

**Summary of University of Kentucky
PCB/Metals Data Collection Efforts at the Paducah Gaseous Diffusion Plant
1997-2007**

2009

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INTRODUCTION

From 1997 through 2007, Dr. Wesley Birge (University of Kentucky) coordinated the collection of water and sediment samples at the Paducah Gaseous Diffusion Plant and the surrounding West Kentucky Wildlife Management Area through a contract with the Kentucky Division of Waste Management. This project was funded through the Kentucky Department of Environmental Protection from funding received from the Department of Energy as part of the Kentucky Agreement in Principle (AIP). In addition to water and sediment samples, samples from animal tissue were also collected and analyzed. Collected samples were analyzed for a range of constituents, including PCBs, various metals of concern (e.g. Ag, Be, Cd, Cr, Cu, Ni, Pb, Zn) and mercury. This research resulted in 58 reports which are summarized in Table 2.

Study Area

The study area and associated major collection sites for this work are detailed in Figures 1, 2 and 3. Figure 1 shows the major collecting sites, as well as the intermittent (003, 013, 014, 015, 016, 017) and continuously flowing PGDP effluents. Figure 2 is an illustration of the Bayou Creek system diagramed over a topographical map of the area and Figure 3 is an enlargement of the PGDP sector of Figure 2. The collecting sites on Big Bayou Creek in downstream order, include BB1A, BB1, BB3, BB4, BB5, BB6, BB7, BB8, BB9, CF1, and CF3. Stations BB2 and BB2A are situated on the unnamed tributary that enters Big Bayou Creek just upstream of station BB3 (Figure 1). Stations CF1 and CF2 are upstream of the juncture of Big and Little Bayou Creeks and CF3 is below this confluence and near the Ohio River. Locations of these stations and the

position of the continuously flowing effluents are given in Table 1 in stream kilometers (Km) measured upstream from the Ohio River. The intermittent 003 effluent and the north/south (N-S) ditch are illustrated in Figures 2 and 3. The N-S ditch enters Little Bayou Creek about 1 Km upstream of station LB4. Figure 3 also shows intermittent effluents 013 on Little Bayou Creek, as well as 017 and 014 that enter Big Bayou Creek. Intermittent effluents 016 and 015 are not shown in Figures 2 and 3. They enter Big Bayou Creek just below station BB3 and upstream of BB4, respectively (Figure 1). The continuous effluents originate from plant operations, whereas the intermittent effluent primarily carry “runoff” from the plant during periods of moderate to high rainfall.

Table 1. Location of Stream Sampling Stations and Effluent Discharge Points to Big Bayou (BB) and Little Bayou (LB) Creeks.

| Effluent | Stream Location | Stream Kilometer ¹ |
|----------|-------------------------------------|-------------------------------|
| | BB1 (upstream reference) | 13.5 |
| 009 | | 12.1 |
| | BB2 (tributary) ² , BB2A | 11.5 |
| | BB3 | 11.7 |
| 008 | | 11.2 |
| | BB4A | 11.0 |
| | BB4 | 10.8 |
| 006 | | 10.6 |
| | BB5 | 10.5 |
| 001 | | 10.4 |
| | BB6 | 10.2 |
| | BB7 | 9.5 |
| | BB8 | 7.4 |
| | BB9 | 2.8 |
| | CF1 | 1.0 |
| | CF3 | 0.2 |
| | LB1 (upstream reference) | 11.4 |
| 012 | | 9.8 |
| 011 | | 9.4 |
| | LB2A | 9.2 |
| 010 | | 9.1 |
| | LB2 | 9.0 |
| 002 | | 8.6 |
| | LB3 | 7.8 |
| | LB4 | 4.3 |
| | CF2 | 1.0 |

¹ Measured as upstream distance from confluence with the Ohio River.

² Collecting stations BB2 located on a tributary 1.5 Km upstream of its confluence with Big Bayou Creek and BB2A located near the confluence.

