

Floodplain Soil Sampling

South River Science Team

Expert Panel Meeting

November 9, 2004

Available Floodplain Soil Data

- Hendricks Survey - 1980
- Deep Core in Wetland - 2002
- Forestry Station Survey - 2003
- Greenway Sampling – 2003
- Floodplain Soil Sampling - 2004

Objectives

- The objectives of recent (Summer 2004) floodplain sampling were:
 - To determine general "representative" levels of mercury in floodplain soils relative to data currently available, and
 - To leverage this activity with data gathering for helping to refine the conceptual site model (CSM), including potentially defining continuing sources.

Summary of Floodplain Data

Event	Year	Site	River Mile(s)	Number of Locations	Sample Type	Low (ppm)	High (ppm)
Circa 1980 Shallow	~1980	South River	0 to 25	25	Shallow Composite	0.200	37
Circa 1980 Deep	~1980	South River	1 to 8	7	12-15"	0.300	330
Deep Cores	2002	Near Dooms	6	3	70 cm to 100 cm Cores	1.000	110
Forestry Garden	2003	Forestry Station	12	59	0-6"	0.020	54
Forestry Cores	2003	Forestry Station	12	6	12" to 21" Cores	0.100	63
Forestry Erosion	2003	Forestry Station	12	1	5 slice bank sample	4.500	15
Loath Spring	2003	Opposite Plant	-0.5 to 0	10	Surface & 3' Cores	0.012	1
Greenway	2003	Opposite Plant	0 to 0.25	14	3 ' Cores	0.019	65
Plant Recreation Area	2003	North of Plant	0.1 to 0.25	6	3 ' Cores	0.030	122
Forestry Cores	2003	Forestry Station	12	10	8, 36" Cores + 2 surface	0.016	94
Floodplain Representative	2004	South River	1 to 25	24	0-0.5, 1-1.5ft Composites	0.500	73
Floodplain Conceptual	2004	South River	2 to 25	39	0-0.5, 0.5 - 1, 1-1.5ft	0.600	47
Floodplain Cores	2004	Crimora	10.5	2	11 slice, 3 ft cores	0.800	124
Bank Erosion	2004	Forestry Station	12	1	10 slice bank sample	4.300	10
Hopeman Erosion	2004	Hopeman Pkwy	3	1	20 slice bank sample	In Process	In Process
Dam Erosion	2004	McGaheysville	30 S.Fork	1	20 slice bank sample	In Process	In Process

- Recent observations are consistent with 1980 findings.
- Surface Hg concentrations in soils to Port Republic are (on average) order-of-magnitude 10 ppm dry wt.
- Depth profiles indicate higher concentrations with depth, but not always. Deposition history variable?
- Based on sampling to date, no high concentration bank outcrops have been found.

Next Steps

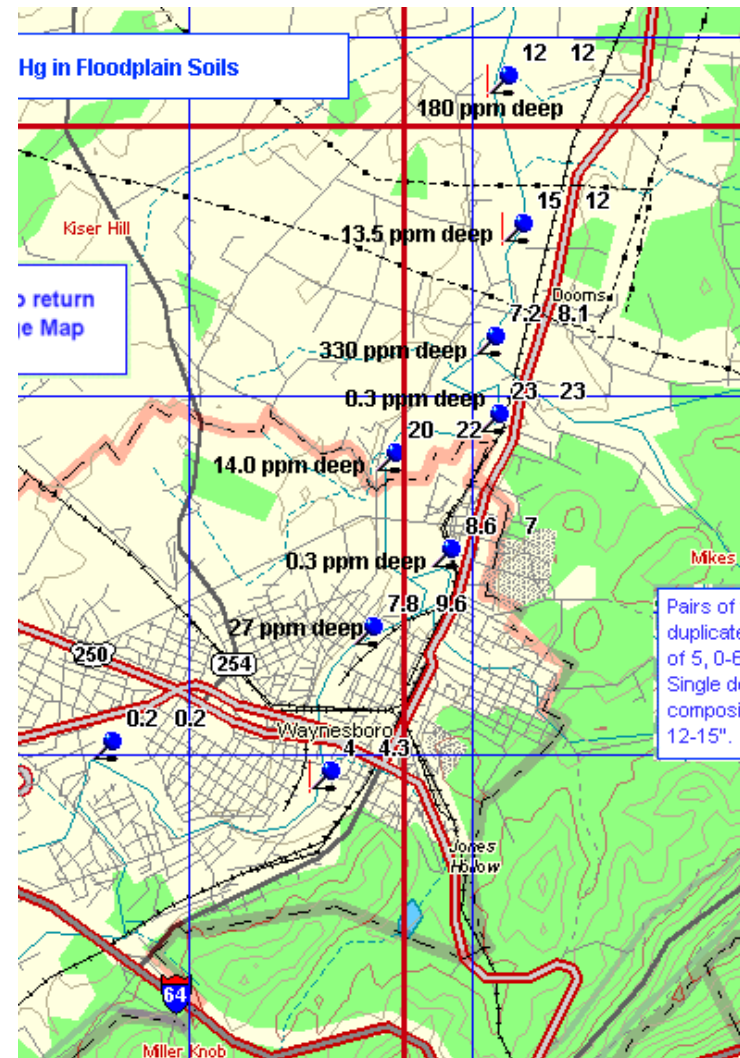
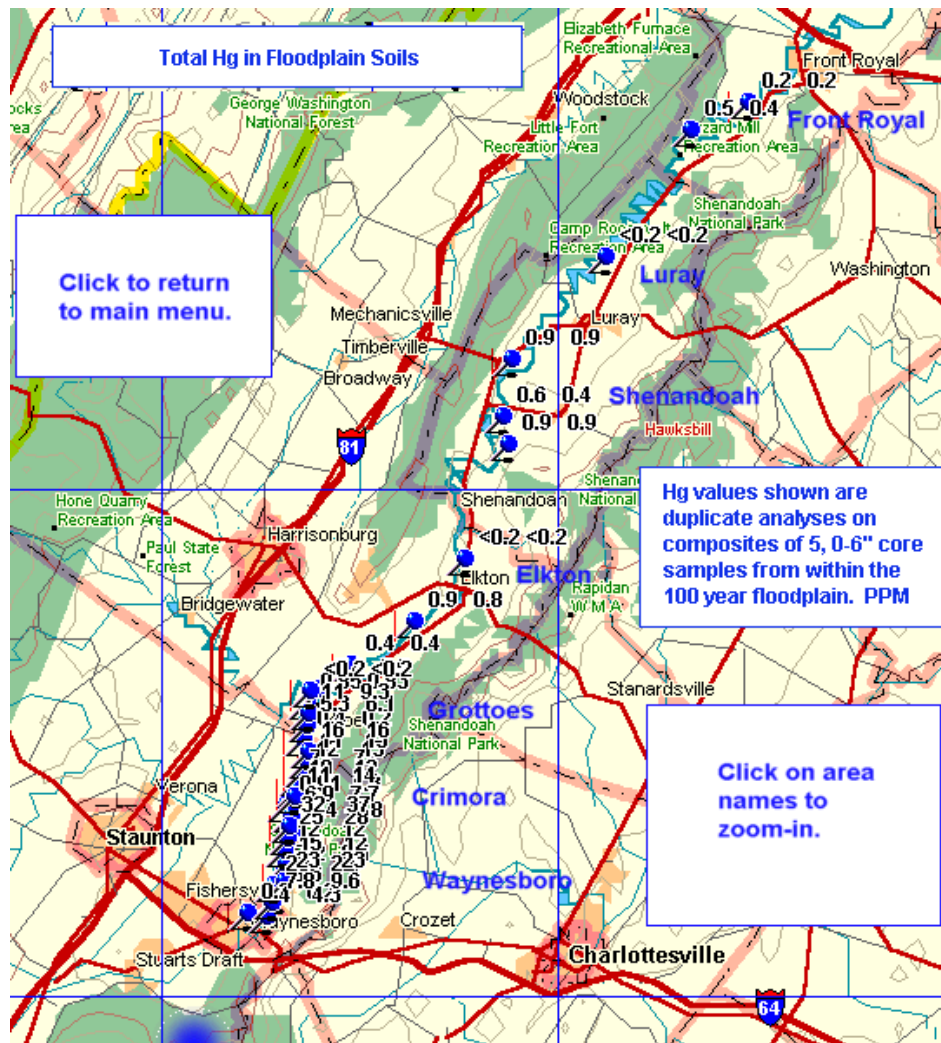
- Complete Sampling Plan
- Input data to common database
- Review data for CSM
- Perform Statistical analysis
- Determine need for additional sampling
- Prepare report

