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STORM WATER MANAGEMENT FOR LITTLE LEHIGH AND CEDAR CREEK DRAINAGE BASINS

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PREPARED UNDER THE SUPPORT OF THE CITY OF

ALLENTOWN, PENNSYLVANIA URBAN OBSERVATORY

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ALLENTOWN URBAN OBSERVATORY

The Allentown Urban Observatory is a joint enterprise between the City of Allentown and several colleges and universities in the Allentown area. The program is designed to utilize university research capabilities to solve problems of local government. Research topics are adopted each year by the Policy Board, and results of the activities are disseminated to City Council, the Mayor and his staff, and other interested persons and organizations.

Funding for the Observatory is provided by the United States Department of Housing and Urban Development, the City of Allentown, and the university or college where the research is performed.

Urban Observatory Staff

Mr. Dennis Hermanson, Director
Mr. Joseph Connovitch, Assistant Director
Mr. Donald Bernhard, Research Assistant
Ms. Joanne Boyle, Secretary

The research team for the project consisted of Robert L. Johnson, Associate Professor, Paul J. Usinowicz, Assistant Professor, Roderick D. Reardon, Research Assistant, Edward D. Wetzel, Research Assistant and Robert A. Putt, Research Assistant, all of the Civil Engineering Department, Lehigh University. The research team reported to an Advisory Committee for the project which consisted of the following members:

Advisory Committee for the Storm Water Management
for Little Lehigh and Cedar Creek Drainage Basins

Hon. Benjamin Howells
City Councilman
City of Allentown, Pennsylvania

Mr. James Kelley
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PROJECT SUMMARY AND RECOMMENDATIONS

Extensive field surveys and data collection were used to develop a first level calibration of the Storm Water Management Model (SWMM) as released by the U. S. Environmental Protection Agency. The calibration accomplished was for both quantity and quality aspects of storm water runoff. Initial steps have been taken by City of Allentown engineering and planning personnel to develop understanding and operational competence to use the computer simulation model for both design and planning efforts in the suburban areas of Allentown.

The College Heights Boulevard drainage system, which was used to calibrate the SWMM, is upstream of the major water supply intake for Allentown. Thus, the ability to predict quality of storm water runoff is an important end result of this study. The field surveys and data collection also brought out some potential water quality problems for Allentown. Algal nutrients, nitrogen and phosphorous, are present in appreciable quantities and can cause excessive growth of algae with potential taste and odor problems in the water supply. In particular, the nitrate levels, as high as 6 mg/l as N, could exceed the U. S. Drinking Water Standard limit of 10 mg/l as N, if further urbanization causes any increase in nutrient levels.

The second quality item concerns the duck ponds in the area upstream of the water supply intake. The limited data available shows a definite degradation of the Cedar Creek water quality due to the duck ponds, particularly with regard to the coliform bacteria levels. It is strongly recommended that further study and evaluation be made of the impact, both real and potential, of these duck ponds.

During the calibration of the SWMM for the College Heights Boulevard drainage system, it was established that appreciable impervious areas of the drainage basin did not discharge their storm runoff into the storm drainage system. Instead, they discharged onto lawns and other pervious areas which allowed the water to infiltrate into the soil. The impact of this observation could be appreciable since this rather drastically reduces the amount and rate of storm runoff. By continuing this practice and encouraging new development areas to do the same or more, the design of future storm sewers would be affected since much smaller and less costly systems could be installed. On the other hand, the increased infiltration of storm water in this particular geological area could contribute to sink hole development.

It is recommended that the City of Allentown address the problem of roof drains, driveways and other impervious areas for storm water discharge and establish a policy of where the storm water from these areas should go. This will be essential to allow the engineering and planning personnel to properly design and evaluate the impact of urban developments. The use of SWMM for this will be of prime importance since the simulation model was calibrated for the Allentown area.

It should be clearly established that the present SWMM has only a first level calibration. To allow optimum use of the planning and design capabilities in SWMM, the City of Allentown should continue collection of storm rainfall data and establish a permanent storm water flow measuring installation to develop a finer calibration of the SWMM computer model. The refined calibration of the SWMM will allow greater confidence in the application of the computer model for planning and engineering design problems.

STORM WATER MANAGEMENT PROBLEMS

On any given summer day, one might expect a sudden thundershower in the afternoon. What happens to the rain water when the skies open up to dump an inch or more of water on the land in a relatively short length of time?

Initially, a small amount of water will be intercepted by trees, plants and grass. With any but the smallest shower, this is only the start. The subsequent quantities of rain will infiltrate into the ground at a rate dependent on the type of soil, ground cover and previous rainfall. If the storm intensity is high, the ability of the ground to assimilate the water will be exceeded. Rainfall in excess of the infiltration rate will become storm water runoff. What happens to this excess precipitation is the concern of this study. In undeveloped areas the amount of runoff will generally be contained within natural channels, but even when there are great quantities of storm runoff, it will not cause extensive damage to man due to flooding. The natural runoff will not degrade the receiving water body and it will not increase background pollution levels.

In contrast, excess rainfall on developed urban and suburban communities can lead to several undesirable effects. On this developed land varying portions of the soil will be covered by many types of impervious material; asphalt or concrete, for example. This fact alone will lead to increased runoff. In addition, developed land often has a much greater hydraulic efficiency. The combination of more rain water runoff and smoother channels will cause larger flows to be delivered to receiving streams sooner. Thus the stage is set for increased flooding of small streams and low lying areas. Communities often install storm water drainage systems to protect homes and property. These are generally separate from the sanitary system but are often combined in older systems. When adequately sized, these systems will reduce flooding of homes and businesses. However, the hydraulic efficiency of the land is increased, often causing larger floods downstream. Continued urbanization generally leads to more impervious land and a bigger storm water problem.

Another point to note is the large reduction (2,3,4,10) in quality that occurs when rainwater falls onto the land, flows over this land to the nearest channel, and into the receiving water body (20). The quality of storm water will often be comparable to raw sewage. The biochemical oxygen demand (BOD) can range upwards of 50 mg/1, coliform bacteria counts range from 10^3 to 10^6 per 100 ml and phosphates and suspended solids will increase. If the receiving water also happens to be a water supply, as is the case with Allentown, large quantities of storm water input will be detrimental to that water supply.

Most people agree that storm water runoff in urban areas is a problem. But, what can be done about it? It would be a great benefit to cities and the suburbs if they could predict, via models, both the quantity and quality of storm runoff.

Such a model would help many communities. First, it would help to size storm drainage systems. While a pipe network needs to be large enough to prevent most flooding, cities do not want to pay excessive costs for a drainage system designed to prevent flooding during an exceptional storm that may occur only once in 25 or 100 years. Secondly, a storm water model would predict quality changes in receiving water. Such a prediction would provide information to planners such as: How much damage will occur to the receiving stream? Will it be usable for fishing or as a water supply? Should storm water be treated? What effect will increased land development have?

The U. S. Environmental Protection Agency, through Water Resources Engineers, Metcalf & Eddy, Inc., and the University of Florida, has developed such a model (12,13). This model, commonly referred to as SWMM (Storm Water Management Model), when properly calibrated, has the capability of providing to the City of Allentown both planning and engineering information needed for making sound decisions to deal with storm water problems of the future.

During the past year, the Water Resources Division of the Fritz Engineering Laboratory at Lehigh University has laid the groundwork for the use of SWMM by the City of Allentown. As a first step towards modeling the effect of storm water of the Little Lehigh Creek, various water quality parameters have been monitored over a period of eight months. The results from these many analyses will provide a measure of background data on this stream which is a major drinking water source for Allentown. A major effort in the sampling program was directed towards defining the quality of storm water from Allentown urban areas. Even though the summer portion of the year was quite dry, storm water samples were collected and analyzed during the period from May through September. These storm water quality analyses, together with rainfall and runoff flow measurements from the College Heights Boulevard drainage basin have allowed a first level calibration of the SWMM computer model.

The SWMM computer program is large and complex. The program is separated into four computational blocks entitled: RUNOFF, TRANSPORT, STORAGE/TREATMENT, and RECEIVE. The blocks model the rainfall and runoff, the piping network, various storage and/or treatment alternatives, and the storm water effect on the receiving water. Simply stated, SWMM takes a specified rainfall intensity and duration, one or more drainage areas with associated piping together with any storage and/or treatment facility, and predicts the quantity and quality of runoff including the effect of storage and treatment on the storm water quality. The changes in water flow and quality in the receiving stream can be predicted using the RECEIVE block.

To accomplish this rather extensive simulation task, SWMM requires appreciable input data of the physical system involved. For successful simulation, the drainage basin must be divided into representative subcatchments and the slope of the contributing land and conveyance channels determined. Land use must be defined along with the portion of hydraulically efficient impervious areas (6). Surface depression and retention storage together with the infiltration capacity of the soil-vegetative cover are needed to define the response of the land and cover to hydrologic events.

Adaption of the SWMM program to the Lehigh University Computer Center CDC 6400 computer was a demanding task in itself. As released by EPA for public use, the SWMM program requires approximately 800,000 octal words of computer storage, The CDC 6400 system at the LUCC has only about 120,000 octal words available to the user. Sophisticated computer operating systems together with reduction of program size were necessary to make SWMM operational. The details of this effort are given in Fritz Engineering Laboratory Report 416.1 (21).

Calibration of SWMM for the Allentown conditions was accomplished by measuring the rainfall and runoff quantity and quality from the College Heights Boulevard drainage basin for several storms and comparing with the SWMM output time sequences of predicted runoff quality and quantity using the observed rainfall data. If there were differences between predicted and observed values, the calibration factors were numerically modified in the model and SWMM was run again to obtain a new set of predicted values. Through repeated comparison between measured and predicted values, a first level calibration was obtained.

The final phase in the project was the introduction of the SWMM to the engineers and planners from the City of Allentown. This was accomplished by assisting the City personnel to develop SWMM for the prediction of runoff through the proposed Salisbury Township Planned Residential Development.

PROJECT APPROACH

Stream sampling locations were chosen on the Little Lehigh Creek and the tributary Cedar Creek after a field survey of the streams. Sampling stations were located at three points on the main stream of the Little Lehigh Creek Between Pa. Route 100 in Macungie and the 15th Street Bridge in Allentown. The Cedar Creek, together with the tributary Little Cedar Creek, was selected for the remainder of the sampling points for two reasons. First, the Cedar Creek Basin is highly developed and receives storm water input at many points. Secondly, the initial field surveys indicated increased turbidities on the Cedar Creek and, in particular, the Little Cedar Creek during storm water runoff periods. Table 1 gives the exact location of each sampling station. Figure 1 is a map of the Little Lehigh Creek Watershed indicating both the sampling locations and the smaller drainage divisions of the basin.

Table 1
Stream Sampling Stations

Station	Description	Symbol[a]
Little Lehigh Creek	North Bank, 30 yards upstream from 15th Street Bridge (Ward Street)	WTP
Little Lehigh Creek	North Bank, 20 yards upstream from Route 29 Bridge (Cedar Crest Boulevard)	LLC-29
Little Lehigh Creek	North Bank, 400 yards downstream from junction with Schaefer Run	LLC-SR
Cedar Creek	North Bank, 100 yards upstream from junction with Little Lehigh Creek	CC1
Cedar Creek	25-50 yards upstream from junction with Little Cedar Creek, downstream from Cedar Crest Boulevard Bridge	CC2
Cedar Creek	Just upstream from fish hatchery at County Home, 50 yards upstream from Cedar Brook Road bridge	CC3
Little Cedar Creek	Midway between Cedar Crest Boulevard and junction with Cedar Creek	LCC1
Little Cedar Creek	Just downstream from Springhouse Road Bridge	LCC2

[a]Used on watershed map and on analysis sample sheets

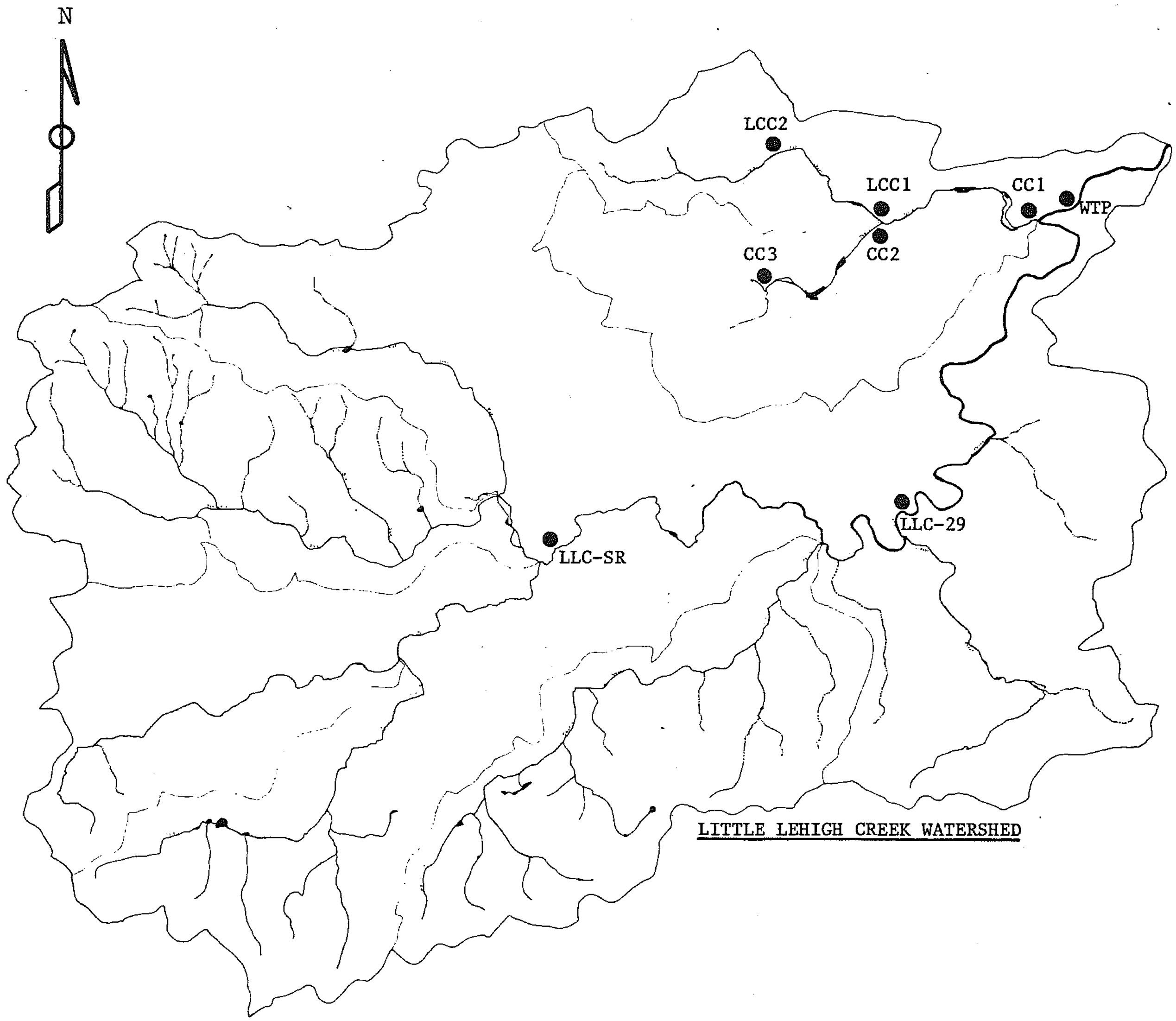


Fig. 1 STREAM WATER QUALITY SAMPLING SITES

Since the Cedar Creek and Little Cedar Creek had already been chosen for more intensive stream sampling, the vast majority of the stormwater sampling was also done in this area. In particular, the 24 inch storm sewer outfall downstream from the Ott Street Bridge and the Trexler Park storm sewer outfall of the College Heights Boulevard drainage network were singled out for the most intensive sampling. The storm runoff sampling points are located on Figure 2 and tabulated in Table 2.

Table 2

Storm Runoff Sampling Points

Sampling Point	Location	Symbol
Ott Street Storm Sewer Outfall	24" pipe: North Bank of Cedar Creek just downstream from Ott Street Bridge	OSS
College Heights Boulevard Storm Sewer	3'x11' twin box sewer in Trexler Park; third manhole upstream from stilling basin	CHB
Trexler Park Apartments Storm Outfall	24" pipe: West Bank Little Cedar Creek; Trexler Park, 100 yards upstream from old springhouse	TAO
15th Street Storm Sewer Outfall	4.5'x8' box sewer North Bank of Little Lehigh just upstream from 15th Street Bridge	WTPSS
Muhlenburg Lake Outfall	15" pipe: South Bank of Lake Muhlenburg, below South Berks Street	LMO

Samples were collected and analyzed on a weekly basis from February through May, and thereafter on a monthly basis. Field tests and laboratory analysis were the two basic types of analyses performed.

The field tests were made at the time the samples were collected. Two 1-liter samples for physical and chemical parameter tests were collected in plastic sampling bottles for analysis in the laboratory, and a 150 ml sample was collected in a sterile bottle for coliform tests. Table 3 shows the tests performed, the methodology used, and any special equipment involved.

In addition to the quality parameters listed in Table 3, tests were performed for heavy metals in the streams, particularly for chromium, cadmium and lead. All of these analyses for heavy metals were performed by atomic absorption spectrophotometry.

Fig. 2 STORM WATER SAMPLING SITES

Table 3

Water Quality Parameter Analyses

Analysis	Method	Equipment and/or Reagents	Major Interferences[a]
pH[f]	Hach Colorimetric	wide range pH indicator	turbidity, color
Temperature[f]	Standard Methods[a]	Mercury thermometer or Thermistor on D. O. Probe	
Alkalinity[f]	Standard Methods[a] colorimetric titration	0.02 N H_2SO_4	interfering color or turbidity
CO_2[f]	Standard Methods[a] colorimetric titration	0.0454 N Na_2CO_3	Al, Cr, Cu, Fe, high TDS, excess indicator
Dissolved Oxygen[f]	Standard Methods[a] membrane electrode	YSI Model D. O. meter w/field probe	
Hardness	Standard Methods[a] EDTA Titrimetric		Si, Al, Fe, Mn, PO_4, suspended solids, dilution water for Ca^{++}
Ammonia	Specific Ion Electrode[b]	Orion Ammonia Electrode model 95-10	Volatile Ammonia
Nitrate	Standard Methods[a] (Tentative) Specific Ion Electrode[c]	Orion Model 93-07 Nitrate Electrode	HCO_3^-, Cl^-, NO_2^-, HS^-, CN^-, $SO_4^{=}$, $CO_3^{=}$
Ortho-Phosphate	Standard Methods[a] Colorimetric	Stannous Chloride, B&L Spec. 20	excess molybdate, F^-, $S^{=}$
COD	Standard Methods[a]		Aliphatic, aromatic hydrocarbons, Cl^-, NO_2

Table 3 (Cont.)

Analysis	Method	Equipment and/or Reagents	Major Interferences[a]
Total, Suspended, Dissolved and Volatile Solids	Standard Methods[a]		volatile compounds, oil, grease, volatile minerals
Tannins and Lignins	Hach colorimetric	--	hydroxylated aromatics
BOD_5	Standard Methods[a]		toxics
Total Coliforms	Standard Methods[a]	Membrane Filter	toxics, excess suspended matter
Turbidity	Standard Methods[a]	Hach Turbidimeter	Bubles, dirty glassware, debris, coarse sediments
Color	Hach Colorimetric		interfering color or turbidity

[a]Reference 1
[b]Reference 14
[c]References 8 and 11
[f]Test run in field

The storm flow measurements were made by two methods, neither of which was entirely satisfactory. Both methods were variations on depth of flow measurement. At Ott Street, where the stormwater runoff discharged from a circular 24 inch concrete pipe into the Cedar Creek, depth measurements were made at the outlet of the pipe. Flow was then calculated using the Manning Equation, assuming the roughness n = 0.013. Unfortunately, this method assumes that the depth of flow at the outlet is the normal depth of flow. In reality, there was an undetermined amount of drawdown at the outlet which introduced error into this determination. At the College Heights Boulevard storm sewer, flow in the twin 3'x11' concrete box sewer terminated in a stilling basin before entering the Little Cedar Creek. Since both barrels of the sewer are the same size, material and slope, it was assumed flow would be equal in either side. The depth of flow was manually recorded from a meter stick strapped to manhole steps in the south barrel several hundred feet upstream from the stilling basin. A backwater analysis of flow in the sewer from the stilling basin to the manhole was made to insure that the measurement site was not influenced by that factor.

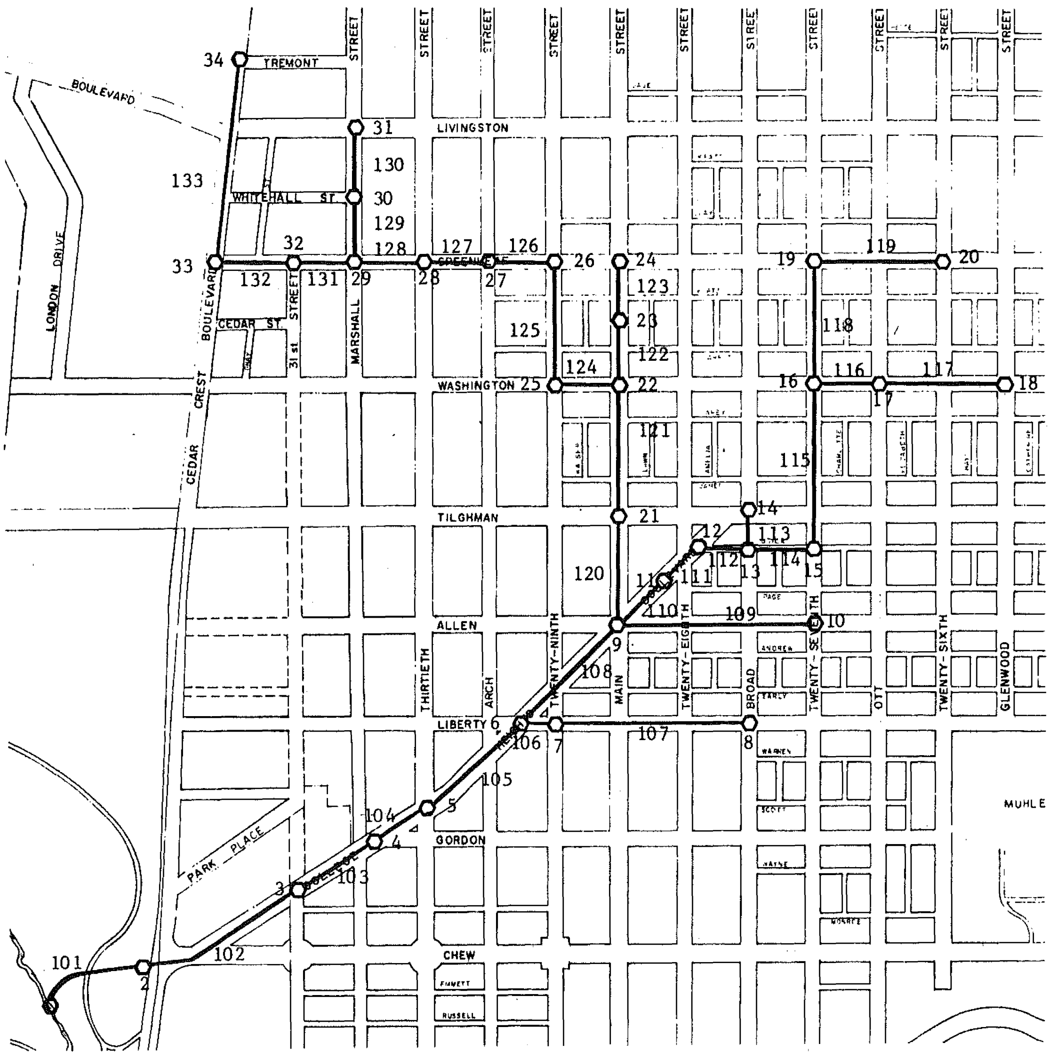
Late in the study it was discovered that sedimentation in the unmonitored north barrel had caused the flow to be highly unsteady in that barrel. Velocity measurements also showed the Manning "n" in the north barrel to be several times larger than would be expected in a concrete pipe. This fact made the flow measurements also somewhat suspect. On the basis of 10 velocity-depth measurements in the north barrel, flow in that barrel was computed to be 1.8 times the flow in the south barrel.

Initial rainfall measurements were made with a digital recording rain gage with a resolution of 0.1 inch provided by the City of Allentown. Mechanical difficulties with this gage necessitated its return to the factory for repairs, and its use was lost for the remainder of this study. Subsequent rainfall measurements were recorded manually from a 2 inch diameter, plastic, 5 inch capacity Taylor rain gage attached to a stake in the center of a field next to the storm water outlets. This simple gage was marked in 0.05 inch increments. During the later stages of the study a U. S. Weather Bureau recording rain gage was made available for use by the National Weather Service of the Allentown-Bethlehem-Easton Airport in Allentown. This was not available soon enough to be an important factor in this phase of the study, but is and will be available for future monitoring of rainfall for refinement of the SWMM calibration.

In addition to the samples and field data collection for rainfall and storm runoff flow rates, it was necessary to obtain the information to adequately describe the physical system for the computer model SWMM. The initial step was to obtain a large scale (1"=400') map of the area. This, along with physical data on the storm sewer pipes, was obtained from the City of Allentown engineering department. Next, the drainage area was divided into subcatchments. Every effort was made to keep the subcatchments generally rectangular in shape and to limit the area to land of uniform shape and land use characteristics (15). In the development of the model input data, the general procedure outlined in the SWMM user manual (7) was followed. The actual extent of the drainage basin was determined from topographic maps, aerial photos, and field observation when necessary. The measurements and the required data as outlined in the SWMM user manual such as area and slope, were obtained or calculated. Tables 5-7 and 6-6 of the SWMM user manual (7, p 74 & 154) and Figure 3 for the College Heights Boulevard drainage system provide additional information on the type of data required as input to the simulation model. The final step in data preparation was the physical representation and numbering of the drainage network. Again, the SWMM user manual or Figure 4 provide more information on this phase of the work.

By the end of October 1976, enough measured data had been acquired on four storms so that comparisons could be made with predicted values from SWMM. Then the required parameter changes were made, and a first calibration achieved. Table 4 shows the dates of the storms, the total rainfall modeled, the time increment in the measured values, and the time increment used in the SWMM computer model. The results of this first level calibration model will be discussed later.

Fig. 3 COLLEGE HEIGHTS BOULEVARD DRAINAGE SYSTEM SUBCATCHMENTS



PIPES 101-133
MANHOLES 1-34

Fig. 4 PIPE SYSTEM FOR COLLEGE HEIGHTS BOULEVARD DRAINAGE SYSTEM

Table 4

Storm Events Modeled

Date	Rain Data							
Year 1976	ABE (USWB) Data				Data Recorded at Sample Site			
	Start	End	Duration	Depth	Start	End	Duration[a]	Depth
6/29	1400	1500	<1 hr	.03	1500	1530	30 min	0.31
9/15-9/17	2000	0600	34 hr	2.74	2200	1500	17 hr[b]	0.65
9/5-9/16	2000	1500	19 hr	1.41				
9/26-9/27	0900	0200	17 hr	0.79	1120	1530	4 hr[c]	0.20
9/26	1100	1600	5 hr	0.18				
10/7-10/9	2100	1200	15 hr	1.48	2100	1200	15 hr[d]	1.96
10/9								

[a]Rainfall recorded from start of storm until flow measurements were stopped.

[b]Flow measurements and incremental rainfall measurements made from 0905-1510

[c]Flow measurements and incremental rainfall measurements made from 1130-1530

[d]Flow measurements and incremental rainfall measurements made from 0715-1500

In addition to the measured storm events, a theoretical storm of 1 in 10 year frequency (16,17,18,19) and 3 hour duration was derived to test the sensitivity to the SWMM model to various input and calibration parameters and to exhibit the use of the model in planning. The development of the 10-year 3-hour design storm event is shown in Appendix A.

For results of this study to be of lasting value for the City of Allentown, it is necessary that the city engineering and planning personnel be confident in their ability to use the computer model to produce valid predictions. One excellent way to understand a simulating model such as SWMM is to use it, and a latter portion of this project has been aimed at assisting the City personnel in applying the first level calibration model to a real life situation.

The drainage basin which includes the proposed Salisbury Township Planned Residential Development was chosen to be modeled as a learning exercise for city personnel as well as to help guide the City in evaluating this development. Lehigh University project personnel have worked closely with the Allentown planning and engineering department as the City personnel collected and organized the data for input to SWMM. Initial runs of SWMM on the CDC 6400 computer at Lehigh University are being made at the termination of this project.

RESULTS AND DISCUSSION

Stream Water Quality

The results of all the stream water quality analyses are tabulated in Appendix B. In addition, values of the dissolved oxygen, temperature and pH at several selected stations are plotted in Figure 5 through Figure 10. Figure 11 and Figure 12 show the nitrate nitrogen concentrations at the same stations.

The Little Lehigh Creek and Cedar Creek stream water quality was generally good. However, the streams did not have the highest quality one would ideally expect for a drinking water supply. The water is moderately hard, has high alkalinity, and has occasionally high nutrient levels, especially phosphorous. The sample analyses did point out three water quality parameters that should be of concern. The samples occasionally had high coliform counts, especially during the summer months. There were repeated problems with the coliform tests during the first part of the study, due to a batch of bad bacteriological culture media. The early reported results are suspect and probably low. The samples had nitrate concentrations ranging between 2 and 6 mg/l as N. Although this is of no immediate concern, it is undesirable in a drinking water since the U. S. Drinking Water Standards have a maximum permissible value of 10 mg/l as N. The stream samples often had quantities of phosphorous in excess of that needed to support excess algal growth. This could lead to excessive algal activity with resulting taste and odor problems.

During the course of this study two areas in the Cedar Creek basis other than the previously described storm sewer outfalls were found to be potentially large sources of nutrients and fecal coliforms. One area is the Trexler Park duck pond. The other area is Lake Muhlenberg. Both of these ponds attract large numbers of water fowl during much of the year. Apparently many of these have taken up full time residence there. Fecal discharge from ducks can be a significant source of bacteria. Geldreich and Kenner (5,9) have shown that the average duck excretes 336 g of feces per 24 hours. They have also found that the average fecal coliform count per gram is 33 million and the average fecal streptococci count is 4 million per gram. Simple calculations show that a flock of 100 ducks has the potential to add 3000 fecal coliform and 5000 fecal streptococci per 100 ml to the waters of Cedar Creek.

It should be noted that extensive measurements were not made to evaluate the duck pond problem, and this problem deserves further attention. Table 5 shows the comparison in water quality between the Trexler Pond effluent and the pond bypass on one occasion. Also, supersaturated dissolved oxygen concentrations observed in the Trexler Pond during most of the summer indicates the growth of algae in the ponds. The extent of effect on water quality by these ponds needs to be studied.