³ Collecting stations BB1A and BB1AA (not shown) are located 200 and 400 m upstream of station BB1.

⁴ Eight or more additional collecting stations will be added in the Ohio River, four downstream of the Bayou Creek confluence and four upstream and will be sampled simultaneously with Bayou sites CF1, CF2, and CF3.

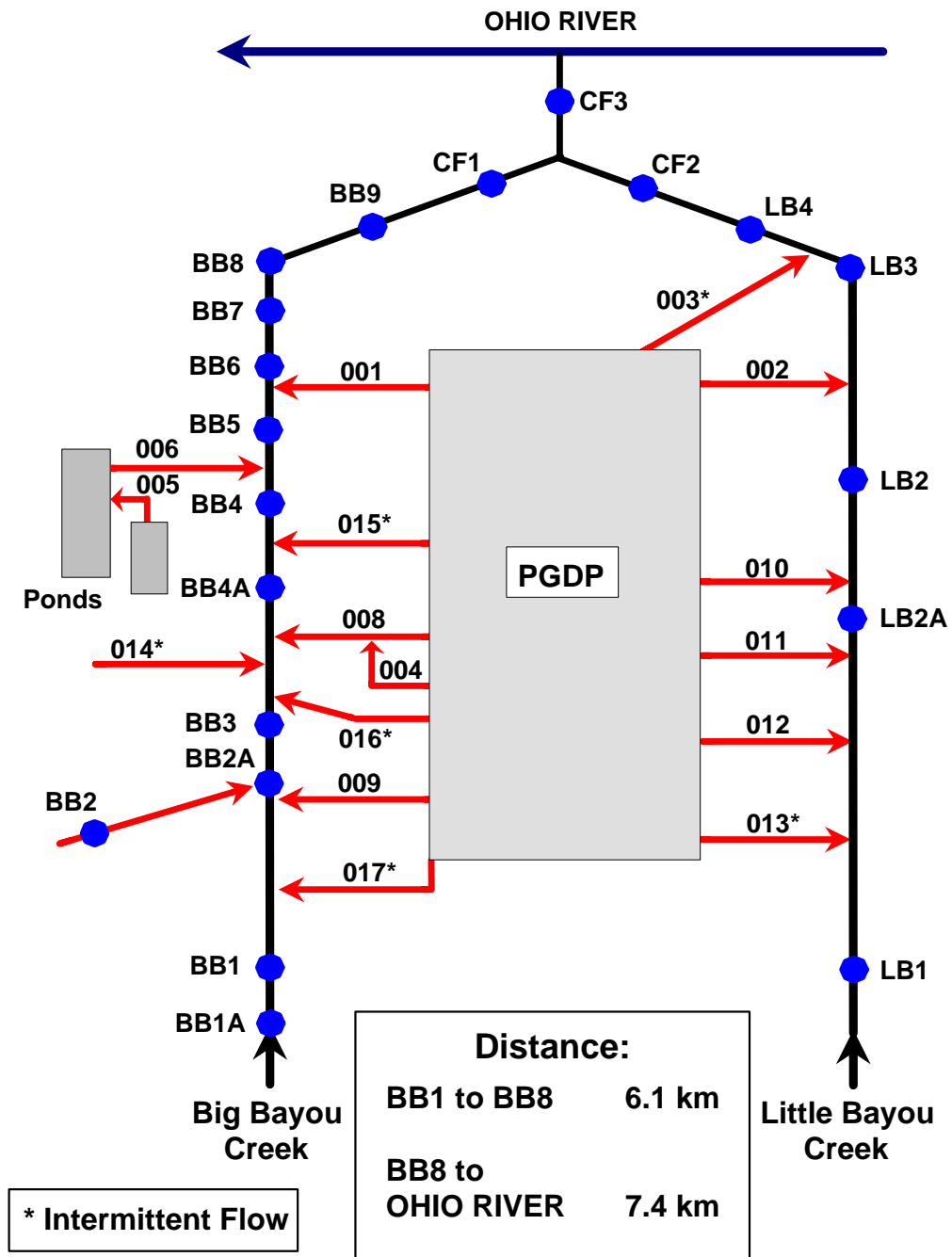


Figure 1. Schematic Map of PGDP Study Area



Figure 2. UK/KYDWM Sampling Sites (1997-2007)



