

Appendix C: Existing Studies-Additional Information

Substance	Highest Level Allowed (EPA's MCL*)	Highest Level Detected	Ideal Goals (EPA's MCLG's*)	Sources of Contamination
Microbiological Contaminants				
Turbidity	Treatment Technique*	.30 turbidity units ₁	None	Soil runoff
Radioactive Contaminants				
Alpha emitters ₂	15 pCi/l*	0.4 ±1.3 pCi/l	0	Erosion of natural deposits
Inorganic Contaminants				
Barium	2 ppm*	0.017 ppm	2 ppm	Erosion of natural deposits
Chromium	100 ppb*	1.2 ppb	100 ppb	Erosion of natural deposits
Copper ₇	1.3 ppm (Action Level)*	0.021 ppm (90th Percentile)*	1.3 ppm	Corrosion of household plumbing systems
Fluoride	4 ppm	1.21 ppm ₃	4 ppm	Water additive which promotes strong teeth
Nitrate	10 ppm	0.44 ppm	10 ppm	Erosion of natural deposits
Lead ₇	15 ppb (Action Level)*	4.4 ppb (90th Percentile)*	0	Corrosion of household plumbing systems
Volatile Organic Contaminants				
Total Trihalomethanes	100 ppb	41.1 ppb average ₄	0	By-product of drinking water chlorination
Haloacetic Acids (HAA5)	60 ppb	33.6 ppb average ₆	0	By-product of drinking water chlorination
Synthetic Organic Contaminants				
Atrazine	3 ppb	0.32 ppb	0	Runoff from herbicide used on row crops
Unregulated Contaminants				
Beta emitters _{2,5}	50 pCi/l	1.3 ±2.1 pCi/l	0	Decay of natural and man-made deposits
Chlorine, Free Residual	Not Regulated	1.6 ppm	Not Regulated	Disinfection process
Chlorine, Total Residual	5.0 ppm	2.6 ppm	None	Disinfection process
Haloacetic Acids (HAA5)	60 ppb (proposed)	52.2 ppb average ₆	Not Regulated	By-product of drinking water chlorination
Heterotrophic Plate Count	500 CFU/ml*	> 200 CFU/ml*	None	Natural lake bacteria, wildlife, septic systems
Sodium	Not Regulated	4.8 ppm	Not Regulated	Erosion of natural deposits

Figure 1: Water Quality Table for the City of Bloomington in 2004 – “Listed above are 16 contaminants detected in Bloomington’s drinking water during 2003. All are below allowed levels. Not listed are the almost 90 contaminants for which we tested that were not detected.”¹

¹ 2004 Water Quality Report. City of Bloomington Utilities. Available at: <<http://bloomington.in.gov/utilities/planning.php>>.

City of Bloomington/Monroe County-Studies

Commonwealth Biomonitoring Inc.

This study includes results for three sampling sites along WFCC, two of which were consistent with sites selected for the present analysis. Chemical data were collected for dissolved oxygen, pH, conductivity, temperature, and total suspended solids.

	D.O. (mg/l)	pH (SU)	Cond. (uS)	Temp. (°C)	TSS (mg/l)	Time	Date
1996							
WFCC1	12.6	8.0	320	7.0	7	1615	11/27
WFCC2	12.6	8.0	330	7.5	10	1551	11/27
WFCC3	12.6	7.9	370	6.5	8	1640	11/27
1997							
WFCC1	13.2	8.1	400	11	7	0920	5/22
WFCC2	13.0	8.1	300	13	12	0945	5/22
WFCC3	14.0	8.0	400	11	11	0830	5/22

Figure 2: Chemical Data from WFCC sampling sites.²

It was further noted that stream impairment was due to:

- Riparian habitat damage;
- Sedimentation problems (fresh sediment from construction), and;
- Eutrophication problems (excess algae).³

The level of degradation in Clear Creek was found to be severe, even more so than expected from investigation of other urban streams.⁴

	WFCC1	WFCC2	WFCC3
E. Coli	< 20 colonies/100 ml	< 20 colonies/100 ml	20 colonies/100 ml
Fall 1996			
Habitat Score	46	56	58
1996 Biotic Index Score	30-slightly impaired	30-slightly impaired	24-moderately impaired
Spring 1997			
1997 Biotic Index Score	14-moderately impaired	26-slightly impaired	20-moderately impaired

Figure 3: Biotic and Habitat Indices for WFCC sampling sites.⁵

² Commonwealth Biomonitoring, Inc., Bloomington/Monroe County Urban Non-point Source Water Pollution Assessment Project. September 1997. Vol. 1, pp. 30-31.