Available Floodplain Soil Data

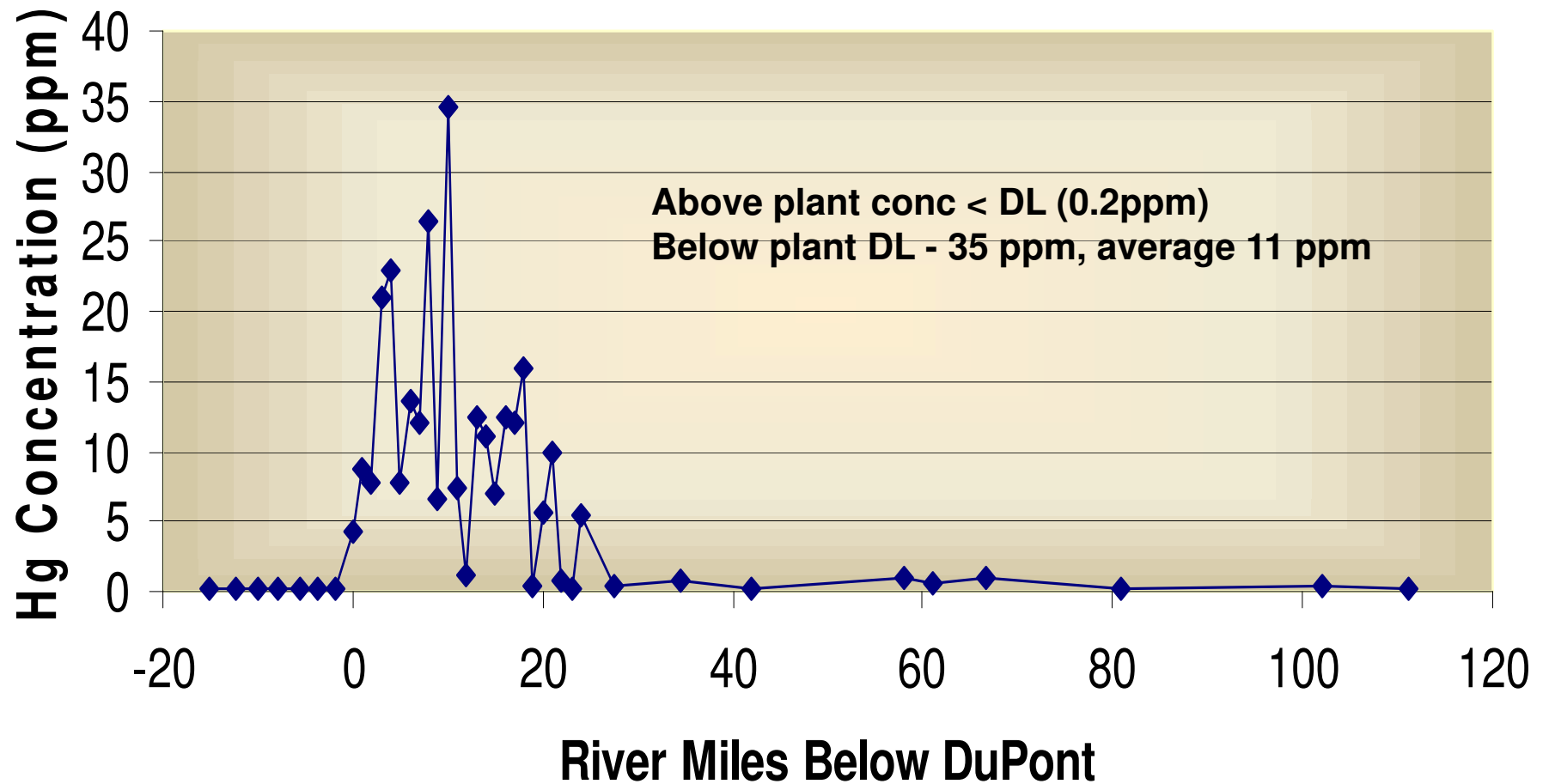
- Hendricks Survey - 1980
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Hendricks Survey - 1980

Extracted from Floodplain CD-ROM



Hg Concentration in Floodplain Soils Summer 1980



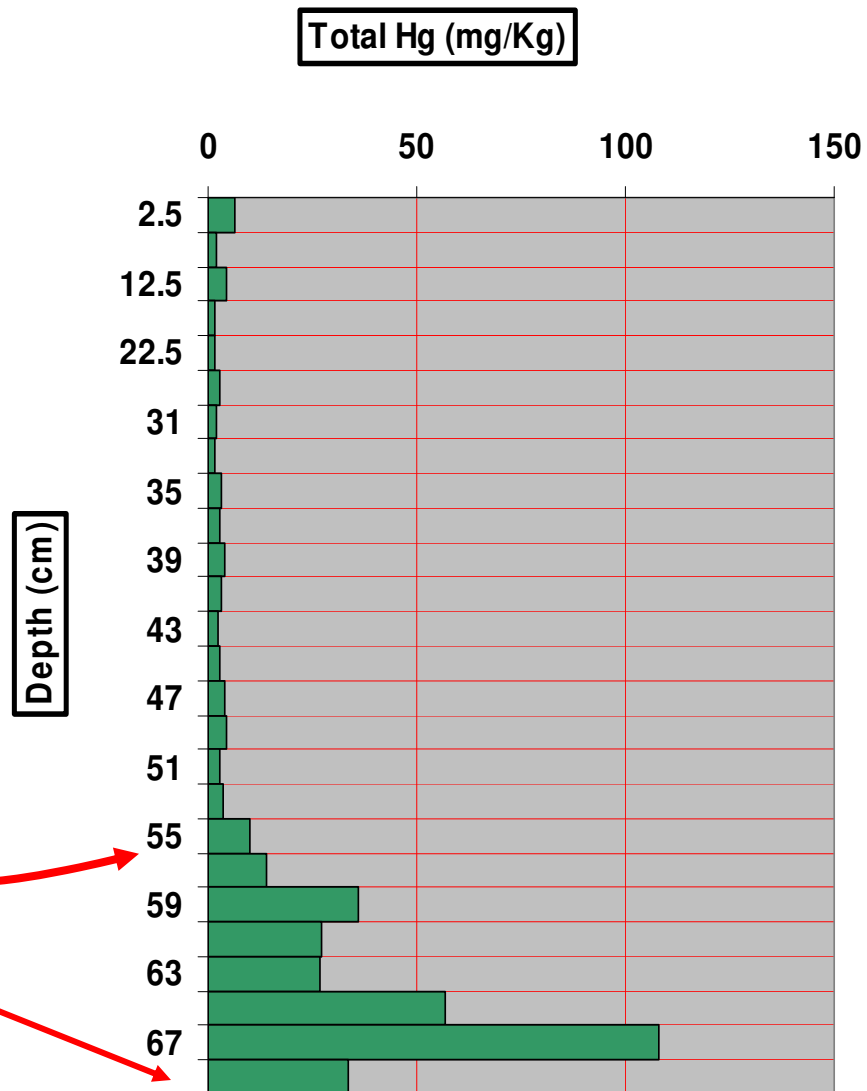
Available Floodplain Soil Data

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Deep Core in Wetland

Just downstream of Dooms

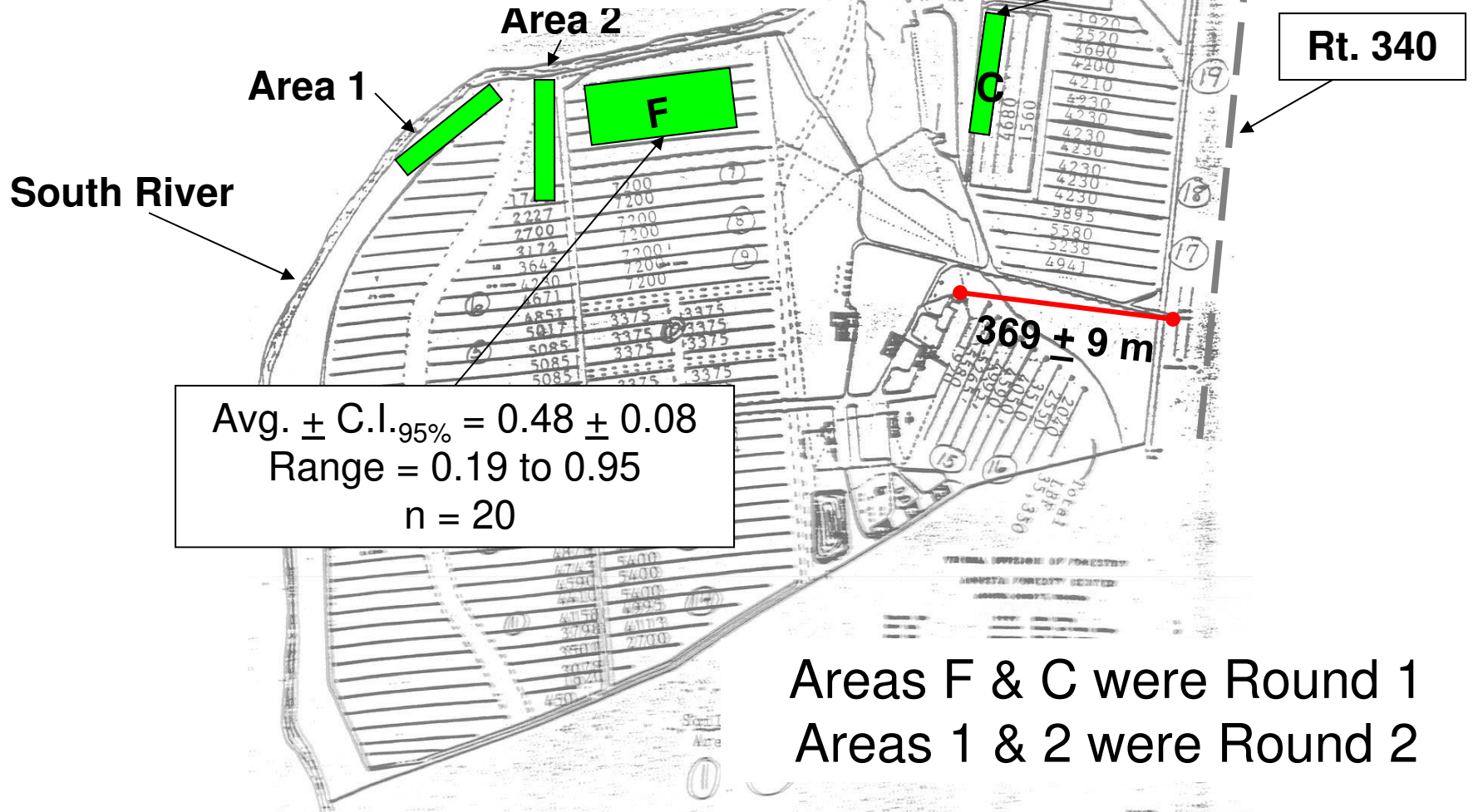
- **Surface soils are dry and covered with vegetation**
- **Core collected by driving with mallet**
- **Note significant decrease in Hg total above ~ 59 cm**
- **Refusal**



Forestry Samples - 2003

- Seeking location for test gardens - Round 1
- Seeking location for test gardens - Round 2
- Adding several deeper core samples and an eroded bank sampling

