1977

# Water quality of the lehigh and jordan creek, October 1977

P. J. Usinowicz

M. C. Hughes

A. G. Collins

J. Kiddon

# WATER QUALITY OF THE LEHIGH RIVER AND JORDAN CREEK

Paul J. Usinowicz, Assistant Professor
Michael C. Hughes, Assistant Professor
Anthony G. Collins, Research Assistant
John Kiddon, Research Assistant

Lehigh University
Bethlehem, Pennsylvania

Prepared under the Support of
Lehigh County Authority
Wescosville, Pennsylvania

October 1977

TABLE OF CONTENTS

# I. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## Summary

Water quality testing of the Lehigh River at two proposed intake points, of the Jordan Creek at the proposed Trexler Dam site, and of Mill Creek, which joins the Jordan Creek just upstream of the proposed dam site, was performed over a two and one-half month period from 15 July 1977 to 27 September 1977. The sampling program focused on water quality as set forth by the Safe Drinking Water Act (7) which became effective on 24 June 1977, specifically dealing with parameters limited by the U.S. Environmental Protection Agency interim primary regulations. The purpose of the study performed was to analyze the water for inorganic and organic substances governed by the interim primary regulations and evaluate the suitability and the treatability of the waters from the above-listed sources for domestic water use.

Trace heavy metals analyses were performed on ten different samples specifically measuring the levels of arsenic, cadmium, chromium, lead, mercury, selenium, and silver. Cadmium and chromium were the only metals to be consistently observed in the water sources studied, and, except for one high value of cadmium at one station in the Lehigh River, no levels in excess of the limitations were observed. The high cadmium result most probably can be dismissed as a random sample contamination because of supporting data for such a conclusion. Therefore, from a trace metal standpoint all of the waters tested fall within the guidelines of the interim primary standards for domestic consumption.

Trace organic pesticide levels on eleven different sampling dates resulted in no detection of any of the pesticides listed in the interim primary regulations. The sampling period was during a period when high pesticide application to potato and alfalfa cropland is recommended. No pesticide residues were observed in any of the samples. The 27 September sample of major runoff and high flows also did not exhibit any positive levels of pesticides. In the testing program, however, some of the concentrated extracts exhibited the property of fluorescence under ultraviolet light, a property not characteristic of pesticides. The identification of the fluorescing compounds was beyond the scope of this study, but should be pursued in future work. These fluorescing compounds were not limited to any single source, but showed up in all but the Mill Creek samples at various times.

Sixteen sets of samples were collected and tested for the analysis of traditional water quality parameters, including nitrate and fluoride concentrations. These two compounds have specified concentration limits under the interim primary regulations. None of the waters tested exceeded limitations of these substances, and in general, all of the waters were of excellent quality for domestic water supply, presenting no special problems for water treatment operations prior to domestic use. Water quality parameters measured in this testing program are in good agreement with general results obtained in earlier studies (Refs. 1-6) on the Lehigh River and Jordan Creek. There does not seem to be any significant change in water quality for either surface water between earlier studies and the present studies, especially considering effects of flow conditions between the studies.

## Conclusions and Recommendations

The results of this study indicate that the overall water quality of the Lehigh River and the Jordan Creek at the stations tested is excellent for potable water supply from a quality standpoint. There are no problems presented under the guidelines of the interim primary regulations of the Safe Drinking Water Act. Trace heavy metals levels are low or absent in detectable concentrations, nitrates and fluorides are below limiting levels, trace organic pesticides were not detected at the limiting levels, and overall water quality appears excellent based on traditional water quality parameters. There do not appear to be any special aspects under the interim primary regulation for either water source which conventional water treatment would not be able to handle.

One important observation in this study which requires further investigation is the identification of the compounds which exhibited fluorescence during the analyses for trace organic pesticides. The identification of the compounds, and, therefore, the determination of the importance of those compounds may influence the use of either of the surface waters investigated. The identification of the source of these compounds should also be undertaken.

This study has developed background information of trace inorganics and organics. The study represents only a brief part of one year, at a time of low flow conditions. The effects of climatic conditions and of man-related activities on water quality should be observed and monitored over a longer data base period, preferably over several years' duration, to account for varying conditions.

## II. INTRODUCTION

Adequate water supply for future potable water uses is a major problem facing many areas of the country. The water sources which are most readily assessible are ground waters and surface waters, each having particular general characteristics, and both coming under the new regulations of the Safe Drinking Water Act (SDWA) (PL93-523). These water sources now must be analyzed for constituents heretofore neglected in determing the suitability of the water for domestic consumption. Included in the interim primary regulations (IPRs) are heavy metals and specific organics on which little, if any, background information has been collected.

In the Lehigh Valley, two surface waters have been suggested as potential sources which may be tapped to satisfy future demands for water supply. These surface waters are the Lehigh River and the Jordan Creek. There have been a number of studies performed on these streams (e.g., Refs. 1-6), but there is a paucity of information available regarding parameters which fall under the interim primary regulations, except for nitrate and fluoride concentrations. A few analyses have been performed for heavy metals (4,6), but the results are limited because of the small scale nature of the studies. A preliminary water quality survey of the Jordan Creek and the Lehigh River was performed from mid-July through mid-September to provide information based on a routine sampling program and to identify levels of substances limited by the IPRs as may exist in the surface waters in question. The suitability and treatability of the waters from the two streams can be evaluated from the data obtained.

## III. AREA AND SCOPE OF STUDY

The water quality samples were collected at two sites on the Lehigh River, corresponding to the North Whitehall Project and the West Catasauqua Project (4), respectively. Because of possibilities of variations of characteristics across the river, samples at each site were taken twenty to thirty feet from either bank and at midstream. The West Catasauqua Project sampling site, termed North Catasauqua in this report, was approximately 1000 feet upstream of the confluence of the Lehigh River and Coplay Creek and approximately 1000 feet downstream of the old low head dam at North Catasauqua. The river was relatively shallow from the west bank to midstream, and then it rapidly deepened and then rose gradually to the east bank, indicating the main channel of the river was along the east bank at the sampling site. The river bottom consisted of medium to large rocks. Of particular interest was noticeable ground water inflow on the west bank, which disappeared due to the lack of substantial rainfall during most of the sampling period.

The North Whitehall sampling site, termed Whitehall in this report, was approximately 100 feet upstream of the confluence of the Lehigh River and Spring Creek. The Lehigh River was relatively shallow across the entire stream depth. The river bottom consisted of medium to large rocks, with areas of smooth bedrock.

The Jordan Creek sampling site was at the location of the proposed Trexler Dam site. The Jordan Creek was about twenty feet wide

at this point, and the bottom consisted of angular rocks overlain with four to six inches of silt, with some large boulders also present. Only one sample at midstream was obtained on each date for this site.

Mill Creek, which joins the Jordan Creek several hundred feet north of the proposed Trexler Dam site was also analyzed for water quality. The creek was about twelve feet wide with small stones and silt bottom. Initially on the stones there was a noticeable attached aquatic plant growth, but that disappeared within several weeks.

Data collection was scheduled on a regular basis for the mid-July through mid-September sampling period. During this time, which generally is a low-flow period in the rivers, provisions were made to permit sampling during rainfall-runoff periods. The program was set up to monitor routine background river conditions and to try to measure the contributions of runoff. The comparison of the two types of conditions allows for the evaluation of effects runoff has on water quality.

The inorganic trace metals monitored and their limiting concentration are listed in Table 1. Nitrate-nitrogen, with a limit of 10 milligrams per liter (mg/$\ell$), turbidity and fluoride, were also measured. These are the substances limited by the IPRs. Hardness, alkalinity pH, and ammonia were also tested for water quality evaluations. Total coliform and fecal coliform testing was also performed. The trace organic pesticides limited by the IPRs and their respective limiting concentrations are shown in Table 2.

TABLE 1
CURRENT USEPA INTERIM PRIMARY REGULATIONS
FOR TRACE METALS IN DRINKING WATER (7)

| Metal | Concentration, µg/ℓ |
|---|---|
| Arsenic | 50 |
| Cadmium | 10 |
| Chromium | 50 |
| Lead | 50 |
| Mercury | 2 |
| Selenium | 10 |
| Silver | 50 |

TABLE 2
CURRENT USEPA INTERIM PRIMARY REGULATIONS
FOR TRACE ORGANIC PESTICIDES IN DRINKING WATER (7)

| Compound | Concentration, (µg/ℓ) |
|---|---|
| Endrin | 0.2 |
| Lindane | 4 |
| Methoxychlor | 10 |
| Toxaphene | 5 |
| 2,4-D | 100 |
| 2,4,5 TP Silvex | 10 |

# IV. ANALYTICAL METHODS

## A. Metals

### 1. Sample Collection and Preparation

Samples of about 100 milliliters (ml) were collected in pre-cleaned plastic bottles, and acidified with nitric acid on-site. For the analysis of chromium, cadmium, lead and silver, 5.0 ml of water was digested overnight with 2 ml of concentrated nitric acid. This treatment ensured that all suspended metal was brought into solution before analysis. The solutions were brought to 10.0 ml final volume, and stored at -10°C prior to analysis.

Water samples for mercury, arsenic and selenium analysis were aliquots taken from the original collected sample. They were stored at -10°C prior to analysis.

### 2. Analytical Methods

Analyses were performed in accordance with existing USEPA Interim Standard Methods of Analysis (8). A Varian Model AA6 Atomic Absorption Spectrophotometer equipped with a Varian Model 64 Vapor Generation System, a Varian Model BC-6 Simultaneous Background Corrector and an Instrumentation Laboratories Model 455 Carbon Rod Atomizer System was used. Chromium, cadmium, lead and silver were analyzed by carbon rod atomization atomic absorption spectroscopy. Detection limits for all four elements were less than one microgram per liter ($\mu g/\ell$), well below the present USEPA Interim Standard Limits (7) (see Table 1).

Mercury analyses were performed using the standard cold vapor generation technique.

Arsenic and selenium analyses were performed by hydride generation-cold flame atomization, using sodium borohydride reduction.

