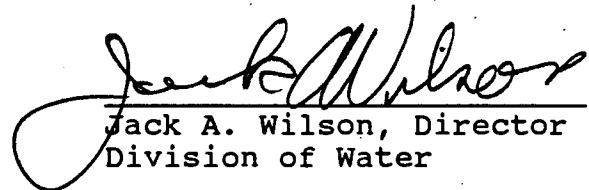


ELIJAH'S CREEK DRAINAGE (OHIO RIVER)
BIOLOGICAL AND WATER QUALITY INVESTIGATION

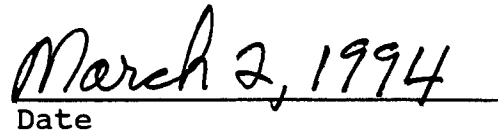
Kentucky Department for Environmental Protection
Division of Water
Water Quality Branch
Ecological Support Section
Frankfort, Kentucky

Technical Report No. 40
March, 1994

This report has been approved for release:



Jack A. Wilson, Director
Division of Water



Date

List of Contributors

**Michael R. Mills
Project Leader**

**Samuel M. Call
Aquatic Invertebrate Zoologist**

**Lythia Metzmeier
Phycologist**

**Clifford C. Schneider
Aquatic Invertebrate Zoologist**

EXECUTIVE SUMMARY

1. Elijah's Creek, a third order tributary to the Ohio River in Boone County, has been severely degraded by intermittent discharges of ethylene glycol from the Greater Cincinnati International Airport and sanitary sewer line construction taking place in the stream channel.
2. Analysis of chemical data collected during this study shows that potential problem parameters in the portion of the stream impacted by the ethylene glycol are five-day biochemical oxygen demand, chloride, conductivity, sulfate, total organic carbon, and sodium. Iron exceeded Kentucky Surface Water Standards chronic aquatic life criterion in the upper and middle portions of the drainage. Ammonia nitrogen was also elevated in the upper and middle portions of the system. Nutrients were elevated in the unnamed tributary.
3. Biological data indicate that the water quality in the entire Elijah's Creek mainstem is poor. All five miles of the Elijah's Creek mainstem are not supporting designated uses, while the 1.3 miles of the unnamed tributary are supporting designated uses.
4. The extensive Sphaerotilus growths that occurred in the upper portions of the drainage created a nuisance situation and violated KSW 401 KAR 5:031, Section 2(1)(e).

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INTRODUCTION

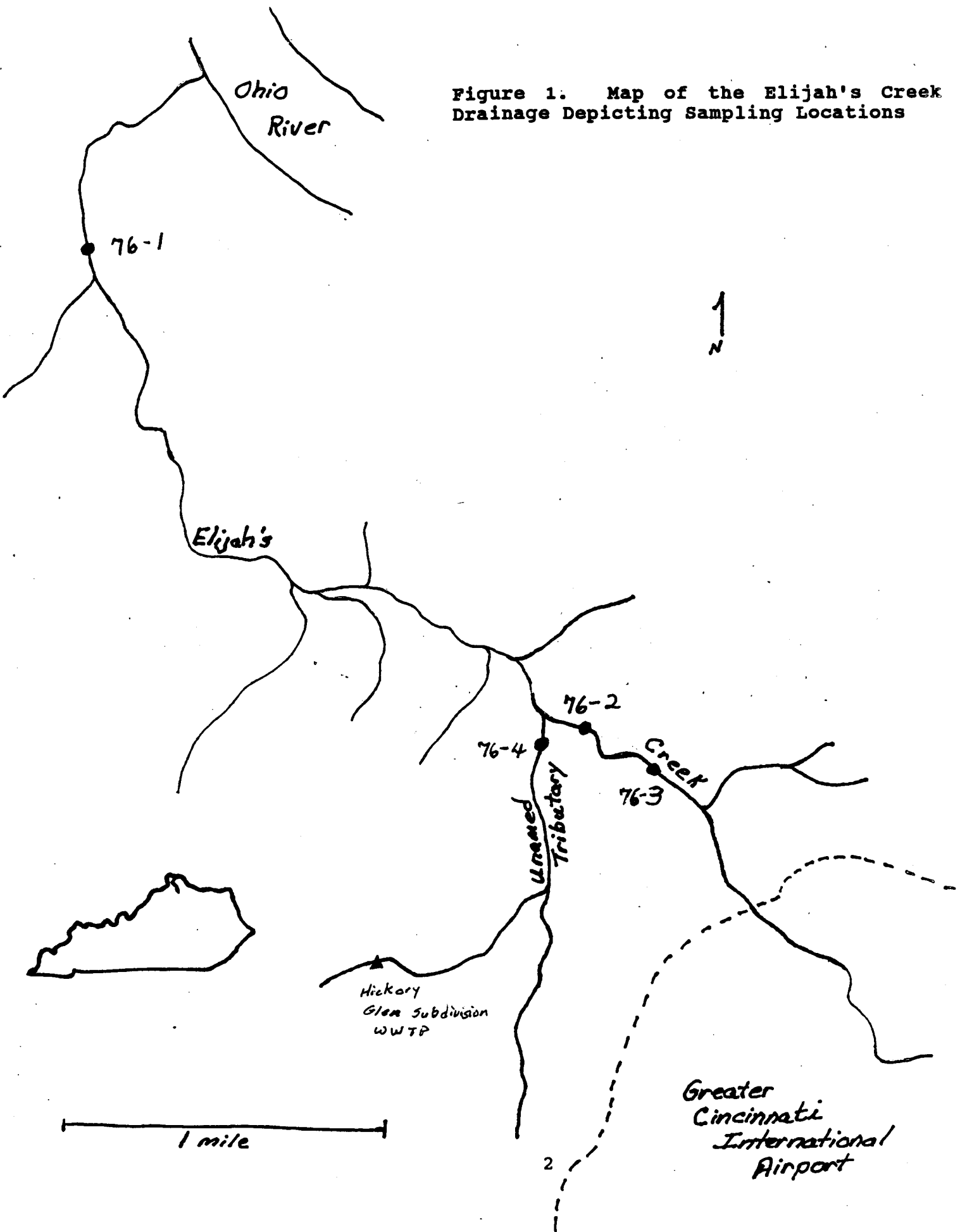
A biological and water quality investigation of Elijah's Creek was conducted by members of the Water Quality Branch of the Kentucky Division of Water (KDOW) in March, 1993. The purpose of this investigation was to determine the impact to the aquatic environment from intermittent ethylene glycol discharges arising from the Greater Cincinnati International Airport (GCIA). It is used by the airport for deicing operations during the cooler months of the year. Runoff from the GCIA conveys the untreated ethylene glycol to Elijah's Creek.

Elijah's Creek rises on the GCIA and flows for approximately five miles in a northwesterly direction to join the Ohio River west of Covington, Kentucky, at Ohio River milepoint 499.5. This third-order stream has one major tributary, which is unnamed, that joins Elijah's Creek at milepoint 3.2. The Elijah's Creek drainage lies in Mississippian-age limestone.

Four sampling locations were established in the Elijah's Creek drainage (Figure 1). The sites are briefly discussed below. Additional information is presented in Appendix A.

