99	0.99
2	2.76	1502.2	6.48	12.93	7.56	0.58	0.99	0.99
14	2.76	1439.8	7.58	6.90	7.83	0.58	0.99	0.99
2	2.80	1501.4	5.07	15.15	7.49	0.59	1.00	0.99
14	2.80	1438.8	6.33	9.18	7.71	0.59	0.99	0.99
2	2.84	1464.2	4.19	16.50	7.46	0.60	1.00	0.99
14	2.84	1403.0	5.30	10.96	7.64	0.60	1.00	0.99
2	2.88	1416.6	4.11	16.60	7.46	0.61	1.00	0.99
14	2.88	1357.4	4.86	11.74	7.61	0.61	1.00	0.99
2	2.92	1369.7	4.15	16.52	7.46	0.61	1.00	0.99
14	2.92	1312.5	4.64	12.12	7.60	0.61	1.00	0.99
2	2.96	1324.1	4.14	16.50	7.46	0.60	1.00	0.99
14	2.96	1268.7	4.52	12.30	7.59	0.60	1.00	0.99
2	3.00	1279.4	4.18	16.42	7.46	0.60	1.00	0.99
14	3.00	1225.9	4.51	12.29	7.59	0.60	1.00	0.99
2	3.04	1236.0	4.20	16.36	7.46	0.60	1.00	0.99
14	3.04	1184.3	4.51	12.24	7.59	0.60	1.00	0.99
2	3.08	1194.1	4.23	16.28	7.47	0.60	1.00	0.99
14	3.08	1144.2	4.55	12.15	7.59	0.60	1.00	0.99
2	3.12	1153.8	4.27	16.20	7.47	0.60	1.00	0.99
14	3.12	1105.5	4.59	12.05	7.60	0.60	1.00	0.99
2	3.16	1115.4	4.33	16.09	7.48	0.61	1.00	0.99
14	3.16	1068.8	4.65	11.93	7.61	0.61	1.00	0.99
2	3.20	1080.0	4.43	15.92	7.49	0.63	1.00	0.99
14	3.20	1034.9	4.77	11.75	7.62	0.63	1.00	0.99
2	3.24	1056.0	5.02	14.99	7.51	0.63	1.00	0.99
14	3.24	1011.7	5.31	10.92	7.65	0.63	1.00	0.99
2	3.28	1058.3	5.97	13.52	7.56	0.63	0.99	0.99
14	3.28	1013.6	6.24	9.49	7.71	0.63	1.00	0.99
2	3.32	1085.2	6.56	12.60	7.59	0.62	0.99	0.99
14	3.32	1039.4	7.02	8.30	7.77	0.62	0.99	0.99
2	3.36	1123.8	6.82	12.20	7.59	0.59	0.99	0.99
14	3.36	1076.9	7.53	7.48	7.80	0.59	0.99	0.99
2	3.40	1167.3	6.93	12.02	7.57	0.55	0.99	0.99
14	3.40	1119.8	7.82	6.93	7.81	0.55	0.99	0.99
2	3.44	1212.0	6.91	11.96	7.56	0.52	0.99	0.99
14	3.44	1164.6	7.86	6.63	7.81	0.52	0.99	0.99
2	3.48	1254.1	6.83	12.01	7.55	0.50	0.99	0.99
14	3.48	1207.5	7.76	6.29	7.83	0.50	0.99	0.99
2	3.52	1294.2	6.78	12.11	7.55	0.51	0.99	0.99
14	3.52	1248.8	7.65	6.08	7.84	0.51	0.99	0.99
2	3.56	1333.3	6.82	12.06	7.55	0.51	0.99	0.99
14	3.56	1289.2	7.65	5.90	7.86	0.51	0.99	0.99
2	3.60	1376.5	7.03	11.77	7.56	0.52	0.99	0.99
14	3.60	1333.5	7.82	5.61	7.88	0.52	0.99	0.99

2	3.64	1428.3	7.36	11.28	7.58	0.51	0.99	0.99
14	3.64	1385.9	8.14	5.14	7.92	0.51	0.99	0.99
2	3.68	1489.0	7.62	10.93	7.60	0.52	0.99	0.99
14	3.68	1446.4	8.42	4.75	7.96	0.52	0.99	0.99
2	3.72	1551.1	7.49	11.27	7.59	0.53	0.99	0.99
14	3.72	1507.4	8.41	4.92	7.95	0.53	0.99	0.99
2	3.76	1595.4	6.63	12.72	7.55	0.55	0.99	0.99
14	3.76	1550.2	7.72	6.36	7.85	0.55	0.99	0.99
2	3.80	1594.4	5.00	15.28	7.48	0.57	1.00	0.99
14	3.80	1548.7	6.26	9.03	7.71	0.57	0.99	0.99
2	3.84	1552.9	4.05	16.76	7.44	0.58	1.00	0.99
14	3.84	1508.2	5.13	11.08	7.62	0.58	1.00	0.99
2	3.88	1499.9	3.96	16.87	7.44	0.59	1.00	0.99
14	3.88	1456.7	4.65	12.00	7.59	0.59	1.00	0.99
2	3.92	1447.7	3.99	16.79	7.45	0.59	1.00	0.99
14	3.92	1406.0	4.40	12.46	7.58	0.59	1.00	0.99
2	3.96	1397.1	4.04	16.69	7.45	0.59	1.00	0.99
14	3.96	1356.9	4.31	12.60	7.57	0.59	1.00	0.99
2	4.00	1348.7	4.08	16.60	7.46	0.61	1.00	0.99
14	4.00	1309.8	4.32	12.57	7.58	0.61	1.00	0.99

Mass Balance for Constituent 1

Initial Mass is 0.1459E+00 KG

Time	***** Accumulated Mass In (KG) ***** Advection	Dispersion	Kinetic	Resident Loading Mass (KG)	********** Excess Advection Mass (KG)	Accumulated Mass Out (KG) ********** Buried	Dispersion
0.000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.040	0.2574E+01	0.0000E+00	0.0000E+00	0.1459E+00	-0.2913E-08	0.0000E+00	0.0000E+00
0.082	0.5277E+01	0.0000E+00	0.8699E-01	0.2775E+01	-0.1740E+00	0.0000E+00	0.0000E+00
0.122	0.7851E+01	0.0000E+00	0.1542E+00	0.5494E+01	-0.3084E+00	0.0000E+00	0.0000E+00
0.162	0.1043E+02	0.0000E+00	0.1957E+00	0.8027E+01	-0.3914E+00	0.0000E+00	0.0000E+00
0.200	0.1287E+02	0.0000E+00	0.2163E+00	0.1036E+02	-0.4326E+00	0.0000E+00	0.0000E+00
0.240	0.1544E+02	0.0000E+00	0.2179E+00	0.1214E+02	-0.4357E+00	0.0000E+00	0.0000E+00
0.280	0.1802E+02	0.0000E+00	0.1822E+00	0.1336E+02	-0.3644E+00	0.0000E+00	0.0000E+00
0.320	0.2059E+02	0.0000E+00	0.6973E-01	0.1395E+02	-0.1395E+00	0.0000E+00	0.0000E+00
0.360	0.2317E+02	0.0000E+00	-0.1113E+00	0.1412E+02	0.8608E-06	0.0000E+00	0.0000E+00
0.400	0.2574E+02	0.0000E+00	-0.3300E+00	0.1410E+02	0.1098E-05	0.0000E+00	0.0000E+00
0.440	0.2831E+02	0.0000E+00	-0.5812E+00	0.1401E+02	-0.5465E-06	0.0000E+00	0.0000E+00
0.480	0.3089E+02	0.0000E+00	-0.8643E+00	0.1389E+02	-0.9353E-06	0.0000E+00	0.0000E+00
0.520	0.3346E+02	0.0000E+00	-0.1158E+01	0.1380E+02	0.1807E-06	0.0000E+00	0.0000E+00
0.562	0.3617E+02	0.0000E+00	-0.1460E+01	0.1373E+02	-0.6314E-06	0.0000E+00	0.0000E+00
0.602	0.3874E+02	0.0000E+00	-0.1777E+01	0.1368E+02	0.1589E-06	0.0000E+00	0.0000E+00
0.642	0.4131E+02	0.0000E+00	-0.2076E+01	0.1366E+02	-0.1113E-05	0.0000E+00	0.0000E+00
0.682	0.4389E+02	0.0000E+00	-0.2399E+01	0.1362E+02	-0.5515E-06	0.0000E+00	0.0000E+00
0.722	0.4646E+02	0.0000E+00	-0.2745E+01	0.1358E+02	-0.5899E-06	0.0000E+00	0.0000E+00
0.762	0.4904E+02	0.0000E+00	-0.3074E+01	0.1356E+02	-0.1414E-05	0.0000E+00	0.0000E+00
0.802	0.5161E+02	0.0000E+00	-0.3329E+01	0.1362E+02	-0.2087E-05	0.0000E+00	0.0000E+00
0.842	0.5418E+02	0.0000E+00	-0.3453E+01	0.1379E+02	-0.7815E-06	0.0000E+00	0.0000E+00
0.882	0.5676E+02	0.0000E+00	-0.3468E+01	0.1403E+02	-0.1163E-05	0.0000E+00	0.0000E+00
0.922	0.5933E+02	0.0000E+00	-0.3452E+01	0.1425E+02	-0.4264E-05	0.0000E+00	0.0000E+00
0.962	0.6191E+02	0.0000E+00	-0.3436E+01	0.1442E+02	-0.1055E-05	0.0000E+00	0.0000E+00
1.002	0.6448E+02	0.0000E+00	-0.3426E+01	0.1453E+02	-0.1437E-06	0.0000E+00	0.0000E+00
1.042	0.6705E+02	0.0000E+00	-0.3421E+01	0.1459E+02	-0.3564E-05	0.0000E+00	0.0000E+00
	0.4917E+02						

0.0000E+00	0.0000E+00	-0.3421E+01	0.1461E+02	-0.1229E-05
1.082	0.6963E+02	0.0000E+00	0.0000E+00	0.5174E+02
0.0000E+00	0.0000E+00	-0.3424E+01	0.1462E+02	-0.7537E-06
1.122	0.7220E+02	0.0000E+00	0.0000E+00	0.5431E+02
0.0000E+00	0.0000E+00	-0.3430E+01	0.1461E+02	-0.1429E-06
1.162	0.7478E+02	0.0000E+00	0.0000E+00	0.5688E+02
0.0000E+00	0.0000E+00	-0.3438E+01	0.1460E+02	0.1300E-05
1.202	0.7735E+02	0.0000E+00	0.0000E+00	0.5945E+02
0.0000E+00	0.0000E+00	-0.3449E+01	0.1459E+02	0.1241E-05
1.242	0.7993E+02	0.0000E+00	0.0000E+00	0.6202E+02
0.0000E+00	0.0000E+00	-0.3492E+01	0.1456E+02	0.8693E-06
1.282	0.8250E+02	0.0000E+00	0.0000E+00	0.6458E+02
0.0000E+00	0.0000E+00	-0.3612E+01	0.1445E+02	0.9097E-06
1.322	0.8507E+02	0.0000E+00	0.0000E+00	0.6711E+02
0.0000E+00	0.0000E+00	-0.3805E+01	0.1430E+02	0.1787E-06
1.362	0.8765E+02	0.0000E+00	0.0000E+00	0.6961E+02
0.0000E+00	0.0000E+00	-0.4040E+01	0.1415E+02	0.1280E-05
1.402	0.9022E+02	0.0000E+00	0.0000E+00	0.7206E+02
0.0000E+00	0.0000E+00	-0.4310E+01	0.1399E+02	-0.8040E-06
1.442	0.9280E+02	0.0000E+00	0.0000E+00	0.7448E+02
0.0000E+00	0.0000E+00	-0.4613E+01	0.1385E+02	-0.2196E-05
1.482	0.9537E+02	0.0000E+00	0.0000E+00	0.7684E+02
0.0000E+00	0.0000E+00	-0.4927E+01	0.1375E+02	-0.4610E-06
1.522	0.9794E+02	0.0000E+00	0.0000E+00	0.7917E+02
0.0000E+00	0.0000E+00	-0.5245E+01	0.1367E+02	0.1074E-05
1.562	0.1005E+03	0.0000E+00	0.0000E+00	0.8147E+02
0.0000E+00	0.0000E+00	-0.5551E+01	0.1364E+02	-0.1027E-07
1.602	0.1031E+03	0.0000E+00	0.0000E+00	0.8376E+02
0.0000E+00	0.0000E+00	-0.5869E+01	0.1361E+02	-0.8127E-06
1.642	0.1057E+03	0.0000E+00	0.0000E+00	0.8603E+02
0.0000E+00	0.0000E+00	-0.6215E+01	0.1357E+02	-0.1723E-05
1.682	0.1082E+03	0.0000E+00	0.0000E+00	0.8829E+02
0.0000E+00	0.0000E+00	-0.6585E+01	0.1352E+02	-0.1880E-05
1.722	0.1108E+03	0.0000E+00	0.0000E+00	0.9053E+02
0.0000E+00	0.0000E+00	-0.6952E+01	0.1348E+02	-0.6167E-06
1.762	0.1134E+03	0.0000E+00	0.0000E+00	0.9277E+02
0.0000E+00	0.0000E+00	-0.7247E+01	0.1352E+02	-0.9191E-06
1.802	0.1160E+03	0.0000E+00	0.0000E+00	0.9502E+02
0.0000E+00	0.0000E+00	-0.7386E+01	0.1370E+02	-0.6526E-06
1.842	0.1185E+03	0.0000E+00	0.0000E+00	0.9731E+02
0.0000E+00	0.0000E+00	-0.7395E+01	0.1398E+02	-0.1996E-05
1.882	0.1211E+03	0.0000E+00	0.0000E+00	0.9966E+02
0.0000E+00	0.0000E+00	-0.7368E+01	0.1423E+02	-0.6037E-06
1.922	0.1237E+03	0.0000E+00	0.0000E+00	0.1021E+03
0.0000E+00	0.0000E+00	-0.7343E+01	0.1442E+02	-0.2347E-07
1.962	0.1263E+03	0.0000E+00	0.0000E+00	0.1045E+03
0.0000E+00	0.0000E+00	-0.7324E+01	0.1454E+02	-0.2882E-05
2.002	0.1288E+03	0.0000E+00	0.0000E+00	0.1071E+03
0.0000E+00	0.0000E+00	-0.7309E+01	0.1461E+02	-0.2815E-05
2.042	0.1314E+03	0.0000E+00	0.0000E+00	0.1096E+03
0.0000E+00	0.0000E+00	-0.7298E+01	0.1464E+02	0.6267E-06
2.082	0.1340E+03	0.0000E+00	0.0000E+00	0.1122E+03
0.0000E+00	0.0000E+00	-0.7290E+01	0.1465E+02	0.1477E-05
2.122	0.1366E+03	0.0000E+00	0.0000E+00	0.1148E+03
0.0000E+00	0.0000E+00	-0.7286E+01	0.1464E+02	-0.2044E-05
2.162	0.1391E+03	0.0000E+00	0.0000E+00	0.1174E+03
0.0000E+00	0.0000E+00	-0.7285E+01	0.1464E+02	-0.6715E-06
2.202	0.1417E+03	0.0000E+00	0.0000E+00	0.1199E+03
0.0000E+00	0.0000E+00	-0.7289E+01	0.1462E+02	0.3599E-07
2.242	0.1443E+03	0.0000E+00	0.0000E+00	0.1225E+03
0.0000E+00	0.0000E+00	-0.7327E+01	0.1458E+02	0.2168E-05
2.282	0.1469E+03	0.0000E+00	0.0000E+00	0.1251E+03
0.0000E+00	0.0000E+00	-0.7451E+01	0.1447E+02	0.5186E-06
2.322	0.1494E+03	0.0000E+00	0.0000E+00	0.1276E+03
0.0000E+00	0.0000E+00	-0.7650E+01	0.1431E+02	0.5663E-06

2.362	0.1520E+03	0.0000E+00	0.0000E+00	0.1301E+03	0.0000E+00	0.0000E+00
-0.7889E+01	0.1414E+02	-0.6260E-06				
2.400	0.1544E+03	0.0000E+00	0.0000E+00	0.1324E+03	0.0000E+00	0.0000E+00
-0.8148E+01	0.1399E+02	-0.1448E-05				
2.440	0.1570E+03	0.0000E+00	0.0000E+00	0.1349E+03	0.0000E+00	0.0000E+00
-0.8451E+01	0.1385E+02	0.1233E-05				
2.480	0.1596E+03	0.0000E+00	0.0000E+00	0.1372E+03	0.0000E+00	0.0000E+00
-0.8762E+01	0.1375E+02	0.8821E-06				
2.520	0.1622E+03	0.0000E+00	0.0000E+00	0.1396E+03	0.0000E+00	0.0000E+00
-0.9080E+01	0.1367E+02	0.1907E-05				
2.560	0.1647E+03	0.0000E+00	0.0000E+00	0.1419E+03	0.0000E+00	0.0000E+00
-0.9398E+01	0.1363E+02	0.1891E-05				
2.600	0.1673E+03	0.0000E+00	0.0000E+00	0.1441E+03	0.0000E+00	0.0000E+00
-0.9712E+01	0.1361E+02	0.1363E-06				
2.640	0.1699E+03	0.0000E+00	0.0000E+00	0.1464E+03	0.0000E+00	0.0000E+00
-0.1005E+02	0.1357E+02	0.1893E-05				
2.680	0.1725E+03	0.0000E+00	0.0000E+00	0.1487E+03	0.0000E+00	0.0000E+00
-0.1042E+02	0.1352E+02	-0.1886E-05				
2.720	0.1750E+03	0.0000E+00	0.0000E+00	0.1509E+03	0.0000E+00	0.0000E+00
-0.1077E+02	0.1350E+02	0.1381E-05				
2.760	0.1776E+03	0.0000E+00	0.0000E+00	0.1532E+03	0.0000E+00	0.0000E+00
-0.1104E+02	0.1356E+02	0.2150E-06				
2.800	0.1802E+03	0.0000E+00	0.0000E+00	0.1554E+03	0.0000E+00	0.0000E+00
-0.1117E+02	0.1374E+02	0.1617E-05				
2.840	0.1828E+03	0.0000E+00	0.0000E+00	0.1577E+03	0.0000E+00	0.0000E+00
-0.1117E+02	0.1402E+02	0.1701E-05				
2.880	0.1853E+03	0.0000E+00	0.0000E+00	0.1601E+03	0.0000E+00	0.0000E+00
-0.1113E+02	0.1427E+02	0.2064E-05				
2.920	0.1879E+03	0.0000E+00	0.0000E+00	0.1625E+03	0.0000E+00	0.0000E+00
-0.1110E+02	0.1445E+02	0.1622E-05				
2.960	0.1905E+03	0.0000E+00	0.0000E+00	0.1650E+03	0.0000E+00	0.0000E+00
-0.1106E+02	0.1457E+02	-0.7012E-06				
3.000	0.1931E+03	0.0000E+00	0.0000E+00	0.1675E+03	0.0000E+00	0.0000E+00
-0.1104E+02	0.1464E+02	0.7808E-06				
3.040	0.1956E+03	0.0000E+00	0.0000E+00	0.1701E+03	0.0000E+00	0.0000E+00
-0.1102E+02	0.1467E+02	0.1839E-05				
3.080	0.1982E+03	0.0000E+00	0.0000E+00	0.1727E+03	0.0000E+00	0.0000E+00
-0.1100E+02	0.1468E+02	-0.3662E-06				
3.120	0.2008E+03	0.0000E+00	0.0000E+00	0.1753E+03	0.0000E+00	0.0000E+00
-0.1099E+02	0.1467E+02	-0.2791E-06				
3.160	0.2034E+03	0.0000E+00	0.0000E+00	0.1779E+03	0.0000E+00	0.0000E+00
-0.1098E+02	0.1466E+02	0.1947E-06				
3.200	0.2059E+03	0.0000E+00	0.0000E+00	0.1804E+03	0.0000E+00	0.0000E+00
-0.1098E+02	0.1465E+02	-0.7690E-06				
3.240	0.2085E+03	0.0000E+00	0.0000E+00	0.1830E+03	0.0000E+00	0.0000E+00
-0.1101E+02	0.1461E+02	-0.9622E-07				
3.280	0.2111E+03	0.0000E+00	0.0000E+00	0.1856E+03	0.0000E+00	0.0000E+00
-0.1112E+02	0.1449E+02	-0.1622E-05				
3.320	0.2136E+03	0.0000E+00	0.0000E+00	0.1881E+03	0.0000E+00	0.0000E+00
-0.1132E+02	0.1432E+02	-0.2738E-05				
3.360	0.2162E+03	0.0000E+00	0.0000E+00	0.1907E+03	0.0000E+00	0.0000E+00
-0.1157E+02	0.1414E+02	-0.2623E-05				
3.400	0.2188E+03	0.0000E+00	0.0000E+00	0.1931E+03	0.0000E+00	0.0000E+00
-0.1186E+02	0.1397E+02	-0.4051E-05				
3.440	0.2214E+03	0.0000E+00	0.0000E+00	0.1955E+03	0.0000E+00	0.0000E+00
-0.1217E+02	0.1382E+02	-0.3474E-05				
3.480	0.2239E+03	0.0000E+00	0.0000E+00	0.1979E+03	0.0000E+00	0.0000E+00
-0.1250E+02	0.1371E+02	-0.2976E-05				
3.520	0.2265E+03	0.0000E+00	0.0000E+00	0.2002E+03	0.0000E+00	0.0000E+00
-0.1283E+02	0.1363E+02	-0.3710E-05				
3.560	0.2291E+03	0.0000E+00	0.0000E+00	0.2025E+03	0.0000E+00	0.0000E+00
-0.1315E+02	0.1360E+02	-0.4625E-05				
3.600	0.2317E+03	0.0000E+00	0.0000E+00	0.2048E+03	0.0000E+00	0.0000E+00
-0.1348E+02	0.1357E+02	-0.3333E-05				
3.640	0.2342E+03	0.0000E+00	0.0000E+00	0.2070E+03		

0.0000E+00	0.0000E+00	-0.1384E+02	0.1353E+02	-0.3595E-05
3.680	0.2368E+03	0.0000E+00	0.0000E+00	0.2093E+03
0.0000E+00	0.0000E+00	-0.1423E+02	0.1347E+02	-0.4502E-05
3.720	0.2394E+03	0.0000E+00	0.0000E+00	0.2115E+03
0.0000E+00	0.0000E+00	-0.1461E+02	0.1343E+02	-0.4530E-05
3.760	0.2420E+03	0.0000E+00	0.0000E+00	0.2137E+03
0.0000E+00	0.0000E+00	-0.1492E+02	0.1347E+02	-0.3268E-05
3.800	0.2445E+03	0.0000E+00	0.0000E+00	0.2160E+03
0.0000E+00	0.0000E+00	-0.1506E+02	0.1367E+02	-0.3028E-05
3.840	0.2471E+03	0.0000E+00	0.0000E+00	0.2182E+03
0.0000E+00	0.0000E+00	-0.1506E+02	0.1396E+02	-0.5348E-05
3.880	0.2497E+03	0.0000E+00	0.0000E+00	0.2206E+03
0.0000E+00	0.0000E+00	-0.1501E+02	0.1424E+02	-0.3233E-05
3.920	0.2523E+03	0.0000E+00	0.0000E+00	0.2230E+03
0.0000E+00	0.0000E+00	-0.1497E+02	0.1444E+02	-0.3021E-05
3.960	0.2548E+03	0.0000E+00	0.0000E+00	0.2255E+03
0.0000E+00	0.0000E+00	-0.1493E+02	0.1458E+02	-0.2087E-05
4.000	0.2574E+03	0.0000E+00	0.0000E+00	0.2280E+03
0.0000E+00	0.0000E+00	-0.1490E+02	0.1466E+02	-0.1562E-05
4.001	0.2574E+03	0.0000E+00	0.0000E+00	0.2280E+03
0.0000E+00	0.0000E+00	-0.1490E+02	0.1466E+02	-0.1562E-05

APPENDIX - A: Santa Fe River Model for DO and pH (continue ...)

A-6. Santa Fe River Water Quality Model Verification using June 1999 and July 2000 data, prepared by U.S. EPA Region 6, TMDL Team, Model Input/Output files (45 pages).

```
Santa Fe River Water Quality Model (June 1999 and July 2000 data)
WASP5pH  V5.1
 NSEG NSYS ICRD MFLG IDMP NSLN INTY ADFC   DD HHMM                A: MODEL
OPTIONS
   24    9    0    0    1    0    0    0    1 0000
   11   12   13   14   15   16
    1
    0.0020       4.0
    1
    0.040      120.0
    0    0    0    0    0    0    0    0    0
    1    0    +    *    +    *    +    *    +    *    +    *
B:EXCHANGES
    1     1.e-4      1.00                    (surface water)
   12
     2210.      0.10    1    2
     2210.      0.10    3    4
     2298.      0.10    5    6
     2386.      0.10    7    8
     2474.      0.10    9   10
     2562.      0.10   11   12
     2610.      0.10   13   14
     2650.      0.11   15   16
     2650.      0.11   17   18
     2650.      0.11   19   20
     2650.      0.11   21   22
     2650.      0.11   23   24
    2
      0.02       0.0      0.02     365.0
    0    0    0    1    0    0    0    0    0
    1    0              *    +    *    +    *    +    *    +    C:
VOLUMES
       1.0   0.02832    million cubic feet to cubic meters
         1         2         1    15920.     0.168       0.0    0.2350
0.0
         2        73         2      433.     0.168       0.0      0.01
0.0
         3         4         1    18324.     0.163       0.0    0.2350
0.0
         4        73         2      433.     0.163       0.0      0.01
0.0
         5         6         1    20732.     0.158       0.0    0.2350
0.0
         6        73         2      433.     0.158       0.0      0.01
0.0
         7         8         1    21938.     0.153       0.0    0.2350
0.0
         8        73         2      433.     0.153       0.0      0.01
0.0
         9        10         1    21938.     0.148       0.0    0.2350
0.0
        10        73         2      433.     0.148       0.0      0.01
0.0
        11        12         1    21938.     0.143       0.0    0.2350
0.0
        12        73         2      433.     0.143       0.0      0.01
0.0
        13        14         1    21938.     0.128       0.0    0.2350
0.0
        14        73         2      433.     0.128       0.0      0.01
0.0
        15        16         1    21938.     0.128       0.0    0.2350
0.0
        16        73         2      433.     0.128       0.0      0.01
0.0
```

```
        17         18         1    21938.     0.128       0.0    0.2350
0.0
        18         73         2      433.     0.128       0.0      0.01
0.0
        19         20         1    21938.     0.128       0.0    0.2350
0.0
        20         73         2      433.     0.128       0.0      0.01
0.0
        21         22         1    21938.     0.128       0.0    0.2350
0.0
        22         73         2      433.     0.128       0.0      0.01
0.0
        23         24         1    21938.     0.128       0.0    0.2350
0.0
        24         73         2      433.     0.128       0.0      0.01
0.0
    1    5    *    +    *    +    *    *    *    +    *    +    D: FLOWS
    2       1.0   0.02832    cubic feet/second to cubic meters/second
   13                    Headwater above Santa Fe Plant
       1.0    0    1       1.0    1    3       1.0    3    5       1.0
5    7
       1.0    7    9       1.0    9   11       1.0   11   13       1.0
13   15
       1.0   15   17       1.0   17   19       1.0   19   21       1.0
21   23
       1.0   23    0
    2
      9.50        0.      9.50      365.
   13                    Headwater above Santa Fe Plant
       1.0    0    2       1.0    2    4       1.0    4    6       1.0
6    8
       1.0    8   10       1.0   10   12       1.0   12   14       1.0
14   16
       1.0   16   18       1.0   18   20       1.0   20   22       1.0
22   24
       1.0   24    0
    2
      0.00        0.      0.00      365.
    0                                     Field 2: pore water
    1       1.0       1.0                 Field 3: (Solids 1: organic
matter)
   24
     2210.    1    2     2210.    2   73     2210.    3    4     2210.
4   73
     2298.    5    6     2298.    6   73     2386.    7    8     2386.
8   73
     2472.    9   10     2474.   10   73     2562.   11   12     2562.
12   73
     2610.   13   14     2650.   14   73     2650.   15   16     2650.
16   73
     2650.   17   18     2650.   18   73     2650.   19   20     2650.
20   73
     2650.   21   22     2650.   22   73     2650.   23   24     2650.
24   73
    2
   3.0E-06        0.   3.0E-06      365.
    1       0.1      .0929 sq ft to sq m    Field 4: (Solids 2:
Phytoplankton)
   24
     2210.    1    2     2210.    2   73     2210.    3    4     2210.
4   73
     2298.    5    6     2298.    6   73     2386.    7    8     2386.
8   73
     2472.    9   10     2474.   10   73     2562.   11   12     2562.
12   73
```

```
     2610.   13   14     2650.   14   73     2650.   15   16     2650.
16   73
     2650.   17   18     2650.   18   73     2650.   19   20     2650.
20   73
     2650.   21   22     2650.   22   73     2650.   23   24     2650.
24   73
    2
   0.0e-05        0.   0.0e-05      365.
    1       1.0     .0929 sq ft to sq m    Field 5: (Solids 3: Inorganic
matter)
   24
     2210.    1    2     2210.    2   73     2210.    3    4     2210.
4   73
     2298.    5    6     2298.    6   73     2386.    7    8     2386.
8   73
     2472.    9   10     2474.   10   73     2562.   11   12     2562.
12   73
     2610.   13   14     2650.   14   73     2650.   15   16     2650.
16   73
     2650.   17   18     2650.   18   73     2650.   19   20     2650.
20   73
     2650.   21   22     2650.   22   73     2650.   23   24     2650.
24   73
    2
   1.0E-06        0.   1.0E-06      365.
    0    0    0    1    0    0    0    0    0
         4    *    +    *    +    *    +    System 1 - Ammonia  E:
BOUNDARIES
       1.0       1.0                         mg/L (total)
    1    2                                   Santa Fe WWTP Input
     0.410        0.     0.410      365.
    2    2
     0.000        0.     0.000      365.
   23    2
     0.001        0.     0.001      365.
   24    2
     0.001        0.     0.001      365.
         4    *    +    *    +    *    +    System 2 - Nitrite/Nitrate
       1.0       1.0                         mg/L (total)
    1    2                                   Santa Fe WWTP Input
       0.27        0.       0.27      365.
    2    2
       0.0         0.       0.0       365.
   23    2
     0.150        0.     0.150      365.
   24    2
     0.150        0.     0.150      365.
         4    *    +    *    +    *    +    System 3 - Orthophosphate
       1.0       1.0                         mg/L (dissolved)
    1    2                                   Santa Fe WWTP Input
      0.40        0.      0.40      365.
    2    2
     0.000        0.     0.000      365.
   23    2
     0.010        0.     0.010      365.
   24    2
     0.010        0.     0.010      365.
         4    *    +    *    +    *    +    System 4 - Periphyton
       1.0       1.0                         ug/L  (viable chlorophyll-a)
    1    2                                   Santa Fe WWTP Input
       0.0         0.       0.0       365.
    2    2
       0.0         0.       0.0       365.
   23    2
      2.00         0.      2.00       365.
```

```
   24     2
      2.00          0.       2.00       365.
         4     *    +     *    +     *    +     System 5 - CBOD
       1.0        1.0                          mg/L (ultimate less algal
component)
    1     2                                     Santa Fe WWTP Input
      2.5          0.        2.5       365.
    2     2
      0.00         0.       0.00       365.
   23     2
      1.00         0.       1.00       365.
   24     2
      1.00         0.       1.00       365.
         4     *    +     *    +     *    +     System 6 - Dissolved Oxygen
       1.0        1.0                          mg/L
    1     2                                     Santa Fe WWTP Input
      5.0         0.0        5.0       365.
    2     2
      0.00         0.       0.00       365.
   23     2
      8.00         0.       8.00       365.
   24     2
      8.00         0.       8.00       365.
         4     *    +     *    +     *    +     System 7 - Nonliving Organic
N
       1.0        1.0                          mg/L (TKN - NH3 - algal N)
    1     2                                     Santa Fe WWTP Input
      1.00         0.       1.00       365.
    2     2
      0.00         0.       0.00       365.
   23     2
      0.40         0.       0.40       365.
   24     2
      0.40         0.       0.40       365.
         4     *    +     *    +     *    +     System 8 - Nonliving Organic
P
       1.0        1.0                          mg/L (TP - PO4 - algal P)
    1     2                                     Santa Fe WWTP Input
      0.10         0.       0.10       365.
    2     2
      0.00         0.       0.00       365.
   23     2
      0.04         0.       0.04       365.
   24     2
      0.04         0.       0.04       365.
         4     *    +     *    +     *    +     System 9 - CO2 Acidity
       1.0        1.0                          mg/L as CaCO3
    1     2                                     Santa Fe WWTP Input
      15.0         0.       15.0       365.
    2     2
       0.0         0.        0.0       365.
   23     2
      10.0         0.       10.0       365.
   24     2
      10.0         0.       10.0       365.
         0     *    +     *    +     *    +     System 1 - Ammonia F: PS
loads
         0     *    +     *    +     *    +     System 2 - Nitrite + Nitrate
         0     *    +     *    +     *    +     System 3 - Dissolved
Orthophosphate
         0     *    +     *    +     *    +     System 4 - Viable
chlorophylla-a
         0     *    +     *    +     *    +     System 5 - Ultimate CBOD (-
algae)
         0     *    +     *    +     *    +     System 6 - Dissolved Oxygen
```

```
          0    *    +    *    +    *    +    System 7 - Nonliving Organic
N
          0    *    +    *    +    *    +    System 8 - Nonliving Organic
P
          0    *    +    *    +    *    +    System 9 - CO2 Acidity
          0                                   No NPS Loads
          8    *    +    *    +    *    +    *    +    *    +    G:
PARAMETERS
TMPSG     3        1.0 KESG     5       1.0 SOD1D    9        1.0SODTA   12
1.0
FNH4      7        0.0 FPO4     8       0.0 ITOTL   13        1.0TMPFN    4
1.0
          1
TMPSG     3        1.0 KESG     5       0.15SOD1D    9        0.0SODTA   12
1.0
FNH4      7        0.0 FPO4     8       0.0 ITOTL   13        1.0TMPFN    4
1.0
          2
TMPSG     3        1.0 KESG     5       0.15SOD1D    9        0.0SODTA   12
1.0
FNH4      7        0.0 FPO4     8       0.0 ITOTL   13        1.0TMPFN    4
1.0
          3
TMPSG     3        1.0 KESG     5       0.15SOD1D    9        0.0SODTA   12
1.0
FNH4      7        0.0 FPO4     8       0.0 ITOTL   13        1.0TMPFN    4
1.0
          4
TMPSG     3        1.0 KESG     5       0.15SOD1D    9        0.0SODTA   12
1.0
FNH4      7        0.0 FPO4     8       0.0 ITOTL   13        1.0TMPFN    4
1.0
          5
TMPSG     3        1.0 KESG     5       0.15SOD1D    9        0.0SODTA   12
1.0
FNH4      7        0.0 FPO4     8       0.0 ITOTL   13        1.0TMPFN    4
1.0
          6
TMPSG     3        1.0 KESG     5       0.15SOD1D    9        0.0SODTA   12
1.0
FNH4      7        0.0 FPO4     8       0.0 ITOTL   13        1.0TMPFN    4
1.0
          7
TMPSG     3        1.0 KESG     5       0.20SOD1D    9        0.0SODTA   12
1.0
FNH4      7        0.0 FPO4     8       0.0 ITOTL   13        1.0TMPFN    4
1.0
          8
TMPSG     3        1.0 KESG     5       0.20SOD1D    9        0.0SODTA   12
1.0
FNH4      7        0.0 FPO4     8       0.0 ITOTL   13        1.0TMPFN    4
1.0
          9
TMPSG     3        1.0 KESG     5       0.20SOD1D    9        0.0SODTA   12
1.0
FNH4      7        0.0 FPO4     8       0.0 ITOTL   13        1.0TMPFN    4
1.0
         10
TMPSG     3        1.0 KESG     5       0.20SOD1D    9        0.0SODTA   12
1.0
FNH4      7        0.0 FPO4     8       0.0 ITOTL   13        1.0TMPFN    4
1.0
         11
TMPSG     3        1.0 KESG     5       0.20SOD1D    9        0.0SODTA   12
1.0
```

```
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
1.0
          12
TMPSG     3        1.0 KESG     5       0.20SOD1D     9       0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
1.0
          13
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          14
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          15
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          16
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA    12
1.0
FNH4      7        7.1 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          17
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          18
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          19
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          20
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          21
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          22
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          23
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          24
TMPSG     3        1.0 KESG     5       0.25SOD1D     9       0.0SODTA    12
1.0
```

```
FNH4      7        0.0 FPO4     8       0.0 ITOTL   13        1.0TMPFN     4
2.0
    +    *    +    *    +    *    +    *    +    *    +    *    H:
CONSTANTS
   GLOBALS          0
       NH3          1
nitrificat          2
      K12C         11      0.20      K12T        12      1.08
       NO3          1
  denitrif          2
      K20C         21      0.10      K20T        22     1.045
       PO4          0
      PHYT          4
    growth          2
       K1C         41      2.45       K1T        42     1.055
     light          3
     LGHTS         43       1.0      CCHL        46       67.
       IS1         47      525.
 nutrients          4
     KMNG1         48     0.025     KMPG1        49     0.005
      NCRB         58      0.18      PCRB        57     0.025
     death          4
      K1RC         50     0.600      K1RT        51     1.069
       K1D         52      0.30     KPZDC        55      0.00
      CBOD          1
 deoxygent          2
       KDC         71      0.07       KDT        72      1.05
        DO          1
     ratio          2
      OCRB         81      2.67        K2        82      4.50
        ON          1
mineralize          3
      K71C         91     0.500      K71T        92      1.08
       FON         95      0.15
        OP          1
mineralize          3
      K83C        100      0.75      K83T       101      1.08
       FOP        104      0.50
    CO2acy          0
         4    *    +    *    +    *    +    *    +    *    +    I: TIME
FUNCTION
TEMP1  193     1            River Water Temperature (C) below WWTP
     25.41    0.00000     25.41    0.01042     25.40    0.02083     25.37
0.03125
     25.36    0.04167     25.36    0.05208     25.32    0.06250     25.33
0.07292
     25.31    0.08333     25.29    0.09375     25.27    0.10417     25.25
0.11458
     25.21    0.12500     25.17    0.13542     25.13    0.14583     25.08
0.15625
     25.01    0.16667     24.94    0.17708     24.88    0.18750     24.83
0.19792
     24.77    0.20833     24.69    0.21875     24.61    0.22917     24.52
0.23958
     24.42    0.25000     24.32    0.26042     24.24    0.27083     24.17
0.28125
     24.11    0.29167     24.07    0.30208     24.07    0.31250     24.12
0.32292
     24.27    0.33333     24.45    0.34375     24.63    0.35417     24.82
0.36458
     24.99    0.37500     25.08    0.38542     25.18    0.39583     25.30
0.40625
     25.40    0.41667     25.55    0.42708     25.63    0.43750     25.69
0.44792
     25.74    0.45833     25.83    0.46875     25.90    0.47917     25.96
```