Figure 3. UK/KYDWM Sampling Sites (1997-2007)

Table 2: List of Electronic Reports Developed (1997-2007)

1. (EFFLUENT MONITORING)

Effluent Monitoring by the Paducah Gaseous Diffusion Plant (PGDP), 1987-1996.
D. J. Price and M. D. Kercher
January 7, 1998. (6 pp.)

2. (WATER QUALITY PARAMETERS)

On-Site Measurements of General Water Quality Parameters in Big and Little Bayou Creeks.

W.J. Birge and D. J. Price
July, 1997. (7 pp.)

3. (PCBs IN FISH)

Report to FFOU on Polychlorinated Biphenyl (PCB) Residues in Fish from the Bayou Creek System.

W. J. Birge, D. J. Price, and M. D. Kercher
January 30, 1998. (13 pp.)

4. (METALS IN SEDIMENTS)

Analysis of Metals in Sediments from the Bayou Creek System.

W.J. Birge, D. J. Price, and M. D. Kercher
February 11, 1998. (16 pp.)

5. (RACCOON PROPOSAL)

Assessment of Polychlorinated Biphenyl (PCB) and Mercury Exposure to Raccoon (*Procyon lotor*) Populations in the Bayou Creek Drainage: An FFOU Study.

W. J. Birge and J. Maybriar
(11 pp.)

6. (PCBs IN WATER)

PCB Assays for Water Samples from Little Bayou Creek Collected in September, 1997.
(4 pp.)

7. (PERIPHYTON MONITORING)

Periphyton Monitoring in the Bayou System, 1996-1997.

D. J. Price, W. J. Birge, and M. D. Kercher
March 5, 1998. (7 pp.)

8. (PCBs IN RED-TAILED HAWK BLOOD, MINK AND DEER LIVER AND KIDNEY)

Analysis of Polychlorinated Biphenyls (PCB) in Red-tailed Hawk Blood, Mink and Deer Liver and Kidney. D. J. Price and W. J. Birge

March 5, 1998 (8 pp.)

9. (METAL BODY BURDEN IN STONEROLLERS)

Metal Body Burden in Stoneroller Minnows (*Campostoma anomalum*) from the Bayou Creek System. W.J. Birge, D. J. Price, and M. D. Kercher
April 10, 1998. (31 pp.)

10. (MERCURY IN SEDIMENT)

Analysis of Mercury in Stream Sediment from PGDP.
A. J. Wigginton and W. J. Birge
April 30, 1998 (6 pp.)

11. (METALS IN RED-TAILED HAWK BLOOD)

Analysis of Metals in Red-tailed Hawk Blood from PGDP.
D. J. Price and W. J. Birge
May 28, 1998 (4 pp.)

12. (MERCURY IN WATER, SEDIMENTS AND FISH)

Analysis of Mercury in Stream Water, Sediments and Fish from the Bayou Creek System.
A. J. Wigginton, D. J. Price, and W. J. Birge
May 28, 1998 (14 pp.)

13. (METALS, MERCURY AND PCBs IN WATER)

Report to FFOU on Metals, Mercury and Polychlorinated Biphenyl (PCB) Residues in Water Samples Collected October 20, 1998 from the Bayou Creek System.
W. J. Birge and D. J. Price
January 26, 1999 (17 pp.)

14. (METALS AND PCBs IN WATER)

Analysis of Metals and Polychlorinated Biphenyl (PCB) Residues in Water Samples Collected September 9, 1999 from the Bayou Creek System.
W. J. Birge and D. J. Price
December 3, 1999 (17 pp.)