The detection limit for mercury was 0.1 $\mu g/\ell$; detection limits for selenium and arsenic were 2 $\mu g/\ell$.

3. Reagent Purity

Water and nitric acid were purified by quartz sub-boiling distillation. Blank samples were run, and showed no detectable levels of any of the metals. Sodium borohydride was reagent grade purchased from Alpha Inorganics. It did not contain detectable concentration of the metals.

B. Organic Compounds - Pesticides

1. Sample Collection and Preparation

One liter water samples were collected in pre-cleaned glass bottles, and acidified with sulfuric acid. The organic compounds in the water were extracted in three 100 ml portions into 1:1 hexane-benzene. The 300 ml of extractant was then concentrated to a volume of 0.5 ml in a Kuderna-Danish apparatus. This final sample was stored at -10°C in a pre-cleaned glass vial until analysis.

2. Analytical Method

A Thin Layer Chromatography procedure designed for pesticide screening was used (9,10). This method is capable of detecting concentrations of pesticides at the current USEPA Interim Primary Regulation Limits (7) (see Table 2), except for endrin. Standard samples, made to

represent concentrations equal to the maximum EPA allowed concentrations were run for comparison.

3. Reagent Purity

All solvents were Pesticide Grade. Blank values were checked by extracting one liter of quartz-distilled water, and following the procedure outlined in section B-2, above. No impurities of any kind were detected. Pesticide standards were obtained as solutions of pure pesticide in organic solvent, except for toxaphene and silvex, which were obtained as pure solids (toxaphene was technical grade). These solids were then dissolved to make required standards.

C. Routine Water Quality Parameters

1. Sample Collection

Approximately two liters of sample at each sampling point were collected in one liter wide mouth polyethylene jars. One of the one-liter samples was acidified with sulfuric acid, the other not, and both were stored on ice in an insulated container for transport to the laboratory.

2. Analytical Methods

Temperature, pH, and alkalinity were determined on site.

All other parameters were analyzed in the Fritz Engineering Sanitary Laboratory. The samples returned to the Laboratory for analysis were preserved according to the recommended procedures in Standard Methods (11).

(a) Temperature was read with a semi-immersible thermometer.

(b) The pH was measured with a Lamotte Chemical Co. portable pH Meter, Model HA. The instrument was temperature adjusted and standardized with pH 7.00 buffer solution.

(c) Turbidity was read with a Hach Turbidimeter, Model 2100A.

(d) Phenolphthalein and total alkalinities were determined by the procedures described in Standard Methods (11), using 0.02 N sulfuric acid titration.

(e) Total and calcium hardness of each sample was determined by the EDTA Titrimetric method described in Standard Methods (11). The magnesium hardness was calculated as the difference between the total hardness and the calcium hardness.

(f) The ammonia concentration was determined by the Direct Nesslerization method described in Standard Methods (11). The colorimetric analysis was performed using a Bausch and Lomb Spectronic 20 spectrophotometer.

(g) The Nitrate Electrode method described in Standard Methods (11) was used to determine nitrate-nitrogen concentrations. A Corning Digital 110, Expanded Scale pH Meter was used in conjunction with an Orion Research nitrate ion electrode, Model 93-07 and an Orion Research double junction reference electrode, Model 90-02.

(h) The SPADNS method described in Standard Methods (11) was the basis of the fluoride analysis. For convenience the fluoride concentration was measured by using the Hach Chemical Co., Hach DR (Direct Reading) Colorimeter.

(i) The total and fecal coliform analysis were conducted according to the relevant Coliform Membrane Filter Procedures detailed in Standard Methods (11).

## V. DISCUSSION OF RESULTS

The results of the water quality monitoring program are given in Appendices A, B, and C for trace metals, trace organic pesticides, and routine water quality testing, respectively. The discussion of these results is divided into these categories as presented below.

### A. Trace Metals

The metals analyses, as presented in Appendix A, showed that there is no significant problem due to any of the metals in either water source. The specific results are condensed by each metal element, as follows:

1. Arsenic levels were all less than the detection limit of 5 $\mu g/\ell$. The IPR value is 50 $\mu g/\ell$.

2. Cadmium levels were detected in all water samples during the testing period. One very high value of 21 $\mu g/\ell$ was detected at the Whitehall sampling station on 07 July. This level was recorded for the midstream sample, but since no other samples in the Lehigh showed any values above the calibrated limit of 2.0 $\mu g/\ell$, it is believed that this high value was due to random contamination. This is also supported by the fact that no other level of cadmium was detected to be close to the 21 $\mu g/\ell$ level at subsequent sampling times. Analysis of the total sampling period indicate a cadmium level of about 2 to 3 $\mu g/\ell$ as an average for all of the streams. Values ranged from 1.4 to 8.4 $\mu g/\ell$ in Mill Creek, 0.8 to 3.4 $\mu g/\ell$ in Jordan Creek, and 1.2 to 6.0 at various

stations in the Lehigh River. The IPR value for cadmium is 10 μg/ℓ, and it is evident that, except for the one aberration, the stream waters all fall below this limitation.

3. Chromium levels were detected in all waters with the highest levels not exceeding 20 μg/ℓ. The values ranged from less than 10 to 19 μg/ℓ in Mill Creek, less than 10 to 14 μg/ℓ in Jordan Creek, and less than 10 to 20 μg/ℓ in the Lehigh River. The Whitehall station in the Lehigh River was generally somewhat lower than the North Catasauqua station. No values exceeded the IPR limit of 50 μg/ℓ.

4. Lead was only detected in one sample on the Jordan Creek in excess of the 5 μg/ℓ detection linit, and that was at the 10 μg/ℓ level on 15 August. The only other observed values in excess of the detection limit were 6, 10, and 11 μg/ℓ on 15 July, 27 July, and 08 August, respectively, at the Whitehall station on the Lehigh River. No sample exhibited levels exceeding the IPR limit of 50 μg/ℓ.

5. Mercury was found to be less than 1 μg/ℓ, effectively the background reagent level. Determination level is 0.1 μg/ℓ. The IPR limit is 2 μg/ℓ.

6. Selenium was not found above the detection limit of 5 μg/ℓ in any of the samples. The IPR limit is 10 μg/ℓ.

7. Silver levels were generally below the determination limit of 2 μg/ℓ. Only three samples showed greater values, none of which exceeded the IPR limit of 50 μg/ℓ. Mill Creek had a value of 17 μg/ℓ on 27 July. The Whitehall station on the Lehigh River had 4 μg/ℓ also on 27 July and 8 μg/ℓ on 29 July.

None of the metal results, except the one cadmium value, exceeded the IPR limitations. The trace metals therefore do not present a problem of suitability or treatability for either surface water to be used for potable purposes.

B. Trace Organic Pesticides

The trace organic pesticide levels are presented in Appendix B as a summary table of sites tested. None of the organochlorine insecticides or herbicides were observed. The sensitivity of the TLC method used was such that standards run at the IPR limits would give detectable signs for all but endrin. Any pesticide levels below the IPR values would not be detected by the TLC technique, but that is inconsequential. The TLC results are reliable at the IPR limit levels, and no indication of any organochlorine pesticide resulted at any sampling site.

Since July and August represent periods for insecticide applications for potato and alfalfa, methoxychlor might be expected to show up in runoff samples. April and May are periods of herbicide and insecticide applications for corn, and 2,4-D would more likely show up at that time. The sampling period, therefore, was done during a period in which certain insecticides are heavily used. The absence of detection of the pesticides is significant.

The trace organic testing did result in some interesting observations with respect to the discovery of some unknown organic compounds in a number of the samples throughout the testing program. The summary table in Appendix B has some samples noted with an "F". In the TLC

tests, it was observed that some of the concentrated extracts exhibited the property of fluorescence under ultraviolet light. This property is not characteristic of pesticides, but is characteristic of several other classes of potential organic pollutants. Further tests using different thin layer chromatographic procedures indicated that there was more than one component in the fluorescing samples. The methods used do not permit identification of the specific compounds, but do indicate that the compounds are probably either polychlorinated biphenyls, polynuclear aromatic hydrocarbons, or, possibly polynuclear phenolic or quinoid compounds. Proper identification of these compounds requires the use of liquid chromatography gas chromatography (12) or gas chromatography-mass spectroscopy. These analyses were beyond the scope of this study, and without such analyses, the identify of the type of organic compound is just speculation. All stations except Mill Creek exhibited the particular type of fluorescence noted. There does not seem to be any definite correlation to weather, i.e., rain, although there seems to be a predominence of the observations with rainy weather. Runoff or changing stream conditions, however, were not always observed at those rainy periods, making weather correlations more difficult.

It was noted on 27 September, when all streams were at greater flows from heavy rains, that there was a self-fluorescing compound or compounds at each station. However, these were of a different fluorescing nature than the earlier substances and exhibited a brownish color.

C. Traditional Water Quality Parameters

Traditional water quality parameters test results are shown in Appendix C for each sampling date and station. Sixteen sampling dates are included from 20 July through 27 September. A summary showing mean and standard deviations for all parameters except pH at each station are presented as well. The median value and range for pH are given because pH is a logarithmic function and an average would be erroneous.

The water quality in all of the waters tested were of such quality so as to be readily treatable for domestic water use. The Lehigh River waters are relatively soft, low alkalinity waters, with pH levels falling in the range of 7.1 to 7.9 for the North Catasauqua station and 7.7 to 8.7 for the Whitehall station. The North Catasauqua station had average hardness levels of around 66 mg/$\ell$ as calcium carbonate ($CaCO_3$), and average total alkalinities of 26 mg/$\ell$ as $CaCO_3$. Whitehall station had corresponding values equalling 49 mg/$\ell$ as $CaCO_3$ and 13 mg/$\ell$ as $CaCO_3$, respectively. Jordan Creek and Mill Creek were slightly harder and more alkaline, i.e., 76 mg/$\ell$ hardness as $CaCO_3$ and 44 mg/$\ell$ total alkalinity as $CaCO_3$ for Jordan Creek and 84 mg/$\ell$ hardness as $CaCO_3$ and 48 mg/$\ell$ total alkalinity as $CaCO_3$ for Mill Creek. The pH values for Jordan Creek ranged from 7.9 to 9.3 with a median value of 8.4. Mill Creek pH values were similar with 8.4 as the median value and a 7.5 to 9.4 range. Certainly, none of these water quality parameters represent any problem with respect to treatability and domestic use.