0.48958
26.04 0.50000 26.09 0.51042 26.17 0.52083 26.24
0.53125
26.25 0.54167 26.26 0.55208 26.29 0.56250 26.29
0.57292
26.33 0.58333 26.37 0.59375 26.34 0.60417 26.44
0.61458
26.39 0.62500 26.17 0.63542 26.09 0.64583 26.35
0.65625
26.51 0.66667 26.46 0.67708 26.34 0.68750 26.06
0.69792
25.94 0.70833 25.93 0.71875 25.93 0.72917 25.98
0.73958
25.99 0.75000 25.92 0.76042 25.77 0.77083 25.68
0.78125
25.74 0.79167 25.81 0.80208 25.60 0.81250 25.17
0.82292
25.25 0.83333 25.46 0.84375 25.64 0.85417 25.67
0.86458
25.61 0.87500 25.49 0.88542 25.53 0.89583 25.53
0.90625
25.61 0.91667 25.60 0.92708 25.58 0.93750 25.58
0.94792
25.58 0.95833 25.57 0.96875 25.56 0.97917 25.58
0.98958
25.58 1.00000 25.58 1.01042 25.58 1.02083 25.55
1.03125
25.54 1.04167 25.53 1.05208 25.51 1.06250 25.48
1.07292
25.45 1.08333 25.42 1.09375 25.42 1.10417 25.38
1.11458
25.33 1.12500 25.29 1.13542 25.25 1.14583 25.21
1.15625
25.19 1.16667 25.21 1.17708 25.18 1.18750 25.06
1.19792
24.92 1.20833 24.81 1.21875 24.72 1.22917 24.67
1.23958
24.65 1.25000 24.67 1.26042 24.60 1.27083 24.45
1.28125
24.30 1.29167 24.20 1.30208 24.16 1.31250 24.22
1.32292
24.37 1.33333 24.52 1.34375 24.66 1.35417 24.77
1.36458
24.89 1.37500 24.88 1.38542 24.84 1.39583 25.02
1.40625
25.31 1.41667 25.54 1.42708 25.70 1.43750 25.82
1.44792
25.86 1.45833 25.83 1.46875 25.88 1.47917 25.92
1.48958
25.98 1.50000 26.05 1.51042 26.12 1.52083 26.20
1.53125
25.95 1.54167 25.95 1.55208 26.19 1.56250 26.24
1.57292
26.21 1.58333 26.05 1.59375 26.11 1.60417 26.20
1.61458
26.14 1.62500 25.95 1.63541 25.76 1.64583 25.74
1.65625
25.79 1.66666 25.86 1.67708 25.91 1.68750 25.95
1.69791
25.96 1.70833 26.00 1.71875 26.01 1.72916 26.00
1.73958
25.85 1.75000 25.69 1.76041 25.66 1.77083 25.66
1.78125
25.62 1.79166 25.57 1.80208 25.57 1.81250 25.57
1.82291

```
     25.59    1.83333      25.45    1.84375      25.14    1.85416      25.34
1.86458
     25.36    1.87500      25.44    1.88541      25.51    1.89583      25.50
1.90625
     25.49    1.91666      25.51    1.92708      25.50    1.93750      25.48
1.94791
     25.45    1.95833      25.41    1.96875      25.39    1.97916      25.39
1.98958
     25.39    2.00000
TEMP2  193     2            River Temperature at Preserve
     23.44    0.00000      23.57    0.01042      23.66    0.02083      23.70
0.03125
     23.71    0.04167      23.70    0.05208      23.65    0.06250      23.62
0.07292
     23.54    0.08333      23.36    0.09375      23.34    0.10417      23.38
0.11458
     23.43    0.12500      23.44    0.13542      23.33    0.14583      23.15
0.15625
     22.82    0.16667      22.49    0.17708      22.23    0.18750      22.10
0.19792
     21.96    0.20833      21.84    0.21875      21.88    0.22917      21.79
0.23958
     21.60    0.25000      21.37    0.26042      21.17    0.27083      21.01
0.28125
     20.93    0.29167      20.78    0.30208      20.73    0.31250      20.83
0.32292
     20.99    0.33333      21.29    0.34375      21.42    0.35417      21.60
0.36458
     21.85    0.37500      22.27    0.38542      23.04    0.39583      23.93
0.40625
     24.93    0.41667      25.92    0.42708      26.78    0.43750      27.46
0.44792
     28.20    0.45833      28.84    0.46875      29.11    0.47917      29.37
0.48958
     29.44    0.50000      28.64    0.51042      28.81    0.52083      28.84
0.53125
     28.98    0.54167      28.79    0.55208      29.23    0.56250      29.46
0.57292
     29.50    0.58333      29.43    0.59375      29.15    0.60417      28.93
0.61458
     28.87    0.62500      27.75    0.63542      27.28    0.64583      26.63
0.65625
     26.41    0.66667      26.19    0.67708      25.95    0.68750      25.65
0.69792
     25.39    0.70833      25.34    0.71875      25.26    0.72917      24.92
0.73958
     24.73    0.75000      24.64    0.76042      24.49    0.77083      24.42
0.78125
     24.37    0.79167      24.42    0.80208      24.47    0.81250      24.35
0.82292
     24.14    0.83333      23.99    0.84375      23.56    0.85417      23.34
0.86458
     23.08    0.87500      23.01    0.88542      23.10    0.89583      23.33
0.90625
     23.59    0.91667      23.75    0.92708      23.82    0.93750      23.85
0.94792
     23.75    0.95833      23.77    0.96875      23.73    0.97917      23.76
0.98958
     23.81    1.00000      23.85    1.01042      23.82    1.02083      23.79
1.03125
     23.76    1.04167      23.73    1.05208      23.70    1.06250      23.63
1.07292
     23.53    1.08333      23.47    1.09375      23.46    1.10417      23.40
1.11458
     23.32    1.12500      23.23    1.13542      23.11    1.14583      23.01
```

```
1.15625
     22.91   1.16667     22.82   1.17708     22.69   1.18750     22.57
1.19792
     22.42   1.20833     22.30   1.21875     22.18   1.22917     22.06
1.23958
     21.92   1.25000     21.80   1.26042     21.68   1.27083     21.63
1.28125
     21.66   1.29167     21.79   1.30208     21.99   1.31250     22.25
1.32292
     22.35   1.33333     22.46   1.34375     22.66   1.35417     22.91
1.36458
     23.29   1.37500     23.67   1.38542     24.11   1.39583     24.55
1.40625
     25.07   1.41667     25.49   1.42708     25.89   1.43750     26.34
1.44792
     26.68   1.45833     27.04   1.46875     27.29   1.47917     27.52
1.48958
     27.66   1.50000     27.90   1.51042     28.09   1.52083     28.20
1.53125
     28.15   1.54167     28.20   1.55208     28.28   1.56250     28.18
1.57292
     28.26   1.58333     27.82   1.59375     26.92   1.60417     25.33
1.61458
     24.25   1.62500     23.61   1.63541     23.29   1.64583     23.45
1.65625
     23.80   1.66666     24.51   1.67708     25.27   1.68750     25.84
1.69791
     25.71   1.70833     25.11   1.71875     24.53   1.72916     24.04
1.73958
     23.89   1.75000     23.82   1.76041     23.95   1.77083     23.88
1.78125
     23.78   1.79166     23.65   1.80208     23.53   1.81250     23.36
1.82291
     21.91   1.83333     22.27   1.84375     22.55   1.85416     22.74
1.86458
     22.85   1.87500     22.89   1.88541     22.85   1.89583     22.75
1.90625
     22.45   1.91666     22.39   1.92708     22.37   1.93750     22.33
1.94791
     22.23   1.95833     22.08   1.96875     21.90   1.97916     21.69
1.98958
     21.47   2.00000
ITOT    26     5           Solar radiation (ly/day)
       0.0       0.0       0.0   0.03681       0.0   0.07847       0.0
0.12014
       0.0   0.16181      4.41   0.20347     78.51   0.24514    254.94
0.28681
    453.43   0.32874    626.33   0.37014    798.36   0.41181    924.50
0.45347
    984.49   0.49514    988.02   0.53681    935.97   0.57847    820.41
0.62014
    668.68   0.66181    486.95   0.70000    285.82   0.74514     94.39
0.78681
     10.59   0.82847       0.0   0.87014       0.0   0.91181       0.0
0.95347
       0.0   0.99514       0.0       1.0
F        2     6           Photoperiod (fraction of day)
      1.00        0.      1.00     365.0
Ammonia                                        3 0.00       10.    J:
INITIAL
    1      0.02       1.0    2      0.02       1.0    3      0.02
1.0
    4      0.02       1.0    5      0.02       1.0    6      0.02
1.0
    7      0.02       1.0    8      0.02       1.0    9      0.02
```

```
1.0
   10       0.02        1.0   11       0.02        1.0   12       0.02
1.0
   13       0.02        1.0   14       0.02        1.0   15       0.02
1.0
   16       0.02        1.0   17       0.02        1.0   18       0.02
1.0
   19       0.02        1.0   20       0.02        1.0   21       0.02
1.0
   22       0.02        1.0   23       0.02        1.0   24       0.02
1.0
Nitrite + Nitrate                                 3 0.00        10.    J:
INITIAL
    1       0.09        1.0    2       0.09        1.0    3       0.09
1.0
    4       0.09        1.0    5       0.09        1.0    6       0.09
1.0
    7       0.09        1.0    8       0.09        1.0    9       0.09
1.0
   10       0.09        1.0   11       0.09        1.0   12       0.09
1.0
   13       0.09        1.0   14       0.09        1.0   15       0.09
1.0
   16       0.09        1.0   17       0.09        1.0   18       0.09
1.0
   19       0.09        1.0   20       0.09        1.0   21       0.09
1.0
   22       0.09        1.0   23       0.09        1.0   24       0.09
1.0
Dissolved Orthophosphate                          3 0.00         5.    J:
INITIAL
    1      1.010        1.0    2      1.010        1.0    3      1.010
1.0
    4      1.010        1.0    5      1.010        1.0    6      1.010
1.0
    7      1.010        1.0    8      1.010        1.0    9      1.010
1.0
   10      1.010        1.0   11      1.010        1.0   12      1.010
1.0
   13      1.010        1.0   14      1.010        1.0   15      1.010
1.0
   16      1.010        1.0   17      1.010        1.0   18      1.010
1.0
   19      1.010        1.0   20      1.010        1.0   21      1.010
1.0
   22      1.010        1.0   23      1.010        1.0   24      1.010
1.0
Viable Chlorophyll-a (ug/l)                       4 0.00       500.    J:
INITIAL
    1         0.        0.0    2     1000.        0.0    3         0.
0.0
    4      1000.        0.0    5        0.        0.0    6      1000.
0.0
    7         0.        0.0    8      975.        0.0    9         0.
0.0
   10       950.        0.0   11        0.        0.0   12       925.
0.0
   13         0.        0.0   14      900.        0.0   15         0.
0.0
   16       900.        0.0   17        0.        0.0   18       900.
0.0
   19         0.        0.0   20      900.        0.0   21         0.
0.0
   22       900.        0.0   23        0.        0.0   24       900.
0.0
```

```
Carbonaceous BOD (ultimate - algae)          3 0.00      100.    J:
INITIAL
    1       5.0       1.0    2       5.0       1.0    3       5.0
1.0
    4       5.0       1.0    5       5.0       1.0    6       5.0
1.0
    7       5.0       1.0    8       5.0       1.0    9       5.0
1.0
   10       5.0       1.0   11       5.0       1.0   12       5.0
1.0
   13       5.0       1.0   14       5.0       1.0   15       5.0
1.0
   16       5.0       1.0   17       5.0       1.0   18       5.0
1.0
   19       5.0       1.0   20       5.0       1.0   21       5.0
1.0
   22       5.0       1.0   23       5.0       1.0   24       5.0
1.0
Dissolved Oxygen                             3 0.00       20.    J:
INITIAL
    1      7.99       1.0    2      7.59       1.0    3      7.59
1.0
    4      7.99       1.0    5      7.59       1.0    6      7.59
1.0
    7      7.99       1.0    8      7.59       1.0    9      7.59
1.0
   10      7.99       1.0   11      7.59       1.0   12      7.59
1.0
   13      7.99       1.0   14      7.59       1.0   15      7.59
1.0
   16      7.99       1.0   17      7.59       1.0   18      7.59
1.0
   19      7.99       1.0   20      7.59       1.0   21      7.59
1.0
   22      7.99       1.0   23      7.59       1.0   24      7.59
1.0
Nonliving Organic Nitrogen                   3 0.00       10.    J:
INITIAL
    1      1.02       0.7    2      1.02       0.7    3      1.02
0.7
    4      1.02       0.7    5      1.02       0.7    6      1.02
0.7
    7      1.02       0.7    8      1.02       0.7    9      1.02
0.7
   10      1.02       0.7   11      1.02       0.7   12      1.02
0.7
   13      1.02       0.7   14      1.02       0.7   15      1.02
0.7
   16      1.02       0.7   17      1.02       0.7   18      1.02
0.7
   19      1.02       0.7   20      1.02       0.7   21      1.02
0.7
   22      1.02       0.7   23      1.02       0.7   24      1.02
0.7
Nonliving Organic Phosphorus                 3 0.00        5.    J:
INITIAL
    1      0.10       1.0    2      0.10       1.0    3      0.10
1.0
    4      0.10       1.0    5      0.10       1.0    6      0.10
1.0
    7      0.10       1.0    8      0.10       1.0    9      0.10
1.0
   10      0.10       1.0   11      0.10       1.0   12      0.10
1.0
   13      0.10       1.0   14      0.10       1.0   15      0.10
```

```
1.0
   16       0.10        1.0   17       0.10        1.0   18       0.10
1.0
   19       0.10        1.0   20       0.10        1.0   21       0.10
1.0
   22       0.10        1.0   23       0.10        1.0   24       0.10
1.0
CO2 Acidity (mg/L as CaCO3)                    3 0.00     5000.    J:
INITIAL
    1       4.0         1.0    2        4.0        1.0    3        4.0
1.0
    4       4.0         1.0    5        4.0        1.0    6        4.0
1.0
    7       4.0         1.0    8        4.0        1.0    9        4.0
1.0
   10       4.0         1.0   11        4.0        1.0   12        4.0
1.0
   13       6.0         1.0   14        6.0        1.0   15        6.0
1.0
   16       6.0         1.0   17        6.0        1.0   18        6.0
1.0
   19       6.0         1.0   20        6.0        1.0   21        6.0
1.0
   22       6.0         1.0   23        6.0        1.0   24        6.0
1.0
```

```
*********************************************************************

            WASP  - - WATER QUALITY ANALYSIS SIMULATION PROGRAM

*********************************************************************

                        Supported by
                 Center for Exposure Assessment Modeling
                              (CEAM)
                 Athens Environmental Research Laboratory
                          College Station Road
                        Athens, Georgia  30613
                    FTS 250-3491 or (404) 546-3491

                        Version 4.32 pH
                 Compiled on: Date: Tuesday, 26 Oct 1999,

                    Maximum Parameters for this Model

            Systems:    9          Segments:  100     Break Points:
193
         Parameters:   15         Constants:  104    Boundary Cond:
35
        Waste Loads:    9     Print Interval:    5    Time Function:
23

*********************************************************************

     No. Segments --->    24        No. Systems --->     9

*********************************************************************
TIME VARIABLE SOLUTION TECHNIQUE

*********************************************************************
            System Bypass Options for System  1 TO  9 are 0 0 0 0 0 0 0
0 0
```

```
**********************************************************************
1
```

Simulation Time Steps
Option 0 Selected
Advection Factor = 0.000

DT	T	DT	T	DT	T
0.00200	4.00000				

Print Intervals

PRINT INTERVAL	ELAPSED TIME	PRINT INTERVAL	ELAPSED TIME	PRINT INTERVAL	ELAPSED TIME
0.040	120.00				

```
1
```

Exchange Coefficients

Number of Exchange Fields = 1

FIELD 1 has 1 Time Functions

SCALR = 0.100E-03 CONVR = 0.100E+01

Time Function 1 has 12 Exchanges

A	EL	From	To
0.221E+04	0.100E+00	1	2
0.221E+04	0.100E+00	3	4
0.230E+04	0.100E+00	5	6
0.239E+04	0.100E+00	7	8
0.247E+04	0.100E+00	9	10
0.256E+04	0.100E+00	11	12
0.261E+04	0.100E+00	13	14
0.265E+04	0.110E+00	15	16

0.265E+04	0.110E+00	17	18
0.265E+04	0.110E+00	19	20
0.265E+04	0.110E+00	21	22
0.265E+04	0.110E+00	23	24

Number of Breaks in Time Function = 2

Dispersion	Time	Dispersion	Time	Dispersion	Time
0.200E-01	0.000E+00	0.200E-01	0.365E+03		

R Bypass Options for Systems 1 to 9 are 0 0 0 1 0 0 0 0 0 1

VOLUMES

Bed Volume Option = 0 Bed Time Step = 0.000E+00

Scale Factor = 0.1000E+01 Conversion Factor = 0.2832E-01

Seg #	BOTSG	Type	Volume	V mult	V exp	D mult	D exp
1	2	1	15920.000	0.168	0.000	0.235	0.000
2	73	2	433.000	0.168	0.000	0.010	0.000
3	4	1	18324.000	0.163	0.000	0.235	0.000
4	73	2	433.000	0.163	0.000	0.010	0.000
5	6	1	20732.000	0.158	0.000	0.235	0.000
6	73	2	433.000	0.158	0.000	0.010	0.000
7	8	1	21938.000	0.153	0.000	0.235	0.000
8	73	2	433.000	0.153	0.000	0.010	0.000
9	10	1	21938.000	0.148	0.000	0.235	0.000
10	73	2	433.000	0.148	0.000	0.010	0.000
11	12	1	21938.000	0.143	0.000	0.235	0.000
12	73	2	433.000	0.143	0.000	0.010	0.000
13	14	1	21938.000	0.128	0.000	0.235	0.000
14	73	2	433.000	0.128	0.000	0.010	0.000

15	16	1	21938.000	0.128	0.000	0.235	0.000
16	73	2	433.000	0.128	0.000	0.010	0.000
17	18	1	21938.000	0.128	0.000	0.235	0.000
18	73	2	433.000	0.128	0.000	0.010	0.000
19	20	1	21938.000	0.128	0.000	0.235	0.000
20	73	2	433.000	0.128	0.000	0.010	0.000
21	22	1	21938.000	0.128	0.000	0.235	0.000
22	73	2	433.000	0.128	0.000	0.010	0.000
23	24	1	21938.000	0.128	0.000	0.235	0.000
24	73	2	433.000	0.128	0.000	0.010	0.000

1

FLOWS
~~~~~

Flow Option 1 Used
Number of Flow Fields = 5

Field 1 has 2 Inflows
SCALQ = 0.100E+01 CONVQ = 0.283E-01

Inflow Number 1
~~~~~~~~~~~~~~~

Continuity Array:

Flow	From	To	Flow	From	To	Flow	From	To
0.100E+01	0	1	0.100E+01	1	3	0.100E+01	3	5
0.100E+01	5	7	0.100E+01	7	9	0.100E+01	9	11
0.100E+01	11	13	0.100E+01	13	15	0.100E+01	15	17
0.100E+01	17	19	0.100E+01	19	21	0.100E+01	21	23
0.100E+01	23	0						

Number of Breaks in Time Function = 2

Flow	Time	Flow	Time	Flow	Time

0.950E+01	0.000E+00	0.950E+01	0.365E+03

Inflow Number 2
~~~~~~~~~~~~~~~~

Continuity Array:

Flow	From	To	Flow	From	To	Flow	From	To
0.100E+01	0	2	0.100E+01	2	4	0.100E+01	4	6
0.100E+01	6	8	0.100E+01	8	10	0.100E+01	10	12
0.100E+01	12	14	0.100E+01	14	16	0.100E+01	16	18
0.100E+01	18	20	0.100E+01	20	22	0.100E+01	22	24
0.100E+01	24	0						

Number of Breaks in Time Function = 2

Flow	Time	Flow	Time	Flow	Time
0.000E+00	0.000E+00	0.000E+00	0.365E+03		

Field 2 has 0 Inflows
SCALQ = 0.000E+00 CONVQ = 0.000E+00

Field 3 has 1 Inflows
SCALQ = 0.100E+01 CONVQ = 0.100E+01

Inflow Number 1
~~~~~~~~~~~~~~~~

Solids Transport:

Area	From	To	Area	From	To	Area	From	To
0.221E+04	1	2	0.221E+04	2	73	0.221E+04	3	4
0.221E+04	4	73	0.230E+04	5	6	0.230E+04	6	73
0.239E+04	7	8	0.239E+04	8	73	0.247E+04	9	10
0.247E+04	10	73	0.256E+04	11	12	0.256E+04	12	73
0.261E+04	13	14	0.265E+04	14	73	0.265E+04	15	16

0.265E+04	16	73	0.265E+04	17	18	0.265E+04	18	73
0.265E+04	19	20	0.265E+04	20	73	0.265E+04	21	22
0.265E+04	22	73	0.265E+04	23	24	0.265E+04	24	73

Number of Breaks in Time Function = 2

Velocity	Time	Velocity	Time	Velocity	Time
0.300E-05	0.000E+00	0.300E-05	0.365E+03		

Field 4 has 1 Inflows
SCALQ = 0.100E+00 CONVQ = 0.929E-01

Inflow Number 1

Solids Transport:

Area	From	To	Area	From	To	Area	From	To
0.221E+04	1	2	0.221E+04	2	73	0.221E+04	3	4
0.221E+04	4	73	0.230E+04	5	6	0.230E+04	6	73
0.239E+04	7	8	0.239E+04	8	73	0.247E+04	9	10
0.247E+04	10	73	0.256E+04	11	12	0.256E+04	12	73
0.261E+04	13	14	0.265E+04	14	73	0.265E+04	15	16
0.265E+04	16	73	0.265E+04	17	18	0.265E+04	18	73
0.265E+04	19	20	0.265E+04	20	73	0.265E+04	21	22
0.265E+04	22	73	0.265E+04	23	24	0.265E+04	24	73

Number of Breaks in Time Function = 2

Velocity	Time	Velocity	Time	Velocity	Time
0.000E+00	0.000E+00	0.000E+00	0.365E+03		

Field 5 has 1 Inflows

SCALQ = 0.100E+01 CONVQ = 0.929E-01

Inflow Number 1

Solids Transport:

Area	From	To	Area	From	To	Area	From	To
0.221E+04	1	2	0.221E+04	2	73	0.221E+04	3	4
0.221E+04	4	73	0.230E+04	5	6	0.230E+04	6	73
0.239E+04	7	8	0.239E+04	8	73	0.247E+04	9	10
0.247E+04	10	73	0.256E+04	11	12	0.256E+04	12	73
0.261E+04	13	14	0.265E+04	14	73	0.265E+04	15	16
0.265E+04	16	73	0.265E+04	17	18	0.265E+04	18	73
0.265E+04	19	20	0.265E+04	20	73	0.265E+04	21	22
0.265E+04	22	73	0.265E+04	23	24	0.265E+04	24	73

Number of Breaks in Time Function = 2

Velocity	Time	Velocity	Time	Velocity	Time
0.100E-05	0.000E+00	0.100E-05	0.365E+03		

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```

Q Bypass Options for Systems 1 to 9 are 0 0 0 1 0 0 0 0 0
1

Boundary Conditions

Boundary Concentrations for System 1

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.4100000E+00	0.00	0.4100000E+00	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.1000000E-02	0.00	0.1000000E-02	365.00
24	2	0.1000000E-02	0.00	0.1000000E-02	365.00

Boundary Concentrations for System 2

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+
01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.2000000E+00	70.00	0.2000000E+00	7365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.1500000E+00	0.00	0.1500000E+00	365.00
24	2	0.1500000E+00	0.00	0.1500000E+00	365.00

Boundary Concentrations for System 3

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+
01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.4000000E+00	0.00	0.4000000E+00	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.1000000E-01	0.00	0.1000000E-01	365.00
24	2	0.1000000E-01	0.00	0.1000000E-01	365.00

Boundary Concentrations for System 4

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+
01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.0000000E+00	0.00	0.0000000E+00	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.2000000E+01	0.00	0.2000000E+01	365.00
24	2	0.2000000E+01	0.00	0.2000000E+01	365.00

Boundary Concentrations for System 5

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.2500000E+01	0.00	0.2500000E+01	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.1000000E+01	0.00	0.1000000E+01	365.00
24	2	0.1000000E+01	0.00	0.1000000E+01	365.00