The lowest station in the drainage (76-1) is located at milepoint 0.7 on the Elijah's Creek mainstem. The principal habitats consist of shallow, bedrock-bottom pools and limestone slabrock, cobble-rubble dominated riffles. Undercut banks with associated rootwads, snags, and driftpiles were

Figure 1. Map of the Elijah's Creek Drainage Depicting Sampling Locations



very scarce. A sanitary sewer line had been recently placed in the streambed through the entire length of this site. This resulted in large quantities of silt and sand being present in the stream. Virtually the entire streambed had been disturbed by the construction activities, resulting in extensive habitat alteration and degradation.

The middle station on Elijah's Creek (76-2) was located off Elijah's Creek Road approximately 0.2 mi. upstream of the unnamed tributary (UT). Habitats consisted of small, gravel-cobble riffles and long, shallow pools. Undercut banks, rootwads, and snags were common. A heavy growth of Sphaerotilus, a filamentous bacteria indicative of organic pollution, covered the entire stream channel at this location. Decomposing Sphaerotilus caused the substrate throughout the site to be anoxic.

The most upstream site on Elijah's Creek (76-3) was located just downstream of the airport at milepoint 3.7. This area was very similar to station 76-2, including the dense growths of Sphaerotilus. Only water physicochemical samples were taken from this location.

One site, which served as a control, was established on the UT (76-4) just upstream from the mouth. At this location, the stream had small shallow pools interspersed with small, gravel-cobble riffles. Undercut banks, rootwads, and snags were common. This site was located in the middle of a pasture in which livestock had direct access to the stream. The

Hickory Glen wastewater treatment plant was located approximately one mile upstream of this site.

According to KDOW facility files, there are nine permitted point-source dischargers in the Elijah's Creek basin ranging in size from 5,000 gallons per day (gpd) to 700,000 gpd. These consist of one school, two industries, one subdivision, and five small sewage plants. The Hickory Glen subdivision is the largest discharger (700,000 gpd).

Methods

Physicochemical and biological field collection methods and biological data analysis methods follow those outlined in KDOW (1993). Physicochemical samples were delivered to the Kentucky Department of Environmental Service's laboratory for analysis.

The physicochemical data were analyzed by comparing results to Kentucky Surface Water Standard (KSWS) chronic and acute criteria and STORET (1983-1993) 50th and 75th percentiles.

PHYSICOCHEMICAL DISCUSSION

Physicochemical data were collected from four locations in the Elijah's Creek drainage. A total of 106 parameters were analyzed for each station. The data for each station are presented in Appendix B.

The physicochemical data were examined to assess water quality and identify designated use support based on KSWS. If the KSWS acute criterion was exceeded, the designated use was

not being met for that parameter at the time of sampling. In addition, STORET (1983-1993) database values were used to aid in evaluation of water quality. If a parameter's concentration exceeded the KSWs chronic criterion or the STORET (1983-1993) 75th percentile, it was considered elevated and a possible cause of water quality degradation. Because the physicochemical data is indicative only of the time frame being sampled, it is used to delineate potential problem parameters and to support biological data.

Station 76-1 had six parameters; five-day biochemical oxygen demand (BOD_5), chloride (Cl), conductivity (Cond), sulfate (SO_4), total organic carbon (TOC), and sodium (Na); that exceeded the STORET (1983-1993) 75th percentile. As stated above, these are potentially problem parameters and are considered a possible cause of water quality degradation. Eight parameters; BOD_5 , Cl, Cond., SO_4 , TOC, ammonia nitrogen (NH_3-N), total Kjeldhal nitrogen (TKN) and Na; exceeded the STORET 75th percentile and iron exceeded KSWs chronic criterion of 1.0 mg/l. At station 76-3, BOD_5 , Cl, Cond. SO_4 , TOC, NH_3-N , Na, and zinc (Zn) exceeded the STORET 75th percentile, and iron exceeded the KSWs chronic criterion. The UT, station 76-4, had five parameters; Cl, Cond, nitrate, total phosphorus, and chromium; that exceeded the STORET 75th percentile.

Those parameters associated with elevated carbon concentrations and high oxygen-demanding waste (i.e. TOC and

BOD₅) were considerably elevated throughout the Elijah's Creek mainstem. Those areas supported heavy growths of Sphaerotilus, a bacteria which thrives in areas with elevated carbon levels.

Of the 70 organics analyzed during this study, only Bis (2-ethylhexyl) phthalate was observed in the water column at stations 76-1, 76-2, and 76-3. This compound was found in the blank and was observed in the samples at levels below the normal calibration limit of the analyzing instrument, thus the concentrations were estimated (refer to Appendix B) and were not evaluated in this report.

BIOLOGICAL DISCUSSION

Biological data were derived from algal and macroinvertebrate collections made from selected locations in the Elijah's Creek drainage. The algae and macroinvertebrate data are discussed separately below.

The Periphyton Bioassessment Index (PBI) scores and Macroinvertebrate Bioassessment Index (MBI) scores are averaged to produce the Biotic Assessment Index (BAI). Sites with scores ranging between 4 and 5 are considered to have excellent water quality, those with scores between 3 and 4 are considered good, those between 2 and 3 are fair, and those with values between 1 and 2 have poor water quality. Table 1 gives the BAI scores and ranking for two mainstem sites and the unnamed tributary in the Elijah's Creek system.

The BAI scores show that the two mainstem sites (76-1 and 76-2) were severely impaired. Both of these stations receive

periodic discharges of ethylene glycol from the GCIA. This discharge has dramatically altered the aquatic communities of these locations.

Stations	PBI	MBI	BAI Scores	BAI Ranking
76-1	2.00	1.00	1.50	Poor
76-2	1.60	1.14	1.37	Poor
76-4	3.25	2.75	3.00	Good to Fair

The BAI ranking for the unnamed tributary (76-4) was good to fair. This location was impacted by nutrients from nonpoint source pollution arising from agricultural and urban activities. This was the most biologically diverse station sampled during this study.

Though fish were not collected during this investigation, attempts were made to observe the community. No fish were observed at stations 76-1, 76-2, or 76-3. Minnows and darters were observed at station 76-4. This is further indication that the ethylene glycol has severely degraded Elijah's Creek.

Extensive Sphaerotilus growths covered virtually all available habitats at stations 76-2 and 76-3. The substrate beneath the Sphaerotilus growths was anoxic. This rendered the substrate unsuitable for colonization by many aquatic organisms. Thus, the Sphaerotilus growths are creating nuisance problems, which is a violation of KSW 401 KAR 5:031, Section 2(1)(e).

Algae

Qualitative periphyton samples were collected from two mainstem sites (76-1 and 76-2), the unnamed tributary (76-4), and from an intermittent tributary (76-1A) flowing into Elijah's Creek upstream of site 76-1. Three replicate quantitative samples were collected from sites 76-2 and 76-4 for chlorophyll a and ash-free dry-weight analyses. Subsamples of the qualitative samples were oxidized with nitric acid for diatom identification and enumeration.

Fifty algal taxa from four divisions were identified from qualitative samples (Appendix C). Forty-three of these taxa were diatoms (Bacillariophyceae). The Periphyton Bioassessment Index (PBI) used by KDOW was modified by replacing the percent sensitive species metric with a score assigned for algal biomass or, if calculated, the Autotrophic Index (sites 76-2 and 76-4). Other metrics used in the PBI are: total number of diatom taxa (TNDT), mean diversity (d), pollution tolerance index (PTI), and percent community similarity (PS_c). Values and scores for these metrics are presented in Table 2.