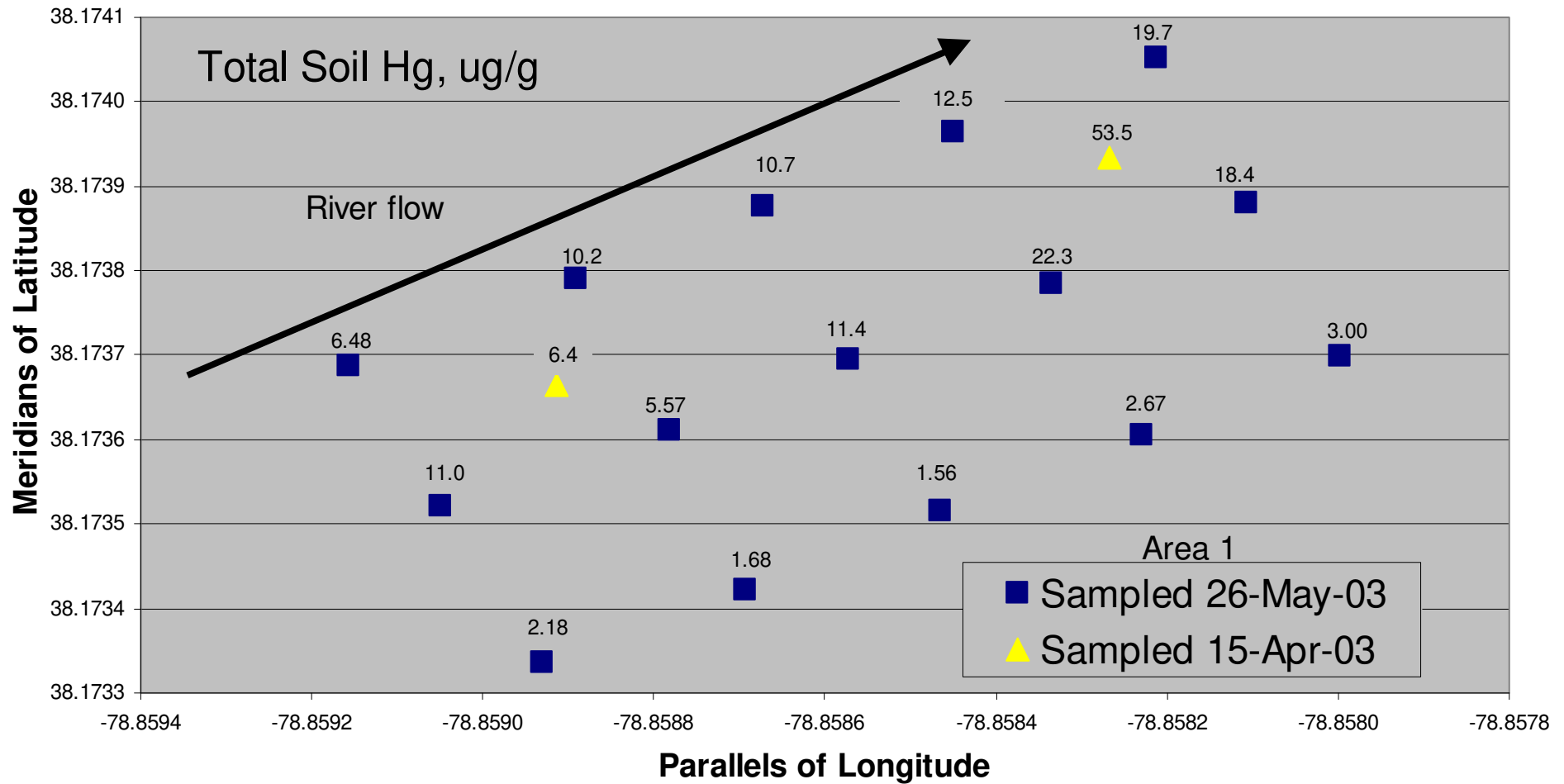
Locations of Areas Sampled April 14-15 & May 26-27, 2000 0-6 Inches