Boundary Concentrations for System 6

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.5000000E+01	0.00	0.5000000E+01	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00

23	2	0.8000000E+01	0.00	0.8000000E+01	365.00
24	2	0.8000000E+01	0.00	0.8000000E+01	365.00

Boundary Concentrations for System 7

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.1000000E+01	0.00	0.1000000E+01	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.4000000E+00	0.00	0.4000000E+00	365.00
24	2	0.4000000E+00	0.00	0.4000000E+00	365.00

Boundary Concentrations for System 8

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.1000000E+00	0.00	0.1000000E+00	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.4000000E-01	0.00	0.4000000E-01	365.00
24	2	0.4000000E-01	0.00	0.4000000E-01	365.00

Boundary Concentrations for System 9

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+
01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.1500000E+02	0.00	0.1500000E+02	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.1000000E+02	0.00	0.1000000E+02	365.00
24	2	0.1000000E+02	0.00	0.1000000E+02	365.00

Waste Loads

Forcing Functions For System 1

Wk Option 3 Used No.of WK'S Read 0

No Forcing Function for System 1
1

Forcing Functions For System 2

Wk Option 3 Used No.of WK'S Read 0

No Forcing Function for System 2
1

Forcing Functions For System 3

Wk Option 3 Used No.of WK'S Read 0

No Forcing Function for System 3
1

```
      Forcing Functions For System  4
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Wk Option  3 Used     No.of WK'S Read    0


   No Forcing Function for System  4
1

      Forcing Functions For System  5
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Wk Option  3 Used     No.of WK'S Read    0


   No Forcing Function for System  5
1

      Forcing Functions For System  6
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Wk Option  3 Used     No.of WK'S Read    0


   No Forcing Function for System  6
1

      Forcing Functions For System  7
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Wk Option  3 Used     No.of WK'S Read    0


   No Forcing Function for System  7
1

      Forcing Functions For System  8
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Wk Option  3 Used     No.of WK'S Read    0


   No Forcing Function for System  8
1

      Forcing Functions For System  9
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

Wk Option 3 Used   No.of WK'S Read   0

No Forcing Function for System 9

1

Segment Parameters
~~~~~~~~~~~~~~~~~~

```
 PARM      SCALE       PARM      SCALE       PARM       SCALE       PARM
SCALE

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
~~~~~~~
 TMPSG    0.100E+01    KESG    0.100E+01    SOD1D    0.100E+01    SODTA
0.100E+01
 FNH4     0.000E+00    FPO4    0.000E+00    ITOTL    0.100E+01    TMPFN
0.100E+01


 Segment #    1
 TMPSG    3 0.100E+01  KESG    5 0.150E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #    2
 TMPSG    3 0.100E+01  KESG    5 0.150E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #    3
 TMPSG    3 0.100E+01  KESG    5 0.150E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #    4
 TMPSG    3 0.100E+01  KESG    5 0.150E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #    5
 TMPSG    3 0.100E+01  KESG    5 0.150E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #    6
 TMPSG    3 0.100E+01  KESG    5 0.150E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #    7
```
~~~~~~~

```
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #    8
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #    9
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #   10
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #   11
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #   12
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.100E+01


 Segment #   13
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.200E+01


 Segment #   14
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.200E+01


 Segment #   15
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN    4
0.200E+01


 Segment #   16
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D    9 0.000E+00 SODTA   12
0.100E+01
```

```
 FNH4     7 0.710E+01  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01


 Segment #  17
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01


 Segment #  18
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01


 Segment #  19
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01


 Segment #  20
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01


 Segment #  21
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01


 Segment #  22
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01


 Segment #  23
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01


 Segment #  24
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

1
                    Environmental and Chemical Constants
                    ------------------------------------

                 No Constants Enter for System  1:     GLOBALS
```

NH3 Constants for System 2

Number of Constants for System 2; Group nitrificat is 2

Constant	Const. #	K Value	Constant	Const. #	K Value
K12C	11	0.200E+00	K12T	12	0.108E+01

NO3 Constants for System 3

Number of Constants for System 3; Group denitrif is 2

Constant	Const. #	K Value	Constant	Const. #	K Value
K20C	21	0.100E+00	K20T	22	0.104E+01

No Constants Enter for System 4: PO4

PHYT Constants for System 5

Number of Constants for System 5; Group growth is 2

Constant	Const. #	K Value	Constant	Const. #	K Value
K1C	41	0.245E+01	K1T	42	0.105E+01

Number of Constants for System 5; Group light is 3

Constant	Const. #	K Value	Constant	Const. #	K Value
LGHTS	43	0.100E+01	CCHL	46	0.670E+02
IS1	47	0.525E+03		0	0.000E+00

Number of Constants for System 5; Group nutrients is 4

Constant	Const. #	K Value	Constant	Const. #	K Value
KMNG1	48	0.250E-01	KMPG1	49	0.500E-02
NCRB	58	0.180E+00	PCRB	57	0.250E-01

Number of Constants for System 5; Group death is 4

Constant	Const. #	K Value	Constant	Const. #	K Value
K1RC	50	0.600E+00	K1RT	51	0.107E+01
K1D	52	0.300E+00	KPZDC	55	0.000E+00

CBOD Constants for System 6

Number of Constants for System 6; Group deoxygent is 2

Constant	Const. #	K Value	Constant	Const. #	K Value
KDC	71	0.700E-01	KDT	72	0.105E+01

DO Constants for System 7

Number of Constants for System 7; Group ratio is 2

Constant	Const. #	K Value	Constant	Const. #	K Value
OCRB	81	0.267E+01	K2	82	0.450E+01

ON Constants for System 8

Number of Constants for System 8; Group mineralize is 3

Constant	Const. #	K Value	Constant	Const. #	K Value
K71C	91	0.500E+00	K71T	92	0.108E+01
FON	95	0.150E+00		0	0.000E+00

OP Constants for System 9

Number of Constants for System 9; Group mineralize is 3

Constant	Const. #	K Value	Constant	Const. #	K Value
K83C	100	0.750E+00	K83T	101	0.108E+01
FOP	104	0.500E+00		0	0.000E+00

No Constants Enter for System 10: CO2acy

Environmental Time Functions

Piecewise Linear Functions

	VAL(T)	T	VAL(T)	T	VAL(T)	T
TEMP1	0.25410E+02	0.00	0.25410E+02	0.01	0.25400E+02	0.02
	0.25370E+02	0.03	0.25360E+02	0.04	0.25360E+02	0.05
	0.25320E+02	0.06	0.25330E+02	0.07	0.25310E+02	0.08
	0.25290E+02	0.09	0.25270E+02	0.10	0.25250E+02	0.11
	0.25210E+02	0.13	0.25170E+02	0.14	0.25130E+02	0.15
	0.25080E+02	0.16	0.25010E+02	0.17	0.24940E+02	0.18
	0.24880E+02	0.19	0.24830E+02	0.20	0.24770E+02	0.21
	0.24690E+02	0.22	0.24610E+02	0.23	0.24520E+02	0.24
	0.24420E+02	0.25	0.24320E+02	0.26	0.24240E+02	0.27
	0.24170E+02	0.28	0.24110E+02	0.29	0.24070E+02	0.30
	0.24070E+02	0.31	0.24120E+02	0.32	0.24270E+02	0.33
	0.24450E+02	0.34	0.24630E+02	0.35	0.24820E+02	0.36
	0.24990E+02	0.38	0.25080E+02	0.39	0.25180E+02	0.40
	0.25300E+02	0.41	0.25400E+02	0.42	0.25550E+02	0.43
	0.25630E+02	0.44	0.25690E+02	0.45	0.25740E+02	0.46
	0.25830E+02	0.47	0.25900E+02	0.48	0.25960E+02	0.49
	0.26040E+02	0.50	0.26090E+02	0.51	0.26170E+02	0.52
	0.26240E+02	0.53	0.26250E+02	0.54	0.26260E+02	0.55
	0.26290E+02	0.56	0.26290E+02	0.57	0.26330E+02	0.58
	0.26370E+02	0.59	0.26340E+02	0.60	0.26440E+02	0.61
	0.26390E+02	0.63	0.26170E+02	0.64	0.26090E+02	0.65
	0.26350E+02	0.66	0.26510E+02	0.67	0.26460E+02	0.68
	0.26340E+02	0.69	0.26060E+02	0.70	0.25940E+02	0.71
	0.25930E+02	0.72	0.25930E+02	0.73	0.25980E+02	0.74
	0.25990E+02	0.75	0.25920E+02	0.76	0.25770E+02	0.77
	0.25680E+02	0.78	0.25740E+02	0.79	0.25810E+02	0.80
	0.25600E+02	0.81	0.25170E+02	0.82	0.25250E+02	0.83
	0.25460E+02	0.84	0.25640E+02	0.85	0.25670E+02	0.86
	0.25610E+02	0.88	0.25490E+02	0.89	0.25530E+02	0.90
	0.25530E+02	0.91	0.25610E+02	0.92	0.25600E+02	0.93
	0.25580E+02	0.94	0.25580E+02	0.95	0.25580E+02	0.96
	0.25570E+02	0.97	0.25560E+02	0.98	0.25580E+02	0.99
	0.25580E+02	1.00	0.25580E+02	1.01	0.25580E+02	1.02
	0.25550E+02	1.03	0.25540E+02	1.04	0.25530E+02	1.05
	0.25510E+02	1.06	0.25480E+02	1.07	0.25450E+02	1.08
	0.25420E+02	1.09	0.25420E+02	1.10	0.25380E+02	1.11
	0.25330E+02	1.13	0.25290E+02	1.14	0.25250E+02	1.15
	0.25210E+02	1.16	0.25190E+02	1.17	0.25210E+02	1.18
	0.25180E+02	1.19	0.25060E+02	1.20	0.24920E+02	1.21
	0.24810E+02	1.22	0.24720E+02	1.23	0.24670E+02	1.24
	0.24650E+02	1.25	0.24670E+02	1.26	0.24600E+02	1.27
	0.24450E+02	1.28	0.24300E+02	1.29	0.24200E+02	1.30
	0.24160E+02	1.31	0.24220E+02	1.32	0.24370E+02	1.33
	0.24520E+02	1.34	0.24660E+02	1.35	0.24770E+02	1.36
	0.24890E+02	1.38	0.24880E+02	1.39	0.24840E+02	1.40
	0.25020E+02	1.41	0.25310E+02	1.42	0.25540E+02	1.43
	0.25700E+02	1.44	0.25820E+02	1.45	0.25860E+02	1.46
	0.25830E+02	1.47	0.25880E+02	1.48	0.25920E+02	1.49
	0.25980E+02	1.50	0.26050E+02	1.51	0.26120E+02	1.52
	0.26200E+02	1.53	0.25950E+02	1.54	0.25950E+02	1.55
	0.26190E+02	1.56	0.26240E+02	1.57	0.26210E+02	1.58
	0.26050E+02	1.59	0.26110E+02	1.60	0.26200E+02	1.61
	0.26140E+02	1.63	0.25950E+02	1.64	0.25760E+02	1.65
	0.25740E+02	1.66	0.25790E+02	1.67	0.25860E+02	1.68
	0.25910E+02	1.69	0.25950E+02	1.70	0.25960E+02	1.71
	0.26000E+02	1.72	0.26010E+02	1.73	0.26000E+02	1.74
	0.25850E+02	1.75	0.25690E+02	1.76	0.25660E+02	1.77

	0.25660E+02	1.78	0.25620E+02	1.79	0.25570E+02	1.80
	0.25570E+02	1.81	0.25570E+02	1.82	0.25590E+02	1.83
	0.25450E+02	1.84	0.25140E+02	1.85	0.25340E+02	1.86
	0.25360E+02	1.88	0.25440E+02	1.89	0.25510E+02	1.90
	0.25500E+02	1.91	0.25490E+02	1.92	0.25510E+02	1.93
	0.25500E+02	1.94	0.25480E+02	1.95	0.25450E+02	1.96
	0.25410E+02	1.97	0.25390E+02	1.98	0.25390E+02	1.99
	0.25390E+02	2.00				
TEMP2	0.23440E+02	0.00	0.23570E+02	0.01	0.23660E+02	0.02
	0.23700E+02	0.03	0.23710E+02	0.04	0.23700E+02	0.05
	0.23650E+02	0.06	0.23620E+02	0.07	0.23540E+02	0.08
	0.23360E+02	0.09	0.23340E+02	0.10	0.23380E+02	0.11
	0.23430E+02	0.13	0.23440E+02	0.14	0.23330E+02	0.15
	0.23150E+02	0.16	0.22820E+02	0.17	0.22490E+02	0.18
	0.22230E+02	0.19	0.22100E+02	0.20	0.21960E+02	0.21
	0.21840E+02	0.22	0.21880E+02	0.23	0.21790E+02	0.24
	0.21600E+02	0.25	0.21370E+02	0.26	0.21170E+02	0.27
	0.21010E+02	0.28	0.20930E+02	0.29	0.20780E+02	0.30
	0.20730E+02	0.31	0.20830E+02	0.32	0.20990E+02	0.33
	0.21290E+02	0.34	0.21420E+02	0.35	0.21600E+02	0.36
	0.21850E+02	0.38	0.22270E+02	0.39	0.23040E+02	0.40
	0.23930E+02	0.41	0.24930E+02	0.42	0.25920E+02	0.43
	0.26780E+02	0.44	0.27460E+02	0.45	0.28200E+02	0.46
	0.28840E+02	0.47	0.29110E+02	0.48	0.29370E+02	0.49
	0.29440E+02	0.50	0.28640E+02	0.51	0.28810E+02	0.52
	0.28840E+02	0.53	0.28980E+02	0.54	0.28790E+02	0.55
	0.29230E+02	0.56	0.29460E+02	0.57	0.29500E+02	0.58
	0.29430E+02	0.59	0.29150E+02	0.60	0.28930E+02	0.61
	0.28870E+02	0.63	0.27750E+02	0.64	0.27280E+02	0.65
	0.26630E+02	0.66	0.26410E+02	0.67	0.26190E+02	0.68
	0.25950E+02	0.69	0.25650E+02	0.70	0.25390E+02	0.71
	0.25340E+02	0.72	0.25260E+02	0.73	0.24920E+02	0.74
	0.24730E+02	0.75	0.24640E+02	0.76	0.24490E+02	0.77
	0.24420E+02	0.78	0.24370E+02	0.79	0.24420E+02	0.80
	0.24470E+02	0.81	0.24350E+02	0.82	0.24140E+02	0.83
	0.23990E+02	0.84	0.23560E+02	0.85	0.23340E+02	0.86
	0.23080E+02	0.88	0.23010E+02	0.89	0.23100E+02	0.90
	0.23330E+02	0.91	0.23590E+02	0.92	0.23750E+02	0.93
	0.23820E+02	0.94	0.23850E+02	0.95	0.23750E+02	0.96
	0.23770E+02	0.97	0.23730E+02	0.98	0.23760E+02	0.99
	0.23810E+02	1.00	0.23850E+02	1.01	0.23820E+02	1.02
	0.23790E+02	1.03	0.23760E+02	1.04	0.23730E+02	1.05
	0.23700E+02	1.06	0.23630E+02	1.07	0.23530E+02	1.08
	0.23470E+02	1.09	0.23460E+02	1.10	0.23400E+02	1.11
	0.23320E+02	1.13	0.23230E+02	1.14	0.23110E+02	1.15
	0.23010E+02	1.16	0.22910E+02	1.17	0.22820E+02	1.18
	0.22690E+02	1.19	0.22570E+02	1.20	0.22420E+02	1.21
	0.22300E+02	1.22	0.22180E+02	1.23	0.22060E+02	1.24
	0.21920E+02	1.25	0.21800E+02	1.26	0.21680E+02	1.27
	0.21630E+02	1.28	0.21660E+02	1.29	0.21790E+02	1.30
	0.21990E+02	1.31	0.22250E+02	1.32	0.22350E+02	1.33
	0.22460E+02	1.34	0.22660E+02	1.35	0.22910E+02	1.36
	0.23290E+02	1.38	0.23670E+02	1.39	0.24110E+02	1.40
	0.24550E+02	1.41	0.25070E+02	1.42	0.25490E+02	1.43
	0.25890E+02	1.44	0.26340E+02	1.45	0.26680E+02	1.46
	0.27040E+02	1.47	0.27290E+02	1.48	0.27520E+02	1.49
	0.27660E+02	1.50	0.27900E+02	1.51	0.28090E+02	1.52
	0.28200E+02	1.53	0.28150E+02	1.54	0.28200E+02	1.55
	0.28280E+02	1.56	0.28180E+02	1.57	0.28260E+02	1.58
	0.27820E+02	1.59	0.26920E+02	1.60	0.25330E+02	1.61
	0.24250E+02	1.63	0.23610E+02	1.64	0.23290E+02	1.65
	0.23450E+02	1.66	0.23800E+02	1.67	0.24510E+02	1.68
	0.25270E+02	1.69	0.25840E+02	1.70	0.25710E+02	1.71
	0.25110E+02	1.72	0.24530E+02	1.73	0.24040E+02	1.74
	0.23890E+02	1.75	0.23820E+02	1.76	0.23950E+02	1.77

```
          0.23880E+02   1.78    0.23780E+02   1.79    0.23650E+02   1.80
          0.23530E+02   1.81    0.23360E+02   1.82    0.21910E+02   1.83
          0.22270E+02   1.84    0.22550E+02   1.85    0.22740E+02   1.86
          0.22850E+02   1.88    0.22890E+02   1.89    0.22850E+02   1.90
          0.22750E+02   1.91    0.22450E+02   1.92    0.22390E+02   1.93
          0.22370E+02   1.94    0.22330E+02   1.95    0.22230E+02   1.96
          0.22080E+02   1.97    0.21900E+02   1.98    0.21690E+02   1.99
          0.21470E+02   2.00
 ITOT     0.00000E+00   0.00    0.00000E+00   0.04    0.00000E+00   0.08
          0.00000E+00   0.12    0.00000E+00   0.16    0.44100E+01   0.20
          0.78510E+02   0.25    0.25494E+03   0.29    0.45343E+03   0.33
          0.62633E+03   0.37    0.79836E+03   0.41    0.92450E+03   0.45
          0.98449E+03   0.50    0.98802E+03   0.54    0.93597E+03   0.58
          0.82041E+03   0.62    0.66868E+03   0.66    0.48695E+03   0.70
          0.28582E+03   0.75    0.94390E+02   0.79    0.10590E+02   0.83
          0.00000E+00   0.87    0.00000E+00   0.91    0.00000E+00   0.95
          0.00000E+00   1.00    0.00000E+00   1.00
 F        0.10000E+01   0.00    0.10000E+01 365.00
1
```

Initial Conditions
~~~~~~~~~~~~~~~~~~

Initial Conditions for System 1
Particulate Fraction of System is Transported by Solids Field 3
Density of System = 0.100E+01

```
      1 0.2000E-01 0.1000E+01      2 0.2000E-01 0.1000E+01      3
0.2000E-01 0.1000E+01
      4 0.2000E-01 0.1000E+01      5 0.2000E-01 0.1000E+01      6
0.2000E-01 0.1000E+01
      7 0.2000E-01 0.1000E+01      8 0.2000E-01 0.1000E+01      9
0.2000E-01 0.1000E+01
     10 0.2000E-01 0.1000E+01     11 0.2000E-01 0.1000E+01     12
0.2000E-01 0.1000E+01
     13 0.2000E-01 0.1000E+01     14 0.2000E-01 0.1000E+01     15
0.2000E-01 0.1000E+01
     16 0.2000E-01 0.1000E+01     17 0.2000E-01 0.1000E+01     18
0.2000E-01 0.1000E+01
     19 0.2000E-01 0.1000E+01     20 0.2000E-01 0.1000E+01     21
0.2000E-01 0.1000E+01
     22 0.2000E-01 0.1000E+01     23 0.2000E-01 0.1000E+01     24
0.2000E-01 0.1000E+01
```

Initial Conditions for System 2
Particulate Fraction of System is Transported by Solids Field 3
Density of System = 0.100E+01

```
      1 0.9000E-01 0.1000E+01      2 0.9000E-01 0.1000E+01      3
0.9000E-01 0.1000E+01
      4 0.9000E-01 0.1000E+01      5 0.9000E-01 0.1000E+01      6
0.9000E-01 0.1000E+01
      7 0.9000E-01 0.1000E+01      8 0.9000E-01 0.1000E+01      9
0.9000E-01 0.1000E+01
     10 0.9000E-01 0.1000E+01     11 0.9000E-01 0.1000E+01     12
0.9000E-01 0.1000E+01
     13 0.9000E-01 0.1000E+01     14 0.9000E-01 0.1000E+01     15
0.9000E-01 0.1000E+01
     16 0.9000E-01 0.1000E+01     17 0.9000E-01 0.1000E+01     18
0.9000E-01 0.1000E+01
```
~~~~~~~~~~~~~~~~~~

```
      19 0.9000E-01 0.1000E+01      20 0.9000E-01 0.1000E+01      21
0.9000E-01 0.1000E+01
      22 0.9000E-01 0.1000E+01      23 0.9000E-01 0.1000E+01      24
0.9000E-01 0.1000E+01
```

Initial Conditions for System 3
Particulate Fraction of System is Transported by Solids Field 3
Density of System = 0.100E+01

```
       1 0.1010E+01 0.1000E+01       2 0.1010E+01 0.1000E+01       3
0.1010E+01 0.1000E+01
       4 0.1010E+01 0.1000E+01       5 0.1010E+01 0.1000E+01       6
0.1010E+01 0.1000E+01
       7 0.1010E+01 0.1000E+01       8 0.1010E+01 0.1000E+01       9
0.1010E+01 0.1000E+01
      10 0.1010E+01 0.1000E+01      11 0.1010E+01 0.1000E+01      12
0.1010E+01 0.1000E+01
      13 0.1010E+01 0.1000E+01      14 0.1010E+01 0.1000E+01      15
0.1010E+01 0.1000E+01
      16 0.1010E+01 0.1000E+01      17 0.1010E+01 0.1000E+01      18
0.1010E+01 0.1000E+01
      19 0.1010E+01 0.1000E+01      20 0.1010E+01 0.1000E+01      21
0.1010E+01 0.1000E+01
      22 0.1010E+01 0.1000E+01      23 0.1010E+01 0.1000E+01      24
0.1010E+01 0.1000E+01
```

Initial Conditions for System 4
Particulate Fraction of System is Transported by Solids Field 4
Density of System = 0.100E+01

```
       1 0.1000E-23 0.0000E+00       2 0.1000E+04 0.0000E+00       3
0.1000E-23 0.0000E+00
       4 0.1000E+04 0.0000E+00       5 0.1000E-23 0.0000E+00       6
0.1000E+04 0.0000E+00
       7 0.1000E-23 0.0000E+00       8 0.9750E+03 0.0000E+00       9
0.1000E-23 0.0000E+00
      10 0.9500E+03 0.0000E+00      11 0.1000E-23 0.0000E+00      12
0.9250E+03 0.0000E+00
      13 0.1000E-23 0.0000E+00      14 0.9000E+03 0.0000E+00      15
0.1000E-23 0.0000E+00
      16 0.9000E+03 0.0000E+00      17 0.1000E-23 0.0000E+00      18
0.9000E+03 0.0000E+00
      19 0.1000E-23 0.0000E+00      20 0.9000E+03 0.0000E+00      21
0.1000E-23 0.0000E+00
      22 0.9000E+03 0.0000E+00      23 0.1000E-23 0.0000E+00      24
0.9000E+03 0.0000E+00
```

Initial Conditions for System 5
Particulate Fraction of System is Transported by Solids Field 3
Density of System = 0.100E+01

```
       1 0.5000E+01 0.1000E+01       2 0.5000E+01 0.1000E+01       3
0.5000E+01 0.1000E+01
       4 0.5000E+01 0.1000E+01       5 0.5000E+01 0.1000E+01       6
0.5000E+01 0.1000E+01
       7 0.5000E+01 0.1000E+01       8 0.5000E+01 0.1000E+01       9
0.5000E+01 0.1000E+01
      10 0.5000E+01 0.1000E+01      11 0.5000E+01 0.1000E+01      12
0.5000E+01 0.1000E+01
      13 0.5000E+01 0.1000E+01      14 0.5000E+01 0.1000E+01      15
0.5000E+01 0.1000E+01
      16 0.5000E+01 0.1000E+01      17 0.5000E+01 0.1000E+01      18
```

```
0.5000E+01 0.1000E+01
      19 0.5000E+01 0.1000E+01      20 0.5000E+01 0.1000E+01      21
0.5000E+01 0.1000E+01
      22 0.5000E+01 0.1000E+01      23 0.5000E+01 0.1000E+01      24
0.5000E+01 0.1000E+01


                    Initial Conditions for System 6
    Particulate Fraction of System is Transported by Solids Field    3
                        Density of System =  0.100E+01

       1 0.7990E+01 0.1000E+01       2 0.7590E+01 0.1000E+01       3
0.7590E+01 0.1000E+01
       4 0.7990E+01 0.1000E+01       5 0.7590E+01 0.1000E+01       6
0.7590E+01 0.1000E+01
       7 0.7990E+01 0.1000E+01       8 0.7590E+01 0.1000E+01       9
0.7590E+01 0.1000E+01
      10 0.7990E+01 0.1000E+01      11 0.7590E+01 0.1000E+01      12
0.7590E+01 0.1000E+01
      13 0.7990E+01 0.1000E+01      14 0.7590E+01 0.1000E+01      15
0.7590E+01 0.1000E+01
      16 0.7990E+01 0.1000E+01      17 0.7590E+01 0.1000E+01      18
0.7590E+01 0.1000E+01
      19 0.7990E+01 0.1000E+01      20 0.7590E+01 0.1000E+01      21
0.7590E+01 0.1000E+01
      22 0.7990E+01 0.1000E+01      23 0.7590E+01 0.1000E+01      24
0.7590E+01 0.1000E+01


                    Initial Conditions for System 7
    Particulate Fraction of System is Transported by Solids Field    3
                        Density of System =  0.100E+01

       1 0.1020E+01 0.7000E+00       2 0.1020E+01 0.7000E+00       3
0.1020E+01 0.7000E+00
       4 0.1020E+01 0.7000E+00       5 0.1020E+01 0.7000E+00       6
0.1020E+01 0.7000E+00
       7 0.1020E+01 0.7000E+00       8 0.1020E+01 0.7000E+00       9
0.1020E+01 0.7000E+00
      10 0.1020E+01 0.7000E+00      11 0.1020E+01 0.7000E+00      12
0.1020E+01 0.7000E+00
      13 0.1020E+01 0.7000E+00      14 0.1020E+01 0.7000E+00      15
0.1020E+01 0.7000E+00
      16 0.1020E+01 0.7000E+00      17 0.1020E+01 0.7000E+00      18
0.1020E+01 0.7000E+00
      19 0.1020E+01 0.7000E+00      20 0.1020E+01 0.7000E+00      21
0.1020E+01 0.7000E+00
      22 0.1020E+01 0.7000E+00      23 0.1020E+01 0.7000E+00      24
0.1020E+01 0.7000E+00


                    Initial Conditions for System 8
    Particulate Fraction of System is Transported by Solids Field    3
                        Density of System =  0.100E+01

       1 0.1000E+00 0.1000E+01       2 0.1000E+00 0.1000E+01       3
0.1000E+00 0.1000E+01
       4 0.1000E+00 0.1000E+01       5 0.1000E+00 0.1000E+01       6
0.1000E+00 0.1000E+01
       7 0.1000E+00 0.1000E+01       8 0.1000E+00 0.1000E+01       9
0.1000E+00 0.1000E+01
      10 0.1000E+00 0.1000E+01      11 0.1000E+00 0.1000E+01      12
0.1000E+00 0.1000E+01
      13 0.1000E+00 0.1000E+01      14 0.1000E+00 0.1000E+01      15
0.1000E+00 0.1000E+01
```

```
     16 0.1000E+00 0.1000E+01     17 0.1000E+00 0.1000E+01     18
0.1000E+00 0.1000E+01
     19 0.1000E+00 0.1000E+01     20 0.1000E+00 0.1000E+01     21
0.1000E+00 0.1000E+01
     22 0.1000E+00 0.1000E+01     23 0.1000E+00 0.1000E+01     24
0.1000E+00 0.1000E+01
```

Initial Conditions for System 9
Particulate Fraction of System is Transported by Solids Field 3
Density of System = 0.100E+01

```
      1 0.4000E+01 0.1000E+01      2 0.4000E+01 0.1000E+01      3
0.4000E+01 0.1000E+01
      4 0.4000E+01 0.1000E+01      5 0.4000E+01 0.1000E+01      6
0.4000E+01 0.1000E+01
      7 0.4000E+01 0.1000E+01      8 0.4000E+01 0.1000E+01      9
0.4000E+01 0.1000E+01
     10 0.4000E+01 0.1000E+01     11 0.4000E+01 0.1000E+01     12
0.4000E+01 0.1000E+01
     13 0.6000E+01 0.1000E+01     14 0.6000E+01 0.1000E+01     15
0.6000E+01 0.1000E+01
     16 0.6000E+01 0.1000E+01     17 0.6000E+01 0.1000E+01     18
0.6000E+01 0.1000E+01
     19 0.6000E+01 0.1000E+01     20 0.6000E+01 0.1000E+01     21
0.6000E+01 0.1000E+01
     22 0.6000E+01 0.1000E+01     23 0.6000E+01 0.1000E+01     24
0.6000E+01 0.1000E+01
```

Stability Criteria for Numerical Integration

System	Maximum Concentration
1	10.00
2	10.00
3	5.00
4	500.00
5	100.00
6	20.00
7	10.00
8	5.00
9	5000.00