15. (METALS AND PCBs IN WATER)

Analysis of Metals and Polychlorinated Biphenyl (PCB) Residues in Water Samples Collected September 9, 1999 from the Bayou Creek System.
W. J. Birge and D. J. Price
December 3, 1999 (15 pp.)

16. (PCBs IN SEDIMENTS)

Analysis of Polychlorinated Biphenyl (PCB) Residues in Stream Sediment Samples Collected September 9, 1999 from the Bayou Creek System.
W. J. Birge and D. J. Price
March 14, 2000 (18 pp.)

17. (METALS IN SEDIMENTS)

Analysis of Metals in Sediments from the Bayou Creek System.

W. J. Birge and D. J. Price

March 14, 2000 (25 pp.)

18. (MERCURY IN WATER)

Analysis of Mercury in Stream Water Samples Collected September 9, 1999 from the Bayou Creek System.

A.J. Wigginton and W.J. Birge

March 14, 2000 (3 pp.)

19. (IRON IN WATER AND SEDIMENTS)

Analysis of Iron in Water and Sediments Samples Collected September 9, 1999 and February 28 – March 1, 2000 from the Bayou Creek System.

W. J. Birge and D. J. Price

June 28, 2000 (17 pp.)

20. (METALS AND PCBs IN BEAVER)

Analysis of Metals and Polychlorinated Biphenyl (PCB) Residues in Beaver Tissue Samples Collected January 27 and February 1, 2000 from PGDP Ditches.

W. J. Birge and D. J. Price

June 27, 2000 (11 pp.), Final February 7, 2001

21. (PCBs IN WATER)

Analysis of PCB Assays in Water Samples Collected February 28 – March 1, 2000 from the Bayou Creek System.

W. J. Birge and D. J. Price

February 13, 2001 (8 pp.)

22. (METALS AND PCBs IN HONEYBEES, HONEY AND POLLEN)

Analysis of Metal and Polychlorinated Biphenyl (PCB) Residues in Honeybees, Honey, and Pollen Samples Collected From the Paducah Gaseous Diffusion Plant and Other Areas.

W. J. Birge and D. J. Price

March 9, 2001 (17 pp.)

23. (METALS IN WATER)

Analysis of Metal Concentrations in Water Samples Collected February 28 – March 1, 2000 from the Bayou Creek System.

W. J. Birge and D. J. Price

April 25, 2001 (14 pp.)

24. (METALS AND PCBs IN WATER)

Polychlorinated Biphenyls (PCB) and Metals in Water Samples Collected September 25, 2000 from the Bayou Creek System.

W. J. Birge and D. J. Price, April 25, 2001 (19 pp.)

25. (METALS IN STONEROLLERS)

Analysis of Metals in Stoneroller Minnows Collected February 28 – March 1, 2000 from the Bayou Creek System. W. J. Birge and D. J. Price, May 7, 2001 (42 pp.)

26. (SUMMARY OF STUDIES)

Summary of Monitoring Studies Reported in December 1997 through December 1999. W. J. Birge and D. J. Price
March 23, 2000, Revised March 24, 2000 (21 pp.), Final August 29, 2001

27. (PCBs IN FISH)

Analysis of Polychlorinated Biphenyl (PCB) Residues in Fish Collected July 27, 2000 from Little Bayou Creek.
W. J. Birge and D. J. Price
February 6, 2001, Final August 28, 2001 (8 pp.)

28. (PCBs IN FISH)

Analysis of Polychlorinated Biphenyl (PCB) Residues in Fish Collected March 13-14, 2001 from the Bayou Creek System.
W. J. Birge and D. J. Price
August 29, 2001 (11 pp.)