Areas F & C were Round 1
Areas 1 & 2 were Round 2

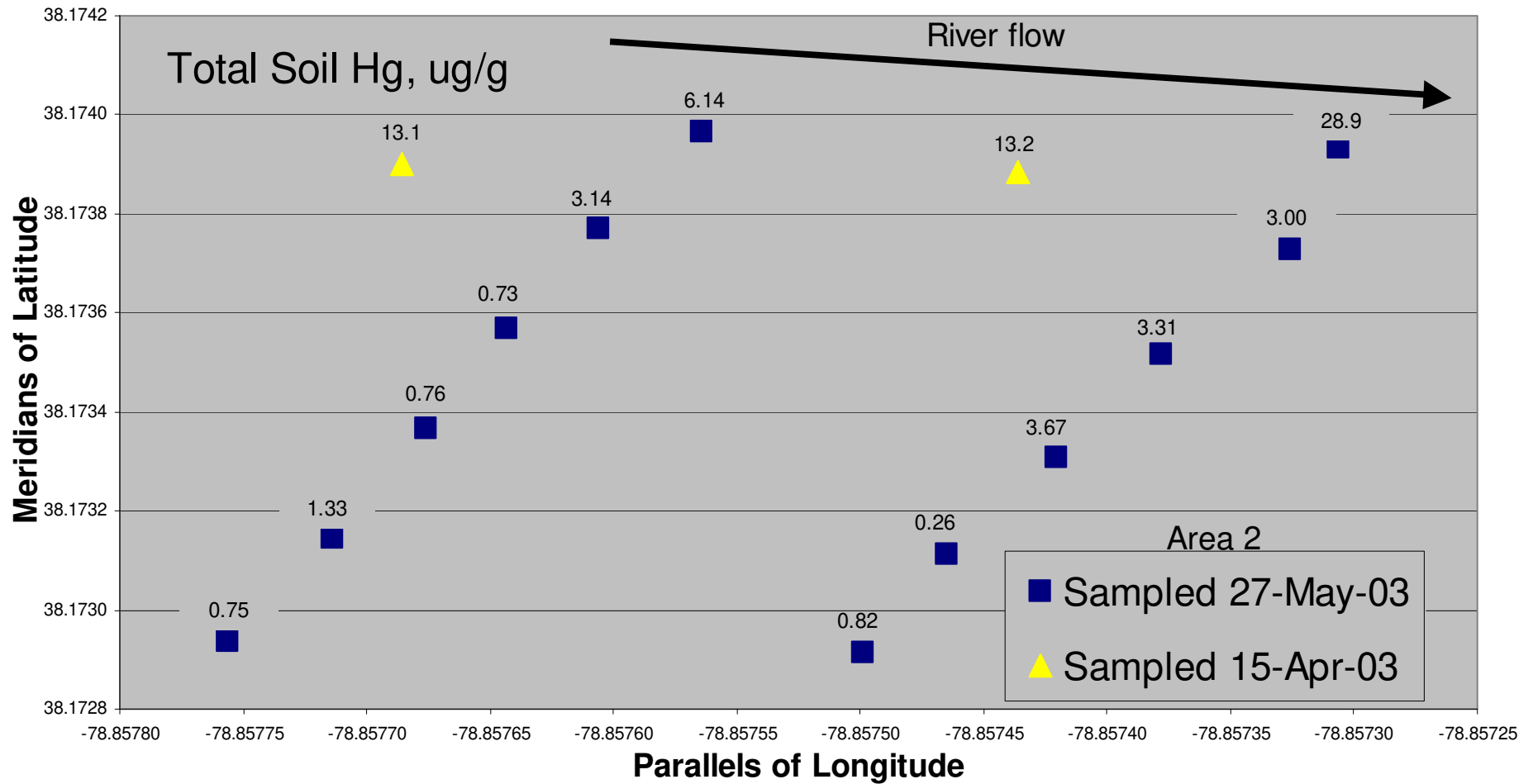
Area 1 Sampled May 26, 2003 - Round 2

0-6 Inches



Area 2 Sampled May 27, 2003 - Round 2

0-6 Inches



Adding a Few Cores in Garden Area

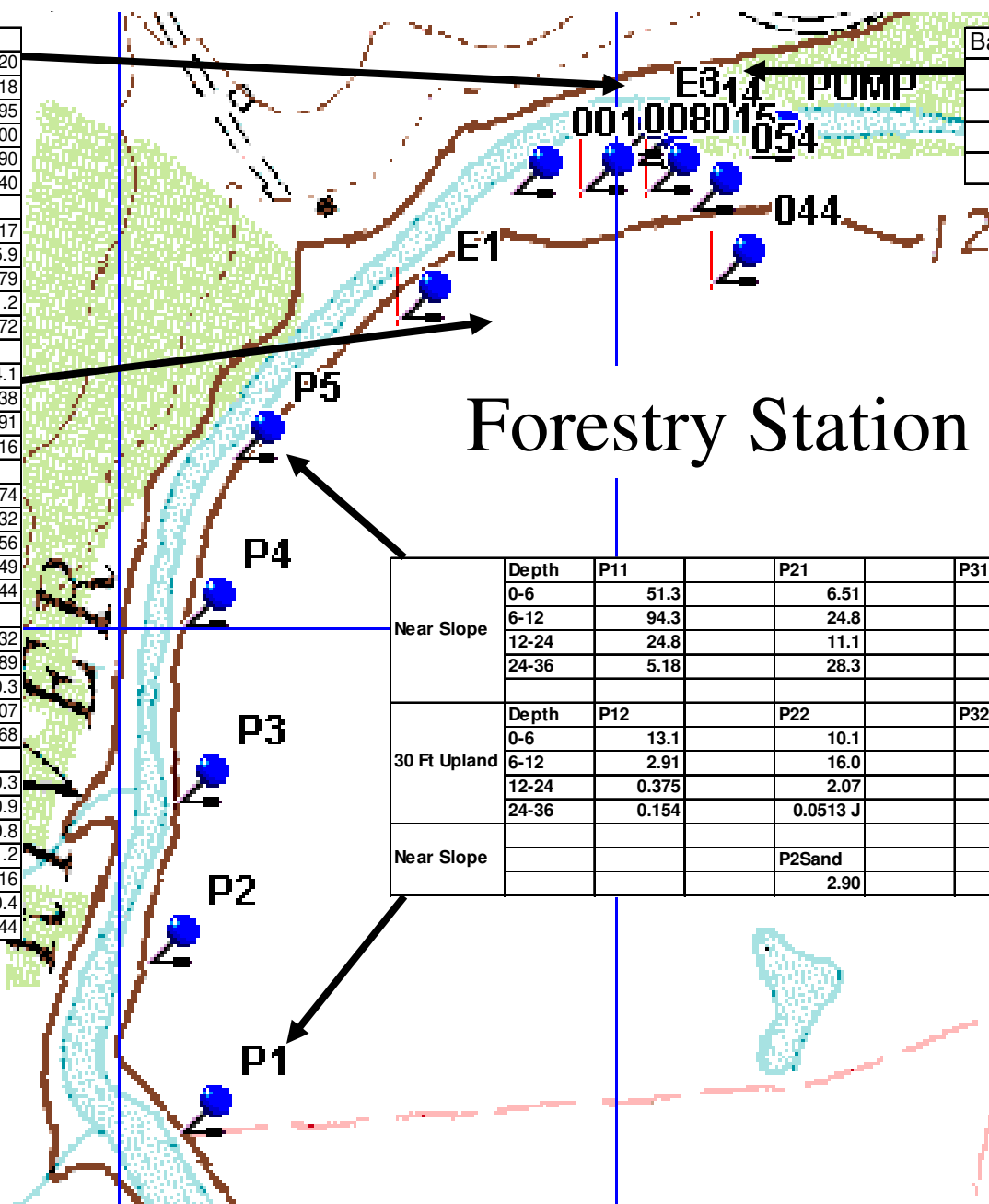


	Depth	PPM
54/55	0-3	1.20
	3-6	0.18
	6-8	0.95
	8-11	14.00
	11-14	14.90
	14-16	14.40
	Depth	PPM
8	0-3	17
	3-6	15.9
	6-9	3.79
	9-12	1.2
	12-17	0.972
	Depth	PPM
15	0-3	4.1
	3-6	4.38
	6-9	4.91
	9-12	0.916
	Depth	PPM
1	0-3	6.74
	3-6	6.32
	6-9	1.56
	9-12	0.749
	12-15	0.244
	Depth	PPM
14	0-3	0.32
	3-6	0.289
	6-9	0.3
	9-12	0.307
	12-16	0.0668
	Depth	PPM
E3	0-3	50.3
	3-6	60.9
	6-9	49.8
	9-12	11.2
	12-15	1.16
	15-18	0.4
	18-21	0.144

Bank	1, Water's Edge	6.67
	2	4.72
	3	10.5
	4	14.7
	5, Bank Top	5.04

Forestry Station Core Samples

	Depth	P11	P21	P31	P41	P51
Near Slope	0-6	51.3	6.51	11.5	8.44	13.5
	6-12	94.3	24.8	57.9	26.2	39.6
	12-24	24.8	11.1	13.5	67.6	53.8
	24-36	5.18	28.3	0.646	17.3	
30 Ft Upland	Depth	P12	P22	P32	P42	P52
	0-6	13.1	10.1	6.24	5.84	4.65
	6-12	2.91	16.0			0.0801 J
	12-24	0.375	2.07			0.0164 J
Near Slope	24-36	0.154	0.0513 J			0.743
			P2Sand			
			2.90			



Greenway Sampling - 10/03

- Samples on river bank opposite plant in Waynesboro - DuPont property only.
 - Constitution Park
 - Parking lot
 - Loath Spring
- Selected samples in plant recreation area on plant side of river.

All values in PPM dry

Near Slope	Depth	1	3	5	7
	0-6	1.08	15.2	10.7	18.6
	18-24	5.12	5.57	1.36	2.16
	30-36	0.814	4.14	1.81	5.32
15 Ft Upland	Depth	2	4	6	8
	0-6	4.47	1.89	22.0	16.8
	18-24	6.93		2.88	0.579
	30-36	20.9	0.369		

	9		10		11		12
0-6	0.0192 J		0.613		0.0661 J		1.44
18-24	2.44		65.0		5.07		19.6
30-36	1.59		9.93		7.84		4.65

Depth	23		24
0-6	12.7		3.47
18-24	3.06		2.43
30-36	6.62		1.04

Recreation	Depth	R1	R2	R3	R4	R5	R7
	0-6	2.15	17.7	25.9	122.	55.0	4.13
	6-12	0.396	15.6	39.7	55.1	52.6	1.52
	12-24	0.0375 J	29.4	37.1	20.3	46	0.118
	24-36	0.0317 J	9.77	19.9	26.2	51.5	0.0304 J

Loath Spring Cores & Flood Deposits

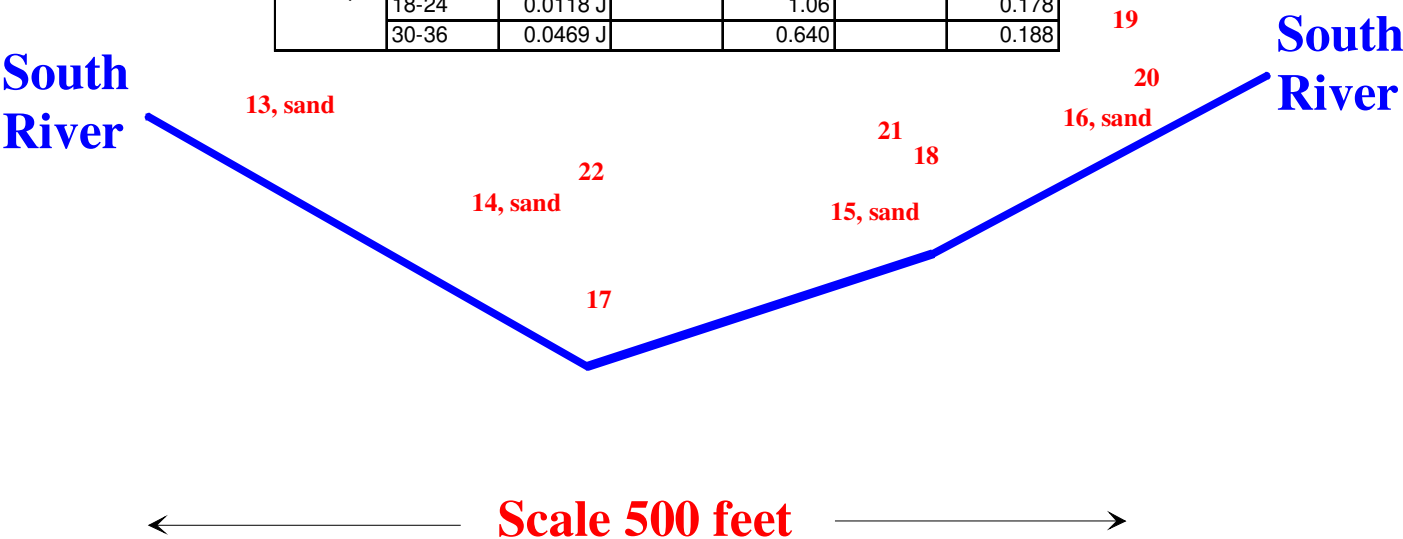


Loath Spring Cores & Flood Deposits

All values in PPM dry

Core Samples

Near Slope	Depth	17		18		19
	0-6	0.0427 J		0.388		0.231
	18-24	0.0710 J		0.585		0.177
	30-36	0.0769 J		0.355		0.262
15 Ft Upland	Depth	22		21		20
	0-6	0.0154 J		0.350		0.328
	18-24	0.0118 J		1.06		0.178
	30-36	0.0469 J		0.640		0.188



Sand Deposits from “Isabel”