Completed

```
# WASP5pH EDF dump file
#
# Seg    = model segment number
# Time   = simulation time in days
# Tchlax = total chlorophyll-a [periphyton] (ug/L)
# DO     = dissolved oxygen (mg/L)
# CO2acy = carbon dioxide acidity (mg/L)
# pH     = pH (standard units)
# CO2sat = saturated CO2 concentration (mg/L)
# Nlim   = Michaelis Nitrogen limitation factor
# Plim   = Michaelis Phosphorus limitation factor
#
# Seg    Time Tchlax     DO CO2acy     pH  CO2sat    Nlim    Plim
   2    0.00 1000.0   7.59   4.00   8.02    0.50    0.81    1.00
  14    0.00  900.0   7.59   6.00   7.86    0.53    0.81    1.00
   2    0.04  954.6   4.92  13.69   7.49    0.50    0.96    0.99
  14    0.04  862.5   7.10   4.77   7.96    0.53    0.85    1.00
   2    0.08  909.3   4.63  14.71   7.46    0.50    0.96    0.99
  14    0.08  824.7   6.74   4.32   8.01    0.53    0.87    0.99
   2    0.12  868.3   4.62  14.75   7.46    0.50    0.96    0.99
  14    0.12  790.6   6.29   5.05   7.94    0.53    0.91    0.99
   2    0.16  829.3   4.65  14.70   7.46    0.51    0.96    0.99
  14    0.16  758.1   5.83   6.27   7.85    0.54    0.94    0.99
   2    0.20  795.1   4.70  14.61   7.47    0.51    0.96    0.99
  14    0.20  730.2   5.57   7.16   7.80    0.55    0.95    0.99
   2    0.24  772.8   5.08  14.03   7.49    0.51    0.96    0.99
  14    0.24  711.9   5.66   7.34   7.79    0.55    0.96    0.99
   2    0.28  782.1   5.68  13.12   7.52    0.52    0.96    0.99
  14    0.28  718.3   6.06   6.89   7.82    0.57    0.96    0.99
   2    0.32  820.7   6.06  12.55   7.54    0.52    0.96    0.99
  14    0.32  747.3   6.44   6.41   7.86    0.57    0.96    0.99
   2    0.36  872.6   6.22  12.33   7.54    0.51    0.96    0.99
  14    0.36  786.8   6.72   6.01   7.88    0.56    0.96    0.99
   2    0.40  927.6   6.23  12.32   7.54    0.50    0.96    0.99
  14    0.40  829.9   6.92   5.70   7.89    0.53    0.96    0.99
   2    0.44  979.4   6.17  12.43   7.53    0.50    0.96    0.99
  14    0.44  877.4   7.06   5.32   7.89    0.48    0.95    0.99
   2    0.48 1026.9   6.11  12.52   7.52    0.50    0.96    0.99
  14    0.48  928.8   7.12   5.13   7.89    0.46    0.95    0.99
   2    0.52 1072.9   6.12  12.52   7.52    0.49    0.96    0.99
  14    0.52  981.2   7.10   5.12   7.89    0.46    0.95    0.99
   2    0.56 1123.5   6.19  12.42   7.52    0.49    0.96    0.99
  14    0.56 1037.9   7.17   5.01   7.90    0.45    0.95    0.99
   2    0.60 1178.2   6.35  12.21   7.53    0.49    0.96    0.99
  14    0.60 1100.9   7.32   4.78   7.92    0.45    0.95    0.99
   2    0.64 1243.9   6.55  11.92   7.54    0.49    0.95    0.99
  14    0.64 1172.9   7.47   4.59   7.95    0.48    0.95    0.99
   2    0.68 1321.6   6.77  11.61   7.55    0.49    0.95    0.99
  14    0.68 1248.7   7.62   4.43   7.97    0.49    0.95    0.99
   2    0.72 1403.4   6.74  11.69   7.55    0.49    0.95    0.99
  14    0.72 1324.1   7.64   4.45   7.98    0.50    0.95    0.99
   2    0.76 1467.8   6.25  12.45   7.53    0.50    0.96    0.99
  14    0.76 1380.8   7.28   5.04   7.93    0.51    0.95    0.99
   2    0.80 1475.5   5.14  14.15   7.47    0.50    0.96    0.99
  14    0.80 1386.4   6.41   6.40   7.83    0.52    0.96    0.99
   2    0.84 1428.7   4.44  15.22   7.44    0.50    0.96    0.99
  14    0.84 1344.4   5.69   7.52   7.76    0.52    0.96    0.99
   2    0.88 1365.2   4.33  15.36   7.44    0.50    0.96    0.99
  14    0.88 1290.4   5.37   8.13   7.73    0.54    0.96    0.99
   2    0.92 1302.8   4.36  15.30   7.44    0.50    0.96    0.99
  14    0.92 1237.4   5.13   8.54   7.71    0.53    0.96    0.99
   2    0.96 1243.1   4.39  15.23   7.44    0.50    0.96    0.99
  14    0.96 1185.4   4.98   8.70   7.70    0.52    0.96    0.99
   2    1.00 1186.2   4.42  15.16   7.44    0.50    0.96    0.99
  14    1.00 1135.6   4.92   8.83   7.69    0.52    0.97    0.99
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2	1.04	1131.9	4.46	15.09	7.45	0.50	0.96	0.99
14	1.04	1087.8	4.91	8.77	7.70	0.52	0.97	0.99
2	1.08	1080.2	4.49	15.02	7.45	0.50	0.96	0.99
14	1.08	1042.3	4.94	8.76	7.70	0.53	0.97	0.99
2	1.12	1031.1	4.52	14.96	7.45	0.50	0.96	0.99
14	1.12	999.2	4.98	8.70	7.70	0.53	0.97	0.99
2	1.16	984.6	4.56	14.89	7.45	0.50	0.96	0.99
14	1.16	958.4	5.02	8.61	7.71	0.54	0.97	0.99
2	1.20	941.5	4.62	14.79	7.46	0.51	0.96	0.99
14	1.20	920.9	5.10	8.50	7.72	0.54	0.96	0.99
2	1.24	916.0	5.08	14.07	7.48	0.51	0.96	0.99
14	1.24	898.3	5.47	7.93	7.75	0.55	0.96	0.99
2	1.28	928.6	5.80	12.99	7.52	0.52	0.96	0.99
14	1.28	907.8	6.08	7.00	7.81	0.56	0.96	0.99
2	1.32	974.3	6.22	12.36	7.54	0.52	0.96	0.99
14	1.32	946.1	6.60	6.23	7.86	0.55	0.96	0.99
2	1.36	1034.2	6.39	12.12	7.55	0.51	0.96	0.99
14	1.36	998.1	6.95	5.71	7.89	0.54	0.96	0.99
2	1.40	1096.3	6.37	12.16	7.54	0.51	0.96	0.99
14	1.40	1054.5	7.18	5.31	7.91	0.52	0.95	0.99
2	1.44	1154.4	6.31	12.26	7.53	0.50	0.96	0.99
14	1.44	1111.5	7.28	5.05	7.92	0.49	0.95	0.99
2	1.48	1207.9	6.25	12.37	7.53	0.50	0.96	0.99
14	1.48	1167.8	7.31	4.96	7.91	0.48	0.95	0.99
2	1.52	1259.2	6.25	12.38	7.53	0.49	0.96	0.99
14	1.52	1224.9	7.33	4.89	7.91	0.47	0.95	0.99
2	1.56	1312.5	6.32	12.29	7.53	0.49	0.96	0.99
14	1.56	1285.7	7.40	4.79	7.92	0.47	0.95	0.99
2	1.60	1373.0	6.49	12.06	7.54	0.49	0.95	0.99
14	1.60	1353.5	7.51	4.63	7.95	0.48	0.95	0.99
2	1.64	1445.0	6.71	11.75	7.55	0.50	0.95	0.99
14	1.64	1421.1	7.55	4.68	7.97	0.53	0.95	0.99
2	1.68	1528.6	6.92	11.45	7.56	0.50	0.95	0.99
14	1.68	1494.7	7.83	4.35	7.99	0.51	0.95	0.99
2	1.72	1618.2	6.93	11.48	7.56	0.49	0.95	0.99
14	1.72	1579.2	7.90	4.21	8.01	0.51	0.95	0.99
2	1.76	1688.5	6.36	12.36	7.53	0.50	0.96	0.99
14	1.76	1639.8	7.46	4.91	7.95	0.52	0.95	0.99
2	1.80	1695.1	5.12	14.25	7.47	0.50	0.96	0.99
14	1.80	1643.8	6.49	6.47	7.83	0.53	0.96	0.99
2	1.84	1640.3	4.32	15.46	7.44	0.50	0.96	0.99
14	1.84	1596.4	5.73	7.72	7.76	0.55	0.96	0.99
2	1.88	1568.3	4.23	15.59	7.43	0.50	0.96	0.99
14	1.88	1534.6	5.31	8.39	7.72	0.54	0.96	0.99
2	1.92	1496.8	4.25	15.53	7.43	0.50	0.96	0.99
14	1.92	1473.2	5.07	8.77	7.71	0.54	0.96	0.99
2	1.96	1428.6	4.29	15.44	7.44	0.50	0.96	0.99
14	1.96	1415.3	4.92	8.98	7.70	0.55	0.96	0.99
2	2.00	1363.7	4.33	15.36	7.44	0.50	0.96	0.99
14	2.00	1360.9	4.89	9.03	7.69	0.53	0.97	0.99
2	2.04	1301.8	4.37	15.28	7.44	0.50	0.96	0.99
14	2.04	1304.1	4.79	9.14	7.68	0.53	0.97	0.99
2	2.08	1242.9	4.41	15.21	7.44	0.50	0.96	0.99
14	2.08	1249.6	4.81	9.08	7.68	0.53	0.97	0.99
2	2.12	1186.8	4.44	15.14	7.45	0.50	0.96	0.99
14	2.12	1198.0	4.85	8.99	7.69	0.53	0.97	0.99
2	2.16	1133.6	4.48	15.06	7.45	0.51	0.96	0.99
14	2.16	1148.8	4.90	8.89	7.70	0.54	0.97	0.99
2	2.20	1084.5	4.55	14.94	7.46	0.51	0.96	0.99
14	2.20	1104.4	5.01	8.73	7.71	0.55	0.97	0.99
2	2.24	1055.1	5.07	14.14	7.48	0.51	0.96	0.99
14	2.24	1077.5	5.43	8.08	7.75	0.55	0.96	0.99
2	2.28	1068.2	5.87	12.92	7.52	0.52	0.96	0.99
14	2.28	1087.3	6.13	7.03	7.81	0.57	0.96	0.99
2	2.32	1118.6	6.35	12.21	7.55	0.52	0.96	0.99

14	2.32	1128.6	6.69	6.21	7.87	0.57	0.96	0.99
2	2.36	1185.0	6.53	11.95	7.55	0.51	0.95	0.99
14	2.36	1183.7	7.08	5.63	7.91	0.56	0.96	0.99
2	2.40	1250.9	6.53	11.96	7.55	0.50	0.95	0.99
14	2.40	1240.1	7.32	5.25	7.92	0.53	0.95	0.99
2	2.44	1315.6	6.45	12.11	7.54	0.50	0.96	0.99
14	2.44	1304.3	7.52	4.80	7.93	0.48	0.95	0.99
2	2.48	1374.3	6.37	12.24	7.53	0.50	0.96	0.99
14	2.48	1372.8	7.59	4.60	7.93	0.46	0.95	0.99
2	2.52	1430.4	6.37	12.26	7.53	0.49	0.96	0.99
14	2.52	1441.6	7.56	4.61	7.94	0.46	0.95	0.99
2	2.56	1488.7	6.45	12.16	7.53	0.49	0.96	0.99
14	2.56	1511.6	7.63	4.50	7.94	0.46	0.95	0.99
2	2.60	1554.5	6.63	11.91	7.54	0.49	0.95	0.99
14	2.60	1592.3	7.82	4.22	7.97	0.45	0.95	0.99
2	2.64	1633.2	6.87	11.56	7.56	0.49	0.95	0.99
14	2.64	1684.5	8.00	3.99	8.01	0.47	0.95	0.99
2	2.68	1726.2	7.14	11.19	7.57	0.49	0.95	0.99
14	2.68	1781.2	8.17	3.80	8.04	0.49	0.95	0.99
2	2.72	1824.3	7.10	11.28	7.57	0.49	0.95	0.99
14	2.72	1877.0	8.19	3.84	8.04	0.50	0.95	0.99
2	2.76	1901.8	6.52	12.18	7.54	0.49	0.95	0.99
14	2.76	1948.9	7.72	4.60	7.97	0.51	0.95	0.99
2	2.80	1911.2	5.15	14.28	7.47	0.50	0.96	0.99
14	2.80	1954.8	6.56	6.40	7.83	0.52	0.96	0.99
2	2.84	1851.8	4.25	15.65	7.43	0.50	0.96	0.99
14	2.84	1896.1	5.59	7.89	7.74	0.52	0.96	0.99
2	2.88	1769.7	4.10	15.85	7.42	0.50	0.97	0.99
14	2.88	1819.9	5.19	8.63	7.71	0.54	0.96	0.99
2	2.92	1688.8	4.13	15.77	7.43	0.50	0.96	0.99
14	2.92	1745.4	4.88	9.13	7.68	0.53	0.96	0.99
2	2.96	1611.4	4.18	15.68	7.43	0.50	0.96	0.99
14	2.96	1672.1	4.70	9.34	7.67	0.52	0.97	0.99
2	3.00	1537.7	4.22	15.59	7.43	0.50	0.96	0.99
14	3.00	1601.9	4.62	9.49	7.66	0.52	0.97	0.99
2	3.04	1467.3	4.26	15.50	7.43	0.50	0.96	0.99
14	3.04	1534.4	4.61	9.42	7.66	0.52	0.97	0.99
2	3.08	1400.3	4.31	15.41	7.44	0.50	0.96	0.99
14	3.08	1470.2	4.65	9.39	7.67	0.53	0.97	0.99
2	3.12	1336.7	4.35	15.33	7.44	0.50	0.96	0.99
14	3.12	1409.3	4.70	9.30	7.67	0.53	0.97	0.99
2	3.16	1276.3	4.39	15.24	7.44	0.50	0.96	0.99
14	3.16	1351.7	4.76	9.19	7.68	0.54	0.97	0.99
2	3.20	1220.2	4.47	15.11	7.45	0.51	0.96	0.99
14	3.20	1298.6	4.86	9.03	7.69	0.54	0.97	0.99
2	3.24	1184.8	5.02	14.25	7.48	0.51	0.96	0.99
14	3.24	1264.4	5.33	8.29	7.73	0.55	0.96	0.99
2	3.28	1196.3	5.91	12.90	7.52	0.51	0.96	0.99
14	3.28	1272.7	6.14	7.07	7.81	0.56	0.96	0.99
2	3.32	1250.1	6.45	12.09	7.55	0.52	0.96	0.99
14	3.32	1320.6	6.82	6.05	7.87	0.55	0.96	0.99
2	3.36	1322.1	6.66	11.80	7.56	0.51	0.95	0.99
14	3.36	1387.1	7.27	5.38	7.92	0.54	0.96	0.99
2	3.40	1396.8	6.64	11.85	7.56	0.51	0.95	0.99
14	3.40	1458.9	7.55	4.91	7.94	0.52	0.95	0.99
2	3.44	1466.1	6.56	11.99	7.54	0.50	0.95	0.99
14	3.44	1530.6	7.68	4.62	7.96	0.49	0.95	0.99
2	3.48	1529.3	6.47	12.14	7.54	0.50	0.96	0.99
14	3.48	1600.5	7.71	4.53	7.95	0.48	0.95	0.99
2	3.52	1589.1	6.46	12.17	7.53	0.49	0.96	0.99
14	3.52	1670.2	7.73	4.48	7.95	0.47	0.95	0.99
2	3.56	1650.6	6.54	12.08	7.54	0.49	0.95	0.99
14	3.56	1743.6	7.79	4.37	7.96	0.47	0.95	0.99
2	3.60	1720.0	6.72	11.82	7.55	0.49	0.95	0.99
14	3.60	1825.2	7.93	4.19	7.99	0.48	0.95	0.99

2	3.64	1802.6	6.98	11.46	7.56	0.50	0.95	0.99
14	3.64	1906.9	7.95	4.25	8.01	0.53	0.95	0.99
2	3.68	1898.4	7.22	11.12	7.58	0.50	0.95	0.99
14	3.68	1994.6	8.27	3.89	8.04	0.51	0.95	0.99
2	3.72	2001.3	7.23	11.14	7.57	0.49	0.95	0.99
14	3.72	2095.6	8.37	3.71	8.06	0.51	0.94	0.99
2	3.76	2082.6	6.59	12.13	7.54	0.50	0.95	0.99
14	3.76	2168.3	7.83	4.57	7.98	0.52	0.95	0.99
2	3.80	2090.6	5.13	14.37	7.47	0.50	0.96	0.99
14	3.80	2171.8	6.62	6.47	7.83	0.53	0.96	0.99
2	3.84	2024.4	4.14	15.86	7.42	0.50	0.97	0.99
14	3.84	2109.9	5.66	8.03	7.75	0.55	0.96	0.99
2	3.88	1935.8	4.02	16.03	7.42	0.50	0.97	0.99
14	3.88	2028.5	5.14	8.86	7.70	0.54	0.96	0.99
2	3.92	1847.5	4.05	15.95	7.42	0.50	0.97	0.99
14	3.92	1947.2	4.85	9.30	7.68	0.54	0.96	0.99
2	3.96	1763.3	4.10	15.85	7.43	0.50	0.97	0.99
14	3.96	1870.7	4.68	9.55	7.67	0.55	0.97	0.99
2	4.00	1683.2	4.15	15.75	7.43	0.50	0.96	0.99
14	4.00	1798.7	4.63	9.61	7.66	0.53	0.97	0.99

Mass Balance for Constituent 1

Initial Mass is 0.1459E+00 KG

Time	***** Accumulated Mass In (KG) ***** Advection	Dispersion	Kinetic	********** Accumulated Mass Out (KG) ********** Resident Loading Mass (KG)	Excess Advection Buried	Dispersion
0.000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.040	0.0000E+00	0.0000E+00	0.1459E+00	-0.2913E-08	0.3812E+00	0.0000E+00
0.082	0.2153E-01	0.0000E+00	0.5675E+00	-0.1237E+00	0.0000E+00	0.6186E-01
0.122	0.5167E-01	0.0000E+00	0.9942E+00	-0.2370E+00	0.7815E+00	0.0000E+00
0.162	0.8746E-01	0.0000E+00	0.1386E+01	-0.3291E+00	0.1163E+01	0.0000E+00
0.200	0.1325E+00	0.0000E+00	0.1761E+01	-0.4074E+00	0.1544E+01	0.0000E+00
0.240	0.1931E+00	0.0000E+00	0.2092E+01	-0.4665E+00	0.1906E+01	0.0000E+00
0.280	0.2936E+00	0.0000E+00	0.2383E+01	-0.4857E+00	0.2287E+01	0.0000E+00
0.320	0.4480E+00	0.0000E+00	0.2573E+01	-0.4138E+00	0.2669E+01	0.0000E+00
0.360	0.6602E+00	0.0000E+00	0.2665E+01	-0.2591E+00	0.3050E+01	0.0000E+00
0.400	0.9212E+00	0.0000E+00	0.2688E+01	-0.6439E-01	0.3431E+01	0.0000E+00
0.440	0.1215E+01	0.0000E+00	0.2671E+01	0.4417E-07	0.3812E+01	0.0000E+00
0.480	0.1524E+01	0.0000E+00	0.2634E+01	-0.5398E-06	0.4193E+01	-0.7236E-01
0.520	0.1835E+01	0.0000E+00	0.2592E+01	-0.2233E-06	0.4575E+01	0.0000E+00
0.562	0.2138E+01	0.0000E+00	0.2557E+01	0.9598E-07	0.4956E+01	-0.1813E+00
0.602	0.2445E+01	0.0000E+00	0.2529E+01	-0.2816E-06	0.5356E+01	0.0000E+00
0.642	0.2728E+01	0.0000E+00	0.2500E+01	-0.1618E-06	0.5737E+01	-0.2938E+00
0.682	0.3001E+01	0.0000E+00	0.2468E+01	-0.5798E-07	0.6119E+01	0.0000E+00
0.722	0.3267E+01	0.0000E+00	0.2434E+01	0.2256E-06	0.6500E+01	-0.4067E+00
0.762	0.3527E+01	0.0000E+00	0.2405E+01	-0.3279E-08	0.6881E+01	0.0000E+00
0.802	0.3785E+01	0.0000E+00	0.2407E+01	-0.2202E-06	0.7262E+01	-0.5278E+00
0.842	0.4046E+01	0.0000E+00	0.2487E+01	-0.2916E-06	0.7643E+01	0.0000E+00
0.882	0.4319E+01	0.0000E+00	0.2634E+01	-0.9539E-07	0.8025E+01	-0.6551E+00
0.922	0.4612E+01	0.0000E+00	0.2783E+01	0.1017E-06	0.8406E+01	0.0000E+00
0.962	0.4925E+01	0.0000E+00	0.2909E+01	-0.6171E-06	0.8787E+01	-0.7957E+00
1.002	0.5259E+01	0.0000E+00	0.3009E+01	-0.2094E-06	0.9168E+01	0.0000E+00
1.042	0.5614E+01	0.0000E+00	0.3083E+01	0.6092E-07	0.9550E+01	-0.9979E+00
	0.5989E+01	0.0000E+00	0.0000E+00		0.9931E+01	0.0000E+00

0.0000E+00	0.0000E+00	-0.9535E+00	0.3134E+01	-0.5687E-06
1.082	0.1031E+02	0.0000E+00	0.0000E+00	0.6382E+01
0.0000E+00	0.0000E+00	-0.9130E+00	0.3163E+01	-0.1767E-06
1.122	0.1069E+02	0.0000E+00	0.0000E+00	0.6787E+01
0.0000E+00	0.0000E+00	-0.8761E+00	0.3176E+01	-0.2385E-06
1.162	0.1107E+02	0.0000E+00	0.0000E+00	0.7201E+01
0.0000E+00	0.0000E+00	-0.8423E+00	0.3178E+01	-0.4056E-06
1.202	0.1146E+02	0.0000E+00	0.0000E+00	0.7618E+01
0.0000E+00	0.0000E+00	-0.8129E+00	0.3170E+01	0.1284E-07
1.242	0.1184E+02	0.0000E+00	0.0000E+00	0.8036E+01
0.0000E+00	0.0000E+00	-0.8084E+00	0.3138E+01	-0.6982E-07
1.282	0.1222E+02	0.0000E+00	0.0000E+00	0.8449E+01
0.0000E+00	0.0000E+00	-0.8584E+00	0.3057E+01	0.1672E-06
1.322	0.1260E+02	0.0000E+00	0.0000E+00	0.8849E+01
0.0000E+00	0.0000E+00	-0.9557E+00	0.2941E+01	-0.7198E-07
1.362	0.1298E+02	0.0000E+00	0.0000E+00	0.9231E+01
0.0000E+00	0.0000E+00	-0.1074E+01	0.2821E+01	-0.2884E-06
1.402	0.1336E+02	0.0000E+00	0.0000E+00	0.9594E+01
0.0000E+00	0.0000E+00	-0.1198E+01	0.2715E+01	-0.4465E-06
1.442	0.1374E+02	0.0000E+00	0.0000E+00	0.9937E+01
0.0000E+00	0.0000E+00	-0.1321E+01	0.2631E+01	-0.2493E-06
1.482	0.1412E+02	0.0000E+00	0.0000E+00	0.1026E+02
0.0000E+00	0.0000E+00	-0.1440E+01	0.2569E+01	0.5247E-07
1.522	0.1451E+02	0.0000E+00	0.0000E+00	0.1057E+02
0.0000E+00	0.0000E+00	-0.1559E+01	0.2526E+01	0.1086E-07
1.562	0.1489E+02	0.0000E+00	0.0000E+00	0.1086E+02
0.0000E+00	0.0000E+00	-0.1682E+01	0.2495E+01	0.2869E-06
1.602	0.1527E+02	0.0000E+00	0.0000E+00	0.1113E+02
0.0000E+00	0.0000E+00	-0.1816E+01	0.2466E+01	0.4853E-07
1.642	0.1565E+02	0.0000E+00	0.0000E+00	0.1140E+02
0.0000E+00	0.0000E+00	-0.1953E+01	0.2442E+01	-0.4846E-07
1.682	0.1603E+02	0.0000E+00	0.0000E+00	0.1166E+02
0.0000E+00	0.0000E+00	-0.2102E+01	0.2412E+01	0.2453E-06
1.722	0.1641E+02	0.0000E+00	0.0000E+00	0.1192E+02
0.0000E+00	0.0000E+00	-0.2264E+01	0.2374E+01	0.2969E-06
1.762	0.1679E+02	0.0000E+00	0.0000E+00	0.1217E+02
0.0000E+00	0.0000E+00	-0.2392E+01	0.2374E+01	0.2854E-06
1.802	0.1717E+02	0.0000E+00	0.0000E+00	0.1243E+02
0.0000E+00	0.0000E+00	-0.2429E+01	0.2462E+01	0.2628E-06
1.842	0.1756E+02	0.0000E+00	0.0000E+00	0.1270E+02
0.0000E+00	0.0000E+00	-0.2379E+01	0.2624E+01	-0.1289E-06
1.882	0.1794E+02	0.0000E+00	0.0000E+00	0.1299E+02
0.0000E+00	0.0000E+00	-0.2306E+01	0.2789E+01	0.2127E-06
1.922	0.1832E+02	0.0000E+00	0.0000E+00	0.1330E+02
0.0000E+00	0.0000E+00	-0.2234E+01	0.2929E+01	-0.6003E-07
1.962	0.1870E+02	0.0000E+00	0.0000E+00	0.1364E+02
0.0000E+00	0.0000E+00	-0.2169E+01	0.3040E+01	-0.2314E-06
2.002	0.1908E+02	0.0000E+00	0.0000E+00	0.1399E+02
0.0000E+00	0.0000E+00	-0.2109E+01	0.3122E+01	0.1425E-06
2.042	0.1946E+02	0.0000E+00	0.0000E+00	0.1438E+02
0.0000E+00	0.0000E+00	-0.2052E+01	0.3179E+01	-0.4854E-06
2.082	0.1984E+02	0.0000E+00	0.0000E+00	0.1478E+02
0.0000E+00	0.0000E+00	-0.2000E+01	0.3212E+01	-0.5326E-07
2.122	0.2022E+02	0.0000E+00	0.0000E+00	0.1519E+02
0.0000E+00	0.0000E+00	-0.1951E+01	0.3227E+01	0.2526E-06
2.162	0.2060E+02	0.0000E+00	0.0000E+00	0.1562E+02
0.0000E+00	0.0000E+00	-0.1907E+01	0.3228E+01	0.1809E-06
2.202	0.2099E+02	0.0000E+00	0.0000E+00	0.1604E+02
0.0000E+00	0.0000E+00	-0.1868E+01	0.3219E+01	0.6999E-07
2.242	0.2137E+02	0.0000E+00	0.0000E+00	0.1647E+02
0.0000E+00	0.0000E+00	-0.1857E+01	0.3182E+01	0.3187E-06
2.282	0.2175E+02	0.0000E+00	0.0000E+00	0.1690E+02
0.0000E+00	0.0000E+00	-0.1908E+01	0.3089E+01	0.7094E-06
2.322	0.2213E+02	0.0000E+00	0.0000E+00	0.1731E+02
0.0000E+00	0.0000E+00	-0.2011E+01	0.2959E+01	0.5086E-06

2.362	0.2251E+02	0.0000E+00	0.0000E+00	0.1769E+02
0.0000E+00	0.0000E+00	-0.2137E+01	0.2826E+01	0.5071E-06
2.400	0.2287E+02	0.0000E+00	0.0000E+00	0.1804E+02
0.0000E+00	0.0000E+00	-0.2261E+01	0.2714E+01	0.3096E-06
2.440	0.2325E+02	0.0000E+00	0.0000E+00	0.1839E+02
0.0000E+00	0.0000E+00	-0.2395E+01	0.2615E+01	0.7360E-06
2.480	0.2364E+02	0.0000E+00	0.0000E+00	0.1871E+02
0.0000E+00	0.0000E+00	-0.2530E+01	0.2538E+01	0.5335E-06
2.520	0.2402E+02	0.0000E+00	0.0000E+00	0.1901E+02
0.0000E+00	0.0000E+00	-0.2663E+01	0.2486E+01	0.4781E-06
2.560	0.2440E+02	0.0000E+00	0.0000E+00	0.1929E+02
0.0000E+00	0.0000E+00	-0.2798E+01	0.2451E+01	0.2480E-06
2.600	0.2478E+02	0.0000E+00	0.0000E+00	0.1956E+02
0.0000E+00	0.0000E+00	-0.2945E+01	0.2418E+01	0.1992E-06
2.640	0.2516E+02	0.0000E+00	0.0000E+00	0.1982E+02
0.0000E+00	0.0000E+00	-0.3109E+01	0.2380E+01	0.4072E-06
2.680	0.2554E+02	0.0000E+00	0.0000E+00	0.2006E+02
0.0000E+00	0.0000E+00	-0.3283E+01	0.2342E+01	0.3396E-06
2.720	0.2592E+02	0.0000E+00	0.0000E+00	0.2030E+02
0.0000E+00	0.0000E+00	-0.3458E+01	0.2308E+01	0.5602E-06
2.760	0.2630E+02	0.0000E+00	0.0000E+00	0.2054E+02
0.0000E+00	0.0000E+00	-0.3598E+01	0.2312E+01	0.2214E-06
2.800	0.2669E+02	0.0000E+00	0.0000E+00	0.2078E+02
0.0000E+00	0.0000E+00	-0.3639E+01	0.2411E+01	0.2981E-06
2.840	0.2707E+02	0.0000E+00	0.0000E+00	0.2104E+02
0.0000E+00	0.0000E+00	-0.3579E+01	0.2596E+01	0.2700E-06
2.880	0.2745E+02	0.0000E+00	0.0000E+00	0.2132E+02
0.0000E+00	0.0000E+00	-0.3488E+01	0.2786E+01	0.3911E-06
2.920	0.2783E+02	0.0000E+00	0.0000E+00	0.2163E+02
0.0000E+00	0.0000E+00	-0.3400E+01	0.2945E+01	0.6852E-06
2.960	0.2821E+02	0.0000E+00	0.0000E+00	0.2197E+02
0.0000E+00	0.0000E+00	-0.3318E+01	0.3072E+01	-0.3260E-07
3.000	0.2859E+02	0.0000E+00	0.0000E+00	0.2233E+02
0.0000E+00	0.0000E+00	-0.3242E+01	0.3166E+01	0.7148E-06
3.040	0.2897E+02	0.0000E+00	0.0000E+00	0.2272E+02
0.0000E+00	0.0000E+00	-0.3172E+01	0.3228E+01	0.4922E-06
3.080	0.2935E+02	0.0000E+00	0.0000E+00	0.2313E+02
0.0000E+00	0.0000E+00	-0.3107E+01	0.3265E+01	0.5546E-07
3.120	0.2974E+02	0.0000E+00	0.0000E+00	0.2355E+02
0.0000E+00	0.0000E+00	-0.3047E+01	0.3280E+01	0.6525E-07
3.160	0.3012E+02	0.0000E+00	0.0000E+00	0.2399E+02
0.0000E+00	0.0000E+00	-0.2991E+01	0.3281E+01	-0.1293E-06
3.200	0.3050E+02	0.0000E+00	0.0000E+00	0.2443E+02
0.0000E+00	0.0000E+00	-0.2942E+01	0.3271E+01	-0.2449E-06
3.240	0.3088E+02	0.0000E+00	0.0000E+00	0.2487E+02
0.0000E+00	0.0000E+00	-0.2922E+01	0.3230E+01	-0.1187E-06
3.280	0.3126E+02	0.0000E+00	0.0000E+00	0.2531E+02
0.0000E+00	0.0000E+00	-0.2973E+01	0.3126E+01	-0.2244E-06
3.320	0.3164E+02	0.0000E+00	0.0000E+00	0.2572E+02
0.0000E+00	0.0000E+00	-0.3087E+01	0.2977E+01	-0.6742E-07
3.360	0.3202E+02	0.0000E+00	0.0000E+00	0.2612E+02
0.0000E+00	0.0000E+00	-0.3228E+01	0.2824E+01	-0.1882E-06
3.400	0.3240E+02	0.0000E+00	0.0000E+00	0.2649E+02
0.0000E+00	0.0000E+00	-0.3374E+01	0.2690E+01	0.2837E-06
3.440	0.3278E+02	0.0000E+00	0.0000E+00	0.2683E+02
0.0000E+00	0.0000E+00	-0.3517E+01	0.2586E+01	0.1310E-06
3.480	0.3317E+02	0.0000E+00	0.0000E+00	0.2715E+02
0.0000E+00	0.0000E+00	-0.3654E+01	0.2512E+01	0.4782E-07
3.520	0.3355E+02	0.0000E+00	0.0000E+00	0.2744E+02
0.0000E+00	0.0000E+00	-0.3789E+01	0.2463E+01	0.2911E-06
3.560	0.3393E+02	0.0000E+00	0.0000E+00	0.2772E+02
0.0000E+00	0.0000E+00	-0.3927E+01	0.2429E+01	-0.6869E-07
3.600	0.3431E+02	0.0000E+00	0.0000E+00	0.2798E+02
0.0000E+00	0.0000E+00	-0.4076E+01	0.2398E+01	0.4186E-06
3.640	0.3469E+02	0.0000E+00	0.0000E+00	0.2823E+02

0.0000E+00	0.0000E+00	-0.4231E+01	0.2371E+01	0.3978E-06
3.680	0.3507E+02	0.0000E+00	0.0000E+00	0.2848E+02
0.0000E+00	0.0000E+00	-0.4398E+01	0.2339E+01	0.5026E-06
3.720	0.3545E+02	0.0000E+00	0.0000E+00	0.2872E+02
0.0000E+00	0.0000E+00	-0.4579E+01	0.2298E+01	0.4740E-06
3.760	0.3583E+02	0.0000E+00	0.0000E+00	0.2896E+02
0.0000E+00	0.0000E+00	-0.4723E+01	0.2299E+01	0.6991E-06
3.800	0.3622E+02	0.0000E+00	0.0000E+00	0.2920E+02
0.0000E+00	0.0000E+00	-0.4760E+01	0.2402E+01	0.7856E-06
3.840	0.3660E+02	0.0000E+00	0.0000E+00	0.2946E+02
0.0000E+00	0.0000E+00	-0.4691E+01	0.2595E+01	0.7072E-06
3.880	0.3698E+02	0.0000E+00	0.0000E+00	0.2974E+02
0.0000E+00	0.0000E+00	-0.4590E+01	0.2795E+01	0.1138E-05
3.920	0.3736E+02	0.0000E+00	0.0000E+00	0.3005E+02
0.0000E+00	0.0000E+00	-0.4492E+01	0.2965E+01	0.7290E-06
3.960	0.3774E+02	0.0000E+00	0.0000E+00	0.3039E+02
0.0000E+00	0.0000E+00	-0.4401E+01	0.3099E+01	0.8846E-06
4.000	0.3812E+02	0.0000E+00	0.0000E+00	0.3075E+02
0.0000E+00	0.0000E+00	-0.4317E+01	0.3197E+01	0.5760E-06
4.001	0.3812E+02	0.0000E+00	0.0000E+00	0.3075E+02
0.0000E+00	0.0000E+00	-0.4317E+01	0.3197E+01	0.5760E-06

APPENDIX - A: Santa Fe River Model for DO and pH (continue ...)

A-7. Santa Fe River Water Quality Model Projection Run for the City of Santa Fe Wastewater Treatment Facility, prepared by U.S. EPA Region 6, TMDL Team, Model Input/Output files (45 pages).

