

Appendix E: Physical, Biological and Chemical Data Reports

The data reports in Appendix E detail the following parameters:

- Reach Level Assessment
- Channel Modification
- Impacted Buffer
- Stream Crossing
- Trash and Debris
- Utility Impacts
- Storm Water Outfalls
- Erosion
- Miscellaneous
- Biological and Chemical Data
- Site Sketch

Chemical & Biological Parameters Definitions¹:

- **Biochemical Oxygen Demand – 5 days (BOD₅):** “BOD₅ is a measure of the amount of oxygen used by aerobic (oxygen-consuming) bacteria as they break down organic wastes over five days.” **Dissolved Oxygen (DO):** DO is the amount of available oxygen (O₂) in the water.
- ***E. coli*:** “While not all strains of *E. coli* are pathogenic themselves, they occur with other intestinal tract pathogens that may be dangerous to human health. We test for *E. coli* as an indicator of fecal contamination.”
- **Nitrate:** “Nitrogen occurs in water as nitrate (NO₃), nitrite (NO₂), and ammonia (NH₄). It enters the water from human and animal waste, decomposing organic matter, and runoff of fertilizer from lawns and crops.”
- **Orthophosphate:** “Orthophosphates are on form of phosphates. Orthophosphates are dissolved in the water (mostly inorganic) and are readily available for plant uptake. Thus, the orthophosphate concentration is useful as an indicator of *current* potential for algae blooms and eutrophication.”
- **pH:** pH is measure of the hydrogen ion concentration in the water. pH is affected by natural processes and by man and affects the aquatic organisms during reproduction.
- **Pollution Tolerance Index (PTI):** This is the Hoosier Riverwatch biological rating system based on macroninvertebrate sampling. The PTI score is indicative of the overall health of the stream over time. Refer to the Biological Monitoring field sheet for the framework of the scoring system.

¹ Volunteer Stream Monitoring Training Manual, Hoosier Riverwatch. March 2004. Indiana Department of Natural Resources, Division of Fish and Wildlife. Available at: <<http://www.in.gov/dnr/riverwatch/>>

- **Turbidity:** “Turbidity is the relative clarity of the water and is measured by shining a light through the water column. Turbid water is more cloudy, and is caused by suspended matter including clay, silt, organic and inorganic matter, and algae.”

Parameter	Typical Range	Indiana Average	State Water Quality Standard
Dissolved Oxygen*	5.4 – 14.2 mg/L	9.8 mg/L	Avg > 5 mg/L, not <4 mg/L
E. Coli	133 – 1,157 colonies/100 ml	645 colonies/100 ml	<235 colonies/100 ml (single sample) AND <125 colonies/100 ml (Geometric mean of 5 samples equally spaced over 30 days)
pH**	7.2 – 8.8	8.0	6 - 9
BOD ₅	0 – 6.3 mg/L	1.5 mg/L	-
Total Phosphate***	0 – 0.85 mg/L	0.05 mg/L	-
Nitrate (NO ₃)	0 – 36.08 mg/L	12.32 mg/L	-
Turbidity	0 – 173 NTU	36 NTU	-
<p>* Dissolved oxygen can be expressed as % saturation, which accounts for the effects of water temperature. Values closer to 100% saturation are considered ideal.</p> <p>** “Due to the state’s limestone geology, Indiana surface waters will typically have a pH that is relatively basic (> 7).”</p> <p>*** “We generally expect orthophosphate values to be less than total phosphate, since orthophosphate is but one component of total phosphate.”</p>			

Figure 1: Chemical Parameter Values and Standards. (Source: Volunteer Stream Monitoring Training Manual, Hoosier Riverwatch. March 2004. Indiana Department of Natural Resources, Division of Fish and Wildlife. Available at: <<http://www.in.gov/dnr/riverwatch/>>.)