³ Commonwealth Biomonitoring, Inc., *Ibid.*, at p. 34.

⁴ Commonwealth Biomonitoring, Inc., *Ibid.*, at p. 34.

⁵ Commonwealth Biomonitoring, Inc., *supra*, note 2

Bloomington Environmental Commission

The West Fork of Clear Creek showed “fewer pollution problems but also exhibited riparian habitat damage, sedimentation and eutrophication (excess nutrients and algal growth) problems.”⁶ Clear Creek as a whole was listed as a Group 5 waterway, indicating that no fish from the waterway should be consumed due to PCB and mercury contamination.⁷

I-69 Environmental Impact Statement

An Environmental Impact Statement conducted for the proposed I-69 highway project confirms Clear Creek’s fish consumption advisory in addition to containing “Impaired Biotic Communities” and the presence of *E. coli* bacteria.⁸ Elevated levels of mercury and PCB contamination have also been documented.⁹ The primary source of PCB contamination is from industrial inputs from the former Westinghouse Corporation plant in Bloomington, and although cleanup has been ongoing and generally effective, there is still substantial concentration in fish.¹⁰

PCB History

Clear Creek has a history of PCB (polychlorinated biphenyl) contamination since the mid 1950’s when Westinghouse Corporation disposed of PCB contaminated waste in local landfills. This contaminant has since leached into the waters of the County and, according to one public health assessment, “[t]he sediment and surface water of Clear Creek are contaminated with PCBs at levels of health concern. The levels of PCBs found in fish taken from Clear Creek are above the FDA recommended level.”¹¹ PCBs have been primarily used as solvents and lubricants in manufacturing and as such, do not quickly degrade. They are also probable carcinogens and may have other health effects such as skin rashes and liver damage.¹²

⁶ Bloomington Environmental Quality Indicators. July 2001. Environmental Commission, City of Bloomington, Indiana.

⁷ *Ibid.*

⁸ I-69 Evansville to Indianapolis, Indiana, Tier 1, Final Environmental Impact Statement. Chapter 5.24, December 5, 2003. Conducted by Bernardin, Lochmueller and Associates, Inc. for the benefit of the U.S. Department of Transportation, Federal Highway Administration and the Indiana Department of Transportation. Available at: <http://deis.i69indyevn.org/FEIS/Vol1-FEIS/PDF/Chapter05_24.pdf>

⁹ *Ibid.*

¹⁰ *Ibid.*

¹¹ Public Health Assessment, Bloomington PCB Sites, Bloomington, Monroe County, Indiana and Spencer, Owen County, Indiana. Revised November 15, 1996. Division of Health Assessment and Consultation, Agency for Toxic Substances and Disease Registry, Department of Health and Human Services, Public Health Service, Atlanta, Georgia. Available at: <http://www.atsdr.cdc.gov/HAC/PHA/bloom1/bl1_toc.html>.

¹² Polychlorinated Biphenyls (PCBs). February 2001. Agency for Toxic Substances and Disease Registry. U.S. Department of Health and Human Services. Available at: <<http://www.atsdr.cdc.gov/tfacts17.html>>.

<u>WATER BODY</u>	<u>PARAMETERS OF CONCERN</u>
Beanblossom Creek*	E. Coli
Clear Creek	E. Coli
	Impaired Biotic Communities
	FCA for PCBs
East Fork Jackson Creek	Impaired Biotic Communities
Griffy Reservoir	FCA for Mercury
Jacks Defeat Creek	E. Coli
	Impaired Biotic Communities
Jackson Creek	Impaired Biotic Communities
Monroe Reservoir (Upper)*	Taste & Odor; Algae FCA for Mercury
Monroe Reservoir (Lower)	FCA for Mercury Taste & Odor; Algae
Richland Creek*	Impaired Biotic Communities
	FCA for PCBs
	FCA for Mercury
Unnamed Tributary of Jackson Creek	Impaired Biotic Communities
White River*	FCA for PCBs
	FCA for Mercury
	Impaired Biotic Communities
Stout Creek	FCA for PCBs
	FCA for Mercury
South Fork Griffy Creek	Impaired Biotic Communities