```
Santa Fe River Water Quality Model (June 1999 and July 2000 data)
WASP5pH  V5.1
 NSEG NSYS ICRD MFLG IDMP NSLN INTY ADFC   DD HHMM                A: MODEL
OPTIONS
   24    9    0    0    1    0    0    0    1 0000
   11   12   13   14   15   16
    1
    0.0020        4.0
    1
    0.040       120.0
    0    0    0    0    0    0    0    0    0
    1    0    +    *    +    *    +    *    +    *    +    *
B:EXCHANGES
    1     1.e-4      1.00                    (surface water)
   12
     2210.       0.10    1    2
     2210.       0.10    3    4
     2298.       0.10    5    6
     2386.       0.10    7    8
     2474.       0.10    9   10
     2562.       0.10   11   12
     2610.       0.10   13   14
     2650.       0.11   15   16
     2650.       0.11   17   18
     2650.       0.11   19   20
     2650.       0.11   21   22
     2650.       0.11   23   24
    2
      0.02        0.0       0.02      365.0
    0    0    0    1    0    0    0    0    0
    1    0              *    +    *    +    *    +    *    +    C:
VOLUMES
       1.0   0.02832    million cubic feet to cubic meters
         1          2          1    15920.     0.168       0.0    0.2350
0.0
         2         73          2      433.     0.168       0.0      0.01
0.0
         3          4          1    18324.     0.163       0.0    0.2350
0.0
         4         73          2      433.     0.163       0.0      0.01
0.0
         5          6          1    20732.     0.158       0.0    0.2350
0.0
         6         73          2      433.     0.158       0.0      0.01
0.0
         7          8          1    21938.     0.153       0.0    0.2350
0.0
         8         73          2      433.     0.153       0.0      0.01
0.0
         9         10          1    21938.     0.148       0.0    0.2350
0.0
        10         73          2      433.     0.148       0.0      0.01
0.0
        11         12          1    21938.     0.143       0.0    0.2350
0.0
        12         73          2      433.     0.143       0.0      0.01
0.0
        13         14          1    21938.     0.128       0.0    0.2350
0.0
        14         73          2      433.     0.128       0.0      0.01
0.0
        15         16          1    21938.     0.128       0.0    0.2350
0.0
        16         73          2      433.     0.128       0.0      0.01
0.0
```

EFFL. INP

```
        17         18         1    21938.     0.128       0.0    0.2350
0.0
        18         73         2      433.     0.128       0.0      0.01
0.0
        19         20         1    21938.     0.128       0.0    0.2350
0.0
        20         73         2      433.     0.128       0.0      0.01
0.0
        21         22         1    21938.     0.128       0.0    0.2350
0.0
        22         73         2      433.     0.128       0.0      0.01
0.0
        23         24         1    21938.     0.128       0.0    0.2350
0.0
        24         73         2      433.     0.128       0.0      0.01
0.0
    1    5    *    +    *    +    *    *    *    +    *    +    D: FLOWS
    2       1.0   0.02832    cubic feet/second to cubic meters/second
   13                    Headwater above Santa Fe Plant
       1.0    0    1       1.0    1    3       1.0    3    5       1.0
5    7
       1.0    7    9       1.0    9   11       1.0   11   13       1.0
13   15
       1.0   15   17       1.0   17   19       1.0   19   21       1.0
21   23
       1.0   23    0
    2
     13.15        0.     13.15      365.
   13                    Headwater above Santa Fe Plant
       1.0    0    2       1.0    2    4       1.0    4    6       1.0
6    8
       1.0    8   10       1.0   10   12       1.0   12   14       1.0
14   16
       1.0   16   18       1.0   18   20       1.0   20   22       1.0
22   24
       1.0   24    0
    2
      0.00        0.      0.00      365.
    0                                     Field 2: pore water
    1       1.0       1.0                 Field 3: (Solids 1: organic
matter)
   24
     2210.    1    2     2210.    2   73     2210.    3    4     2210.
4   73
     2298.    5    6     2298.    6   73     2386.    7    8     2386.
8   73
     2472.    9   10     2474.   10   73     2562.   11   12     2562.
12   73
     2610.   13   14     2650.   14   73     2650.   15   16     2650.
16   73
     2650.   17   18     2650.   18   73     2650.   19   20     2650.
20   73
     2650.   21   22     2650.   22   73     2650.   23   24     2650.
24   73
    2
   3.0E-06        0.   3.0E-06      365.
    1       0.1     .0929 sq ft to sq m    Field 4: (Solids 2:
Phytoplankton)
   24
     2210.    1    2     2210.    2   73     2210.    3    4     2210.
4   73
     2298.    5    6     2298.    6   73     2386.    7    8     2386.
8   73
     2472.    9   10     2474.   10   73     2562.   11   12     2562.
12   73
```

```
     2610.   13   14     2650.   14   73     2650.   15   16     2650.
16   73
     2650.   17   18     2650.   18   73     2650.   19   20     2650.
20   73
     2650.   21   22     2650.   22   73     2650.   23   24     2650.
24   73
    2
   0.0e-05        0.   0.0e-05      365.
    1       1.0     .0929 sq ft to sq m    Field 5: (Solids 3: Inorganic
matter)
   24
     2210.    1    2     2210.    2   73     2210.    3    4     2210.
4   73
     2298.    5    6     2298.    6   73     2386.    7    8     2386.
8   73
     2472.    9   10     2474.   10   73     2562.   11   12     2562.
12   73
     2610.   13   14     2650.   14   73     2650.   15   16     2650.
16   73
     2650.   17   18     2650.   18   73     2650.   19   20     2650.
20   73
     2650.   21   22     2650.   22   73     2650.   23   24     2650.
24   73
    2
   1.0E-06        0.   1.0E-06      365.
    0    0    0    1    0    0    0    0    0
         4    *    +    *    +    *    +    System 1 - Ammonia  E:
BOUNDARIES
       1.0       1.0                         mg/L (total)
    1    2                                   Santa Fe WWTP Input
     2.000        0.     2.000      365.
    2    2
     0.000        0.     0.000      365.
   23    2
     0.001        0.     0.001      365.
   24    2
     0.001        0.     0.001      365.
         4    *    +    *    +    *    +    System 2 - Nitrite/Nitrate
       1.0       1.0                         mg/L (total)
    1    2                                   Santa Fe WWTP Input
       3.00        0.       3.00     365.
    2    2
       0.0         0.       0.0      365.
   23    2
     0.150        0.     0.150      365.
   24    2
     0.150        0.     0.150      365.
         4    *    +    *    +    *    +    System 3 - Orthophosphate
       1.0       1.0                         mg/L (dissolved)
    1    2                                   Santa Fe WWTP Input
      0.40        0.      0.40      365.
    2    2
     0.000        0.     0.000      365.
   23    2
     0.010        0.     0.010      365.
   24    2
     0.010        0.     0.010      365.
         4    *    +    *    +    *    +    System 4 - Periphyton
       1.0       1.0                         ug/L  (viable chlorophyll-a)
    1    2                                   Santa Fe WWTP Input
       0.0         0.       0.0      365.
    2    2
       0.0         0.       0.0      365.
   23    2
      2.00         0.      2.00      365.
```

```
  24    2
     2.00          0.       2.00       365.
        4    *    +    *    +    *    +    System 5 - CBOD
      1.0        1.0                       mg/L (ultimate less algal
component)
   1    2                                   Santa Fe WWTP Input
     14.0          0.      14.0       365.
   2    2
     0.00          0.      0.00       365.
  23    2
     1.00          0.      1.00       365.
  24    2
     1.00          0.      1.00       365.
        4    *    +    *    +    *    +    System 6 - Dissolved Oxygen
      1.0        1.0                       mg/L
   1    2                                   Santa Fe WWTP Input
      5.0        0.0       5.0       365.
   2    2
     0.00          0.      0.00       365.
  23    2
     8.00          0.      8.00       365.
  24    2
     8.00          0.      8.00       365.
        4    *    +    *    +    *    +    System 7 - Nonliving Organic
N
      1.0        1.0                       mg/L (TKN - NH3 - algal N)
   1    2                                   Santa Fe WWTP Input
     1.00          0.      1.00       365.
   2    2
     0.00          0.      0.00       365.
  23    2
     0.40          0.      0.40       365.
  24    2
     0.40          0.      0.40       365.
        4    *    +    *    +    *    +    System 8 - Nonliving Organic
P
      1.0        1.0                       mg/L (TP - PO4 - algal P)
   1    2                                   Santa Fe WWTP Input
     0.10          0.      0.10       365.
   2    2
     0.00          0.      0.00       365.
  23    2
     0.04          0.      0.04       365.
  24    2
     0.04          0.      0.04       365.
        4    *    +    *    +    *    +    System 9 - CO2 Acidity
      1.0        1.0                       mg/L as CaCO3
   1    2                                   Santa Fe WWTP Input
     15.0          0.      15.0       365.
   2    2
      0.0          0.       0.0       365.
  23    2
     10.0          0.      10.0       365.
  24    2
     10.0          0.      10.0       365.
        0    *    +    *    +    *    +    System 1 - Ammonia F: PS
loads
        0    *    +    *    +    *    +    System 2 - Nitrite + Nitrate
        0    *    +    *    +    *    +    System 3 - Dissolved
Orthophosphate
        0    *    +    *    +    *    +    System 4 - Viable
chlorophylla-a
        0    *    +    *    +    *    +    System 5 - Ultimate CBOD (-
algae)
        0    *    +    *    +    *    +    System 6 - Dissolved Oxygen
```

```
          0    *    +    *    +    *    +    System 7 - Nonliving Organic
N
          0    *    +    *    +    *    +    System 8 - Nonliving Organic
P
          0    *    +    *    +    *    +    System 9 - CO2 Acidity
          0                                   No NPS Loads
          8    *    +    *    +    *    +    *    +    *    +    G:
PARAMETERS
TMPSG     3         1.0 KESG     5         1.0 SOD1D     9         1.0SODTA    12
1.0
FNH4      7         0.0 FPO4     8         0.0 ITOTL    13         1.0TMPFN     4
1.0
          1
TMPSG     3         1.0 KESG     5         0.15SOD1D     9         0.0SODTA    12
1.0
FNH4      7         0.0 FPO4     8         0.0 ITOTL    13         1.0TMPFN     4
1.0
          2
TMPSG     3         1.0 KESG     5         0.15SOD1D     9         0.0SODTA    12
1.0
FNH4      7         0.0 FPO4     8         0.0 ITOTL    13         1.0TMPFN     4
1.0
          3
TMPSG     3         1.0 KESG     5         0.15SOD1D     9         0.0SODTA    12
1.0
FNH4      7         0.0 FPO4     8         0.0 ITOTL    13         1.0TMPFN     4
1.0
          4
TMPSG     3         1.0 KESG     5         0.15SOD1D     9         0.0SODTA    12
1.0
FNH4      7         0.0 FPO4     8         0.0 ITOTL    13         1.0TMPFN     4
1.0
          5
TMPSG     3         1.0 KESG     5         0.15SOD1D     9         0.0SODTA    12
1.0
FNH4      7         0.0 FPO4     8         0.0 ITOTL    13         1.0TMPFN     4
1.0
          6
TMPSG     3         1.0 KESG     5         0.15SOD1D     9         0.0SODTA    12
1.0
FNH4      7         0.0 FPO4     8         0.0 ITOTL    13         1.0TMPFN     4
1.0
          7
TMPSG     3         1.0 KESG     5         0.20SOD1D     9         0.0SODTA    12
1.0
FNH4      7         0.0 FPO4     8         0.0 ITOTL    13         1.0TMPFN     4
1.0
          8
TMPSG     3         1.0 KESG     5         0.20SOD1D     9         0.0SODTA    12
1.0
FNH4      7         0.0 FPO4     8         0.0 ITOTL    13         1.0TMPFN     4
1.0
          9
TMPSG     3         1.0 KESG     5         0.20SOD1D     9         0.0SODTA    12
1.0
FNH4      7         0.0 FPO4     8         0.0 ITOTL    13         1.0TMPFN     4
1.0
         10
TMPSG     3         1.0 KESG     5         0.20SOD1D     9         0.0SODTA    12
1.0
FNH4      7         0.0 FPO4     8         0.0 ITOTL    13         1.0TMPFN     4
1.0
         11
TMPSG     3         1.0 KESG     5         0.20SOD1D     9         0.0SODTA    12
1.0
```

```
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
1.0
          12
TMPSG     3        1.0 KESG     5        0.20SOD1D     9        0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
1.0
          13
TMPSG     3        1.0 KESG     5        0.25SOD1D     9        0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          14
TMPSG     3        1.0 KESG     5        0.25SOD1D     9        0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          15
TMPSG     3        1.0 KESG     5        0.25SOD1D     9        0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          16
TMPSG     3        1.0 KESG     5        0.25SOD1D     9        0.0SODTA    12
1.0
FNH4      7        7.1 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          17
TMPSG     3        1.0 KESG     5        0.25SOD1D     9        0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          18
TMPSG     3        1.0 KESG     5        0.25SOD1D     9        0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          19
TMPSG     3        1.0 KESG     5        0.25SOD1D     9        0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          20
TMPSG     3        1.0 KESG     5        0.25SOD1D     9        0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          21
TMPSG     3        1.0 KESG     5        0.25SOD1D     9        0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          22
TMPSG     3        1.0 KESG     5        0.25SOD1D     9        0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          23
TMPSG     3        1.0 KESG     5        0.25SOD1D     9        0.0SODTA    12
1.0
FNH4      7        0.0 FPO4     8        0.0 ITOTL    13        1.0TMPFN     4
2.0
          24
TMPSG     3        1.0 KESG     5        0.25SOD1D     9        0.0SODTA    12
1.0
```

```
FNH4      7        0.0 FPO4     8       0.0 ITOTL   13        1.0TMPFN     4
2.0
    +    *    +    *    +    *    +    *    +    *    +    *    H:
CONSTANTS
   GLOBALS          0
       NH3          1
nitrificat          2
      K12C         11       0.20       K12T        12       1.08
       NO3          1
  denitrif          2
      K20C         21       0.10       K20T        22      1.045
       PO4          0
      PHYT          4
    growth          2
       K1C         41       2.45        K1T        42      1.055
     light          3
     LGHTS         43        1.0       CCHL        46        67.
       IS1         47       525.
 nutrients          4
     KMNG1         48      0.025      KMPG1        49      0.005
      NCRB         58       0.18       PCRB        57      0.025
     death          4
      K1RC         50      0.600       K1RT        51      1.069
       K1D         52       0.30      KPZDC        55       0.00
      CBOD          1
 deoxygent          2
       KDC         71       0.07        KDT        72       1.05
        DO          1
     ratio          2
      OCRB         81       2.67         K2        82       4.50
        ON          1
mineralize          3
      K71C         91      0.500       K71T        92       1.08
       FON         95       0.15
        OP          1
mineralize          3
      K83C        100       0.75       K83T       101       1.08
       FOP        104       0.50
    CO2acy          0
         4    *    +    *    +    *    +    *    +    *    +    I: TIME
FUNCTION
TEMP1  193    1            River Water Temperature (C) below WWTP
     25.41   0.00000     25.41   0.01042     25.40   0.02083     25.37
0.03125
     25.36   0.04167     25.36   0.05208     25.32   0.06250     25.33
0.07292
     25.31   0.08333     25.29   0.09375     25.27   0.10417     25.25
0.11458
     25.21   0.12500     25.17   0.13542     25.13   0.14583     25.08
0.15625
     25.01   0.16667     24.94   0.17708     24.88   0.18750     24.83
0.19792
     24.77   0.20833     24.69   0.21875     24.61   0.22917     24.52
0.23958
     24.42   0.25000     24.32   0.26042     24.24   0.27083     24.17
0.28125
     24.11   0.29167     24.07   0.30208     24.07   0.31250     24.12
0.32292
     24.27   0.33333     24.45   0.34375     24.63   0.35417     24.82
0.36458
     24.99   0.37500     25.08   0.38542     25.18   0.39583     25.30
0.40625
     25.40   0.41667     25.55   0.42708     25.63   0.43750     25.69
0.44792
     25.74   0.45833     25.83   0.46875     25.90   0.47917     25.96
```

0.48958						
26.04	0.50000	26.09	0.51042	26.17	0.52083	26.24
0.53125						
26.25	0.54167	26.26	0.55208	26.29	0.56250	26.29
0.57292						
26.33	0.58333	26.37	0.59375	26.34	0.60417	26.44
0.61458						
26.39	0.62500	26.17	0.63542	26.09	0.64583	26.35
0.65625						
26.51	0.66667	26.46	0.67708	26.34	0.68750	26.06
0.69792						
25.94	0.70833	25.93	0.71875	25.93	0.72917	25.98
0.73958						
25.99	0.75000	25.92	0.76042	25.77	0.77083	25.68
0.78125						
25.74	0.79167	25.81	0.80208	25.60	0.81250	25.17
0.82292						
25.25	0.83333	25.46	0.84375	25.64	0.85417	25.67
0.86458						
25.61	0.87500	25.49	0.88542	25.53	0.89583	25.53
0.90625						
25.61	0.91667	25.60	0.92708	25.58	0.93750	25.58
0.94792						
25.58	0.95833	25.57	0.96875	25.56	0.97917	25.58
0.98958						
25.58	1.00000	25.58	1.01042	25.58	1.02083	25.55
1.03125						
25.54	1.04167	25.53	1.05208	25.51	1.06250	25.48
1.07292						
25.45	1.08333	25.42	1.09375	25.42	1.10417	25.38
1.11458						
25.33	1.12500	25.29	1.13542	25.25	1.14583	25.21
1.15625						
25.19	1.16667	25.21	1.17708	25.18	1.18750	25.06
1.19792						
24.92	1.20833	24.81	1.21875	24.72	1.22917	24.67
1.23958						
24.65	1.25000	24.67	1.26042	24.60	1.27083	24.45
1.28125						
24.30	1.29167	24.20	1.30208	24.16	1.31250	24.22
1.32292						
24.37	1.33333	24.52	1.34375	24.66	1.35417	24.77
1.36458						
24.89	1.37500	24.88	1.38542	24.84	1.39583	25.02
1.40625						
25.31	1.41667	25.54	1.42708	25.70	1.43750	25.82
1.44792						
25.86	1.45833	25.83	1.46875	25.88	1.47917	25.92
1.48958						
25.98	1.50000	26.05	1.51042	26.12	1.52083	26.20
1.53125						
25.95	1.54167	25.95	1.55208	26.19	1.56250	26.24
1.57292						
26.21	1.58333	26.05	1.59375	26.11	1.60417	26.20
1.61458						
26.14	1.62500	25.95	1.63541	25.76	1.64583	25.74
1.65625						
25.79	1.66666	25.86	1.67708	25.91	1.68750	25.95
1.69791						
25.96	1.70833	26.00	1.71875	26.01	1.72916	26.00
1.73958						
25.85	1.75000	25.69	1.76041	25.66	1.77083	25.66
1.78125						
25.62	1.79166	25.57	1.80208	25.57	1.81250	25.57
1.82291						

```
     25.59    1.83333      25.45    1.84375      25.14    1.85416      25.34
1.86458
     25.36    1.87500      25.44    1.88541      25.51    1.89583      25.50
1.90625
     25.49    1.91666      25.51    1.92708      25.50    1.93750      25.48
1.94791
     25.45    1.95833      25.41    1.96875      25.39    1.97916      25.39
1.98958
     25.39    2.00000
TEMP2  193     2            River Temperature at Preserve
     23.44    0.00000      23.57    0.01042      23.66    0.02083      23.70
0.03125
     23.71    0.04167      23.70    0.05208      23.65    0.06250      23.62
0.07292
     23.54    0.08333      23.36    0.09375      23.34    0.10417      23.38
0.11458
     23.43    0.12500      23.44    0.13542      23.33    0.14583      23.15
0.15625
     22.82    0.16667      22.49    0.17708      22.23    0.18750      22.10
0.19792
     21.96    0.20833      21.84    0.21875      21.88    0.22917      21.79
0.23958
     21.60    0.25000      21.37    0.26042      21.17    0.27083      21.01
0.28125
     20.93    0.29167      20.78    0.30208      20.73    0.31250      20.83
0.32292
     20.99    0.33333      21.29    0.34375      21.42    0.35417      21.60
0.36458
     21.85    0.37500      22.27    0.38542      23.04    0.39583      23.93
0.40625
     24.93    0.41667      25.92    0.42708      26.78    0.43750      27.46
0.44792
     28.20    0.45833      28.84    0.46875      29.11    0.47917      29.37
0.48958
     29.44    0.50000      28.64    0.51042      28.81    0.52083      28.84
0.53125
     28.98    0.54167      28.79    0.55208      29.23    0.56250      29.46
0.57292
     29.50    0.58333      29.43    0.59375      29.15    0.60417      28.93
0.61458
     28.87    0.62500      27.75    0.63542      27.28    0.64583      26.63
0.65625
     26.41    0.66667      26.19    0.67708      25.95    0.68750      25.65
0.69792
     25.39    0.70833      25.34    0.71875      25.26    0.72917      24.92
0.73958
     24.73    0.75000      24.64    0.76042      24.49    0.77083      24.42
0.78125
     24.37    0.79167      24.42    0.80208      24.47    0.81250      24.35
0.82292
     24.14    0.83333      23.99    0.84375      23.56    0.85417      23.34
0.86458
     23.08    0.87500      23.01    0.88542      23.10    0.89583      23.33
0.90625
     23.59    0.91667      23.75    0.92708      23.82    0.93750      23.85
0.94792
     23.75    0.95833      23.77    0.96875      23.73    0.97917      23.76
0.98958
     23.81    1.00000      23.85    1.01042      23.82    1.02083      23.79
1.03125
     23.76    1.04167      23.73    1.05208      23.70    1.06250      23.63
1.07292
     23.53    1.08333      23.47    1.09375      23.46    1.10417      23.40
1.11458
     23.32    1.12500      23.23    1.13542      23.11    1.14583      23.01
```

```
1.15625
     22.91   1.16667     22.82   1.17708     22.69   1.18750     22.57
1.19792
     22.42   1.20833     22.30   1.21875     22.18   1.22917     22.06
1.23958
     21.92   1.25000     21.80   1.26042     21.68   1.27083     21.63
1.28125
     21.66   1.29167     21.79   1.30208     21.99   1.31250     22.25
1.32292
     22.35   1.33333     22.46   1.34375     22.66   1.35417     22.91
1.36458
     23.29   1.37500     23.67   1.38542     24.11   1.39583     24.55
1.40625
     25.07   1.41667     25.49   1.42708     25.89   1.43750     26.34
1.44792
     26.68   1.45833     27.04   1.46875     27.29   1.47917     27.52
1.48958
     27.66   1.50000     27.90   1.51042     28.09   1.52083     28.20
1.53125
     28.15   1.54167     28.20   1.55208     28.28   1.56250     28.18
1.57292
     28.26   1.58333     27.82   1.59375     26.92   1.60417     25.33
1.61458
     24.25   1.62500     23.61   1.63541     23.29   1.64583     23.45
1.65625
     23.80   1.66666     24.51   1.67708     25.27   1.68750     25.84
1.69791
     25.71   1.70833     25.11   1.71875     24.53   1.72916     24.04
1.73958
     23.89   1.75000     23.82   1.76041     23.95   1.77083     23.88
1.78125
     23.78   1.79166     23.65   1.80208     23.53   1.81250     23.36
1.82291
     21.91   1.83333     22.27   1.84375     22.55   1.85416     22.74
1.86458
     22.85   1.87500     22.89   1.88541     22.85   1.89583     22.75
1.90625
     22.45   1.91666     22.39   1.92708     22.37   1.93750     22.33
1.94791
     22.23   1.95833     22.08   1.96875     21.90   1.97916     21.69
1.98958
     21.47   2.00000
ITOT    26     5           Solar radiation (ly/day)
       0.0       0.0       0.0   0.03681       0.0   0.07847       0.0
0.12014
       0.0   0.16181      4.41   0.20347     78.51   0.24514    254.94
0.28681
    453.43   0.32874    626.33   0.37014    798.36   0.41181    924.50
0.45347
    984.49   0.49514    988.02   0.53681    935.97   0.57847    820.41
0.62014
    668.68   0.66181    486.95   0.70000    285.82   0.74514     94.39
0.78681
     10.59   0.82847       0.0   0.87014       0.0   0.91181       0.0
0.95347
       0.0   0.99514       0.0       1.0
F        2     6           Photoperiod (fraction of day)
      1.00       0.      1.00     365.0
Ammonia                                        3 0.00       10.    J:
INITIAL
    1      0.02       1.0    2      0.02       1.0    3      0.02
1.0
    4      0.02       1.0    5      0.02       1.0    6      0.02
1.0
    7      0.02       1.0    8      0.02       1.0    9      0.02
```

```
1.0
   10      0.02        1.0   11      0.02        1.0   12      0.02
1.0
   13      0.02        1.0   14      0.02        1.0   15      0.02
1.0
   16      0.02        1.0   17      0.02        1.0   18      0.02
1.0
   19      0.02        1.0   20      0.02        1.0   21      0.02
1.0
   22      0.02        1.0   23      0.02        1.0   24      0.02
1.0
Nitrite + Nitrate                              3 0.00       10.    J:
INITIAL
    1      0.09        1.0    2      0.09        1.0    3      0.09
1.0
    4      0.09        1.0    5      0.09        1.0    6      0.09
1.0
    7      0.09        1.0    8      0.09        1.0    9      0.09
1.0
   10      0.09        1.0   11      0.09        1.0   12      0.09
1.0
   13      0.09        1.0   14      0.09        1.0   15      0.09
1.0
   16      0.09        1.0   17      0.09        1.0   18      0.09
1.0
   19      0.09        1.0   20      0.09        1.0   21      0.09
1.0
   22      0.09        1.0   23      0.09        1.0   24      0.09
1.0
Dissolved Orthophosphate                       3 0.00        5.    J:
INITIAL
    1     1.010        1.0    2     1.010        1.0    3     1.010
1.0
    4     1.010        1.0    5     1.010        1.0    6     1.010
1.0
    7     1.010        1.0    8     1.010        1.0    9     1.010
1.0
   10     1.010        1.0   11     1.010        1.0   12     1.010
1.0
   13     1.010        1.0   14     1.010        1.0   15     1.010
1.0
   16     1.010        1.0   17     1.010        1.0   18     1.010
1.0
   19     1.010        1.0   20     1.010        1.0   21     1.010
1.0
   22     1.010        1.0   23     1.010        1.0   24     1.010
1.0
Viable Chlorophyll-a (ug/l)                    4 0.00      500.    J:
INITIAL
    1        0.        0.0    2     1000.        0.0    3        0.
0.0
    4     1000.        0.0    5        0.        0.0    6     1000.
0.0
    7        0.        0.0    8      975.        0.0    9        0.
0.0
   10      950.        0.0   11        0.        0.0   12      925.
0.0
   13        0.        0.0   14      900.        0.0   15        0.
0.0
   16      900.        0.0   17        0.        0.0   18      900.
0.0
   19        0.        0.0   20      900.        0.0   21        0.
0.0
   22      900.        0.0   23        0.        0.0   24      900.
0.0
```

```
Carbonaceous BOD (ultimate - algae)          3 0.00      100.    J:
INITIAL
    1       5.0       1.0    2       5.0       1.0    3       5.0
1.0
    4       5.0       1.0    5       5.0       1.0    6       5.0
1.0
    7       5.0       1.0    8       5.0       1.0    9       5.0
1.0
   10       5.0       1.0   11       5.0       1.0   12       5.0
1.0
   13       5.0       1.0   14       5.0       1.0   15       5.0
1.0
   16       5.0       1.0   17       5.0       1.0   18       5.0
1.0
   19       5.0       1.0   20       5.0       1.0   21       5.0
1.0
   22       5.0       1.0   23       5.0       1.0   24       5.0
1.0
Dissolved Oxygen                             3 0.00       20.    J:
INITIAL
    1      7.99       1.0    2      7.59       1.0    3      7.59
1.0
    4      7.99       1.0    5      7.59       1.0    6      7.59
1.0
    7      7.99       1.0    8      7.59       1.0    9      7.59
1.0
   10      7.99       1.0   11      7.59       1.0   12      7.59
1.0
   13      7.99       1.0   14      7.59       1.0   15      7.59
1.0
   16      7.99       1.0   17      7.59       1.0   18      7.59
1.0
   19      7.99       1.0   20      7.59       1.0   21      7.59
1.0
   22      7.99       1.0   23      7.59       1.0   24      7.59
1.0
Nonliving Organic Nitrogen                   3 0.00       10.    J:
INITIAL
    1      1.02       0.7    2      1.02       0.7    3      1.02
0.7
    4      1.02       0.7    5      1.02       0.7    6      1.02
0.7
    7      1.02       0.7    8      1.02       0.7    9      1.02
0.7
   10      1.02       0.7   11      1.02       0.7   12      1.02
0.7
   13      1.02       0.7   14      1.02       0.7   15      1.02
0.7
   16      1.02       0.7   17      1.02       0.7   18      1.02
0.7
   19      1.02       0.7   20      1.02       0.7   21      1.02
0.7
   22      1.02       0.7   23      1.02       0.7   24      1.02
0.7
Nonliving Organic Phosphorus                 3 0.00        5.    J:
INITIAL
    1      0.10       1.0    2      0.10       1.0    3      0.10
1.0
    4      0.10       1.0    5      0.10       1.0    6      0.10
1.0
    7      0.10       1.0    8      0.10       1.0    9      0.10
1.0
   10      0.10       1.0   11      0.10       1.0   12      0.10
1.0
   13      0.10       1.0   14      0.10       1.0   15      0.10
```