Reach Level Assessment

			<u>Latitude</u>	<u>Longitude</u>	<u>Land Use</u>	<u>Dominant Substrate</u>	<u>Water Clarity</u>	<u>Aquatic Plants</u>		<u>Wildlife</u>	<u>Stream Shading</u>	<u>Channel Dynamics</u>
								<u>Attached</u>	<u>Floating</u>			
West Fork Clear Creek												
WFCC1	11/13/04	1:00pm	39° 8.201	86° 33.689	industrial, park, commercial	Gravel (0.1-2.5)	Clear	some	none	Beaver, Deer	Partially Shaded (>25%)	downcutting
WFCC2	11/13/04	11:30am	39° 7.745	86° 33.568	industrial, park, quarry	Gravel (0.1-2.5)	Turbid (suspended matter)	some	none	Deer, Birds	Halfway (>50%)	sediment deposition, bank scour
WFCC3	3/30/05	8:30am	39° 8.889	86° 33.828	suburban/residential commercial	Cobble (2.5-10)	Clear	some	none	Deer, Snails, Frogs	Halfway (>50%)	sediment deposition
WFCC4	3/26/05	9:30am	39° 7.051	86° 33.019	suburban/residential park, pasture	Bed Rock	Clear	some	none	Birds	Mostly shaded (>75% coverage)	widening

	<u>Site Access</u>	<u>In-stream Habitat</u>	<u>Vegetative Protection</u>		<u>Erosion</u>		<u>Floodplain Connection</u>	<u>Floodplain Vegetation</u>	<u>Vegetated Buffer Width</u>		<u>Floodplain Habitat</u>	<u>Floodplain Encroachment</u>
			<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>			<u>Left</u>	<u>Right</u>		
West Fork Clear Creek (cont.)												
WFCC1	3	11	4	4	5	5	11	5	6	5	17	10
WFCC2	2	16	8	7	6	6	13	13	9	5	17	12
WFCC3	5	16	8	7	3	7	0	0	10	0	17	9
WFCC4	5	11	3	4	6	6	0	12	5	5	5	5

Channel Modification Data Summary

	Type	Material	Perennial Flow	Sediment Deposition	Channel Vegetation	Connected To Floodplain	Height	Width		Length	Flow Depth	% of Channel Bottom	Utilities Present	Fill in Floodplain	Channelization Severity	
								Bottom	Top							
West Fork Clear Creek																
WFCC1	11/13/04	bank armoring	Rip Rap	x	--	x	--	7	--	--	~30	33	1.5%	yes	--	2
WFCC4	3/26/05	bank armoring	Rip Rap	x	--	x	--	4	--	--	200	12	~100%	--	--	2

Impacted Buffer Data Summary

	Impacted Bank	Reason Inadequate	Land Use		Land Cover		Invasive Plants	Stream Shade	Wetlands	Restoration Candidate	
			Left	Right	Left Bank	Right					
West Fork Clear Creek											
WFCC1	11/13/04	Both	lack of veg., too narrow, recently planted	private	private	lawn/turf	lawn	Unknown	Partial	unknown	natural regen.
WFCC2	11/13/04	Right	too narrow, btwn quarry and stream	park	private	shrub/scrub, trees	shrub/scrub, trees	Unknown	Full	unknown	unknown
WFCC3	3/30/05	Right	too narrow	private	road	shrub scrub	tall grasses	Unknown	Partial	unknown	unknown
WFCC4	3/26/05	Both	slight erosion	private	park	lawn/turf, tall grasses	lawn, shrub/scrub	Unknown	Partial	unknown	na

*Restoration Candidate Note: unknown restoration sites are most likely NOT candidates

Stream Crossing Data Summary

		Type	Shape	# of Barrels	Material	Alignment	Condition	Dimension	Restoration	<u>Fish Blockage</u> Extent Severity	
West Fork Clear Creek											
WFCC1	11/13/04	road crossing	cut corner box	1	concrete	with flow	normal	10 ft stream to road	none	none	0
WFCC3	03/30/05	road crossing	box	1	concrete	with flow	debris caught in grate	5 ft stream to road	none	very slight	1