Turbidity values of the Lehigh River were generally lower than Jordan Creek or Mill Creek. The average values in the Lehigh River were 4.6 FTU (NTU), and in Jordan Creek and Mill Creek were 9.3 and 5.1,

respectively. The nature of the stream beds supports this difference. No treatability problem is presented by these low turbidity waters.

Ammonia-nitrogen levels were highest in the Lehigh River at the North Catasauqua, most probably as a result of the Northampton sewage treatment discharge. This is supported by the gradation of low (average 0.17 mg/$\ell$ as N) values of ammonia on the west bank and increasing higher values across the river, e.g., 0.45 mg/$\ell$ as N average at midstream to 0.67 mg/$\ell$ as N average at the east bank. The Whitehall station and Jordan Creek and Mill Creek all had similar average values around 0.1 mg/$\ell$ ammonia-nitrogen.

Nitrate-nitrogen values in the Lehigh River averaged 2.4 to 3.0 mg/$\ell$ as N in the North Catasauqua station and 3.2 to 3.6 mg/$\ell$ as N in the Whitehall station. The Jordan Creek average was 6.3 mg/$\ell$ as N and the Mill Creek average was 5.7 mg/$\ell$ as N. The highest value observed in the sampling program was 9.1 mg/$\ell$ as N on the Jordan Creek on 29 August. All samples tested on that day were relatively higher than at other times. This may have been due to some systematic laboratory error or natural phenomenon. In any case, the nitrate-nitrogen values obtained never exceeded the IPR limitation of 10 mg/$\ell$ nitrate-nitrogen and therefore poses no health threat with respect to consumption of any of these surface waters.

Coliform tests performed were total and fecal coliforms using the membrane filtration technique. No fecal coliforms were observed, but this result is suspect because of incubation problems in maintaining the proper temperature. Fecal coliforms are highly sensitive and require rigorous temperature control. The total coliform counts were

lowest in the Lehigh River at the North Catasauqua station, averaging around 300/100 ml, with values of around 420/100 ml for the Whitehall station. Jordan Creek and Mill Creek had average values of around 520/100 ml and 510/100 ml, respectively. Treatability of any of these waters presents no problem.

Fluoride, also listed as an IPR, appeared at low levels, averaging about 0.1 mg/$\ell$ at all stations. This is well under IPR levels at any temperature and presents no health problem with respect to consumption of these waters.

Because there was little effect of runoff observed due to the very dry weather conditions of the 15 July through 16 September sampling periods, a special effort was made to obtain results for a high flow period which occurred during the last week of September. The results of these samples are shown in Table 3 in Appendix C. A comparison of these results to earlier results indicate a decrease in pH at all stations with an attendent decrease in alkalinity, a dilution of hardness values, no significant effects on nitrate or fluoride levels, and expected rises in turbidity at all stations. There were no treatability problems with respect to any of the parameters monitored for this heavy runoff period.

## References


1. McCarren, E. F. and Keighton, W. B., "Water Quality and Discharge of Streams in the Lehigh River Basin, Pennsylvania," Geological Survey Water-Supply Paper 1879-14, U.S. Government Printing Office, Washington, D. C., 1969.

2. Wood, C. R., Flippo, H. N., Jr., Lescinsky, J. B. and Barker, J. L., Water Resources of Lehigh County, Pennsylvania, Water Resource Report 31, Pennsylvania Geological Survey, 1972.

3. Mathematical Modeling Applied to Lehigh River Water Quality, Fritz Engineering Laboratory Report No. 404.1, Lehigh University, Bethlehem, Pa., 1974.

4. "Water Supply Study Central Lehigh County," prepared by Gannet Fleming Corddry and Carpenter, Inc., Harrisburg, Pa., April 1976.

5. Everett, J. J., "A Water Quality Investigation of the Jordan Creek Watershed in the Area to be Impounded by the Trexler Dam," Allentown-Bethlehem Bi-City Health Bureau, Allentown, Pa., September 13, 1976.

6. "Report to the City of Allentown, Pennsylvania upon the Municipal Water System with Emphasis on Treatment and Distribution," Metcalf and Eddy, Inc./Engineers, Boston, Ma., April 1977.

7. National Interim Primary Drinking Water Regulations, Proposed by USEPA, March 1975; Reported in the Journal of the American Water Works Association, February 1976.

8. "Methods for Chemical Analysis of Water and Wastes," USEPA Method Development and Quality Control Laboratory, Cincinnati, Ohio, 1975.

9. Kawahara, F. K., Lichtenberg, J. J. and Eichelberger, J. W., Journal of Water Pollution Control Federation, 39 446 (1967).

10. Kawahara, F. K., Moure, R. L. and Gorman, R. W., Journal Gas Chromatography, 6, 24 (1968).

11. Standard Methods for the Examination of Water and Wastewater, Fourteenth Edition, APHA, AWWA, WPCF, American Public Health Association, Washington, D. C., 1976.

12. "Methods for Analysis of Organic Compounds in Industrial Effluencts," USEPA Environmental Research Center, Cincinnati, Ohio, November 1974; these methods were proposed as interim methods, but are still in effect as of this date.

# APPENDIX A

## Trace Metal Results

STATION: Lehigh River
North Catasauqua, East Bank

| METAL (µg/ℓ) \ DATE | 15 Jul 1977 | 20 Jul 1977 | 27 Jul 1977 | 29 Jul 1977 | 01 Aug 1977 |
|---|---|---|---|---|---|
| Arsenic | <20 | <20 | <20 | <20 | <20 |
| Cadmium | 3 | < 2 | < 2 | < 2 | |
| Chromium | <10 | 12 | 10 | 15 | |
| Lead | 6 | < 5 | 10 | | |
| Mercury | < 1 | < 1 | < 1 | < 1 | < 1 |
| Selenium | < 5 | < 5 | | | < 5 |
| Silver | < 2 | < 2 | < 2 | < 2 | < 2 |
| Site Description | Clear weather | Turbid-runoff from heavy rain on preceding day | No visible effects from rain on pre-ceding day | Light rain - no visible effect | Light rain during sampling period |

Lehigh River
STATION: North Catasauqua, Mid Stream

| METAL (µg/ℓ) \ DATE | 15 Jul 1977 | 20 Jul 1977 | 27 Jul 1977 | 29 Jul 1977 | 01 Aug 1977 |
|---|---|---|---|---|---|
| Arsenic | <20 | <20 | <20 | <20 | <20 |
| Cadmium | < 1 | < 2 | < 2 | < 2 | |
| Chromium | <10 | 11 | 11 | <10 | |
| Lead | < 5 | < 5 | < 5 | < 5 | |
| Mercury | < 1 | < 1 | < 1 | < 1 | < 1 |
| Selenium | < 5 | < 5 | | < 5 | |
| Silver | < 2 | < 2 | < 2 | < 2 | |
| Site Description | Clear weather | Turbid-runoff from heavy rain on preceding day | No visible effects from rain on pre-ceding day | Light rain - no visible effect | Light rain during sampling period |

Lehigh River
STATION: North Catasauqua, West Bank

| DATE / METAL (µg/ℓ) | 15 Jul 1977 | 20 Jul 1977 | 27 Jul 1977 | 29 Jul 1977 | 01 Aug 1977 |
|---|---|---|---|---|---|
| Arsenic | <20 | <20 | <20 | <20 | <20 |
| Cadmium | < 2 | < 2 | < 2 | < 2 | < 2 |
| Chromium | <10 | 11 | 10 | 16 | <10 |
| Lead | < 5 | < 5 | < 5 | | < 5 |
| Mercury | < 1 | < 1 | < 1 | < 1 | < 1 |
| Selenium | < 5 | < 5 | < 5 | | |
| Silver | < 2 | < 2 | 4 | 8 | < 2 |
| Site Description | Clear weather | Turbid-runoff from heavy rain on preceding day | No visible effects from rain on pre-ceding day | Light rain no visible effect | Light rain during sampling period |

STATION: Lehigh River
Whitehall, East Bank

| METAL (µg/ℓ) \ DATE | 15 Jul 1977 | 20 Jul 1977 | 27 Jul 1977 | 29 Jul 1977 | 01 Aug 1977 |
|---|---|---|---|---|---|
| Arsenic | <20 | <20 | <20 | <20 | <20 |
| Cadmium | < 2 | < 2 | < 2 | < 2 | |
| Chromium | 18 | | 17 | 16 | |
| Lead | < 5 | < 5 | < 5 | | |
| Mercury | < 1 | < 1 | < 1 | < 1 | < 1 |
| Selenium | < 5 | < 5 | | | < 5 |
| Silver | < 2 | < 2 | < 2 | < 2 | |
| Site Description | Clear weather | Turbid - runoff from heavy rain on preceding day | No visible effects from rain on preceding day | Light rain - no visible effect | Light rain during sampling period |

STATION: Lehigh River
Whitehall, Mid Stream

| METAL (µg/ℓ) \ DATE | 15 Jul 1977 | 20 Jul 1977 | 27 Jul 1977 | 29 Jul 1977 | 01 Aug 1977 |
|---|---|---|---|---|---|
| Arsenic | <20 | <20 | <20 | <20 | <20 |
| Cadmium | < 2 | < 2 | < 2 | < 2 | |
| Chromium | 20 | 12 | <10 | <10 | |
| Lead | < 5 | < 5 | < 5 | < 5 | |
| Mercury | < 1 | < 1 | < 1 | < 1 | < 1 |
| Selenium | < 5 | < 5 | | < 5 | |
| Silver | < 2 | < 2 | < 2 | < 2 | |
| Site Description | Clear weather | Turbid - runoff from heavy rain on preceding day | No visible effects from rain on preceding day | Light rain - no visible effect | Light rain during sampling period |