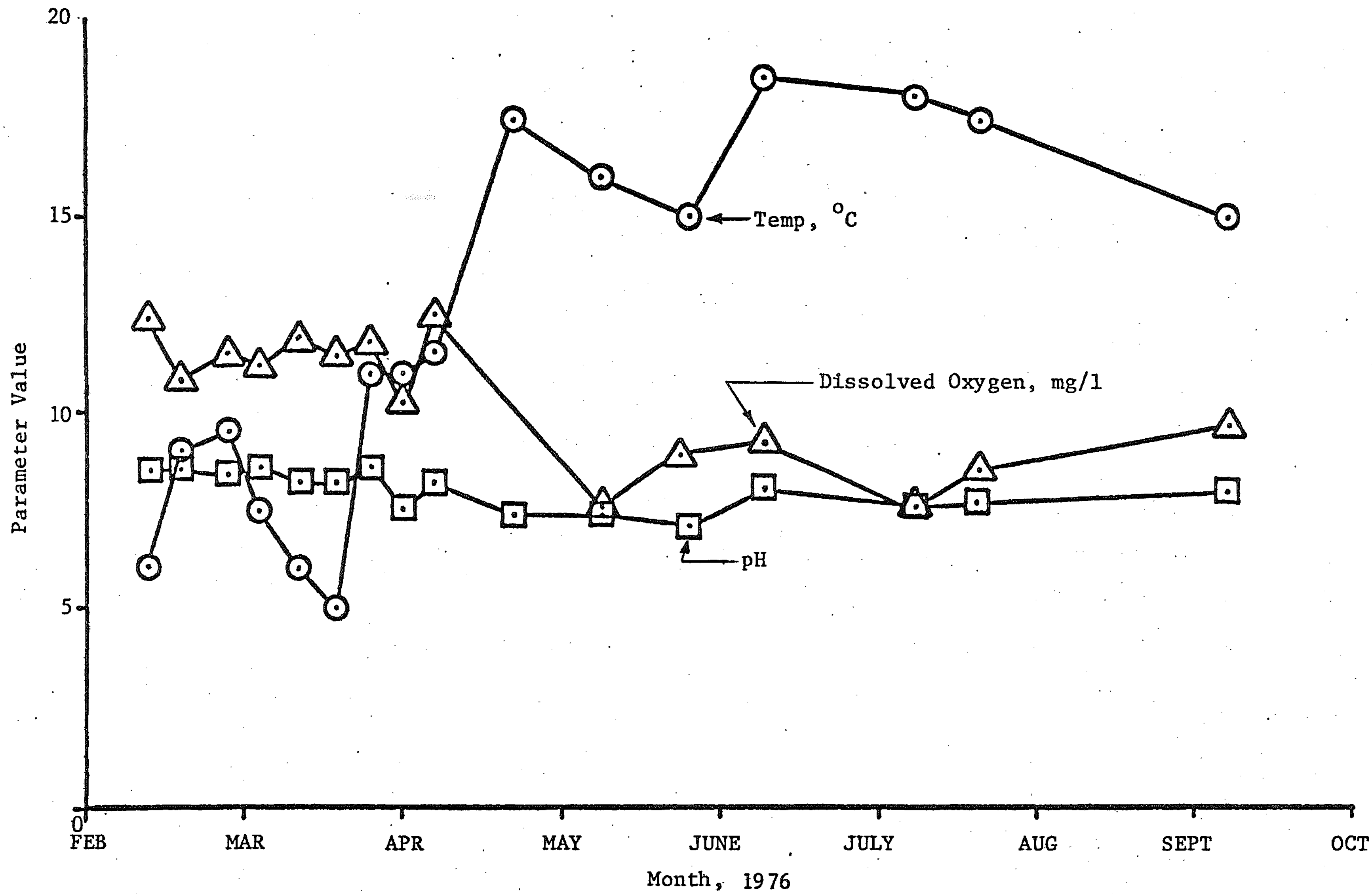


Fig. 5 SELECTED WATER QUALITY PARAMETERS: STATION WTP

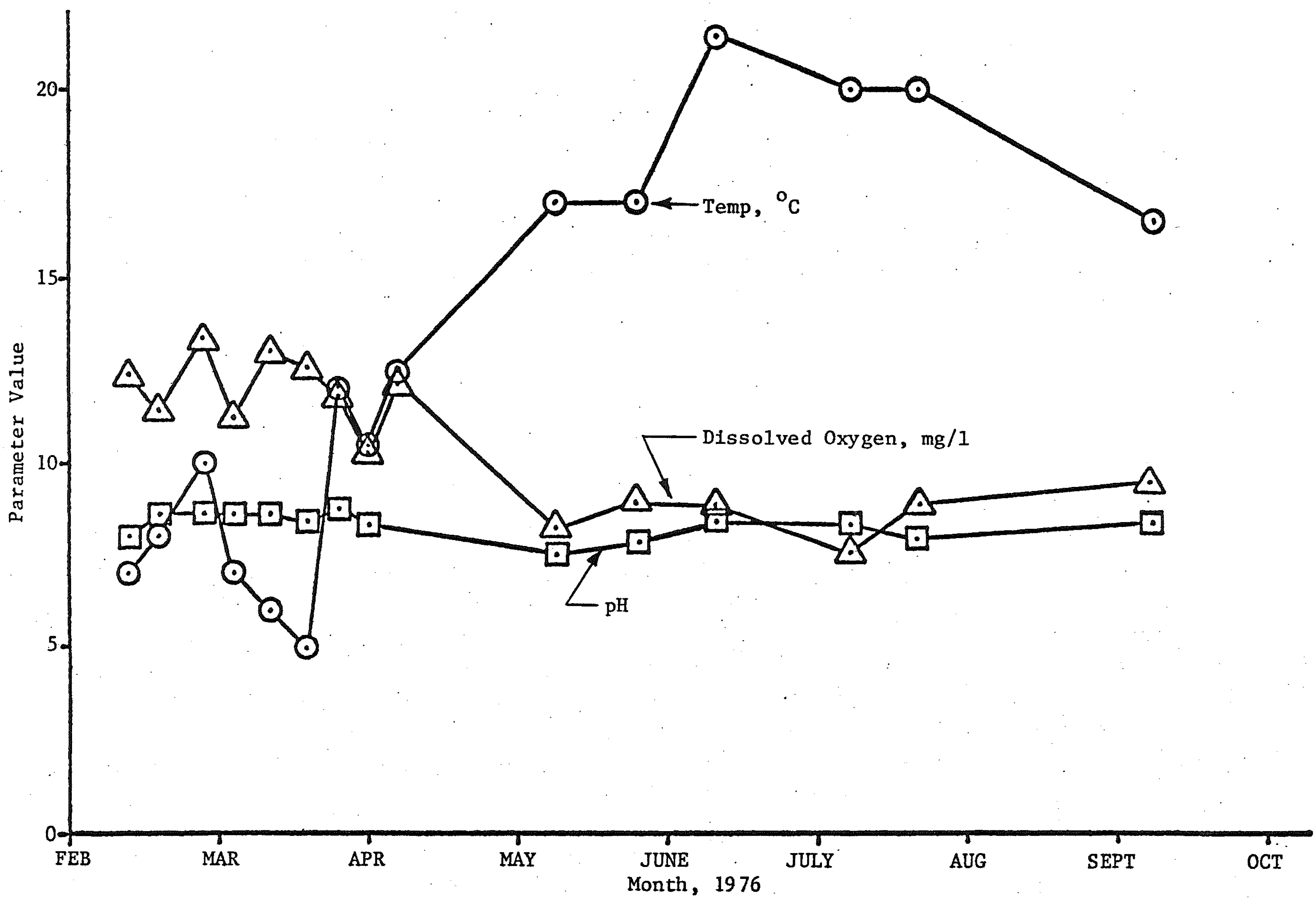


Fig. 6 SELECTED WATER QUALITY PARAMETERS: STATION CC1

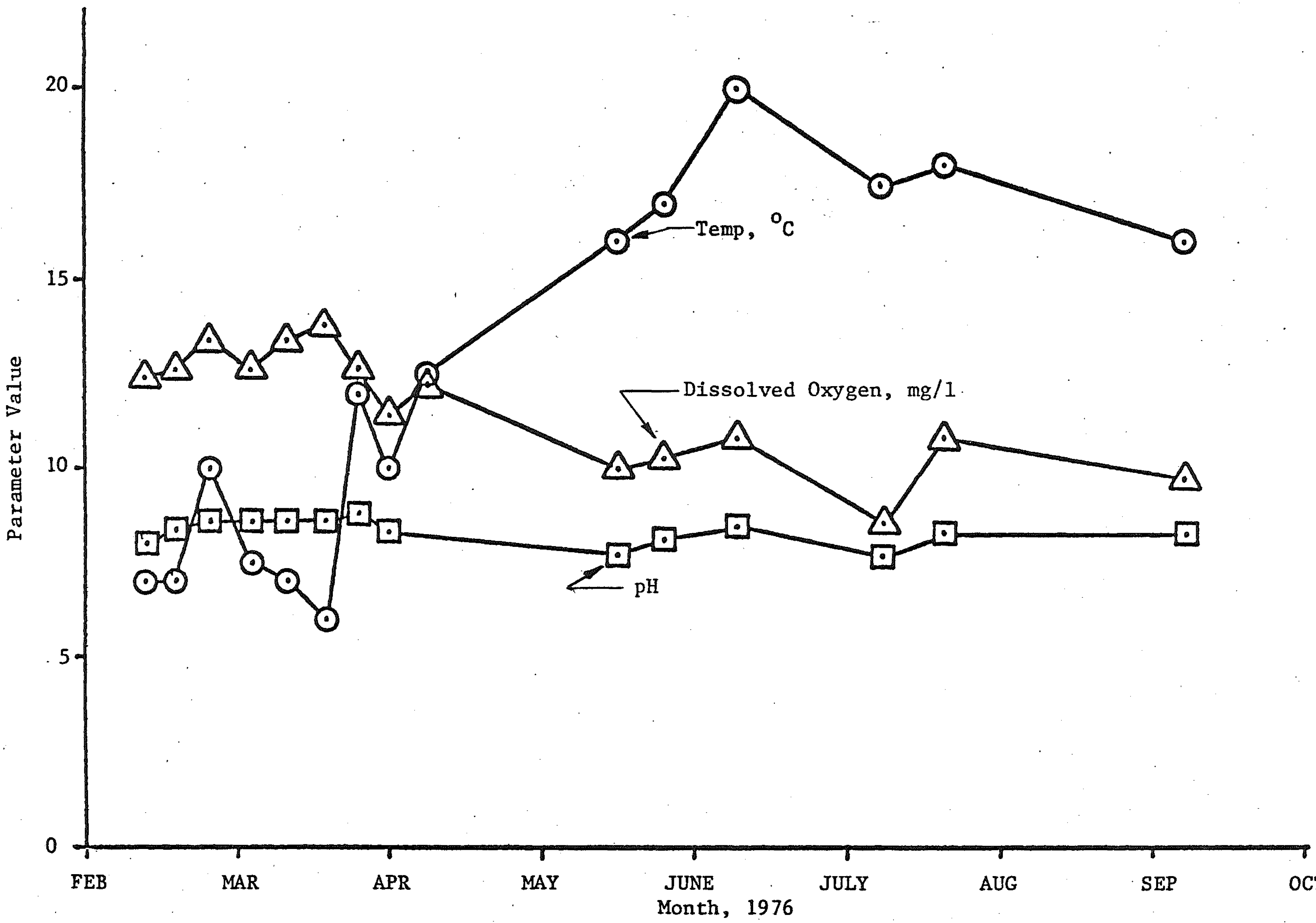


Fig. 7 SELECTED WATER QUALITY PARAMETERS: STATION CC2

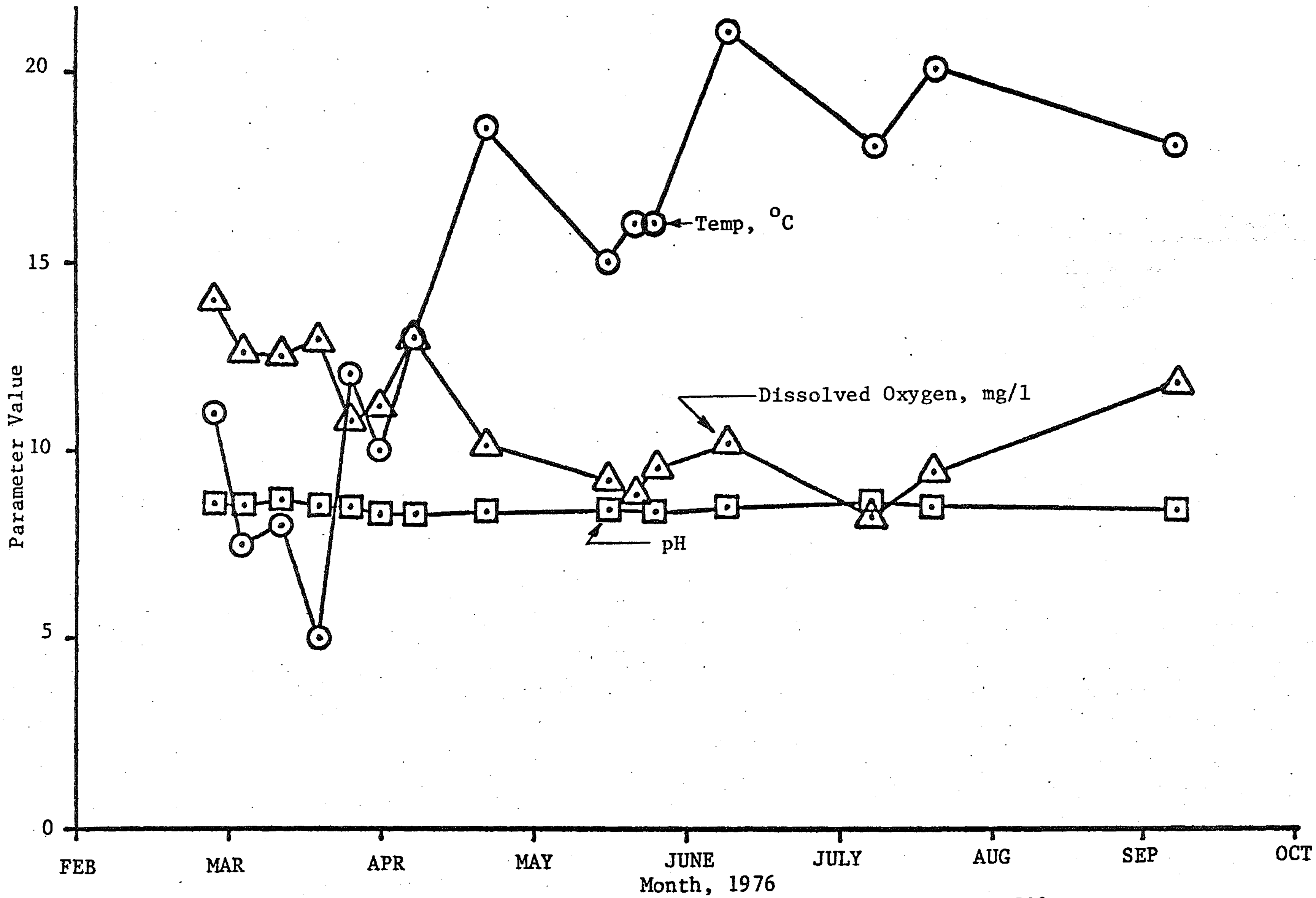


Fig. 8 SELECTED WATER QUALITY PARAMETERS: STATION LCC1

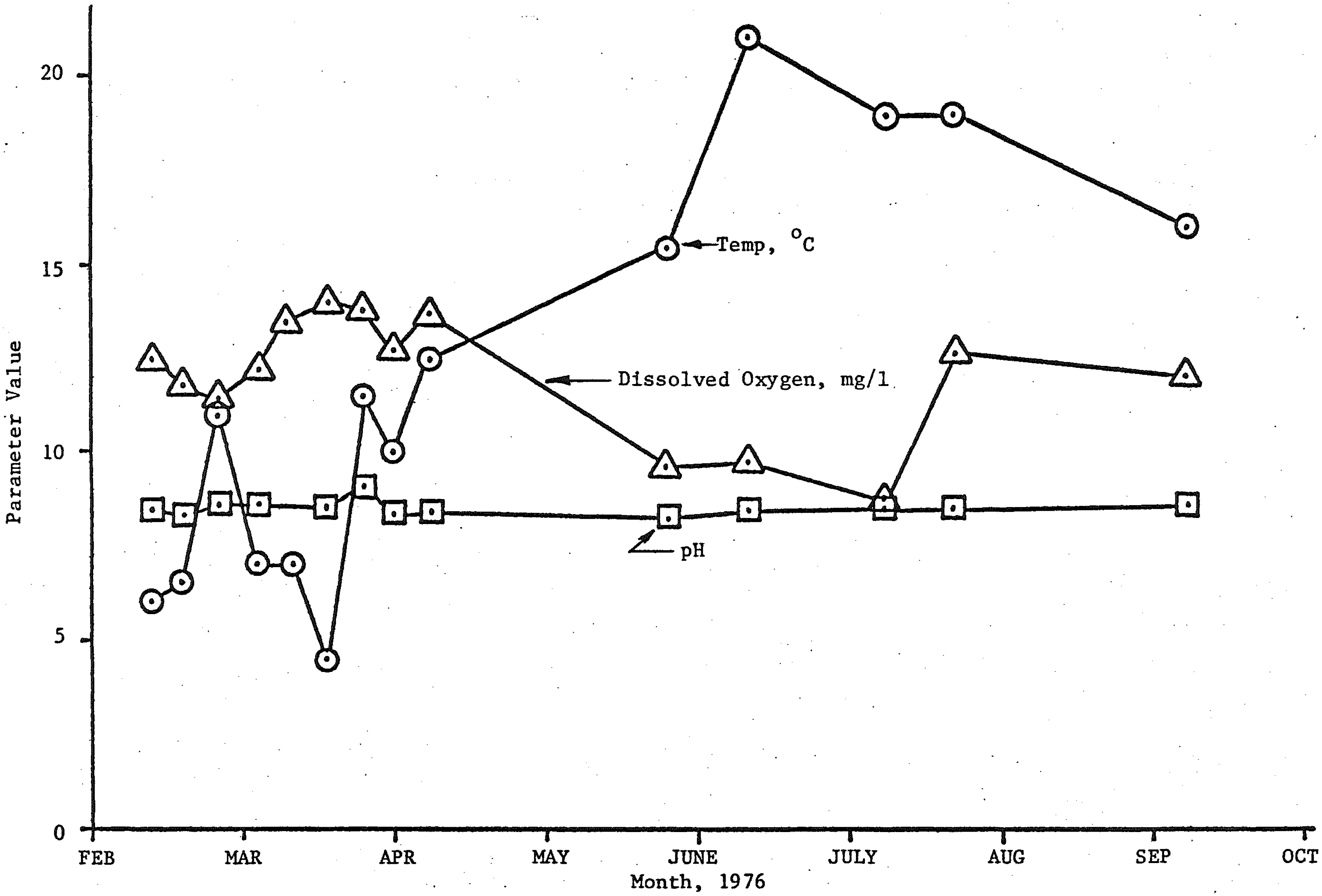


Fig. 9 SELECTED WATER QUALITY PARAMETERS: STATION LLC-29

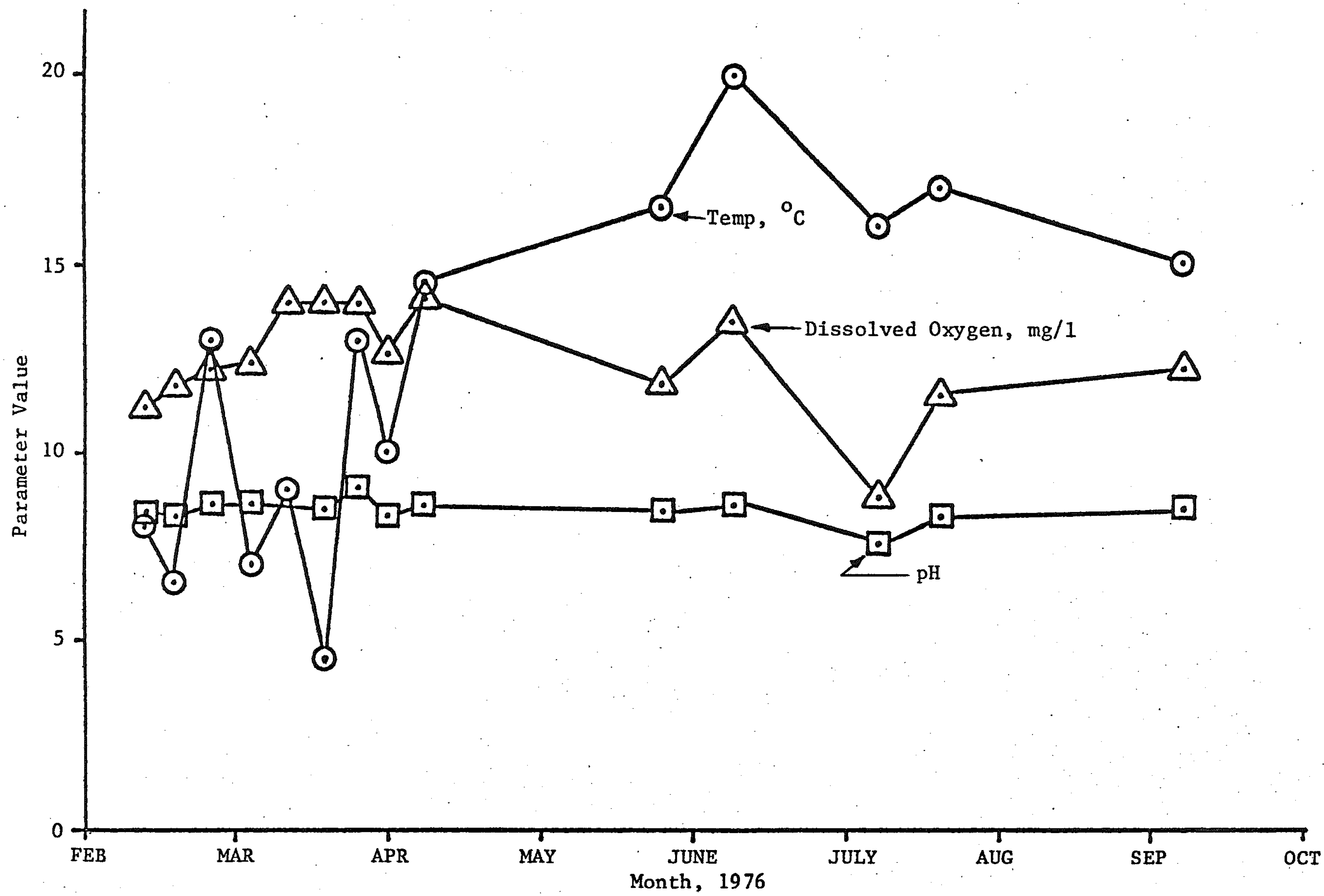


Fig. 10 SELECTED WATER QUALITY PARAMETERS: STATION LLC-SR

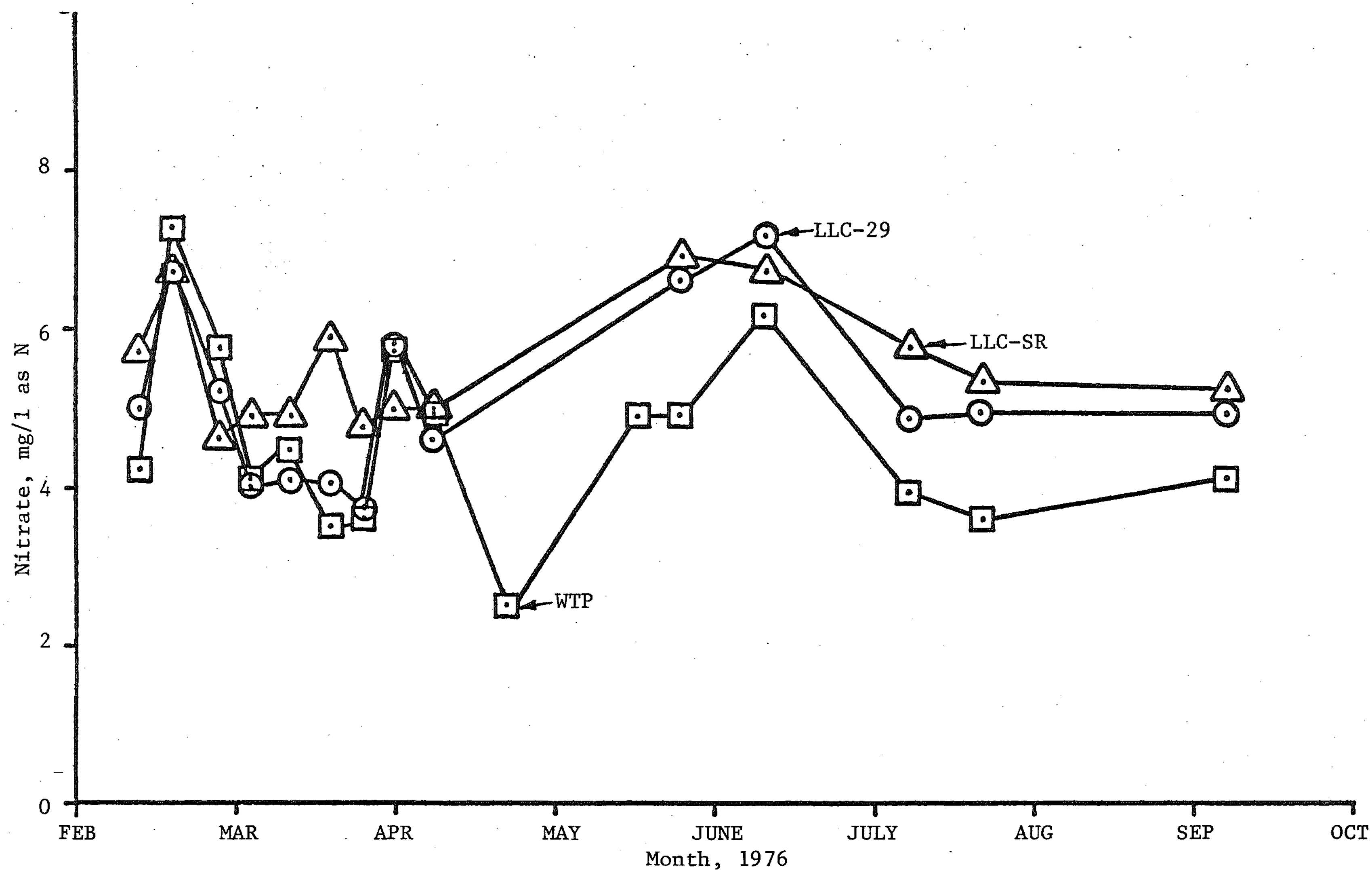


Fig. 11 NITRATE NITROGEN AT SELECTED STATIONS

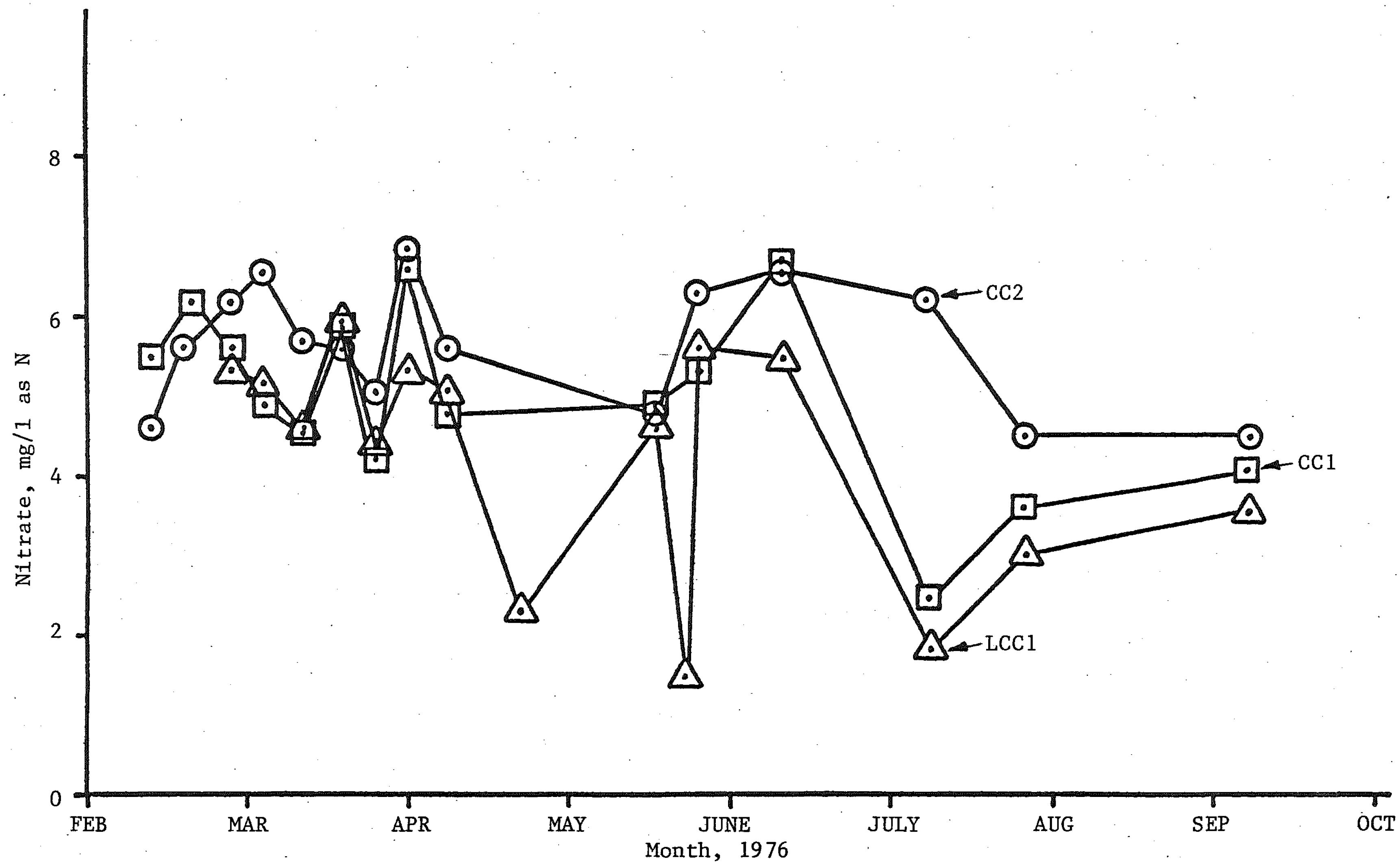


Fig. 12 NITRATE NITROGEN AT SELECTED STATIONS

Table 5

Water Quality Comparison

Trexler Pond and Pond Bypass

Little Cedar Creek 4/21/76 1350		
Parameter	Outlet Spillway from Trexler Park Pond	Pond Bypass
pH	8.35 (Lab)	8.19 (Lab)
Temperature	17.5	15.
Alkalinity		
Phenolpthalein	12.	3.
Total	176.	176.
D.O.	11.0	10.5
Hardness		
Calcium	160.	168.
Total	236.	236.
Ammonia-N	0.35	0.0
Nitrate-N	2.8	2.4
Ortho phosphate	0.033	0.007
Tannins & Lignins	1.6	0.8
BOD_5	4.	2.6
Turbidity	27.	3.
Color	130.	10.0

Storm Runoff Water Quality

The results of the analysis performed on numerous storm water samples as a part of this study are tabulated in Appendix C.

Storm runoff water quality is as poor as raw sewage in many aspects and can be worse than sewage in others. The analyses shows storm water to have significant levels of biochemical oxygen demand (BOD), very high chemical oxygen demand (COD), very high coliform counts, high suspended solids, and high phosphorous concentrations. Table 6 shows some typical ranges of storm water quality values measured. Clearly storm water input to the Little Lehigh Creek and Cedar Creek do degrade the stream quality as shown in Table 7.

Table 6

Storm Water Characteristics

Parameter	Range	Average	Number Observations
BOD_5	2-150	28.	26
COD	10-880	177.	35
Total Coliforms	$4x10^3$-$1x10^6$	$2.1x10^5$	15
Total Suspended Solids	7-524	115.	33

The extra water quality sampling and analyses that was performed during this project did not show any appreciable amounts of heavy metal concentrations. Several series of the stream water quality samples were analyzed for the heavy metal concentration and in each case, the levels were below those found in the analytical blank used.

Subsequent samples and analyses of the storm water runoff showed some heavy metals content, particularly lead. These results are shown in Table 8. It should be pointed out that even here, the heavy metal concentration was quite low and does not appear to present any particular problem.

Table 7

Effects of Storm Water on Stream Quality

	Little Cedar Creek		Cedar Creek - Ott St.			
	6/16 2100		6/16		6/29	
Parameter	Above Trexler Park Discharge	Below Trexler Park Discharge	1500 Before Storm	2050 During Storm	1500 Before Storm	1540 After Storm
Hardness:						
Total	192.	104.	136.	148.	144.	124.
Calcium	128.	64.	116.	83.	102.	68.
Ammonia-N	0.007	0.005	0.014	0.027	0.020	0.035
Nitrate-N	8.4	4.1	8.4	7.3	4.2	3.6
Ortho phosphate	0.01	0.02	0.01	0.02	0.01	0.02
COD	9.	168.	4.	78.	8.	58.
Tannins & Lignins	--	2.4	0.2	0.9	0.4	0.8
BOD_5	4.	>50.	0.8	33.	4.5	7.6
Total Coliforms			--	1.2×10^4	3×10^3	2.5×10^4
Turbidity	34.	45.	7.	63.	23.	58.
Color	0	70.	--	30.	5.	30.
Solids:						
Total	330.	309.	254.	367.	297.	243.
Total Suspended	48.	108.	--	167.	18.	100.
Total Volatile	135.	220.	81.	139.	100.	75.

Table 8

Heavy Metals Analyses

Sample Site	Date & Time	Concentration - μg/l		
		Chromium	Cadmium	Lead
Trexler Park Spring	Jul 29	8.	3.5	<[b]
LCC1	Jul 29	3.5	4.5	<
CHB	Jul 29	3.	1.	<
CC-Ott St.	Jul 29	2.5	<[b]	3
CHB #1	Aug 9 - 1245	<[b]	<	<
CHB #2	Aug 9 - 1815	<	<	8
CHB #3	Aug 9 - 2035	<	<	4
CHB #4	Aug 9 - 2200	<	<	1
LCC	Aug 9 - 1000	<	<	<
CHB #1	Sep 2 - 1625	<		91[a]
CHB #2	Sep 2 - 1640	<		7
CHB #3	Sep 2 - 1655	<		7
CHB #4	Sep 2 - 1710	<		9
CHB #5	Sep 2 - 1725	<		4.5
WTP	Sep 7	0.5		<
CC1	Sep 7	<		1
CC2	Sep 7	<		1
LCC1	Sep 7	14		1
LCC-SR	Sep 7	7		4
LLC-29	Sep 7	7		8
CHB #1	Sep 10 - 0925	<	<	32.5[a]
CHB #2	Sep 10 - 1125	48[a]	5	<

Table 8 (Cont)

Sample Site	Date & Time	Concentration - μg/l		
		Chromium	Cadmium	Lead
CHB #1	Sep 16 - 0910	<	<	8.5
CHB #2	Sep 16 - 1130	<	<	16.5[a]
CHB #3	Sep 16 - 1150	<	<	7
CHB #4	Sep 16 - 1500	<	<	3.5
CHB #5	Sep 16 - 1500	<	<	7

[a] Extrapolated, non linear region
[b] Symbol < signifies concentration less than blank sample

SWMM Model Calibration and Verification

Storms of June 6, September 16 and 26, and October 9, 1976, which were monitored, provided adequate flow data to allow comparison between SWMM predictions and the actual flow as measured and estimated. The storms of September 26 and October 9, 1976 were used to calibrate the model. This calibration was verified by comparison with the storm flow data from June 6 and Septmeber 16, 1976.

The predicted flow using the calibrated model is shown with the observed flows for the four storm events in Figure 13 through Figure 16. Good agreement between predicted and observed rates was obtained for this first level calibration.

Values of the storm water quality indicators such as BOD or suspended solids are strongly dependent upon the rate of runoff. After achieving the first level calibration of the quantity aspects, the calibration of the quality prediction portion of the SWMM computer model was addressed. Using the "normal" default values of the quality calibration parameters in the SWMM computer model, it was found that the predicted storm water quality agreed well with the observed values. As an example, Figure 17 and Figure 18 show BOD and suspended solids comparisons for the September 26, 1976 storm event. There is a slight time phase shift, but the magnitude of the parameter is well modeled, consequently the program default values were used to serve as the first level calibration of the quality predictions. It will take many more seasons of data to provide a calibration that is appreciably better than is provided with current values with regard to the quality parameters.

Several of the input parameters to the RUNOFF block were difficult to determine precisely. These parameters, dealing with infiltration rates and surface characteristics which affect the hydraulic efficiency, and listed in Table 9, were varied to obtain calibration. The three most important of these factors are 1) the percent of impervious area, 2) maximum and minimum infiltration rates, and 3) subcatchment lengths and widths.