Sand Deposit		13		14		15		16
		0.0141 J		0.0143 J		0.0899 J		0.242

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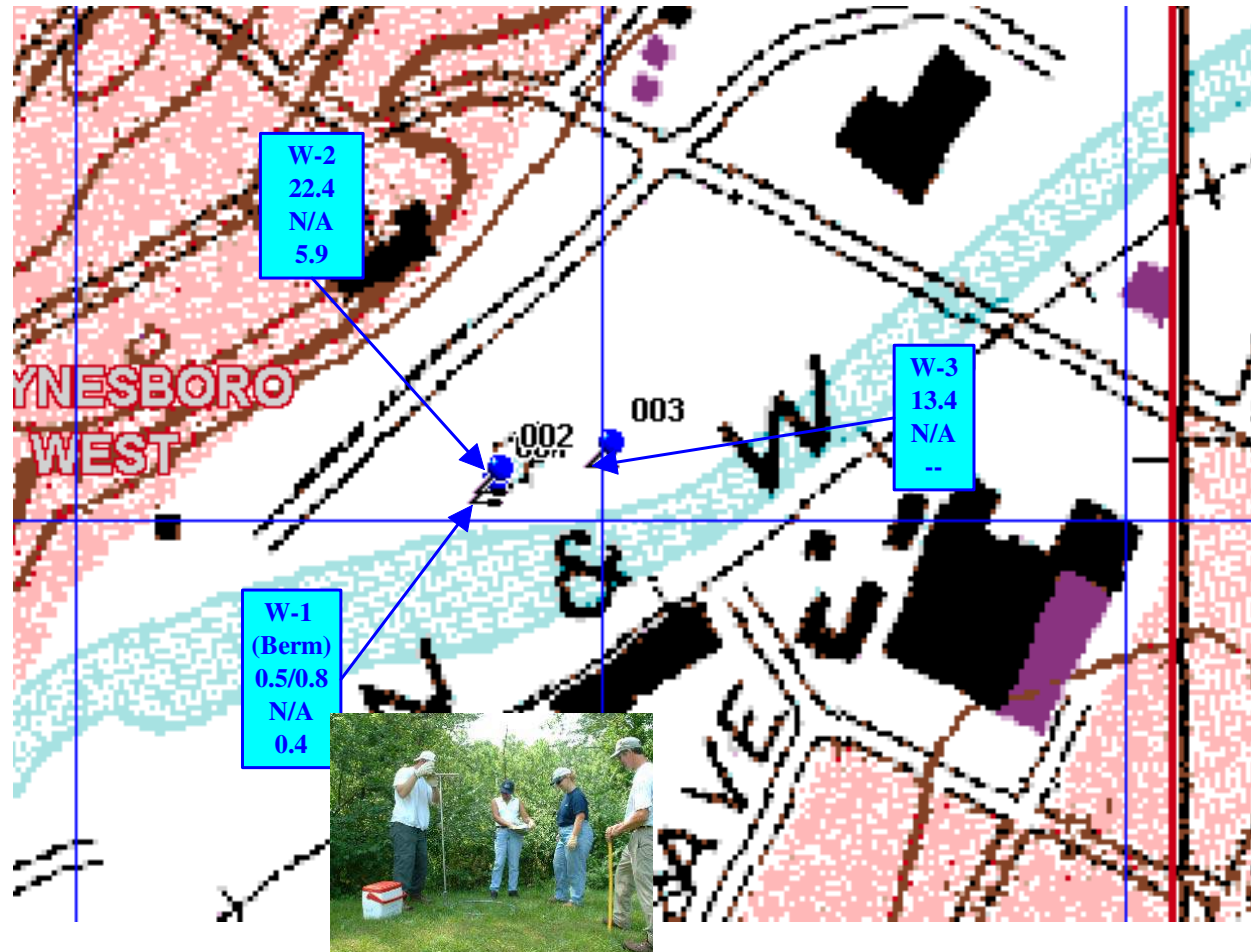
Phased Approach

- Phase 1: Sampling for crop study in 2003
- Phase 2: June 2004
- The objectives of Phase 2 sampling were
 - To determine general "representative" levels of mercury in floodplain soils relative to data currently available and
 - To leverage this activity with data gathering for helping to refine the conceptual site model including potentially defining continuing sources.

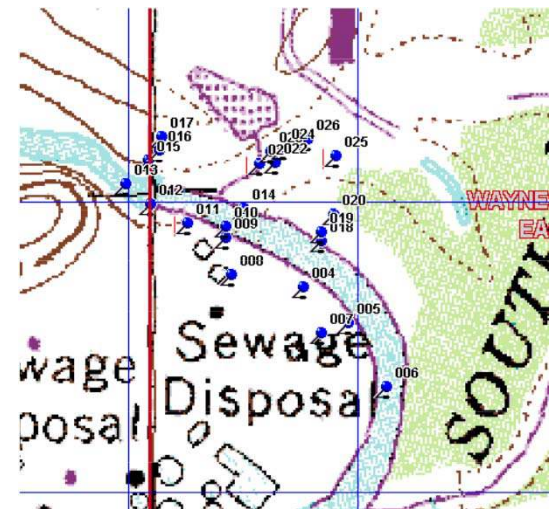
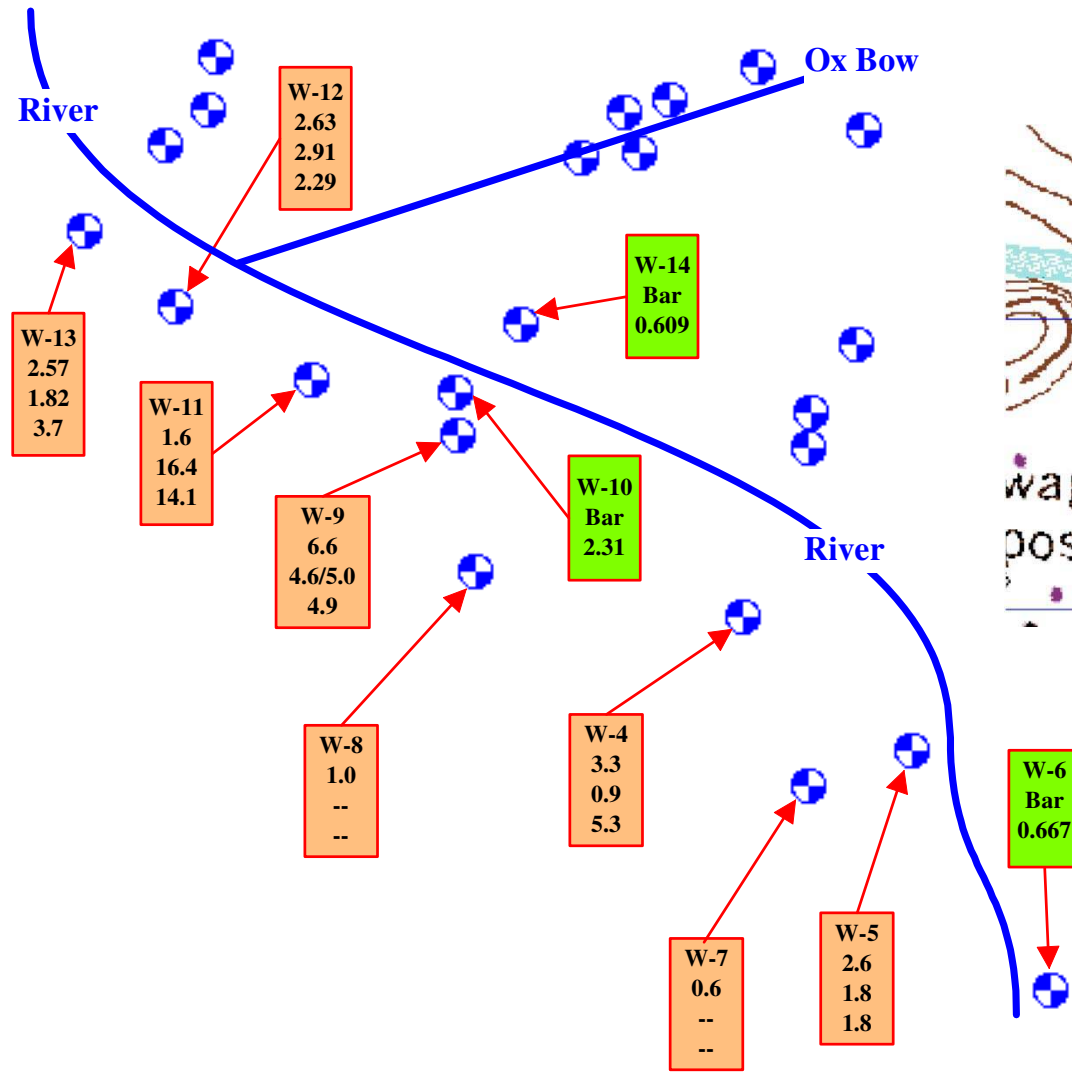
Site Along River	Approximate River Mile	Objective	No of Sample Locations	Specific Sites	Depth	No of Samples	Comments
1. Constitution Park	0						Leverage samples taken previously
2. DuPont Credit Union	0.25						Leverage samples taken previously
3. North Park	1.25	Representative	3	Berm & Playground	0-6'; 12- 18'	6	1 composite sample at each depth
4. Waynesboro Shops (Sewer)	1.75	Conceptual Model	8	Random	0-6"; 6-12"; 12-18"	24	Individual sample at each depth
4. Waynesboro Shops (Sewer)	1.75	Conceptual Model	3	Sandbars	0-6";	3	Individual sample at each depth
5. Allied Readymix (Ox Bow)	1.75	Representative	3	0, 40, 100	0-6"; 12-18"	6	1 composite sample at each depth
5. Allied Readymix (Ox Bow)	1.75	Conceptual Model	6	Random	0-6"; 6-12"; 12-18"	18	Individual sample at each depth
5. Allied Readymix (Ox Bow)	1.75	Conceptual Model	3	Sediment	0-6";	3	Individual sample at each depth
6. Basic Park	2	Representative	3	0, 40, 100	0-6"; 12-18"	6	1 composite sample at each depth
7. Waynesboro property by Hopeman	2.75	Representative	3	0, 20, 40, 100	0-6"; 12-18"	6	1 composite sample at each depth
7. Waynesboro property by Hopeman	2.75	Conceptual Model	5	0, 20, 40, 60, 100	0-6"; 6-12"; 12-18"	15	2 Transects; Individual sample at each depth
7. Waynesboro property by Hopeman	2.75	Conceptual Model	10	Bank near Sycamore tree	varies	10	Bank Profiling; Individual sample at each depth
8. Genicom Property	3						No samples proposed; Contiguous with Waynesboro City Property at Hopeman
9. Augusta Park at Crimora	10.5	Representative	3	0, 40, 60	0-6"; 12-18"	6	1 composite sample at each depth
10. Augusta Park at Crimora	10.5	Conceptual Model	12	0, 20, 40, 60, 100	0-6"; 6-12" 12-18"	36	3 Transects (2 perpendicular; 1 parallel)
11. Forestry Center	12						Individual samples at each depth
12. Park at Grand Caverns	20.5	Representative	3	0, 40, 100	0-6"; 12-18"	6	Leverage samples taken previously
13. Park at Grand Caverns	20.5	Conceptual Model	5	0, 20, 40, 60, 100	0-6"; 12-18"	10	1 composite sample at each depth
14. Alcoa Plant (Reynolds)	20.5	Representative	3	0, 40, 100	0-6"; 12-18"	6	Individual sample at each depth
15. Grottoes Town Park	23	Representative	3	0, 40, 100	0-6"; 12-18"	6	1 composite sample at each depth
16. G&IF Launch at Port Republic	25	Representative	3	0, 40, 100	0-6"; 12-18"	6	1 composite sample at each depth