Chlorophyll a values were much lower in Elijah's Creek than in the unnamed tributary, while the reverse held true for ash-free dry-weight values. Filamentous bacteria (Sphaerotilus sp.) covered the entire substrate of the riffle samples at site 76-2 (below the airport), and decomposition of the bacteria had caused the substrate to become anoxic. Autotrophic index (AI) values were calculated using the mean

Station	TNDT	d	PTI	PS _c	Trophic Status (AI)	PBI
76-1	16(1)	2.7(3)	2.0(2)	32.7(3)	(1)*	2.0 Poor Fair
76-1a	21(2)	2.4(3)	2.5(4)	55.7(4)	(5)*	3.6 Good
76-2	21(2)	2.3(3)	1.8(1)	8.1(1)	8,545(1)	1.6 Poor
76-4	21(2)	2.6(3)	2.1(3)	-	211(5)	3.25 Good

* subjective ranking based on appearance of the substrate, abundance of algae and/or bacteria. In 76-2 and 76-4, autotrophic index value.

chlorophyll a and AFDW values for each site (Table 3). The autotrophic index indicates the trophic nature of the stream (APHA 1985) and is quite descriptive, in this particular case, of the heterotrophic nature and poor water quality of Elijah's Creek. Normal AI values range from 50 to 200 (APHA 1985). Elijah's Creek (AI = 8545.5) is extremely heterotrophic, as is obvious from the Sphaerotilus masses at site 76-2. Based on the PBI, AI, and field observations, Elijah's Creek is severely impaired by runoff from the GCIA. The unnamed tributary sites showed only slight impairments from nonpoint source nutrient enrichment. The algal community of Elijah's Creek should recover once the impact ceases.

Station	CHL <u>a</u> (mg/m ²)	AFDW (mg/l ²)	AI
76-2	5.5	47,000	8545.5
76-4	55.8	11,800	211.5

Macroinvertebrates

Macroinvertebrate collections were made from three locations in the Elijah's Creek drainage, two samples from the mainstem (76-1 and 76-2) and one from an unnamed tributary (76-4). The unnamed tributary served as a control. Qualitative samples were taken from pool and riffle areas at all locations. These samples yielded 32 taxa of macroinvertebrates, which included representatives from the annelids, mollusks, crustaceans, and aquatic insects. The dipterans were the most diverse group.

A series of seven macroinvertebrate metrics were averaged at each site to produce the macroinvertebrate bioassessment index (MBI). The seven metrics are taxa richness (TR), total number of individuals (TNI), Ephemeroptera - Plecoptera - Trichoptera (EPT) index, percent contribution of dominance, five (PCD₅), Hilsenhoff Biotic Index (HBI), and percent community similarity (PS_c). Metric values, scores, and rankings are presented in Table 4.

The MBI ranking of poor for the two mainstem sites shows that these two locations are severely impaired. Both of these stations are impacted by the discharge of ethylene glycol from the airport. At the upper station (76-2), macroinvertebrates were found living only on snags and rootwads that were suspended in the water column. The stream channel substrate was devoid of aquatic macroinvertebrates. Extensive growths of Sphaerotilus and the anoxic condition of the stream bottom

Station	TR	TNI	EPT	PCD _s	DIC _s	HBI	PS _s	MBI Ranking
76-1	0(1)	0(1)	0(1)	ND	0(1)	ND	ND	Poor (1.00)
76-2	7(1)	20(1)	0(1)	35(2)	1(1)	8.12(1)	21(1)	Poor (1.14)
76-4	29(3)	ND	7(3)	66(3)	ND	7.07(2)	ND	Fair (2.75)

Note: MBI Scores are listed in parentheses.

rendered the substrate unusable for macroinvertebrate colonization. Heavy growths of Sphaerotilus have been observed to severely impair macroinvertebrate colonization in a previous study conducted (KDES 1983).

The most downstream mainstem station (76-1) was degraded by two major impacts, the discharge of ethylene glycol, and the installation of a sanitary sewer line down the length of the creek bed. The combination of these two impacts were so severe that no aquatic macroinvertebrates were found living at this location. This resulted in an MBI score of 1.0, the lowest possible score.

Station 76-4 was located on a small unnamed tributary to Elijah's Creek. This site was not impacted by either ethylene glycol discharges or sanitary sewer line construction. As a result, this station had the highest MBI score (2.75) observed in this study. This MBI score yields a ranking of fair. This location was impaired by both point and nonpoint pollution.

The impacts arising from ethylene glycol discharges and stream channel sewer line construction are so severe that the stream will probably take several years to fully recover. However, with cessation of these impacts, recovery should commence immediately.

Biological and water quality data from this study indicate that the entire 5.0 miles of the mainstem of Elijah's Creek do not support designated uses. The (1.3 miles) UT is supporting designated uses; however, any degradation in water quality will cause this UT to be downgraded to partially supporting designated uses.

LITERATURE CITED

- American Public Health Association. (APHA) 1989. Standard Methods for the Examination of Water and Wastewater. 17th Edition. Am. Publ. Health Assoc., Am. Water Works Assoc., Water Poll. Contr. Fed., Washington, D.C.
- Kentucky Division of Water (KDOW). 1993. Methods for Assessing Biological Integrity of Surface Waters. KY Dept. Environ. Prot., KY Div. of Water, Water Qual. Br., Ecol. Sup. Sect., Frankfort, KY.
- Kentucky Division of Environmental Services (KDES). 1983. Sharps Branch Drainage Biological and Water Quality Investigation. KY Div. Environ. Serv., Biol. Branch, Frankfort, KY. Tech. Rept. No. 7.
- STORET. 1983-1989. United States Environmental Protection Agency water quality file. U.S. EPA, Office of Reg. and Stds., U.S. Environmental Protection Agency. Washington, D.C.

APPENDIX A

Site Information

Appendix A: Site Information

Site No: 08076001
Waterbody No: KY5090203-004
Stream: Elijah's Creek
County: Boone
Location: Off Tanner Rd. 0.8 mi from mouth
Latitude: 39-05-43
Longitude: 84-41-04
Stream Order: III
USGS Topo Quad: Burlington, KY-OH
DOW Map No.: 21-43
MP: 0.8
Sampling Dates: 10 March 1993

Type Sampling:
Physicochemical
Biological

Site No: 08076002
Waterbody No: KY5090203-004
Stream: Elijah's Creek
County: Boone
Location: Off Elijah's Ck. Rd. 0.2 mi
upstream of UT
Latitude: 39-04-24
Longitude: 84-40-24
Stream Order: II
USGS Topo Quad: Burlington, KY-OH
DOW Map No.: 21-43
MP: 3.4
Sampling Dates: 10 March 1993

Type Sampling:
Physicochemical
Biological

Site No: 08076003
Waterbody No: KY5090203-004
Stream: Elijah's Creek
County: Boone
Location: Downstream of airport and east of
KY 20 approximately 0.2 mi.
Latitude: 39-04-17
Longitude: 84-40-10
Stream Order: II
USGS Topo Quad: Burlington, KY-OH
DOW Map No.: 21-43
MP: 3.7
Sampling Dates: 10 March 1993