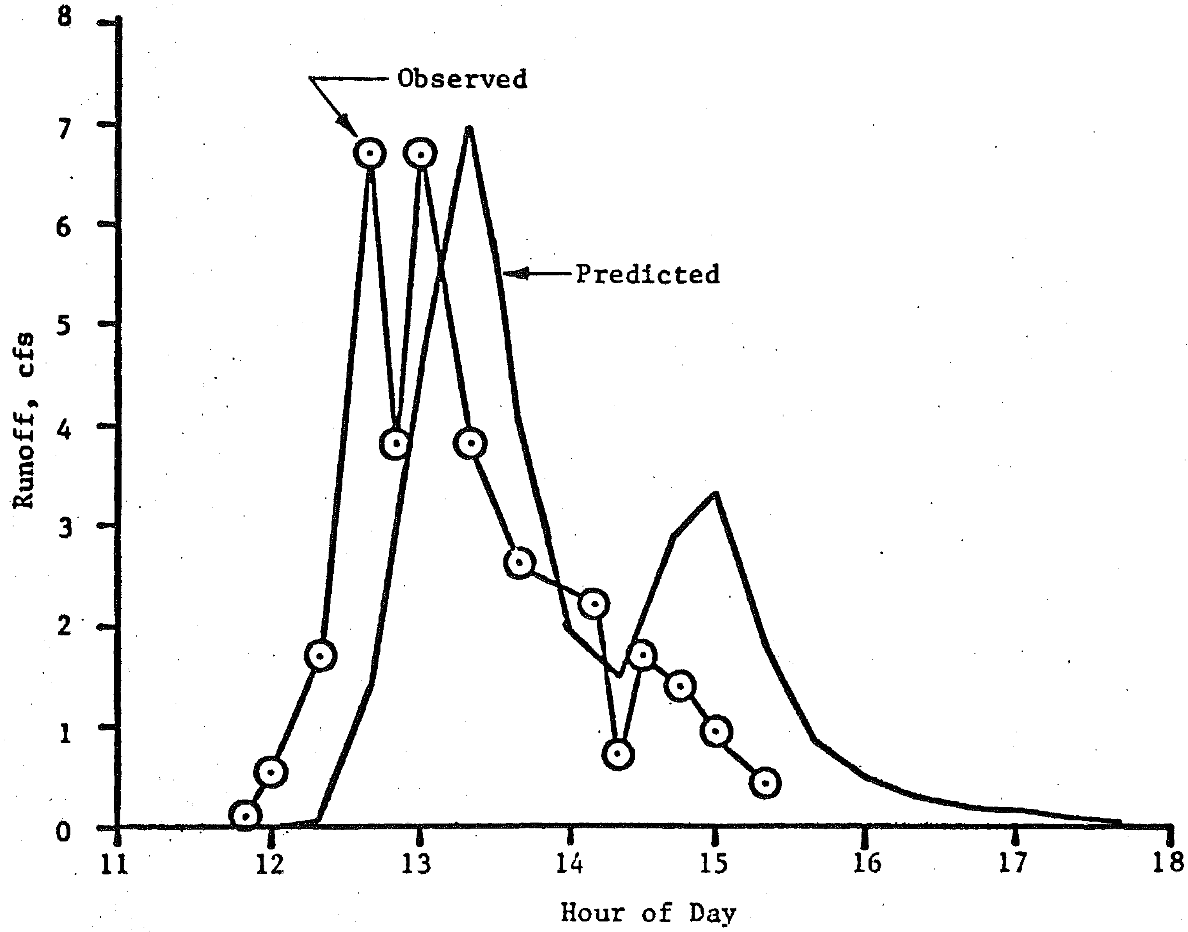


Fig. 13 OBSERVED AND SWMM PREDICTED RUNOFF
September 26, 1976

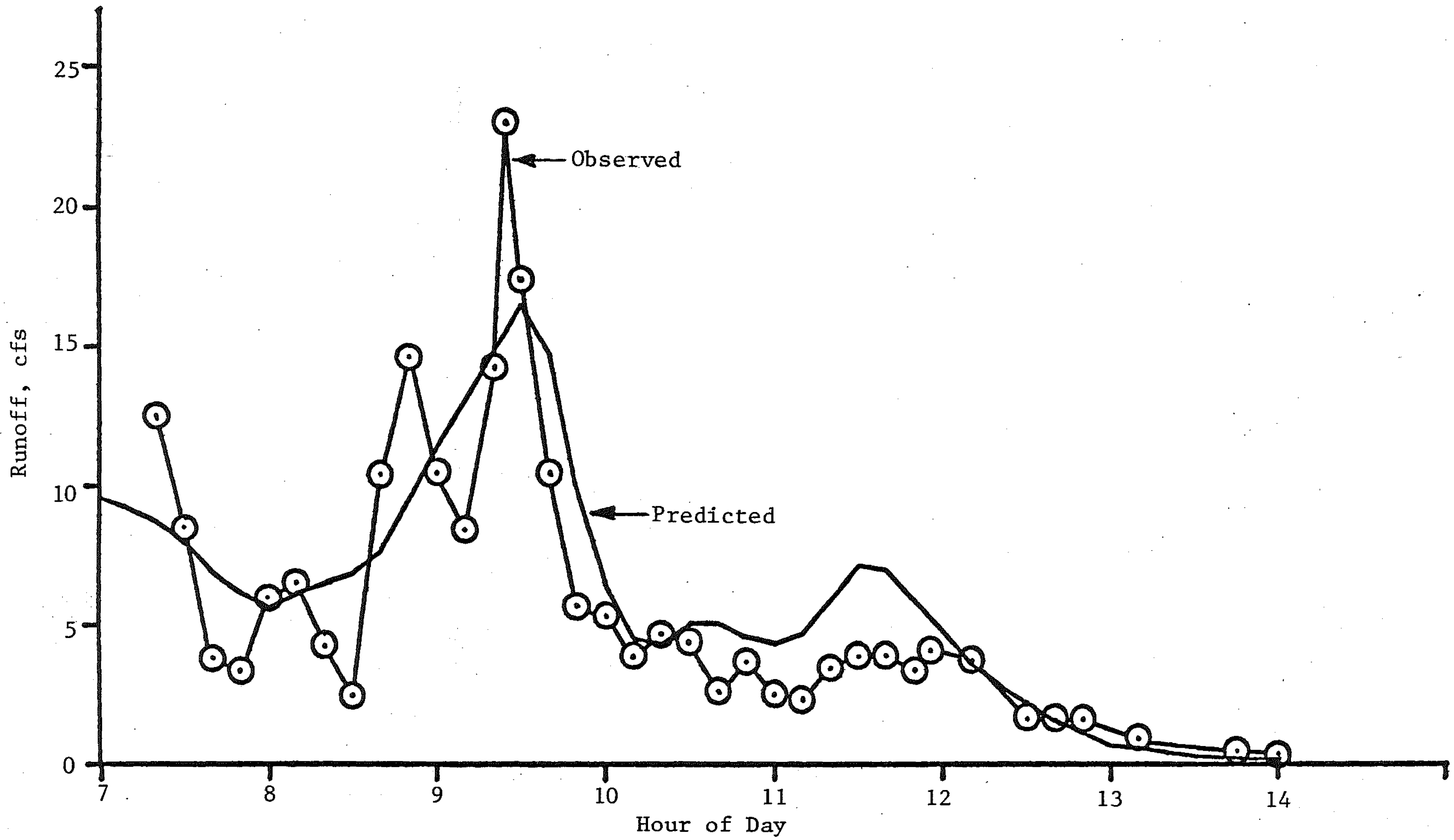


Fig. 14 OBSERVED AND SWMM PREDICTED RUNOFF
October 9, 1976

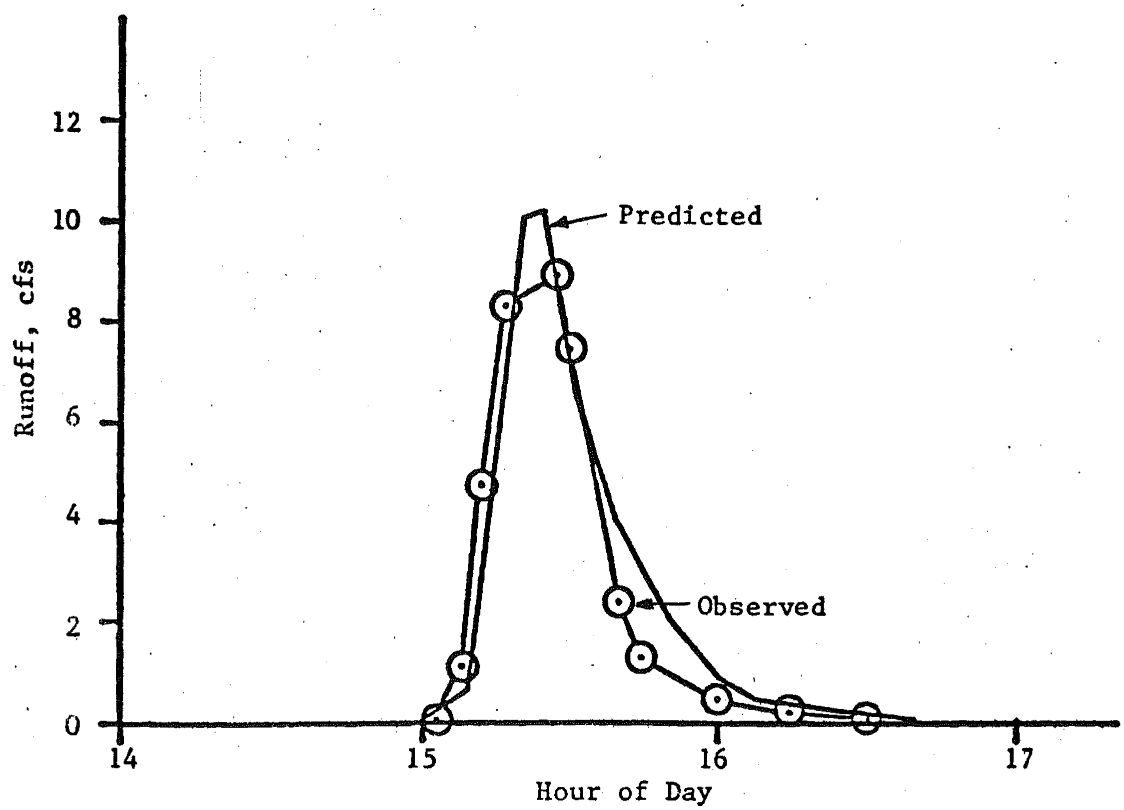


Fig. 15 OBSERVED AND SWMM PREDICTED RUNOFF
June 29, 1976

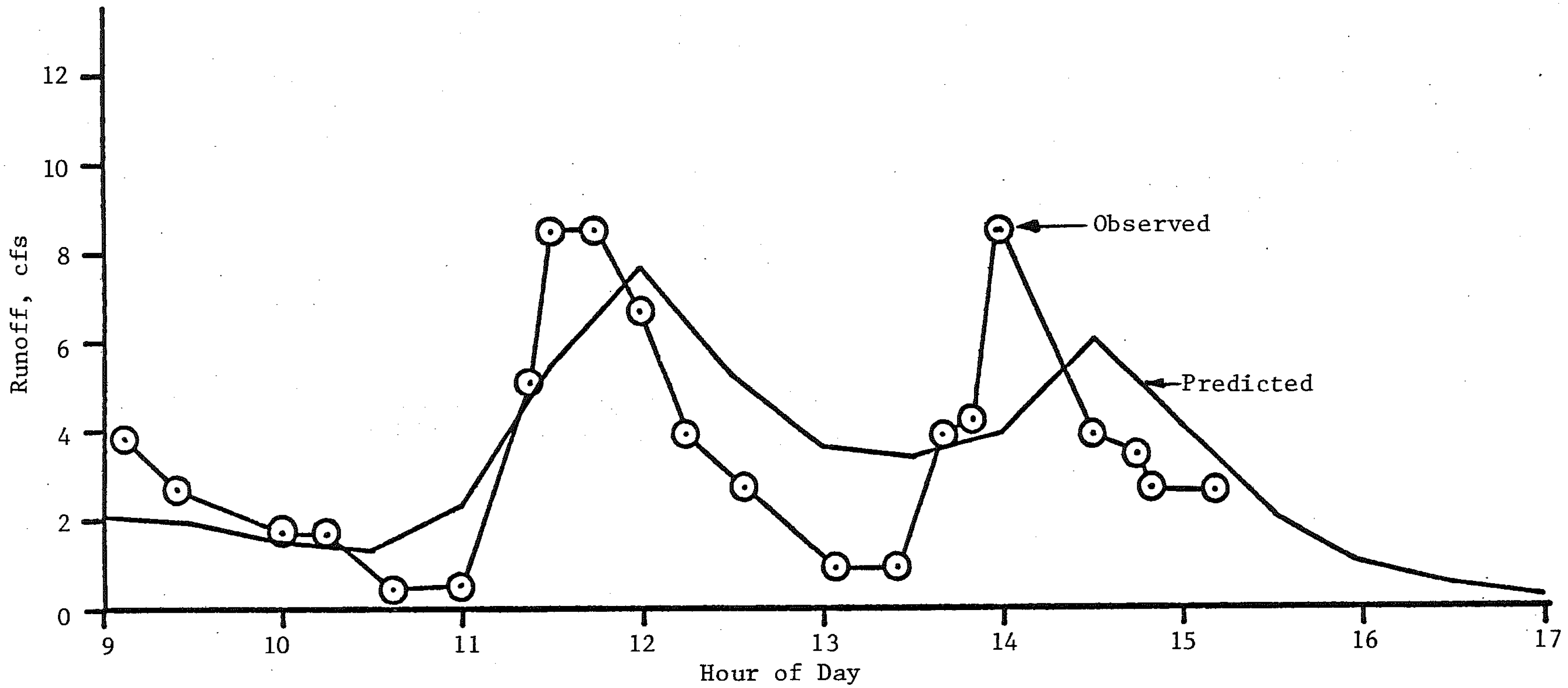


Fig. 16 OBSERVED AND SWMM PREDICTED RUNOFF
September 16, 1976

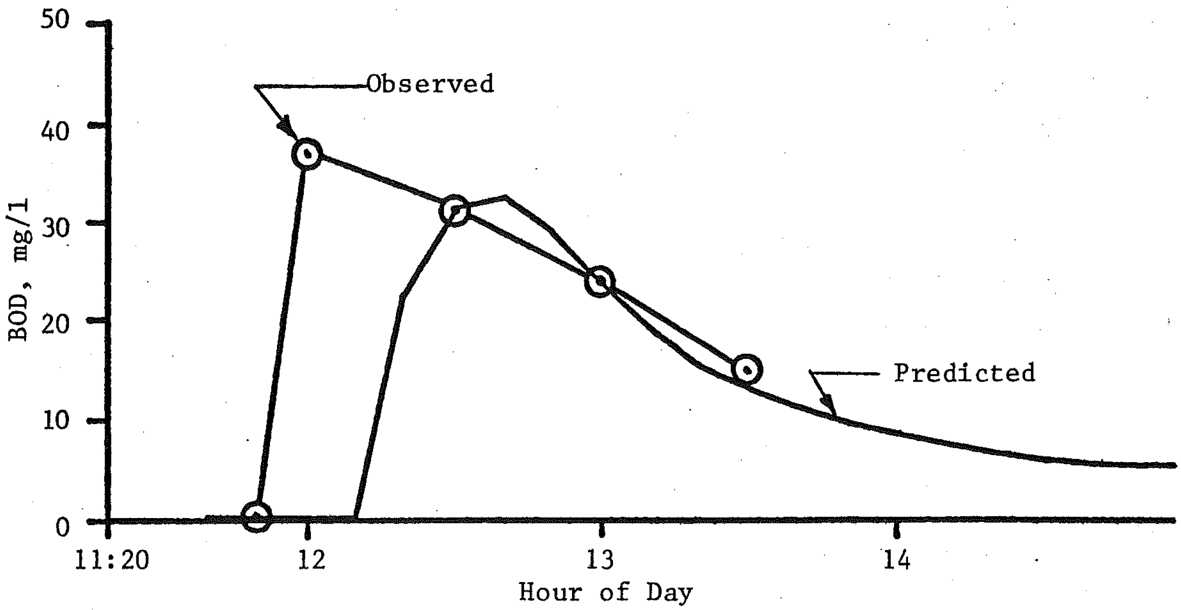


Fig. 17 STORM WATER QUALITY COMPARISON
BOD: September 26, 1976

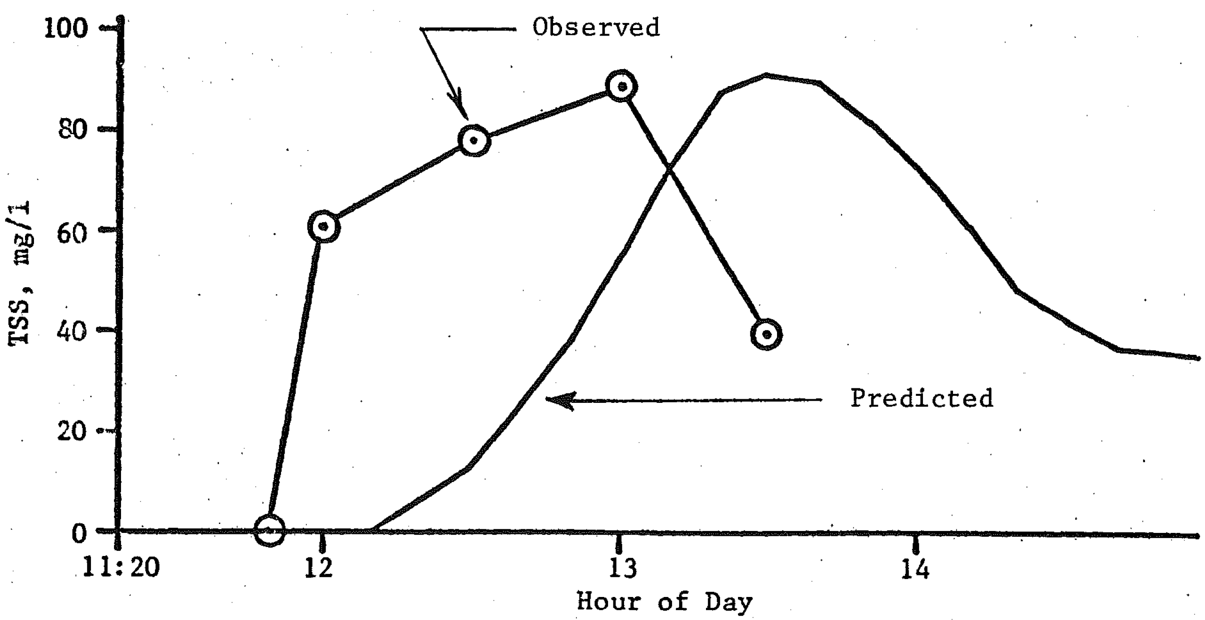


Fig. 18 STORM WATER QUALITY COMPARISON
TOTAL SUSPENDED SOLIDS: September 26, 1976

The percent of impervious land factor deserves special attention. Initial attempts were made to measure this factor from aerial photos and maps, but this proved virtually impossible to do accurately because of insufficient detail available on the maps and aerial photos. As a result, the values were estimated for each subcatchment, and then varied in the model until agreement was found between actual and predicted runoff. The calibrated percent imperviousness or effective imperviousness is much less than the actual percentage of impervious area. This apparent anomoly occurs because many rooftops, patios and sidewalks drain onto open land where the water infiltrates into the ground. If the above items were to drain into the streets and into the storm drainage system, the value for percent imperviousness used in the model would have to be increased.

Table 9

SWMM Model Calibration Parameters

	SWMM Default Value	Suggested Calibration Value as of 12/31/76
Maximum infiltration rate	3.00	2.00
Minimum infiltration rate	0.52	0.70
Infiltration decay constant	0.00115	0.00115
Manning's "n" for pervious areas	0.250	0.200
Manning's "n" for impervious areas	0.013	0.012
Surface storage for pervious areas	0.184	0.200
Surface storage for impervious areas	0.062	0.062
% impervious area w/zero detention	25%	35%
Concentration of BOD of the stored water in each catch basin	0.0	100.0[a]

[a]Value of 30.0 mg/l measured but 100 mg/l gives better results

This aspect of storm water management has several important ramifications. If Allentown requires that all roofs, sidewalks and driveways drain into the street, there will be two immediate impacts. First, the volume of storm water will increase and second, the rate of storm water runoff will increase, both of which mean larger and more extensive storm sewer systems. Other, longer term considerations, that must be addressed are the loss of an appreciable volume of rainfall that can never reach the groundwater via infiltration and percolation, and the potential reduction in the problems of sink hole development due to the infiltration of precipitation.

It would appear necessary that Allentown address itself directly to this aspect of storm water management since 1) there are sink hole problems in this geological area, 2) part of the Allentown water supply comes from ground water aquifers and 3) there are areas of flooding problems within the city confines.

An additional observation to make from this project is the stilling basin problem. When large capacity storm sewer systems empty into natural watercourses of much smaller capacity, stilling basins or energy dissipators are needed to prevent severe stream erosion. However, stilling basins can also be efficient sediment traps. Stilling basins must be periodically cleaned of trapped silt in order to prevent clogging of the storm sewer. The Trexler Park stilling basin, if not cleaned, will fill the College Heights Boulevard sewer with sediment to the point where it will no longer have the desired capacity and thus not serve the intended function of storm water carriage. At the current rate this stilling basin will be filled in a few more years.

The present calibration of the SWMM is only a first level calibration for two reasons. First, rainfall and flows during this study was measured very crudely. A finer calibration of the SWMM model needs to be done using at least one recording rain gauge in the basin under study, with accuracy to 1/100 of an inch and at least one continuous recording flow meter located in the storm sewer in a location where there is uniform flow. A continuing program for refinement of the calibrated SWMM computer model should be initiated by the planning and engineering personnel of the City of Allentown. This program will encourage the use of the SWMM in decision making, and will also build confidence in the applicability of the model as greater numbers of actual field observations are compared to SWMM predictions. In addition to the continuous recording instruments, better determination of the unknown papameters is needed. The effective percentage of imperviousness and the infiltration rates of the soils should be determined. Maximum and minimum rates and decay factors should be measured.

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APPENDIX A

DEVELOPMENT OF 10-YEAR 3-HOUR DESIGN STORM EVENT

A decision was made to check the SWMM model predictions of flow and quality in the College Heights Boulevard storm sewer system resulting from a 10-year design storm event. The total rainfall in a 10-year storm of 3-hour duration was found to be 2.7 inches from the National Weather Service Technical Paper No. 40 (19). This total was then divided into 10 minute intervals for input into the SWMM model using a modification of the SCS method (16). This is more representative of an actual storm event than assuming a uniform rainfall for 3 hours (17,18).

The total rainfall was first found for 30 minute increments as follows:

Total Precipitation	Increment
	1.15
0-30 min = 0.43x2.7 = 1.15 in	
	0.41
0-60 min = 0.58x2.7 = 1.56 in	
	0.40
0-90 min = 0.73x2.7 = 1.96 in	
	0.30
0-120 min = 0.84x2.7 = 2.26 in	
	0.24
0-150 min = 0.93x2.7 = 2.50 in	
	0.20

These rainfall increments were then rearranged in the following order: 6-4-3-1-2-5. This gives the precipitation pattern as:

30 Min Interval	Precipitation (inches)
0-30	0.20
30-60	0.30
60-90	0.40
90-120	1.15
120-150	0.41
150-180	0.24

These 30-minute incremental rainfalls were then divided into 10-minute intervals in a stepwise fashion to provide smooth transitions. This is done for better data input into the SWMM model. The precipitation data was also converted to intensity in inches/hour.

Time Starting hour:min	Precipitation inches	Intensity inches/hour
0:00	0.05	0.30
0:10	0.07	0.42
0:20	0.08	0.48
0:30	0.09	0.54
0:40	0.10	0.60
0:50	0.11	0.66
1:00	0.12	0.72
1:10	0.13	0.78
1:20	0.15	0.90
1:30	0.25	1.50
1:40	0.54	3.24
1:50	0.36	2.16
2:00	0.18	1.08
2:10	0.13	0.78
2:20	0.10	0.60
2:30	0.09	0.54
2:40	0.08	0.48
2:50	0.07	0.42

APPENDIX B

STREAM WATER QUALITY DATA

The units for the observed data on the subsequent pages are:

pH:	None
Temperature:	^{o}C
P-Alkalinity:	mg/l as $CaCO_3$
T-Alkalinity:	mg/l as $CaCO_3$
Carbon Dioxide:	mg/l as $CaCO_3$
Dissolved Oxygen:	mg/l
Calcium Hardness:	mg/l as $CaCO_3$
Total Hardness:	mg/l as $CaCO_3$
Ammonia:	mg/l as N
Nitrate:	mg/l as N
Ortho Phosphate:	mg/l as P
COD:	mg/l
Solids:	mg/l
Tannins and Lignins:	mg/l as Tannic Acid
BOD_5:	mg/l
Total Coliforms:	Count per 100 ml (TNTC = Too numerous to count)
Turbidity:	FTU
Color:	mg/l

STATION: WTP

Description: Little Lehigh Creek upstream from the 15th Street Bridge

PARAMETER	Date	2/12	2/18	2/25	3/3	3/10	3/17
	Time	13:15	12:40	12:55	12:40	11:45	10:00
pH		8.5	8.6	8.4	8.6	8.2	8.2
Temperature		6.	9.	9.5	7.5	6.	5.
P - Alkalinity		-	-	-	4.0	-	-
T - Alkalinity		116.	292.	164.	148.	140.	140.
Carbon Dioxide		T	T	-	-	T	T
Dissolved Oxygen		12.4	10.8	11.5	11.2	11.9	11.4
Calcium Hardness			100.	112.	112.	104.	108.
Total Hardness			176.	192.	204.	184.	184.
Ammonia		0.22	0.073	0.052	0.014	0.046	0.021
Nitrate		4.2	7.3	5.7	4.1	4.5	3.5
Ortho Phosphate					0.008		0.010
COD			0.			8.	21.
Solids:							
Total							
Total Suspended							
Total Dissolved							
Total Volatile							
Volatile Suspended							
Volatile Dissolved							
Tannins & Lignins				0.		0.3	
BOD_5		2.2		1.8	1.7	2.8	3.1
Total Coliforms		10.	36.	3.	26.	47.	1400
Turbidity			18.	4.		6.5	5.5
Color							

STATION: WTP

Description:

PARAMETER	Date	3/24	3/31	4/7	4/22	5/16	5/24
	Time	13:10	12:30				
pH		8.6	7.5	8.2	7.4	7.4	7.1
Temperature		11.	11.	11.5	17.5	16.	15.
P - Alkalinity		12.	-	-	-	-	-
T - Alkalinity		140.	156.	148.	160.	160.	112.
Carbon Dioxide		-	T	T	4.0	T	T
Dissolved Oxygen		11.8	10.2	12.5		7.6	8.9
Calcium Hardness		128.	120.	116.	112.	112.	108.
Total Hardness		196.	212.	200.	192.	188.	184.
Ammonia		0.024	0.024	0.025	0.1		0.044
Nitrate		3.6	5.7	4.9	2.5	4.9	4.9
Ortho Phosphate				0.016	0.010		0.030
COD		5.	10.	3.		6.	8.
Solids:							
Total		140.				260.	255.
Total Suspended						28.	6.
Total Dissolved						232.	249.
Total Volatile							
Volatile Suspended							0.
Volatile Dissolved							
Tannins & Lignins				0.4	0.8		
BOD_5		0.5	0.8	0.7	5.4	2.2	
Total Coliforms		71.	TNTC	280			
Turbidity		3.2	2.4	3.0	4.0	20.	
Color				0.	25.	0.	

STATION: WTP

Description:

PARAMETER	Date	6/10	7/7	7/20	9/7		
	Time						
pH		8.0	7.6	7.7	8.0		
Temperature		18.5	18.0	17.5	15.		
P - Alkalinity		-	-	-	-		
T - Alkalinity		144.	138.	156.	160.		
Carbon Dioxide		T	T	T	T		
Dissolved Oxygen		9.3	7.5	8.5	9.7		
Calcium Hardness		102.	96.	108.	100.		
Total Hardness		176.	176.	192.	196.		
Ammonia		0.035	0.19	0.028	0.046		
Nitrate		6.2	3.9	3.6	4.1		
Ortho Phosphate		0.030	0.180	0.0	0.01		
COD		2.	0.	0.	0.		
Solids:							
Total		251.	264.	244.	269.		
Total Suspended			30.	3.	1.		
Total Dissolved			234.	241.	268.		
Total Volatile			104.	97.	98.		
Volatile Suspended			8.	0.			
Volatile Dissolved			96.	97.			
Tannins & Lignins			0.4	0.3	0.4		
BOD_5		0.6	1.7	0.8	0.9		
Total Coliforms		50.	1.2×10^4	1100	200		
Turbidity		5.5	26.	8.5	3.6		
Color		10.	0.	10.	5.		

STATION: LLC-29

Description: Little Lehigh Creek upstream from Route 29

PARAMETER	Date	2/12	2/18	2/25	3/3	3/10	3/17
	Time	15:45	14:30	14:40	14:20	14:45	12:45
pH		8.5	8.3	8.6	8.6		8.5
Temperature		6.	6.5	11.	7.	7.	4.5
P - Alkalinity		-	-	4.	12.	8.	T
T - Alkalinity		60.	96.	112.	108.	100.	96.
Carbon Dioxide		T	T	-	-	-	-
Dissolved Oxygen		12.5	11.8	11.4	12.2	13.5	14.0
Calcium Hardness			92.	100.	92.	88.	84.
Total Hardness			136.	148.	152.	148.	136.
Ammonia		0.15	0.085	0.022	0.014	0.036	0.020
Nitrate		5.0	6.7	5.2	4.1	4.1	4.1
Ortho Phosphate					0.016		0.028
COD			20.	0.			24.
Solids:							
Total							
Total Suspended							
Total Dissolved							
Total Volatile							
Volatile Suspended							
Volatile Dissolved							
Tannins & Lignins				0.		0.2	
BOD_5		0.5		2.1	1.8	1.7	2.4
Total Coliforms			12.	44.	110	120	62.
Turbidity			18.	5.6		6.2	6.8
Color							

STATION: LLC-29

Description:

PARAMETER	Date	3/24	3/31	4/7	5/24	6/10	7/7
	Time	15:00	15:35				
pH		9.1	8.3	8.4	8.2	8.4	8.5
Temperature		11.5	10.0	12.5	15.5	21.	19.
P - Alkalinity		16.	8.	16.	8.	10.	-
T - Alkalinity		120.	128.	116.	122.	132.	120.
Carbon Dioxide		-	-	-	-	-	T
Dissolved Oxygen		13.8	12.7	13.7	9.6	9.7	8.6
Calcium Hardness		96.	96.	92.	112.	96.	88.
Total Hardness		152.	164.	148.	176.	162.	164.
Ammonia		0.024	0.021	0.021	0.028	<0.014	0.029
Nitrate		3.6	5.9	4.6	6.6	7.1	4.8
Ortho Phosphate				0.026	0.030	0.06	0.03
COD		12.	6.	3.		1.	0.
Solids:							
Total		140.			195.	238.	250.
Total Suspended					13.		61.
Total Dissolved					182.		189.
Total Volatile							81.
Volatile Suspended					2.		10.
Volatile Dissolved							71.
Tannins & Lignins				0.3	0.		0.4
BOD_5		1.1	0.1	1.1	0.8	0.6	0.6
Total Coliforms		17.	TNTC	24.	230		$1.1X10^4$
Turbidity		2.3	2.4	3.5	6.2	5.6	52.
Color				10.	10.	20.	15.

STATION: LLC-29

Description:

PARAMETER	Date	7/20	9/7				
	Time		14:15				
pH		8.4	8.5				
Temperature		19.	16.				
P - Alkalinity		12.	8.				
T - Alkalinity		136.	144.				
Carbon Dioxide		-	-				
Dissolved Oxygen		12.6	12.0				
Calcium Hardness		100.	94.				
Total Hardness		176.	172.				
Ammonia		0.034	0.022				
Nitrate		4.9	4.9				
Ortho Phosphate		0.	0.015				
COD		0.	0.2				
Solids:							
Total		221.	247.				
Total Suspended		6.	1.				
Total Dissolved		215.	246.				
Total Volatile		99.	80.				
Volatile Suspended		5.					
Volatile Dissolved		94.					
Tannins & Lignins		0.2	0.3				
BOD_5		1.0	0.6				
Total Coliforms		1600	1000				
Turbidity		5.7	3.4				
Color		0.	5.				

STATION: LLC-SR

Description: Little Lehigh Creek several hundred yards downstream from junction with Schaefer Run

PARAMETER	Date	2/12	2/18	2/25	3/3	3/10	3/17
	Time	15:15	14:00	14:25	14:00	14:10	12:30
pH		8.4	8.4	8.6	8.6		8.6
Temperature		8.	7.	13.	7.	9.	6.
P - Alkalinity		-	-	4.	12.	4.	4.
T - Alkalinity		104.	100.	112.	116.	108.	108.
Carbon Dioxide		T	T	-	-	-	-
Dissolved Oxygen		11.2	11.4	12.2	12.4	14.0	13.8
Calcium Hardness			88.	100.	100.	96.	96.
Total Hardness			160.	152.	164.	144.	140.
Ammonia		0.08	0.070	0.054	0.059	0.056	0.035
Nitrate		5.7	6.7	4.6	4.9	4.9	5.9
Ortho Phosphate					0.025		0.025
COD				0.		24.	2.
Solids:							
Total							
Total Suspended							
Total Dissolved							
Total Volatile							
Volatile Suspended							
Volatile Dissolved							
Tannins & Lignins				0.		0.2	
BOD_5		0.7		1.9	1.3	3.2	2.0
Total Coliforms			24.	16.	84.	20.	25.
Turbidity			47.	4.5		7.5	6.1
Color							

STATION: LLC-SR

Description:

PARAMETER	Date	3/24	3/31	4/7	5/24	6/10	7/7
	Time	14:30	15:15				
pH		9.1	8.3	8.6	8.4	8.6	7.5
Temperature		13.	10.	14.5	16.5	20.	16.
P - Alkalinity		20.	8.	8.	20.	16.	-
T - Alkalinity		120.	128.	104.	118.	126.	132.
Carbon Dioxide		-	-	-	-	-	T
Dissolved Oxygen		14.0	12.6	14.1	11.8	12.5	8.8
Calcium Hardness		100.	104.	96.	116.	100.	100.
Total Hardness		152.	156.	140.	160.	160.	176.
Ammonia		0.035	0.039	0.039	0.036	0.154	0.070
Nitrate		4.8	5.5	4.9	6.9	6.7	5.7
Ortho Phosphate				0.049	0.10	0.050	0.050
COD		5.	8.	4.	2.	4.	0.
Solids:							
Total		80.			220.	222.	212.
Total Suspended					9.		16.
Total Dissolved					211.		196.
Total Volatile							97.
Volatile Suspended					1.		5.
Volatile Dissolved							92.
Tannins & Lignins				0.4	0.1		0.4
BOD_5		0.7	1.2	1.9	1.0	1.0	0.4
Total Coliforms		10.	80.	14.	50.		6200
Turbidity		4.5	4.5	4.8	6.5	9.2	15.
Color				10.	15.	20.	5.

STATION: LLC-SR

Description:

PARAMETER	Date	7/20	9/7				
	Time		13:40				
pH		8.3	8.5				
Temperature		17.	15.				
P - Alkalinity		12.	16.				
T - Alkalinity		132.	128.				
Carbon Dioxide		-	-				
Dissolved Oxygen		11.6	12.3				
Calcium Hardness		104.	100.				
Total Hardness		164.	168.				
Ammonia		0.034	0.084				
Nitrate		5.3	5.2				
Ortho Phosphate		0.025	0.050				
COD		2.	0.				
Solids:							
Total		217.	225.				
Total Suspended		8.	1.				
Total Dissolved		209.	224.				
Total Volatile		78.	72.				
Volatile Suspended		4.					
Volatile Dissolved		74.					
Tannins & Lignins		0.2	0.4				
BOD_5		0.4	0.6				
Total Coliforms		2900	300				
Turbidity		8.3	4.1				
Color		0.	5.				

STATION: CC1

Description: Cedar Creek 50 yards upstream from the Little Lehigh Creek

PARAMETER	Date	2/12	2/18	2/26	3/3	3/10	3/17
	Time	13:40	12:55	13:15	13:00	12:20	10:40
pH		8.0	8.6	8.6	8.6	8.6	8.4
Temperature		7.0	8.0	10.0	7.0	6.0	5.0
P - Alkalinity		-	-	12.	12.	-	4.
T - Alkalinity		144.	152.	168.	168.	156.	152.
Carbon Dioxide		T	T	-	-	T	-
Dissolved Oxygen		12.4	11.4	13.4	11.2	13.0	12.6
Calcium Hardness			136.	140.	136.	132.	132.
Total Hardness			216.	224.	220.	220.	216.
Ammonia		0.06	0.073	0.025	0.025	0.045	0.028
Nitrate		5.5	6.2	5.6	4.9	4.5	5.9
Ortho Phosphate					0.013		0.010
COD			90.		7.	6.	9.
Solids:							
Total							
Total Suspended							
Total Dissolved							
Total Volatile							
Volatile Suspended							
Volatile Dissolved							
Tannins & Lignins				0.2		0.7	
BOD_5		1.3		2.6	1.9	3.0	2.5
Total Coliforms					100	TNTC	220
Turbidity			25.	6.0		14.	7.3
Color							

STATION: CC1

Description:

PARAMETER	Date	3/24	3/31	4/7	5/16	5/24	6/10
	Time	13:30	13:10				
pH		8.7	8.3		7.5	7.8	8.4
Temperature		12.	10.5	12.5	17.0	17.0	21.5
P - Alkalinity		12.	4.	-	-	8.	8.
T - Alkalinity		164.	172.	172.	160.	152.	150.
Carbon Dioxide		-	-	T	T		
Dissolved Oxygen		11.8	10.2	12.2	8.2	9.0	8.8
Calcium Hardness		136.	132.	136.	116.	112.	106.
Total Hardness		216.	216.	220.	192.	204.	190.
Ammonia		0.025	0.025	0.028		0.036	0.017
Nitrate		4.2	6.6	4.8	4.9	5.3	6.7
Ortho Phosphate				0.016		0.03	0.02
COD		2.	19.	8.		2.	2.
Solids:							
Total		230.			270.	281.	300.
Total Suspended					30.	11.	
Total Dissolved					240.	270.	
Total Volatile		40.					
Volatile Suspended							
Volatile Dissolved							
Tannins & Lignins				0.6		0.1	
BOD_5		1.2	0.8	1.5	3.9	1.7	1.1
Total Coliforms		44.	TNTC	10.		1100	160
Turbidity		4.2	6.0	4.5	22.	9.7	9.
Color				20.	0.	5.	15.

STATION: CC1

Description:

PARAMETER	Date	7/7	7/20	9/7			
	Time			12:00			
pH		8.3	7.8	8.2			
Temperature		20.0	20.0	16.5			
P - Alkalinity		-	-	4.			
T - Alkalinity		88.	156.	160.			
Carbon Dioxide		T	4.	-			
Dissolved Oxygen		7.5	8.8	9.4			
Calcium Hardness		68.	112.	80.			
Total Hardness		120.	160.	208.			
Ammonia		0.165	0.050	0.024			
Nitrate		2.4	3.6	4.1			
Ortho Phosphate		0.18	0.	0.005			
COD		12.	1.	10.			
Solids:							
Total		273.	269.	291.			
Total Suspended		120.	14.	8.			
Total Dissolved		153.	255.	283.			
Total Volatile		75.	101.	95.			
Volatile Suspended		24.	4.				
Volatile Dissolved		51.	97.				
Tannins & Lignins		0.5	0.3	0.4			
BOD_5		3.3	0.7	0.6			
Total Coliforms		$3.4X10^4$	1300	500			
Turbidity		65.	18.	7.4			
Color		15.	10.	5.			

STATION: CC2

Description: Cedar Creek above junction with Little Cedar Creek

PARAMETER	Date	2/12	2/18	2/25	3/3	3/10	3/17
	Time	13:30	13:10	13:30	13:20	13:50	11:30
pH		8.5	8.4	8.6	8.6	8.6	8.6
Temperature		8.	7.	11.	7.5	7.	6.
P - Alkalinity		-	-	12.	12.	8.	8.
T - Alkalinity		148.	140.	164.	160.	148.	156.
Carbon Dioxide		T	T	-	-		-
Dissolved Oxygen		13.0	12.6	12.4	12.6	13.4	13.8
Calcium Hardness			152.	144.	148.	128.	132.
Total Hardness			216.	224.	212.	208.	208.
Ammonia		0.009	0.062	0.015	0.10	0.036	0.020
Nitrate		4.6	5.6	6.2	6.6	5.7	5.6
Ortho Phosphate			0.		0.004		
COD				50.	9.	2.	0.
Solids:							
Total							
Total Suspended							
Total Dissolved							
Total Volatile							
Volatile Suspended							
Volatile Dissolved							
Tannins & Lignins				0.		0.4	
BOD_5		0.4		2.8	2.0	2.0	2.7
Total Coliforms		4.	24.	11.	150	31.	200
Turbidity			28.	2.3		2.3	2.7
Color							

STATION: CC2

Description:

PARAMETER	Date	3/24	3/31	4/7	5/16	5/24	6/10
	Time	13:30	13:40	13:30			
pH		8.8	8.3	8.3	7.7	8.1	8.4
Temperature		12.	10.	12.5	16.	17.	20.
P - Alkalinity		28.	4.	8.	-	10.	12.
T - Alkalinity		160.	124.	164.	156.	144.	152.
Carbon Dioxide		-	-	-	T		-
Dissolved Oxygen		12.6	11.4	12.5	10.0	10.3	10.8
Calcium Hardness		144.	120.	132.	120.	112.	110.
Total Hardness		220.	212.	208.	196.	196.	194.
Ammonia		0.021	0.022	<0.014		0.031	0.036
Nitrate		5.0	6.9	5.6	4.8	6.3	6.6
Ortho Phosphate				0.016		0.13	0.02
COD		5.	11.	1.	9.	2.	6.
Solids:							
Total		160.			260.	257.	288.
Total Suspended		100.				3.	
Total Dissolved		60.				254.	
Total Volatile							
Volatile Suspended						3.2	
Volatile Dissolved							
Tannins & Lignins				0.6		0.1	
BOD_5		1.3	1.5	0.5	1.6	0.5	1.1
Total Coliforms		110	TNTC			140	
Turbidity		4.8	7.5	4.0	12.	4.4	6.6
Color				20.	0.	0.	15.

STATION: CC2

Description:

PARAMETER	Date	7/7	7/20	9/7			
	Time						
pH		7.6	8.2	8.2			
Temperature		17.5	18.	16.			
P - Alkalinity		-	8.	-			
T - Alkalinity		166.	156.	160.			
Carbon Dioxide		T	-	T			
Dissolved Oxygen		8.5	10.8	9.7			
Calcium Hardness		112.	116.	78.			
Total Hardness		188.	208.	204.			
Ammonia		0.081	0.031	0.084			
Nitrate		6.2	4.5	4.5			
Ortho Phosphate		0.02	0.	0.005			
COD		0.	0.	1.			
Solids:							
Total		262.	262.	279.			
Total Suspended		10.	3.	2.			
Total Dissolved		252.	259.	277.			
Total Volatile		123.	86.	90.			
Volatile Suspended		5.	0.				
Volatile Dissolved		118.	86.				
Tannins & Lignins		0.3	0.3	0.4			
BOD_5		0.3	1.1	0.9			
Total Coliforms		$1.6X10^4$	500	3000			
Turbidity		8.0	4.0	4.2			
Color		0.	5.	0.			