29. (METALS AND PCBs IN WATER)

Analysis of Polychlorinated Biphenyl (PCB) Residues and Metals in Water Samples Collected February 19-20, 2001 from the Bayou Creek System.
W. J. Birge and D. J. Price
February 1, 2002

30. (METALS AND PCBs IN SEDIMENTS)

Analysis of Polychlorinated Biphenyl (PCB) Residues and Metals in Sediment Samples Collected February 19-20, 2001 from the Bayou Creek System.
W. J. Birge and D. J. Price
February 4, 2002

31. (PCBs IN STONEROLLERS)

Analysis of Polychlorinated Biphenyl (PCB) Residues in Whole-body Stoneroller Minnows Collected March 13-14, 2001 from the Bayou Creek System.
W. J. Birge and D. J. Price
October 9, 2001

32. (METALS IN STONEROLLERS)

Analysis of Metals in Stoneroller Minnows Collected March 13-14, 2001 from the Bayou Creek System.
W. J. Birge and D. J. Price
February 7, 2002

33. (METALS AND PCBs IN WATER)

Analysis of Polychlorinated Biphenyl Mixtures (PCB) and Metals in Water Samples Collected from the Bayou Creek System on August 13-14, 2001.

W. J. Birge and D. J. Price

July 19, 2002

34. (METALS AND PCBs IN SEDIMENTS)

Analysis of Polychlorinated Biphenyl Mixtures (PCB) and Metals in Sediment Samples Collected August 13-14, 2001 from the Bayou Creek System.

W. J. Birge and D. J. Price

April 18, 2002

35. (PCBs IN FISH)

Analysis of Polychlorinated Biphenyl (PCB) Residues in Fish Collected August 13-14, 2001 from the Bayou Creek System.

W. J. Birge and D. J. Price

July 19, 2002

36. (PCBs IN STONEROLLERS)

Analysis of Polychlorinated Biphenyl (PCB) Residues in Stoneroller Minnows Collected August 13-14, 2001 from the Bayou Creek System.

W. J. Birge and D. J. Price

July 19, 2002

37. (PCBs IN WATER)

Analysis of Polychlorinated Biphenyl Mixtures (PCB) and Metals in Water Samples Collected from the Bayou Creek System on June 3-4, 2002.

W. J. Birge and D. J. Price

March 18, 2003

38. (PCBs IN SEDIMENTS AND FLOODPLAINS)

Polychlorinated Biphenyl (PCB) Residues in Stream Sediments and Floodplains Soils Collected June 3-4, 2002 from the Bayou Creek System.

W. J. Birge and D. J. Price

July 30, 2003

39. (PCBs IN FISH)

Analysis of Polychlorinated Biphenyl (PCB) Residues in Fish Collected June 4-5, 2002 from the Bayou Creek System.

W. J. Birge and D. J. Price

July 2, 2003

40. (METALS IN WATER, SEDIMENTS, FLOODPLAIN SOILS)

Analysis of Metals in Water, Stream Sediments and Floodplain Soils Collected June 3-4, 2002 from the Bayou Creek System

W. J. Birge and D. J. Price, December 9, 2003

41. (PCBs IN FISH)

Analysis of Polychlorinated Biphenyl (PCB) Residues in Fish Collected March 26-28, 2003 from the Bayou Creek System

W. J. Birge and D. J. Price, December 4, 2003

42. (PCBs IN WATER, SEDIMENTS, FLOODPLAIN SOILS)

Polychlorinated Biphenyl (PCB) Residues in Water, Stream Sediments and Floodplain Soils Collected March 26-28, 2003 from the Bayou Creek System

W. J. Birge and D. J. Price

April 29, 2004

43. (PCBs IN FISH)

Analysis of Polychlorinated Biphenyl (PCB) Residues in Fish Collected September 8-10, 2003 from the Bayou Creek System

W. J. Birge and D. J. Price

May 7, 2004

44. (PCBs IN WATER, SEDIMENTS, FLOODPLAIN SOILS)

Polychlorinated Biphenyl (PCB) Residues in Water, Stream Sediments and Floodplain Soils Collected September 8-10, 2003 from the Bayou Creek System