STATION: Lehigh River
Whitehall, West Bank

| METAL (µg/ℓ) \ DATE | 15 Jul 1977 | 20 Jul 1977 | 27 Jul 1977 | 29 Jul 1977 | 01 Aug 1977 |
|---|---|---|---|---|---|
| Arsenic | <20 | <20 | <20 | <20 | <20 |
| Cadmium | < 2 | < 2 | < 2 | < 2 | 2.4 |
| Chromium | <10 | 19 | <10 | 19 | <10 |
| Lead | < 5 | < 5 | < 5 | | < 5 |
| Mercury | < 1 | < 1 | < 1 | < 1 | < 1 |
| Selenium | < 5 | < 5 | | < 5 | |
| Silver | < 2 | < 2 | < 2 | < 2 | |
| Site Description | Clear weather | Turbid - runoff from heavy rain on preceding day | No visible effects from rain on pre-ceding day | Light rain - no visible effect | Light rain during sampling period |

STATION: Jordan Creek
Trexler Dam Site

| METAL (µg/ℓ) \ DATE | 15 Jul 1977 | 20 Jul 1977 | 27 Jul 1977 | 29 Jul 1977 | 01 Aug 1977 |
|---|---|---|---|---|---|
| Arsenic | <20 | <20 | <20 | <20 | <20 |
| Cadmium | < 2 | < 2 | < 2 | < 2 | 3.4 |
| Chromium | <10 | 12 | <10 | 12 | 12 |
| Lead | < 5 | < 5 | < 5 | < 5 | < 5 |
| Mercury | < 1 | < 1 | < 1 | < 1 | < 1 |
| Selenium | < 5 | < 5 | < 5 | < 5 | < 5 |
| Silver | < 2 | < 2 | < 2 | < 2 | < 2 |
| Site Description | Clear weather | Turbid - runoff from heavy rain on preceding day | No visible effects from rain on pre-ceding day | Light rain - no visible effect | Light rain during sampling period |

Mill Creek
STATION: Junction with Jordan Creek

| METAL (µg/ℓ) \ DATE | 15 Jul 1977 | 20 Jul 1977 | 27 Jul 1977 | 29 Jul 1977 | 01 Aug 1977 |
|---|---|---|---|---|---|
| Arsenic | <20 | <20 | <20 | <20 | <20 |
| Cadmium | < 2 | < 2 | < 2 | < 2 | 8.4 |
| Chromium | <10 | 14 | 19 | 13 | <10 |
| Lead | < 5 | < 5 | < 5 | < 5 | < 5 |
| Mercury | < 1 | < 1 | < 1 | < 1 | < 1 |
| Selenium | < 5 | < 5 | < 5 | < 5 | < 5 |
| Silver | < 2 | < 2 | 17 | < 2 | < 2 |
| Site Description | Clear weather | Turbid - runoff from heavy rain on preceding day | No visible effects from rain on preceding day | Light rain - no visible effect | Light rain during sampling period |

Lehigh River
STATION: North Catasauqua, East Bank

| DATE / METAL (µg/ℓ) | 04 Aug 1977 | 08 Aug 1977 | 11 Aug 1977 | 15 Aug 1977 | 27 Sep 1977 |
|---|---|---|---|---|---|
| Arsenic | <20 | | | <20 | |
| Cadmium | | 4.2 | 2.7 | | |
| Chromium | | 13 | | <10 | |
| Lead | | < 5 | | < 5 | |
| Mercury | < 1 | < 1 | | | |
| Selenium | | | < 5 | | |
| Silver | < 2 | < 2 | | | |
| Site Description | Raining - rain on preceding day | Rain on preceding day - increase in flow | Rain on preceding day - no noticeable effect | Rain on preceding day-slight turbidity increase noticeable | Raining - very high flow |

Lehigh River
STATION: North Catasauqua, Mid Stream

| DATE / METAL (µg/ℓ) | 04 Aug 1977 | 08 Aug 1977 | 11 Aug 1977 | 15 Aug 1977 | 27 Sep 1977 |
|---|---|---|---|---|---|
| Arsenic | <20 | | <20 | | |
| Cadmium | 1.2 | | | 6.0 | |
| Chromium | 17 | | | 15 | |
| Lead | | < 5 | | < 5 | |
| Mercury | < 1 | | < 1 | | |
| Selenium | | | < 5 | | |
| Silver | < 2 | | | < 2 | |
| Site Description | Raining - rain on preceding day | Rain on preceding day - increase in flow | Rain on preceding day - no noticeable effect | Rain on preceding day-slight turbidity increase noticeable | Raining - very high flow |

Lehigh River
STATION: North Catasauqua, West Bank

| METAL (µg/ℓ) \ DATE | 04 Aug 1977 | 08 Aug 1977 | 11 Aug 1977 | 15 Aug 1977 | 27 Sep 1977 |
|---|---|---|---|---|---|
| Arsenic | <20 | | <20 | | |
| Cadmium | | 1.7 | 4.4 | | < 1 |
| Chromium | | | <10 | <10 | <10 |
| Lead | | < 5 | < 5 | | < 5 |
| Mercury | < 1 | | | < 1 | |
| Selenium | < 5 | | | < 5 | |
| Silver | | < 2 | < 2 | | < 2 |
| Site Description | Raining - rain on preceding day | Rain on preceding day - increase in flow. | Rain on preceding day - no noticeable effect | Rain on preceding day-slight turbidity increase noticeable | Raining - very high flow |

STATION: Lehigh River
Whitehall, East Bank

| DATE / METAL (µg/ℓ) | 04 Aug 1977 | 08 Aug 1977 | 11 Aug 1977 | 15 Aug 1977 | 27 Sep 1977 |
|---|---|---|---|---|---|
| Arsenic | | <20 | <20 | | |
| Cadmium | 5.2 | 4.8 | | | |
| Chromium | | 12 | | <10 | |
| Lead | | 11 | | < 5 | |
| Mercury | < 1 | | < 1 | | |
| Selenium | < 5 | | < 5 | | |
| Silver | | < 2 | | < 2 | |
| Site Description | Raining - rain on preceding day | Rain on preceding day - increase in flow | Rain on preceding day - no noticeable effect | Rain on preceding day-slight turbidity increase noticeable | Raining - very high flow |

STATION: Lehigh River
Whitehall, Mid Stream

| DATE / METAL (µg/ℓ) | 04 Aug 1977 | 08 Aug 1977 | 11 Aug 1977 | 15 Aug 1977 | 27 Sep 1977 |
|---|---|---|---|---|---|
| Arsenic | <20 | | <20 | | |
| Cadmium | 5.2 | | | 2.6 | |
| Chromium | 13 | | | <10 | |
| Lead | < 5 | < 5 | | < 5 | |
| Mercury | | < 1 | | < 1 | |
| Selenium | | < 5 | | | |
| Silver | < 2 | | < 2 | | |
| Site Description | Raining - rain on preceding day | Rain on preceding day - increase in flow | Rain on preceding day - no noticeable effect | Rain on preceding day-slight turbidity increase noticeable | Raining - very high flow |

STATION: Lehigh River
Whitehall, West Bank

| METAL (µg/ℓ) \ DATE | 04 Aug 1977 | 08 Aug 1977 | 11 Aug 1977 | 15 Aug 1977 | 27 Sep 1977 |
|---|---|---|---|---|---|
| Arsenic | <20 | <20 | <20 | <20 | |
| Cadmium | 5.2 | | 2.0 | | < 1 |
| Chromium | | | 15 | | <10 |
| Lead | | < 5 | < 5 | | < 5 |
| Mercury | < 1 | | < 1 | | |
| Selenium | < 5 | | | < 5 | |
| Silver | < 2 | | < 2 | | < 2 |
| Site Description | Raining - rain on preceding day | Rain on preceding day - increase in flow | Rain on preceding day - no noticeable effect | Rain on preceding day-slight turbidity increase noticeable | Raining - very high flow |

STATION: Jordan Creek
Trexler Dam Site

| DATE / METAL (µg/ℓ) | 04 Aug 1977 | 08 Aug 1977 | 11 Aug 1977 | 15 Aug 1977 | 27 Sep 1977 |
|---|---|---|---|---|---|
| Arsenic | <20 | <20 | <20 | <20 | |
| Cadmium | 3.0 | 2.8 | 0.8 | 1.4 | < 1 |
| Chromium | <10 | <10 | 13 | 14 | <10 |
| Lead | < 5 | < 5 | < 5 | 10 | < 5 |
| Mercury | < 1 | < 1 | < 1 | < 1 | |
| Selenium | < 5 | < 5 | < 5 | < 5 | |
| Silver | < 2 | < 2 | < 2 | < 2 | < 2 |
| Site Description | Raining - rain on preceding day | Rain on preceding day - increase in flow | Rain on preceding day-higher flow and more turbid | Rain on preceding day - no noticeable effect | Raining - very high flow |

STATION: Mill Creek
Junction with Jordan Creek

| DATE / METAL (µg/ℓ) | 04 Aug 1977 | 08 Aug 1977 | 11 Aug 1977 | 15 Aug 1977 | 27 Sep 1977 |
|---|---|---|---|---|---|
| Arsenic | <20 | <20 | <20 | <20 | |
| Cadmium | 2.8 | 1.4 | 1.7 | 2.4 | < 1 |
| Chromium | 14 | 10 | <10 | 18 | <10 |
| Lead | < 5 | < 5 | < 5 | < 5 | < 5 |
| Mercury | < 1 | < 1 | < 1 | < 1 | |
| Selenium | < 5 | < 5 | < 5 | < 5 | |
| Silver | < 2 | < 2 | < 2 | < 2 | < 2 |
| Site Description | Raining - rain on preceding day | Rain on preceding day - increase in flow | Rain on preceding day-higher flow and more turbid | Rain on preceding day - no noticeable effect | Raining - very high flow |

# APPENDIX B

## Trace Organic Pesticides Results

| SITE \ DATE | 04 Aug 1977 | 08 Aug 1977 | 11 Aug 1977 | 18 Aug 1977 | 22 Aug 1977 | 25 Aug 1977 |
|---|---|---|---|---|---|---|
| Mill Creek Junction with Jordan | X | X | X | X | X | X |
| Jordan Creek Trexler Dam Site | X | X F | X F | X | X F | X |
| Lehigh River North Catasauqua, West Bank | X F | X | X F | X | X | X |
| Lehigh River North Catasauqua, Mid Stream | X F | X | X F | | | X |
| Lehigh River North Catasauqua, East Bank | X F | | X | | X | X |
| Lehigh River Whitehall, West Bank | X F | X F | X | X F | | X |
| Lehigh River Whitehall, Mid Stream | X F | X F | X F | | X F | |
| Lehigh River Whitehall, East Bank | X F | | X F | | | |

X indicates sites tested on each date. All tests failed to indicate presence of pesticide or herbicide contamination.