Type Sampling:
Physicochemical

Site No: 08076004
Waterbody No: KY5090203-004
Stream: UT to Elijah's Creek
County: Boone
Location: Off Elijah's Creek Rd at mouth
Latitude: 39-04-22
Longitude: 84-40-33
Stream Order: II
USGS Topo Quad: Burlington, KY-OH
DOW Map No.: 21-43
MP: 0.1
Sampling Dates: 10 March 1993

Type Sampling:
Physicochemical
Biological

APPENDIX B
Physicochemical Data for the
Elijah's Creek Drainage

PHILLIP J. SHEPHERD
SECRETARY



BRERETON C. JONES
GOVERNOR

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
FRANKFORT OFFICE PARK
14 REILLY ROAD
FRANKFORT, KENTUCKY 40601

April 1, 1993

Division of Environmental Services
Report Number: A20-01199
Sample Number: 9301198

TO: Division of Water
Frankfort Office Park
Frankfort, Kentucky 40601

RE: Elijahs Creek

ATTN: Michael Mills

County: Boone

Facility:

Collected by: S.M. Call & Lythia Metzmeier

Date: 03/10/93 Time: 1000

Delivered by: S.M. Call

Date: 03/11/93 Time: 1020

Received by: Polly Ellis

Date: 03/11/93 Time: 1020

Sample Matrix: Water

Collection Method: Grab

Sample Identification: 08076001 Elijahs Creek near mouth

REPORT OF ANALYSIS

TOTAL CONSTITUENTS

CONCENTRATION

Acidity	2.5 mg/L
Alkalinity	188 mg/L
BOD-5	13.3 mg/L
Chloride	39.5 mg/L
Conductivity	627 μ mho/cm
Fluoride	0.15 mg/L
Hardness, total	108 mg/L
pH	8.0 S.U.
Total Suspended Solids	10 mg/L
Total Dissolved Solids	366 mg/L
Sulfate	81.6 mg/L
Organic Carbon	9.0 mg/L
Turbidity	10 NTU
Ammonia-Nitrogen	ND @ 0.05 mg/L
Total Kjeldhal Nitrogen	0.381 mg/L
Nitrate	0.700 mg/L
Phosphorus, total	0.090 mg/L
Calcium	78.2 mg/L
Magnesium	13.3 mg/L
Potassium	ND @ 0.119 mg/L
Sodium	23.8 mg/L
Aluminum	0.433 mg/L
Arsenic	ND @ 0.002 mg/L



April 1, 1993

Report Number: A20-01199

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TOTAL CONSTITUENTS

CONCENTRATION

Barium	0.036 mg/L
Beryllium	ND @ 0.001 mg/L
Cadmium	ND @ 0.001 mg/L
Chromium	0.002 mg/L
Copper	0.002 mg/L
Iron	0.898 mg/L
Lead	ND @ 0.002 mg/L
Manganese	0.604 mg/L
Mercury	ND @ 0.0001 mg/L
Nickel	ND @ 0.002 mg/L
Selenium	ND @ 0.002 mg/L
Silver	ND @ 0.001 mg/L
Zinc	0.007 mg/L
Phenol	ND @ 0.010 mg/L
Aniline	ND @ 0.010 mg/L
Bis(2-chloroethyl) ether	ND @ 0.010 mg/L
2-Chlorophenol	ND @ 0.010 mg/L
1,3-Dichlorobenzene	ND @ 0.010 mg/L
1,4-Dichlorobenzene	ND @ 0.010 mg/L
Benzyl alcohol	ND @ 0.010 mg/L
1,2-Dichlorobenzene	ND @ 0.010 mg/L
2-Methylphenol	ND @ 0.010 mg/L
4-Methylphenol	ND @ 0.010 mg/L
Bis(2-chloroisopropyl) ether	ND @ 0.010 mg/L
N-Nitrosodi-n-propylamine	ND @ 0.010 mg/L
Hexachloroethane	ND @ 0.010 mg/L
Nitrobenzene	ND @ 0.010 mg/L
Isophorone	ND @ 0.010 mg/L
2-Nitrophenol	ND @ 0.010 mg/L
2,4-Dimethylphenol	ND @ 0.010 mg/L
Bis(2-chloroethoxy)-methane	ND @ 0.010 mg/L
Benzoic Acid	ND @ 0.048 mg/L
2,4-Dichlorophenol	ND @ 0.010 mg/L
1,2,4-Trichlorobenzene	ND @ 0.010 mg/L
Naphthalene	ND @ 0.010 mg/L
4-Chloroaniline	ND @ 0.010 mg/L
1,1,2,3,4,4-Hexachloro-1,3-butadiene	ND @ 0.010 mg/L
4-Chloro-3-methylphenol	ND @ 0.010 mg/L
2-Methylnaphthalene	ND @ 0.010 mg/L
1,2,3,4,5,5-Hexachloro-1,3-cyclopentadiene	ND @ 0.010 mg/L
2,4,6-Trichlorophenol	ND @ 0.010 mg/L
2,4,5-Trichlorophenol	ND @ 0.010 mg/L
2-Chloronaphthalene	ND @ 0.010 mg/L
2-Nitroaniline	ND @ 0.048 mg/L
Dimethyl phthalate	ND @ 0.010 mg/L
Acenaphthylene	ND @ 0.010 mg/L
2,6-Dinitrotoluene	ND @ 0.010 mg/L
3-Nitroaniline	ND @ 0.048 mg/L
Acenaphthene	ND @ 0.010 mg/L
2,4-Dinitrophenol	ND @ 0.048 mg/L

April 1, 1993

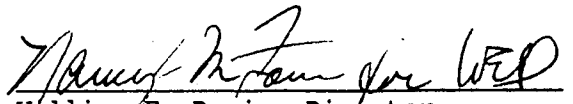
Report Number: A20-01199

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<u>TOTAL CONSTITUENTS</u>	<u>CONCENTRATION</u>
4-Nitrophenol	ND @ 0.048 mg/L
Dibenzofuran	ND @ 0.010 mg/L
2,4-Dinitrotoluene	ND @ 0.010 mg/L
Diethyl phthalate	ND @ 0.010 mg/L
Fluorene	ND @ 0.010 mg/L
4-Chlorophenyl phenyl ether	ND @ 0.010 mg/L
4-Nitroaniline	ND @ 0.048 mg/L
2,4-Dinitro-6-methylphenol	ND @ 0.048 mg/L
N-Nitrosodiphenylamine	ND @ 0.010 mg/L
Diphenylamine	ND @ 0.010 mg/L
Azobenzene	ND @ 0.010 mg/L
4-Bromophenyl phenyl ether	ND @ 0.010 mg/L
Hexachlorobenzene	ND @ 0.010 mg/L
Pentachlorophenol	ND @ 0.048 mg/L
Phenanthrene	ND @ 0.010 mg/L
Anthracene	ND @ 0.010 mg/L
Carbazole	ND @ 0.010 mg/L
Dibutyl phthalate	ND @ 0.010 mg/L
Fluoranthene	ND @ 0.010 mg/L
Benzidine	ND @ 0.048 mg/L
Pyrene	ND @ 0.010 mg/L
Butyl benzyl phthalate	ND @ 0.010 mg/L
3,3'-Dichlorobenzidine	ND @ 0.019 mg/L
Benzo(a)anthracene	ND @ 0.010 mg/L
Chrysene	ND @ 0.010 mg/L
Bis(2-ethylhexyl)phthalate	0.003 mg/L ^{B, J}
Di-n-octyl phthalate	ND @ 0.010 mg/L
Benzo(b)fluoranthene	ND @ 0.010 mg/L
Benzo(k)fluoranthene	ND @ 0.010 mg/L
Benzo(a)pyrene	ND @ 0.010 mg/L
Indeno(1,2,3-c,d)pyrene	ND @ 0.010 mg/L
Dibenzo(a,h)anthracene	ND @ 0.010 mg/L
Benzo(ghi)perylene	ND @ 0.010 mg/L

ND = Not Detected, B = Analyte Found In Blank, J = Estimated Value

This report has been prepared and reviewed by personnel within the Division of Environmental Services. It has been approved for release.