W. J. Birge and D. J. Price

March 18, 2005

45. (PCBs IN WATER, SEDIMENTS, FLOODPLAIN SOILS)

Polychlorinated Biphenyl (PCB) Residues in Water, Stream Sediments and Floodplain Soils Collected March 16-18, 2004 from the Bayou Creek System

W. J. Birge and D. J. Price

March 18, 2005

46. (PCBs IN FISH)

Analysis of Polychlorinated Biphenyl (PCB) Residues in Fish Collected March 16-18, 2004 from the Bayou Creek System

W. J. Birge and D. J. Price

April 8, 2005

47. (METALS IN WATER, SEDIMENTS, FLOODPLAIN SOILS)

Analysis of Metals in Water, Stream Sediments and Floodplain Soils Collected March 26-27, 2003 from the Bayou Creek System

W. J. Birge and D. J. Price

July 22, 2005

48. (PCBs IN WATER, SEDIMENTS, FLOODPLAIN SOILS)

Polychlorinated Biphenyl (PCB) Residues in Water, Stream Sediments and Floodplain Soils Collected October 1-2, 2004 from the Bayou Creek System

W. J. Birge and D. J. Price

September 9, 2005

49. (PCBs IN WATER, SEDIMENTS, FLOODPLAIN SOILS)

Polychlorinated Biphenyl (PCB) Residues in Water, Stream Sediments and Floodplain Soils Collected March 21-23, 2005 from the Bayou Creek System
W. J. Birge and D. J. Price, December 1, 2005

50. (METALS IN WATER, SEDIMENTS, FLOODPLAIN SOILS)

Analysis of Metals in Water, Stream Sediments and Floodplain Soils Collected March 16-18, 2004 and October 1-2, 2004 from the Bayou Creek System
W. J. Birge and D. J. Price
December 7, 2005

51. (PCBs IN FISH)

Analysis of Polychlorinated Biphenyl (PCB) Residues in Fish Collected March 21-23, 2005 from the Bayou Creek System
D. J. Price
July 19, 2006

52. (METALS IN WATER, SEDIMENTS, FLOODPLAIN SOILS)

Analysis of Metals in Water, Stream Sediments and Floodplain Soils Collected March 21-23, 2005 from the Bayou Creek System
D. J. Price
December 7, 2006

53. (PCBs IN WATER, SEDIMENTS, FLOODPLAIN SOILS)

Polychlorinated Biphenyl (PCB) Residues in Water, Stream Sediments and Floodplain Soils Collected May 23-25, 2006 from the Bayou Creek System
D. J. Price
January 24, 2007

54. (PCBs IN FISH)

Analysis of Polychlorinated Biphenyl (PCB) Residues in Fish Collected May 24-25, 2006 from the Bayou Creek System
D. J. Price
January 24, 2007

55. (METALS IN WATER, SEDIMENTS, FLOODPLAIN SOILS)

Analysis of Metals in Water, Stream Sediments, and Floodplain Soils Collected May 23-25, 2006 from the Bayou Creek System
A. J. Wigginton and D. J. Price
February 20, 2007

56. (PCBs IN WATER, SEDIMENTS, FLOODPLAIN SOILS)

Polychlorinated Biphenyl (PCB) Residues in Water, Stream Sediments and Floodplain Soils Collected September 18-21, 2006 from the Bayou Creek System
D. J. Price
April 20, 2007

57. (METALS AND PCBs IN CONFLUENCE SEDIMENTS)

Polychlorinated Biphenyls (PCBs) and Metals in Sediments Cores Collected September 20, 2006 from the Ohio River Sand Bank at the Bayou Creek – Ohio River Confluence

D. J. Price and A. J. Wigginton

May 10, 2007

58. (METALS IN WATER, SEDIMENTS, FLOODPLAIN SOILS)

Analysis of Metals in Water, Stream Sediments, and Floodplain Soils Collected September 18-21, 2006 from the Bayou Creek System

A. J. Wigginton and D. J. Price

June 20, 2007