North Park - Waynesboro

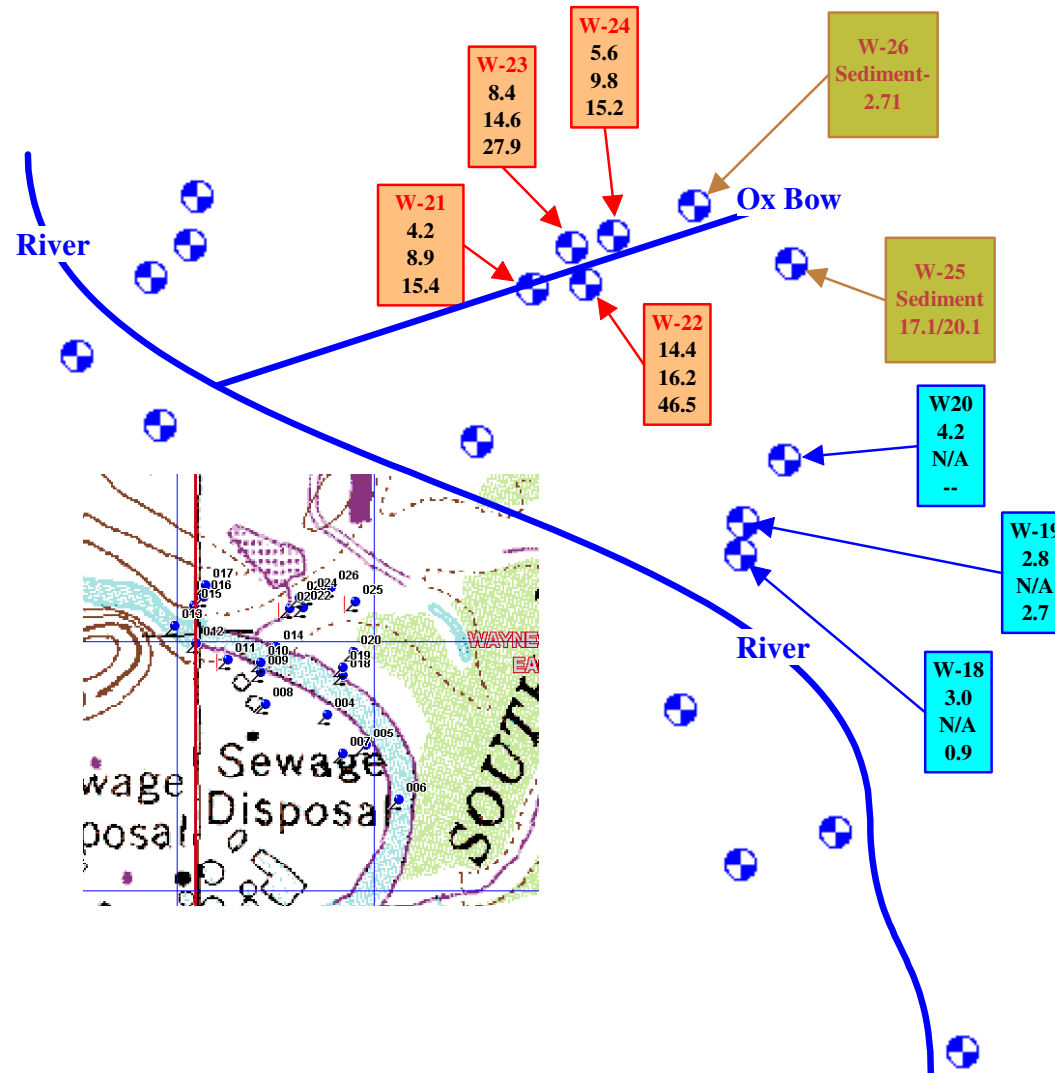
Representative Samples



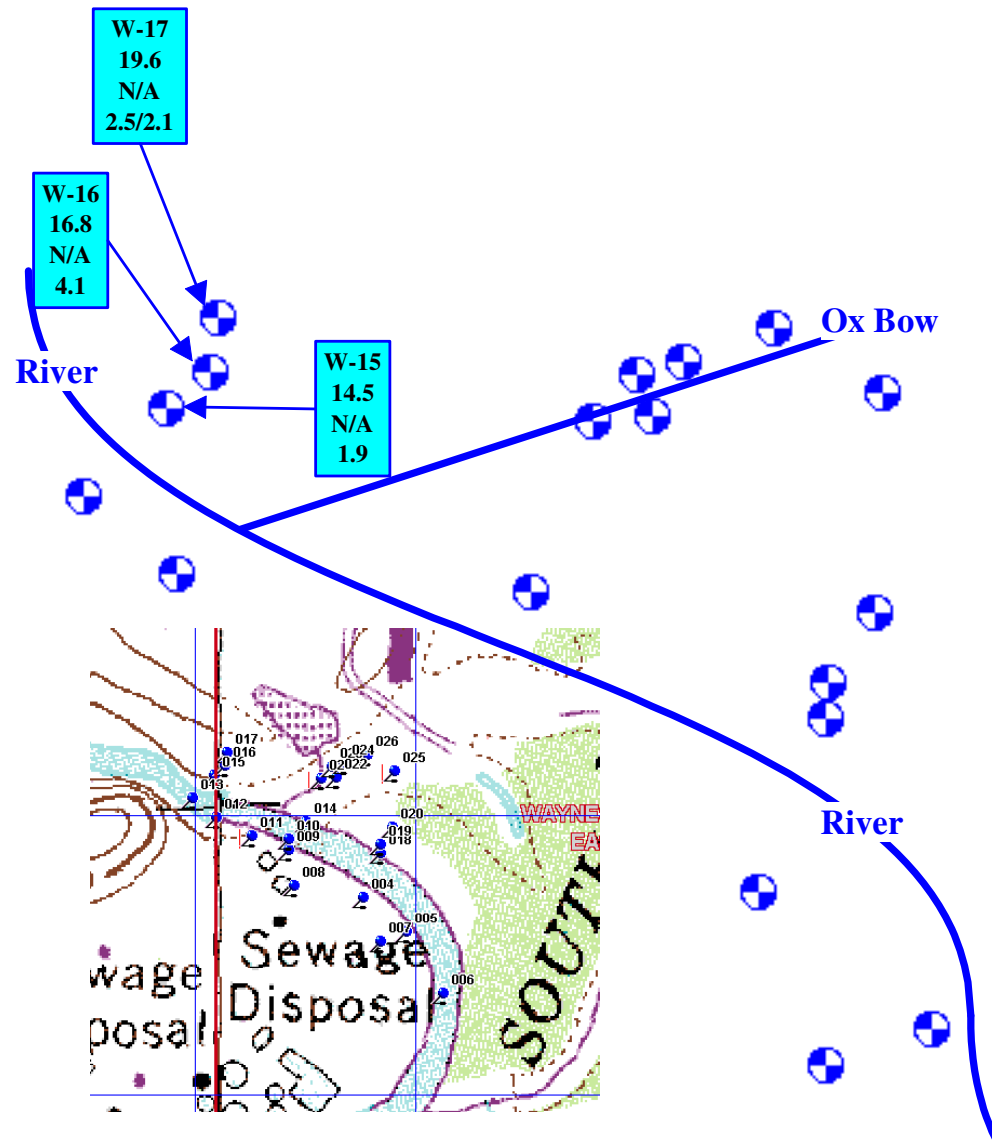
Waynesboro Shops



Allied Ready Mix

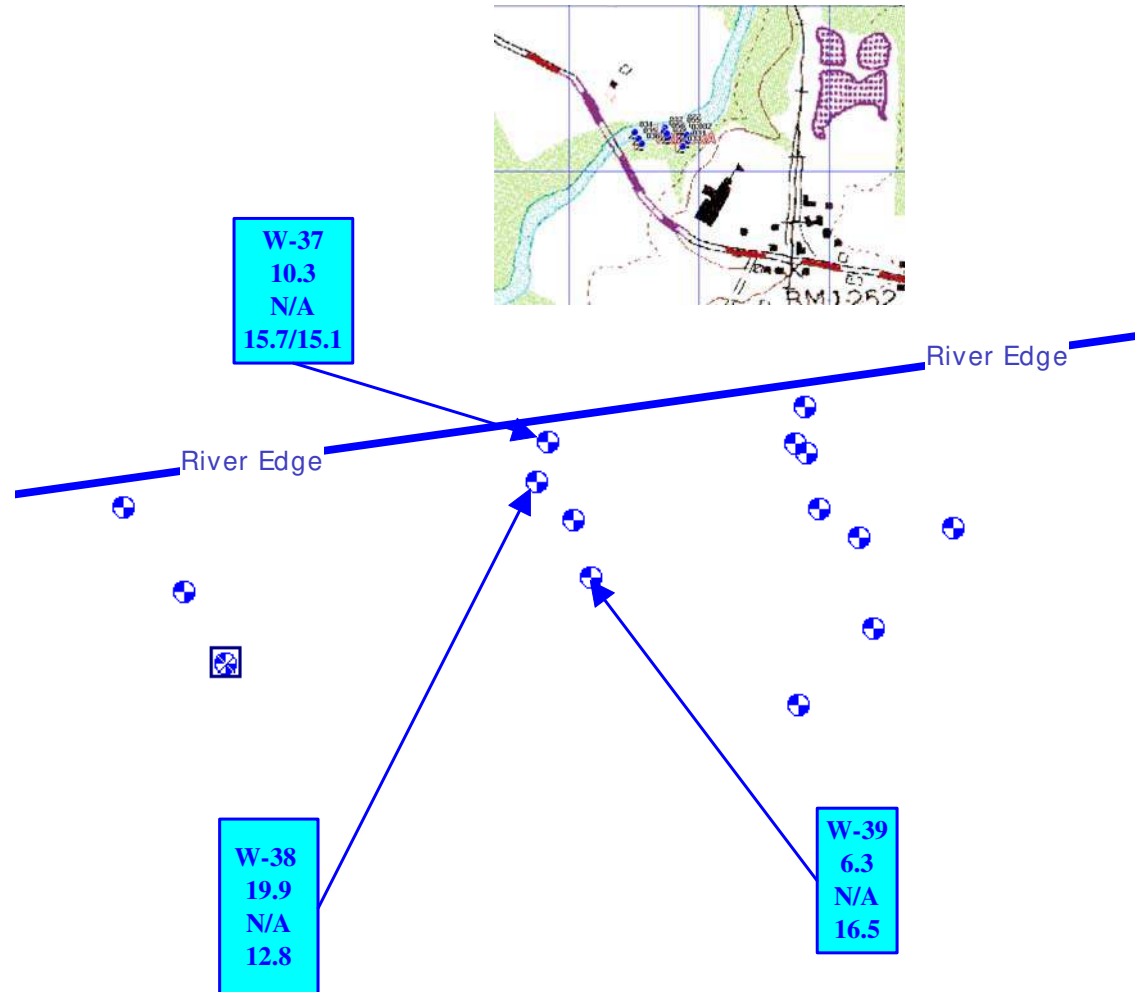


Basic Park



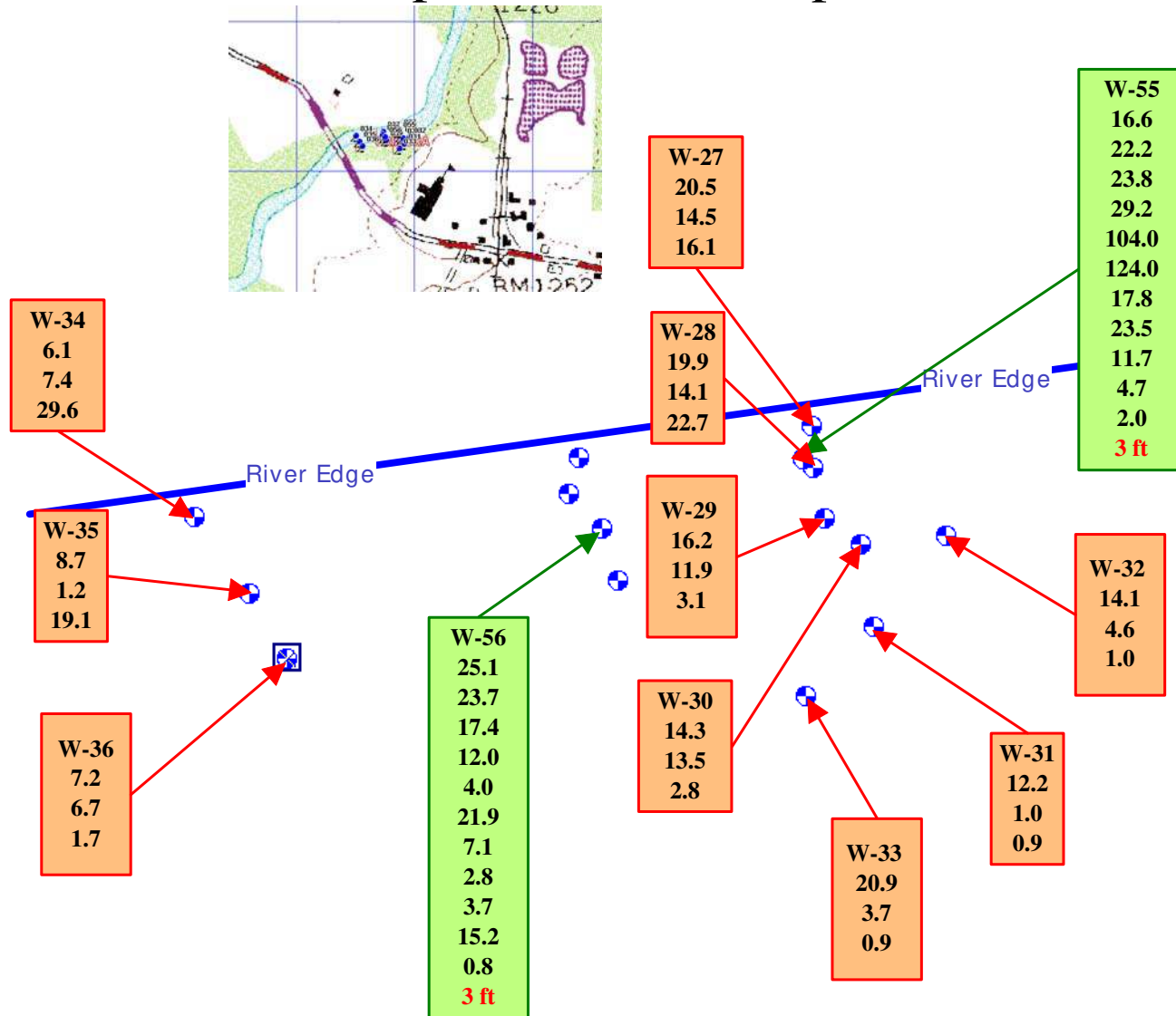
Augusta Park - Crimora

Representative Samples

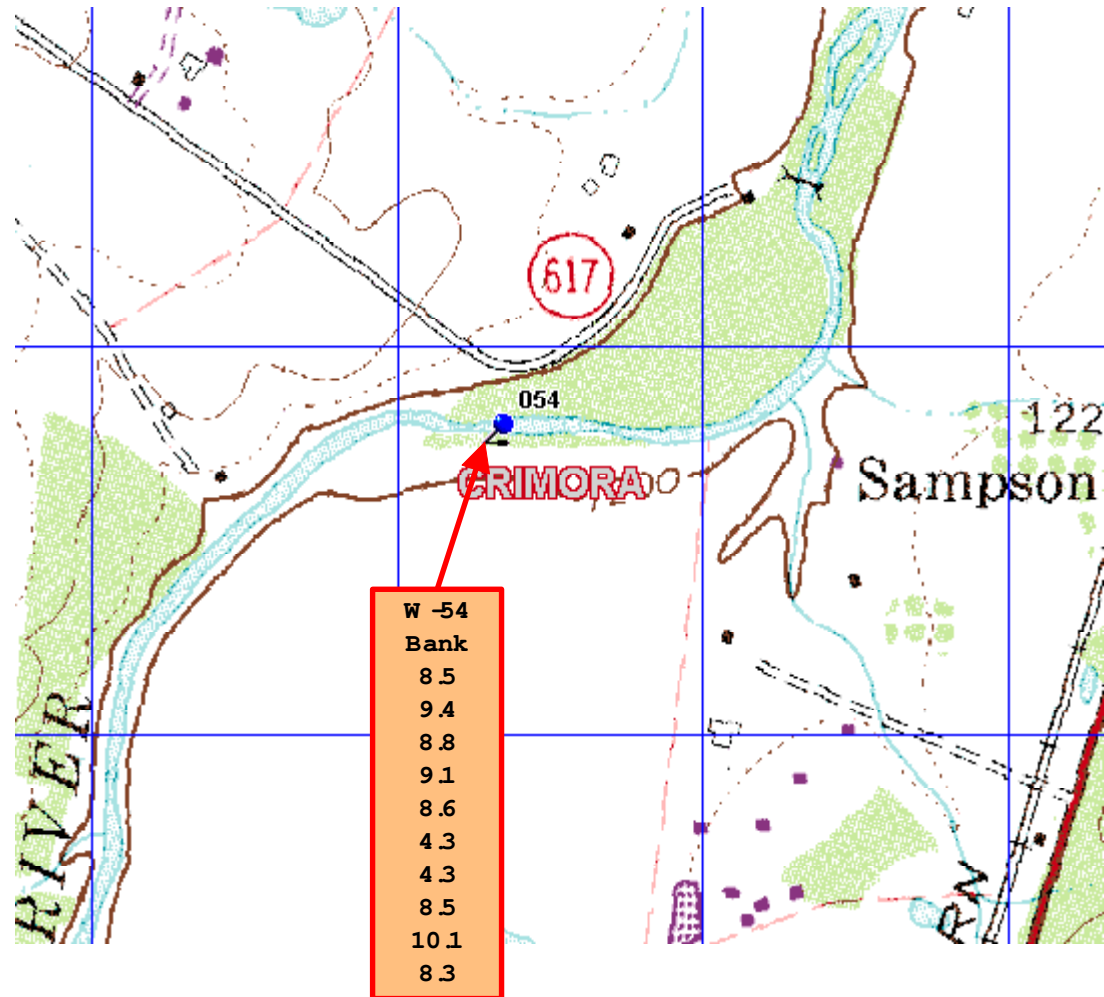


Augusta Park - Crimora

Conceptual Model Samples