STATION: CC3

Description: Cedar Creek above the Fish Hatchery near the County Home

PARAMETER	Date	2/12	2/18	2/26	3/3	3/10	3/17
	Time	13:45	13:30	14:00	13:40	13:40	11:55
pH		8.4		8.6	8.6	8.7	8.6
Temperature		9.0	8.0	13.5	8.0	11.0	7.0
P - Alkalinity		-	-	8.0	8.0	12.0	12.0
T - Alkalinity		148.	164.	160.	160.	148.	152.
Carbon Dioxide		T	T	-	-	-	-
Dissolved Oxygen		11.6	11.4	11.0	11.4	12.8	13.2
Calcium Hardness			144.	144.	144.	140.	152.
Total Hardness			224.	224.	216.	220.	220.
Ammonia		0.01	0.031	0.047	0.046	0.031	0.021
Nitrate		4.8	7.3	5.6	5.2	5.2	5.0
Ortho Phosphate					0.01		<0.004
COD							8.8
Solids:							
Total							
Total Suspended							
Total Dissolved							
Total Volatile							
Volatile Suspended							
Volatile Dissolved							
Tannins & Lignins				0.1		0.5	
BOD_5		0.7		1.9	1.5	2.0	2.4
Total Coliforms				26.	27.	23.	100
Turbidity			4.0	3.6		5.6	2.6
Color							

STATION: LCC1

Description: Little Cedar Creek between Cedar Creek and Cedar Crest Boulevard

PARAMETER Date	2/25	3/3	3/10	3/17	3/24	3/31
Time	13:30	13:20	13:50	11:30	13:30	13:45
pH	8.6	8.5	8.7	8.5	8.5	8.3
Temperature	11.	7.5	8.0	5.	12.	10.
P - Alkalinity	12.	8.	-	T	8.	8.
T - Alkalinity	164.	156.	144.	148.	168.	180.
Carbon Dioxide	-	-	T	-	-	-
Dissolved Oxygen	14.0	12.6	12.5	13.0	10.8	11.2
Calcium Hardness	156.	160.	152.	160.	164.	164.
Total Hardness	224.	236.	216.	224.	232.	240.
Ammonia	0.018	0.021	0.031		0.026	0.038
Nitrate	5.3	5.2	4.6	5.9	4.3	5.3
Ortho Phosphate		0.006		0.010		
COD		24.	13.	1.	6.	
Solids:						
Total					230.	
Total Suspended						
Total Dissolved						
Total Volatile					40.	
Volatile Suspended						
Volatile Dissolved						
Tannins & Lignins	0.5		1.2			
BOD_5	2.0	1.6	3.3	2.3	0.5	0.2
Total Coliforms		150	430.	100	29.	300
Turbidity	9.5		32.	12.	6.8	4.8
Color						

STATION: LCC1

Description:

PARAMETER	Date	4/7	4/21	5/16	5/20	5/24	6/10
	Time	13:30	13:50				
pH		8.3	8.4	8.4	-	8.4	8.5
Temperature		13.	18.5	15.	16.	16.	21.
P - Alkalinity		8.	-	8.	-	6.	16.
T - Alkalinity		172.	184.	156.	64.	168.	172.
Carbon Dioxide		-	T	-	T	-	-
Dissolved Oxygen		12.9	10.1	9.2	8.8	9.5	10.2
Calcium Hardness		160.	168.	132.	64.	156.	124.
Total Hardness		228.	236.	212.	92.	236.	228.
Ammonia		0.028	0.18		0.31	0.023	<0.014
Nitrate		5.0	2.3	4.6	1.5	5.6	5.5
Ortho Phosphate		0.013	0.016		0.033	0.030	0.020
COD		2.		6.	25.	5.	0.
Solids:							
Total				305.	256.	343.	351.
Total Suspended				35.	99.	25.0	
Total Dissolved				270.	157.	318.	
Total Volatile					138.		
Volatile Suspended						5.0	
Volatile Dissolved							
Tannins & Lignins		0.8	1.0		0.70	0.6	
BOD_5		1.8	3.6	1.6	10.4	1.4	0.8
Total Coliforms		10.				300	
Turbidity		6.5	14.	30.	90.	24.	17.
Color		20.	60.	0.	30.	10.	15.

STATION: LCC1

Description:

PARAMETER	Date	7/7	7/20	9/7			
	Time		12:45				
pH		8.6	8.5	8.4			
Temperature		18.	20.	18.			
P - Alkalinity		-	-	-			
T - Alkalinity		118.	172.	172.			
Carbon Dioxide		T	T	T			
Dissolved Oxygen		8.2	9.4	11.8			
Calcium Hardness		100.	156.	44.			
Total Hardness		144.	248.	236.			
Ammonia		0.027	0.14	0.17			
Nitrate		1.8	3.0	3.6			
Ortho Phosphate		0.020	0.	0.007			
COD		3.	4.	8.			
Solids:							
Total		283.	362.	416.			
Total Suspended		96.	43.	96.			
Total Dissolved		187.	319.	320.			
Total Volatile		77.	126.	122.			
Volatile Suspended		16.	7.				
Volatile Dissolved		61.	121.				
Tannins & Lignins		0.3	0.8	0.8			
BOD_5		2.5	0.9	1.6			
Total Coliforms		$2.3X10^4$	900	4000			
Turbidity		74.	47.	76.			
Color		20.	5.	5.			

STATION: LCC2

Description: Little Cedar Creek at Spring House Road

PARAMETER	Date	3/24	3/31	4/7	4/21	5/16	5/24
	Time	14:05	14:15	14:00	14:15	16:00	Dry
pH		>9.2	8.5	8.9	8.4	8.0	
Temperature		13.	9.0	15.	24.5	18.5	
P - Alkalinity		20.	16.	16.	8.	8.	
T - Alkalinity		72.	100.	84.	88.	120.	
Carbon Dioxide		-	-	-	-	-	
Dissolved Oxygen		13.6	12.6	13.6	10.9	9.2	
Calcium Hardness		104.	132.	96.	116.	156.	
Total Hardness		156.	168.	148.	148.	196.	
Ammonia		0.018	0.026	0.022	0.05		
Nitrate		2.7	3.2	3.4	1.0	2.4	
Ortho Phosphate				0.013	0.24		
COD		4.	26.	7.		12.	
Solids:							
Total		230.				330.	
Total Suspended							
Total Dissolved							
Total Volatile		10.					
Volatile Suspended							
Volatile Dissolved							
Tannins & Lignins				0.4	0.4		
BOD_5		1.2	1.8	1.0	4.3	3.1	
Total Coliforms		23.	20.	2.			
Turbidity		2.	8.5	2.3	1.6	14.	
Color				10.	15.	20.	

STATION: LCC2

Description:

PARAMETER	Date	6/10	7/7	7/20	9/7		
	Time	Dry		Dry	Dry		
pH			8.5				
Temperature			22.				
P - Alkalinity			-				
T - Alkalinity			70.				
Carbon Dioxide			T				
Dissolved Oxygen			8.5				
Calcium Hardness			96.				
Total Hardness			128.				
Ammonia			0.015				
Nitrate			1.4				
Ortho Phosphate			0.02				
COD			11.				
Solids:							
Total			320.				
Total Suspended			43.				
Total Dissolved			277.				
Total Volatile			99.				
Volatile Suspended			11.				
Volatile Dissolved			88.				
Tannins & Lignins			0.9				
BOD_5			3.9				
Total Coliforms			2.4×10^4				
Turbidity			42.				
Color			20.				

APPENDIX C

STORM RUNOFF WATER QUALITY DATA

The units for the observed data on the subsequent pages are:

pH:	None
Temperature:	^oC
P-Alkalinity:	mg/l as $CaCO_3$
T-Alkalinity:	mg/l as $CaCO_3$
Carbon Dioxide:	mg/l as $CaCO_3$
Dissolved Oxygen:	mg/l
Calcium Hardness:	mg/l as $CaCO_3$
Total Hardness:	mg/l as $CaCO_3$
Ammonia:	mg/l as N
Nitrate:	mg/l as N
Ortho Phosphate:	mg/l as P
COD:	mg/l
Solids:	mg/l
Tannins and Lignins:	mg/l as Tannic Acid
BOD_5:	mg/l
Total Coliforms:	Count per 100 ml (TNTC = Too numerous to count)
Turbidity:	FTU
Color:	mg/l

STATION: Ott Street Sewer

Description: North bank of Cedar Creek just downstream from Ott Street

PARAMETER							
	Date	6/16	6/16	6/16	6/16		
	Time	15:00	19:55	20:30	21:00		
pH							
Temperature							
P - Alkalinity							
T - Alkalinity							
Carbon Dioxide							
Dissolved Oxygen							
Calcium Hardness		120.	36.	32.	28.		
Total Hardness		180.	48.	48.	36.		
Ammonia		0.137	0.076	0.048	0.013		
Nitrate		6.4	2.5	2.2	1.8		
Ortho Phosphate		0.08	0.47	0.10	0.06		
COD		7.	670.	207.	200.		
Solids:							
Total		247.	911.	262.	293.		
Total Suspended		-	324.	64.	103.		
Total Dissolved		-	587.	193.	190.		
Total Volatile		79.	610.	173.	182.		
Volatile Suspended							
Volatile Dissolved							
Tannins & Lignins		0.	4.2	3.4	2.8		
BOD_5		0.2	>50.	>50.	>50.		
Total Coliforms			2.0×10^4				
Turbidity		0.35	62.	27.	30.		
Color		0.	75.	80.	75.		

STATION: Ott Street Sewer

Description:

PARAMETER	Date	6/21	6/21	6/21			
	Time	9:50	10:55	11:55			
pH							
Temperature		22.	24.	23.			
P - Alkalinity							
T - Alkalinity							
Carbon Dioxide							
Dissolved Oxygen		8.3	8.6	7.9			
Calcium Hardness		24.	22.	40.			
Total Hardness		40.	26.	56.			
Ammonia		0.020	0.098	0.027			
Nitrate		0.14	1.3	1.4			
Ortho Phosphate		0.26	0.02	0.03			
COD		48.	131.	19.			
Solids:							
Total		143.	277.	127.			
Total Suspended		34.	191.	7.			
Total Dissolved		109.	86.	120.			
Total Volatile							
Volatile Suspended							
Volatile Dissolved							
Tannins & Lignins		1.3	1.0	1.2			
BOD_5		22.	17.	6.			
Total Coliforms							
Turbidity		27.	58.	15.			
Color		40.	32.	45.			

STATION: Ott Street Sewer

Description:

PARAMETER	Date	6/29	6/29	6/29	6/29		
	Time	15:08	15:12	15:25	15:40		
pH							
Temperature							
P - Alkalinity							
T - Alkalinity							
Carbon Dioxide							
Dissolved Oxygen							
Calcium Hardness		46.	26.	22.	22.		
Total Hardness		54.	36.	34.	34.		
Ammonia		0.27	0.11	0.28	0.22		
Nitrate		4.1	1.6	1.6	1.5		
Ortho Phosphate		0.04	0.06	0.07	0.07		
COD		239.	162.	93.	81.		
Solids:							
Total		434.	246.	218.	182.		
Total Suspended		341.	211.	145.	105.		
Total Dissolved		93.	35.	73.	77.		
Total Volatile		180.	122.	90.	69.		
Volatile Suspended		137.	114.	54.	37.		
Volatile Dissolved		43.	8.	36.	32.		
Tannins & Lignins		2.7	1.8	1.3	1.4		
BOD_5		20.	40.	19.	12.		
Total Coliforms			$1.2X10^4$	$4.0X10^3$	$3.4X10^4$		
Turbidity		53.	42.	44.	46.		
Color		80.	40.	40.	45.		

STATION: Ott Street Sewer

Description:

PARAMETER							
	Date	7/23	7/23	7/23	7/23		
	Time	12:30	12:35	12:55	1:30		
pH		6.4	6.7	6.9	6.9		
Temperature							
P - Alkalinity							
T - Alkalinity							
Carbon Dioxide							
Dissolved Oxygen							
Calcium Hardness		104.	92.	68.	64.		
Total Hardness		136.	112.	84.	80.		
Ammonia		0.33	0.70	0.46	0.27		
Nitrate		13.6	10.2	9.8	5.2		
Ortho Phosphate		0.65	0.27	0.16	0.13		
COD		281.	351.	185.	151.		
Solids:							
Total		651.	475.	276.	259.		
Total Suspended		185.	163.	35.	31.		
Total Dissolved		466.	312.	241.	228.		
Total Volatile		257.	216.	141.	109.		
Volatile Suspended		59.	55.	21.	16.		
Volatile Dissolved		198.	161.	120.	93.		
Tannins & Lignins		7.2	5.8	5.0	3.9		
BOD_5		43.	58.	34.	26.		
Total Coliforms		-	-	-	-		
Turbidity		56.	51.	30.	34.		
Color		210.	180.	170.	160.		

STATION: Cedar Creek

Description: Below Ott Street Storm Sewer

PARAMETER							
	Date	6/16	6/16		6/29	6/29	
	Time	15:00	20:50		15:00	15:40	
pH							
Temperature		21.					
P - Alkalinity							
T - Alkalinity							
Carbon Dioxide							
Dissolved Oxygen		9.5					
Calcium Hardness		116.	83.		102.	68.	
Total Hardness		156.	148.		144.	124.	
Ammonia		0.014	0.027		0.020	0.035	
Nitrate		8.4	7.3		4.2	3.6	
Ortho Phosphate		0.01	0.02		0.01	0.02	
COD		4.	78.		8.	58.	
Solids:							
Total		254.	367.		297.	243.	
Total Suspended		--	167.		18.	100.	
Total Dissolved			200.		279.	143.	
Total Volatile		81.	139.		100.	75.	
Volatile Suspended					10.	27.	
Volatile Dissolved					90.	48.	
Tannins & Lignins		0.2	0.9		0.4	0.8	
BOD_5		1.0	33.			7.6	
Total Coliforms			1.2×10^4		$3. \times 10^3$	2.5×10^4	
Turbidity		7.	63.		23.	58.	
Color			30.		5.	30.	

STATION: Cedar Creek

Description: Below Ott Street Storm Sewer

PARAMETER	Date	6/21	6/21		6/23	6/3	
	Time	9:55	12:00		10:35	13:55	
pH					8.3	8.2	
Temperature		19.	24.				
P - Alkalinity							
T - Alkalinity							
Carbon Dioxide							
Dissolved Oxygen		7.9	7.9				
Calcium Hardness		102.	94.		124.	124.	
Total Hardness		158.	150.		180.	196.	
Ammonia		0.021	0.018		0.09	0.08	
Nitrate		4.6	4.1		5.5	5.5	
Ortho Phosphate		0.01	0.01		0.005	0.005	
COD		13.	13.		18.	26.	
Solids:							
Total		274.	253.		303.	312.	
Total Suspended		26.	20.		5.	7.	
Total Dissolved		248.	233.		298.	305.	
Total Volatile					110.	107.	
Volatile Suspended					2.	4.	
Volatile Dissolved					108.	103.	
Tannins & Lignins		0.4	0.4		0.	0.1	
BOD_5		5.	5.		<2	<2	
Total Coliforms		22.	24.		$1.6x10^3$	$1.1x10^3$	
Turbidity		15.	22.		7.	6.5	
Color					5.	10.	

STATION: College Heights Boulevard Storm Sewer

Description: From Stilling Basin

PARAMETER							
Date	6/16	6/16					
Time	20:10	21:00					
pH							
Temperature							
P - Alkalinity							
T - Alkalinity							
Carbon Dioxide							
Dissolved Oxygen							
Calcium Hardness	72.	48.					
Total Hardness	88.	76.					
Ammonia	0.005	0.005					
Nitrate	7.3	3.1					
Ortho Phosphate	0.02	0.01					
COD	880.	213.					
Solids:							
Total	1289.	282.					
Total Suspended	524.	86.					
Total Dissolved	765.	196.					
Total Volatile	973.	243.					
Volatile Suspended							
Volatile Dissolved							
Tannins & Lignins	-	2.9					
BOD_5	>50.	>50.					
Total Coliforms							
Turbidity	80.	35.					
Color	160.	80.					

STATION: College Heights Boulevard Storm Sewer

Description: South Barrel, third manhole upstream from stilling basin

PARAMETER	Date	8/9	8/9	8/9	8/9		
	Time	12:45	18:75	20:35	22:00		
pH		6.5	6.5	6.6			
Temperature							
P - Alkalinity							
T - Alkalinity							
Carbon Dioxide							
Dissolved Oxygen							
Calcium Hardness		44.	56.	38.	18.		
Total Hardness		62.	70.	44.	24.		
Ammonia		0.052	0.045	0.18	0.054		
Nitrate		0.66	2.1	0.81	0.45		
Ortho Phosphate		0.10	0.03	0.05	0.06		
COD		10.	80.	48.	13.		
Solids:							
Total		107.	336.	174.	85.		
Total Suspended		7.	211.	92.	43.		
Total Dissolved		100.	125.	82.	42.		
Total Volatile		32.	86.	50.	26.		
Volatile Suspended		7.	47.	29.	13.		
Volatile Dissolved		25.	39.	21.	13.		
Tannins & Lignins		1.1	1.3	1.2	0.8		
BOD_5		2.5	6.8	<2	<2		
Total Coliforms		$4.2x10^4$	$>10^5$	$>10^5$	$>10^5$		
Turbidity		13.	200.	96.	38.		
Color		40.	80.	65.	45.		

STATION: College Heights Boulevard Storm Sewer

Description: South Barrel, third manhole upstream from stilling basin

PARAMETER	Date	9/2	9/2	9/2	9/2		
	Time	16:25	16:40	16:55	17:10		
pH							
Temperature							
P - Alkalinity							
T - Alkalinity							
Carbon Dioxide							
Dissolved Oxygen							
Calcium Hardness							
Total Hardness							
Ammonia							
Nitrate							
Ortho Phosphate		0.36	0.41	0.34	0.40		
COD		178.	128.	97.	95.		
Solids:							
Total		353.	259.	227.	213.		
Total Suspended		114.	77.	44.	33.		
Total Dissolved		239.	182.	183.	180.		
Total Volatile							
Volatile Suspended							
Volatile Dissolved							
Tannins & Lignins							
BOD_5		34.	24.	19.	20.		
Total Coliforms							
Turbidity							
Color		210.	165.	150.	170.		

STATION: College Heights Boulevard Storm Sewer

Description: South Barrel, third manhole upstream from Stilling basin

PARAMETER	Date	9/10	9/10				
	Time	9:25	11:25				
pH							
Temperature							
P - Alkalinity							
T - Alkalinity							
Carbon Dioxide							
Dissolved Oxygen							
Calcium Hardness							
Total Hardness							
Ammonia							
Nitrate							
Ortho Phosphate							
COD		422.	110.				
Solids:							
Total							
Total Suspended							
Total Dissolved							
Total Volatile							
Volatile Suspended							
Volatile Dissolved							
Tannins & Lignins							
BOD_5		150.	29.				
Total Coliforms		$1.X10^6$	$2X10^5$				
Turbidity		33.	31.				
Color							

STATION: College Heights Boulevard Storm Sewer

Description: South Barrel, third manhole upstream from Stilling basin

PARAMETER	Date	9/16	9/16	9/16	9/16		
	Time	9:10	11:30	11:50	15:00		
pH							
Temperature							
P - Alkalinity							
T - Alkalinity							
Carbon Dioxide							
Dissolved Oxygen							
Calcium Hardness							
Total Hardness							
Ammonia							
Nitrate							
Ortho Phosphate							
COD		78.	69.	66.	31.		
Solids:							
Total							
Total Suspended		42.	67.	76.	16.		
Total Dissolved							
Total Volatile							
Volatile Suspended							
Volatile Dissolved							
Tannins & Lignins							
BOD_5		13.	14.	9.	<6.		
Total Coliforms		$3.X10^5$	$4.X10^5$	$2.X10^5$	$2.X10^5$		
Turbidity							
Color							

STATION: College Heights Boulevard Storm Sewer

Description: South Barrel, third manhole upstream from stilling basin

PARAMETER							
	Date	9/26	9/26	9/26	9/26		
	Time	12:00	12:30	13:00	13:30		
pH							
Temperature							
P - Alkalinity							
T - Alkalinity							
Carbon Dioxide							
Dissolved Oxygen							
Calcium Hardness							
Total Hardness							
Ammonia							
Nitrate							
Ortho Phosphate		0.40	0.37	0.28	0.26		
COD		210.	170.	125.	70.		
Solids:							
Total							
Total Suspended		61.	78.	89.	40.		
Total Dissolved							
Total Volatile							
Volatile Suspended							
Volatile Dissolved							
Tannins & Lignins							
BOD_5		37.	31.	24.	15.		
Total Coliforms		$2.x10^5$	$2.x10^5$	$3.x10^5$	$6.x10^4$		
Turbidity		36.	43.	35.	25.		
Color		190.	145.	120.	90.		

STATION: Trexler Park Apartment Storm Sewer Outfall

Description: West bank of Little Cedar Creek in Trexler Park

PARAMETER	Date	5/1					
	Time						
pH		7.2					
Temperature		12.0					
P - Alkalinity		-					
T - Alkalinity		40.					
Carbon Dioxide		T					
Dissolved Oxygen							
Calcium Hardness		92.					
Total Hardness		116.					
Ammonia							
Nitrate		1.7					
Ortho Phosphate		0.11					
COD		269.					
Solids:							
Total		410.					
Total Suspended		150.					
Total Dissolved		260.					
Total Volatile		250.					
Volatile Suspended		67.					
Volatile Dissolved		183.					
Tannins & Lignins							
BOD_5		>10.					
Total Coliforms							
Turbidity		45.					
Color		120.					

STATION: Little Cedar Creek

Description: At Trexler Park Apartment Outfall

PARAMETER	Date	5/1					
	Time						
pH		7.5					
Temperature		11.5					
P - Alkalinity		-					
T - Alkalinity		176.					
Carbon Dioxide		4.					
Dissolved Oxygen							
Calcium Hardness		176.					
Total Hardness		240.					
Ammonia							
Nitrate		4.5					
Ortho Phosphate		0.053					
COD		4.					
Solids:							
Total		310.					
Total Suspended		4.					
Total Dissolved		306.					
Total Volatile							
Volatile Suspended							
Volatile Dissolved							
Tannins & Lignins							
BOD_5		<2.					
Total Coliforms							
Turbidity		2.2					
Color		0.					

STATION: WTP Storm Sewer Outfall

Description: North bank of Little Lehigh, upstream from 15th Street

PARAMETER	Date	4/22					
	Time						
pH		7.0					
Temperature		11.0					
P - Alkalinity		-					
T - Alkalinity		188.					
Carbon Dioxide		4.					
Dissolved Oxygen							
Calcium Hardness		152.					
Total Hardness		272.					
Ammonia		0.					
Nitrate		2.7					
Ortho Phosphate		0.					
COD							
Solids:							
Total							
Total Suspended							
Total Dissolved							
Total Volatile							
Volatile Suspended							
Volatile Dissolved							
Tannins & Lignins		0.7					
BOD_5		1.					
Total Coliforms							
Turbidity		0.24					
Color		0.					

STATION: Little Cedar Creek

Description: Above College Heights Boulevard Outfall

PARAMETER	Date	8/9					
	Time	10:00					
pH		6.4					
Temperature							
P - Alkalinity							
T - Alkalinity							
Carbon Dioxide							
Dissolved Oxygen							
Calcium Hardness		92.					
Total Hardness		126.					
Ammonia		0.11					
Nitrate		2.2					
Ortho Phosphate		0.025					
COD		13.					
Solids:							
Total		358.					
Total Suspended		151.					
Total Dissolved		207.					
Total Volatile		81.					
Volatile Suspended		20.					
Volatile Dissolved		61.					
Tannins & Lignins		0.7					
BOD_5		2.8					
Total Coliforms		$2.X10^3$					
Turbidity		130.					
Color		35.					

STATION: Little Cedar Creek

Description:

PARAMETER		1.			2.	
Date		6/16			6/16	
Time		21:00			21:00	
pH						
Temperature						
P - Alkalinity						
T - Alkalinity						
Carbon Dioxide						
Dissolved Oxygen						
Calcium Hardness		128.			64.	
Total Hardness		192.			104.	
Ammonia		0.007			0.005	
Nitrate		8.4			4.1	
Ortho Phosphate		0.01			0.02	
COD		9.			168.	
Solids:						
Total		330.			309.	
Total Suspended		48.			108.	
Total Dissolved		282.			201.	
Total Volatile		135.			220.	
Volatile Suspended						
Volatile Dissolved						
Tannins & Lignins		-			2.4	
BOD_5		4.			>50.	
Total Coliforms						
Turbidity		34.			45 .	
Color		0.			70.	

1. Above College Heights Boulevard Sewer
2. Below College Heights Boulevard Sewer

STATION: Storm Sewer Catchbasins

Description: 24th and Washington Avenue ↓ 29th Street and Tilghman ↓

PARAMETER						
Date		7/30	7/30			
Time						
pH						
Temperature						
P - Alkalinity						
T - Alkalinity						
Carbon Dioxide						
Dissolved Oxygen						
Calcium Hardness						
Total Hardness						
Ammonia						
Nitrate						
Ortho Phosphate						
COD		65.	100.			
Solids:						
Total						
Total Suspended						
Total Dissolved						
Total Volatile						
Volatile Suspended						
Volatile Dissolved						
Tannins & Lignins						
BOD_5		7.0	29.			
Total Coliforms						
Turbidity						
Color						

APPENDIX D

OBSERVED RAIN DATA

Date	Time	Accumulative Precipitation (inches)
June 29, 1976	3:00	0.00
	3:05	0.03
	3:10	0.12
	3:15	0.22
	3:20	0.27
	3:25	0.30
	3:30	0.31
September 15, 1976	21:40	0.00
September 16, 1976	9:05	0.28
	9:25	0.29
	9:40	0.30
	11:00	0.35
	11:10	0.36
	11:20	0.38
	11:30	0.41
	11:45	0.42
	12:15	0.48
	13:05	0.50
	13:25	0.51
	13:40	0.55
	13:50	0.57
	14:00	0.60
	14:30	0.63
	14:45	0.65

APPENDIX D (Cont)

OBSERVED RAIN DATA

Date	Time	Accumulative Precipitation (inches)
September 26, 1976	10:30	0.00
	11:50	<0.05
	12:00	0.03
	12:10	0.05
	12:15	0.06
	12:25	0.07
	12:35	0.08
	12:45	0.10
	12:50	0.12
	12:55	0.13
	13:05	0.15
	13:20	0.15
	13:40	0.15
	14:15	0.18
	14:25	0.20
	15:25	0.20
October 9, 1976	7:15	1.45
	7:30	1.46
	7:45	1.47
	7:50	1.49
	7:55	1.50
	8:00	1.51
	8:15	1.53
	8:25	1.54
	8:35	1.60
	8:40	1.61
	8:50	1.63
	8:55	1.64
	9:05	1.67
	9:15	1.73

APPENDIX D (Cont)

OBSERVED RAIN DATA

Date	Time	Accumulative Precipitation (inches)
October 9, 1976	9:20	1.78
(Cont)	9:50	1.80
	10:00	1.82
	10:20	1.85
	11:05	1.90
	11:10	1.92
	11:25	1.94
	11:50	1.95
	11:55	1.96

APPENDIX E

SWMM COMPUTER OUTPUT
FOR OCTOBER 9, 1976 STORM EVENT

ALLENTOWN, PENNSYLVANIA - COLLEGE HEIGHTS BLVD. DRAINAGE AREA

STORM OF 09 OCTOBER 1976

BASIN NUMBER 1

NUMBER OF TIME STEPS 100

INTEGRATION TIME INTERVAL (MINUTES), 10.00

35.0 PERCENT OF IMPERVIOUS AREA HAS ZERO DETENTION DEPTH

FOR 80 RAINFALL STEPS, THE TIME INTERVAL IS 10.00 MINUTES

FOR RAINGAGE NUMBER 1, RAINFALL HISTORY IS

.00	.09	.09	.09	.09	.09	.09	.04	.04	.04
.04	.04	.04	.12	.12	.12	.12	.12	.12	.30
.30	.30	.30	.30	.30	.35	.35	.35	.35	.35
.35	.08	.08	.08	.08	.08	.08	.03	.03	.03
.03	.03	.03	.15	.15	.15	.15	.15	.15	.12
.12	.06	.06	.12	.12	.12	.06	.12	.30	.12
.18	.24	.48	.03	.03	.05	.12	.09	.09	.00
.09	.09	.06	.18	.12	.05	.06	.05	.00	.00

* * * * * GUTTER AND PIPE DATA * * * * *

GUTTER NUMBER		GUTTER CONNECTION	WIDTH (FT)	LENGTH (FT)	SLOPE (FT/FT)	SIDE SLOPES L	SIDE SLOPES R	MANNING N	OVERFLOW (IN)
1	* 101	3	1.0	950.	.026	-.0	-.0	.015	10.00
2	* 102	4	1.6	1200.	.036	-.0	-.0	.015	10.00
3	103	3	4.0	1800.	.031	-.0	-.0	.015	5.00
4	104	4	4.0	1600.	.036	-.0	-.0	.015	5.00
5	107	7	4.0	1000.	.027	-.0	-.0	.015	6.00
6	* 108	8	2.3	1650.	.004	-.0	-.0	.015	10.00
7	109	9	4.0	980.	.014	-.0	-.0	.015	5.00
8	110	10	4.0	1450.	.010	-.0	-.0	.015	6.00
9	* 113	15	2.0	1270.	.010	-.0	-.0	.015	10.00
10	* 114	18	2.5	950.	.005	-.0	-.0	.015	10.00
11	115	15	4.0	950.	.006	-.0	-.0	.015	6.00
12	116	14	4.0	800.	.019	-.0	-.0	.015	6.00
13	117	15	4.0	350.	.020	-.0	-.0	.015	6.00
14	* 118	20	1.3	680.	.018	-.0	-.0	.015	10.00
15	119	19	4.0	650.	.004	-.0	-.0	.015	5.00
16	120	19	4.0	1300.	.037	-.0	-.0	.015	5.00
17	121	24	4.0	1800.	.036	-.0	-.0	.015	6.00
18	* 123	21	1.3	930.	.020	-.0	-.0	.015	10.00
19	124	25	4.0	500.	.038	-.0	-.0	.015	5.00
20	* 125	25	1.8	1300.	.030	-.0	-.0	.015	10.00
21	* 126	27	1.7	1300.	.023	-.0	-.0	.015	10.00
22	* 127	28	2.4	1300.	.015	-.0	-.0	.015	10.00
23	128	28	4.0	1200.	.023	-.0	-.0	.015	6.00
24	129	29	4.0	1200.	.019	-.0	-.0	.015	6.00
25	130	29	4.0	600.	.007	-.0	-.0	.015	5.00
26	* 131	31	2.0	700.	.038	-.0	-.0	.015	10.00
27	* 132	34	2.0	650.	.023	-.0	-.0	.015	10.00
28	133	33	4.0	920.	.034	-.0	-.0	.015	6.00
29	134	33	4.0	920.	.034	-.0	-.0	.015	6.00
30	135	33	4.0	1200.	.019	-.0	-.0	.015	6.00
31	136	33	4.0	1250.	.019	-.0	-.0	.015	6.00

TOTAL NUMBER OF GUTTERS/PIPES, 31

ASTERICK (*) DENOTES CIRCULAR PIPE, DIAMETER=.WIDTH.

***** SUBCATCHMENT DATA *****

SUBCATCH-MENT NO.		GUTTER OR INLET	WIDTH (FT)	AREA (AC)	PERCENT IMPERV.	SLOPE (FT/FT)	RESISTANCE FACTOR IMPERV.	RESISTANCE FACTOR PERV.	SURFACE STORAGE (IN) IMPERV.	SURFACE STORAGE (IN) PERV.	INFILTRATION RATE (IN/HR) MAXIMUM	INFILTRATION RATE (IN/HR) MINIMUM	DECAY RATE (1/SEC)	GAGE NO.
1	1	101	3030.0	15.	13.0	.050	.012	.250	.062	.200	2.00	.70	.00115	1
2	2	102	2570.0	13.	12.0	.070	.012	.250	.062	.200	2.00	.70	.00115	1
3	3	103	1700.0	15.	7.0	.010	.012	.250	.062	.200	2.00	.70	.00115	1
4	4	104	2950.0	20.	9.0	.030	.012	.250	.062	.200	2.00	.70	.00115	1
5	5	5	1950.0	12.	14.0	.044	.012	.250	.062	.200	2.00	.70	.00115	1
6	6	5	370.0	7.	13.0	.037	.012	.250	.062	.200	2.00	.70	.00115	1
7	7	107	1520.0	11.	14.0	.027	.012	.250	.062	.200	2.00	.70	.00115	1
8	8	108	7090.0	11.	18.0	.027	.012	.250	.062	.200	2.00	.70	.00115	1
9	9	109	1050.0	13.	15.0	.023	.012	.250	.062	.200	2.00	.70	.00115	1
10	10	110	2510.0	18.	17.0	.023	.012	.250	.062	.200	2.00	.70	.00115	1
11	11	9	350.0	9.	13.0	.017	.012	.250	.062	.200	2.00	.70	.00115	1
12	12	12	1390.0	5.	17.0	.020	.012	.250	.062	.200	2.00	.70	.00115	1
13	13	113	2570.0	13.	17.0	.010	.012	.250	.062	.200	2.00	.70	.00115	1
14	14	114	2510.0	25.	17.0	.030	.012	.250	.062	.200	2.00	.70	.00115	1
15	15	115	1370.0	20.	14.0	.022	.012	.250	.062	.200	2.00	.70	.00115	1
16	16	116	970.0	10.	15.0	.010	.012	.250	.062	.200	2.00	.70	.00115	1
17	17	117	350.0	5.	15.0	.017	.012	.250	.062	.200	2.00	.70	.00115	1
18	18	118	1540.0	11.	12.0	.050	.012	.250	.062	.200	2.00	.70	.00115	1
19	19	119	950.0	13.	12.0	.070	.012	.250	.062	.200	2.00	.70	.00115	1
20	20	120	2110.0	23.	14.0	.030	.012	.250	.062	.200	2.00	.70	.00115	1
21	21	121	5560.0	17.	13.0	.030	.012	.250	.062	.200	2.00	.70	.00115	1
22	22	22	1120.0	13.	17.0	.019	.012	.250	.062	.200	2.00	.70	.00115	1
23	23	123	310.0	16.	15.0	.017	.012	.250	.062	.200	2.00	.70	.00115	1
24	24	124	390.0	11.	10.0	.016	.012	.250	.062	.200	2.00	.70	.00115	1
25	25	125	3340.0	15.	11.0	.030	.012	.250	.062	.200	2.00	.70	.00115	1
26	26	126	4120.0	17.	11.0	.031	.012	.250	.062	.200	2.00	.70	.00115	1
27	27	127	4280.0	17.	11.0	.023	.012	.250	.062	.200	2.00	.70	.00115	1
28	28	128	2490.0	10.	12.0	.017	.012	.250	.062	.200	2.00	.70	.00115	1
29	29	129	1770.0	20.	10.0	.030	.012	.250	.062	.200	2.00	.70	.00115	1
30	30	130	1300.0	9.	11.0	.017	.012	.250	.062	.200	2.00	.70	.00115	1
31	31	131	2870.0	19.	11.0	.030	.012	.250	.062	.200	2.00	.70	.00115	1
32	32	132	2800.0	18.	10.0	.023	.012	.250	.062	.200	2.00	.70	.00115	1
33	33	133	1100.0	17.	9.0	.040	.012	.250	.062	.200	2.00	.70	.00115	1
34	34	134	370.0	5.	13.0	.020	.012	.250	.062	.200	2.00	.70	.00115	1
35	35	135	1200.0	7.	22.0	.030	.012	.250	.062	.200	2.00	.70	.00115	1
36	36	136	1200.0	11.	17.0	.020	.012	.250	.062	.200	2.00	.70	.00115	1

TOTAL NUMBER OF SUBCATCHMENTS, 36

TOTAL TRIBUTARY AREA (ACRES), 482.80

ARRANGEMENT OF SUBCATCHMENTS AND GUTTERS/PIPES

GUTTER OR PIPE	TRIBUTARY GUTTER/PIPE	TRIBUTARY SUBAREA
101		1
102		2
103		3
104		4
107		7
108		8
109		9
110		10
113		13
114		14
115		15
116		16
117		17
118		18
119		19
120		20
121		21
123		23
124		24
125		25
126		26
127		27
128		28
129		29
130		30
131		31
132		32
133		33
134		34
135		35
136		36

INLET	TRIBUTARY GUTTERS AND/OR PIPES	TRIBUTARY SUBAREAS
3	101 103	
4	102 104	
7	107	
8	108	
9	109	11
10	110	
15	113	
18	114	
16	115 117	
14	116	
20	118	
19	119 120	
24	121	
21	123	
25	124	
26	125	
27	126	
28	127 128	
29	129 130	
31	131	
34	132	
33	133 134 135 136	
6		5 5
12		12
22		22

```
HYDROGRAPHS WILL BE STORED FOR THE FOLLOWING  25 INLETS

            3     4     7     8     9    10    15    18    16    14
           20    19    24    21    25    26    27    28    29    31
           34    33     6    12    22


         .....QUALITY SIMULATION INCLUDED IN THIS RUN.....


         INPUT PARAMETERS AS FOLLOWS

         NUMBER OF CONSTITUENTS         8

         NUMBER OF DRY DAYS          10.0

         STREET CLEANING FREQ        14.0 DAYS

         PASSES PER CLEANING            1

         STD CATCHBASIN VOLUME       5.30 FT3

         CATCHBASIN CONTENTS BOD    100.0 MG/L

         METHOD FOR CALCULATING SS
           SPECIAL TECHNIQUE.
           SAME AS IN ORIGINAL
           RELEASE I OF THE SWMM.
           ISS = 1
```