*not in Unincorp. Monroe Co. MS4 Area

FCA - Fish Consumption Advisory

PCBs - Carcinogen

Mercury - Poison

E. Coli - Bacteria indicating that fecal matter is present in streams, therefore it is possible for pathogens associated with fecal matter to be present

13 Water Bodies Total:
3 cited for E. Coli
8 cited for Impaired Biotic Communities
6 cited for Mercury
4 cited for PCBs

Figure 4: 2004 303(d) List of Impaired Water Bodies for Monroe County.¹³

¹³ 2004 List of Monroe County Urbanized Area's Impaired Water Bodies. June 2005. Storm Water Education, Highway Department, Monroe County Government. Available at: <<http://www.co.monroe.in.us/stormwaterquality/sweducation.html>>.

Hoosier Riverwatch Data

Habitat Data

The Citizens Qualitative Habitat Evaluation Index (CQHEI) was developed by the Ohio Environmental Protection Agency as a more easily used and understood version of the Qualitative Habitat Evaluation Index (QHEI). The CQHEI is used by stream monitoring groups, such as Hoosier Riverwatch, and incorporates information about substrate, fish cover, stream shape & human alterations, stream forests & wetlands & erosion, depth & velocity, and riffles/runs. If the CQHEI score is over 100, the stream is considered of high quality and scores greater than 60 have been found to be “generally conducive to the existence of warm water fauna.”¹⁴

Site ID	Watershed Name	River Name	Description	Time	Date	Weather	Past Weather	CQHEI
830	Lower East-Fork White 05120208	WFCC	Tapp Rd., north of bridge	1:30 pm	10/14/2004	Overcast	Rain	69.5
831	Lower East-Fork White	WFCC	Rockport Rd., south of bridge	2:15 pm	10/14/2004	Overcast	Rain	76
832	Lower East-Fork White	WFCC	That Rd., north of bridge	3:00 pm	10/14/2004	Overcast	Rain	78
833	Lower East-Fork White	WFCC	Church Ln, below trail bridge at parking lot	3:30 pm	10/7/2004	Clear/Sunny	Clear/Sunny	78

Figure 5: Habitat data for WFCC from Hoosier Riverwatch Database, as of 6/15/05.¹⁵

¹⁴ Hoosier Riverwatch, Volunteer Stream Monitoring Internet Database. Indiana Department of Natural Resources, Division of Fish and Wildlife. Available at: www.hoosieriverwatch.com.

¹⁵ Hoosier Riverwatch, *Ibid.*

Chemical Data

Because the Hoosier Riverwatch chemical data collection methodology was the main guide for the current study, the format and compliment of data are very similar. The sampling locations 831 and 833 however, do not exactly coincide with the sites chosen for the current investigation.

Site ID	Watershed Name	River Name	Description	Time	Date	Current Weather	Past Weather	DO (ppm)	DO (% Saturation)	pH	Temp Change (C)	Temp Celsius (C)	Orthophosphate (mg/l)	Nitrate NO3 (mg/l)	Turbidity (NTU)
830	Lower East-Fork White 05120208	W. Fork Clear Creek	Tapp Rd., north of bridge	1:30 pm	10/14/2004	Overcast	Rain	6	59	8		14	0	0	15.01
830	Lower East-Fork White 05120208	W. Fork Clear Creek	Tapp Rd., north of bridge	1:30 pm	11/19/2004	Overcast	Showers	10	95	8		14	0.15	0.5	15.01
831	Lower East-Fork White 05120208	W. Fork Clear Creek	Rockport Rd., south of bridge	2:15 pm	10/14/2004	Overcast	Rain	7	67	7.6	1	15	0	1.5	15.01
832	Lower East-Fork White 05120208	W. Fork Clear Creek	That Rd., north of bridge	3:00 pm	10/14/2004	Overcast	Rain	9	89	7.4	0	15	0.5	0.4	15.01
833	Lower East-Fork White 05120208	W. Fork Clear Creek	Church Ln., below trail bridge at parking lot	3:30 pm	10/7/2004	Clear/Sunny	Clear/Sunny	11	100	7.8		15	0.6	0.2	15.01

Figure 6: Chemical data for WFCC from the Hoosier Riverwatch Database, as of 6/15/05.¹⁶

¹⁶ Hoosier Riverwatch, Volunteer Stream Monitoring Internet Database. Indiana Department of Natural Resources, Division of Fish and Wildlife. Available at: www.hoosieriverwatch.com.