F indicates presence of fluorescent material, a non-pesticide unidentified contaminant.

| SITE \ DATE | 29 Aug 1977 | 02 Sep 1977 | 06 Sep 1977 | 09 Sep 1977 | 27 Sep 1977 |
|---|---|---|---|---|---|
| Mill Creek Junction with Jordan | X | X | X | X | F X |
| Jordan Creek Trexler Dam Site | X | X | X | F X | F X |
| Lehigh River North Catasauqua, West Bank | X | | | X | F X |
| Lehigh River North Catasauqua, Mid Stream | | F X | | F X | |
| Lehigh River North Catasauqua, East Bank | | | X | F X | |
| Lehigh River Whitehall, West Bank | X | X | | F X | F X |
| Lehigh River Whitehall, Mid Stream | | | | X | |
| Lehigh River Whitehall, East Bank | | | X | X | |

X indicates sites tested on each date. All tests failed to indicate presence of pesticide or herbicide contamination.

F indicates presence of fluorescent material, a non-pesticide unidentified contaminant.

# APPENDIX C

## Traditional Water Quality Parameters Results

Station: Lehigh R., E. Bank, North Cata.

| Parameter \ Date | 20 Jul 1977 | 27 Jul 1977 | 29 Jul 1977 | 1 Aug 1977 | 8 Aug 1977 |
|---|---|---|---|---|---|
| Temperature °C | 27 | 23 | 21 | 23 | 26 |
| pH | 7.4 | 7.4 | 7.3 | 7.2 | 7.5 |
| Turdibity FTU | 18 | 7.5 | 7 | 6 | 8 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 28 | 24 | 28 | 28 | 26 |
| Total Hardness mg/ℓ as $CaCO_3$ | 80 | 72 | 72 | 60 | 60 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | | 36 | 40 | 40 | 40 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | | 36 | 32 | 20 | 20 |
| Ammonia mg/ℓ as N | | | | 0.01 | 0.13 |
| Nitrate mg/ℓ as N | | | | | |
| Fluoride mg/ℓ | | | | | |
| Total Coliforms /100 ml | | | | | |
| Fecal Coliforms /100 ml | | | | | |
| Site Description | Turbid-runoff from heavy rain on preceding day | No visible effects from rain on preceding day | Light rain-no visible effect | Light rain during sampling period | Rain on preceding day. Increase in flow |

Station: Lehigh R., Mid Stream, N. Cata.

| Parameter \ Date | 20 Jul 1977 | 27 Jul 1977 | 29 Jul 1977 | 1 Aug 1977 | 8 Aug 1977 |
|---|---|---|---|---|---|
| Temperature °C | 27 | 23 | 21 | 23 | 26 |
| pH | 7.6 | 7.4 | 7.3 | 7.2 | 7.5 |
| Turdibity FTU | 16 | 7.5 | 7 | 6 | 8 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 28 | 24 | 28 | 28 | 26 |
| Total Hardness mg/ℓ as $CaCO_3$ | 76 | 64 | 72 | 60 | 60 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | | 36 | 40 | 40 | 44 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | | 28 | 32 | 20 | 16 |
| Ammonia mg/ℓ as N | | | | 0.01 | 0.05 |
| Nitrate mg/ℓ as N | | | | | |
| Fluoride mg/ℓ | | | | | |
| Total Coliforms /100 ml | | | | | |
| Fecal Coliforms /100 ml | | | | | |
| Site Description | Turbid-runoff from heavy rain on preceding day | No visible effects from rain on preceding day | Light rain-no visible effect | Light rain during sampling period | Rain on preceding day. Increase in flow |

Station: Lehigh R., W. Bank, North Cata.

| Parameter \ Date | 20 Jul 1977 | 27 Jul 1977 | 29 Jul 1977 | 1 Aug 1977 | 8 Aug 1977 |
|---|---|---|---|---|---|
| Temperature °C | 27 | 23 | 21 | 23 | 26 |
| pH | 7.5 | 7.3 | 7.3 | 7.2 | 7.5 |
| Turdibity FTU | 16 | 8 | 7 | 6 | 8 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 28 | 28 | 28 | 28 | 24 |
| Total Hardness mg/ℓ as $CaCO_3$ | 76 | 60 | 72 | 60 | 60 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | | 36 | 40 | 40 | 40 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | | 24 | 32 | 20 | 20 |
| Ammonia mg/ℓ as N | | | | 0.01 | 0.10 |
| Nitrate mg/ℓ as N | | | | | |
| Fluoride mg/ℓ | | | | | |
| Total Coliforms /100 ml | | | | | |
| Fecal Coliforms /100 ml | | | | | |
| Site Description | Turbid-runoff from heavy rain on preceding day | No visible effects from rain on preceding day | Light rain no visible effect | Light rain during sampling period | Rain on preceding day. Increase in flow |

Station: Lehigh R., E. Bank, Whitehall

| Parameter \ Date | 20 Jul 1977 | 27 Jul 1977 | 29 Jul 1977 | 1 Aug 1977 | 8 Aug 1977 |
|---|---|---|---|---|---|
| Temperature °C | 30 | 26 | 25 | 25 | 28 |
| pH | 8.4 | 8.6 | 8.6 | 8.7 | 8.7 |
| Turdibity FTU | 8 | 7.5 | 7 | 6 | 17 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 | 0 | 0 | 4 | 2 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 12 | 12 | 12 | 12 | 16 |
| Total Hardness mg/ℓ as $CaCO_3$ | 56 | 56 | 48 | 36 | 48 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | | 24 | 28 | 24 | 32 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | | 32 | 20 | 12 | 16 |
| Ammonia mg/ℓ as N | | | | 0.05 | 0.05 |
| Nitrate mg/ℓ as N | | | | | |
| Fluoride mg/ℓ | | | | | |
| Total Coliforms /100 ml | | | | | |
| Fecal Coliforms /100 ml | | | | | |
| Site Description | Turbid-runoff from heavy rain on preceding day | No visible effects from rain on preceding day | Light rain-no visible effect | Light rain during sampling period | Rain on preceding day. Increase in flow |

Station: Lehigh R., Mid Stream, Whitehall

| Parameter \ Date | 20 Jul 1977 | 27 Jul 1977 | 29 Jul 1977 | 1 Aug 1977 | 8 Aug 1977 |
|---|---|---|---|---|---|
| Temperature °C | 29 | 25 | 24 | 25 | 27 |
| pH | 8.0 | 8.2 | 8.5 | 8.4 | 8.2 |
| Turdibity FTU | 9 | 8 | 7 | 6 | 18 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 16 | 12 | 12 | 10 | 16 |
| Total Hardness mg/ℓ as $CaCO_3$ | 56 | 48 | 48 | 36 | 48 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | | 24 | 28 | 24 | 36 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | | 24 | 20 | 12 | 12 |
| Ammonia mg/ℓ as N | | | | 0.01 | 0.03 |
| Nitrate mg/ℓ as N | | | | | |
| Fluoride mg/ℓ | | | | | |
| Total Coliforms /100 ml | | | | | |
| Fecal Coliforms /100 ml | | | | | |
| Site Description | Turbid-runoff from heavy rain on preceding day | No visible effects from rain on pre-ceding day | Light rain-no visible effect | Light rain during sampling period | Rain on preceding day. Increase in flow |

Station: Lehigh R., W. Bank, Whitehall

| Parameter \ Date | 20 Jul 1977 | 27 Jul 1977 | 29 Jul 1977 | 1 Aug 1977 | 8 Aug 1977 |
|---|---|---|---|---|---|
| Temperature °C | 29 | 25 | 24 | 25 | 27 |
| pH | 8.0 | 8.2 | 8.5 | 8.3 | 8.1 |
| Turdibity FTU | 9 | 7 | 7 | 6 | 18 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 12 | 14 | 12 | 10 | 18 |
| Total Hardness mg/ℓ as $CaCO_3$ | 72 | 52 | 52 | 40 | 52 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | | 28 | 32 | 24 | 32 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | | 24 | 20 | 12 | 20 |
| Ammonia mg/ℓ as N | | | | 0.01 | 0.05 |
| Nitrate mg/ℓ as N | | | | | |
| Fluoride mg/ℓ | | | | | |
| Total Coliforms /100 ml | | | | | |
| Fecal Coliforms /100 ml | | | | | |
| Site Description | Turbid-runoff from heavy rain on preceding day | No visible effects from rain on pre-ceding day | Light rain-no visible effect | Light rain during sampling period | Rain on preceding day. Increase in flow |

Station: Jordan Creek, Trexler Dam Site

| Parameter \ Date | 20 Jul 1977 | 27 Jul 1977 | 29 Jul 1977 | 1 Aug 1977 | 8 Aug 1977 |
|---|---|---|---|---|---|
| Temperature °C | 27 | 24 | 25 | 24 | 29 |
| pH | 8.4 | 8.7 | 9.3 | 8.7 | 9.2 |
| Turdibity FTU | 40 | 18 | 9 | 8 | 10 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 | 4 | 10 | 4 | 8 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 32 | 48 | 46 | 52 | 48 |
| Total Hardness mg/ℓ as $CaCO_3$ | 72 | 72 | 84 | 80 | 72 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | | 64 | 52 | 52 | 56 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | | 8 | 32 | 28 | 16 |
| Ammonia mg/ℓ as N | | | | 0.05 | 0.35 |
| Nitrate mg/ℓ as N | | | | | |
| Fluoride mg/ℓ | | | | | |
| Total Coliforms /100 ml | | | | | |
| Fecal Coliforms /100 ml | | | | | |
| Site Description | Turbid-runoff from heavy rain on preceding day | No visible effects from rain on preceding day | Light rain-no visible effect | Light rain during sampling period | Rain on preceding day. Increase in flow |