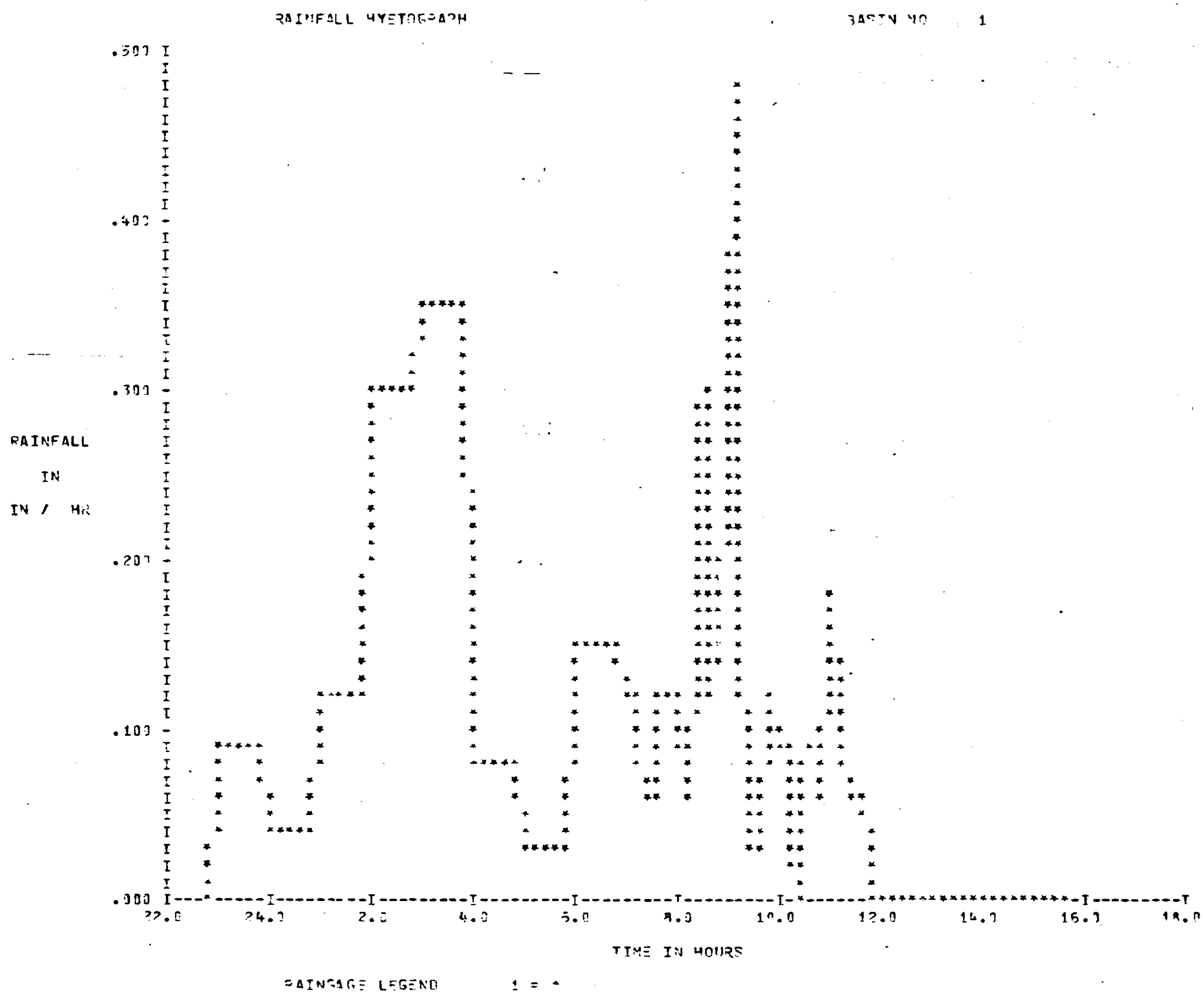
WATERSHED QUALITY DEFINITIONS

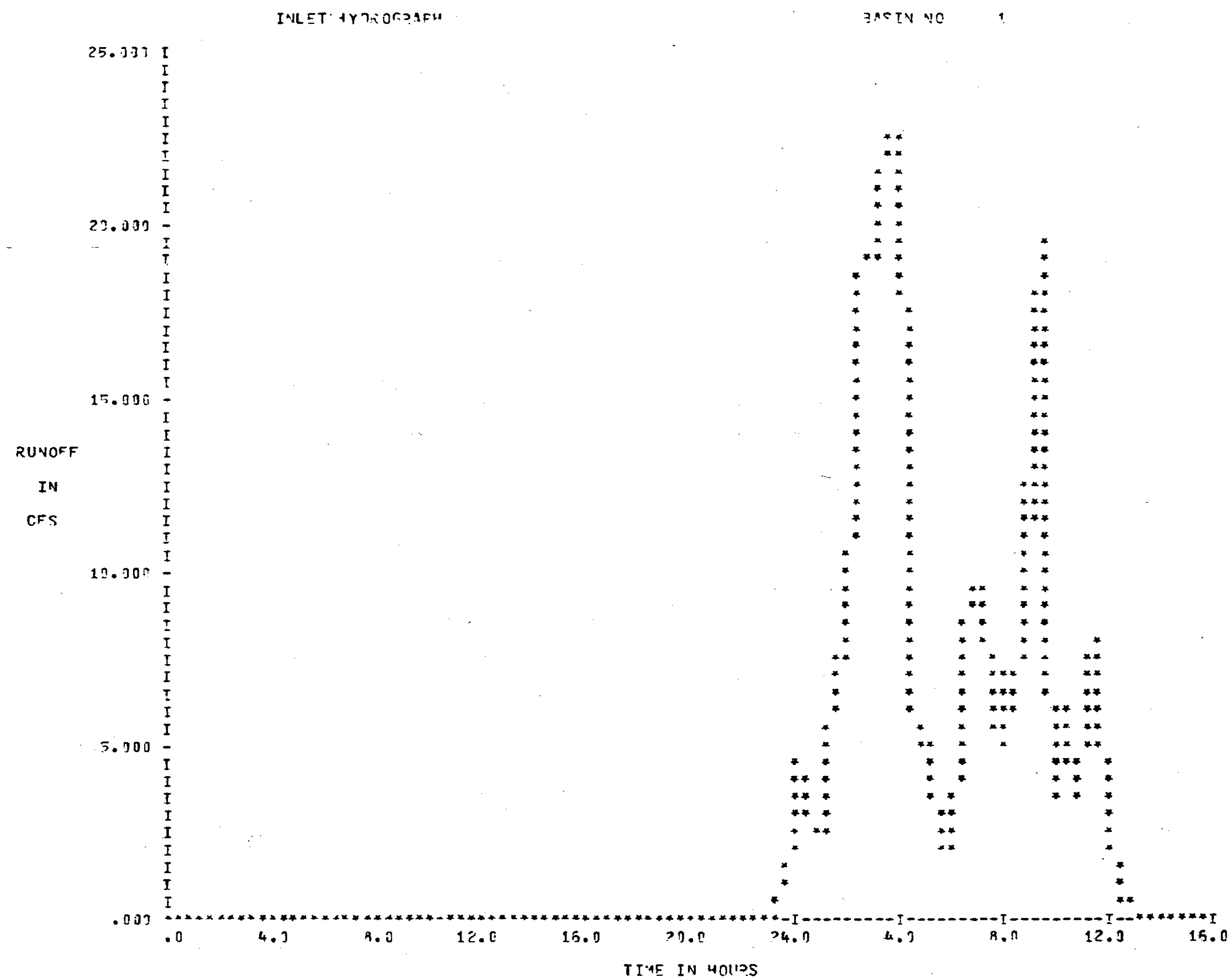
SUBAREA NUMBER		LAND USE CLASS.	TOTAL GUTTER LENGTH*10**2 FT.	NUMBER OF CATCHBASINS
1	1	1	64.00	15.00
2	2	1	55.00	22.00
3	3	5	73.00	4.00
4	4	1	48.00	10.00
5	5	1	34.00	14.00
6	6	1	11.00	2.00
7	7	1	36.00	16.00
8	8	1	55.00	14.00
9	9	1	60.00	22.00
10	10	1	84.00	22.00
11	11	1	31.00	5.00
12	12	1	28.00	11.00
13	13	1	84.00	32.00
14	14	1	169.00	34.00
15	15	1	101.00	19.00
16	16	1	57.00	11.00
17	17	1	30.00	6.00
18	18	1	53.00	14.00
19	19	1	61.00	12.00
20	20	1	116.00	33.00
21	21	1	59.00	6.00
22	22	1	62.00	16.00
23	23	1	45.00	22.00
24	24	1	55.00	9.00
25	25	1	53.00	18.00
26	26	1	51.00	14.00
27	27	1	53.00	14.00
28	28	1	34.00	4.00
29	29	1	56.00	18.00
30	30	1	25.00	7.00
31	31	1	58.00	14.00
32	32	1	36.00	10.00
33	33	1	20.00	6.00
34	34	1	25.00	6.00
35	35	3	26.00	5.00
36	36	1	20.00	6.00

HYDROGRAPHS WILL BE LISTED FOR THE FOLLOWING 5 GUTTERS OR INLETS

3 4 10 19 33

TOTAL RAINFALL (CU FT)	.301441E+07
TOTAL INFILTRATION (CU FT)	.261967E+07
TOTAL GUTTER FLOW AT INLET (CU FT)	.385397E+06
TOTAL SURFACE STORAGE AT END OF STORM (CU FT)	.925887E+04
ERROR IN CONTINUITY, PERCENTAGE OF RAINFALL,	.00276


RAINFALL HYETOGRAPH
BASIN NO 1
.500
.400
.300
.200
.100
.000
RAINFALL
IN
IN / HR
22.0
24.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
TIME IN HOURS
RAINGAGE LEGEND 1 = *


INLET HYDROGRAPH
BASIN NO 1
25.000
20.000
15.000
10.000
5.000
.000
RUNOFF
IN
CFS
.0
4.0
8.0
12.0
16.0
20.0
24.0
4.0
8.0
12.0
16.0
TIME IN HOURS

ALLENTOWN, PENNSYLVANIA - COLLEGE HEIGHTS BLVD. DRAINAGE AREA
. STORM OF 30 OCTOBER 1976

SUMMARY OF QUANTITY AND QUALITY RESULTS AT LOCATION 3

FLOW IN CFS AND QUALITY IN MG/L (AND COLIF IN MPN/L). VALUES ARE AVERAGES OVER PRECEEDING TIME STEP.

TIME	FLOW	BOD	SUS-S	COLIF	COD	SET-S	NIT	PO4	GREASE
23 -.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
23 10.0	.01	.00	.00	.0	.00	.00	.00	.00	.00
23 20.0	.03	36.74	13.53	.52E+06	121.45	1.11	.81	.08	.40
23 30.0	.07	40.99	18.41	.53E+05	136.24	1.54	1.09	.11	.55
23 40.0	.08	34.54	19.25	.51E+06	116.50	1.79	1.12	.11	.64
23 50.0	.10	26.21	21.69	.59E+05	89.92	1.98	1.22	.12	.70
24 -.0	.17	19.03	38.66	.58E+06	65.05	2.09	2.00	.20	.74
24 10.0	.22	14.06	45.44	.55E+06	48.39	2.21	2.29	.23	.77
24 20.0	.18	10.41	35.57	.49E+06	37.81	2.39	1.87	.19	.84
24 30.0	.13	8.34	23.02	.45E+06	32.98	2.54	1.25	.13	.89
24 40.0	.13	7.38	20.75	.46E+06	30.50	2.51	1.15	.12	.88
24 50.0	.13	6.73	19.73	.47E+06	28.72	2.49	1.11	.11	.87
25 -.0	.13	5.26	18.73	.47E+06	27.44	2.49	1.07	.11	.85
25 10.0	.16	6.01	24.90	.50E+06	26.02	2.39	1.35	.14	.82
25 20.0	.27	6.53	44.59	.52E+05	24.80	2.31	2.24	.23	.79
25 30.0	.33	6.94	55.30	.51E+06	24.22	2.36	2.72	.27	.89
25 40.0	.35	6.91	53.89	.48E+05	23.96	2.44	2.65	.27	.92
25 50.0	.37	6.74	50.49	.46E+06	23.73	2.48	2.49	.25	.93
26 -.0	.37	6.50	48.29	.45E+06	23.49	2.49	2.39	.24	.82
26 10.0	.48	7.35	56.92	.47E+05	22.99	2.44	3.23	.33	.79
26 20.0	.75	9.29	108.73	.47E+05	22.44	2.44	5.11	.51	.75
26 30.0	.91	10.06	123.59	.44E+06	22.12	2.53	5.78	.58	.76
26 40.0	.92	9.50	113.87	.41E+05	21.77	2.59	5.33	.54	.77
26 50.0	.93	9.10	105.22	.40E+06	21.29	2.60	4.93	.50	.76
27 -.0	.93	8.64	97.49	.39E+06	20.80	2.60	4.57	.46	.74
27 10.0	.97	8.27	92.03	.38E+05	20.27	2.60	4.33	.44	.72
27 20.0	1.04	8.37	96.03	.37E+06	19.71	2.61	4.50	.45	.70
27 30.0	1.08	8.47	99.40	.35E+05	19.21	2.63	4.65	.47	.69
27 40.0	1.08	8.35	98.46	.34E+05	18.73	2.64	4.60	.46	.58
27 50.0	1.09	8.25	97.92	.33E+05	18.22	2.64	4.57	.45	.66
28 -.0	1.09	8.15	97.47	.31E+05	17.73	2.64	4.55	.45	.64
28 10.0	.90	7.40	81.89	.29E+06	17.52	2.66	3.84	.39	.65
28 20.0	.52	6.02	49.65	.25E+06	17.85	2.77	2.38	.24	.70
28 30.0	.29	4.98	25.67	.23E+05	18.07	2.85	1.30	.13	.73
28 40.0	.27	4.46	22.43	.27E+06	17.24	2.63	1.16	.12	.56
28 50.0	.26	4.20	20.27	.28E+06	16.83	2.54	1.06	.11	.53
29 -.0	.25	4.04	18.42	.28E+05	16.53	2.51	.98	.10	.51
29 10.0	.23	3.94	15.14	.28E+05	16.59	2.53	.87	.09	.62
29 20.0	.17	3.92	12.40	.25E+06	16.90	2.64	.70	.07	.55
29 30.0	.12	3.90	9.28	.24E+05	17.16	2.73	.56	.06	.58
29 40.0	.10	3.71	7.90	.25E+06	16.36	2.65	.50	.05	.65
29 50.0	.10	3.54	7.19	.26E+05	16.54	2.57	.47	.05	.63
30 -.0	.10	3.45	6.71	.27E+06	16.37	2.53	.45	.05	.51
30 10.0	.15	3.34	11.05	.30E+05	15.53	2.34	.65	.07	.55
30 20.0	.31	3.88	25.52	.32E+05	15.15	2.24	1.30	.13	.51

30 30.0	.43	4.37	33.47	.30E+06	15.22	2.32	1.55	.17	.53
30 40.0	.45	4.51	33.97	.28E+06	15.40	2.42	1.57	.17	.55
30 50.0	.47	4.52	33.41	.27E+06	15.37	2.45	1.56	.17	.56
31 -.0	.45	4.53	33.71	.26E+06	15.24	2.47	1.55	.17	.55
31 10.0	.45	4.45	32.04	.26E+06	15.15	2.49	1.38	.15	.55
31 20.0	.41	4.29	28.48	.25E+06	15.08	2.51	1.42	.14	.55
31 30.0	.35	4.07	23.52	.24E+06	15.08	2.54	1.19	.12	.57
31 40.0	.25	3.85	17.74	.23E+06	15.20	2.60	.93	.10	.58
31 50.0	.24	3.55	15.00	.23E+06	15.35	2.56	.81	.08	.57
32 -.0	.31	3.69	20.74	.25E+06	14.32	2.41	1.07	.11	.52
32 10.0	.35	3.85	24.96	.25E+06	14.14	2.40	1.25	.13	.51
32 20.0	.33	3.84	22.85	.24E+06	14.28	2.47	1.15	.12	.53
32 30.0	.29	3.58	18.40	.23E+06	14.36	2.52	.96	.10	.54
32 40.0	.42	4.25	34.90	.25E+06	13.65	2.38	1.70	.17	.49
32 50.0	.52	4.37	49.98	.25E+06	13.38	2.38	2.38	.24	.48
33 -.0	.57	4.30	45.27	.23E+06	13.53	2.50	2.21	.22	.51
33 10.0	.54	4.52	40.98	.22E+06	13.49	2.71	1.95	.20	.51
33 20.0	.85	6.17	75.31	.23E+06	12.90	2.46	3.56	.36	.46
33 30.0	.95	6.55	83.23	.22E+06	12.75	2.53	3.87	.39	.47
33 40.0	.64	5.53	58.58	.18E+06	13.50	2.75	2.75	.28	.51
33 50.0	.19	4.44	18.43	.19E+06	13.38	3.24	.93	.10	.59
34 -.0	.19	3.77	20.05	.17E+06	13.47	2.72	1.01	.10	.54
34 10.0	.29	3.40	21.85	.21E+06	12.27	2.42	1.10	.11	.45
34 20.0	.30	3.43	22.25	.21E+06	12.23	2.41	1.12	.11	.45
34 30.0	.24	3.35	17.49	.19E+06	12.60	2.54	.90	.09	.49
34 40.0	.17	3.24	12.06	.17E+06	12.96	2.65	.65	.07	.52
34 50.0	.13	3.04	13.24	.19E+06	12.26	2.47	.71	.07	.46
35 -.0	.27	3.02	15.63	.20E+06	11.94	2.37	.82	.08	.43
35 10.0	.23	3.14	18.71	.20E+06	11.75	2.37	.95	.10	.43
35 20.0	.38	3.52	27.74	.20E+06	11.51	2.37	1.35	.14	.42
35 30.0	.38	3.61	27.68	.19E+06	11.58	2.42	1.36	.14	.44
35 40.0	.25	3.34	17.54	.17E+06	12.25	2.60	.90	.09	.48
35 50.0	.20	3.11	12.37	.16E+06	12.27	2.61	.65	.07	.49
36 -.0	.17	2.99	10.74	.17E+06	12.14	2.59	.59	.05	.48
36 10.0	.10	3.15	8.69	.14E+06	12.33	2.79	.49	.05	.53
36 20.0	.07	3.72	8.08	.88E+05	14.38	3.24	.46	.05	.65
36 30.0	.03	4.10	8.25	.24E+05	14.94	3.45	.45	.05	.72
36 40.0	.02	4.22	8.30	.0	14.95	3.51	.45	.05	.75
36 50.0	.01	4.33	8.50	.0	15.34	3.60	.46	.05	.77
37 -.0	.01	4.39	8.62	.0	15.55	3.65	.46	.05	.78
37 10.0	.01	4.43	8.69	.0	15.70	3.68	.47	.05	.79
37 20.0	.01	4.46	8.74	.0	15.79	3.71	.47	.05	.79
37 30.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
37 40.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
37 50.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38 -.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38 10.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38 20.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38 30.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38 40.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38 50.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39 -.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39 10.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39 20.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39 30.0	.00	.00	.00	.0	.00	.00	.00	.00	.00

ALLENTOWN, PENNSYLVANIA - COLLEGE HEIGHTS BLVD. DRAINAGE AREA
STORM OF 03 OCTOBER 1975

SUMMARY OF QUANTITY AND QUALITY RESULTS AT LOCATION 4

FLOW IN CFS AND QUALITY IN MG/L (AND COLIF IN MPN/L). VALUES ARE AVERAGES OVER PRECEDING TIME STEP.

TIME	FLOW	BOD	SUS-S	COLIF	COD	SET-S	NIT	PO4	GREASE
23 -.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
23 10.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
23 20.0	.03	40.83	12.72	.44E+05	131.21	.94	.74	.07	.34
23 30.0	.07	45.81	16.96	.54E+05	149.45	1.15	.97	.10	.41
23 40.0	.09	41.70	17.92	.55E+05	136.86	1.20	1.02	.11	.43
23 50.0	.12	34.38	19.75	.56E+05	113.91	1.21	1.11	.11	.43
24 -.0	.19	26.02	32.96	.56E+05	85.94	1.22	1.70	.17	.42
24 10.0	.26	19.32	39.77	.55E+05	64.31	1.22	2.01	.21	.43
24 20.0	.22	14.20	35.35	.54E+05	48.71	1.20	1.83	.18	.42
24 30.0	.17	10.34	25.65	.53E+05	39.70	1.19	1.35	.14	.41
24 40.0	.15	8.53	21.93	.54E+05	33.17	1.19	1.19	.12	.41
24 50.0	.15	7.12	19.89	.54E+05	29.03	1.19	1.11	.11	.41
25 -.0	.17	6.05	18.49	.54E+05	25.32	1.20	1.04	.11	.41
25 10.0	.19	5.39	22.57	.54E+05	23.27	1.21	1.23	.12	.41
25 20.0	.30	5.39	38.42	.54E+05	20.33	1.23	1.94	.19	.42
25 30.0	.41	5.29	48.87	.53E+05	16.91	1.22	2.41	.24	.41
25 40.0	.43	4.91	49.93	.52E+05	17.30	1.21	2.45	.25	.40
25 50.0	.43	4.59	47.90	.52E+05	15.48	1.21	2.35	.24	.40
26 -.0	.44	4.39	46.01	.51E+05	16.04	1.21	2.27	.23	.39
26 10.0	.56	5.04	62.30	.51E+05	15.78	1.23	2.92	.29	.39
26 20.0	.87	6.93	97.11	.50E+05	15.50	1.26	4.57	.45	.39
26 30.0	1.08	7.64	114.59	.49E+05	15.08	1.27	5.35	.54	.38
26 40.0	1.09	7.35	110.11	.48E+05	14.53	1.27	5.14	.52	.37
26 50.0	1.09	6.91	102.01	.46E+05	14.27	1.27	4.77	.48	.36
27 -.0	1.10	6.48	94.30	.45E+05	13.93	1.27	4.42	.44	.35
27 10.0	1.13	6.13	88.55	.44E+05	13.38	1.27	4.15	.42	.34
27 20.0	1.23	6.24	91.15	.43E+05	13.24	1.28	4.27	.43	.33
27 30.0	1.28	6.37	94.71	.42E+05	12.36	1.29	4.43	.44	.32
27 40.0	1.28	6.31	94.45	.41E+05	12.49	1.29	4.41	.44	.31
27 50.0	1.28	6.24	93.89	.39E+05	12.13	1.29	4.39	.44	.30
28 -.0	1.28	6.17	93.37	.38E+05	11.79	1.29	4.36	.44	.29
28 10.0	1.07	5.59	80.86	.37E+05	11.47	1.25	3.79	.38	.29
28 20.0	.62	4.13	54.29	.36E+05	11.15	1.20	2.59	.25	.28
28 30.0	.34	2.88	29.66	.36E+05	10.95	1.16	1.48	.15	.27
28 40.0	.33	2.49	21.82	.35E+05	11.01	1.18	1.13	.11	.28
28 50.0	.30	2.33	18.58	.36E+05	10.39	1.19	.93	.10	.27
29 -.0	.29	2.22	16.59	.35E+05	10.32	1.19	.89	.09	.27
29 10.0	.27	2.11	14.64	.35E+05	10.34	1.18	.80	.08	.27
29 20.0	.20	1.95	11.68	.35E+05	10.71	1.17	.67	.07	.27
29 30.0	.14	1.79	8.88	.34E+05	10.61	1.16	.54	.07	.27
29 40.0	.12	1.72	7.31	.35E+05	10.62	1.15	.47	.05	.27
29 50.0	.12	1.58	6.49	.35E+05	10.65	1.17	.43	.04	.27
30 -.0	.11	1.65	5.99	.35E+05	10.53	1.18	.41	.06	.27
30 10.0	.17	1.83	9.32	.35E+05	12.73	1.20	.56	.05	.27
30 20.0	.35	2.44	21.53	.35E+05	12.72	1.22	1.11	.11	.27

30 30.0	.51	2.80	29.20	.34E+06	10.57	1.22	1.45	.13	.26
30 40.0	.54	2.88	31.14	.34E+06	10.37	1.20	1.54	.15	.26
30 50.0	.54	2.87	31.28	.33E+06	10.22	1.20	1.54	.15	.26
31 -.0	.55	2.87	31.65	.33E+06	10.10	1.20	1.56	.15	.25
31 10.0	.53	2.79	30.48	.32E+06	9.97	1.20	1.50	.15	.25
31 20.0	.48	2.63	27.55	.32E+06	9.85	1.19	1.37	.14	.25
31 30.0	.41	2.40	23.26	.32E+06	9.74	1.18	1.18	.12	.24
31 40.0	.31	2.14	18.20	.31E+06	9.64	1.17	.95	.10	.24
31 50.0	.25	1.97	14.93	.31E+06	9.59	1.17	.80	.08	.24
32 -.0	.35	2.15	18.65	.31E+06	9.39	1.19	.97	.10	.24
32 10.0	.42	2.33	22.39	.31E+06	9.51	1.20	1.13	.11	.24
32 20.0	.40	2.27	21.52	.31E+06	9.39	1.19	1.09	.11	.23
32 30.0	.34	2.09	18.13	.30E+06	9.28	1.18	.94	.09	.23
32 40.0	.49	2.71	30.59	.30E+06	9.25	1.21	1.50	.15	.23
32 50.0	.72	3.39	44.45	.30E+06	9.14	1.22	2.12	.21	.23
33 -.0	.68	3.34	43.87	.29E+06	8.97	1.21	2.09	.21	.22
33 10.0	.64	3.10	39.43	.29E+06	8.81	1.20	1.89	.19	.22
33 20.0	.98	4.53	68.46	.28E+06	8.68	1.26	3.20	.32	.22
33 30.0	1.14	4.96	77.54	.28E+06	8.49	1.26	3.60	.35	.21
33 40.0	.67	4.16	62.04	.27E+06	8.25	1.21	2.90	.29	.21
33 50.0	.22	2.56	30.78	.26E+06	8.01	1.11	1.49	.15	.20
34 -.0	.20	2.15	22.26	.26E+06	8.12	1.16	1.11	.11	.20
34 10.0	.31	2.07	20.44	.27E+06	8.17	1.19	1.03	.10	.20
34 20.0	.35	2.04	20.12	.26E+06	8.10	1.19	1.01	.10	.20
34 30.0	.29	1.85	16.50	.26E+06	8.00	1.17	.85	.09	.20
34 40.0	.20	1.52	12.06	.26E+06	7.92	1.15	.65	.07	.20
34 50.0	.22	1.61	11.97	.26E+06	7.93	1.17	.65	.06	.20
35 -.0	.28	1.70	13.81	.26E+06	7.92	1.19	.73	.07	.20
35 10.0	.33	1.83	15.52	.26E+06	7.85	1.19	.85	.09	.20
35 20.0	.45	2.21	24.18	.25E+06	7.79	1.20	1.19	.12	.19
35 30.0	.46	2.25	25.35	.25E+06	7.70	1.19	1.25	.12	.19
35 40.0	.32	1.91	18.68	.25E+06	7.59	1.16	.94	.09	.19
35 50.0	.24	1.63	13.33	.24E+06	7.53	1.15	.70	.07	.19
36 -.0	.20	1.51	11.01	.24E+06	7.51	1.16	.60	.06	.19
36 10.0	.13	1.41	9.10	.24E+06	7.44	1.14	.51	.05	.19
36 20.0	.06	1.36	8.40	.24E+06	7.31	1.09	.48	.05	.18
36 30.0	.03	1.36	8.70	.23E+06	7.21	1.05	.49	.05	.18
36 40.0	.02	1.25	8.36	.21E+06	6.48	.91	.46	.05	.16
36 50.0	.01	1.17	8.12	.19E+06	5.98	.82	.45	.04	.15
37 -.0	.01	1.19	8.24	.20E+06	6.08	.83	.45	.05	.15
37 10.0	.01	1.20	8.33	.20E+06	6.15	.84	.46	.05	.15
37 20.0	.01	.51	4.20	.10E+06	3.10	.42	.23	.02	.08
37 30.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
37 40.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
37 50.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38 -.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38 10.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38 20.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38 30.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38 40.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38 50.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39 -.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39 10.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39 20.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39 30.0	.00	.00	.00	.0	.00	.00	.00	.00	.00

ALLENTOWN, PENNSYLVANIA - COLLEGE HEIGHTS BLVD. DRAINAGE AREA
STORM OF 09 OCTOBER 1976

SUMMARY OF QUANTITY AND QUALITY RESULTS AT LOCATION 10

FLOW IN CFS AND QUALITY IN MG/L (AND COLIF IN MPN/L). VALUES ARE AVERAGES OVER PRECEEDING TIME STEP.

TIME	FLOW	BOD	SUS-S	COLIF	COD	SET-S	NIT	PO4	GREASE
23 -.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
23 10.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
23 20.0	.01	43.32	15.77	.66E+06	144.14	1.42	.97	.10	.51
23 30.0	.03	46.28	22.56	.78E+06	154.55	1.69	1.32	.13	.59
23 40.0	.05	43.23	25.36	.82E+06	145.42	1.78	1.45	.15	.63
23 50.0	.07	37.78	27.90	.84E+06	128.48	1.82	1.58	.16	.65
24 -.0	.11	30.16	41.72	.85E+06	102.90	1.86	2.21	.22	.65
24 10.0	.17	23.51	56.14	.85E+06	80.10	1.88	2.56	.29	.65
24 20.0	.18	18.85	58.53	.85E+06	65.25	1.89	2.97	.30	.65
24 30.0	.16	15.38	51.79	.85E+06	55.50	1.89	2.66	.27	.65
24 40.0	.14	12.64	45.05	.84E+06	47.99	1.89	2.35	.24	.65
24 50.0	.13	10.46	39.88	.84E+06	41.96	1.89	2.12	.21	.65
25 -.0	.13	8.81	35.94	.84E+06	37.35	1.89	1.94	.20	.64
25 10.0	.14	7.54	36.73	.83E+06	33.22	1.89	1.98	.20	.54
25 20.0	.20	7.27	54.04	.82E+06	29.53	1.90	2.75	.28	.63
25 30.0	.29	7.59	74.00	.81E+06	27.25	1.91	3.65	.37	.63
25 40.0	.34	7.71	84.02	.80E+06	25.90	1.92	4.10	.41	.62
25 50.0	.36	7.59	85.98	.79E+06	25.01	1.92	4.18	.42	.61
26 -.0	.36	7.39	84.78	.78E+06	24.36	1.93	4.12	.41	.60
26 10.0	.42	7.89	97.05	.77E+06	23.72	1.94	4.67	.47	.59
26 20.0	.63	10.07	142.81	.75E+06	23.01	2.02	6.72	.67	.57
26 30.0	.84	11.72	177.77	.72E+06	22.30	2.10	8.29	.83	.56
26 40.0	.90	11.99	185.01	.70E+06	21.55	2.13	8.61	.86	.54
26 50.0	.91	11.47	176.56	.67E+06	20.75	2.14	8.22	.82	.52
27 -.0	.91	10.76	164.35	.65E+06	19.97	2.14	7.66	.77	.50
27 10.0	.93	10.07	152.58	.62E+06	19.19	2.15	7.12	.71	.48
27 20.0	1.00	9.84	149.99	.60E+06	18.40	2.18	6.99	.70	.46
27 30.0	1.05	9.89	152.89	.57E+06	17.61	2.21	7.11	.71	.44
27 40.0	1.06	9.82	153.35	.55E+06	16.85	2.22	7.13	.71	.42
27 50.0	1.06	9.67	152.16	.52E+06	16.10	2.22	7.06	.71	.40
28 -.0	1.05	9.50	150.71	.50E+06	15.39	2.22	6.99	.70	.38
28 10.0	.94	8.85	139.11	.48E+06	14.80	2.18	6.46	.65	.37
28 20.0	.64	7.51	113.42	.47E+06	14.38	2.09	5.30	.53	.36
28 30.0	.38	5.94	82.74	.46E+06	14.11	2.01	3.91	.39	.35
28 40.0	.28	4.79	60.29	.45E+06	13.88	1.96	2.90	.29	.35
28 50.0	.26	4.03	45.75	.44E+06	13.67	1.92	2.24	.22	.34
29 -.0	.25	3.57	36.96	.44E+06	13.49	1.90	1.84	.19	.34
29 10.0	.23	3.26	31.15	.43E+06	13.33	1.88	1.58	.16	.33
29 20.0	.19	3.00	26.16	.43E+06	13.22	1.87	1.35	.14	.33
29 30.0	.15	2.75	21.64	.43E+06	13.14	1.87	1.15	.12	.33
29 40.0	.12	2.57	17.91	.42E+06	13.07	1.86	.98	.10	.33
29 50.0	.10	2.41	14.96	.42E+06	12.99	1.86	.85	.09	.32
30 -.0	.10	2.29	12.76	.42E+06	12.92	1.85	.75	.08	.32
30 10.0	.12	2.31	13.48	.42E+06	12.82	1.85	.78	.08	.32
30 20.0	.21	2.97	25.94	.41E+06	12.67	1.87	1.38	.14	.32

30	30.0	.35	3.65	41.07	.41E+05	12.59	1.89	2.02	.23	.31
30	40.0	.42	4.02	48.77	.40E+05	12.32	1.93	2.36	.24	.31
30	50.0	.45	4.14	51.82	.39E+06	12.11	1.91	2.50	.25	.30
31	-.0	.45	4.19	53.39	.39E+06	11.89	1.91	2.56	.25	.30
31	10.0	.44	4.15	53.03	.38E+05	11.68	1.91	2.55	.26	.29
31	20.0	.41	3.98	50.16	.37E+05	11.48	1.90	2.41	.24	.29
31	30.0	.35	3.71	45.02	.37E+05	11.30	1.89	2.18	.22	.28
31	40.0	.30	3.35	38.35	.36E+06	11.16	1.88	1.88	.19	.28
31	50.0	.25	3.01	31.92	.36E+05	11.03	1.87	1.59	.16	.28
32	-.0	.27	2.97	31.44	.35E+06	10.87	1.87	1.56	.15	.27
32	10.0	.32	3.15	35.37	.35E+05	10.72	1.87	1.74	.17	.27
32	20.0	.33	3.19	36.52	.34E+06	10.57	1.87	1.79	.18	.26
32	30.0	.30	3.04	33.94	.34E+06	10.45	1.87	1.67	.17	.26
32	40.0	.35	3.45	42.51	.33E+05	10.26	1.88	2.05	.21	.26
32	50.0	.52	4.42	62.53	.33E+06	10.04	1.93	2.95	.30	.25
33	-.0	.57	4.75	69.59	.32E+06	9.84	1.94	3.27	.33	.25
33	10.0	.54	4.62	67.52	.31E+05	9.62	1.93	3.17	.32	.24
33	20.0	.72	5.88	93.59	.30E+05	9.31	2.01	4.34	.43	.23
33	30.0	.90	6.82	113.09	.29E+05	9.02	2.07	5.22	.52	.23
33	40.0	.68	6.49	106.88	.29E+06	8.91	2.05	4.94	.49	.22
33	50.0	.32	5.27	82.89	.28E+05	8.69	1.99	3.85	.39	.22
34	-.0	.20	4.28	63.45	.28E+05	8.59	1.95	2.98	.30	.21
34	10.0	.24	3.42	46.51	.27E+05	8.44	1.93	2.21	.22	.21
34	20.0	.27	3.04	39.20	.27E+05	8.31	1.88	1.88	.19	.21
34	30.0	.26	2.74	33.56	.27E+06	8.22	1.86	1.63	.15	.21
34	40.0	.22	2.43	27.53	.27E+06	8.15	1.85	1.35	.14	.20
34	50.0	.18	2.21	23.31	.26E+06	8.08	1.84	1.15	.12	.20
35	-.0	.21	2.18	22.92	.26E+05	7.99	1.84	1.15	.11	.20
35	10.0	.25	2.30	25.50	.26E+06	7.89	1.84	1.26	.13	.20
35	20.0	.33	2.71	34.09	.25E+05	7.78	1.85	1.65	.17	.19
35	30.0	.37	2.94	38.79	.25E+05	7.68	1.86	1.85	.19	.19
35	40.0	.31	2.77	35.67	.25E+05	7.59	1.85	1.71	.17	.19
35	50.0	.24	2.44	29.31	.24E+05	7.52	1.85	1.43	.14	.19
36	-.0	.19	2.18	24.27	.24E+06	7.46	1.84	1.20	.12	.19
36	10.0	.14	2.00	20.63	.24E+05	7.42	1.83	1.04	.10	.19
36	20.0	.09	1.89	18.62	.24E+05	7.40	1.83	.94	.09	.18
36	30.0	.05	1.85	17.88	.24E+06	7.39	1.83	.91	.09	.18
36	40.0	.04	1.83	17.42	.24E+06	7.39	1.83	.89	.09	.18
36	50.0	.02	1.81	17.09	.24E+05	7.39	1.83	.88	.09	.18
37	-.0	.02	1.80	16.82	.24E+05	7.38	1.83	.86	.09	.18
37	10.0	.01	1.79	16.59	.24E+06	7.37	1.83	.85	.09	.18
37	20.0	.01	1.78	16.38	.24E+05	7.36	1.82	.84	.08	.18
37	30.0	.01	1.77	16.22	.24E+06	7.35	1.82	.84	.08	.18
37	40.0	.01	1.76	16.07	.24E+05	7.35	1.82	.83	.08	.18
37	50.0	.01	1.75	15.94	.24E+06	7.34	1.82	.82	.08	.18
38	-.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38	10.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38	20.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38	30.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38	40.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38	50.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39	-.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39	10.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39	20.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39	30.0	.00	.00	.00	.0	.00	.00	.00	.00	.00

ALLENTOWN, PENNSYLVANIA - COLLEGE HEIGHTS BLVD. DRAINAGE AREA
STORM OF 03 OCTOBER 1975

SUMMARY OF QUANTITY AND QUALITY RESULTS AT LOCATION 19

FLOW IN CFS AND QUALITY IN MG/L (AND COLIF IN MPN/L). VALUES ARE AVERAGES OVER PRECEDING TIME STEP.