William E. Davis, Director
Division of Environmental Services

PHILLIP J. SHEPHERD
SECRETARY



BRERETON C. JONES
GOVERNOR

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION

FRANKFORT OFFICE PARK
14 REILLY ROAD
FRANKFORT, KENTUCKY 40601

April 1, 1993

Division of Environmental Services
Report Number: A20-01200
Sample Number: 9301199

TO: Division of Water
Frankfort Office Park
Frankfort, Kentucky 40601

RE: Elijahs Creek

ATTN: Michael Mills

County: Boone

Facility:

Collected by: S.M. Call & Lythia Metzmeier

Date: 03/10/93 Time: 1300

Delivered by: S.M. Call

Date: 03/11/93 Time: 1020

Received by: Polly Ellis

Date: 03/11/93 Time: 1020

Sample Matrix: Water

Collection Method: Grab

Sample Identification: 08076002 Elijahs Creek above UT

REPORT OF ANALYSIS

TOTAL CONSTITUENTS

CONCENTRATION

Acidity	7.8 mg/L
Alkalinity	209 mg/L
BOD-5	78.4 mg/L
Chloride	68.8 mg/L
Conductivity	791 μ mho/cm
Fluoride	0.17 mg/L
Hardness, total	162 mg/L
pH	7.7 S.U.
Total Suspended Solids	ND @ 1 mg/L
Total Dissolved Solids	450 mg/L
Sulfate	90.3 mg/L
Organic Carbon	43.1 mg/L
Turbidity	5.7 NTU
Ammonia-Nitrogen	0.144 mg/L
Total Kjeldhal Nitrogen	0.790 mg/L
Nitrate	0.478 mg/L
Phosphorus, total	0.077 mg/L
Calcium	96.9 mg/L
Magnesium	16.0 mg/L
Potassium	0.636 mg/L
Sodium	40.7 mg/L
Aluminum	0.161 mg/L
Arsenic	ND @ 0.002 mg/L



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TOTAL CONSTITUENTS

CONCENTRATION

Barium	0.060 mg/L
Beryllium	ND @ 0.001 mg/L
Cadmium	ND @ 0.001 mg/L
Chromium	0.001 mg/L
Copper	0.002 mg/L
Iron	1.08 mg/L
Lead	ND @ 0.002 mg/L
Manganese	1.12 mg/L
Mercury	ND @ 0.0001 mg/L
Nickel	ND @ 0.002 mg/L
Selenium	ND @ 0.002 mg/L
Silver	ND @ 0.001 mg/L
Zinc	0.029 mg/L
Phenol	ND @ 0.009 mg/L
Aniline	ND @ 0.009 mg/L
Bis(2-chloroethyl) ether	ND @ 0.009 mg/L
2-Chlorophenol	ND @ 0.009 mg/L
1,3-Dichlorobenzene	ND @ 0.009 mg/L
1,4-Dichlorobenzene	ND @ 0.009 mg/L
Benzyl alcohol	ND @ 0.009 mg/L
1,2-Dichlorobenzene	ND @ 0.009 mg/L
2-Methylphenol	ND @ 0.009 mg/L
4-Methylphenol	ND @ 0.009 mg/L
Bis(2-chloroisopropyl)ether	ND @ 0.009 mg/L
N-Nitrosodi-n-propylamine	ND @ 0.009 mg/L
Hexachloroethane	ND @ 0.009 mg/L
Nitrobenzene	ND @ 0.009 mg/L
Isophorone	ND @ 0.009 mg/L
2-Nitrophenol	ND @ 0.009 mg/L
2,4-Dimethylphenol	ND @ 0.009 mg/L
Bis(2-chloroethoxy)-methane	ND @ 0.009 mg/L
Benzoic Acid	ND @ 0.047 mg/L
2,4-Dichlorophenol	ND @ 0.009 mg/L
1,2,4-Trichlorobenzene	ND @ 0.009 mg/L
Naphthalene	ND @ 0.009 mg/L
4-Chloroaniline	ND @ 0.009 mg/L
1,1,2,3,4,4-Hexachloro-1,3-butadiene	ND @ 0.009 mg/L
4-Chloro-3-methylphenol	ND @ 0.009 mg/L
2-Methylnaphthalene	ND @ 0.009 mg/L
1,2,3,4,5,5-Hexachloro-1,3-cyclopentadiene	ND @ 0.009 mg/L
2,4,6-Trichlorophenol	ND @ 0.009 mg/L
2,4,5-Trichlorophenol	ND @ 0.009 mg/L
2-Chloronaphthalene	ND @ 0.009 mg/L
2-Nitroaniline	ND @ 0.047 mg/L
Dimethyl phthalate	ND @ 0.009 mg/L
Acenaphthylene	ND @ 0.009 mg/L
2,6-Dinitrotoluene	ND @ 0.009 mg/L
3-Nitroaniline	ND @ 0.047 mg/L
Acenaphthene	ND @ 0.009 mg/L
2,4-Dinitrophenol	ND @ 0.047 mg/L

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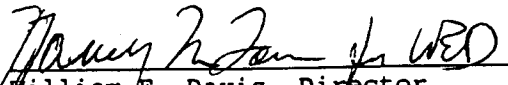
TOTAL CONSTITUENTS