```
1.0
   16       0.10        1.0   17       0.10        1.0   18       0.10
1.0
   19       0.10        1.0   20       0.10        1.0   21       0.10
1.0
   22       0.10        1.0   23       0.10        1.0   24       0.10
1.0
CO2 Acidity (mg/L as CaCO3)                    3 0.00     5000.    J:
INITIAL
    1       4.0         1.0    2        4.0        1.0    3        4.0
1.0
    4       4.0         1.0    5        4.0        1.0    6        4.0
1.0
    7       4.0         1.0    8        4.0        1.0    9        4.0
1.0
   10       4.0         1.0   11        4.0        1.0   12        4.0
1.0
   13       6.0         1.0   14        6.0        1.0   15        6.0
1.0
   16       6.0         1.0   17        6.0        1.0   18        6.0
1.0
   19       6.0         1.0   20        6.0        1.0   21        6.0
1.0
   22       6.0         1.0   23        6.0        1.0   24        6.0
1.0
```

```
*********************************************************************

            WASP  - - WATER QUALITY ANALYSIS SIMULATION PROGRAM

*********************************************************************

                          Supported by
                 Center for Exposure Assessment Modeling
                              (CEAM)
                 Athens Environmental Research Laboratory
                          College Station Road
                        Athens, Georgia  30613
                   FTS 250-3491 or (404) 546-3491

                          Version 4.32 pH
                 Compiled on: Date: Tuesday, 26 Oct 1999,

                     Maximum Parameters for this Model

            Systems:    9          Segments:  100     Break Points:
193
         Parameters:   15         Constants:  104    Boundary Cond:
35
        Waste Loads:    9     Print Interval:    5    Time Function:
23


*********************************************************************


     No. Segments --->    24        No. Systems --->     9


*********************************************************************
TIME VARIABLE SOLUTION TECHNIQUE

*********************************************************************
            System Bypass Options for System  1 TO  9 are 0 0 0 0 0 0 0
0 0
```

****
1

Simulation Time Steps
Option 0 Selected
Advection Factor = 0.000

DT	T	DT	T	DT	T
0.00200	4.00000				

Print Intervals

PRINT INTERVAL	ELAPSED TIME	PRINT INTERVAL	ELAPSED TIME	PRINT INTERVAL	ELAPSED TIME
0.040	120.00				

1

Exchange Coefficients

Number of Exchange Fields = 1

FIELD 1 has 1 Time Functions

SCALR = 0.100E-03 CONVR = 0.100E+01

Time Function 1 has 12 Exchanges

A	EL	From	To
0.221E+04	0.100E+00	1	2
0.221E+04	0.100E+00	3	4
0.230E+04	0.100E+00	5	6
0.239E+04	0.100E+00	7	8
0.247E+04	0.100E+00	9	10
0.256E+04	0.100E+00	11	12
0.261E+04	0.100E+00	13	14
0.265E+04	0.110E+00	15	16

0.265E+04	0.110E+00	17	18
0.265E+04	0.110E+00	19	20
0.265E+04	0.110E+00	21	22
0.265E+04	0.110E+00	23	24

Number of Breaks in Time Function = 2

Dispersion	Time	Dispersion	Time	Dispersion	Time
0.200E-01	0.000E+00	0.200E-01	0.365E+03		

R Bypass Options for Systems 1 to 9 are 0 0 0 1 0 0 0 0 0
1

VOLUMES

Bed Volume Option = 0 Bed Time Step = 0.000E+00

Scale Factor = 0.1000E+01 Conversion Factor = 0.2832E-01

Seg #	BOTSG	Type	Volume	V mult	V exp	D mult	D exp
1	2	1	15920.000	0.168	0.000	0.235	0.000
2	73	2	433.000	0.168	0.000	0.010	0.000
3	4	1	18324.000	0.163	0.000	0.235	0.000
4	73	2	433.000	0.163	0.000	0.010	0.000
5	6	1	20732.000	0.158	0.000	0.235	0.000
6	73	2	433.000	0.158	0.000	0.010	0.000
7	8	1	21938.000	0.153	0.000	0.235	0.000
8	73	2	433.000	0.153	0.000	0.010	0.000
9	10	1	21938.000	0.148	0.000	0.235	0.000
10	73	2	433.000	0.148	0.000	0.010	0.000
11	12	1	21938.000	0.143	0.000	0.235	0.000
12	73	2	433.000	0.143	0.000	0.010	0.000
13	14	1	21938.000	0.128	0.000	0.235	0.000
14	73	2	433.000	0.128	0.000	0.010	0.000

```
    15      16      1     21938.000    0.128    0.000    0.235
0.000
    16      73      2       433.000    0.128    0.000    0.010
0.000
    17      18      1     21938.000    0.128    0.000    0.235
0.000
    18      73      2       433.000    0.128    0.000    0.010
0.000
    19      20      1     21938.000    0.128    0.000    0.235
0.000
    20      73      2       433.000    0.128    0.000    0.010
0.000
    21      22      1     21938.000    0.128    0.000    0.235
0.000
    22      73      2       433.000    0.128    0.000    0.010
0.000
    23      24      1     21938.000    0.128    0.000    0.235
0.000
    24      73      2       433.000    0.128    0.000    0.010
0.000
1
```

```
                                   FLOWS
                                   -----

                            Flow Option  1 Used
                          Number of Flow Fields =    5


                         Field  1 has   2 Inflows
                         SCALQ = 0.100E+01   CONVQ = 0.283E-01


                              Inflow Number  1
                              ----------------
     Continuity Array:

        Flow     From   To          Flow     From   To          Flow     From
To
--------------------------------------------------------------------------
--------

      0.100E+01    0    1      0.100E+01    1    3      0.100E+01    3
5
      0.100E+01    5    7      0.100E+01    7    9      0.100E+01    9
11
      0.100E+01   11   13      0.100E+01   13   15      0.100E+01   15
17
      0.100E+01   17   19      0.100E+01   19   21      0.100E+01   21
23
      0.100E+01   23    0

     Number of Breaks in Time Function =      2


        Flow      Time              Flow      Time              Flow      Time

--------------------------------------------------------------------------
------
```

0.131E+02	0.000E+00	0.131E+02	0.365E+03

Inflow Number 2

Continuity Array:

Flow	From	To	Flow	From	To	Flow	From	To
0.100E+01	0	2	0.100E+01	2	4	0.100E+01	4	6
0.100E+01	6	8	0.100E+01	8	10	0.100E+01	10	12
0.100E+01	12	14	0.100E+01	14	16	0.100E+01	16	18
0.100E+01	18	20	0.100E+01	20	22	0.100E+01	22	24
0.100E+01	24	0						

Number of Breaks in Time Function = 2

Flow	Time	Flow	Time	Flow	Time
0.000E+00	0.000E+00	0.000E+00	0.365E+03		

Field 2 has 0 Inflows
SCALQ = 0.000E+00 CONVQ = 0.000E+00

Field 3 has 1 Inflows
SCALQ = 0.100E+01 CONVQ = 0.100E+01

Inflow Number 1

Solids Transport:

Area	From	To	Area	From	To	Area	From	To
0.221E+04	1	2	0.221E+04	2	73	0.221E+04	3	4
0.221E+04	4	73	0.230E+04	5	6	0.230E+04	6	73
0.239E+04	7	8	0.239E+04	8	73	0.247E+04	9	10
0.247E+04	10	73	0.256E+04	11	12	0.256E+04	12	73
0.261E+04	13	14	0.265E+04	14	73	0.265E+04	15	16

```
      0.265E+04   16   73      0.265E+04   17   18      0.265E+04   18
73
      0.265E+04   19   20      0.265E+04   20   73      0.265E+04   21
22
      0.265E+04   22   73      0.265E+04   23   24      0.265E+04   24
73

     Number of Breaks in Time Function =     2

      Velocity    Time         Velocity    Time         Velocity    Time
------------------------------------------------------------------------
------

      0.300E-05 0.000E+00      0.300E-05 0.365E+03

                        Field  4 has   1 Inflows
                        SCALQ = 0.100E+00  CONVQ = 0.929E-01


                                Inflow Number  1
                                ----------------
     Solids Transport:

        Area    From   To        Area    From   To        Area    From
To
------------------------------------------------------------------------
--------

      0.221E+04    1    2      0.221E+04    2   73      0.221E+04    3
4
      0.221E+04    4   73      0.230E+04    5    6      0.230E+04    6
73
      0.239E+04    7    8      0.239E+04    8   73      0.247E+04    9
10
      0.247E+04   10   73      0.256E+04   11   12      0.256E+04   12
73
      0.261E+04   13   14      0.265E+04   14   73      0.265E+04   15
16
      0.265E+04   16   73      0.265E+04   17   18      0.265E+04   18
73
      0.265E+04   19   20      0.265E+04   20   73      0.265E+04   21
22
      0.265E+04   22   73      0.265E+04   23   24      0.265E+04   24
73

     Number of Breaks in Time Function =     2

      Velocity    Time         Velocity    Time         Velocity    Time
------------------------------------------------------------------------
------

      0.000E+00 0.000E+00      0.000E+00 0.365E+03

                        Field  5 has   1 Inflows
```

SCALQ = 0.100E+01 CONVQ = 0.929E-01

Inflow Number 1

Solids Transport:

Area	From	To	Area	From	To	Area	From	To
0.221E+04	1	2	0.221E+04	2	73	0.221E+04	3	4
0.221E+04	4	73	0.230E+04	5	6	0.230E+04	6	73
0.239E+04	7	8	0.239E+04	8	73	0.247E+04	9	10
0.247E+04	10	73	0.256E+04	11	12	0.256E+04	12	73
0.261E+04	13	14	0.265E+04	14	73	0.265E+04	15	16
0.265E+04	16	73	0.265E+04	17	18	0.265E+04	18	73
0.265E+04	19	20	0.265E+04	20	73	0.265E+04	21	22
0.265E+04	22	73	0.265E+04	23	24	0.265E+04	24	73

Number of Breaks in Time Function = 2

Velocity	Time	Velocity	Time	Velocity	Time
0.100E-05	0.000E+00	0.100E-05	0.365E+03		

```
QSUMX=      0.000
QSUMX=      0.000
QSUMX=      0.000
QSUMX=      0.000
QSUMX=      0.000
QSUMX=      0.000
QSUMX=      0.000
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QSUMX=      0.000
QSUMX=      0.000
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QSUMX=      0.000
QSUMX=      0.000
QSUMX=      0.000
QSUMX=      0.000
QSUMX=      0.000
QSUMX=      0.000
```

Q Bypass Options for Systems 1 to 9 are 0 0 0 1 0 0 0 0 0
1

Boundary Conditions

Boundary Concentrations for System 1

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.2000000E+01	0.00	0.2000000E+01	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.1000000E-02	0.00	0.1000000E-02	365.00
24	2	0.1000000E-02	0.00	0.1000000E-02	365.00

Boundary Concentrations for System 2

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+
01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.3000000E+01	0.00	0.3000000E+01	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.1500000E+00	0.00	0.1500000E+00	365.00
24	2	0.1500000E+00	0.00	0.1500000E+00	365.00

Boundary Concentrations for System 3

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+
01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.4000000E+00	0.00	0.4000000E+00	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.1000000E-01	0.00	0.1000000E-01	365.00
24	2	0.1000000E-01	0.00	0.1000000E-01	365.00

Boundary Concentrations for System 4

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+
01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.0000000E+00	0.00	0.0000000E+00	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.2000000E+01	0.00	0.2000000E+01	365.00
24	2	0.2000000E+01	0.00	0.2000000E+01	365.00

Boundary Concentrations for System 5

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.1400000E+02	0.00	0.1400000E+02	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.1000000E+01	0.00	0.1000000E+01	365.00
24	2	0.1000000E+01	0.00	0.1000000E+01	365.00

Boundary Concentrations for System 6

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.5000000E+01	0.00	0.5000000E+01	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00

23	2	0.8000000E+01	0.00	0.8000000E+01
365.00				
24	2	0.8000000E+01	0.00	0.8000000E+01
365.00				

Boundary Concentrations for System 7

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.1000000E+01	0.00	0.1000000E+01	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.4000000E+00	0.00	0.4000000E+00	365.00
24	2	0.4000000E+00	0.00	0.4000000E+00	365.00

Boundary Concentrations for System 8

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.1000000E+00	0.00	0.1000000E+00	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.4000000E-01	0.00	0.4000000E-01	365.00
24	2	0.4000000E-01	0.00	0.4000000E-01	365.00

Boundary Concentrations for System 9

BC Option 0 Used No.Of BC'S Read 4

Scale Factor = 0.1000E+01 Conversion Factor = 0.1000E+
01

Segment	No.Brk.	BC(T)	T	BC(T)	T
1	2	0.1500000E+02	0.00	0.1500000E+02	365.00
2	2	0.0000000E+00	0.00	0.0000000E+00	365.00
23	2	0.1000000E+02	0.00	0.1000000E+02	365.00
24	2	0.1000000E+02	0.00	0.1000000E+02	365.00

Waste Loads

Forcing Functions For System 1

Wk Option 3 Used No.of WK'S Read 0

No Forcing Function for System 1
1

Forcing Functions For System 2

Wk Option 3 Used No.of WK'S Read 0

No Forcing Function for System 2
1

Forcing Functions For System 3

Wk Option 3 Used No.of WK'S Read 0

No Forcing Function for System 3
1

```
      Forcing Functions For System  4
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Wk Option  3 Used     No.of WK'S Read    0


   No Forcing Function for System  4
1

      Forcing Functions For System  5
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Wk Option  3 Used     No.of WK'S Read    0


   No Forcing Function for System  5
1

      Forcing Functions For System  6
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Wk Option  3 Used     No.of WK'S Read    0


   No Forcing Function for System  6
1

      Forcing Functions For System  7
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Wk Option  3 Used     No.of WK'S Read    0


   No Forcing Function for System  7
1

      Forcing Functions For System  8
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Wk Option  3 Used     No.of WK'S Read    0


   No Forcing Function for System  8
1

      Forcing Functions For System  9
      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

Wk Option 3 Used No.of WK'S Read 0

No Forcing Function for System 9

1

Segment Parameters

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PARM SCALE PARM SCALE PARM SCALE PARM
SCALE

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~~~~~~~
TMPSG 0.100E+01 KESG 0.100E+01 SOD1D 0.100E+01 SODTA
0.100E+01
FNH4 0.000E+00 FPO4 0.000E+00 ITOTL 0.100E+01 TMPFN
0.100E+01

Segment # 1
TMPSG 3 0.100E+01 KESG 5 0.150E+00 SOD1D 9 0.000E+00 SODTA 12
0.100E+01
FNH4 7 0.000E+00 FPO4 8 0.000E+00 ITOTL 13 0.100E+01 TMPFN 4
0.100E+01

Segment # 2
TMPSG 3 0.100E+01 KESG 5 0.150E+00 SOD1D 9 0.000E+00 SODTA 12
0.100E+01
FNH4 7 0.000E+00 FPO4 8 0.000E+00 ITOTL 13 0.100E+01 TMPFN 4
0.100E+01

Segment # 3
TMPSG 3 0.100E+01 KESG 5 0.150E+00 SOD1D 9 0.000E+00 SODTA 12
0.100E+01
FNH4 7 0.000E+00 FPO4 8 0.000E+00 ITOTL 13 0.100E+01 TMPFN 4
0.100E+01

Segment # 4
TMPSG 3 0.100E+01 KESG 5 0.150E+00 SOD1D 9 0.000E+00 SODTA 12
0.100E+01
FNH4 7 0.000E+00 FPO4 8 0.000E+00 ITOTL 13 0.100E+01 TMPFN 4
0.100E+01

Segment # 5
TMPSG 3 0.100E+01 KESG 5 0.150E+00 SOD1D 9 0.000E+00 SODTA 12
0.100E-01
FNH4 7 0.000E+00 FPO4 8 0.000E+00 ITOTL 13 0.100E+01 TMPFN 4
0.100E+01

Segment # 6
TMPSG 3 0.100E+01 KESG 5 0.150E+00 SOD1D 9 0.000E+00 SODTA 12
0.100E+01
FNH4 7 0.000E+00 FPO4 8 0.000E+00 ITOTL 13 0.100E+01 TMPFN 4
0.100E+01

Segment # 7
~~~~~~~

```
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA  12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN   4
0.100E+01


 Segment #    8
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA  12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN   4
0.100E+01


 Segment #    9
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA  12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN   4
0.100E+01


 Segment #   10
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA  12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN   4
0.100E+01


 Segment #   11
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA  12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN   4
0.100E+01


 Segment #   12
 TMPSG    3 0.100E+01  KESG    5 0.200E+00 SOD1D    9 0.000E+00 SODTA  12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN   4
0.100E+01


 Segment #   13
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D    9 0.000E+00 SODTA  12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN   4
0.200E+01


 Segment #   14
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D    9 0.000E+00 SODTA  12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN   4
0.200E+01


 Segment #   15
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D    9 0.000E+00 SODTA  12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL   13 0.100E+01 TMPFN   4
0.200E+01


 Segment #   16
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D    9 0.000E+00 SODTA  12
0.100E+01
```

```
 FNH4     7 0.710E+01  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

 Segment #  17
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

 Segment #  18
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

 Segment #  19
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

 Segment #  20
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

 Segment #  21
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

 Segment #  22
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

 Segment #  23
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

 Segment #  24
 TMPSG    3 0.100E+01  KESG    5 0.250E+00 SOD1D   9 0.000E+00 SODTA   12
0.100E+01
 FNH4     7 0.000E+00  FPO4    8 0.000E+00 ITOTL  13 0.100E+01 TMPFN    4
0.200E+01

1
                    Environmental and Chemical Constants
                    ------------------------------------

                 No Constants Enter for System  1:     GLOBALS
```

NH3 Constants for System 2

Number of Constants for System 2; Group nitrificat is 2

Constant	Const. #	K Value	Constant	Const. #	K Value
K12C	11	0.200E+00	K12T	12	0.108E+01

NO3 Constants for System 3

Number of Constants for System 3; Group denitrif is 2

Constant	Const. #	K Value	Constant	Const. #	K Value
K20C	21	0.100E+00	K20T	22	0.104E+01

No Constants Enter for System 4: PO4

PHYT Constants for System 5

Number of Constants for System 5; Group growth is 2

Constant	Const. #	K Value	Constant	Const. #	K Value
K1C	41	0.245E+01	K1T	42	0.105E+01

Number of Constants for System 5; Group light is 3

Constant	Const. #	K Value	Constant	Const. #	K Value
LGHTS	43	0.100E+01	CCHL	46	0.670E+02
IS1	47	0.525E+03		0	0.000E+00

Number of Constants for System 5; Group nutrients is 4

Constant	Const. #	K Value	Constant	Const. #	K Value
KMNG1	48	0.250E-01	KMPG1	49	0.500E-02
NCRB	58	0.180E+00	PCRB	57	0.250E-01

Number of Constants for System 5; Group death is 4

Constant	Const. #	K Value	Constant	Const. #	K Value
K1RC	50	0.600E+00	K1RT	51	0.107E+01
K1D	52	0.300E+00	KPZDC	55	0.000E+00

CBOD Constants for System 6

Number of Constants for System 6; Group deoxygent is 2

Constant	Const. #	K Value	Constant	Const. #	K Value
KDC	71	0.700E-01	KDT	72	0.105E+01

DO Constants for System 7

Number of Constants for System 7; Group ratio is 2

Constant	Const. #	K Value	Constant	Const. #	K Value
OCRB	81	0.267E+01	K2	82	0.450E+01

ON Constants for System 8

Number of Constants for System 8; Group mineralize is 3

Constant	Const. #	K Value	Constant	Const. #	K Value
K71C	91	0.500E+00	K71T	92	0.108E+01
FON	95	0.150E+00		0	0.000E+00

OP Constants for System 9

Number of Constants for System 9; Group mineralize is 3

Constant	Const. #	K Value	Constant	Const. #	K Value
K83C	100	0.750E+00	K83T	101	0.108E+01
FOP	104	0.500E+00		0	0.000E+00

No Constants Enter for System 10: CO2acy

Environmental Time Functions

Piecewise Linear Functions

	VAL(T)	T	VAL(T)	T	VAL(T)	T
TEMP1	0.25410E+02	0.00	0.25410E+02	0.01	0.25400E+02	0.02
	0.25370E+02	0.03	0.25360E+02	0.04	0.25360E+02	0.05
	0.25320E+02	0.06	0.25330E+02	0.07	0.25310E+02	0.08
	0.25290E+02	0.09	0.25270E+02	0.10	0.25250E+02	0.11
	0.25210E+02	0.13	0.25170E+02	0.14	0.25130E+02	0.15
	0.25080E+02	0.16	0.25010E+02	0.17	0.24940E+02	0.18
	0.24880E+02	0.19	0.24830E+02	0.20	0.24770E+02	0.21
	0.24690E+02	0.22	0.24610E+02	0.23	0.24520E+02	0.24
	0.24420E+02	0.25	0.24320E+02	0.26	0.24240E+02	0.27
	0.24170E+02	0.28	0.24110E+02	0.29	0.24070E+02	0.30
	0.24070E+02	0.31	0.24120E+02	0.32	0.24270E+02	0.33
	0.24450E+02	0.34	0.24630E+02	0.35	0.24820E+02	0.36
	0.24990E+02	0.38	0.25080E+02	0.39	0.25180E+02	0.40
	0.25300E+02	0.41	0.25400E+02	0.42	0.25550E+02	0.43
	0.25630E+02	0.44	0.25690E+02	0.45	0.25740E+02	0.46
	0.25830E+02	0.47	0.25900E+02	0.48	0.25960E+02	0.49
	0.26040E+02	0.50	0.26090E+02	0.51	0.26170E+02	0.52
	0.26240E+02	0.53	0.26250E+02	0.54	0.26260E+02	0.55
	0.26290E+02	0.56	0.26290E+02	0.57	0.26330E+02	0.58
	0.26370E+02	0.59	0.26340E+02	0.60	0.26440E+02	0.61
	0.26390E+02	0.63	0.26170E+02	0.64	0.26090E+02	0.65
	0.26350E+02	0.66	0.26510E+02	0.67	0.26460E+02	0.68
	0.26340E+02	0.69	0.26060E+02	0.70	0.25940E+02	0.71
	0.25930E+02	0.72	0.25930E+02	0.73	0.25980E+02	0.74
	0.25990E+02	0.75	0.25920E+02	0.76	0.25770E+02	0.77
	0.25680E+02	0.78	0.25740E+02	0.79	0.25810E+02	0.80
	0.25600E+02	0.81	0.25170E+02	0.82	0.25250E+02	0.83
	0.25460E+02	0.84	0.25640E+02	0.85	0.25670E+02	0.86
	0.25610E+02	0.88	0.25490E+02	0.89	0.25530E+02	0.90
	0.25530E+02	0.91	0.25610E+02	0.92	0.25600E+02	0.93
	0.25580E+02	0.94	0.25580E+02	0.95	0.25580E+02	0.96
	0.25570E+02	0.97	0.25560E+02	0.98	0.25580E+02	0.99
	0.25580E+02	1.00	0.25580E+02	1.01	0.25580E+02	1.02
	0.25550E+02	1.03	0.25540E+02	1.04	0.25530E+02	1.05
	0.25510E+02	1.06	0.25480E+02	1.07	0.25450E+02	1.08
	0.25420E+02	1.09	0.25420E+02	1.10	0.25380E+02	1.11
	0.25330E+02	1.13	0.25290E+02	1.14	0.25250E+02	1.15
	0.25210E+02	1.16	0.25190E+02	1.17	0.25210E+02	1.18
	0.25180E+02	1.19	0.25060E+02	1.20	0.24920E+02	1.21
	0.24810E+02	1.22	0.24720E+02	1.23	0.24670E+02	1.24
	0.24650E+02	1.25	0.24670E+02	1.26	0.24600E+02	1.27
	0.24450E+02	1.28	0.24300E+02	1.29	0.24200E+02	1.30
	0.24160E+02	1.31	0.24220E+02	1.32	0.24370E+02	1.33
	0.24520E+02	1.34	0.24660E+02	1.35	0.24770E+02	1.36
	0.24890E+02	1.38	0.24880E+02	1.39	0.24840E+02	1.40
	0.25020E+02	1.41	0.25310E+02	1.42	0.25540E+02	1.43
	0.25700E+02	1.44	0.25820E+02	1.45	0.25860E+02	1.46
	0.25830E+02	1.47	0.25880E+02	1.48	0.25920E+02	1.49
	0.25980E+02	1.50	0.26050E+02	1.51	0.26120E+02	1.52
	0.26200E+02	1.53	0.25950E+02	1.54	0.25950E+02	1.55
	0.26190E+02	1.56	0.26240E+02	1.57	0.26210E+02	1.58
	0.26050E+02	1.59	0.26110E+02	1.60	0.26200E+02	1.61
	0.26140E+02	1.63	0.25950E+02	1.64	0.25760E+02	1.65
	0.25740E+02	1.66	0.25790E+02	1.67	0.25860E+02	1.68
	0.25910E+02	1.69	0.25950E+02	1.70	0.25960E+02	1.71
	0.26000E+02	1.72	0.26010E+02	1.73	0.26000E+02	1.74
	0.25850E+02	1.75	0.25690E+02	1.76	0.25660E+02	1.77

	0.25660E+02	1.78	0.25620E+02	1.79	0.25570E+02	1.80
	0.25570E+02	1.81	0.25570E+02	1.82	0.25590E+02	1.83
	0.25450E+02	1.84	0.25140E+02	1.85	0.25340E+02	1.86
	0.25360E+02	1.88	0.25440E+02	1.89	0.25510E+02	1.90
	0.25500E+02	1.91	0.25490E+02	1.92	0.25510E+02	1.93
	0.25500E+02	1.94	0.25480E+02	1.95	0.25450E+02	1.96
	0.25410E+02	1.97	0.25390E+02	1.98	0.25390E+02	1.99
	0.25390E+02	2.00				
TEMP2	0.23440E+02	0.00	0.23570E+02	0.01	0.23660E+02	0.02
	0.23700E+02	0.03	0.23710E+02	0.04	0.23700E+02	0.05
	0.23650E+02	0.06	0.23620E+02	0.07	0.23540E+02	0.08
	0.23360E+02	0.09	0.23340E+02	0.10	0.23380E+02	0.11
	0.23430E+02	0.13	0.23440E+02	0.14	0.23330E+02	0.15
	0.23150E+02	0.16	0.22820E+02	0.17	0.22490E+02	0.18
	0.22230E+02	0.19	0.22100E+02	0.20	0.21960E+02	0.21
	0.21840E+02	0.22	0.21880E+02	0.23	0.21790E+02	0.24
	0.21600E+02	0.25	0.21370E+02	0.26	0.21170E+02	0.27
	0.21010E+02	0.28	0.20930E+02	0.29	0.20780E+02	0.30
	0.20730E+02	0.31	0.20830E+02	0.32	0.20990E+02	0.33
	0.21290E+02	0.34	0.21420E+02	0.35	0.21600E+02	0.36
	0.21850E+02	0.38	0.22270E+02	0.39	0.23040E+02	0.40
	0.23930E+02	0.41	0.24930E+02	0.42	0.25920E+02	0.43
	0.26780E+02	0.44	0.27460E+02	0.45	0.28200E+02	0.46
	0.28840E+02	0.47	0.29110E+02	0.48	0.29370E+02	0.49
	0.29440E+02	0.50	0.28640E+02	0.51	0.28810E+02	0.52
	0.28840E+02	0.53	0.28980E+02	0.54	0.28790E+02	0.55
	0.29230E+02	0.56	0.29460E+02	0.57	0.29500E+02	0.58
	0.29430E+02	0.59	0.29150E+02	0.60	0.28930E+02	0.61
	0.28870E+02	0.63	0.27750E+02	0.64	0.27280E+02	0.65
	0.26630E+02	0.66	0.26410E+02	0.67	0.26190E+02	0.68
	0.25950E+02	0.69	0.25650E+02	0.70	0.25390E+02	0.71
	0.25340E+02	0.72	0.25260E+02	0.73	0.24920E+02	0.74
	0.24730E+02	0.75	0.24640E+02	0.76	0.24490E+02	0.77
	0.24420E+02	0.78	0.24370E+02	0.79	0.24420E+02	0.80
	0.24470E+02	0.81	0.24350E+02	0.82	0.24140E+02	0.83
	0.23990E+02	0.84	0.23560E+02	0.85	0.23340E+02	0.86
	0.23080E+02	0.88	0.23010E+02	0.89	0.23100E+02	0.90
	0.23330E+02	0.91	0.23590E+02	0.92	0.23750E+02	0.93
	0.23820E+02	0.94	0.23850E+02	0.95	0.23750E+02	0.96
	0.23770E+02	0.97	0.23730E+02	0.98	0.23760E+02	0.99
	0.23810E+02	1.00	0.23850E+02	1.01	0.23820E+02	1.02
	0.23790E+02	1.03	0.23760E+02	1.04	0.23730E+02	1.05
	0.23700E+02	1.06	0.23630E+02	1.07	0.23530E+02	1.08
	0.23470E+02	1.09	0.23460E+02	1.10	0.23400E+02	1.11
	0.23320E+02	1.13	0.23230E+02	1.14	0.23110E+02	1.15
	0.23010E+02	1.16	0.22910E+02	1.17	0.22820E+02	1.18
	0.22690E+02	1.19	0.22570E+02	1.20	0.22420E+02	1.21
	0.22300E+02	1.22	0.22180E+02	1.23	0.22060E+02	1.24
	0.21920E+02	1.25	0.21800E+02	1.26	0.21680E+02	1.27
	0.21630E+02	1.28	0.21660E+02	1.29	0.21790E+02	1.30
	0.21990E+02	1.31	0.22250E+02	1.32	0.22350E+02	1.33
	0.22460E+02	1.34	0.22660E+02	1.35	0.22910E+02	1.36
	0.23290E+02	1.38	0.23670E+02	1.39	0.24110E+02	1.40
	0.24550E+02	1.41	0.25070E+02	1.42	0.25490E+02	1.43
	0.25890E+02	1.44	0.26340E+02	1.45	0.26680E+02	1.46
	0.27040E+02	1.47	0.27290E+02	1.48	0.27520E+02	1.49
	0.27660E+02	1.50	0.27900E+02	1.51	0.28090E+02	1.52
	0.28200E+02	1.53	0.28150E+02	1.54	0.28200E+02	1.55
	0.28280E+02	1.56	0.28180E+02	1.57	0.28260E+02	1.58
	0.27820E+02	1.59	0.26920E+02	1.60	0.25330E+02	1.61
	0.24250E+02	1.63	0.23610E+02	1.64	0.23290E+02	1.65
	0.23450E+02	1.66	0.23800E+02	1.67	0.24510E+02	1.68
	0.25270E+02	1.69	0.25840E+02	1.70	0.25710E+02	1.71
	0.25110E+02	1.72	0.24530E+02	1.73	0.24040E+02	1.74
	0.23890E+02	1.75	0.23820E+02	1.76	0.23950E+02	1.77

```
          0.23880E+02   1.78    0.23780E+02   1.79    0.23650E+02   1.80
          0.23530E+02   1.81    0.23360E+02   1.82    0.21910E+02   1.83
          0.22270E+02   1.84    0.22550E+02   1.85    0.22740E+02   1.86
          0.22850E+02   1.88    0.22890E+02   1.89    0.22850E+02   1.90
          0.22750E+02   1.91    0.22450E+02   1.92    0.22390E+02   1.93
          0.22370E+02   1.94    0.22330E+02   1.95    0.22230E+02   1.96
          0.22080E+02   1.97    0.21900E+02   1.98    0.21690E+02   1.99
          0.21470E+02   2.00
 ITOT     0.00000E+00   0.00    0.00000E+00   0.04    0.00000E+00   0.08
          0.00000E+00   0.12    0.00000E+00   0.16    0.44100E+01   0.20
          0.78510E+02   0.25    0.25494E+03   0.29    0.45343E+03   0.33
          0.62633E+03   0.37    0.79836E+03   0.41    0.92450E+03   0.45
          0.98449E+03   0.50    0.98802E+03   0.54    0.93597E+03   0.58
          0.82041E+03   0.62    0.66868E+03   0.66    0.48695E+03   0.70
          0.28582E+03   0.75    0.94390E+02   0.79    0.10590E+02   0.83
          0.00000E+00   0.87    0.00000E+00   0.91    0.00000E+00   0.95
          0.00000E+00   1.00    0.00000E+00   1.00
 F        0.10000E+01   0.00    0.10000E+01 365.00
1
```

Initial Conditions
~~~~~~~~~~~~~~~~~~