TIME	FLOW	BOD	SUS-S	COLIF	COD	SET-S	NIT	PO4	GREASE
23 -.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
23 10.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
23 20.0	.02	44.59	12.95	.67E+05	148.82	1.45	.85	.09	.52
23 30.0	.05	48.55	18.14	.80E+06	163.04	1.73	1.13	.11	.62
23 40.0	.11	46.18	20.29	.85E+06	155.85	1.83	1.24	.13	.65
23 50.0	.14	40.72	22.20	.87E+06	138.98	1.88	1.34	.14	.67
24 -.0	.22	32.55	33.43	.87E+06	112.10	1.91	1.85	.19	.57
24 10.0	.31	25.26	44.51	.88E+06	87.80	1.93	2.35	.24	.67
24 20.0	.31	19.98	45.32	.87E+06	70.96	1.93	2.38	.24	.67
24 30.0	.25	15.71	37.85	.87E+06	59.12	1.93	2.04	.21	.67
24 40.0	.21	12.57	31.45	.87E+06	50.31	1.93	1.75	.18	.57
24 50.0	.20	10.26	27.37	.86E+06	43.73	1.93	1.57	.15	.66
25 -.0	.20	8.61	24.68	.86E+06	38.35	1.93	1.45	.15	.66
25 10.0	.23	7.38	26.60	.86E+06	34.74	1.93	1.53	.15	.66
25 20.0	.35	7.03	42.51	.85E+06	31.07	1.94	2.25	.23	.65
25 30.0	.51	7.09	58.43	.84E+06	28.57	1.95	2.96	.30	.65
25 40.0	.58	6.38	65.14	.83E+06	27.10	1.95	3.26	.33	.64
25 50.0	.59	6.59	64.92	.82E+06	26.06	1.95	3.24	.33	.63
26 -.0	.53	6.42	62.77	.81E+06	25.37	1.95	3.14	.32	.63
26 10.0	.71	6.89	74.41	.80E+06	24.78	1.97	3.66	.37	.62
26 20.0	1.09	8.86	115.77	.78E+06	24.18	2.03	5.52	.55	.60
26 30.0	1.43	10.19	144.08	.77E+06	23.57	2.08	6.79	.68	.59
26 40.0	1.48	10.23	145.48	.74E+06	22.99	2.09	6.89	.69	.57
26 50.0	1.47	9.63	136.37	.72E+06	22.19	2.09	6.42	.64	.55
27 -.0	1.47	9.02	125.81	.70E+06	21.53	2.09	5.94	.60	.54
27 10.0	1.51	8.50	117.08	.68E+06	20.85	2.10	5.54	.56	.52
27 20.0	1.63	8.47	118.02	.66E+06	20.17	2.12	5.57	.56	.50
27 30.0	1.71	8.62	122.81	.63E+06	19.49	2.14	5.78	.58	.49
27 40.0	1.72	8.58	123.68	.61E+06	18.82	2.14	5.81	.59	.47
27 50.0	1.71	8.46	122.92	.59E+06	18.15	2.14	5.77	.58	.45
28 -.0	1.72	8.34	122.19	.57E+06	17.51	2.14	5.73	.57	.44
28 10.0	1.49	7.67	110.12	.55E+06	16.99	2.10	5.18	.52	.42
28 20.0	.94	6.23	82.36	.54E+06	16.60	2.03	3.93	.39	.42
28 30.0	.51	4.58	49.96	.53E+06	16.35	1.97	2.46	.25	.41
28 40.0	.40	3.70	32.90	.53E+06	16.16	1.93	1.69	.17	.40
28 50.0	.40	3.31	25.47	.52E+06	16.00	1.92	1.36	.14	.40
29 -.0	.39	3.12	22.02	.52E+06	15.85	1.91	1.20	.12	.40
29 10.0	.37	2.98	19.59	.51E+06	15.73	1.91	1.09	.11	.39
29 20.0	.29	2.82	15.46	.51E+06	15.64	1.91	.95	.10	.39
29 30.0	.21	2.64	13.04	.51E+06	15.57	1.90	.79	.08	.39
29 40.0	.17	2.50	10.45	.50E+06	15.50	1.90	.68	.07	.39
29 50.0	.16	2.41	8.77	.50E+06	15.43	1.90	.60	.06	.39
30 -.0	.15	2.35	7.74	.50E+06	15.38	1.90	.55	.06	.38
30 10.0	.20	2.44	9.78	.50E+06	15.30	1.90	.64	.07	.38
30 20.0	.39	3.07	22.80	.49E+06	15.16	1.91	1.23	.12	.38

30	30.0	.63	3.65	34.65	.49E+06	15.01	1.97	1.75	.18	.38
30	40.0	.73	3.92	40.53	.48E+06	14.82	1.94	2.02	.20	.37
30	50.0	.73	3.97	42.04	.47E+06	14.61	1.94	2.09	.21	.37
31	-.0	.74	3.37	42.69	.47E+06	14.39	1.94	2.11	.21	.36
31	10.0	.71	3.90	41.78	.46E+06	14.18	1.97	2.07	.21	.35
31	20.0	.66	3.72	38.66	.45E+06	13.99	1.93	1.93	.19	.35
31	30.0	.57	3.45	33.63	.45E+06	13.82	1.92	1.70	.17	.35
31	40.0	.45	3.12	27.36	.44E+06	13.68	1.91	1.41	.14	.34
31	50.0	.38	2.93	21.87	.44E+06	13.56	1.90	1.17	.12	.34
32	-.0	.44	2.88	23.29	.44E+06	13.41	1.90	1.23	.12	.34
32	10.0	.54	3.10	27.97	.43E+06	13.27	1.91	1.44	.14	.33
32	20.0	.55	3.13	28.96	.43E+06	13.14	1.91	1.48	.15	.33
32	30.0	.49	2.97	26.04	.42E+06	13.01	1.91	1.35	.14	.33
32	40.0	.60	3.40	35.17	.42E+06	12.82	1.92	1.76	.18	.32
32	50.0	.91	4.29	53.50	.41E+06	12.61	1.95	2.58	.25	.32
33	-.0	.95	4.50	58.22	.40E+06	12.41	1.95	2.79	.28	.31
33	10.0	.87	4.26	54.04	.40E+06	12.17	1.95	2.60	.25	.30
33	20.0	1.23	5.58	81.20	.39E+06	11.96	2.02	3.82	.38	.30
33	30.0	1.52	6.38	97.78	.38E+06	11.57	2.05	4.56	.45	.29
33	40.0	1.02	5.95	88.13	.37E+06	11.34	2.03	4.12	.41	.28
33	50.0	.39	4.19	55.04	.36E+06	11.21	1.96	2.63	.25	.28
34	-.0	.26	3.21	35.74	.36E+06	11.09	1.92	1.75	.18	.28
34	10.0	.37	2.77	27.21	.36E+06	10.96	1.90	1.37	.14	.27
34	20.0	.46	2.58	25.63	.35E+06	10.86	1.90	1.30	.13	.27
34	30.0	.41	2.52	22.70	.35E+06	10.77	1.89	1.17	.12	.27
34	40.0	.30	2.27	17.87	.35E+06	10.71	1.89	.95	.10	.27
34	50.0	.23	2.14	15.40	.35E+06	10.63	1.88	.84	.08	.27
35	-.0	.35	2.20	16.82	.34E+06	10.54	1.88	.90	.09	.26
35	10.0	.43	2.35	20.23	.34E+06	10.45	1.89	1.05	.11	.26
35	20.0	.56	2.77	28.75	.34E+06	10.33	1.90	1.44	.14	.26
35	30.0	.62	2.94	32.48	.33E+06	10.23	1.90	1.60	.16	.26
35	40.0	.48	2.72	28.28	.33E+06	10.13	1.90	1.41	.14	.25
35	50.0	.35	2.36	21.21	.33E+06	10.05	1.89	1.09	.11	.25
36	-.0	.28	2.12	16.64	.32E+06	9.99	1.88	.89	.09	.25
36	10.0	.20	1.96	13.51	.32E+06	9.95	1.88	.73	.08	.25
36	20.0	.11	1.86	11.62	.32E+06	9.93	1.88	.65	.07	.25
36	30.0	.05	1.82	10.91	.32E+06	9.93	1.87	.63	.06	.25
36	40.0	.04	1.80	10.47	.32E+06	9.93	1.87	.61	.05	.25
36	50.0	.03	1.79	10.14	.32E+06	9.93	1.87	.59	.05	.25
37	-.0	.02	1.77	9.88	.32E+06	9.91	1.87	.58	.05	.25
37	10.0	.01	1.43	7.91	.26E+06	8.04	1.55	.47	.05	.20
37	20.0	.01	1.09	5.99	.20E+06	6.16	1.23	.36	.04	.15
37	30.0	.01	1.09	5.86	.20E+06	6.14	1.22	.35	.04	.15
37	40.0	.01	.54	2.90	.10E+06	3.07	.61	.17	.02	.08
37	50.0	.01	.00	.00	.0	.00	.00	.00	.00	.00
38	-.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38	10.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38	20.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38	30.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38	40.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38	50.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39	-.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39	10.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39	20.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39	30.0	.00	.00	.00	.0	.00	.00	.00	.00	.00

ALLENTOWN, PENNSYLVANIA - COLLEGE HEIGHTS BLVD. DRAINAGE AREA
STORM OF 09 OCTOBER 1976

SUMMARY OF QUANTITY AND QUALITY RESULTS AT LOCATION 33

FLOW IN CFS AND QUALITY IN MG/L (AND COLIF IN MPN/L). VALUES ARE AVERAGES OVER PRECEEDING TIME STEP.

TIME	FLOW	BOD	SUS-S	COLIF	COD	SET-S	NIT	PO4	GREASE
23 -.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
23 10.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
23 20.0	.02	13.76	3.84	.78E+05	43.50	.17	.20	.02	.06
23 30.0	.05	25.59	12.92	.73E+06	85.45	1.30	.79	.09	.46
23 40.0	.09	29.50	18.15	.12E+07	101.13	2.05	1.15	.13	.73
23 50.0	.12	27.46	22.10	.14E+07	96.58	2.47	1.39	.15	.87
24 -.0	.19	22.80	36.26	.15E+07	81.35	2.74	2.07	.23	.96
24 10.0	.28	18.79	48.71	.16E+07	67.70	2.90	2.65	.29	1.00
24 20.0	.28	16.09	50.13	.17E+07	59.54	3.00	2.72	.30	1.03
24 30.0	.22	14.06	43.26	.17E+07	54.56	3.05	2.42	.27	1.05
24 40.0	.20	12.42	36.92	.17E+07	50.39	3.07	2.13	.24	1.04
24 50.0	.19	11.13	32.43	.17E+07	47.15	3.05	1.93	.22	1.03
25 -.0	.18	10.31	29.20	.17E+07	44.85	3.05	1.78	.20	1.03
25 10.0	.21	9.71	30.71	.16E+07	42.52	3.04	1.94	.21	1.01
25 20.0	.32	9.92	46.95	.16E+07	40.35	3.03	2.56	.28	.99
25 30.0	.45	10.46	63.42	.16E+07	39.30	3.08	3.30	.35	.99
25 40.0	.52	10.68	70.79	.16E+07	38.75	3.12	3.63	.39	.98
25 50.0	.53	10.57	71.43	.16E+07	38.11	3.14	3.66	.39	.97
26 -.0	.53	10.34	69.78	.15E+07	37.38	3.15	3.58	.38	.95
26 10.0	.65	10.63	81.44	.15E+07	36.24	3.17	4.09	.43	.92
26 20.0	.98	12.45	121.84	.14E+07	34.92	3.33	5.90	.61	.89
26 30.0	1.28	13.59	150.03	.14E+07	33.93	3.52	7.16	.74	.85
26 40.0	1.34	13.59	153.91	.13E+07	32.82	3.61	7.32	.75	.84
26 50.0	1.34	13.00	145.45	.13E+07	31.43	3.63	6.92	.71	.80
27 -.0	1.34	12.23	135.08	.12E+07	30.07	3.63	6.44	.65	.77
27 10.0	1.38	11.50	125.74	.12E+07	28.70	3.65	6.01	.62	.73
27 20.0	1.48	11.22	125.15	.11E+07	27.32	3.71	5.97	.61	.70
27 30.0	1.55	11.17	128.82	.11E+07	26.05	3.77	6.12	.63	.66
27 40.0	1.55	10.98	129.65	.10E+07	24.80	3.80	6.14	.63	.63
27 50.0	1.56	10.72	129.08	.96E+06	23.56	3.80	6.10	.62	.60
28 -.0	1.56	10.47	128.40	.91E+06	22.39	3.79	6.06	.62	.57
28 10.0	1.36	9.78	117.74	.87E+06	21.54	3.71	5.57	.57	.55
28 20.0	.87	8.49	93.56	.85E+06	21.10	3.55	4.48	.45	.54
28 30.0	.49	6.98	64.61	.84E+06	20.77	3.38	3.16	.33	.53
28 40.0	.38	5.88	45.08	.81E+06	20.14	3.20	2.28	.24	.51
28 50.0	.37	5.25	34.37	.79E+06	19.69	3.11	1.79	.19	.50
29 -.0	.36	4.90	28.55	.78E+06	19.40	3.06	1.53	.16	.49
29 10.0	.34	4.68	24.69	.77E+06	19.22	3.05	1.35	.15	.49
29 20.0	.27	4.49	20.92	.77E+06	19.18	3.06	1.18	.13	.49
29 30.0	.20	4.30	17.18	.77E+06	19.16	3.06	1.01	.11	.49
29 40.0	.15	4.11	14.06	.77E+06	18.98	3.04	.87	.10	.48
29 50.0	.15	3.95	11.73	.76E+06	18.76	3.01	.76	.09	.48
30 -.0	.14	3.84	10.13	.75E+06	18.60	2.99	.69	.08	.47
30 10.0	.18	3.84	11.74	.73E+06	18.21	2.95	.75	.09	.46
30 20.0	.35	4.42	25.11	.71E+06	17.90	2.95	1.36	.14	.45

30 30.0	.56	5.31	37.36	.71E+06	17.36	3.03	1.91	.20	.45
30 40.0	.55	5.31	43.63	.70E+06	17.55	3.09	2.19	.23	.45
30 50.0	.65	5.38	45.80	.69E+06	17.28	3.12	2.28	.24	.44
31 -.0	.67	5.37	46.86	.68E+06	16.33	3.12	2.33	.24	.43
31 10.0	.65	5.27	46.22	.67E+06	16.51	3.12	2.29	.24	.42
31 20.0	.60	5.18	43.32	.65E+06	16.32	3.11	2.15	.22	.42
31 30.0	.52	4.79	38.44	.64E+06	16.08	3.09	1.94	.20	.41
31 40.0	.42	4.45	32.27	.64E+06	15.92	3.08	1.63	.17	.40
31 50.0	.35	4.12	26.50	.63E+06	15.58	3.04	1.33	.13	.40
32 -.0	.40	4.07	27.10	.61E+06	15.29	3.00	1.42	.15	.39
32 10.0	.49	4.23	31.27	.60E+06	15.03	3.01	1.60	.17	.38
32 20.0	.49	4.25	32.21	.60E+06	14.90	3.04	1.64	.17	.38
32 30.0	.44	4.10	29.50	.59E+06	14.76	3.04	1.52	.15	.38
32 40.0	.55	4.49	38.93	.57E+06	14.32	3.04	1.94	.20	.36
32 50.0	.81	5.32	56.98	.56E+06	13.96	3.13	2.75	.28	.35
33 -.0	.85	5.56	62.31	.55E+06	13.90	3.20	2.99	.31	.35
33 10.0	.79	5.35	59.32	.54E+06	13.48	3.18	2.85	.29	.34
33 20.0	1.11	6.34	85.31	.51E+06	12.97	3.34	4.01	.41	.33
33 30.0	1.37	7.31	101.83	.50E+06	12.31	3.49	4.76	.49	.32
33 40.0	.94	6.95	94.95	.49E+06	12.38	3.51	4.44	.45	.31
33 50.0	.39	5.73	70.20	.50E+06	12.42	3.45	3.33	.34	.32
34 -.0	.27	4.64	50.07	.48E+06	12.04	3.23	2.42	.25	.31
34 10.0	.35	3.86	36.40	.46E+06	11.60	3.04	1.80	.19	.29
34 20.0	.41	3.62	32.04	.45E+06	11.45	3.01	1.60	.17	.29
34 30.0	.37	3.41	27.96	.45E+06	11.42	3.02	1.41	.15	.29
34 40.0	.28	3.15	22.74	.45E+06	11.40	3.03	1.18	.12	.29
34 50.0	.26	2.95	19.47	.44E+06	11.20	2.98	1.03	.11	.28
35 -.0	.32	2.93	19.96	.43E+06	10.99	2.94	1.05	.11	.28
35 10.0	.38	3.05	22.91	.43E+06	10.86	2.95	1.18	.12	.28
35 20.0	.51	3.45	31.47	.42E+06	10.68	2.97	1.56	.16	.27
35 30.0	.56	3.64	35.51	.42E+06	10.59	3.01	1.75	.18	.27
35 40.0	.44	3.45	31.86	.42E+06	10.56	3.04	1.58	.15	.27
35 50.0	.32	3.11	25.33	.41E+06	10.47	3.03	1.29	.13	.27
36 -.0	.25	2.85	20.58	.41E+06	10.35	3.03	1.07	.11	.26
36 10.0	.19	2.70	17.42	.41E+06	10.35	3.01	.93	.10	.26
36 20.0	.11	2.54	15.92	.41E+06	10.44	3.06	.86	.09	.27
36 30.0	.06	2.64	15.56	.42E+06	10.50	3.09	.85	.09	.27
36 40.0	.04	2.63	15.29	.42E+06	10.51	3.10	.84	.09	.27
36 50.0	.03	2.42	13.76	.38E+06	9.46	2.93	.75	.08	.24
37 -.0	.02	2.22	12.31	.35E+06	8.44	2.75	.67	.07	.22
37 10.0	.01	2.22	12.21	.35E+06	8.45	2.75	.67	.07	.22
37 20.0	.01	1.11	6.09	.18E+06	4.23	1.38	.33	.04	.11
37 30.0	.01	.00	.00	.0	.00	.00	.00	.00	.00
37 40.0	.01	.00	.00	.0	.00	.00	.00	.00	.00
37 50.0	.01	.00	.00	.0	.00	.00	.00	.00	.00
38 -.0	.01	.00	.00	.0	.00	.00	.00	.00	.00
38 10.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38 20.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38 30.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38 40.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
38 50.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39 -.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39 10.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39 20.0	.00	.00	.00	.0	.00	.00	.00	.00	.00
39 30.0	.00	.00	.00	.0	.00	.00	.00	.00	.00

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TOTAL FLOW =    .38540E+06 CFS
TOTAL BOD =   .15740E+03 LBS
TOTAL SUS =   .18380E+04 LBS
TOTAL COL =   .54602E+13 MPN
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TRANSPOR BLOCK CALLED


ENTRY MADE TO TRANSPORT MODEL

TRANSPORT MODEL UPDATED BY UNIVERSITY OF FLORIDA FEBRUARY 1975
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COLLEGE HEIGHTS BLVD. SEWER - STORM OF 09 OCTOBER 1975

* * * * * ELEMENT LINKAGES AND COMPUTATION SEQUENCE * * * * *

ELEMENT NO. ZERO IS GIVEN INTERNAL NO. = NO. ELEMENTS + 1 = 68

EXTERNAL ELEMENT NUMBER	INTERNAL ELEMENT NUMBER	TYPE	DESCRIPTION	UPSTREAM ELEMENTS (EXTERNAL NOS.) 1	2	3
101	1	2	RECTANGULAR	2	-0	-0
102	2	2	RECTANGULAR	3	-0	-0
103	3	2	RECTANGULAR	4	-0	-0
104	4	2	RECTANGULAR	5	-0	-0
105	5	1	CIRCULAR	6	-0	-0
106	6	1	CIRCULAR	7	-0	-0
107	7	1	CIRCULAR	8	-0	-0
108	8	1	CIRCULAR	9	-0	-0
109	9	1	CIRCULAR	10	-0	-0
110	10	1	CIRCULAR	11	-0	-0
111	11	1	CIRCULAR	12	-0	-0
112	12	1	CIRCULAR	13	-0	-0
113	13	1	CIRCULAR	14	-0	-0
114	14	1	CIRCULAR	15	-0	-0
115	15	1	CIRCULAR	16	-0	-0
116	16	1	CIRCULAR	17	-0	-0
117	17	1	CIRCULAR	18	-0	-0
118	18	1	CIRCULAR	19	-0	-0
119	19	1	CIRCULAR	20	-0	-0
120	20	2	RECTANGULAR	21	-0	-0
121	21	2	RECTANGULAR	22	-0	-0
122	22	1	CIRCULAR	23	-0	-0
123	23	1	CIRCULAR	24	-0	-0
124	24	2	RECTANGULAR	25	-0	-0
125	25	2	RECTANGULAR	26	-0	-0
126	26	2	RECTANGULAR	27	-0	-0
127	27	2	RECTANGULAR	28	-0	-0
128	28	2	RECTANGULAR	29	-0	-0
129	29	1	CIRCULAR	30	-0	-0
130	30	1	CIRCULAR	31	-0	-0
131	31	1	CIRCULAR	32	-0	-0
132	32	1	CIRCULAR	33	-0	-0
133	33	1	CIRCULAR	34	-0	-0
1	34	16	MANHOLE	101	-0	-0
2	35	16	MANHOLE	102	-0	-0
3	36	16	MANHOLE	103	-0	-0
4	37	16	MANHOLE	104	-0	-0
5	38	16	MANHOLE	105	-0	-0
6	39	16	MANHOLE	106	108	-0
7	40	16	MANHOLE	107	-0	-0
8	41	16	MANHOLE	-0	-0	-0
9	42	16	MANHOLE	109	110	120
10	43	16	MANHOLE	-0	-0	-0
11	44	16	MANHOLE	111	-0	-0

ORDER OF COMPUTATIONS AT EACH TIME STEP (PROCEEDING DOWNSTREAM)

COMPUTATION SEQUENCE	EXTERNAL NUMBER	INTERNAL NUMBER	INTERNAL UPSTREAM ELEMENT NUMBERS		
1	8	41	68	68	68
2	107	7	41	68	68
3	7	40	7	68	68
4	106	6	40	68	68
5	10	43	68	68	68
6	109	9	43	68	68
7	14	47	68	68	68
8	113	13	47	68	68
9	18	51	68	68	68
10	117	17	51	68	68
11	17	50	17	68	68
12	116	16	50	68	68
13	20	53	68	68	68
14	119	19	53	68	68
15	19	52	19	68	68
16	118	18	52	68	68
17	16	49	16	18	68
18	115	15	49	68	68
19	15	48	15	68	68
20	114	14	48	68	68
21	13	46	13	14	68
22	112	12	46	68	68
23	12	45	12	68	68
24	111	11	45	68	68
25	11	44	11	68	68
26	110	10	44	68	68
27	24	57	68	68	68
28	123	23	57	68	68
29	23	56	23	68	68
30	122	22	56	68	68
31	31	64	68	68	68
32	130	30	64	68	68
33	30	63	30	68	68
34	129	29	63	68	68
35	34	67	68	68	68
36	133	33	67	68	68
37	33	66	33	68	68
38	132	32	66	68	68
39	32	65	32	68	68
40	131	31	65	68	68
41	29	52	29	31	68
42	128	28	62	68	68
43	28	61	28	68	68
44	127	27	61	68	68

12	45	16	MANHOLE	112	-0	-0
13	46	15	MANHOLE	113	114	-0
14	47	15	MANHOLE	-0	-0	-0
15	48	15	MANHOLE	115	-0	-0
16	49	16	MANHOLE	116	118	-0
17	50	15	MANHOLE	117	-0	-0
18	51	16	MANHOLE	-0	-0	-0
19	52	15	MANHOLE	119	-0	-0
20	53	16	MANHOLE	-0	-0	-0
21	54	15	MANHOLE	121	-0	-0
22	55	16	MANHOLE	122	124	-0
23	56	15	MANHOLE	123	-0	-0
24	57	15	MANHOLE	-0	-0	-0
25	58	15	MANHOLE	125	-0	-0
26	59	16	MANHOLE	126	-0	-0
27	60	15	MANHOLE	127	-0	-0
28	61	16	MANHOLE	128	-0	-0
29	62	15	MANHOLE	129	131	-0
30	63	16	MANHOLE	130	-0	-0
31	64	15	MANHOLE	-0	-0	-0
32	65	15	MANHOLE	132	-0	-0
33	66	15	MANHOLE	133	-0	-0
34	67	15	MANHOLE	-0	-0	-0

45	27	60	27	68	68
46	126	26	60	68	68
47	26	59	26	68	68
48	125	25	59	68	68
49	25	58	25	68	68
50	124	24	58	68	68
51	22	55	22	24	68
52	121	21	55	68	68
53	21	54	21	68	68
54	120	20	54	68	68
55	9	42	9	10	20
56	108	8	42	68	68
57	6	39	6	8	68
58	105	5	39	68	68
59	5	38	5	68	68
60	104	4	38	68	68
61	4	37	4	68	58
62	103	3	37	68	68
63	3	36	3	68	68
64	102	2	36	68	68
65	2	35	2	68	68
66	101	1	35	68	68
67	1	34	1	68	68

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ALLENTOWN, PENNSYLVANIA - COLLEGE HEIGHTS BLVD. DRAINAGE AREA

NUMBER OF ELEMENTS = 67
NUMBER OF TIME INT = 100
TIME INTERVAL = 600.0 SECONDS

* * * * * ELEMENT PARAMETERS * * * * *

EXT. ELE. NUM.	TYPE	DESCRIPTION	SLOPE (FT/FT)	DISTANCE (FT)	MANNING ROUGHNESS	GEOM1 (FT)	GEOM2 (FT)	GEOM3 (FT)	NUMBER OF BARRELS	AFULL (SQ.FT)	QFULL (CFS)	QMAX (CFS)	SUPER-CRITICAL FLOW WHEN LESS THAN 95% FULL*
101	2	RECTANGULAR	.0030	617.0	.0150	3.0	22.0	-.0	1.0	66.000	557.336	783.793	NO
102	2	RECTANGULAR	.0152	714.0	.0150	5.0	11.0	-.0	1.0	55.000	966.469	1228.176	NO
103	2	RECTANGULAR	.0057	374.0	.0150	5.0	11.0	-.0	1.0	55.000	581.363	739.739	NO
104	2	RECTANGULAR	.0064	378.0	.0150	5.0	11.0	-.0	1.0	55.000	627.128	796.946	NO
105	1	CIRCULAR	.0143	642.0	.0150	7.0	-.0	-.0	1.0	38.485	708.762	765.463	NO
106	1	CIRCULAR	.0213	182.0	.0150	3.0	-.0	-.0	1.0	7.069	84.591	91.358	NO
107	1	CIRCULAR	.0197	914.0	.0150	2.5	-.0	-.0	1.0	4.909	48.742	52.642	NO
108	1	CIRCULAR	.0125	664.0	.0150	7.0	-.0	-.0	1.0	38.485	623.149	673.001	NO
109	1	CIRCULAR	.0033	924.0	.0150	3.0	-.0	-.0	1.0	7.069	55.895	60.367	NO
110	1	CIRCULAR	.0067	347.0	.0150	6.0	-.0	-.0	1.0	28.274	301.244	325.344	NO
111	1	CIRCULAR	.0051	90.0	.0150	5.5	-.0	-.0	1.0	23.758	227.917	245.151	NO
112	1	CIRCULAR	.0075	259.0	.0150	5.5	-.0	-.0	1.0	23.758	252.722	272.940	NO
113	1	CIRCULAR	.0053	192.0	.0150	3.0	-.0	-.0	1.0	7.069	42.196	45.572	NO
114	1	CIRCULAR	.0060	302.0	.0150	5.5	-.0	-.0	1.0	23.758	226.041	244.125	NO
115	1	CIRCULAR	.0065	788.0	.0150	5.0	-.0	-.0	1.0	19.635	182.469	197.066	NO
116	1	CIRCULAR	.0058	310.0	.0150	4.0	-.0	-.0	1.0	12.566	95.065	102.670	NO
117	1	CIRCULAR	.0058	620.0	.0150	3.5	-.0	-.0	1.0	9.621	72.096	77.864	NO
118	1	CIRCULAR	.0048	624.0	.0150	4.0	-.0	-.0	1.0	12.566	86.482	93.401	NO
119	1	CIRCULAR	.0054	620.0	.0150	3.0	-.0	-.0	1.0	7.069	42.592	46.000	NO
120	2	RECTANGULAR	.0160	507.0	.0150	4.0	8.0	-.0	1.0	32.000	487.077	612.882	NO
121	2	RECTANGULAR	.0043	668.0	.0150	4.0	8.0	-.0	1.0	32.000	269.548	339.124	NO
122	1	CIRCULAR	.0070	312.0	.0150	2.5	-.0	-.0	1.0	4.909	29.822	32.208	NO
123	1	CIRCULAR	.0073	309.0	.0150	2.3	-.0	-.0	1.0	3.976	23.921	25.835	NO
124	2	RECTANGULAR	.0474	289.0	.0150	4.0	8.0	-.0	1.0	32.000	838.352	1054.750	YES
125	2	RECTANGULAR	.0048	510.0	.0150	4.0	8.0	-.0	1.0	32.000	256.783	335.646	NO
126	2	RECTANGULAR	.0059	348.0	.0150	4.0	8.0	-.0	1.0	32.000	295.776	372.123	NO
127	2	RECTANGULAR	.0055	309.0	.0150	4.0	8.0	-.0	1.0	32.000	285.574	359.287	NO
128	2	RECTANGULAR	.0054	305.0	.0150	4.0	8.0	-.0	1.0	32.000	282.966	356.006	NO
129	1	CIRCULAR	.0075	331.0	.0150	3.5	-.0	-.0	1.0	9.621	75.716	81.774	NO
130	1	CIRCULAR	.0070	269.0	.0150	3.0	-.0	-.0	1.0	7.069	48.494	52.373	NO
131	1	CIRCULAR	.0065	323.0	.0150	3.5	-.0	-.0	1.0	9.621	70.488	76.127	NO
132	1	CIRCULAR	.0141	338.0	.0150	3.0	-.0	-.0	1.0	7.069	68.825	74.331	NO
133	1	CIRCULAR	.0195	950.0	.0150	3.0	-.0	-.0	1.0	7.069	80.939	87.413	NO
1	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000	
2	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000	
3	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000	
4	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000	
5	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000	
6	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000	
7	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000	
8	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000	
9	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000	
10	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000	
11	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000	

12	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
13	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
14	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
15	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
16	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
17	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
18	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
19	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
20	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
21	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
22	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
23	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
24	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
25	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
26	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
27	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
28	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
29	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
30	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
31	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
32	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
33	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000
34	16	MANHOLE	-.0000	-.0	-.0000	.0	-.0	-.0	1.0	.000	.000	.000

EPSILON = .000100   NO. OF ITERATIONS IN ROUTING ROUTINE= 4

HYDROGRAPHS AND POLLUTOGRAPHS PROVIDED TO SUBSEQUENT PROGRAMS FOR THE FOLLOWING ELEMENTS

1

INITIAL BED OF SOLIDS (LBS) IN SEWER DUE TO
10.0 DAYS OF DRY WEATHER PRIOR TO STORM

ELEMENT NUMBER	SOLIDS IN BOTTOM (LBS)
107	.00000
106	.00000
109	.00000
113	.00000
117	.00000
116	.00000
119	.00000
118	.00000
115	.00000
114	.00000
112	.00000
111	.00000
110	.00000
123	.00000
122	.00000
130	.00000
129	.00000
133	.00000
132	.00000
131	.00000
128	.00000
127	.00000
126	.00000
125	.00000
124	.00000
121	.00000
120	.00000
108	.00000
105	.00000
104	.00000
103	.00000
102	.00000
101	.00000

ELEMENT FLOWS, AREAS, AND CONCENTRATIONS ARE INITIALIZED TO DRY WEATHER FLOW AND INFILTRATION VALUES.

ELE. NO.	TYPE	FLOW (CFS)	AREA (SQ. FT.)	INIT. VEL. (FPS)	BOD (LBS/CF)	S.S. (LBS/CF)	ECOLI. (MPN/ML)	CPOLL NO.4
8	16	.000	.000	.0000	.0000	.0000	.0	
107	1	.000	.000	.0000	.0000	.0000	.0	
7	16	.000	.000	.0000	.0000	.0000	.0	
106	1	.000	.000	.0000	.0000	.0000	.0	
10	16	.000	.000	.0000	.0000	.0000	.0	
109	1	.000	.000	.0000	.0000	.0000	.0	
14	16	.000	.000	.0000	.0000	.0000	.0	
113	1	.000	.000	.0000	.0000	.0000	.0	
18	16	.000	.000	.0000	.0000	.0000	.0	
117	1	.000	.000	.0000	.0000	.0000	.0	
17	16	.000	.000	.0000	.0000	.0000	.0	
116	1	.000	.000	.0000	.0000	.0000	.0	
20	16	.000	.000	.0000	.0000	.0000	.0	
119	1	.000	.000	.0000	.0000	.0000	.0	
19	16	.000	.000	.0000	.0000	.0000	.0	
118	1	.000	.000	.0000	.0000	.0000	.0	
16	16	.000	.000	.0000	.0000	.0000	.0	
115	1	.000	.000	.0000	.0000	.0000	.0	
15	16	.000	.000	.0000	.0000	.0000	.0	
114	1	.000	.000	.0000	.0000	.0000	.0	
13	16	.000	.000	.0000	.0000	.0000	.0	
112	1	.000	.000	.0000	.0000	.0000	.0	
12	16	.000	.000	.0000	.0000	.0000	.0	
111	1	.000	.000	.0000	.0000	.0000	.0	
11	16	.000	.000	.0000	.0000	.0000	.0	
110	1	.000	.000	.0000	.0000	.0000	.0	
24	16	.000	.000	.0000	.0000	.0000	.0	
123	1	.000	.000	.0000	.0000	.0000	.0	
23	16	.000	.000	.0000	.0000	.0000	.0	
122	1	.000	.000	.0000	.0000	.0000	.0	
31	16	.000	.000	.0000	.0000	.0000	.0	
130	1	.000	.000	.0000	.0000	.0000	.0	
30	16	.000	.000	.0000	.0000	.0000	.0	
129	1	.000	.000	.0000	.0000	.0000	.0	
34	16	.000	.000	.0000	.0000	.0000	.0	
133	1	.000	.000	.0000	.0000	.0000	.0	
33	16	.000	.000	.0000	.0000	.0000	.0	
132	1	.000	.000	.0000	.0000	.0000	.0	
32	16	.000	.000	.0000	.0000	.0000	.0	
131	1	.000	.000	.0000	.0000	.0000	.0	
29	16	.000	.000	.0000	.0000	.0000	.0	
128	2	.000	.000	.0000	.0000	.0000	.0	
28	16	.000	.000	.0000	.0000	.0000	.0	
127	2	.000	.000	.0000	.0000	.0000	.0	
27	16	.000	.000	.0000	.0000	.0000	.0	
126	2	.000	.000	.0000	.0000	.0000	.0	
26	16	.000	.000	.0000	.0000	.0000	.0	
125	2	.000	.000	.0000	.0000	.0000	.0	
25	16	.000	.000	.0000	.0000	.0000	.0	
124	2	.000	.000	.0000	.0000	.0000	.0	
22	16	.000	.000	.0000	.0000	.0000	.0	
121	2	.000	.000	.0000	.0000	.0000	.0	

21	16	.000	.000	.0000	.0000	.0000	0.
120	2	.000	.000	.0000	.0000	.0000	0.
9	16	.000	.000	.0000	.0000	.0000	0.
108	1	.000	.000	.0000	.0000	.0000	0.
6	16	.000	.000	.0000	.0000	.0000	0.
105	1	.000	.000	.0000	.0000	.0000	0.
5	16	.000	.000	.0000	.0000	.0000	0.
104	2	.000	.000	.0000	.0000	.0000	0.
4	16	.000	.000	.0000	.0000	.0000	0.
103	2	.000	.000	.0000	.0000	.0000	0.
3	16	.000	.000	.0000	.0000	.0000	0.
102	2	.000	.000	.0000	.0000	.0000	0.
2	16	.000	.000	.0000	.0000	.0000	0.
101	2	.000	.000	.0000	.0000	.0000	0.
1	16	.000	.000	.0000	.0000	.0000	0.

BED OF SOLIDS IN SEWER AT END OF STORM

ELEMENT NUMBER	SOLIDS IN BOTTOM (LBS)
107	.00000
106	.00000
109	.00001
113	.00010
117	.00004
116	.00025
119	.00033
118	.00019
115	.00019
114	.00027
112	.00021
111	.00033
110	.00033
123	.00001
122	.00005
130	.00017
129	.00044
133	.00000
132	.00000
131	.00001
128	.00658
127	.01235
126	.01490
125	.01931
124	.00090
121	.01728
120	.00478
108	.00029
105	.00021
104	.01500
103	.01932
102	.00419
101	.04857

* * * * * RESULTS OF POLLUTANT MONITORING ROUTINE * * * * *

POLLUTANTS ASSOCIATED WITH MANHOLES (INLET POINTS) RANKED IN ORDER OF SIGNIFICANCE OF SUSPENDED SOLIDS.