Station: Mill Creek, Jct./Jordan Creek

| Parameter \ Date | 20 Jul 1977 | 27 Jul 1977 | 29 Jul 1977 | 1 Aug 1977 | 8 Aug 1977 |
|---|---|---|---|---|---|
| Temperature °C | 25 | 22 | 22 | 22 | 26 |
| pH | 8.4 | 8.8 | 9.4 | 9.0 | 9.0 |
| Turdibity FTU | 13 | 11 | 8 | 7 | 7 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 | 10 | 16 | 6 | 6 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 40 | 52 | 56 | 56 | 52 |
| Total Hardness mg/ℓ as $CaCO_3$ | 88 | 80 | 80 | 92 | 84 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | | 60 | 56 | 64 | 56 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | | 20 | 24 | 28 | 28 |
| Ammonia mg/ℓ as N | | | | 0.01 | 0.05 |
| Nitrate mg/ℓ as N | | | | | |
| Fluoride mg/ℓ | | | | | |
| Total Coliforms /100 ml | | | | | |
| Fecal Coliforms /100 ml | | | | | |
| Site Description | Turbid-runoff from heavy rain on preceding day | No visible effects from rain on pre-ceding day | Light rain-no visible effect | Light rain during sampling period | Rain on preceding day. Increase in flow |

Station: Lehigh R., E. Bank, N. Cata.

| Date / Parameter | 11 Aug 1977 | 15 Aug 1977 | 18 Aug 1977 | 22 Aug 1977 | 25 Aug 1977 |
|---|---|---|---|---|---|
| Temperature °C | 25 | 24 | 23 | 22 | 19 |
| pH | 7.8 | 7.7 | 7.6 | 7.5 | 7.1 |
| Turbidity FTU | 7 | 3.3 | 1.2 | 3.4 | 1.3 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 28 | 26 | 24 | 28 | 28 |
| Total Hardness mg/ℓ as $CaCO_3$ | 68 | 64 | 60 | 68 | 64 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 44 | 48 | 44 | 48 | 48 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 24 | 16 | 20 | 20 | 16 |
| Ammonia mg/ℓ as N | 0.10 | 0.35 | 0.25 | 0.03 | 0.03 |
| Nitrate mg/ℓ as N | | | | | 3.0 |
| Fluoride mg/ℓ | | | | | |
| Total Coliforms /100 ml | | | | | |
| Fecal Coliforms /100 ml | | | | | |
| Site Description | Rain on preceding day-no noticeable effect | Rain on preceding day-slight turbidity increase noticeable | Rain on preceding day-no noticeable effect | Raining just prior to sampling-no visible effect | Lower flow |

Station: Lehigh R., Mid Stream, N. Cata.

| Date / Parameter | 11 Aug 1977 | 15 Aug 1977 | 18 Aug 1977 | 22 Aug 1977 | 25 Aug 1977 |
|---|---|---|---|---|---|
| Temperature °C | 25 | 24 | 23 | 22 | 19 |
| pH | 7.7 | 7.7 | 7.5 | 7.4 | 7.1 |
| Turbidity FTU | 7 | 3.2 | 1.2 | 3.3 | 1.3 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 28 | 24 | 22 | 28 | 24 |
| Total Hardness mg/ℓ as $CaCO_3$ | 64 | 64 | 60 | 68 | 64 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 44 | 48 | 44 | 48 | 48 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 20 | 16 | 20 | 20 | 16 |
| Ammonia mg/ℓ as N | 0.13 | 0.03 | 0.25 | 0.03 | 0.01 |
| Nitrate mg/ℓ as N | | | | | 3.4 |
| Fluoride mg/ℓ | | | | | |
| Total Coliforms /100 ml | | | | | |
| Fecal Coliforms /100 ml | | | | | |
| Site Description | Rain on preceding day-no noticeable effect | Rain on preceding day-slight turbidity increase noticeable | Rain on preceding day-no noticeable effect | Raining just prior to sampling-no visible effect | Lower flow |

Station: Lehigh R., W. Bank, N. Cata.

| Date / Parameter | 11 Aug 1977 | 15 Aug 1977 | 18 Aug 1977 | 22 Aug 1977 | 25 Aug 1977 |
|---|---|---|---|---|---|
| Temperature °C | 25 | 24 | 23 | 22 | 19 |
| pH | 7.8 | 7.6 | 7.5 | 7.3 | 7.1 |
| Turbidity FTU | 7 | 3.2 | 1.2 | 3.3 | 1.3 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 24 | 20 | 22 | 28 | 28 |
| Total Hardness mg/ℓ as $CaCO_3$ | 64 | 64 | 60 | 68 | 64 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 44 | 48 | 48 | 48 | 48 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 20 | 16 | 16 | 20 | 16 |
| Ammonia mg/ℓ as N | 0.13 | 0.03 | 0.10 | 0.01 | 0.01 |
| Nitrate mg/ℓ as N | | | | | 3.6 |
| Fluoride mg/ℓ | | | | | |
| Total Coliforms /100 ml | | | | | |
| Fecal Coliforms /100 ml | | | | | |
| Site Description | Rain on preceding day-no noticeable effect | Rain on preceding day-slight turbidity increase noticeable | Rain on preceding day-no noticeable effect | Raining just prior to sampling-no visible effect | Lower flow |

Station: Lehigh R., E. Bank, Whitehall

| Date / Parameter | 11 Aug 1977 | 15 Aug 1977 | 18 Aug 1977 | 22 Aug 1977 | 25 Aug 1977 |
|---|---|---|---|---|---|
| Temperature °C | 28 | 28 | 25 | 25 | 23 |
| pH | 8.8 | 8.6 | 8.5 | 8.6 | 8.4 |
| Turbidity FTU | 7 | 3.3 | 2.3 | 1.5 | 1.3 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 8 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 16 | 12 | 14 | 12 | 16 |
| Total Hardness mg/ℓ as $CaCO_3$ | 48 | 44 | 48 | 48 | 48 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 32 | 28 | 32 | 32 | 32 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 16 | 16 | 16 | 16 | 16 |
| Ammonia mg/ℓ as N | 0.20 | 0.01 | 0.01 | 0.05 | 0.13 |
| Nitrate mg/ℓ as N | | | | | 5.3 |
| Fluoride mg/ℓ | | | | | |
| Total Coliforms /100 ml | | | | | |
| Fecal Coliforms /100 ml | | | | | |
| Site Description | Rain on preceding day-no noticeable effect | Rain on preceding day-slight turbidity increase noticeable | Rain on preceding day-no noticeable effect | Raining just prior to sampling-no visible effect | Lower flow |

Station: Lehigh R., Mid Stream, Whitehall

| Date / Parameter | 11 Aug 1977 | 15 Aug 1977 | 18 Aug 1977 | 22 Aug 1977 | 25 Aug 1977 |
|---|---|---|---|---|---|
| Temperature °C | 28 | 27 | 25 | 24 | 23 |
| pH | 8.7 | 8.3 | 8.3 | 8.4 | 8.3 |
| Turbidity FTU | 7 | 3.3 | 2.3 | 1.5 | 1.3 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 8 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 20 | 12 | 16 | 10 | 14 |
| Total Hardness mg/ℓ as $CaCO_3$ | 48 | 48 | 48 | 44 | 48 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 32 | 28 | 32 | 32 | 32 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 16 | 20 | 16 | 12 | 16 |
| Ammonia mg/ℓ as N | 0.05 | 0.25 | 0.03 | 0.01 | 0.01 |
| Nitrate mg/ℓ as N | | | | | 5.0 |
| Fluoride mg/ℓ | | | | | |
| Total Coliforms /100 ml | | | | | |
| Fecal Coliforms /100 ml | | | | | |
| Site Description | Rain on preceding day-no noticeable effect | Rain on preceding day-slight turbidity increase noticeable | Rain on preceding day-no noticeable effect | Raining just prior to sampling-no visible effect | Lower flow |

Station: Lehigh R., W. Bank, Whitehall

| Date / Parameter | 11 Aug 1977 | 15 Aug 1977 | 18 Aug 1977 | 22 Aug 1977 | 25 Aug 1977 |
|---|---|---|---|---|---|
| Temperature °C | 28 | 27 | 25 | 24 | 22 |
| pH | 8.6 | 8.2 | 8.3 | 8.3 | 8.2 |
| Turbidity FTU | 7 | 3.4 | 2.4 | 1.5 | 1.3 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 2 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 16 | 12 | 14 | 12 | 16 |
| Total Hardness mg/ℓ as $CaCO_3$ | 48 | 48 | 48 | 48 | 48 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 32 | 32 | 36 | 32 | 32 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 16 | 16 | 12 | 16 | 16 |
| Ammonia mg/ℓ as N | 0.20 | 0.03 | 0.03 | 0.01 | 0.01 |
| Nitrate mg/ℓ as N | | | | | 4.9 |
| Fluoride mg/ℓ | | | | | |
| Total Coliforms /100 ml | | | | | |
| Fecal Coliforms /100 ml | | | | | |
| Site Description | Rain on preceding day-no noticeable effect | Rain on preceding day-slight turbidity increase noticeable | Rain on preceding day-no noticeable effect | Raining just prior to sampling-no visible effect | Lower flow |