CONCENTRATION

4-Nitrophenol	ND @ 0.047 mg/L
Dibenzofuran	ND @ 0.009 mg/L
2,4-Dinitrotoluene	ND @ 0.009 mg/L
Diethyl phthalate	ND @ 0.009 mg/L
Fluorene	ND @ 0.009 mg/L
4-Chlorophenyl phenyl ether	ND @ 0.009 mg/L
4-Nitroaniline	ND @ 0.047 mg/L
2,4-Dinitro-6-methylphenol	ND @ 0.047 mg/L
N-Nitrosodiphenylamine	ND @ 0.009 mg/L
Diphenylamine	ND @ 0.009 mg/L
Azobenzene	ND @ 0.009 mg/L
4-Bromophenyl phenyl ether	ND @ 0.009 mg/L
Hexachlorobenzene	ND @ 0.009 mg/L
Pentachlorophenol	ND @ 0.047 mg/L
Phenanthrene	ND @ 0.009 mg/L
Anthracene	ND @ 0.009 mg/L
Carbazole	ND @ 0.009 mg/L
Dibutyl phthalate	ND @ 0.009 mg/L
Fluoranthene	ND @ 0.009 mg/L
Benzidine	ND @ 0.047 mg/L
Pyrene	ND @ 0.009 mg/L
Butyl benzyl phthalate	ND @ 0.009 mg/L
3,3'-Dichlorobenzidine	ND @ 0.019 mg/L
Benzo(a)anthracene	ND @ 0.009 mg/L
Chrysene	ND @ 0.009 mg/L
Bis(2-ethylhexyl)phthalate	0.002 mg/L ^{B,J}
Di-n-octyl phthalate	ND @ 0.009 mg/L
Benzo(b)fluoranthene	ND @ 0.009 mg/L
Benzo(k)fluoranthene	ND @ 0.009 mg/L
Benzo(a)pyrene	ND @ 0.009 mg/L
Indeno(1,2,3-c,d)pyrene	ND @ 0.009 mg/L
Dibenzo(a,h)anthracene	ND @ 0.009 mg/L
Benzo(ghi)perylene	ND @ 0.009 mg/L

ND = Not Detected, B = Analyte Found In Blank, J = Estimated Value

This report has been prepared and reviewed by personnel within the Division of Environmental Services. It has been approved for release.


William E. Davis, Director
Division of Environmental Services

PHILLIP J. SHEPHERD
SECRETARY



BRERETON C. JONES
GOVERNOR

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION

FRANKFORT OFFICE PARK
14 REILLY ROAD
FRANKFORT, KENTUCKY 40601

April 1, 1993

Division of Environmental Services

Report Number: A20-01201

Sample Number: 9301200

TO: Division of Water
Frankfort Office Park
Frankfort, Kentucky 40601

RE: Elijahs Creek

ATTN: Michael Mills

County: Boone

Facility:

Collected by: S.M. Call & Lythia Metzmeier

Date: 03/10/93 Time: 1500

Delivered by: S.M. Call

Date: 03/11/93 Time: 1020

Received by: Polly Ellis

Date: 03/11/93 Time: 1020

Sample Matrix: Water

Collection Method: Grab

Sample Identification: 08076003 Elijahs Creeek below airport

REPORT OF ANALYSIS

TOTAL CONSTITUENTS

CONCENTRATION

Acidity	10.3 mg/L
Alkalinity	210 mg/L
BOD-5	96.7 mg/L
Chloride	71.5 mg/L
Conductivity	808 μ mho/cm
Fluoride	0.15 mg/L
Hardness, total	166 mg/L
pH	7.7 S.U.
Total Suspended Solids	1 mg/L
Total Dissolved Solids	460 mg/L
Sulfate	89.3 mg/L
Organic Carbon	44.4 mg/L
Turbidity	6.6 NTU
Ammonia-Nitrogen	0.180 mg/L
Total Kjeldhal Nitrogen	0.817 mg/L
Nitrate	0.450 mg/L
Phosphorus, total	0.076 mg/L
Calcium	97.5 mg/L
Magnesium	16.0 mg/L
Potassium	0.529 mg/L
Sodium	41.7 mg/L
Aluminum	0.260 mg/L
Arsenic	ND @ 0.002 mg/L



TOTAL CONSTITUENTS

CONCENTRATION

Barium	0.059 mg/L
Beryllium	ND @ 0.001 mg/L
Cadmium	ND @ 0.001 mg/L
Chromium	0.001 mg/L
Copper	0.002 mg/L
Iron	1.11 mg/L
Lead	ND @ 0.002 mg/L
Manganese	1.13 mg/L
Mercury	ND @ 0.0001 mg/L
Nickel	ND @ 0.002 mg/L
Selenium	ND @ 0.002 mg/L
Silver	ND @ 0.001 mg/L
Zinc	0.031 mg/L
Phenol	ND @ 0.010 mg/L
Aniline	ND @ 0.010 mg/L
Bis(2-chloroethyl) ether	ND @ 0.010 mg/L
2-Chlorophenol	ND @ 0.010 mg/L
1,3-Dichlorobenzene	ND @ 0.010 mg/L
1,4-Dichlorobenzene	ND @ 0.010 mg/L
Benzyl alcohol	ND @ 0.010 mg/L
1,2-Dichlorobenzene	ND @ 0.010 mg/L
2-Methylphenol	ND @ 0.010 mg/L
4-Methylphenol	ND @ 0.010 mg/L
Bis(2-chloroisopropyl)ether	ND @ 0.010 mg/L
N-Nitrosodi-n-propylamine	ND @ 0.010 mg/L
Hexachloroethane	ND @ 0.010 mg/L
Nitrobenzene	ND @ 0.010 mg/L
Isophorone	ND @ 0.010 mg/L
2-Nitrophenol	ND @ 0.010 mg/L
2,4-Dimethylphenol	ND @ 0.010 mg/L
Bis(2-chloroethoxy)-methane	ND @ 0.010 mg/L
Benzoic Acid	ND @ 0.050 mg/L
2,4-Dichlorophenol	ND @ 0.010 mg/L
1,2,4-Trichlorobenzene	ND @ 0.010 mg/L
Naphthalene	ND @ 0.010 mg/L
4-Chloroaniline	ND @ 0.010 mg/L
1,1,2,3,4,4-Hexachloro-1,3-butadiene	ND @ 0.010 mg/L
4-Chloro-3-methylphenol	ND @ 0.010 mg/L
2-Methylnaphthalene	ND @ 0.010 mg/L
1,2,3,4,5,5-Hexachloro-1,3-cyclopentadiene	ND @ 0.010 mg/L
2,4,6-Trichlorophenol	ND @ 0.010 mg/L
2,4,5-Trichlorophenol	ND @ 0.010 mg/L
2-Chloronaphthalene	ND @ 0.010 mg/L
2-Nitroaniline	ND @ 0.050 mg/L
Dimethyl phthalate	ND @ 0.010 mg/L
Acenaphthylene	ND @ 0.010 mg/L
2,6-Dinitrotoluene	ND @ 0.010 mg/L
3-Nitroaniline	ND @ 0.050 mg/L
Acenaphthene	ND @ 0.010 mg/L
2,4-Dinitrophenol	ND @ 0.050 mg/L