		SUSPENDED SOLIDS (LB)				5 - DAY BOD (LB)			TOTAL
RANK	INLET	RUNOFF	D.W.F.	P.SCOUR	TOTAL SS	RUNOFF	D.W.F.	TOTAL BOD	INFLOW (CF)
1	18	.16E+03	.0	.00	.16E+03	13.34	.0	.13E+02	.43E+02
2	19	.14E+03	.0	-.00	.14E+03	12.37	.0	.12E+02	.49E+02
3	33	.14E+03	.0	-.00	.14E+03	14.11	.0	.14E+02	.45E+02
4	15	.11E+03	.0	-.00	.11E+03	8.71	.0	.87E+01	.31E+02
5	10	.11E+03	.0	.00	.11E+03	8.29	.0	.83E+01	.31E+02
6	16	.11E+03	.0	-.00	.11E+03	9.23	.0	.92E+01	.36E+02
7	9	.99E+02	.0	-.01	.99E+02	8.03	.0	.80E+01	.32E+02
8	4	.79E+02	.0	-.02	.79E+02	6.96	.0	.70E+01	.37E+02
9	22	.77E+02	.0	-.00	.77E+02	6.01	.0	.60E+01	.22E+02
10	8	.75E+02	.0	.00	.75E+02	5.67	.0	.57E+01	.20E+02
11	28	.74E+02	.0	-.01	.74E+02	5.97	.0	.60E+01	.32E+02
12	3	.70E+02	.0	-.02	.70E+02	7.79	.0	.78E+01	.31E+02
13	29	.62E+02	.0	-.00	.62E+02	5.61	.0	.56E+01	.30E+02
14	24	.61E+02	.0	.00	.61E+02	4.54	.0	.45E+01	.23E+02
15	25	.60E+02	.0	-.02	.60E+02	4.66	.0	.47E+01	.18E+02
16	14	.54E+02	.0	.00	.54E+02	4.43	.0	.44E+01	.16E+02
17	6	.50E+02	.0	-.00	.50E+02	4.09	.0	.41E+01	.18E+02
18	21	.49E+02	.0	-.02	.49E+02	4.27	.0	.43E+01	.16E+02
19	7	.46E+02	.0	-.00	.46E+02	3.67	.0	.37E+01	.16E+02
20	31	.44E+02	.0	.00	.44E+02	3.86	.0	.39E+01	.20E+02
21	27	.42E+02	.0	-.01	.42E+02	3.55	.0	.35E+01	.19E+02
22	26	.40E+02	.0	-.01	.40E+02	3.63	.0	.36E+01	.18E+02
23	34	.35E+02	.0	.00	.36E+02	2.80	.0	.28E+01	.18E+02
24	20	.34E+02	.0	.00	.34E+02	3.28	.0	.33E+01	.14E+02
25	12	.29E+02	.0	-.00	.29E+02	2.52	.0	.25E+01	.93E+01
26	32	.0	.0	-.00	-.16E-06	.00	.0	.0	.0
27	23	.0	.0	-.00	-.67E-05	.00	.0	.0	.0
28	17	.0	.0	-.00	-.45E-04	.00	.0	.0	.0
29	30	.0	.0	-.00	-.17E-03	.00	.0	.0	.0
30	5	.0	.0	-.00	-.21E-03	.00	.0	.0	.0
31	11	.0	.0	-.00	-.33E-03	.00	.0	.0	.0
32	13	.0	.0	-.00	-.37E-03	.00	.0	.0	.0
33	2	.0	.0	-.00	-.42E-02	.00	.0	.0	.0
34	1	.0	.0	-.05	-.49E-01	.00	.0	.0	.0

ALLENTOWN, PENNSYLVANIA - COLLEGE HEIGHTS BLVD. DRAINAGE AREA

TOTAL SIMULATION TIME = 60000.0 SECONDS. TIME STEP = 600.0 SECONDS.

INFLOW POLLUTOGRAPHS AND HYDROGRAPHS AT THE FOLLOWING EXTERNAL ELEMENT NUMBERS

3 4 7 8 9 10 15 18 16 14 20 19 24 21 25 26 27 28 29 31
34 33 6 12 22

SELECTED INLET HYDROGRAPHS - CFS

EXTERNAL ELEMENT NUMBER	TIME STEP 1	2	3	4	5	6	7	8	9	10
3	.000	.005	.032	.066	.079	.097	.135	.217	.178	.133
	.129	.129	.126	.162	.265	.347	.360	.365	.371	.480
	.759	.914	.918	.928	.932	.966	1.045	1.085	1.085	1.086
	1.087	.904	.518	.289	.259	.262	.253	.228	.155	.117
	.104	.101	.098	.130	.337	.430	.448	.456	.454	.446
	.436	.345	.265	.237	.305	.362	.334	.288	.623	.621
	.566	.541	.852	.961	.538	.182	.185	.283	.304	.237
	.166	.191	.246	.284	.383	.385	.261	.203	.171	.103
	.048	.025	.017	.012	.009	.007	.006	.004	.004	.003
	.003	.002	.002	.002	.001	.001	.001	.001	.001	.001
4	.003	.034	.030	.070	.093	.116	.192	.258	.222	.156
	.153	.150	.148	.196	.303	.407	.432	.435	.438	.558
	.873	1.085	1.094	1.094	1.098	1.135	1.227	1.279	1.279	1.278
	1.279	1.073	.624	.337	.301	.299	.293	.257	.198	.140
	.120	.115	.112	.168	.347	.507	.540	.543	.548	.528
	.481	.409	.315	.275	.348	.422	.399	.344	.485	.723
	.585	.639	.984	1.143	.658	.224	.139	.311	.353	.286
	.200	.217	.281	.332	.446	.460	.322	.240	.203	.125
	.060	.033	.019	.012	.009	.007	.035	.004	.003	.003
	.002	.002	.002	.001	.001	.001	.001	.001	.001	.001
10	.000	.000	.007	.025	.049	.072	.114	.169	.182	.157
	.138	.129	.125	.140	.234	.289	.340	.355	.361	.425
	.627	.875	.903	.907	.911	.932	.995	1.049	1.062	1.061
	1.062	.944	.642	.376	.279	.257	.248	.232	.192	.146
	.117	.104	.098	.119	.214	.348	.424	.445	.452	.444
	.415	.355	.297	.250	.269	.322	.333	.303	.359	.521
	.571	.543	.720	.902	.679	.323	.224	.235	.275	.256
	.201	.183	.212	.252	.327	.369	.310	.235	.130	.138
	.087	.054	.035	.025	.018	.014	.011	.008	.007	.006
	.005	.004	.003	.003	.003	.002	.002	.002	.002	.001
19	.000	.001	.018	.061	.107	.143	.219	.313	.312	.247
	.212	.201	.198	.232	.361	.514	.579	.585	.598	.713
	1.094	1.429	1.481	1.465	1.472	1.513	1.628	1.712	1.718	1.714
	1.716	1.487	.936	.508	.401	.396	.393	.367	.292	.211
	.170	.156	.151	.199	.395	.633	.727	.732	.735	.715
	.658	.569	.450	.378	.438	.542	.547	.479	.603	.938

	.347	.867	1.229	1.522	1.022	.395	.265	.374	.459	.409
	.300	.283	.351	.427	.563	.620	.480	.745	.230	.195
	.110	.061	.038	.025	.018	.013	.010	.008	.006	.005
	.004	.004	.003	.003	.002	.002	.002	.002	.001	.001
33	.000	.001	.015	.051	.088	.121	.192	.277	.277	.224
	.196	.185	.182	.212	.323	.456	.516	.529	.534	.645
	.930	1.278	1.339	1.335	1.341	1.378	1.480	1.565	1.564	1.562
	1.563	1.350	.873	.490	.384	.369	.361	.335	.253	.198
	.161	.147	.140	.182	.352	.558	.647	.661	.669	.651
	.602	.523	.417	.352	.402	.490	.494	.438	.548	.814
	.850	.791	1.111	1.366	.937	.390	.255	.349	.415	.371
	.277	.264	.320	.385	.505	.556	.438	.324	.253	.185
	.108	.062	.040	.028	.020	.015	.012	.009	.007	.006
	.005	.004	.004	.003	.003	.002	.002	.002	.002	.001

SELECTED INLET POLLUTOGRAPHS

EXTERNAL ELEMENT NUMBER	TIME STEP 1	2	3	4	5	6	7	8	9	10
	*** BOD IN LBS/MIN ***									
3	.000	.000	.004	.010	.010	.010	.012	.011	.007	.004
	.004	.023	.003	.004	.005	.009	.009	.009	.009	.013
	.026	.034	.033	.032	.030	.030	.033	.034	.034	.034
	.033	.025	.012	.005	.004	.004	.004	.003	.002	.002
	.001	.001	.001	.002	.004	.007	.018	.008	.018	.007
	.007	.005	.004	.003	.004	.005	.005	.004	.017	.011
	.010	.009	.020	.024	.011	.003	.003	.004	.014	.003
	.002	.002	.003	.003	.005	.005	.003	.002	.002	.001
	.001	.000	.000	.000	.000	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	SUSPENDED SOLIDS IN LBS/MIN									
3	.000	.000	.002	.005	.006	.008	.024	.037	.024	.011
	.010	.003	.009	.015	.044	.072	.073	.069	.057	.120
	.305	.423	.392	.366	.341	.333	.375	.404	.400	.398
	.397	.277	.095	.028	.023	.020	.017	.014	.008	.004
	.033	.023	.002	.006	.029	.056	.057	.057	.053	.054
	.043	.030	.018	.013	.024	.034	.029	.020	.055	.116
	.036	.083	.243	.300	.118	.013	.014	.023	.025	.016
	.008	.009	.014	.020	.040	.040	.017	.009	.007	.003
	.001	.001	.001	.000	.000	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	*** COLIFORM IN MPN/MIN ***									
3	.0	.0	2.91E+07	7.93E+07	8.22E+07	9.60E+07	1.53E+08	2.04E+08	1.48E+08	1.91E+08
	1.01E+08	1.01E+08	1.01E+08	1.38E+08	2.36E+08	3.00E+08	2.93E+08	2.97E+08	2.85E+08	3.80E+08
	5.99E+08	5.98E+08	5.44E+06	5.29E+08	6.11E+08	6.17E+08	6.51E+08	5.30E+08	6.22E+08	6.02E+08
	5.81E+08	4.52E+08	2.23E+08	1.12E+08	1.21E+08	1.24E+08	1.21E+08	1.07E+08	7.11E+07	4.69E+07
	4.38E+07	4.69E+07	4.46E+07	7.72E+07	1.57E+08	2.23E+08	2.14E+08	2.09E+08	2.08E+08	1.95E+08
	1.72E+08	1.41E+08	1.02E+08	9.34E+07	1.32E+08	1.56E+08	1.36E+08	1.12E+08	1.80E+08	2.63E+08
	2.19E+08	2.02E+08	3.35E+08	3.57E+08	1.62E+08	3.17E+07	5.34E+07	1.01E+08	1.06E+08	7.64E+07
	4.33E+07	6.24E+07	9.71E+07	9.74E+07	1.33E+08	1.26E+08	7.47E+07	5.56E+07	4.82E+07	2.48E+07
	7.24E+06	1.25E+05	.0	.0	.0	.0	.0	.0	.0	.0
	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	*** BOD IN LBS/MIN ***									
4	.000	.000	.005	.012	.015	.015	.019	.019	.012	.007
	.005	.004	.003	.004	.006	.008	.008	.007	.007	.011
	.022	.031	.030	.028	.027	.026	.029	.031	.030	.030
	.030	.022	.010	.004	.003	.003	.002	.002	.001	.001
	.001	.001	.001	.001	.003	.005	.006	.005	.005	.006
	.005	.004	.003	.002	.003	.004	.003	.003	.005	.009
	.009	.007	.017	.021	.010	.002	.002	.002	.003	.002
	.001	.001	.002	.002	.004	.004	.002	.001	.001	.001
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

SUSPENDED SOLIDS IN LBS/MIN

4	.000	.000	.001	.004	.005	.009	.024	.039	.029	.016
	.012	.011	.010	.016	.044	.075	.031	.073	.076	.125
	.317	.466	.451	.418	.388	.376	.419	.454	.452	.450
	.447	.325	.127	.037	.025	.021	.018	.015	.009	.005
	.003	.003	.003	.006	.028	.055	.053	.054	.055	.060
	.050	.036	.021	.015	.024	.035	.032	.023	.035	.129
	.113	.094	.252	.332	.155	.026	.017	.024	.027	.018
	.009	.010	.015	.021	.040	.044	.023	.012	.008	.004
	.002	.001	.001	.000	.000	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

*** COLIFORM IN MPN/MIN ***

4	.0	.0	2.23E+07	6.38E+07	8.74E+07	1.10E+08	1.82E+08	2.43E+08	2.05E+08	1.50E+08
	1.33E+08	1.35E+08	1.34E+08	1.70E+08	2.78E+08	3.69E+08	3.85E+08	3.92E+08	3.92E+08	4.83E+08
	7.45E+08	9.02E+08	8.33E+08	8.52E+08	8.44E+08	8.50E+08	8.96E+08	9.08E+08	8.81E+08	8.56E+08
	8.32E+08	6.79E+08	3.84E+08	2.04E+08	1.83E+08	1.82E+08	1.77E+08	1.60E+08	1.17E+08	8.17E+07
	7.02E+07	5.77E+07	6.00E+07	9.94E+07	2.05E+08	2.95E+08	3.09E+08	3.07E+08	3.06E+08	2.91E+08
	2.61E+08	2.20E+08	1.57E+08	1.46E+08	1.84E+08	2.21E+08	2.07E+08	1.76E+08	2.48E+08	3.65E+08
	3.39E+08	3.11E+08	4.71E+08	3.75E+08	3.04E+08	9.88E+07	8.90E+07	1.40E+08	1.58E+08	1.26E+08
	8.75E+07	9.50E+07	1.23E+08	1.44E+08	1.92E+08	1.95E+08	1.35E+08	3.98E+07	8.28E+07	5.13E+07
	2.41E+07	1.21E+07	6.54E+06	4.11E+06	2.98E+06	2.25E+06	8.71E+05	.0	.0	.0
	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

*** BOD IN LBS/MIN ***

10	.000	.000	.001	.004	.008	.010	.013	.015	.013	.009
	.007	.005	.004	.004	.005	.008	.010	.010	.010	.013
	.024	.037	.041	.039	.037	.035	.037	.039	.039	.038
	.038	.031	.018	.008	.005	.004	.003	.003	.002	.002
	.001	.001	.001	.001	.002	.005	.006	.007	.007	.007
	.006	.005	.004	.003	.003	.004	.004	.003	.005	.009
	.010	.009	.016	.023	.016	.006	.003	.003	.003	.003
	.002	.002	.002	.002	.003	.004	.003	.002	.002	.001
	.001	.000	.000	.000	.000	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

SUSPENDED SOLIDS IN LBS/MIN

10	.000	.000	.000	.002	.005	.007	.018	.036	.040	.030
	.023	.019	.017	.019	.041	.080	.107	.115	.115	.154
	.335	.555	.626	.600	.561	.533	.559	.601	.610	.605
	.606	.492	.273	.116	.063	.044	.034	.027	.019	.012
	.008	.005	.005	.005	.022	.054	.077	.086	.090	.088
	.078	.062	.043	.030	.032	.043	.046	.039	.037	.122
	.149	.137	.252	.382	.272	.100	.049	.041	.040	.032
	.021	.016	.018	.024	.042	.054	.041	.026	.017	.011
	.006	.004	.002	.002	.001	.001	.001	.001	.000	.000
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

*** COLIFORM IN MPN/MIN ***

10	.0	.0	7.54E+06	3.34E+07	5.79E+07	1.02E+08	1.65E+08	2.44E+08	2.63E+08	2.26E+08
	1.97E+08	1.84E+08	1.78E+08	1.39E+08	2.84E+08	3.99E+08	4.63E+08	4.78E+08	4.79E+08	5.53E+08
	7.94E+08	1.03E+09	1.07E+09	1.04E+09	1.00E+09	9.87E+08	1.01E+09	1.02E+09	9.87E+08	9.43E+08

	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

SUSPENDED SOLIDS IN LBS/MIN

33	.000	.000	.000	.002	.006	.010	.026	.050	.052	.036
	.027	.023	.020	.024	.057	.108	.137	.141	.140	.197
	.447	.718	.772	.728	.679	.649	.694	.750	.760	.755
	.752	.600	.306	.118	.065	.047	.039	.031	.021	.013
	.008	.006	.005	.008	.033	.078	.106	.113	.117	.113
	.098	.075	.050	.035	.041	.057	.060	.048	.080	.174
	.198	.176	.355	.521	.333	.103	.050	.048	.050	.039
	.024	.019	.024	.033	.050	.074	.052	.031	.020	.012
	.006	.004	.002	.001	.001	.001	.000	.000	.000	.000
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

*** COLIFORM IN MPN/MIN ***

33	.0	.0	2.03E+06	6.26E+07	1.74E+08	2.88E+08	5.03E+08	7.57E+08	7.81E+08	6.43E+08
	5.60E+08	5.29E+08	5.13E+08	5.68E+08	8.77E+08	1.23E+09	1.38E+09	1.40E+09	1.39E+09	1.63E+09
	2.38E+09	3.02E+09	3.06E+09	2.92E+09	2.80E+09	2.74E+09	2.80E+09	2.90E+09	2.68E+09	2.54E+09
	2.41E+09	2.01E+09	1.27E+09	6.99E+08	5.31E+08	4.98E+08	4.80E+08	4.42E+08	3.54E+08	2.60E+08
	2.09E+08	1.88E+08	1.78E+08	2.27E+08	4.26E+08	6.71E+08	7.74E+08	7.79E+08	7.71E+08	7.37E+08
	6.69E+08	5.72E+08	4.51E+08	3.76E+08	4.17E+08	4.99E+08	4.99E+08	4.39E+08	5.31E+08	7.67E+08
	7.93E+08	7.21E+08	9.64E+08	1.15E+09	7.83E+08	3.28E+08	2.15E+08	2.72E+08	3.19E+08	2.85E+08
	2.13E+08	1.98E+08	2.36E+08	2.80E+08	3.61E+08	3.94E+08	3.10E+08	2.27E+08	1.83E+08	1.28E+08
	7.55E+07	4.42E+07	2.84E+07	1.79E+07	1.18E+07	8.87E+06	3.43E+06	.0	.0	.0
	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

	9.02E+08	7.71E+08	3.10E+08	2.93E+08	2.14E+08	1.94E+08	1.85E+08	1.71E+08	1.40E+08	1.06E+08
	8.46E+07	7.49E+07	5.99E+07	8.42E+07	1.50E+08	2.40E+08	2.88E+08	2.97E+08	2.97E+08	2.86E+08
	2.63E+08	2.28E+08	1.83E+08	1.52E+08	1.52E+08	1.90E+08	1.95E+08	1.75E+08	2.04E+08	2.89E+08
	3.10E+08	2.88E+08	3.70E+08	4.49E+08	3.30E+08	1.55E+08	9.67E+07	1.10E+08	1.26E+08	1.16E+08
	9.02E+07	8.18E+07	9.34E+07	1.10E+08	1.40E+08	1.56E+08	1.30E+08	3.76E+07	7.81E+07	5.67E+07
	3.54E+07	2.18E+07	1.44E+07	1.01E+07	7.38E+06	5.57E+06	4.33E+06	3.44E+06	2.79E+06	2.30E+06
	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

*** BOD IN LBS/MIN ***

19	.000	.000	.003	.011	.018	.022	.027	.030	.023	.015
	.010	.008	.006	.006	.009	.014	.015	.015	.014	.018
	.036	.055	.057	.053	.050	.048	.052	.055	.055	.054
	.054	.043	.022	.009	.006	.005	.005	.004	.003	.002
	.002	.001	.001	.002	.005	.009	.011	.011	.011	.010
	.009	.007	.005	.004	.005	.006	.006	.005	.008	.015
	.015	.014	.026	.036	.022	.006	.003	.004	.005	.004
	.003	.002	.003	.004	.006	.007	.005	.003	.002	.001
	.001	.000	.000	.000	.000	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

SUSPENDED SOLIDS IN LBS/MIN

19	.000	.000	.001	.004	.008	.012	.027	.052	.053	.035
	.025	.021	.018	.023	.057	.112	.141	.142	.138	.199
	.474	.771	.813	.749	.694	.664	.720	.797	.796	.789
	.785	.613	.289	.095	.049	.078	.032	.027	.018	.019
	.007	.005	.004	.007	.034	.082	.110	.115	.118	.112
	.095	.072	.046	.031	.038	.057	.059	.047	.079	.182
	.207	.175	.374	.557	.337	.081	.035	.038	.044	.035
	.020	.016	.022	.032	.061	.075	.051	.028	.017	.010
	.005	.002	.001	.001	.001	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

*** COLIFORM IN MPN/MIN ***

19	.0	.0	2.04E+07	9.33E+07	1.54E+08	2.10E+08	3.26E+08	4.66E+08	4.53E+08	3.65E+08
	3.12E+08	2.95E+08	2.89E+08	3.38E+08	5.20E+08	7.34E+08	8.18E+08	9.18E+08	8.12E+08	9.69E+08
	1.46E+09	1.86E+09	1.87E+09	1.79E+09	1.75E+09	1.74E+09	1.81E+09	1.84E+09	1.78E+09	1.72E+09
	1.66E+09	1.39E+09	8.58E+08	4.59E+08	3.57E+08	3.49E+08	3.44E+08	3.18E+08	2.52E+08	1.81E+08
	1.45E+08	1.33E+08	1.28E+08	1.68E+08	3.30E+08	5.24E+08	5.95E+08	5.90E+08	5.84E+08	5.59E+08
	5.08E+08	4.34E+08	3.40E+08	2.83E+08	3.24E+08	3.97E+08	3.97E+08	3.44E+08	4.25E+08	6.32E+08
	5.49E+08	5.82E+08	8.04E+08	9.72E+08	6.40E+08	2.44E+08	1.62E+08	2.26E+08	2.75E+08	2.43E+08
	1.77E+08	1.66E+08	2.04E+08	2.46E+08	3.21E+08	3.50E+08	2.69E+08	1.92E+08	1.54E+08	1.07E+08
	5.03E+07	3.33E+07	2.06E+07	1.38E+07	9.73E+06	5.82E+06	3.40E+06	2.65E+06	1.06E+06	.0
	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

*** BOD IN LBS/MIN ***

33	.000	.000	.001	.005	.010	.012	.016	.019	.017	.012
	.009	.008	.007	.008	.012	.018	.021	.021	.021	.026
	.046	.066	.069	.065	.051	.059	.062	.065	.064	.053
	.051	.050	.028	.013	.008	.007	.007	.006	.005	.003
	.002	.002	.002	.003	.006	.010	.013	.013	.013	.013
	.011	.009	.007	.005	.006	.008	.008	.007	.009	.016
	.018	.015	.027	.037	.024	.008	.005	.005	.005	.005
	.003	.003	.004	.004	.007	.008	.006	.004	.003	.002
	.001	.001	.000	.000	.000	.000	.000	.000	.000	.000

SELECTED OUTFLOW HYDROGRAPHS - CFS

EXTERNAL ELEMENT NUMBER	TIME STEP 1	2	3	4	5	6	7	8	9	10
1	.000	.000	.000	.000	.000	.060	.479	1.245	2.236	3.123
	3.540	3.521	3.233	2.892	2.830	3.385	4.593	5.283	7.537	7.929
	9.002	12.090	13.441	19.179	19.411	19.149	19.730	20.891	21.938	22.389
	22.387	21.721	19.113	14.417	9.866	6.961	5.531	5.020	4.937	4.496
	3.895	3.339	2.783	2.371	2.354	3.144	5.086	7.830	9.582	9.625
	9.293	8.859	8.056	6.966	6.010	5.685	6.024	6.584	5.983	7.720
	9.330	11.232	12.795	14.785	16.514	14.747	9.974	6.286	4.696	4.582
	5.045	5.023	4.607	4.336	4.703	5.915	7.018	5.989	5.939	4.768
	3.655	2.846	2.170	1.555	1.080	.765	.556	.414	.327	.263
	.213	.175	.146	.124	.106	.091	.079	.070	.061	.054
6	.000	.021	.097	.230	.446	.836	1.414	2.237	2.951	3.302
	3.197	2.790	2.441	2.427	2.904	3.945	5.587	6.621	6.883	7.339
	9.444	13.388	15.585	17.370	17.040	17.275	18.116	19.223	19.940	20.018
	19.931	18.803	15.031	9.998	6.544	4.855	4.535	4.451	4.124	3.506
	2.332	2.386	1.954	1.967	2.635	4.231	6.858	8.370	8.622	8.414
	8.124	7.482	5.428	5.393	4.921	5.234	5.932	5.155	6.376	7.780
	9.769	10.903	11.987	14.720	15.042	10.417	5.820	3.934	4.101	4.640
	4.652	4.023	3.688	3.991	5.127	6.316	6.554	5.519	4.334	3.299
	2.540	1.745	1.132	.701	.455	.318	.240	.177	.143	.113
	.093	.077	.065	.055	.047	.041	.035	.032	.029	.024
9	.000	.009	.059	.176	.397	.746	1.318	2.142	2.812	3.976
	2.871	2.449	2.158	2.176	2.652	3.687	5.203	5.095	5.231	6.543
	8.660	12.397	15.280	15.708	15.439	15.669	16.459	17.486	18.121	18.129
	18.370	17.047	13.473	8.812	5.532	4.343	4.110	4.060	3.735	3.172
	2.540	2.013	1.723	1.745	2.390	4.022	6.464	7.691	7.830	7.621
	7.369	6.743	5.771	4.806	4.386	4.756	5.484	5.597	5.710	7.125
	9.116	9.899	10.789	13.605	13.928	9.162	4.946	3.462	3.558	4.356
	4.229	3.573	3.274	3.619	4.715	5.861	5.940	5.040	3.833	2.951
	2.206	1.510	.954	.599	.387	.286	.207	.161	.127	.103
	.084	.070	.059	.050	.043	.037	.032	.031	.025	.022
16	.000	.003	.033	.134	.279	.394	.534	.775	.928	.824
	.543	.575	.569	.613	.845	1.315	1.651	1.693	1.634	1.905
	2.771	3.930	4.295	4.207	4.214	4.309	4.579	4.875	4.945	4.918
	4.922	4.482	3.143	1.750	1.175	1.103	1.136	1.084	.945	.716
	.523	.448	.432	.495	.948	1.590	2.093	2.108	2.115	2.074
	1.947	1.712	1.406	1.139	1.158	1.444	1.608	1.457	1.555	2.310
	2.798	2.574	3.112	4.245	3.592	1.627	.816	.836	1.244	1.275
	.999	.817	.881	1.142	1.483	1.762	1.539	1.123	.865	.671
	.426	.214	.112	.071	.048	.034	.025	.019	.015	.012
	.010	.008	.007	.006	.005	.004	.004	.003	.003	.003
25	.000	.001	.011	.040	.119	.341	.538	.929	1.190	1.209
	1.030	.850	.798	.844	1.068	1.564	2.126	2.374	2.358	2.557
	3.482	5.038	5.972	5.950	5.980	5.039	6.371	6.739	6.935	6.901
	6.901	5.445	4.920	3.048	1.945	1.587	1.569	1.558	1.397	1.123
	.853	.708	.530	.653	.989	1.783	2.659	2.994	2.935	2.910
	2.800	2.525	2.148	1.754	1.523	1.866	2.171	2.140	2.150	2.833
	3.684	3.768	4.140	5.441	5.291	3.122	1.539	1.190	1.674	1.780

SELECTED OUTFLOW POLLUTOGRAPHS

*** BOD IN LBS/MIN ***

EXTERNAL ELEMENT NUMBER	TIME STEP 1	2	3	4	5	6	7	8	9	10
1	.000	.000	.000	.000	.000	.005	.055	.151	.258	.316
	.306	.255	.191	.136	.105	.102	.123	.161	.192	.209
	.232	.349	.550	.707	.723	.689	.658	.679	.703	.717
	.713	.679	.578	.409	.247	.147	.096	.073	.053	.054
	.044	.035	.028	.022	.021	.030	.055	.095	.130	.137
	.134	.126	.111	.091	.073	.064	.066	.072	.078	.090
	.122	.163	.215	.257	.336	.324	.218	.123	.074	.058
	.055	.050	.043	.037	.039	.051	.055	.068	.059	.045
	.033	.024	.017	.012	.008	.005	.004	.003	.002	.002
	.001	.001	.001	.001	.001	.000	.000	.000	.000	.000

SUSPENDED SOLIDS IN LBS/MIN

EXTERNAL ELEMENT NUMBER	TIME STEP 1	2	3	4	5	6	7	8	9	10
1	.000	.000	.000	.000	.000	.001	.025	.105	.235	.423
	.324	.535	.473	.388	.350	.443	.735	1.233	1.701	1.952
	2.496	4.262	7.386	9.972	10.477	9.877	9.435	9.624	10.051	10.393
	10.459	10.023	8.499	5.872	3.418	1.895	1.111	.741	.569	.434
	.319	.237	.169	.122	.111	.185	.434	.902	1.333	1.477
	1.473	1.383	1.201	.953	.723	.607	.604	.661	.735	.925
	1.389	2.018	2.708	3.774	5.010	4.943	3.320	1.814	1.031	.729
	.630	.530	.418	.344	.353	.401	.573	.733	.639	.477
	.326	.221	.149	.095	.058	.039	.027	.018	.013	.010
	.008	.005	.005	.004	.003	.003	.002	.002	.002	.001

*** COLIFORM IN MPN/MIN ***

EXTERNAL ELEMENT NUMBER	TIME STEP 1	2	3	4	5	6	7	8	9	10
1	.0	.0	.0	.0	.0	3.41E+07	4.20E+08	1.33E+09	2.69E+09	3.96E+09
	4.66E+09	4.80E+09	4.48E+09	3.97E+09	3.78E+09	4.39E+09	5.90E+09	8.15E+09	9.91E+09	1.04E+10
	1.13E+10	1.47E+10	1.98E+10	2.30E+10	2.27E+10	2.15E+10	2.13E+10	2.17E+10	2.20E+10	2.17E+10
	2.09E+10	1.95E+10	1.69E+10	1.26E+10	8.47E+09	5.78E+09	4.40E+09	3.91E+09	3.83E+09	3.54E+09
	3.06E+09	2.62E+09	2.15E+09	1.79E+09	1.71E+09	2.19E+09	3.49E+09	5.49E+09	6.90E+09	6.88E+09
	6.52E+09	6.14E+09	5.53E+09	4.74E+09	4.00E+09	3.69E+09	3.82E+09	4.15E+09	4.41E+09	4.75E+09
	5.59E+09	5.65E+09	7.53E+09	8.41E+09	9.19E+09	8.37E+09	5.74E+09	3.50E+09	2.45E+09	2.27E+09
	2.52E+09	2.58E+09	2.77E+09	2.18E+09	2.26E+09	2.81E+09	3.37E+09	3.41E+09	2.94E+09	2.33E+09
	1.77E+09	1.37E+09	1.07E+09	7.56E+08	5.19E+08	3.61E+08	2.60E+08	1.84E+08	1.43E+08	1.12E+08
	8.85E+07	7.06E+07	5.71E+07	4.68E+07	3.84E+07	3.19E+07	2.66E+07	2.24E+07	1.90E+07	1.62E+07

*** BOD IN LBS/MIN ***

EXTERNAL ELEMENT NUMBER	TIME STEP 1	2	3	4	5	6	7	8	9	10
6	.000	.004	.018	.038	.059	.118	.181	.241	.272	.259
	.197	.135	.097	.076	.089	.103	.146	.172	.176	.189
	.278	.462	.531	.673	.631	.599	.600	.629	.652	.652
	.639	.581	.431	.248	.131	.076	.062	.054	.048	.038
	.030	.022	.017	.017	.025	.048	.088	.117	.125	.123
	.117	.103	.083	.064	.054	.057	.065	.069	.074	.104
	.147	.173	.216	.305	.337	.229	.108	.054	.046	.047
	.045	.035	.030	.032	.045	.061	.065	.053	.040	.027
	.020	.013	.008	.005	.003	.002	.001	.001	.001	.001
	.000	.001	.000	.000	.000	.000	.000	.000	.000	.000
	1.533	1.229	1.217	1.462	1.911	2.325	2.280	1.824	1.340	1.022
	.751	.513	.312	.192	.128	.095	.073	.057	.045	.036
	.030	.025	.021	.018	.016	.014	.011	.011	.009	.009

SUSPENDED SOLIDS IN LBS/MIN

6	.000	.001	.006	.015	.033	.068	.163	.312	.458	.535
	.503	.394	.297	.278	.407	.718	1.232	1.532	1.739	2.021
	3.415	6.275	9.004	9.759	9.117	8.569	8.557	9.049	9.510	9.622
	9.330	8.641	5.251	3.411	1.539	.827	.592	.453	.353	.262
	.187	.118	.083	.080	.176	.423	.981	1.254	1.333	1.389
	1.314	1.134	.870	.625	.504	.530	.626	.662	.753	1.238
	1.885	2.321	3.089	4.540	5.209	3.595	1.594	.722	.563	.516
	.460	.338	.259	.292	.459	.653	.736	.611	.413	.262
	.170	.098	.057	.033	.020	.014	.010	.006	.003	.003
	.003	.002	.001	.001	.001	.001	.001	.001	.001	.000

*** COLIFORM IN MPN/MIN ***

6	.0	1.32E+07	1.01E+08	2.58E+08	5.45E+08	1.06E+09	1.88E+09	2.96E+09	4.02E+09	4.63E+09
	4.32E+09	4.03E+09	3.47E+09	3.42E+09	3.99E+09	5.36E+09	7.67E+09	9.14E+09	9.40E+09	9.74E+09
	1.21E+10	1.69E+10	2.07E+10	2.12E+10	2.00E+10	1.95E+10	1.97E+10	2.01E+10	2.01E+10	1.95E+10
	1.96E+10	1.70E+10	1.34E+10	8.79E+09	5.57E+09	3.96E+09	3.71E+09	3.59E+09	3.35E+09	2.84E+09
	2.37E+09	1.81E+09	1.51E+09	1.49E+09	1.91E+09	3.04E+09	5.05E+09	5.23E+09	6.32E+09	6.05E+09
	5.78E+09	5.28E+09	4.48E+09	3.70E+09	3.28E+09	3.41E+09	3.86E+09	4.03E+09	4.25E+09	4.76E+09
	5.97E+09	6.59E+09	7.33E+09	8.33E+09	8.67E+09	6.11E+09	3.28E+09	2.14E+09	2.09E+09	2.40E+09
	2.50E+09	2.12E+09	1.85E+09	1.97E+09	2.50E+09	3.12E+09	3.25E+09	2.80E+09	2.14E+09	1.61E+09
	1.26E+09	8.63E+08	5.55E+08	3.34E+08	2.12E+08	1.45E+08	1.06E+08	7.37E+07	5.54E+07	3.94E+07
	3.02E+07	2.18E+07	1.73E+07	1.41E+07	1.17E+07	9.68E+06	7.83E+06	6.78E+06	5.95E+06	4.35E+06

*** BOD IN LBS/MIN ***

9	.000	.001	.011	.028	.062	.112	.172	.231	.252	.226
	.170	.112	.079	.067	.072	.096	.136	.159	.159	.171
	.256	.433	.586	.608	.569	.540	.543	.571	.593	.590
	.579	.526	.381	.214	.107	.067	.054	.049	.043	.034
	.026	.019	.015	.015	.023	.046	.085	.109	.114	.112
	.106	.093	.074	.057	.048	.052	.051	.053	.056	.096
	.140	.160	.195	.287	.311	.199	.087	.046	.040	.044
	.040	.031	.025	.029	.042	.057	.060	.050	.035	.024
	.017	.011	.006	.004	.002	.002	.001	.001	.001	.001
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

SUSPENDED SOLIDS IN LBS/MIN

9	.000	.000	.003	.011	.029	.061	.140	.291	.436	.497
	.445	.334	.256	.242	.358	.669	1.157	1.502	1.580	1.801
	3.105	5.858	8.316	8.758	8.151	7.644	7.674	8.149	8.591	8.649
	8.575	7.752	5.482	2.893	1.304	.702	.491	.399	.313	.229
	.153	.099	.070	.068	.149	.403	.842	1.159	1.250	1.253
	1.132	1.007	.753	.542	.434	.475	.578	.599	.674	1.137
	1.787	2.105	2.759	4.344	4.796	3.020	1.253	.502	.471	.471
	.403	.288	.230	.262	.417	.625	.672	.543	.353	.224
	.139	.082	.046	.027	.017	.012	.008	.006	.004	.003
	.002	.002	.001	.001	.001	.001	.001	.001	.000	.000

*** COLIFORM IN MPN/MIN ***

9	.0	5.77E+06	6.44E+07	2.07E+08	5.11E+08	1.03E+09	1.81E+09	2.89E+09	3.88E+09	4.79E+09
	4.21E+09	3.57E+09	3.13E+09	3.14E+09	3.75E+09	5.13E+09	7.31E+09	8.55E+09	8.62E+09	9.00E+09
	1.14E+10	1.60E+10	1.94E+10	1.94E+10	1.84E+10	1.80E+10	1.82E+10	1.85E+10	1.86E+10	1.79E+10

	1.71E+10	1.56E+10	1.22E+10	7.82E+09	4.79E+09	3.61E+09	3.38E+09	3.35E+09	3.07E+09	2.60E+09
	2.07E+09	1.60E+09	1.35E+09	1.76E+09	1.79E+09	2.98E+09	4.89E+09	5.82E+09	5.81E+09	5.57E+09
	5.34E+09	4.83E+09	4.08E+09	3.35E+09	2.97E+09	3.17E+09	3.64E+09	3.73E+09	3.71E+09	4.46E+09
	5.70E+09	6.19E+09	5.45E+09	7.85E+09	8.10E+09	5.43E+09	2.74E+09	1.93E+09	1.90E+09	2.32E+09
	2.31E+09	1.91E+09	1.38E+09	1.83E+09	2.36E+09	2.96E+09	3.01E+09	2.55E+09	1.91E+09	1.46E+09
	1.10E+09	7.56E+08	4.68E+08	2.89E+08	1.82E+08	1.34E+08	8.89E+07	6.59E+07	4.89E+07	3.75E+07
	2.73E+07	2.05E+07	1.54E+07	1.35E+07	1.11E+07	9.26E+06	7.28E+06	6.89E+06	5.29E+06	4.28E+06