Initial Conditions for System 1
Particulate Fraction of System is Transported by Solids Field 3
Density of System = 0.100E+01

```
      1 0.2000E-01 0.1000E+01      2 0.2000E-01 0.1000E+01      3
0.2000E-01 0.1000E+01
      4 0.2000E-01 0.1000E+01      5 0.2000E-01 0.1000E+01      6
0.2000E-01 0.1000E+01
      7 0.2000E-01 0.1000E+01      8 0.2000E-01 0.1000E+01      9
0.2000E-01 0.1000E+01
     10 0.2000E-01 0.1000E+01     11 0.2000E-01 0.1000E+01     12
0.2000E-01 0.1000E+01
     13 0.2000E-01 0.1000E+01     14 0.2000E-01 0.1000E+01     15
0.2000E-01 0.1000E+01
     16 0.2000E-01 0.1000E+01     17 0.2000E-01 0.1000E+01     18
0.2000E-01 0.1000E+01
     19 0.2000E-01 0.1000E+01     20 0.2000E-01 0.1000E+01     21
0.2000E-01 0.1000E+01
     22 0.2000E-01 0.1000E+01     23 0.2000E-01 0.1000E+01     24
0.2000E-01 0.1000E+01
```

Initial Conditions for System 2
Particulate Fraction of System is Transported by Solids Field 3
Density of System = 0.100E+01

```
      1 0.9000E-01 0.1000E+01      2 0.9000E-01 0.1000E+01      3
0.9000E-01 0.1000E+01
      4 0.9000E-01 0.1000E+01      5 0.9000E-01 0.1000E+01      6
0.9000E-01 0.1000E+01
      7 0.9000E-01 0.1000E+01      8 0.9000E-01 0.1000E+01      9
0.9000E-01 0.1000E+01
     10 0.9000E-01 0.1000E+01     11 0.9000E-01 0.1000E+01     12
0.9000E-01 0.1000E+01
     13 0.9000E-01 0.1000E+01     14 0.9000E-01 0.1000E+01     15
0.9000E-01 0.1000E+01
     16 0.9000E-01 0.1000E+01     17 0.9000E-01 0.1000E+01     18
0.9000E-01 0.1000E+01
```
~~~~~~~~~~~~~~~~~~

```
      19 0.9000E-01 0.1000E+01      20 0.9000E-01 0.1000E+01      21
0.9000E-01 0.1000E+01
      22 0.9000E-01 0.1000E+01      23 0.9000E-01 0.1000E+01      24
0.9000E-01 0.1000E+01
```

Initial Conditions for System 3
Particulate Fraction of System is Transported by Solids Field 3
Density of System = 0.100E+01

```
       1 0.1010E+01 0.1000E+01       2 0.1010E+01 0.1000E+01       3
0.1010E+01 0.1000E+01
       4 0.1010E+01 0.1000E+01       5 0.1010E+01 0.1000E+01       6
0.1010E+01 0.1000E+01
       7 0.1010E+01 0.1000E+01       8 0.1010E+01 0.1000E+01       9
0.1010E+01 0.1000E+01
      10 0.1010E+01 0.1000E+01      11 0.1010E+01 0.1000E+01      12
0.1010E+01 0.1000E+01
      13 0.1010E+01 0.1000E+01      14 0.1010E+01 0.1000E+01      15
0.1010E+01 0.1000E+01
      16 0.1010E+01 0.1000E+01      17 0.1010E+01 0.1000E+01      18
0.1010E+01 0.1000E+01
      19 0.1010E+01 0.1000E+01      20 0.1010E+01 0.1000E+01      21
0.1010E+01 0.1000E+01
      22 0.1010E+01 0.1000E+01      23 0.1010E+01 0.1000E+01      24
0.1010E+01 0.1000E+01
```

Initial Conditions for System 4
Particulate Fraction of System is Transported by Solids Field 4
Density of System = 0.100E+01

```
       1 0.1000E-23 0.0000E+00       2 0.1000E+04 0.0000E+00       3
0.1000E-23 0.0000E+00
       4 0.1000E+04 0.0000E+00       5 0.1000E-23 0.0000E+00       6
0.1000E+04 0.0000E+00
       7 0.1000E-23 0.0000E+00       8 0.9750E+03 0.0000E+00       9
0.1000E-23 0.0000E+00
      10 0.9500E+03 0.0000E+00      11 0.1000E-23 0.0000E+00      12
0.9250E+03 0.0000E+00
      13 0.1000E-23 0.0000E+00      14 0.9000E+03 0.0000E+00      15
0.1000E-23 0.0000E+00
      16 0.9000E+03 0.0000E+00      17 0.1000E-23 0.0000E+00      18
0.9000E+03 0.0000E+00
      19 0.1000E-23 0.0000E+00      20 0.9000E+03 0.0000E+00      21
0.1000E-23 0.0000E+00
      22 0.9000E+03 0.0000E+00      23 0.1000E-23 0.0000E+00      24
0.9000E+03 0.0000E+00
```

Initial Conditions for System 5
Particulate Fraction of System is Transported by Solids Field 3
Density of System = 0.100E+01

```
       1 0.5000E+01 0.1000E+01       2 0.5000E+01 0.1000E+01       3
0.5000E+01 0.1000E+01
       4 0.5000E+01 0.1000E+01       5 0.5000E+01 0.1000E+01       6
0.5000E+01 0.1000E+01
       7 0.5000E+01 0.1000E+01       8 0.5000E+01 0.1000E+01       9
0.5000E+01 0.1000E+01
      10 0.5000E+01 0.1000E+01      11 0.5000E+01 0.1000E+01      12
0.5000E+01 0.1000E+01
      13 0.5000E+01 0.1000E+01      14 0.5000E+01 0.1000E+01      15
0.5000E+01 0.1000E+01
      16 0.5000E+01 0.1000E+01      17 0.5000E+01 0.1000E+01      18
```

```
0.5000E+01 0.1000E+01
      19 0.5000E+01 0.1000E+01      20 0.5000E+01 0.1000E+01      21
0.5000E+01 0.1000E+01
      22 0.5000E+01 0.1000E+01      23 0.5000E+01 0.1000E+01      24
0.5000E+01 0.1000E+01


                    Initial Conditions for System 6
    Particulate Fraction of System is Transported by Solids Field    3
                      Density of System =  0.100E+01

       1 0.7990E+01 0.1000E+01       2 0.7590E+01 0.1000E+01       3
0.7590E+01 0.1000E+01
       4 0.7990E+01 0.1000E+01       5 0.7590E+01 0.1000E+01       6
0.7590E+01 0.1000E+01
       7 0.7990E+01 0.1000E+01       8 0.7590E+01 0.1000E+01       9
0.7590E+01 0.1000E+01
      10 0.7990E+01 0.1000E+01      11 0.7590E+01 0.1000E+01      12
0.7590E+01 0.1000E+01
      13 0.7990E+01 0.1000E+01      14 0.7590E+01 0.1000E+01      15
0.7590E+01 0.1000E+01
      16 0.7990E+01 0.1000E+01      17 0.7590E+01 0.1000E+01      18
0.7590E+01 0.1000E+01
      19 0.7990E+01 0.1000E+01      20 0.7590E+01 0.1000E+01      21
0.7590E+01 0.1000E+01
      22 0.7990E+01 0.1000E+01      23 0.7590E+01 0.1000E+01      24
0.7590E+01 0.1000E+01


                    Initial Conditions for System 7
    Particulate Fraction of System is Transported by Solids Field    3
                      Density of System =  0.100E+01

       1 0.1020E+01 0.7000E+00       2 0.1020E+01 0.7000E+00       3
0.1020E+01 0.7000E+00
       4 0.1020E+01 0.7000E+00       5 0.1020E+01 0.7000E+00       6
0.1020E+01 0.7000E+00
       7 0.1020E+01 0.7000E+00       8 0.1020E+01 0.7000E+00       9
0.1020E+01 0.7000E+00
      10 0.1020E+01 0.7000E+00      11 0.1020E+01 0.7000E+00      12
0.1020E+01 0.7000E+00
      13 0.1020E+01 0.7000E+00      14 0.1020E+01 0.7000E+00      15
0.1020E+01 0.7000E+00
      16 0.1020E+01 0.7000E+00      17 0.1020E+01 0.7000E+00      18
0.1020E+01 0.7000E+00
      19 0.1020E+01 0.7000E+00      20 0.1020E+01 0.7000E+00      21
0.1020E+01 0.7000E+00
      22 0.1020E+01 0.7000E+00      23 0.1020E+01 0.7000E+00      24
0.1020E+01 0.7000E+00


                    Initial Conditions for System 8
    Particulate Fraction of System is Transported by Solids Field    3
                      Density of System =  0.100E+01

       1 0.1000E+00 0.1000E+01       2 0.1000E+00 0.1000E+01       3
0.1000E+00 0.1000E+01
       4 0.1000E+00 0.1000E+01       5 0.1000E+00 0.1000E+01       6
0.1000E+00 0.1000E+01
       7 0.1000E+00 0.1000E+01       8 0.1000E+00 0.1000E+01       9
0.1000E+00 0.1000E+01
      10 0.1000E+00 0.1000E+01      11 0.1000E+00 0.1000E+01      12
0.1000E+00 0.1000E+01
      13 0.1000E+00 0.1000E+01      14 0.1000E+00 0.1000E+01      15
0.1000E+00 0.1000E+01
```

```
      16 0.1000E+00 0.1000E+01      17 0.1000E+00 0.1000E+01      18
0.1000E+00 0.1000E+01
      19 0.1000E+00 0.1000E+01      20 0.1000E+00 0.1000E+01      21
0.1000E+00 0.1000E+01
      22 0.1000E+00 0.1000E+01      23 0.1000E+00 0.1000E+01      24
0.1000E+00 0.1000E+01
```

Initial Conditions for System 9
Particulate Fraction of System is Transported by Solids Field 3
Density of System = 0.100E+01

```
       1 0.4000E+01 0.1000E+01       2 0.4000E+01 0.1000E+01       3
0.4000E+01 0.1000E+01
       4 0.4000E+01 0.1000E+01       5 0.4000E+01 0.1000E+01       6
0.4000E+01 0.1000E+01
       7 0.4000E+01 0.1000E+01       8 0.4000E+01 0.1000E+01       9
0.4000E+01 0.1000E+01
      10 0.4000E+01 0.1000E+01      11 0.4000E+01 0.1000E+01      12
0.4000E+01 0.1000E+01
      13 0.6000E+01 0.1000E+01      14 0.6000E+01 0.1000E+01      15
0.6000E+01 0.1000E+01
      16 0.6000E+01 0.1000E+01      17 0.6000E+01 0.1000E+01      18
0.6000E+01 0.1000E+01
      19 0.6000E+01 0.1000E+01      20 0.6000E+01 0.1000E+01      21
0.6000E+01 0.1000E+01
      22 0.6000E+01 0.1000E+01      23 0.6000E+01 0.1000E+01      24
0.6000E+01 0.1000E+01
```

Stability Criteria for Numerical Integration

System	Maximum Concentration
1	10.00
2	10.00
3	5.00
4	500.00
5	100.00
6	20.00
7	10.00
8	5.00
9	5000.00

Completed