Station: Jordan Creek, Trexler Dam Site

| Date / Parameter | 11 Aug 1977 | 15 Aug 1977 | 18 Aug 1977 | 22 Aug 1977 | 25 Aug 1977 |
|---|---|---|---|---|---|
| Temperature °C | 27 | 24 | 24 | 21 | 21 |
| pH | 8.4 | 8.3 | 8.7 | 8.0 | 8.3 |
| Turbidity FTU | 18 | 3.2 | 4.1 | 17 | 3.2 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 2 | 0 | 2 | 0 | 4 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 38 | 48 | 44 | 40 | 40 |
| Total Hardness mg/ℓ as $CaCO_3$ | 64 | 76 | 76 | 64 | 80 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 48 | 52 | 52 | 48 | 56 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 16 | 24 | 24 | 16 | 24 |
| Ammonia mg/ℓ as N | 0.20 | 0.05 | 0.03 | 0.13 | 0.03 |
| Nitrate mg/ℓ as N | | | | | 8.8 |
| Fluoride mg/ℓ | | | | | |
| Total Coliforms /100 ml | | | | | |
| Fecal Coliforms /100 ml | | | | | |
| Site Description | Rain on preceding day-higher flow and more turbid | Rain on preceding day-no noticeable effect | Rain on preceding day-no noticeable effect | Rain during sampling-increased flow | Rain on preceding day-higher flow |

Station: Mill Creek, Jct./Jordan Creek

| Date / Parameter | 11 Aug 1977 | 15 Aug 1977 | 18 Aug 1977 | 22 Aug 1977 | 25 Aug 1977 |
|---|---|---|---|---|---|
| Temperature °C | 24 | 22 | 22 | 20 | 20 |
| pH | 8.3 | 8.2 | 8.2 | 7.9 | 7.8 |
| Turbidity FTU | 8 | 1.2 | 2.2 | 12 | 1.5 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 48 | 48 | 48 | 44 | 44 |
| Total Hardness mg/ℓ as $CaCO_3$ | 80 | 84 | 80 | 80 | 80 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 56 | 64 | 60 | 64 | 64 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 24 | 20 | 20 | 16 | 16 |
| Ammonia mg/ℓ as N | 0.03 | 0.05 | 0.30 | 0.01 | 0.03 |
| Nitrate mg/ℓ as N | | | | | 6.7 |
| Fluoride mg/ℓ | | | | | |
| Total Coliforms /100 ml | | | | | |
| Fecal Coliforms /100 ml | | | | | |
| Site Description | Rain on preceding day-higher flow and more turbid | Rain on preceding day-no noticeable effect | Rain on preceding day-no noticeable effect | Rain during sampling-increased flow | Rain on preceding day-higher flow |

Station: Lehigh R., E. Bank, N. Cata.

| Parameter \ Date | 29 Aug 1977 | 30 Aug 1977 | 5 Sep 1977 | 9 Sep 1977 | 16 Sep 1977 |
|---|---|---|---|---|---|
| Temperature °C | 23 | 26 | 23 | 21 | 17 |
| pH | 7.2 | 7.8 | 7.5 | 7.6 | 7.4 |
| Turbidity FTU | 1.3 | 1.2 | 0.9 | 0.8 | 1.7 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 26 | 26 | 30 | 28 | 24 |
| Total Hardness mg/ℓ as $CaCO_3$ | 72 | 64 | 76 | 72 | 52 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 48 | 44 | 48 | 40 | 28 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 24 | 20 | 28 | 32 | 24 |
| Ammonia mg/ℓ as N | 0.10 | 1.00 | 0.01 | 6.0 | 0.03 |
| Nitrate mg/ℓ as N | 3.6 | 2.3 | 2.0 | 1.8 | 1.5 |
| Fluoride mg/ℓ | | | | 0.10 | 0.12 |
| Total Coliforms /100 ml | | | 300 | 100 | 400 |
| Fecal Coliforms /100 ml | 0 | 0 | | | |
| Site Description | Lower flow- noticeably clear | Unchanged | Unchanged | Unchanged | First sub- stantial rain after dry period- higher flow small in- |

Station: Lehigh R., Mid Stream, N. Cata.

| Parameter \ Date | 29 Aug 1977 | 30 Aug 1977 | 5 Sep 1977 | 9 Sep 1977 | 16 Sep 1977 |
|---|---|---|---|---|---|
| Temperature °C | 23 | 26 | 23 | 21 | 17 |
| pH | 7.2 | 7.8 | 7.5 | 7.6 | 7.4 |
| Turbidity FTU | 1.3 | 1.2 | 0.9 | 0.8 | 1.7 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 28 | 24 | 28 | 28 | 24 |
| Total Hardness mg/ℓ as $CaCO_3$ | 72 | 64 | 76 | 76 | 56 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 48 | 44 | 48 | 40 | 32 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 24 | 20 | 28 | 36 | 24 |
| Ammonia mg/ℓ as N | 0.10 | 2.05 | 0.20 | 2.5 | 0.01 |
| Nitrate mg/ℓ as N | 7.3 | 2.0 | 2.0 | 1.8 | 1.4 |
| Fluoride mg/ℓ | | | | 0.10 | 0.10 |
| Total Coliforms /100 ml | | | 240 | 120 | 450 |
| Fecal Coliforms /100 ml | 0 | 0 | | | |
| Site Description | Lower flow-noticeably clear | Unchanged | Unchanged | Unchanged | First substantial rain after dry period-higher flow |

Station: Lehigh R., W. Bank, N. Cata.

| Parameter \ Date | 29 Aug 1977 | 30 Aug 1977 | 5 Sep 1977 | 9 Sep 1977 | 16 Sep 1977 |
|---|---|---|---|---|---|
| Temperature °C | 23 | 26 | 23 | 21 | 17 |
| pH | 7.2 | 7.9 | 7.5 | 7.6 | 7.4 |
| Turbidity FTU | 1.3 | 1.2 | 0.9 | 0.8 | 1.7 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 28 | 24 | 28 | 28 | 22 |
| Total Hardness mg/ℓ as $CaCO_3$ | 72 | 64 | 76 | 76 | 52 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 48 | 44 | 48 | 40 | 28 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 24 | 20 | 28 | 36 | 24 |
| Ammonia mg/ℓ as N | 0.03 | 0.35 | 0.03 | 1.25 | 0.01 |
| Nitrate mg/ℓ as N | 3.5 | 2.3 | 1.8 | 1.7 | 1.5 |
| Fluoride mg/ℓ | | | | 0.10 | 0.10 |
| Total Coliforms /100 ml | | | 230 | 150 | 530 |
| Fecal Coliforms /100 ml | 0 | 0 | | | |
| Site Description | Lower flow-noticeably clear | Unchanged | Unchanged | Unchanged | First substantial rain after dry period-higher flow |

Station: Lehigh R., E. Bank, Whitehall

| Parameter \ Date | 29 Aug 1977 | 30 Aug 1977 | 5 Sep 1977 | 9 Sep 1977 | 16 Sep 1977 |
|---|---|---|---|---|---|
| Temperature °C | 27 | 29 | 23 | 22 | 18 |
| pH | 8.6 | 8.8 | 7.7 | 8.6 | 7.9 |
| Turbidity FTU | 1.4 | 1.1 | 1.1 | 1.5 | 1.7 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 2 | 2 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 12 | 12 | 14 | 14 | 10 |
| Total Hardness mg/ℓ as $CaCO_3$ | 52 | 48 | 48 | 60 | 40 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 32 | 32 | 28 | 32 | 24 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 20 | 16 | 20 | 28 | 12 |
| Ammonia mg/ℓ as N | 0.03 | 0.25 | 0.01 | 0.46 | 0.01 |
| Nitrate mg/ℓ as N | 5.9 | 4.6 | 1.8 | 2.1 | 2.0 |
| Fluoride mg/ℓ | | | | 0.10 | 0.10 |
| Total Coliforms /100 ml | | | 390 | 200 | 570 |
| Fecal Coliforms /100 ml | 0 | 0 | | | |
| Site Description | Lower flow- noticeably clear | Unchanged | Unchanged | Unchanged | First substantial rain after dry period- higher flow small in- |

Station: Lehigh R., Mid Stream, Whitehall

| Parameter \ Date | 29 Aug 1977 | 30 Aug 1977 | 5 Sep 1977 | 9 Sep 1977 | 16 Sep 1977 |
|---|---|---|---|---|---|
| Temperature °C | 26 | 28 | 23 | 22 | 18 |
| pH | 8.4 | 8.6 | 7.7 | 8.5 | 7.7 |
| Turbidity FTU | 1.4 | 1.1 | 1.1 | 1.5 | 1.7 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 12 | 12 | 14 | 14 | 10 |
| Total Hardness mg/ℓ as $CaCO_3$ | 52 | 48 | 48 | 60 | 36 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 32 | 28 | 28 | 32 | 24 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 20 | 20 | 20 | 28 | 12 |
| Ammonia mg/ℓ as N | 0.03 | 0.35 | 0.01 | 0.35 | 0.01 |
| Nitrate mg/ℓ as N | 4.6 | 5.3 | 1.5 | 2.0 | 2.0 |
| Fluoride mg/ℓ | | | | 0.16 | 0.10 |
| Total Coliforms /100 ml | | | 450 | 200 | 590 |
| Fecal Coliforms /100 ml | 0 | 0 | | | |
| Site Description | Lower flow-noticeably clear | Unchanged | Unchanged | Unchanged | First substantial rain after dry period-higher flow |

Station: Lehigh R., W. Bank, Whitehall

| Parameter \ Date | 29 Aug 1977 | 30 Aug 1977 | 5 Sep 1977 | 9 Sep 1977 | 16 Sep 1977 |
|---|---|---|---|---|---|
| Temperature °C | 26 | 28 | 23 | 22 | 18 |
| pH | 8.4 | 8.5 | 7.7 | 8.5 | 7.7 |
| Turbidity FTU | 1.4 | 1.1 | 1.1 | 1.5 | 1.7 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 12 | 12 | 14 | 14 | 8 |
| Total Hardness mg/ℓ as $CaCO_3$ | 52 | 48 | 48 | 56 | 40 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 28 | 32 | 28 | 28 | 24 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 24 | 16 | 20 | 28 | 16 |
| Ammonia mg/ℓ as N | 0.35 | 0.25 | 0.01 | 0.10 | 0.03 |
| Nitrate mg/ℓ as N | 5.2 | 3.6 | 1.8 | 1.7 | 2.2 |
| Fluoride mg/ℓ | | | | 0.11 | 0.10 |
| Total Coliforms /100 ml | | | 490 | 300 | 600 |
| Fecal Coliforms /100 ml | 0 | 0 | | | |
| Site Description | Lower flow-noticeably clear | Unchanged | Unchanged | Unchanged | First substantial rain after dry period-higher flow |