April 1, 1993

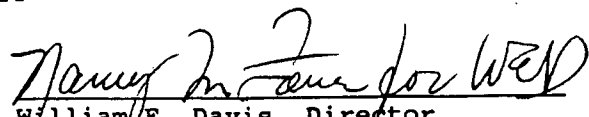
Report Number: A20-01201

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<u>TOTAL CONSTITUENTS</u>	<u>CONCENTRATION</u>
4-Nitrophenol	ND @ 0.050 mg/L
Dibenzofuran	ND @ 0.010 mg/L
2,4-Dinitrotoluene	ND @ 0.010 mg/L
Diethyl phthalate	ND @ 0.010 mg/L
Fluorene	ND @ 0.010 mg/L
4-Chlorophenyl phenyl ether	ND @ 0.010 mg/L
4-Nitroaniline	ND @ 0.050 mg/L
2,4-Dinitro-6-methylphenol	ND @ 0.050 mg/L
N-Nitrosodiphenylamine	ND @ 0.010 mg/L
Diphenylamine	ND @ 0.010 mg/L
Azobenzene	ND @ 0.010 mg/L
4-Bromophenyl phenyl ether	ND @ 0.010 mg/L
Hexachlorobenzene	ND @ 0.010 mg/L
Pentachlorophenol	ND @ 0.050 mg/L
Phenanthrene	ND @ 0.010 mg/L
Anthracene	ND @ 0.010 mg/L
Carbazole	ND @ 0.010 mg/L
Dibutyl phthalate	ND @ 0.010 mg/L
Fluoranthene	ND @ 0.010 mg/L
Benzidine	ND @ 0.050 mg/L
Pyrene	ND @ 0.010 mg/L
Butyl benzyl phthalate	ND @ 0.010 mg/L
3,3'-Dichlorobenzidine	ND @ 0.020 mg/L
Benzo(a)anthracene	ND @ 0.010 mg/L
Chrysene	ND @ 0.010 mg/L
Bis(2-ethylhexyl)phthalate	ND @ 0.010 mg/L ^B
Di-n-octyl phthalate	ND @ 0.010 mg/L
Benzo(b)fluoranthene	ND @ 0.010 mg/L
Benzo(k)fluoranthene	ND @ 0.010 mg/L
Benzo(a)pyrene	ND @ 0.010 mg/L
Indeno(1,2,3-c,d)pyrene	ND @ 0.010 mg/L
Dibenzo(a,h)anthracene	ND @ 0.010 mg/L
Benzo(ghi)perylene	ND @ 0.010 mg/L

ND = Not Detected, B = Analyte Found In Blank

This report has been prepared and reviewed by personnel within the Division of Environmental Services. It has been approved for release.


William E. Davis, Director
Division of Environmental Services

PHILLIP J. SHEPHERD
SECRETARY



BRERETON C. JONES
GOVERNOR

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
FRANKFORT OFFICE PARK
14 REILLY ROAD
FRANKFORT, KENTUCKY 40601

April 1, 1993

Division of Environmental Services
Report Number: A20-01202
Sample Number: 9301201

TO: Division of Water
Frankfort Office Park
Frankfort, Kentucky 40601

RE: Elijahs Creek

ATTN: Michael Mills

County: Boone

Facility:

Collected by: S.M. Call & Lythia Metzmeier

Date: 03/10/93 Time: 1130

Delivered by: S.M. Call

Date: 03/11/93 Time: 1020

Received by: Polly Ellis

Date: 03/11/93 Time: 1020

Sample Matrix: Water

Collection Method: Grab

Sample Identification: 08076004 UT to Elijahs Creek at mouth

REPORT OF ANALYSIS

TOTAL CONSTITUENTS

CONCENTRATION

Acidity	ND @ 0.1 mg/L
Alkalinity	150 mg/L
BOD-5	1.49 mg/L
Chloride	20.0 mg/L
Conductivity	481 μ mho/cm
Fluoride	0.19 mg/L
Hardness, total	168 mg/L
pH	8.3 S.U.
Total Suspended Solids	7 mg/L
Total Dissolved Solids	268 mg/L
Sulfate	68.8 mg/L
Organic Carbon	3.37 mg/L
Turbidity	6.8 NTU
Ammonia-Nitrogen	0.065 mg/L
Total Kjeldhal Nitrogen	0.321 mg/L
Nitrate	1.48 mg/L
Phosphorus, total	0.162 mg/L
Calcium	64.2 mg/L
Magnesium	11.3 mg/L
Potassium	ND @ 0.119 mg/L
Sodium	15.7 mg/L
Aluminum	0.263 mg/L
Arsenic	ND @ 0.002 mg/L



April 1, 1993

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TOTAL CONSTITUENTS

CONCENTRATION

Barium	0.028 mg/L
Beryllium	ND @ 0.001 mg/L
Cadmium	ND @ 0.001 mg/L
Chromium	0.007 mg/L
Copper	0.002 mg/L
Iron	0.323 mg/L
Lead	ND @ 0.002 mg/L
Manganese	0.110 mg/L
Mercury	ND @ 0.0001 mg/L
Nickel	ND @ 0.002 mg/L
Selenium	ND @ 0.002 mg/L
Silver	ND @ 0.001 mg/L
Zinc	0.011 mg/L
Phenol	ND @ 0.009 mg/L
Aniline	ND @ 0.009 mg/L
Bis(2-chloroethyl) ether	ND @ 0.009 mg/L
2-Chlorophenol	ND @ 0.009 mg/L
1,3-Dichlorobenzene	ND @ 0.009 mg/L
1,4-Dichlorobenzene	ND @ 0.009 mg/L
Benzyl alcohol	ND @ 0.009 mg/L
1,2-Dichlorobenzene	ND @ 0.009 mg/L
2-Methylphenol	ND @ 0.009 mg/L
4-Methylphenol	ND @ 0.009 mg/L
Bis(2-chloroisopropyl) ether	ND @ 0.009 mg/L
N-Nitrosodi-n-propylamine	ND @ 0.009 mg/L
Hexachloroethane	ND @ 0.009 mg/L
Nitrobenzene	ND @ 0.009 mg/L
Isophorone	ND @ 0.009 mg/L
2-Nitrophenol	ND @ 0.009 mg/L
2,4-Dimethylphenol	ND @ 0.009 mg/L
Bis(2-chloroethoxy)-methane	ND @ 0.009 mg/L
Benzoic Acid	ND @ 0.046 mg/L
2,4-Dichlorophenol	ND @ 0.009 mg/L
1,2,4-Trichlorobenzene	ND @ 0.009 mg/L
Naphthalene	ND @ 0.009 mg/L
4-Chloroaniline	ND @ 0.009 mg/L
1,1,2,3,4,4-Hexachloro-1,3-butadiene	ND @ 0.009 mg/L
4-Chloro-3-methylphenol	ND @ 0.009 mg/L
2-Methylnaphthalene	ND @ 0.009 mg/L
1,2,3,4,5,5-Hexachloro-1,3-cyclopentadiene	ND @ 0.009 mg/L
2,4,6-Trichlorophenol	ND @ 0.009 mg/L
2,4,5-Trichlorophenol	ND @ 0.009 mg/L
2-Chloronaphthalene	ND @ 0.009 mg/L
2-Nitroaniline	ND @ 0.046 mg/L
Dimethyl phthalate	ND @ 0.009 mg/L
Acenaphthylene	ND @ 0.009 mg/L
2,6-Dinitrotoluene	ND @ 0.009 mg/L
3-Nitroaniline	ND @ 0.046 mg/L
Acenaphthene	ND @ 0.009 mg/L
2,4-Dinitrophenol	ND @ 0.046 mg/L