```
# WASP5pH EDF dump file
#
# Seg    = model segment number
# Time   = simulation time in days
# Tchlax = total chlorophyll-a [periphyton] (ug/L)
# DO     = dissolved oxygen (mg/L)
# CO2acy = carbon dioxide acidity (mg/L)
# pH     = pH (standard units)
# CO2sat = saturated CO2 concentration (mg/L)
# Nlim   = Michaelis Nitrogen limitation factor
# Plim   = Michaelis Phosphorus limitation factor
#
# Seg    Time Tchlax     DO CO2acy     pH CO2sat    Nlim    Plim
    2    0.00 1000.0   7.59   4.00   8.02   0.50    0.81    1.00
   14    0.00  900.0   7.59   6.00   7.86   0.53    0.81    1.00
    2    0.04  954.6   4.67  14.61   7.46   0.50    0.99    0.99
   14    0.04  862.5   7.08   4.60   7.98   0.53    0.86    1.00
    2    0.08  909.3   4.54  15.08   7.45   0.50    1.00    0.99
   14    0.08  824.7   6.51   5.14   7.93   0.53    0.97    0.99
    2    0.12  868.3   4.56  15.05   7.45   0.50    1.00    0.99
   14    0.12  790.6   5.70   7.25   7.78   0.53    0.99    0.99
    2    0.16  829.3   4.58  15.00   7.45   0.51    1.00    0.99
   14    0.16  758.1   5.15   8.80   7.70   0.54    0.99    0.99
    2    0.20  795.1   4.64  14.91   7.46   0.51    1.00    0.99
   14    0.20  730.3   4.98   9.35   7.68   0.55    0.99    0.99
    2    0.24  773.1   5.01  14.33   7.48   0.51    1.00    0.99
   14    0.24  712.2   5.18   9.12   7.69   0.55    0.99    0.99
    2    0.28  783.8   5.60  13.41   7.51   0.52    0.99    0.99
   14    0.28  719.7   5.65   8.43   7.73   0.57    0.99    0.99
    2    0.32  824.7   5.98  12.84   7.53   0.52    0.99    0.99
   14    0.32  750.5   6.07   7.83   7.77   0.57    0.99    0.99
    2    0.36  879.7   6.13  12.61   7.53   0.51    0.99    0.99
   14    0.36  792.3   6.35   7.40   7.79   0.56    0.99    0.99
    2    0.40  938.4   6.14  12.61   7.53   0.50    0.99    0.99
   14    0.40  838.2   6.51   7.13   7.79   0.53    0.99    0.99
    2    0.44  993.9   6.08  12.71   7.52   0.50    0.99    0.99
   14    0.44  889.0   6.61   6.78   7.78   0.48    0.99    0.99
    2    0.48 1045.1   6.03  12.80   7.51   0.50    0.99    0.99
   14    0.48  944.5   6.63   6.65   7.77   0.46    0.99    0.99
    2    0.52 1094.8   6.04  12.80   7.51   0.49    0.99    0.99
   14    0.52 1001.5   6.60   6.67   7.77   0.46    0.99    0.99
    2    0.56 1149.7   6.12  12.69   7.52   0.49    0.99    0.99
   14    0.56 1063.4   6.67   6.56   7.78   0.45    0.99    0.99
    2    0.60 1209.1   6.27  12.46   7.52   0.49    0.99    0.99
   14    0.60 1132.3   6.83   6.31   7.80   0.45    0.99    0.99
    2    0.64 1280.3   6.48  12.16   7.54   0.49    0.99    0.99
   14    0.64 1211.2   6.99   6.10   7.82   0.48    0.99    0.99
    2    0.68 1364.9   6.71  11.82   7.54   0.49    0.99    0.99
   14    0.68 1294.4   7.15   5.91   7.85   0.49    0.99    0.99
    2    0.72 1454.0   6.68  11.91   7.55   0.49    0.99    0.99
   14    0.72 1377.4   7.17   5.93   7.85   0.50    0.99    0.99
    2    0.76 1524.7   6.17  12.72   7.52   0.50    0.99    0.99
   14    0.76 1440.5   6.79   6.59   7.81   0.51    0.99    0.99
    2    0.80 1534.6   5.03  14.50   7.46   0.50    1.00    0.99
   14    0.80 1448.3   5.85   8.08   7.73   0.52    0.99    0.99
    2    0.84 1486.3   4.33  15.58   7.43   0.50    1.00    0.99
   14    0.84 1404.8   5.08   9.30   7.67   0.52    1.00    0.99
    2    0.88 1420.3   4.24  15.71   7.43   0.50    1.00    0.99
   14    0.88 1348.4   4.77   9.93   7.65   0.54    1.00    0.99
    2    0.92 1355.4   4.27  15.64   7.43   0.50    1.00    0.99
   14    0.92 1293.1   4.57  10.26   7.63   0.53    1.00    0.99
    2    0.96 1293.3   4.30  15.57   7.43   0.50    1.00    0.99
   14    0.96 1238.7   4.49  10.31   7.63   0.52    1.00    0.99
    2    1.00 1234.1   4.34  15.50   7.43   0.50    1.00    0.99
   14    1.00 1186.7   4.48  10.34   7.62   0.52    1.00    0.99
```

2	1.04	1177.6	4.37	15.43	7.44	0.50	1.00	0.99
14	1.04	1136.8	4.51	10.24	7.63	0.52	1.00	0.99
2	1.08	1123.8	4.40	15.36	7.44	0.50	1.00	0.99
14	1.08	1089.2	4.55	10.21	7.63	0.53	1.00	0.99
2	1.12	1072.8	4.44	15.30	7.44	0.50	1.00	0.99
14	1.12	1044.1	4.59	10.13	7.64	0.53	1.00	0.99
2	1.16	1024.4	4.47	15.23	7.44	0.50	1.00	0.99
14	1.16	1001.5	4.64	10.05	7.64	0.54	1.00	0.99
2	1.20	979.5	4.54	15.12	7.45	0.51	1.00	0.99
14	1.20	962.3	4.72	9.93	7.65	0.54	1.00	0.99
2	1.24	953.4	5.01	14.37	7.47	0.51	1.00	0.99
14	1.24	939.0	5.10	9.33	7.68	0.55	1.00	0.99
2	1.28	967.9	5.75	13.24	7.51	0.52	0.99	0.99
14	1.28	949.9	5.75	8.35	7.73	0.56	1.00	0.99
2	1.32	1018.0	6.17	12.59	7.54	0.52	0.99	0.99
14	1.32	991.9	6.29	7.53	7.77	0.55	0.99	0.99
2	1.36	1083.7	6.34	12.35	7.54	0.51	0.99	0.99
14	1.36	1048.9	6.64	7.01	7.80	0.54	0.99	0.99
2	1.40	1151.9	6.32	12.40	7.54	0.51	0.99	0.99
14	1.40	1111.0	6.83	6.64	7.81	0.52	0.99	0.99
2	1.44	1216.1	6.26	12.50	7.53	0.50	0.99	0.99
14	1.44	1174.2	6.88	6.45	7.81	0.49	0.99	0.99
2	1.48	1275.4	6.20	12.61	7.52	0.50	0.99	0.99
14	1.48	1237.2	6.87	6.42	7.80	0.48	0.99	0.99
2	1.52	1332.5	6.20	12.61	7.52	0.49	0.99	0.99
14	1.52	1301.2	6.87	6.39	7.80	0.47	0.99	0.99
2	1.56	1391.8	6.28	12.51	7.52	0.49	0.99	0.99
14	1.56	1369.7	6.93	6.28	7.80	0.47	0.99	0.99
2	1.60	1459.1	6.45	12.26	7.53	0.49	0.99	0.99
14	1.60	1446.2	7.06	6.10	7.83	0.48	0.99	0.99
2	1.64	1539.3	6.69	11.92	7.55	0.50	0.99	0.99
14	1.64	1522.2	7.11	6.15	7.85	0.53	0.99	0.99
2	1.68	1632.5	6.91	11.60	7.56	0.50	0.99	0.99
14	1.68	1605.2	7.41	5.76	7.87	0.51	0.99	0.99
2	1.72	1732.4	6.91	11.63	7.56	0.49	0.99	0.99
14	1.72	1700.8	7.49	5.60	7.88	0.51	0.99	0.99
2	1.76	1811.3	6.31	12.60	7.52	0.50	0.99	0.99
14	1.76	1769.7	7.00	6.42	7.83	0.52	0.99	0.99
2	1.80	1819.9	5.01	14.63	7.46	0.50	1.00	0.99
14	1.80	1775.7	5.92	8.18	7.73	0.53	0.99	0.99
2	1.84	1761.4	4.19	15.89	7.42	0.50	1.00	0.99
14	1.84	1724.9	5.09	9.57	7.67	0.55	1.00	0.99
2	1.88	1684.1	4.10	16.00	7.42	0.50	1.00	0.99
14	1.88	1658.2	4.65	10.27	7.63	0.54	1.00	0.99
2	1.92	1607.4	4.13	15.93	7.42	0.50	1.00	0.99
14	1.92	1591.8	4.46	10.56	7.63	0.54	1.00	0.99
2	1.96	1534.1	4.18	15.84	7.43	0.50	1.00	0.99
14	1.96	1529.3	4.39	10.65	7.62	0.55	1.00	0.99
2	2.00	1464.4	4.22	15.75	7.43	0.50	1.00	0.99
14	2.00	1470.5	4.42	10.60	7.62	0.53	1.00	0.99
2	2.04	1398.0	4.26	15.67	7.43	0.50	1.00	0.99
14	2.04	1409.1	4.35	10.65	7.61	0.53	1.00	0.99
2	2.08	1334.7	4.30	15.60	7.43	0.50	1.00	0.99
14	2.08	1350.3	4.39	10.56	7.62	0.53	1.00	0.99
2	2.12	1274.5	4.33	15.52	7.44	0.50	1.00	0.99
14	2.12	1294.5	4.44	10.47	7.62	0.53	1.00	0.99
2	2.16	1217.3	4.37	15.44	7.44	0.51	1.00	0.99
14	2.16	1241.3	4.50	10.37	7.63	0.54	1.00	0.99
2	2.20	1164.6	4.45	15.31	7.45	0.51	1.00	0.99
14	2.20	1193.4	4.61	10.20	7.64	0.55	1.00	0.99
2	2.24	1133.3	5.00	14.45	7.47	0.51	1.00	0.99
14	2.24	1164.5	5.06	9.50	7.68	0.55	1.00	0.99
2	2.28	1148.7	5.84	13.15	7.52	0.52	0.99	0.99
14	2.28	1176.0	5.82	8.35	7.74	0.57	1.00	0.99
2	2.32	1205.2	6.34	12.40	7.54	0.52	0.99	0.99

14	2.32	1222.2	6.42	7.45	7.79	0.57	0.99	0.99
2	2.36	1279.7	6.53	12.12	7.55	0.51	0.99	0.99
14	2.36	1284.2	6.81	6.86	7.82	0.56	0.99	0.99
2	2.40	1354.0	6.52	12.14	7.54	0.50	0.99	0.99
14	2.40	1347.7	7.02	6.51	7.83	0.53	0.99	0.99
2	2.44	1426.9	6.43	12.30	7.53	0.50	0.99	0.99
14	2.44	1420.6	7.17	6.11	7.83	0.48	0.99	0.99
2	2.48	1493.2	6.35	12.44	7.53	0.50	0.99	0.99
14	2.48	1498.9	7.19	5.97	7.82	0.46	0.99	0.99
2	2.52	1556.8	6.35	12.46	7.52	0.49	0.99	0.99
14	2.52	1577.9	7.14	6.04	7.82	0.46	0.99	0.99
2	2.56	1622.9	6.43	12.34	7.53	0.49	0.99	0.99
14	2.56	1658.4	7.21	5.93	7.82	0.46	0.99	0.99
2	2.60	1697.4	6.63	12.06	7.54	0.49	0.99	0.99
14	2.60	1751.3	7.42	5.60	7.85	0.45	0.99	0.99
2	2.64	1786.6	6.89	11.68	7.55	0.49	0.99	0.99
14	2.64	1857.5	7.62	5.33	7.88	0.47	0.99	0.99
2	2.68	1892.0	7.17	11.27	7.57	0.49	0.99	0.99
14	2.68	1968.9	7.82	5.11	7.91	0.49	0.99	0.99
2	2.72	2003.3	7.12	11.38	7.57	0.49	0.99	0.99
14	2.72	2079.4	7.82	5.16	7.91	0.50	0.99	0.99
2	2.76	2091.5	6.50	12.39	7.53	0.49	0.99	0.99
14	2.76	2162.6	7.29	6.06	7.85	0.51	0.99	0.99
2	2.80	2102.9	5.02	14.70	7.46	0.50	1.00	0.99
14	2.80	2170.6	5.99	8.12	7.72	0.52	0.99	0.99
2	2.84	2037.7	4.08	16.14	7.42	0.50	1.00	0.99
14	2.84	2105.7	4.91	9.82	7.64	0.52	1.00	0.99
2	2.88	1947.4	3.94	16.33	7.41	0.50	1.00	0.99
14	2.88	2021.1	4.49	10.62	7.62	0.54	1.00	0.99
2	2.92	1858.4	3.99	16.23	7.41	0.50	1.00	0.99
14	2.92	1938.3	4.22	11.04	7.60	0.53	1.00	0.99
2	2.96	1773.2	4.04	16.13	7.42	0.50	1.00	0.99
14	2.96	1856.9	4.12	11.11	7.59	0.52	1.00	0.99
2	3.00	1692.1	4.08	16.04	7.42	0.50	1.00	0.99
14	3.00	1778.9	4.11	11.14	7.59	0.52	1.00	0.99
2	3.04	1614.6	4.13	15.94	7.42	0.50	1.00	0.99
14	3.04	1704.1	4.15	11.01	7.60	0.52	1.00	0.99
2	3.08	1540.9	4.17	15.85	7.43	0.50	1.00	0.99
14	3.08	1632.7	4.21	10.94	7.60	0.53	1.00	0.99
2	3.12	1470.9	4.22	15.76	7.43	0.50	1.00	0.99
14	3.12	1565.1	4.27	10.83	7.61	0.53	1.00	0.99
2	3.16	1404.5	4.26	15.67	7.43	0.50	1.00	0.99
14	3.16	1501.2	4.34	10.71	7.62	0.54	1.00	0.99
2	3.20	1342.8	4.35	15.52	7.44	0.51	1.00	0.99
14	3.20	1442.2	4.44	10.54	7.63	0.54	1.00	0.99
2	3.24	1304.1	4.95	14.58	7.47	0.51	1.00	0.99
14	3.24	1404.3	4.96	9.73	7.66	0.55	1.00	0.99
2	3.28	1317.8	5.90	13.10	7.52	0.51	0.99	0.99
14	3.28	1414.2	5.84	8.37	7.73	0.56	1.00	0.99
2	3.32	1379.2	6.47	12.24	7.55	0.52	0.99	0.99
14	3.32	1468.7	6.59	7.23	7.79	0.55	0.99	0.99
2	3.36	1461.3	6.69	11.92	7.55	0.51	0.99	0.99
14	3.36	1544.6	7.06	6.52	7.83	0.54	0.99	0.99
2	3.40	1546.6	6.66	11.99	7.55	0.51	0.99	0.99
14	3.40	1626.9	7.31	6.09	7.85	0.52	0.99	0.99
2	3.44	1626.0	6.57	12.14	7.54	0.50	0.99	0.99
14	3.44	1709.7	7.37	5.88	7.85	0.49	0.99	0.99
2	3.48	1698.3	6.47	12.31	7.53	0.50	0.99	0.99
14	3.48	1790.7	7.34	5.88	7.84	0.48	0.99	0.99
2	3.52	1766.8	6.47	12.34	7.53	0.49	0.99	0.99
14	3.52	1871.8	7.33	5.87	7.84	0.47	0.99	0.99
2	3.56	1837.3	6.55	12.23	7.53	0.49	0.99	0.99
14	3.56	1957.3	7.39	5.77	7.84	0.47	0.99	0.99
2	3.60	1916.8	6.75	11.94	7.54	0.49	0.99	0.99
14	3.60	2052.4	7.55	5.55	7.87	0.48	0.99	0.99

2	3.64	2011.4	7.02	11.54	7.56	0.50	0.99	0.99
14	3.64	2147.3	7.59	5.62	7.89	0.53	0.99	0.99
2	3.68	2121.2	7.29	11.16	7.57	0.50	0.99	0.99
14	3.68	2249.2	7.94	5.17	7.92	0.51	0.99	0.99
2	3.72	2239.1	7.29	11.20	7.57	0.49	0.99	0.99
14	3.72	2366.9	8.04	4.97	7.93	0.51	0.99	0.99
2	3.76	2332.3	6.58	12.33	7.53	0.50	0.99	0.99
14	3.76	2451.6	7.42	6.00	7.86	0.52	0.99	0.99
2	3.80	2341.8	4.99	14.82	7.45	0.50	1.00	0.99
14	3.80	2456.6	6.03	8.24	7.72	0.53	0.99	0.99
2	3.84	2267.6	3.95	16.41	7.41	0.50	1.00	0.99
14	3.84	2386.6	4.95	10.02	7.65	0.55	1.00	0.99
2	3.88	2168.3	3.84	16.56	7.41	0.50	1.00	0.99
14	3.88	2294.5	4.39	10.91	7.61	0.54	1.00	0.99
2	3.92	2069.5	3.88	16.47	7.41	0.50	1.00	0.99
14	3.92	2202.6	4.15	11.27	7.60	0.54	1.00	0.99
2	3.96	1975.1	3.93	16.35	7.41	0.50	1.00	0.99
14	3.96	2116.0	4.07	11.38	7.59	0.55	1.00	0.99
2	4.00	1885.4	3.99	16.24	7.41	0.50	1.00	0.99
14	4.00	2034.5	4.10	11.30	7.59	0.53	1.00	0.99

Mass Balance for Constituent 1

Initial Mass is 0.1459E+00 KG

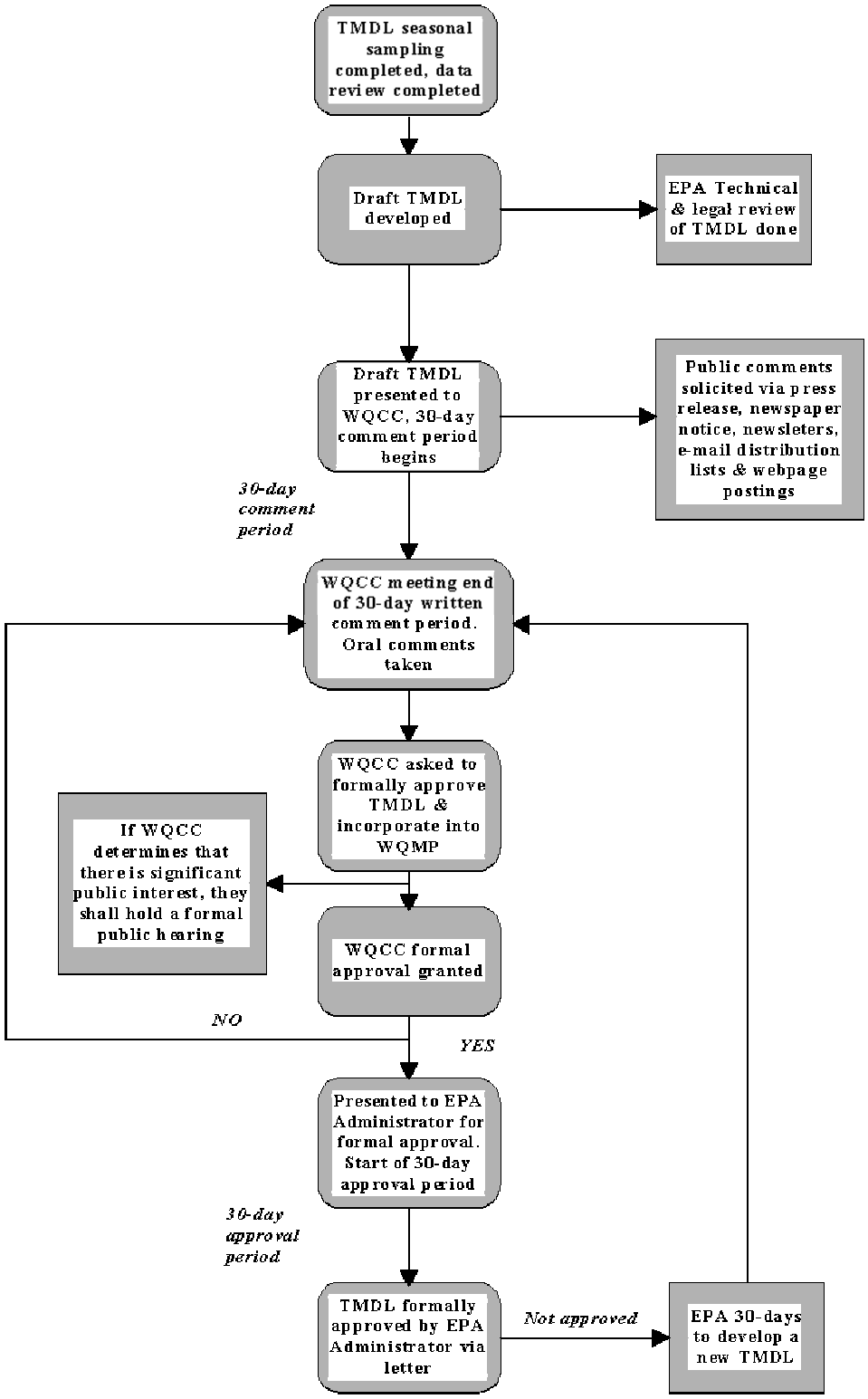
Time	Accumulated Mass In (KG) ***** Advection	Dispersion	Kinetic	Accumulated Mass Out (KG) ********** Resident Loading Mass (KG)	Excess Advection Mass (KG)	Buried	Dispersion
0.000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.040	0.2574E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.2980E-01	0.0000E+00	0.0000E+00
0.082	0.5277E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.7190E-01	0.0000E+00	0.0000E+00
0.122	0.7851E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.1414E+00	0.0000E+00	0.0000E+00
0.162	0.1043E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.3798E+00	0.0000E+00	0.0000E+00
0.200	0.1287E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.1017E+01	0.0000E+00	0.0000E+00
0.240	0.1544E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.2291E+01	0.0000E+00	0.0000E+00
0.280	0.1802E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.4110E+01	0.0000E+00	0.0000E+00
0.320	0.2059E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.6274E+01	0.0000E+00	0.0000E+00
0.360	0.2317E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.8599E+01	0.0000E+00	0.0000E+00
0.400	0.2574E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.1098E+02	0.0000E+00	0.0000E+00
0.440	0.2831E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.1336E+02	0.0000E+00	0.0000E+00
0.480	0.3089E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.1571E+02	0.0000E+00	0.0000E+00
0.520	0.3346E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.1804E+02	0.0000E+00	0.0000E+00
0.562	0.3617E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.2045E+02	0.0000E+00	0.0000E+00
0.602	0.3874E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.2274E+02	0.0000E+00	0.0000E+00
0.642	0.4131E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.2501E+02	0.0000E+00	0.0000E+00
0.682	0.4389E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.2728E+02	0.0000E+00	0.0000E+00
0.722	0.4646E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.2954E+02	0.0000E+00	0.0000E+00
0.762	0.4904E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.3181E+02	0.0000E+00	0.0000E+00
0.802	0.5161E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.3409E+02	0.0000E+00	0.0000E+00
0.842	0.5418E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.3639E+02	0.0000E+00	0.0000E+00
0.882	0.5676E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.3873E+02	0.0000E+00	0.0000E+00
0.922	0.5933E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.4110E+02	0.0000E+00	0.0000E+00
0.962	0.6191E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.4352E+02	0.0000E+00	0.0000E+00
1.002	0.6448E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.4597E+02	0.0000E+00	0.0000E+00
1.042	0.6705E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.4845E+02		

0.0000E+00	0.0000E+00	-0.4410E+01	0.1434E+02	-0.2196E-05
1.082	0.6963E+02	0.0000E+00	0.0000E+00	0.5093E+02
0.0000E+00	0.0000E+00	-0.4494E+01	0.1435E+02	-0.7121E-06
1.122	0.7220E+02	0.0000E+00	0.0000E+00	0.5343E+02
0.0000E+00	0.0000E+00	-0.4580E+01	0.1434E+02	-0.1208E-05
1.162	0.7478E+02	0.0000E+00	0.0000E+00	0.5592E+02
0.0000E+00	0.0000E+00	-0.4667E+01	0.1434E+02	-0.9830E-06
1.202	0.7735E+02	0.0000E+00	0.0000E+00	0.5841E+02
0.0000E+00	0.0000E+00	-0.4756E+01	0.1433E+02	-0.7497E-07
1.242	0.7993E+02	0.0000E+00	0.0000E+00	0.6090E+02
0.0000E+00	0.0000E+00	-0.4870E+01	0.1430E+02	-0.1576E-05
1.282	0.8250E+02	0.0000E+00	0.0000E+00	0.6338E+02
0.0000E+00	0.0000E+00	-0.5044E+01	0.1422E+02	-0.2124E-05
1.322	0.8507E+02	0.0000E+00	0.0000E+00	0.6585E+02
0.0000E+00	0.0000E+00	-0.5272E+01	0.1410E+02	-0.6442E-06
1.362	0.8765E+02	0.0000E+00	0.0000E+00	0.6828E+02
0.0000E+00	0.0000E+00	-0.5531E+01	0.1398E+02	-0.3549E-05
1.402	0.9022E+02	0.0000E+00	0.0000E+00	0.7069E+02
0.0000E+00	0.0000E+00	-0.5805E+01	0.1387E+02	-0.3632E-05
1.442	0.9280E+02	0.0000E+00	0.0000E+00	0.7306E+02
0.0000E+00	0.0000E+00	-0.6090E+01	0.1379E+02	-0.2936E-05
1.482	0.9537E+02	0.0000E+00	0.0000E+00	0.7540E+02
0.0000E+00	0.0000E+00	-0.6384E+01	0.1373E+02	-0.3329E-05
1.522	0.9794E+02	0.0000E+00	0.0000E+00	0.7771E+02
0.0000E+00	0.0000E+00	-0.6686E+01	0.1369E+02	-0.3590E-05
1.562	0.1005E+03	0.0000E+00	0.0000E+00	0.8000E+02
0.0000E+00	0.0000E+00	-0.6998E+01	0.1366E+02	-0.4556E-05
1.602	0.1031E+03	0.0000E+00	0.0000E+00	0.8228E+02
0.0000E+00	0.0000E+00	-0.7324E+01	0.1363E+02	-0.3195E-05
1.642	0.1057E+03	0.0000E+00	0.0000E+00	0.8455E+02
0.0000E+00	0.0000E+00	-0.7638E+01	0.1363E+02	-0.2918E-05
1.682	0.1082E+03	0.0000E+00	0.0000E+00	0.8682E+02
0.0000E+00	0.0000E+00	-0.7961E+01	0.1360E+02	-0.4863E-05
1.722	0.1108E+03	0.0000E+00	0.0000E+00	0.8909E+02
0.0000E+00	0.0000E+00	-0.8312E+01	0.1356E+02	-0.2800E-05
1.762	0.1134E+03	0.0000E+00	0.0000E+00	0.9135E+02
0.0000E+00	0.0000E+00	-0.8614E+01	0.1357E+02	-0.5649E-05
1.802	0.1160E+03	0.0000E+00	0.0000E+00	0.9362E+02
0.0000E+00	0.0000E+00	-0.8798E+01	0.1369E+02	-0.3649E-05
1.842	0.1185E+03	0.0000E+00	0.0000E+00	0.9592E+02
0.0000E+00	0.0000E+00	-0.8872E+01	0.1389E+02	-0.2609E-05
1.882	0.1211E+03	0.0000E+00	0.0000E+00	0.9826E+02
0.0000E+00	0.0000E+00	-0.8913E+01	0.1408E+02	-0.3848E-05
1.922	0.1237E+03	0.0000E+00	0.0000E+00	0.1006E+03
0.0000E+00	0.0000E+00	-0.8958E+01	0.1423E+02	-0.2138E-05
1.962	0.1263E+03	0.0000E+00	0.0000E+00	0.1031E+03
0.0000E+00	0.0000E+00	-0.9008E+01	0.1433E+02	-0.4234E-05
2.002	0.1288E+03	0.0000E+00	0.0000E+00	0.1055E+03
0.0000E+00	0.0000E+00	-0.9060E+01	0.1438E+02	-0.5001E-05
2.042	0.1314E+03	0.0000E+00	0.0000E+00	0.1080E+03
0.0000E+00	0.0000E+00	-0.9124E+01	0.1440E+02	-0.4836E-05
2.082	0.1340E+03	0.0000E+00	0.0000E+00	0.1105E+03
0.0000E+00	0.0000E+00	-0.9191E+01	0.1440E+02	-0.4018E-05
2.122	0.1366E+03	0.0000E+00	0.0000E+00	0.1130E+03
0.0000E+00	0.0000E+00	-0.9261E+01	0.1440E+02	-0.5328E-05
2.162	0.1391E+03	0.0000E+00	0.0000E+00	0.1156E+03
0.0000E+00	0.0000E+00	-0.9334E+01	0.1439E+02	-0.5573E-05
2.202	0.1417E+03	0.0000E+00	0.0000E+00	0.1181E+03
0.0000E+00	0.0000E+00	-0.9408E+01	0.1438E+02	-0.3981E-05
2.242	0.1443E+03	0.0000E+00	0.0000E+00	0.1206E+03
0.0000E+00	0.0000E+00	-0.9512E+01	0.1434E+02	-0.4425E-05
2.282	0.1469E+03	0.0000E+00	0.0000E+00	0.1231E+03
0.0000E+00	0.0000E+00	-0.9685E+01	0.1425E+02	-0.4100E-05
2.322	0.1494E+03	0.0000E+00	0.0000E+00	0.1255E+03
0.0000E+00	0.0000E+00	-0.9920E+01	0.1411E+02	-0.5536E-05

2.362	0.1520E+03	0.0000E+00	0.0000E+00	0.1280E+03	0.0000E+00	0.0000E+00	-0.1019E+02
0.1398E+02	-0.5445E-05						
2.400	0.1544E+03	0.0000E+00	0.0000E+00	0.1303E+03	0.0000E+00	0.0000E+00	-0.1045E+02
0.1386E+02	-0.6464E-05						
2.440	0.1570E+03	0.0000E+00	0.0000E+00	0.1327E+03	0.0000E+00	0.0000E+00	-0.1076E+02
0.1376E+02	-0.5227E-05						
2.480	0.1596E+03	0.0000E+00	0.0000E+00	0.1350E+03	0.0000E+00	0.0000E+00	-0.1108E+02
0.1367E+02	-0.6086E-05						
2.520	0.1622E+03	0.0000E+00	0.0000E+00	0.1373E+03	0.0000E+00	0.0000E+00	-0.1142E+02
0.1362E+02	-0.7668E-05						
2.560	0.1647E+03	0.0000E+00	0.0000E+00	0.1395E+03	0.0000E+00	0.0000E+00	-0.1176E+02
0.1359E+02	-0.7479E-05						
2.600	0.1673E+03	0.0000E+00	0.0000E+00	0.1418E+03	0.0000E+00	0.0000E+00	-0.1212E+02
0.1356E+02	-0.6906E-05						
2.640	0.1699E+03	0.0000E+00	0.0000E+00	0.1440E+03	0.0000E+00	0.0000E+00	-0.1250E+02
0.1351E+02	-0.8960E-05						
2.680	0.1725E+03	0.0000E+00	0.0000E+00	0.1462E+03	0.0000E+00	0.0000E+00	-0.1288E+02
0.1348E+02	-0.7474E-05						
2.720	0.1750E+03	0.0000E+00	0.0000E+00	0.1485E+03	0.0000E+00	0.0000E+00	-0.1326E+02
0.1345E+02	-0.7588E-05						
2.760	0.1776E+03	0.0000E+00	0.0000E+00	0.1507E+03	0.0000E+00	0.0000E+00	-0.1359E+02
0.1347E+02	-0.8632E-05						
2.800	0.1802E+03	0.0000E+00	0.0000E+00	0.1529E+03	0.0000E+00	0.0000E+00	-0.1379E+02
0.1361E+02	-0.7816E-05						
2.840	0.1828E+03	0.0000E+00	0.0000E+00	0.1552E+03	0.0000E+00	0.0000E+00	-0.1385E+02
0.1385E+02	-0.7656E-05						
2.880	0.1853E+03	0.0000E+00	0.0000E+00	0.1575E+03	0.0000E+00	0.0000E+00	-0.1387E+02
0.1408E+02	-0.9318E-05						
2.920	0.1879E+03	0.0000E+00	0.0000E+00	0.1599E+03	0.0000E+00	0.0000E+00	-0.1390E+02
0.1425E+02	-0.8061E-05						
2.960	0.1905E+03	0.0000E+00	0.0000E+00	0.1623E+03	0.0000E+00	0.0000E+00	-0.1394E+02
0.1436E+02	-0.7509E-05						
3.000	0.1931E+03	0.0000E+00	0.0000E+00	0.1648E+03	0.0000E+00	0.0000E+00	-0.1398E+02
0.1442E+02	-0.7835E-05						
3.040	0.1956E+03	0.0000E+00	0.0000E+00	0.1673E+03	0.0000E+00	0.0000E+00	-0.1403E+02
0.1445E+02	-0.9364E-05						
3.080	0.1982E+03	0.0000E+00	0.0000E+00	0.1698E+03	0.0000E+00	0.0000E+00	-0.1408E+02
0.1445E+02	-0.1040E-04						
3.120	0.2008E+03	0.0000E+00	0.0000E+00	0.1723E+03	0.0000E+00	0.0000E+00	-0.1413E+02
0.1445E+02	-0.1000E-04						
3.160	0.2034E+03	0.0000E+00	0.0000E+00	0.1749E+03	0.0000E+00	0.0000E+00	-0.1419E+02
0.1443E+02	-0.9263E-05						
3.200	0.2059E+03	0.0000E+00	0.0000E+00	0.1774E+03	0.0000E+00	0.0000E+00	-0.1425E+02
0.1442E+02	-0.9062E-05						
3.240	0.2085E+03	0.0000E+00	0.0000E+00	0.1799E+03	0.0000E+00	0.0000E+00	-0.1435E+02
0.1438E+02	-0.8548E-05						
3.280	0.2111E+03	0.0000E+00	0.0000E+00	0.1824E+03	0.0000E+00	0.0000E+00	-0.1453E+02
0.1427E+02	-0.1133E-04						
3.320	0.2136E+03	0.0000E+00	0.0000E+00	0.1849E+03	0.0000E+00	0.0000E+00	-0.1478E+02
0.1411E+02	-0.1068E-04						
3.360	0.2162E+03	0.0000E+00	0.0000E+00	0.1873E+03	0.0000E+00	0.0000E+00	-0.1507E+02
0.1395E+02	-0.1061E-04						
3.400	0.2188E+03	0.0000E+00	0.0000E+00	0.1898E+03	0.0000E+00	0.0000E+00	-0.1538E+02
0.1381E+02	-0.1005E-04						
3.440	0.2214E+03	0.0000E+00	0.0000E+00	0.1921E+03	0.0000E+00	0.0000E+00	-0.1570E+02
0.1371E+02	-0.1112E-04						
3.480	0.2239E+03	0.0000E+00	0.0000E+00	0.1944E+03	0.0000E+00	0.0000E+00	-0.1603E+02
0.1364E+02	-0.1203E-04						
3.520	0.2265E+03	0.0000E+00	0.0000E+00	0.1967E+03	0.0000E+00	0.0000E+00	-0.1636E+02
0.1360E+02	-0.1049E-04						
3.560	0.2291E+03	0.0000E+00	0.0000E+00	0.1990E+03	0.0000E+00	0.0000E+00	-0.1670E+02
0.1357E+02	-0.1117E-04						
3.600	0.2317E+03	0.0000E+00	0.0000E+00	0.2012E+03	0.0000E+00	0.0000E+00	-0.1706E+02
0.1354E+02	-0.1177E-04						
3.640	0.2342E+03	0.0000E+00	0.0000E+00	0.2035E+03			

0.0000E+00	0.0000E+00	-0.1741E+02	0.1353E+02	-0.1022E-04
3.680	0.2368E+03	0.0000E+00	0.0000E+00	0.2057E+03
0.0000E+00	0.0000E+00	-0.1777E+02	0.1350E+02	-0.1060E-04
3.720	0.2394E+03	0.0000E+00	0.0000E+00	0.2079E+03
0.0000E+00	0.0000E+00	-0.1816E+02	0.1345E+02	-0.1243E-04
3.760	0.2420E+03	0.0000E+00	0.0000E+00	0.2102E+03
0.0000E+00	0.0000E+00	-0.1849E+02	0.1346E+02	-0.1140E-04
3.800	0.2445E+03	0.0000E+00	0.0000E+00	0.2124E+03
0.0000E+00	0.0000E+00	-0.1868E+02	0.1360E+02	-0.9490E-05
3.840	0.2471E+03	0.0000E+00	0.0000E+00	0.2147E+03
0.0000E+00	0.0000E+00	-0.1873E+02	0.1386E+02	-0.9695E-05
3.880	0.2497E+03	0.0000E+00	0.0000E+00	0.2170E+03
0.0000E+00	0.0000E+00	-0.1874E+02	0.1410E+02	-0.1169E-04
3.920	0.2523E+03	0.0000E+00	0.0000E+00	0.2194E+03
0.0000E+00	0.0000E+00	-0.1874E+02	0.1429E+02	-0.9883E-05
3.960	0.2548E+03	0.0000E+00	0.0000E+00	0.2218E+03
0.0000E+00	0.0000E+00	-0.1876E+02	0.1441E+02	-0.9543E-05
4.000	0.2574E+03	0.0000E+00	0.0000E+00	0.2243E+03
0.0000E+00	0.0000E+00	-0.1878E+02	0.1448E+02	-0.8161E-05
4.001	0.2574E+03	0.0000E+00	0.0000E+00	0.2243E+03
0.0000E+00	0.0000E+00	-0.1878E+02	0.1448E+02	-0.8161E-05

APPENDIX B. PUBLIC PARTICIPATION



Appendix C:

One response was received during the public comment period. Jose Varela Lopez, a private citizen, provided three comments. His comment and the responses follow. Also attached is a copy of his original letter containing these comments.

C: According to recently released information in the Jemez Y Sangre Water Supply Study the dissolved oxygen and pH both fall within acceptable parameters outlined in the TMDL Draft Plan's Water Quality Criteria. I do not know why the numerical differences exist with respect to the two plans, but believe that the inconsistencies should be addressed.

R: The only pH or dissolved oxygen data presented in the Draft Jemez y Sangre Water Planning Region's Water Supply Study (August, 2000) are that of the National Water Quality Assessment (NWQA) administered by the U.S. Geological Survey. These data are median values for pH (8.5) and dissolved oxygen (102 percent saturation). The medians do not indicate what the maximum values for pH were, or the minimum values for dissolved oxygen. Violations of NM water quality standards are not based on medians. It is possible to violate water quality standards with only one sample. It is also possible to have violations of a standard in a data set that when a median is calculated, the median is not a violation of a standard. It is not clear that the NWQA data presented was collected using similar methods and measuring tools employed SWQB. SWQB employed continuous sampling for this TMDL (with example results summarized in Figure 5 of the draft TMDL), and any values above the standard for pH or below the standard for DO were taken as violations.

C: The State of New Mexico Surface Water Quality Bureau (SWQB) Implementation Plan also contains flaws. First of all, the Santa Fe River Restoration Project being undertaken by the Forest Guardians is not on land leased to them by BLM. The BLM is prohibited from leasing land for this type of undertaking. The Forest Guardians are in fact creating the riparian forest on property belonging to the City of Santa Fe. Secondly, the SWQB should realize that the BMPs being implemented on this project do not take into account the ephemeral nature of this section of the Santa Fe River. As such, extensive vegetation has never been a factor in this area. However, with the creation of this riparian forest along the flood plain, the SWQB and Forest Guardians have in effect greatly altered the prevailing ecosystem without any studies to address the consequences of such a project on downstream communities in general, nor private property in specific.

R2: You are correct that the Santa Fe River Restoration Project is being conducted on land owned by the City of Santa Fe. The document will be updated to reflect this.

With regard to your comment about the past condition of the Santa Fe River, please note that SWQB is not charged with restoring streams to their historical conditions (despite the suggestion implied by some project titles), but rather to enforce the New Mexico Water Quality Act, which recognizes designated uses for surface water and sets standards which are believed to protect those uses. If either the uses or the standards are believed to be inappropriate for a water body,

and sufficient evidence to that effect is available, then the New Mexico Water Quality Control Commission may amend the standards to better reflect reality.

With regard to the environmental impact of the Santa Fe River Restoration Project, you are correct that a detailed study has not been completed to assess the potential downstream impacts of the project. However, several features of the project are intended to improve downstream conditions. The vegetation that is being planted and encouraged is intended to strengthen the bank, with the desired outcome that less sediment will erode and be transported downstream. Providing access by flood flows to more of the flood plain in the project area will also reduce erosion and potential downstream flooding by slowing the floodwater.

C: The TMDL Draft also states that the Water Quality Act, "does not grant to the commission or to any other entity the power to take away or modify the property rights in water, nor is it the intention of the Water Quality Act to take away or modify such rights." This policy is also upheld under Federal Law. Therefore, given the fact that the State of New Mexico SWQB is allowing Forest Guardians to construct a riparian forest, and given the resulting consumptive use of water by said forest, it would appear that the SWQB is in fact abrogating the rights of senior water rights users downstream. This would appear to be a violation of both State and Federal Law. To the best of my knowledge no study has been completed or commissioned to deal with this matter.

R: The SWQB supports efforts to stabilize streambanks along the Santa Fe River. The Santa Fe River is impaired by not only dissolved oxygen and pH, but also by stream bottom deposits (TMDL previously approved Dec 1999). Stabilizing streambanks will help to decrease sediment loads into the river by decreasing the erosion of streambanks. Holding the streambanks in place with riparian vegetation also provides shade to the stream. This shade is necessary to reduce temperatures and direct sunlight to the stream, which drive the dissolved oxygen and pH problems in the Santa Fe River. The intent of stabilizing the streambanks along the Santa Fe River is to improve water quality so that water quality standards are being met. The SWQB believes that an additional benefit of shading streams would be decreases in evaporative losses. However, all inquiries related to water rights should be directed to the Office of the New Mexico State Engineer.

Appendix D: §319 Projects in the Santa Fe Watershed

Listed below are completed, current, and proposed Clean Water Act Section 319(h) nonpoint source pollution prevention projects administered by the New Mexico Environment Department Surface Water Quality Bureau in the Santa Fe River watershed. Any effect that each project may have on dissolved oxygen or pH in the Santa Fe River is briefly included.

The map below depicts the approximate locations of the projects.

1. La Bajada Mine Restoration (95-D, $107,922, Complete)
This project successfully demonstrated Best Management Practices (BMP's) on uranium mine tailings and the adjacent Santa Fe River, reducing detectable radiation downstream of the mine to meet water quality standards.

2. Santa Fe River Restoration (99-L, $143,840, In Progress)
The lead agency is the New Mexico State Land Office, which is partnering with the City of Santa Fe and the Santa Fe Watershed Association to mechanically improve the currently ephemeral portion of the Santa Fe River above the WWTP with enhancement of riparian growth and minimization of the erosion and sediment discharge that has occurred in this watershed. This project will indirectly contribute to stabilized dissolved oxygen concentrations and pH in the Santa Fe River by inhibiting algal growth through decreased solarization, which is expected to result from a decreased width to depth ratio of the river channel, which in turn is an expected outcome of reduced sediment supply. The reduced available light and resulting lower temperatures will both reduce algal growth. With less algal growth, lower pH is expected in the day (because more CO_2 will be left in the water column), and higher DO is expected at night (with less respiration by algae occurring).

3. Caja del Rio Project (99-N, $133,000, Proposed)
The lead agency is the US Santa Fe National Forest. The Forest Service plans to increase vegetation on damaged rangelands by drawing cattle away from riparian areas with a pipeline, fencing riparian areas, and burning sagebrush to enhance grasses. This project will indirectly contribute to stabilized dissolved oxygen concentrations and pH in the Santa Fe River by inhibiting algal growth through decreased solarization, which is expected to result from increased shading by riparian vegetation and a concomitant decreased width to depth ratio of the river channel.

4. Santa Fe River Restoration Project (00-E, $134,500, In Progress)
The lead organization is the Forest Guardians, who are continuing to work on land on the Santa Fe River leased by them by the Bureau of Land Management. The focus of this project is on enhancing the riparian zone to reduce temperatures, remove nutrients form the water, and decrease sediment discharge. The BMP's being implemented include temporary cattle exclusion, revegetating stream banks (*e.g.,* planting of willows and cottonwoods), and removal of a levee (to allow access of high flows to the flood plain). The created wetlands expected to form will directly address ph and DO problems in the river by removing a portion of the nutrient

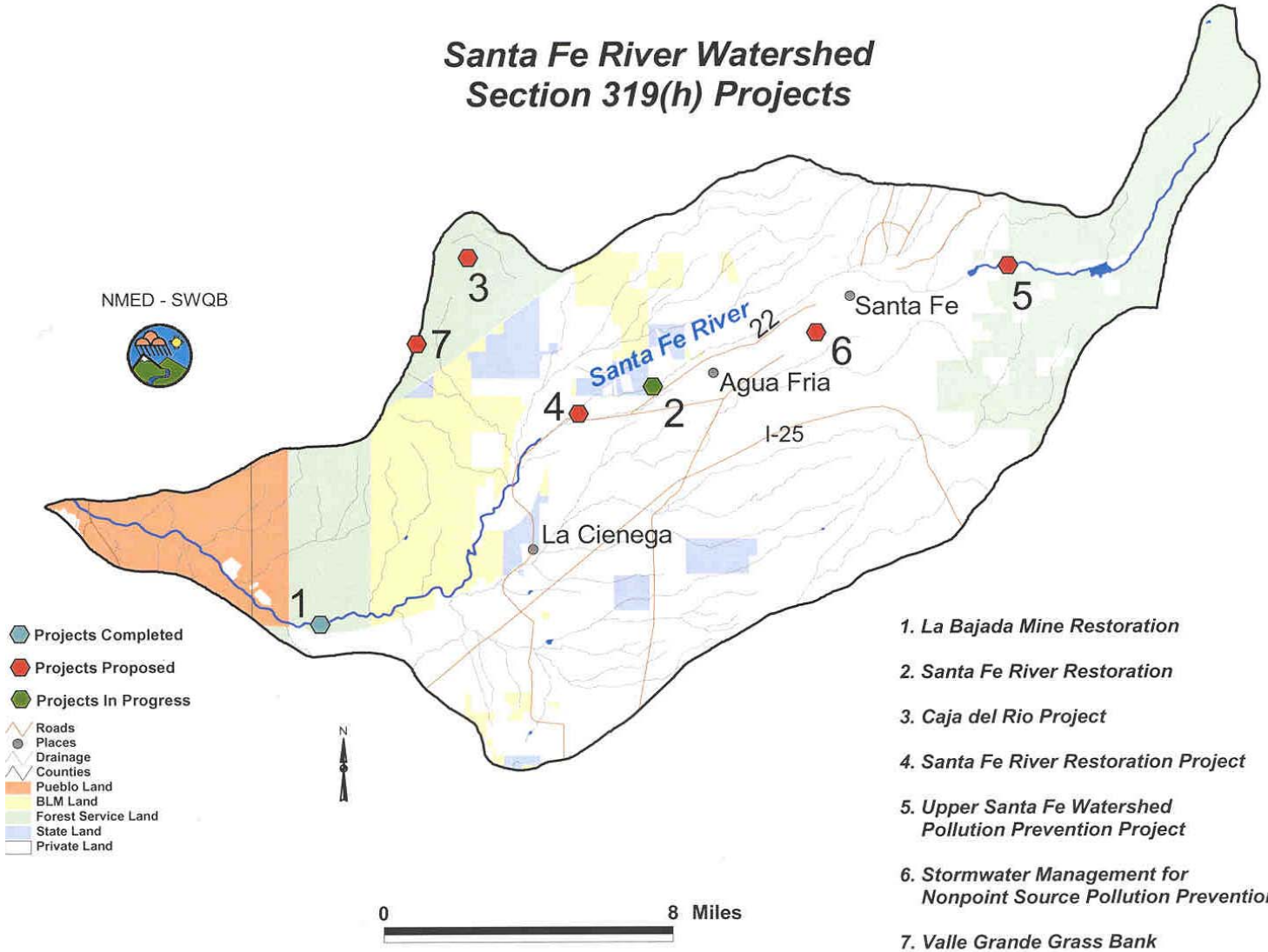
load. This project will also indirectly contribute to stabilized dissolved oxygen concentrations and pH in the Santa Fe River by inhibiting algal growth through decreased solarization, which is expected to result from increased shading by riparian vegetation and a concomitant decreased width to depth ratio of the river channel.

5. Upper Santa Fe Watershed Pollution Prevention Project (00-D, $736,450, Proposed)
The Santa Fe National Forest and City of Santa Fe propose to thin and burn 1100 ac of piñon/juniper and ponderosa forest in the upper Santa Fe River watershed. The upper watershed contributes 40% of Santa Fe's municipal water supply, and 70 years of fire suppression have resulted in very high fuel loading levels that increase the chances of a large intense wildfire that would reduce the quality or quantity of this water supply. Another component of the project that will be an important key to improving water quality in the listed portion of the Santa Fe River is the development of a watershed restoration action strategy (WRAS) for the entire Santa Fe River watershed. This WRAS is incorporated in an EPA-approved workplan as a deliverable and includes the components described as per EPA guidance on WRAS's.

6. Stormwater Management for Nonpoint Source Pollution Reduction in Santa Fe (97-N, $463,735, Proposed)
The City of Santa Fe proposes to implement urban runoff controls in the Arroyo de los Pinos channel and watershed. The Arroyo de los Pinos is an important tributary of the Arroyo de los Chamisos, which discharges a large amount of stormwater-driven sediment to the Santa Fe River. The proposed project will slow, detain, and utilize urban runoff to reduce peak flows reaching the Arroyo de los Chamisos. The on-the-ground project components will be used to illustrate effectiveness of a proposed drainage ordinance also to be developed with project funding. The reduction in peak stormwater flows expected from this project will be less erosive than current peak flows, allowing establishment of more riparian vegetation and a concomitant reduction in width to depth ratio of the stream channel. The resulting reduction in solarization will indirectly contribute to stabilized dissolved oxygen concentrations and pH in the Santa Fe River by inhibiting algal growth.

7. Valle Grande Grass Bank Composite Project (00-C, $541,417, Proposed)
The Conservation Fund proposes several coordinated range restoration projects on Forest Service land utilizing the Valle Grande Grass Bank. Proposed projects in the Santa Fe River watershed include erosion control using channel structures, slash lopping and scattering, and seeding on 250 ac of rapidly eroding land in the Cerrito Pelado area of the Caja del Rìo Plateau, and rest from grazing and prescribed burning on the Caja del Rìo Plateau and a portion of Rowe Mesa that is within the Galisteo River watershed. This project also includes an education program of outdoor workshops and conferences attended by ranchers from across New Mexico. The improved management of rangelands on the Caja del Rio allotment of the Santa Fe National Forest expected from this project will improve infiltration and reduce runoff to the Santa Fe River, with the indirect result of permitting more establishment of riparian vegetation and a concomitant decrease in width to depth ratio of the stream channel. The resulting reduction in solarization will indirectly contribute to stabilized dissolved oxygen concentrations and pH in the Santa Fe River by inhibiting algal growth.

Santa Fe River Watershed
Section 319(h) Projects



1. *La Bajada Mine Restoration*
2. *Santa Fe River Restoration*
3. *Caja del Rio Project*
4. *Santa Fe River Restoration Project*
5. *Upper Santa Fe Watershed Pollution Prevention Project*
6. *Stormwater Management for Nonpoint Source Pollution Prevention*
7. *Valle Grande Grass Bank Composite Project*