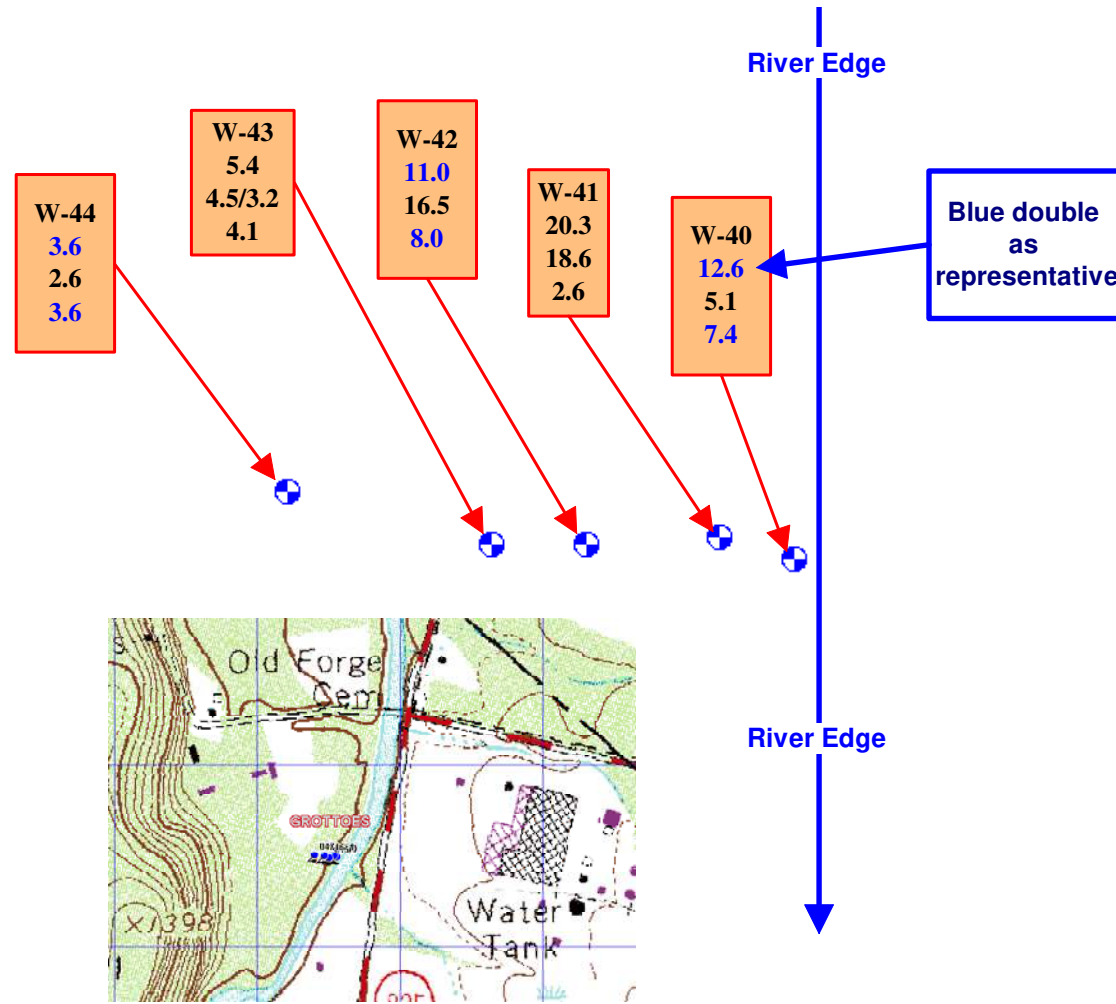


Forestry Station Eroded Bank



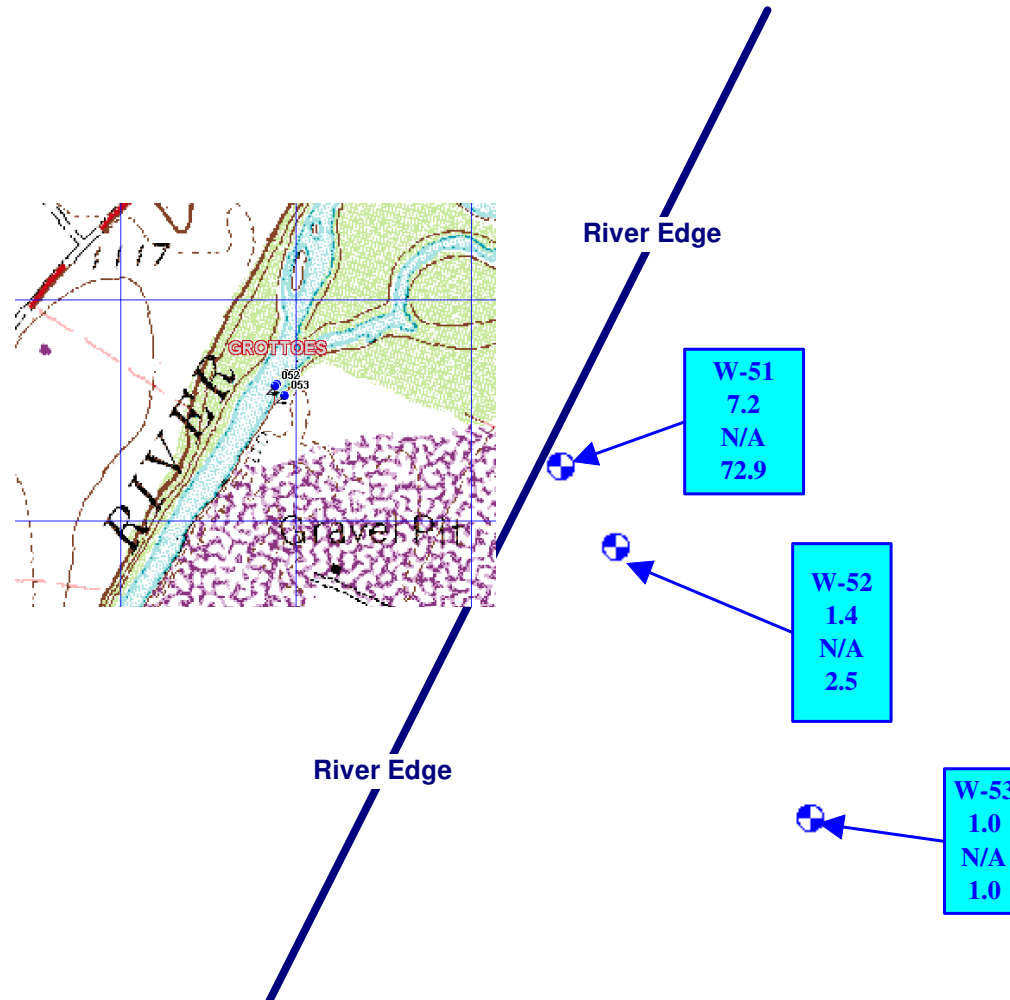
Grand Caverns

Representative & Conceptual Model Samples



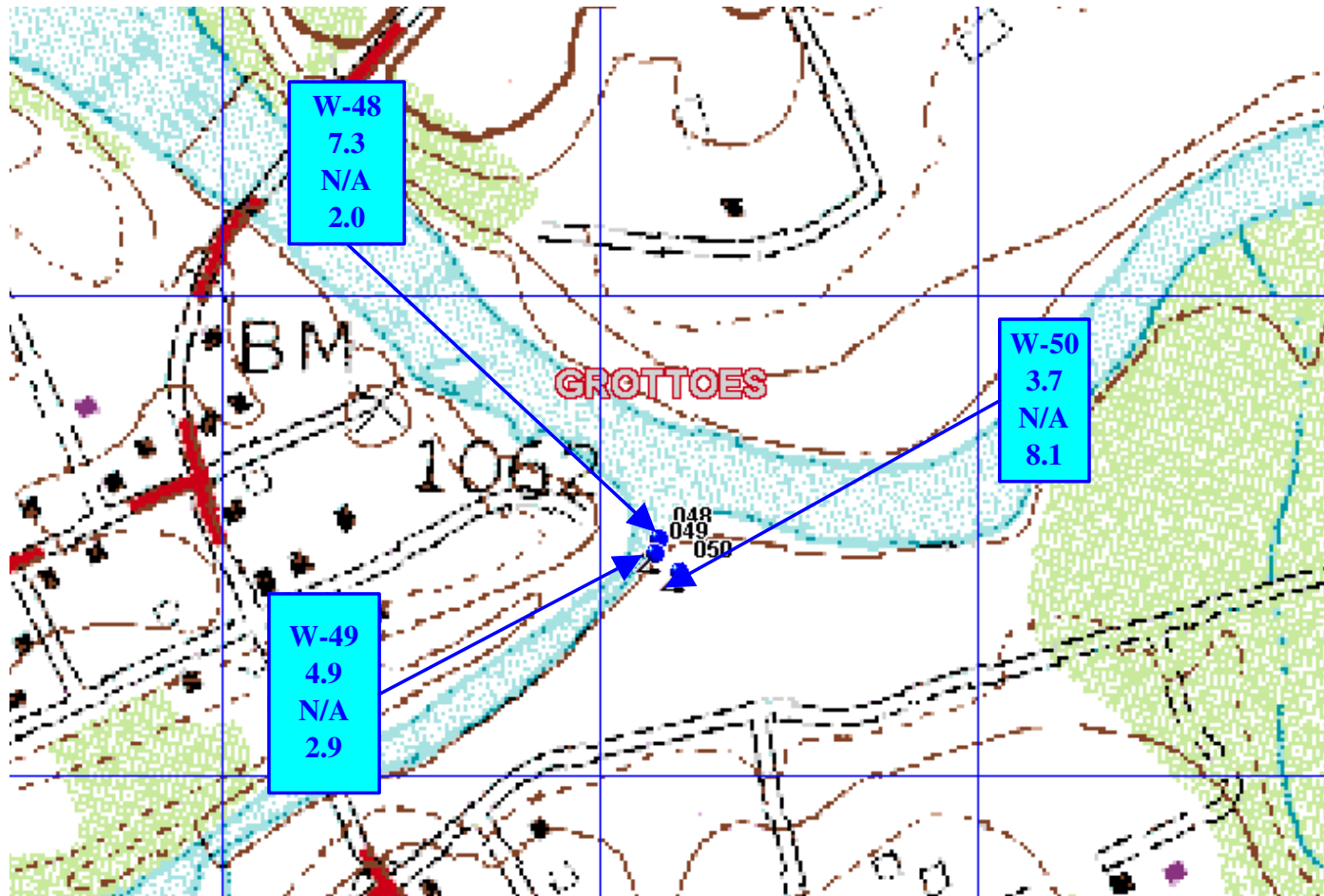
Grottoes Town Park

Representative Samples



Port Republic

Representative Samples



Floodplain Soil Sampling

Initial Observations

- Consistent with 1980 findings.
- Surface soils above Port Republic are order-of-magnitude 10 ppm dry wt, but variable.
- Deeper soils are sometimes higher, but not always. Deposition history variable?
- No higher bank outcrops have been found, but samples are few.

Next Steps

- Complete Sampling Plan
- Review data for CSM
- Input data to common database
- Perform Statistical analysis
- Determine need for additional sampling
- Prepare report