TOTAL CONSTITUENTS

CONCENTRATION

4-Nitrophenol	ND @ 0.046 mg/L
Dibenzofuran	ND @ 0.009 mg/L
2,4-Dinitrotoluene	ND @ 0.009 mg/L
Diethyl phthalate	ND @ 0.009 mg/L
Fluorene	ND @ 0.009 mg/L
4-Chlorophenyl phenyl ether	ND @ 0.009 mg/L
4-Nitroaniline	ND @ 0.046 mg/L
2,4-Dinitro-6-methylphenol	ND @ 0.046 mg/L
N-Nitrosodiphenylamine	ND @ 0.009 mg/L
Diphenylamine	ND @ 0.009 mg/L
Azobenzene	ND @ 0.009 mg/L
4-Bromophenyl phenyl ether	ND @ 0.009 mg/L
Hexachlorobenzene	ND @ 0.009 mg/L
Pentachlorophenol	ND @ 0.046 mg/L
Phenanthrene	ND @ 0.009 mg/L
Anthracene	ND @ 0.009 mg/L
Carbazole	ND @ 0.009 mg/L
Dibutyl phthalate	ND @ 0.009 mg/L
Fluoranthene	ND @ 0.009 mg/L
Benzidine	ND @ 0.046 mg/L
Pyrene	ND @ 0.009 mg/L
Butyl benzyl phthalate	ND @ 0.009 mg/L
3,3'-Dichlorobenzidine	ND @ 0.019 mg/L
Benzo(a)anthracene	ND @ 0.009 mg/L
Chrysene	ND @ 0.009 mg/L
Bis(2-ethylhexyl)phthalate	0.003 mg/L ^{B, J}
Di-n-octyl phthalate	ND @ 0.009 mg/L
Benzo(b)fluoranthene	ND @ 0.009 mg/L
Benzo(k)fluoranthene	ND @ 0.009 mg/L
Benzo(a)pyrene	ND @ 0.009 mg/L
Indeno(1,2,3-c,d)pyrene	ND @ 0.009 mg/L
Dibenzo(a,h)anthracene	ND @ 0.009 mg/L
Benzo(ghi)perylene	ND @ 0.009 mg/L

ND = Not Detected, B = Analyte Found In Blank, J = Estimated Value

This report has been prepared and reviewed by personnel within the Division of Environmental Services. It has been approved for release.


William E. Davis, Director
Division of Environmental Services

APPENDIX C

Elijah's Creek Diatom Data

Appendix C: Elijah's Creek Diatom Data

Species	76-1	76-1A	76-2	76-4
<i>Achnanthes deflexa</i>	0.0	0.0	8.1	0.0
<i>Achnanthes lanceolata</i>	0.0	0.0	0.0	0.3
<i>Achnanthes lanceolata</i> var. <i>dubia</i>	0.0	1.0	0.0	0.0
<i>Achnanthes minutissima</i>	0.0	0.0	8.1	0.0
<i>Achnanthes</i> spp.	0.0	0.3	0.0	0.0
<i>Amphora perpusilla</i>	0.0	1.6	0.0	0.0
<i>Caloneis bacillum</i>	0.0	0.6	0.5	0.0
<i>Cocconeis placentula</i> var. <i>euglypta</i>	0.0	0.0	0.0	0.0
<i>Cymatopleura solea</i>	0.0	0.0	0.5	0.0
<i>Cymbella delicatula</i>	0.0	0.0	1.5	0.0
<i>Fragilaria vaucheriae</i>	0.7	0.0	0.0	0.0
<i>Gomphonema angustatum</i>	2.3	22.4	3.0	26.7
<i>Gomphonema olivaceum</i>	1.0	0.0	0.0	31.0
<i>Gomphonema parvulum</i>	1.0	0.0	61.1	0.0
<i>Gomphonema truncatum</i>	1.0	0.0	6.6	0.0
<i>Navicula cryptocephala</i>	0.0	0.0	0.0	0.0
<i>Navicula integra</i>	0.0	0.0	0.5	0.0
<i>Navicula menisculus</i> var. <i>upsaliensis</i>	0.0	1.0	0.0	0.0
<i>Navicula minima</i>	0.7	0.6	0.5	0.7
<i>Navicula mutica</i>	0.3	0.0	0.5	0.0
<i>Navicula radiosa</i> var. <i>tenella</i>	0.0	0.3	0.0	0.0
<i>Navicula salinarum</i>	0.0	0.0	0.5	0.0
<i>Navicula secreta</i> var. <i>apiculata</i>	4.3	0.3	0.0	2.0
<i>Navicula</i> spp.	0.0	0.0	0.5	0.0
<i>Navicula subminuscula</i>	0.0	0.0	0.0	0.3
<i>Navicula symmetrica</i>	0.0	0.0	0.5	0.0
<i>Navicula tripunctata</i>	0.0	0.0	0.0	0.0
<i>Navicula viridula</i>	36.5	7.4	0.5	13.3
<i>Nitzschia acicularis</i>	0.0	0.0	0.0	0.0
<i>Nitzschia amphibia</i>	0.0	0.0	0.5	0.0
<i>Nitzschia chasei</i>	0.0	0.0	0.5	0.0
<i>Nitzschia constricta</i>	0.0	0.0	0.0	0.0
<i>Nitzschia dissipata</i>	11.0	3.8	0.5	2.7
<i>Nitzschia dubia</i>	0.0	0.0	0.0	0.0
<i>Nitzschia filiformis</i>	4.7	0.0	0.0	0.0
<i>Nitzschia hungarica</i>	0.3	0.0	0.5	0.7
<i>Nitzschia inconspicua</i>	0.0	1.3	0.0	0.0
<i>Nitzschia linearis</i>	0.0	0.0	0.0	0.0
<i>Nitzschia palea</i>	0.3	0.0	2.0	0.0
<i>Nitzschia sigma</i>	0.0	0.0	0.0	0.0
<i>Nitzschia sociabilis</i>	20.1	1.6	0.0	1.7
<i>Rhoicosphenia curvata</i>	0.0	47.8	0.0	12.0
<i>Surirella ovata</i>	15.7	9.9	3.0	8.7

APPENDIX D

Elijah's Creek Macroinvertebrate Data

Appendix D: Elijah's Creek Macroinvertebrate Data

Taxa	76-1	76-2	76-4
<i>Tricladida</i>			1
<i>Naididae</i>		1	2
<i>Limbriculidae</i>			2
<i>Eclipidrilus sp. (?)</i>			2
<i>Haplotaxa sp.</i>		1	
<i>Crangonyx obliquus</i>			25
<i>C. sp.</i>		7	5
<i>Lirceus fontinalis</i>		6	73
<i>Cambarus sp.</i>		2	
<i>Orconectes rusticus</i>			5
<i>Physella sp.</i>		2	
<i>Musculium transversum</i>			1
<i>Pisidium sp.</i>			1
<i>Stenocron interpunctatum</i>			3
<i>Stenonema femoratum</i>			32
<i>Stenelmis markeli</i>			20
<i>Psephenus herricki</i>			29
<i>Gerris remigis</i>			1
<i>Cheumatopsyche sp.</i>			55
<i>Ceratopsyche sparna</i>			1
<i>Hydropsyche bettini gp</i>			4
<i>Neoplax mitchelli</i>			1
<i>Ironoquia sp.</i>			1
<i>Tipula sp. 1</i>			2
<i>T. sp. 2</i>			1
<i>Cricotopus/Orthocladius sp.</i>			8
<i>Diamesa sp.</i>			2
<i>Dlipocladius sp.</i>			5
<i>Natarsia baltimoreus</i>		1	
<i>Orthocladius obumbratus</i>			30
<i>O. oliveri</i>			63
<i>Parametriocnemus lundbecki</i>			4
<i>Sticochironomus sp.</i>			2