*** BOD IN LBS/MIN ***

16	.000	.010	.005	.023	.049	.063	.067	.076	.074	.051
	.030	.022	.018	.017	.022	.037	.048	.048	.045	.053
	.095	.160	.185	.171	.160	.154	.139	.172	.175	.171
	.168	.145	.088	.037	.018	.015	.015	.013	.011	.008
	.005	.004	.004	.005	.010	.022	.033	.034	.034	.033
	.030	.025	.019	.013	.013	.017	.021	.018	.020	.037
	.051	.046	.064	.106	.089	.033	.010	.008	.013	.013
	.010	.007	.007	.010	.015	.021	.018	.011	.007	.005
	.003	.001	.001	.000	.000	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

SUSPENDED SOLIDS IN LBS/MIN

16	.000	.000	.001	.008	.022	.035	.065	.131	.179	.148
	.089	.065	.038	.063	.129	.289	.439	.469	.449	.556
	1.175	2.208	2.630	2.429	2.231	2.114	2.197	2.421	2.507	2.479
	2.462	2.111	1.218	.441	.158	.114	.105	.090	.070	.042
	.023	.015	.013	.018	.066	.202	.340	.370	.374	.365
	.325	.254	.175	.112	.106	.155	.194	.158	.203	.453
	.667	.605	.919	1.620	1.379	.478	.121	.079	.127	.124
	.084	.053	.057	.089	.158	.230	.202	.115	.053	.039
	.020	.009	.004	.003	.002	.001	.001	.000	.000	.000
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

*** COLIFORM IN MPN/MIN ***

16	.0	.0	3.78E+07	1.96E+08	4.56E+08	6.71E+08	9.02E+08	1.31E+09	1.60E+09	1.41E+09
	1.07E+09	9.52E+08	9.47E+08	1.01E+09	1.37E+09	2.13E+09	2.68E+09	2.70E+09	2.53E+09	2.93E+09
	4.15E+09	5.80E+09	6.18E+09	5.80E+09	5.63E+09	5.56E+09	5.69E+09	5.85E+09	5.71E+09	5.45E+09
	5.24E+09	4.63E+09	3.17E+09	1.71E+09	1.12E+09	1.04E+09	1.08E+09	1.02E+09	8.88E+08	6.65E+08
	4.75E+08	4.06E+08	3.94E+08	4.45E+08	7.49E+08	1.42E+09	1.87E+09	1.83E+09	1.80E+09	1.74E+09
	1.61E+09	1.40E+09	1.14E+09	9.05E+08	9.04E+08	1.12E+09	1.25E+09	1.12E+09	1.15E+09	1.70E+09
	2.05E+09	1.84E+09	2.12E+09	2.87E+09	2.35E+09	1.05E+09	6.03E+08	5.05E+08	7.81E+08	8.00E+08
	5.19E+08	4.92E+08	5.24E+08	5.86E+08	8.78E+08	1.04E+09	9.15E+08	6.45E+08	4.88E+08	3.81E+08
	2.41E+08	1.15E+08	5.75E+07	3.66E+07	2.48E+07	1.71E+07	1.08E+07	6.57E+06	3.19E+06	5.80E+05
	2.37E+04	1.02E+03	4.54E+01	2.10E+00	1.00E-01	4.97E-03	1.93E-04	6.65E-05	.0	6.90E-07

*** BOD IN LBS/MIN ***

25	.000	.000	.002	.006	.015	.041	.072	.085	.087	.070
	.047	.031	.024	.022	.024	.035	.048	.055	.054	.059
	.092	.156	.205	.206	.191	.183	.186	.196	.203	.200
	.197	.177	.124	.066	.034	.022	.019	.018	.015	.012
	.009	.007	.006	.005	.009	.019	.032	.039	.039	.039
	.037	.032	.025	.019	.017	.019	.022	.022	.023	.035
	.051	.055	.068	.103	.108	.062	.025	.014	.015	.017
	.014	.010	.009	.011	.016	.021	.021	.017	.011	.008
	.005	.004	.002	.001	.001	.001	.000	.000	.000	.000

.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

SUSPENDED SOLIDS IN LBS/MIN

25	.000	.000	.000	.003	.006	.018	.050	.102	.155	.168
	.139	.102	.082	.080	.121	.236	.393	.491	.592	.578
	1.052	2.007	2.777	2.825	2.606	2.459	2.491	2.667	2.808	2.816
	2.795	2.502	1.699	.838	.373	.201	.149	.127	.099	.068
	.045	.031	.023	.023	.053	.149	.293	.385	.405	.404
	.377	.316	.237	.165	.134	.156	.193	.195	.219	.390
	.619	.692	.921	1.506	1.609	.908	.347	.170	.157	.164
	.129	.084	.074	.090	.144	.212	.223	.170	.106	.064
	.040	.026	.015	.009	.005	.003	.002	.002	.001	.001
	.001	.001	.001	.001	.000	.000	.000	.000	.000	.000

*** COLIFORM IN MPN/MIN ***

25	.0	.0	1.33E+07	5.19E+07	1.22E+08	3.15E+08	6.56E+08	1.07E+09	1.49E+09	1.64E+09
	1.46E+09	1.22E+09	1.13E+09	1.19E+09	1.44E+09	2.05E+09	2.80E+09	3.17E+09	3.14E+09	3.32E+09
	4.34E+09	6.10E+09	7.24E+09	7.07E+09	5.72E+09	6.64E+09	6.72E+09	6.87E+09	6.84E+09	6.55E+09
	6.29E+09	5.71E+09	4.32E+09	2.66E+09	1.65E+09	1.30E+09	1.26E+09	1.25E+09	1.12E+09	8.95E+08
	6.93E+08	5.61E+08	4.93E+08	5.07E+08	7.23E+08	1.27E+09	1.92E+09	2.18E+09	2.12E+09	2.07E+09
	1.97E+09	1.76E+09	1.48E+09	1.20E+09	1.08E+09	1.21E+09	1.40E+09	1.39E+09	1.36E+09	1.73E+09
	2.25E+09	2.30E+09	2.41E+09	3.07E+09	3.04E+09	1.82E+09	8.61E+08	6.30E+08	7.68E+08	9.47E+08
	8.53E+08	6.44E+08	6.20E+08	7.34E+08	9.49E+08	1.16E+09	1.14E+09	9.16E+08	6.69E+08	5.02E+08
	3.79E+08	2.62E+08	1.59E+08	9.62E+07	6.05E+07	4.40E+07	3.34E+07	2.55E+07	1.95E+07	1.50E+07
	1.15E+07	8.82E+06	6.77E+06	5.20E+06	4.00E+06	3.16E+06	2.28E+06	1.99E+06	1.44E+06	1.26E+06

SELECTED OUTFLOW POLLUTOGRAPHS

EXTERNAL ELEMENT NUMBER	TIME STEP 1	2	3	4	5	6	7	8	9	10
*** BOD IN MG/L ***										
1	.000	.000	.000	.000	.000	21.688	30.583	32.535	30.655	27.992
	23.112	19.364	15.837	12.609	9.913	8.072	7.156	6.867	6.824	6.750
	6.832	7.728	8.950	9.857	10.049	9.624	9.050	8.690	8.576	8.568
	8.523	8.375	8.091	7.561	6.715	5.674	4.549	3.877	3.459	3.209
	3.004	2.854	2.699	2.535	2.438	2.551	2.879	3.288	3.633	3.809
	3.845	3.801	3.678	3.496	3.242	3.034	2.922	2.909	2.971	3.135
	3.484	3.883	4.294	4.839	5.447	5.875	5.848	5.216	4.224	3.364
	2.907	2.669	2.479	2.312	2.220	2.315	2.493	2.619	2.635	2.543
	2.332	2.228	2.113	2.012	1.921	1.849	1.781	1.715	1.656	1.615
	1.562	1.509	1.456	1.403	1.347	1.293	1.239	1.189	1.142	1.098
*** SUSPENDED SOLIDS IN MG/L ***										
1	.000	.000	.000	.000	.000	5.616	14.025	22.747	30.394	36.236
	39.583	40.727	39.343	35.903	33.092	34.996	42.693	52.477	60.605	65.854
	74.179	94.292	120.158	139.088	144.379	137.987	128.599	123.230	122.674	124.178
	124.976	123.618	118.945	108.950	92.671	72.948	54.024	39.499	31.028	25.928
	21.306	19.005	16.284	13.723	12.670	15.725	22.836	30.807	37.225	41.059
	42.411	41.944	39.881	36.588	32.187	28.534	26.841	25.859	28.201	32.049
	39.701	48.179	55.619	68.259	81.138	89.665	89.045	77.191	58.730	42.552
	33.417	28.207	24.246	21.219	20.091	22.195	25.660	28.132	28.492	26.784
	23.778	20.803	18.421	16.406	14.800	13.693	12.702	11.674	10.955	10.394
	9.896	9.443	9.040	8.697	8.389	8.117	7.870	7.650	7.455	7.286
*** COLIFORM IN MPN/100ML ***										
1	.0	.0	.0	.0	.0	3.33E+04	5.14E+04	6.28E+04	7.01E+04	7.43E+04
	7.73E+04	8.00E+04	8.13E+04	8.05E+04	7.84E+04	7.61E+04	7.52E+04	7.61E+04	7.75E+04	7.68E+04
	7.38E+04	7.12E+04	7.05E+04	7.03E+04	6.86E+04	6.59E+04	6.33E+04	6.10E+04	5.89E+04	5.68E+04
	5.47E+04	5.29E+04	5.18E+04	5.13E+04	5.04E+04	4.88E+04	4.70E+04	4.57E+04	4.58E+04	4.62E+04
	4.61E+04	4.60E+04	4.54E+04	4.43E+04	4.26E+04	4.09E+04	4.03E+04	4.12E+04	4.22E+04	4.20E+04
	4.12E+04	4.07E+04	4.03E+04	4.00E+04	3.90E+04	3.81E+04	3.72E+04	3.70E+04	3.70E+04	3.61E+04
	3.51E+04	3.48E+04	3.45E+04	3.34E+04	3.27E+04	3.33E+04	3.38E+04	3.27E+04	3.06E+04	2.91E+04
	2.93E+04	3.01E+04	3.03E+04	2.95E+04	2.83E+04	2.79E+04	2.82E+04	2.96E+04	2.98E+04	2.86E+04
	2.83E+04	2.93E+04	2.93E+04	2.85E+04	2.82E+04	2.77E+04	2.70E+04	2.61E+04	2.56E+04	2.51E+04
	2.44E+04	2.37E+04	2.29E+04	2.21E+04	2.13E+04	2.05E+04	1.97E+04	1.89E+04	1.82E+04	1.75E+04
*** BOD IN MG/L ***										
6	.000	51.004	49.672	44.398	41.370	39.271	34.241	28.872	24.535	20.275
	16.498	12.917	10.055	8.338	7.356	6.996	6.968	6.956	6.822	6.875
	7.963	9.225	10.186	10.379	9.903	9.281	8.835	8.744	8.747	8.710
	8.582	8.271	7.663	6.631	5.345	4.186	3.622	3.256	3.086	2.902
	2.753	2.535	2.392	2.322	2.593	3.019	3.441	3.745	3.891	3.898
	3.837	3.687	3.452	3.158	2.937	2.888	2.943	2.978	3.111	3.567
	4.020	4.294	4.829	5.551	5.993	5.889	4.970	3.667	3.023	2.695
	2.573	2.358	2.166	2.143	2.350	2.569	2.592	2.634	2.443	2.218
	2.071	1.930	1.842	1.766	1.733	1.693	1.676	1.495	1.450	1.305
	1.212	1.063	1.002	.961	.923	.882	.829	.787	.751	.674

*** SUSPENDED SOLIDS IN MG/L ***

6	.000	7.787	15.671	18.822	19.823	22.453	30.897	37.300	41.791	43.296
	42.283	37.795	32.540	30.643	37.510	48.670	58.989	57.954	59.351	73.650
	96.744	125.383	143.226	150.281	143.127	132.685	126.357	125.798	127.534	128.581
	127.902	122.327	111.244	91.275	56.939	45.548	34.532	27.249	23.534	20.023
	17.059	13.671	11.377	10.894	17.871	26.752	34.369	40.568	43.229	44.167
	43.272	40.580	35.218	31.052	27.390	27.071	28.278	28.757	32.257	42.553
	51.514	56.952	68.932	84.316	92.624	89.998	72.836	49.115	36.697	29.755
	26.337	22.450	19.528	19.636	23.947	28.079	30.258	29.098	25.488	21.217
	17.902	15.040	13.475	12.479	11.396	11.422	10.934	9.748	9.158	7.833
	7.189	6.245	5.706	5.358	5.154	5.026	4.897	4.835	4.932	4.691

*** COLIFORM IN MPN/100ML ***

6	.0	5.47E+04	6.11E+04	6.58E+04	7.16E+04	7.70E+04	7.79E+04	7.77E+04	7.97E+04	8.24E+04
	8.47E+04	8.47E+04	8.74E+04	8.26E+04	8.06E+04	7.97E+04	8.06E+04	8.10E+04	8.02E+04	7.79E+04
	7.52E+04	7.49E+04	7.33E+04	7.15E+04	6.88E+04	6.64E+04	6.39E+04	6.15E+04	5.93E+04	5.70E+04
	5.47E+04	5.31E+04	5.24E+04	5.16E+04	4.99E+04	4.78E+04	4.75E+04	4.74E+04	4.77E+04	4.75E+04
	4.74E+04	4.61E+04	4.54E+04	4.44E+04	4.26E+04	4.21E+04	4.32E+04	4.37E+04	4.30E+04	4.22E+04
	4.18E+04	4.14E+04	4.09E+04	4.03E+04	3.91E+04	3.93E+04	3.82E+04	3.84E+04	3.74E+04	3.59E+04
	3.59E+04	3.60E+04	3.46E+04	3.32E+04	3.38E+04	3.44E+04	3.31E+04	3.04E+04	2.99E+04	3.03E+04
	3.15E+04	3.09E+04	2.95E+04	2.89E+04	2.87E+04	2.90E+04	2.93E+04	2.93E+04	2.90E+04	2.86E+04
	2.90E+04	2.90E+04	2.88E+04	2.79E+04	2.74E+04	2.67E+04	2.59E+04	2.35E+04	2.27E+04	2.05E+04
	1.99E+04	1.67E+04	1.58E+04	1.52E+04	1.46E+04	1.40E+04	1.32E+04	1.26E+04	1.22E+04	1.08E+04

*** BOD IN MG/L ***

9	.000	28.195	48.469	43.378	41.828	40.235	34.810	28.907	23.953	19.619
	15.971	12.232	9.771	8.215	7.232	6.985	7.002	6.970	6.813	6.880
	7.894	9.342	10.259	10.356	9.855	9.215	8.970	8.727	8.759	8.599
	8.570	8.247	7.558	5.481	5.133	4.112	3.526	3.254	3.032	2.896
	2.725	2.533	2.399	2.354	2.597	3.078	3.513	3.790	3.911	3.920
	3.851	3.693	3.434	3.149	2.923	2.910	2.973	3.002	3.110	3.698
	4.336	4.313	4.932	5.635	6.025	5.812	4.793	3.561	2.930	2.689
	2.531	2.334	2.150	2.161	2.358	2.622	2.711	2.642	2.614	2.193
	2.035	1.915	1.819	1.775	1.723	1.713	1.578	1.518	1.430	1.367
	1.217	1.096	1.078	1.000	.956	.916	.848	.828	.752	.705

*** SUSPENDED SOLIDS IN MG/L ***

9	.000	1.648	12.546	17.152	19.252	21.823	28.400	35.316	41.438	43.188
	41.511	36.521	31.639	29.792	36.117	48.570	59.465	65.936	67.812	72.521
	95.916	126.399	146.583	149.133	141.221	130.489	124.715	124.664	125.822	127.629
	126.936	121.811	108.844	87.817	62.372	43.238	31.972	25.308	22.491	19.320
	16.132	13.080	10.897	10.419	16.728	26.813	34.851	40.296	43.215	43.982
	42.918	39.975	35.380	30.153	26.472	26.758	28.213	29.652	31.592	42.681
	52.452	56.887	68.409	85.403	92.769	88.165	69.169	46.485	34.346	28.917
	25.508	21.590	18.734	19.346	23.675	28.559	30.273	28.816	24.633	20.306
	16.877	14.447	12.940	12.259	11.589	11.348	10.173	9.550	8.674	8.130
	7.206	6.406	5.843	5.592	5.339	5.254	5.072	5.150	5.019	4.936

*** COLIFORM IN MPN/100ML ***

9	.0	3.65E+04	6.44E+04	6.92E+04	7.56E+04	8.08E+04	8.04E+04	7.92E+04	8.09E+04	8.78E+04
	8.61E+04	8.55E+04	8.48E+04	8.47E+04	8.30E+04	8.17E+04	8.24E+04	8.24E+04	8.12E+04	7.95E+04
	7.59E+04	7.55E+04	7.45E+04	7.25E+04	6.99E+04	6.73E+04	6.49E+04	6.23E+04	6.12E+04	5.78E+04

	5.33E+04	5.33E+04	5.30E+04	5.21E+04	5.03E+04	4.88E+04	4.82E+04	4.84E+04	4.82E+04	4.81E+04
	4.78E+04	4.57E+04	4.31E+04	4.37E+04	4.40E+04	4.35E+04	4.44E+04	4.44E+04	4.37E+04	4.29E+04
	4.25E+04	4.20E+04	4.15E+04	4.09E+04	3.98E+04	3.91E+04	3.89E+04	3.91E+04	3.81E+04	3.67E+04
	3.57E+04	3.57E+04	3.71E+04	3.39E+04	3.44E+04	3.48E+04	3.32E+04	3.11E+04	3.05E+04	3.12E+04
	3.20E+04	3.14E+04	3.01E+04	2.96E+04	2.94E+04	2.97E+04	2.97E+04	2.98E+04	2.93E+04	2.91E+04
	2.94E+04	2.94E+04	2.89E+04	2.93E+04	2.76E+04	2.75E+04	2.53E+04	2.41E+04	2.26E+04	2.14E+04
	1.91E+04	1.72E+04	1.64E+04	1.58E+04	1.52E+04	1.46E+04	1.35E+04	1.32E+04	1.22E+04	1.13E+04

*** BOD IN MG/L ***

16	.000	.000	39.340	45.658	46.514	42.430	33.464	26.027	21.212	16.697
	12.405	10.891	9.561	7.402	7.034	7.469	7.725	7.585	7.250	7.477
	9.135	10.920	11.497	10.895	10.155	9.530	9.262	9.411	9.445	9.301
	9.154	8.685	7.510	5.591	4.104	3.565	3.430	3.294	3.159	2.940
	2.688	2.557	2.522	2.554	3.088	3.765	4.242	4.357	4.339	4.299
	4.150	3.874	3.539	3.153	3.032	3.238	3.419	3.724	3.477	4.333
	4.895	4.804	7.541	6.688	6.834	5.414	3.384	2.664	2.825	2.766
	2.566	2.275	2.252	2.447	2.939	3.127	3.106	2.713	2.291	2.104
	1.953	1.774	1.672	1.679	1.671	1.627	1.338	1.101	.678	.171
	.007	.000	.000	.000	.000	.000	.000	.000	.000	.000

*** SUSPENDED SOLIDS IN MG/L ***

16	.000	.000	9.911	16.680	20.837	23.728	32.513	45.202	51.537	48.025
	37.115	30.286	27.389	27.712	40.865	58.809	71.069	74.150	71.769	78.097
	113.440	130.304	153.734	154.455	141.645	131.215	128.357	132.859	135.635	134.831
	133.819	125.979	103.651	67.029	38.295	27.658	24.632	22.194	19.718	15.837
	11.728	9.388	8.269	9.481	20.805	33.996	43.423	45.914	47.539	47.034
	44.383	39.653	37.315	26.229	24.419	28.722	32.199	30.928	35.005	52.459
	53.740	62.865	78.965	102.101	105.342	73.592	39.666	25.351	27.257	26.016
	22.333	17.347	17.206	20.834	28.452	34.932	34.657	27.425	13.445	15.454
	12.877	10.779	9.551	9.521	8.826	8.279	7.456	6.875	4.709	2.205
	1.575	1.295	1.109	.972	.858	.787	.723	.672	.629	.595

*** COLIFORM IN MPN/100ML ***

16	.0	.0	5.74E+04	8.63E+04	9.59E+04	9.98E+04	9.91E+04	9.93E+04	1.01E+05	1.01E+05
	9.75E+04	9.71E+04	9.75E+04	9.63E+04	9.49E+04	9.51E+04	9.53E+04	9.37E+04	9.17E+04	9.03E+04
	8.80E+04	8.67E+04	8.44E+04	8.39E+04	7.84E+04	7.57E+04	7.29E+04	7.04E+04	6.77E+04	6.50E+04
	6.25E+04	6.05E+04	5.92E+04	5.71E+04	5.58E+04	5.54E+04	5.58E+04	5.52E+04	5.51E+04	5.45E+04
	5.33E+04	5.32E+04	5.35E+04	5.27E+04	5.18E+04	5.23E+04	5.24E+04	5.09E+04	5.01E+04	4.93E+04
	4.86E+04	4.79E+04	4.74E+04	4.65E+04	4.58E+04	4.55E+04	4.37E+04	4.49E+04	4.36E+04	4.31E+04
	4.30E+04	4.19E+04	4.00E+04	3.97E+04	3.94E+04	3.78E+04	3.62E+04	3.55E+04	3.68E+04	3.68E+04
	3.64E+04	3.54E+04	3.49E+04	3.52E+04	3.47E+04	3.46E+04	3.44E+04	3.37E+04	3.31E+04	3.34E+04
	3.32E+04	3.14E+04	3.31E+04	3.04E+04	3.05E+04	2.95E+04	2.51E+04	1.98E+04	1.22E+04	2.77E+03
	1.38E+02	7.10E+00	3.77E-01	2.05E-02	1.14E-03	6.50E-05	2.88E-06	1.13E-06	.0	1.48E-08

*** BOD IN MG/L ***

25	.000	.000	45.398	43.135	34.149	32.178	30.192	24.798	19.671	15.576
	12.239	9.633	7.954	6.869	6.121	5.936	6.060	6.193	6.175	6.219
	7.092	8.321	9.176	9.245	8.710	8.159	7.843	7.773	7.817	7.768
	7.531	7.745	6.757	5.803	4.575	3.686	3.229	3.039	2.833	2.752
	2.656	2.515	2.390	2.376	2.458	2.825	3.139	3.478	3.537	3.579
	3.510	3.359	3.149	2.923	2.727	2.688	2.741	2.788	2.834	3.314
	3.721	3.937	4.385	5.069	5.467	5.307	4.366	3.189	2.648	2.480
	2.374	2.190	2.043	2.071	2.212	2.416	2.511	2.469	2.268	2.039
	1.932	1.921	1.904	1.872	1.776	1.751	1.725	1.680	1.614	1.527

	1.421	1.303	1.180	1.059	.945	.866	.737	.646	.562	.492

*** SUSPENDED SOLIDS IN MG/L ***

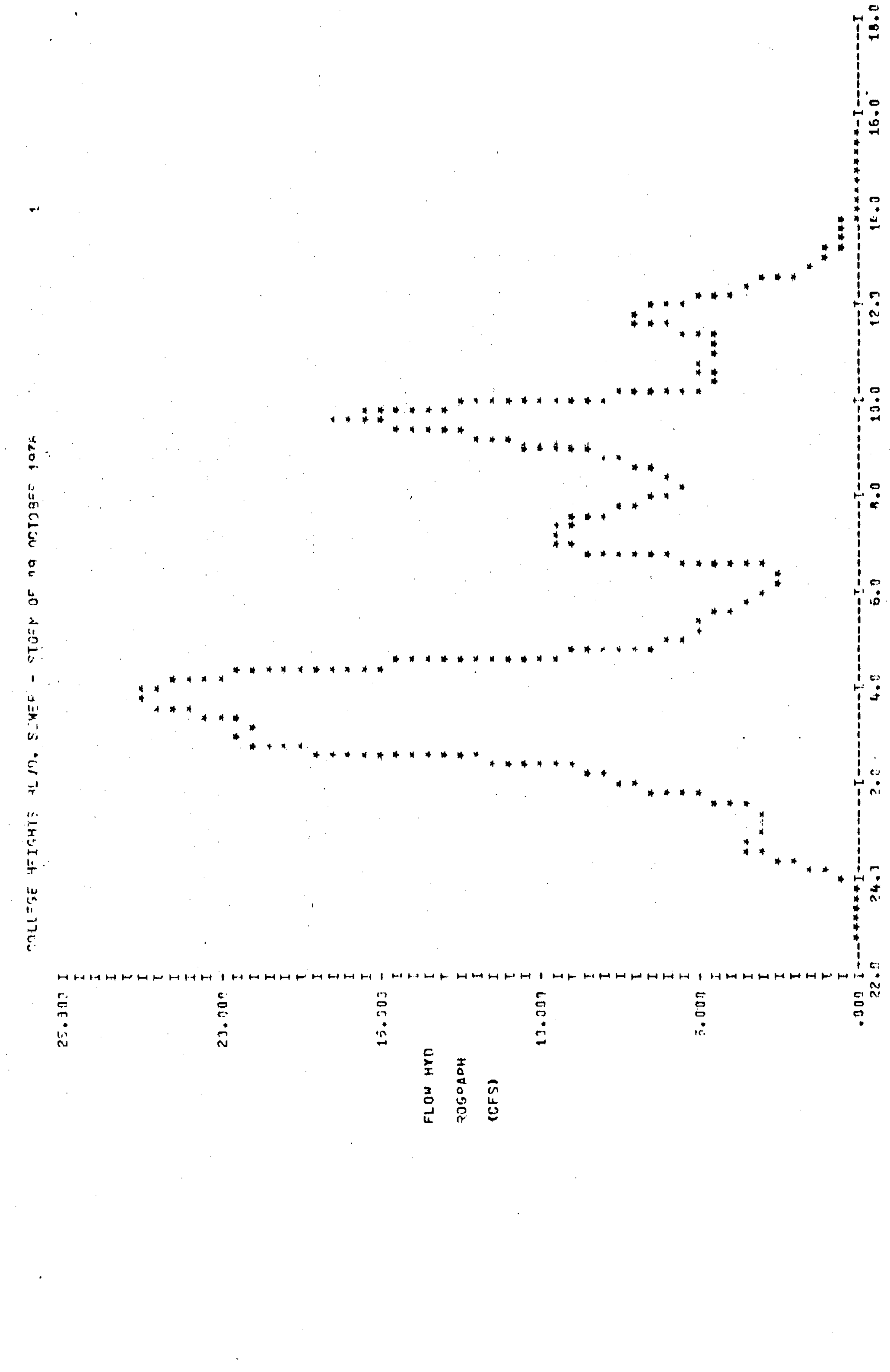
25	.000	.000	12.447	17.086	14.183	14.438	20.870	29.396	34.928	37.187
	36.035	31.742	27.449	25.522	30.323	40.357	49.414	55.301	56.998	60.517
	80.862	107.174	124.399	127.007	118.546	109.450	105.256	105.865	108.318	109.177
	108.336	103.843	92.392	73.577	51.262	33.915	25.443	21.811	18.998	16.241
	13.948	11.714	9.878	9.211	14.296	22.392	29.408	34.398	36.870	37.119
	35.010	33.429	29.530	25.112	22.031	22.392	23.739	24.361	27.242	36.865
	44.939	49.103	59.540	74.035	81.345	77.815	60.234	38.328	28.423	24.611
	21.723	18.185	15.216	16.476	20.392	24.449	26.121	24.953	21.056	16.697
	14.213	13.344	12.897	12.091	10.460	9.338	8.692	8.125	7.817	7.630
	7.530	7.492	7.498	7.538	7.599	7.727	7.715	7.751	7.772	7.848

*** COLIFORM IN MPN/100ML ***

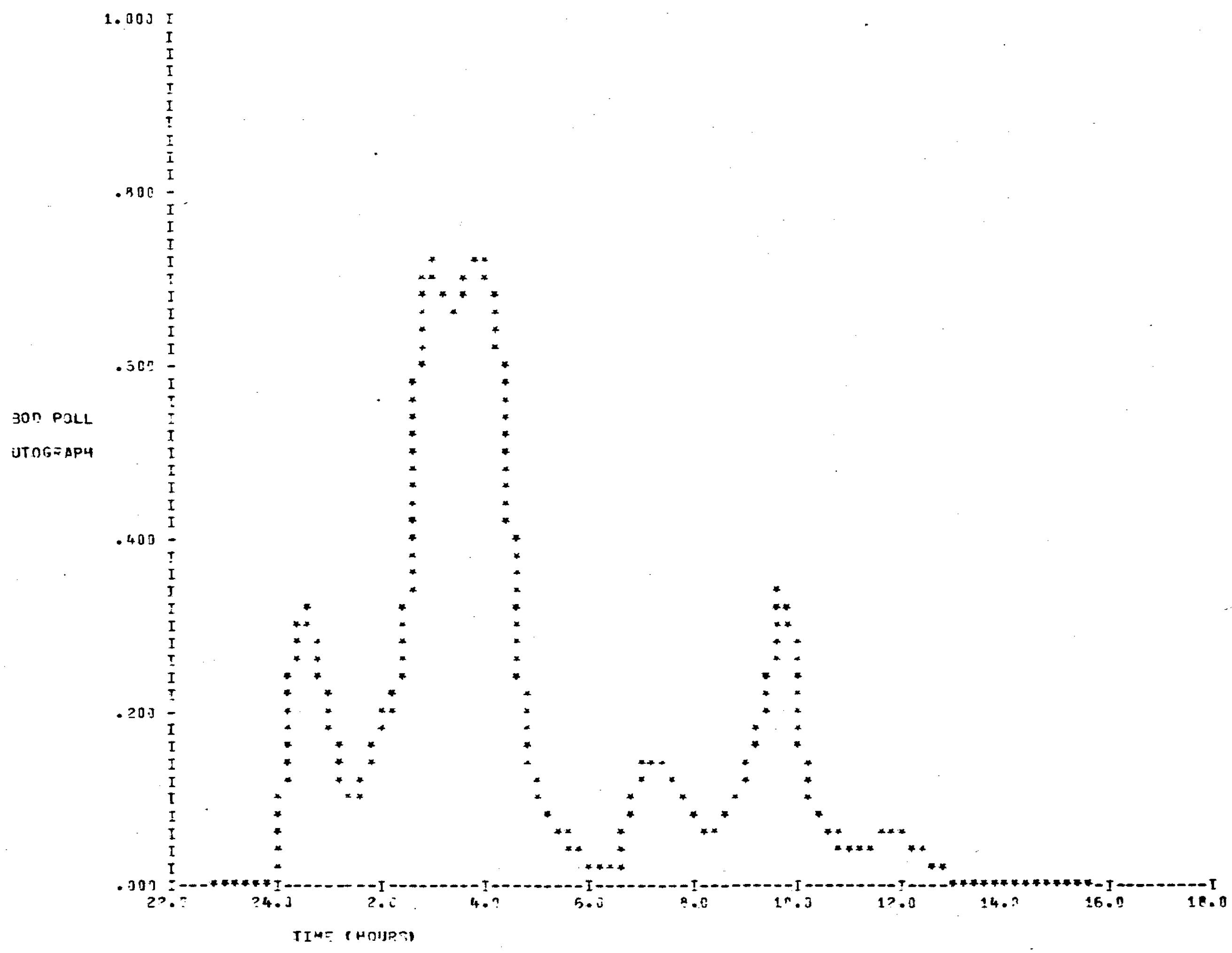
25	.0	.0	7.30E+04	7.69E+04	6.02E+04	5.42E+04	6.03E+04	5.73E+04	7.35E+04	7.97E+04
	8.33E+04	8.35E+04	8.34E+04	8.26E+04	7.92E+04	7.68E+04	7.72E+04	7.83E+04	7.81E+04	7.62E+04
	7.32E+04	7.14E+04	7.11E+04	6.97E+04	6.71E+04	6.49E+04	6.23E+04	5.98E+04	5.79E+04	5.57E+04
	5.35E+04	5.20E+04	5.15E+04	5.12E+04	4.98E+04	4.81E+04	4.73E+04	4.72E+04	4.69E+04	4.68E+04
	4.71E+04	4.65E+04	4.59E+04	4.49E+04	4.29E+04	4.18E+04	4.23E+04	4.28E+04	4.23E+04	4.18E+04
	4.14E+04	4.09E+04	4.04E+04	4.02E+04	3.92E+04	3.81E+04	3.79E+04	3.81E+04	3.72E+04	3.58E+04
	3.58E+04	3.59E+04	3.41E+04	3.31E+04	3.37E+04	3.42E+04	3.28E+04	3.11E+04	3.06E+04	3.12E+04
	3.16E+04	3.07E+04	2.99E+04	2.95E+04	2.93E+04	2.92E+04	2.93E+04	2.95E+04	2.91E+04	2.88E+04
	2.92E+04	2.99E+04	2.89E+04	2.94E+04	2.77E+04	2.73E+04	2.69E+04	2.63E+04	2.54E+04	2.41E+04
	2.25E+04	2.07E+04	1.88E+04	1.69E+04	1.51E+04	1.35E+04	1.19E+04	1.04E+04	9.07E+03	7.97E+03

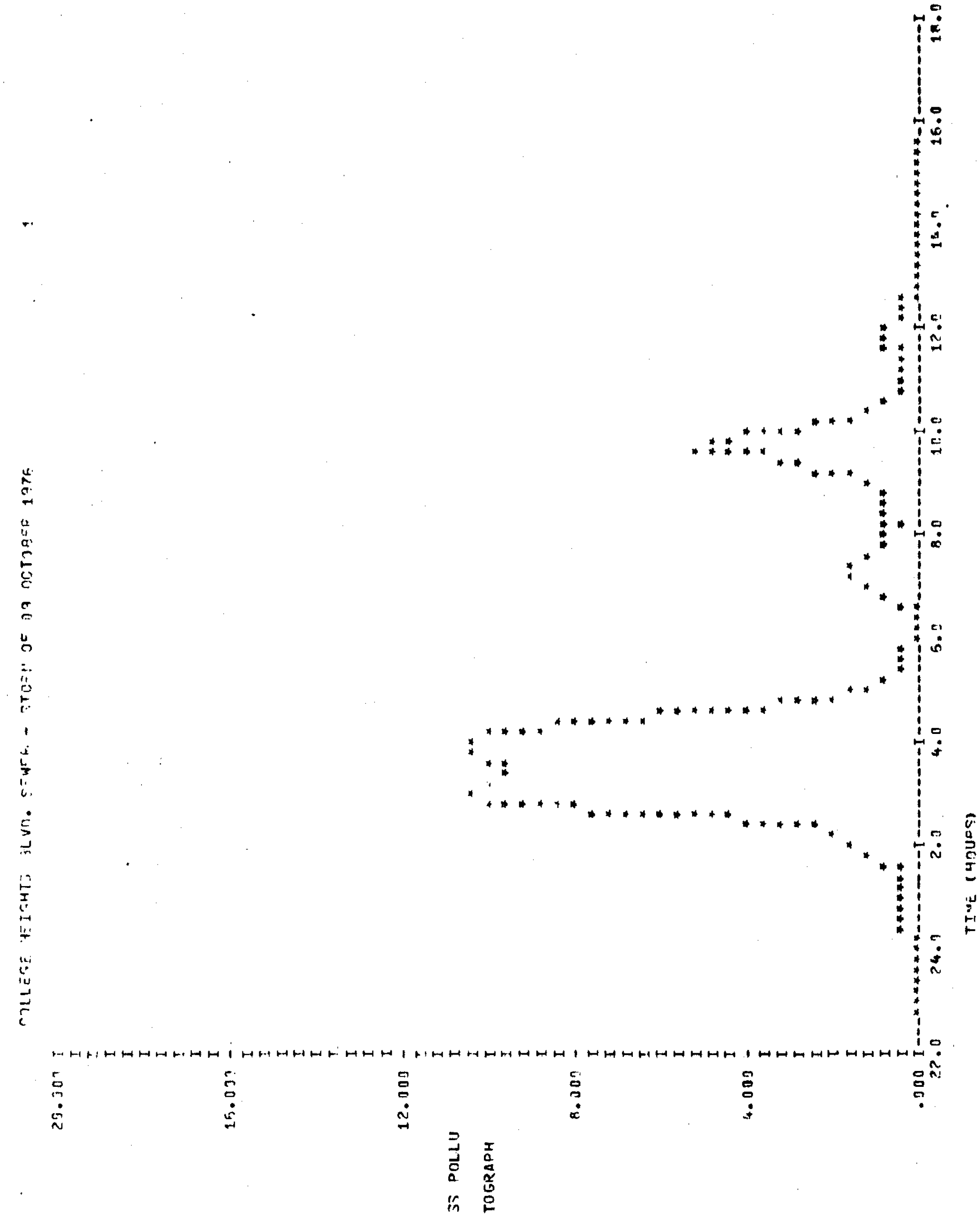
TOTAL POUNDS OF SUSPENDED SOLIDS OUTPUT FROM ELEMENT 25 = 492.77

TOTAL POUNDS OF FIVE-DAY BOD OUTPUT FROM ELEMENT 25 = 44.08


COLLEGE HEIGHTS BLVD. SEWER - STORM OF OCTOBER 1976
25.000
20.000
15.000
10.000
5.000
.000
FLOW HYDROGRAPH
(CFS)
22.0
24.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
TIME (HOURS)

COLLEGE HEIGHTS BLVD. SEWER - STORM OF 19 OCTOBER 1975 1




COLLEGE HEIGHTS BLVD. SEWER - STORM OF 03 OCTOBER 1976
20.000
16.000
12.000
8.000
4.000
.000
SS POLLU
TOGRAPH
22.0
24.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
TIME (HOURS)

COLLEGE HEIGHTS BLVD. SEWER - STORM OF 09 OCTOBER 1976 1