Station: Jordan Creek, Trexler Dam Site

| Parameter \ Date | 29 Aug 1977 | 30 Aug 1977 | 5 Sep 1977 | 9 Sep 1977 | 16 Sep 1977 |
|---|---|---|---|---|---|
| Temperature °C | 25 | 25 | 20 | 19 | 17 |
| pH | 8.5 | 8.0 | 7.9 | 8.4 | 8.2 |
| Turbidity FTU | 2.2 | 2.0 | 1.6 | 1.6 | 1.8 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 4 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 40 | 36 | 46 | 48 | 48 |
| Total Hardness mg/ℓ as $CaCO_3$ | 72 | 84 | 80 | 80 | 80 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 52 | 56 | 52 | 48 | 52 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 20 | 28 | 28 | 32 | 28 |
| Ammonia mg/ℓ as N | 0.13 | 0.25 | 0.05 | 0.03 | 0.01 |
| Nitrate mg/ℓ as N | 9.1 | 7.3 | 4.2 | 4.6 | 3.8 |
| Fluoride mg/ℓ | | | | 0.12 | 0.10 |
| Total Coliforms /100 ml | | | 520 | 300 | 730 |
| Fecal Coliforms /100 ml | 0 | 0 | | | |
| Site Description | Higher flow some turbidity | Less turbidity | Lower flow | Lower flow | First substantial rain after dry period-higher flow |

Station: Mill Creek, Jct./Jordan Creek

| Parameter \ Date | 29 Aug 1977 | 30 Aug 1977 | 5 Sep 1977 | 9 Sep 1977 | 16 Sep 1977 |
|---|---|---|---|---|---|
| Temperature °C | 23 | 22 | 19 | 18 | 16 |
| pH | 8.4 | 7.5 | 7.8 | 8.5 | 7.8 |
| Turbidity FTU | 1.2 | 1.5 | 1.0 | 0.8 | 1.4 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 2 | 0 | 0 | 0 | 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 44 | 44 | 52 | 46 | 52 |
| Total Hardness mg/ℓ as $CaCO_3$ | 84 | 88 | 84 | 88 | 92 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 60 | 56 | 60 | 60 | 64 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 24 | 32 | 24 | 28 | 28 |
| Ammonia mg/ℓ as N | 0.05 | 0.55 | 0.05 | 0.03 | 0.01 |
| Nitrate mg/ℓ as N | 8.1 | 4.9 | 4.5 | 4.8 | 5.0 |
| Fluoride mg/ℓ | | | | 0.13 | 0.12 |
| Total Coliforms /100 ml | | | 420 | 420 | 680 |
| Fecal Coliforms /100 ml | 0 | 0 | | | |
| Site Description | Higher flow some turbidity | Less turbidity | Lower flow | Lower flow | First substantial rain after dry period-higher flow |

Mean Value and Standard Deviation

| Parameter \ Site | Lehigh R. Mid Stream Whitehall | Lehigh R. East Bank Whitehall | Jordan Cr. Trexler Dam Site | Mill Creek Junction/ Jordan Cr. |
|---|---|---|---|---|
| Temperature $^{o}C$ | 25 ± 3 | 25 ± 3 | 23 ± 3 | 22 ± 3 |
| *pH | 8.3 7.7-8.7 | 8.6 7.7-8.8 | 8.4 7.9-9.3 | 8.4 7.5-9.4 |
| Turbidity FTU | 4.6 ±4.6 | 4.6 ±4.6 | 9.3 ±10.5 | 5.1 ±4.5 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 1 ± 2 | 1 ± 2 | 3 ± 3 | 3 ± 5 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 13 ± 3 | 13 ± 2 | 44 ± 6 | 48 ± 5 |
| Total Hardness mg/ℓ as $CaCO_3$ | 48 ± 6 | 49 ± 6 | 76 ± 6 | 84 ± 4 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 29 ± 4 | 29 ± 3 | 53 ± 4 | 60 ± 3 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 18 ± 5 | 18 ± 6 | 23 ± 7 | 24 ± 5 |
| Ammonia mg/ℓ as N | 0.10 ±0.14 | 0.11 ±0.14 | 0.11 ±0.11 | 0.10 ±0.16 |
| Nitrate mg/ℓ as N | 3.4 ±1.7 | 3.6 ±1.9 | 6.3 ±2.4 | 5.7 ±1.4 |
| Fluoride mg/ℓ | 0.13 ±0.04 | 0.10 ±0.00 | 0.11 ±0.01 | 0.13 ±0.01 |
| Total Coliforms /100 ml | 413 ±196 | 387 ±185 | 517 ±215 | 507 ±150 |
| Fecal Coliforms /100 ml | 0 ± 0 | 0 ± 0 | 0 ± 0 | 0 ± 0 |

*Median and Range

Mean Value and Standard Deviation

| Parameter \ Site | Lehigh R. West Bank N. Cata. | Lehigh R. Mid Stream N. Cata. | Lehigh R. East Bank N. Cata. | Lehigh R. West Bank Whitehall |
|---|---|---|---|---|
| Temperature $^{o}C$ | 23 ± 3 | 23 ± 3 | 23 ± 3 | 25 ± 3 |
| *pH | 7.4 7.1-7.9 | 7.4 7.1-7.8 | 7.4 7.1-7.8 | 8.3 7.7-8.6 |
| Turbidity FTU | 4.5 ±4.2 | 4.4 ±4.2 | 4.6 ±4.6 | 4.6 ±4.6 |
| P Alkalinity mg/ℓ as $CaCO_3$ | 0 ± 0 | 0 ± 0 | 0 ± 0 | 0 ± 0 |
| Total Alkalinity mg/ℓ as $CaCO_3$ | 26 ± 3 | 26 ± 2 | 27 ± 2 | 13 ± 2 |
| Total Hardness mg/ℓ as $CaCO_3$ | 66 ± 7 | 66 ± 7 | 67 ± 7 | 50 ± 7 |
| $Ca^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 43 ± 6 | 43 ± 6 | 43 ± 6 | 30 ± 3 |
| $Mg^{2+}$ Hardness mg/ℓ as $CaCO_3$ | 23 ± 6 | 23 ± 6 | 24 ± 6 | 18 ± 5 |
| Ammonia mg/ℓ as N | 0.17 ±0.35 | 0.45 ±0.85 | 0.67 ±1.70 | 0.09 ±0.11 |
| Nitrate mg/ℓ as N | 2.4 ±0.9 | 3.0 ±2.2 | 2.4 ±0.8 | 3.2 ±1.6 |
| Fluoride mg/ℓ | 0.10 ±0.00 | 0.10 ±0.00 | 0.11 ±0.01 | 0.11 ±0.01 |
| Total Coliforms /100 ml | 303 ±200 | 270 ±167 | 287 ±180 | 463 ±152 |
| Fecal Coliforms /100 ml | 0 ± 0 | 0 ± 0 | 0 ± 0 | 0 ± 0 |

*Median and Range

Table 3 Samples* Collected September 27, 1977

| Parameter \ Site | Lehigh R. West Bank N. Cata. | Lehigh R. Mid Stream N. Cata. | Lehigh R. East Bank N. Cata. | Lehigh R. West Bank Whitehall |
|---|---|---|---|---|
| Temperature $^{o}C$ | 15 | -- | 15 | 15 |
| pH | 7.0 | -- | 7.0 | 6.8 |
| Turbidity FTU | 15.0 | -- | 15.0 | 17.0 |
| P Alkalinity mg/$\ell$ as $CaCO_3$ | 0 | -- | 0 | 0 |
| Total Alkalinity mg/$\ell$ as $CaCO_3$ | 12 | -- | 12 | 8 |
| Total Hardness mg/$\ell$ as $CaCO_3$ | 32 | -- | 32 | 28 |
| $Ca^{2+}$ Hardness mg/$\ell$ as $CaCO_3$ | 20 | -- | 20 | 16 |
| $Mg^{2+}$ Hardness mg/$\ell$ as $CaCO_3$ | 12 | -- | 12 | 12 |
| Ammonia mg/$\ell$ as N | 0.03 | -- | 0.05 | 0.25 |
| Nitrate mg/$\ell$ as N | 3.1 | -- | 2.9 | 3.4 |
| Fluoride mg/$\ell$ | 0.12 | -- | 0.12 | 0.08 |
| Total Coliforms /100 ml | -- | -- | -- | -- |
| Fecal Coliforms /100 ml | -- | -- | -- | -- |

*Samples collected after extensive rainfall which increased stream flow rates by an estimated 300-400%

Table 3 (Continued)

| Parameter \ Site | Lehigh R. Mid Stream Whitehall | Lehigh R. East Bank Whitehall | Jordan Cr. Trexler Dam Site | Mill Creek Junction/ Jordan Cr. |
|---|---|---|---|---|
| Temperature $^{o}C$ | -- | 15 | 16 | 15 |
| pH | -- | 6.9 | 7.4 | 7.4 |
| Turbidity FTU | -- | 17.0 | 6.0 | 8.4 |
| P Alkalinity mg/$\ell$ as $CaCO_3$ | -- | 0 | 0 | 0 |
| Total Alkalinity mg/$\ell$ as $CaCO_3$ | -- | 8 | 36 | 32 |
| Total Hardness mg/$\ell$ as $CaCO_3$ | -- | 28 | 72 | 80 |
| $Ca^{2+}$ Hardness mg/$\ell$ as $CaCO_3$ | -- | 16 | 52 | 64 |
| $Mg^{2+}$ Hardness mg/$\ell$ as $CaCO_3$ | -- | 12 | 20 | 16 |
| Ammonia mg/$\ell$ as N | -- | 0.20 | 0.10 | 0.16 |
| Nitrate mg/$\ell$ as N | -- | 3.1 | 6.2 | 7.0 |
| Fluoride mg/$\ell$ | -- | 0.08 | 0.21 | 0.11 |
| Total Coliforms /100 ml | -- | -- | -- | -- |
| Fecal Coliforms /100 ml | -- | -- | -- | -- |