Trash and Debris Data Summary

		Type	Material	Source	Location	Amount of Trash (pick-up truck loads)	Land Ownership	Restoration	Clean-up Equipment	Clean-up Needs	Clean-up Potential
West Fork Clear Creek											
WFCC1	11/13/04	Res.	metal, paper	unknown, illegal	left riparian	0	public	stream clean-up	trash bags	volunteers	5
WFCC2	11/13/04	Com., Res.	plastic, metal	unknown, illegal	left riparian	1	public	stream clean-up	trash bags	volunteers	5
									<i>Amount: 1 load including shack/old pump house.</i>		
WFCC3	3/30/05	Res.	plastic, paper	unknown, illegal	stream, both bank riparian	0	PUD, roadway	stream clean-up	trash bags	volunteers	5
									<i>less than a truckload needed, a few pieces of trash present.</i>		
WFCC4	3/26/05	Res.	paper, metal	unknown, illegal	stream	1	public, private	stream clean-up	trash bags	volunteers	5
									<i>only a few pieces, much less than a truckload</i>		

Utility Impacts Data Summary

	Utility Impact	Type	Material	Location	Fish Barrier	Diameter	Length Exposed	Condition	Discharge			Restoration	Water Drop	
									Color	Odor	Deposits			
West Fork Clear Creek														
WFCC1	11/13/04	unsure	sewer cover	smooth metal	35 ft from stream		0	0	undet.	undet.	undet.	undet.	undet.	0
Notes: No identifiable impact on stream, just in slight proximity.														
WFCC2	11/13/04	yes	old pump station	concrete, metal	stream bank		na	na	not currently in use	none	none	none	shed removal	0
Notes: Suggest removal of structure? Fish barrier: Dammed area created (with small waterfall, less than 2 feet). Water is also able to flow around side of waterfall.														

Stormwater Outfall Data Summary

		Bank	Flow	Type	Material	Shape	Diameter	Submerged	Condition	Odor	Deposits			
												Density	Growth	Pool
West Fork Clear Creek														
WFCC1	11/13/04	left	moderate	closed pipe	PVC pipe	circular, double	18 in.	no	good	none	none			
WFCC4	03/26/05	left/right	undetermined	closed pipe	metal	circular	6 in.	partially	good	none	none			
West Fork Clear Creek (cont.)														
WFCC1	11/13/04	recent	none	normal	clear	none	none	none	none				1	
WFCC4	03/26/05	normal	brown/green	normal	undetermined	undetermined	undetermined	none	none				1	

Erosion Data Summary

		Process	Bank of Concern	<u>Bank Length</u>		<u>Bank Height</u>		<u>Bank Angle</u>		Top Width	Wetted Width
				Left	Right	Left	Right	Left	Right		
West Fork Clear Creek											
WFCC1	11/13/04	slight slope failure	both banks	200	200	4-7	4-7	19	~45	40	16.5
WFCC2	11/13/04	downcutting	meander bend, both sides	200	200	1-3	1-3	90	90	24.2	24.2
WFCC3	3/30/05	sediment deposition	none	200	200	4-6	5.5-6	variable	variable	24	12
WFCC4	3/26/05	downcutting	meander bend, steep	200	200	2.5-5	2.5-5	~80	~65	18-52	15.75

		Land Ownership	Land Cover	Threat to Infrastructure	<u>Riparian Width</u>		Erosion Severity	Site Access
					Left	Right		
West Fork Clear Creek (cont.)								
WFCC1	11/13/04	Field/Ag, Developed (road shoulder)		no	25-50 ft.	<25 ft.	1	5
WFCC2	11/13/04	Public	Forest	no	>100 ft.	25-50 ft.	3	1
WFCC3	3/30/05	Unknown	Field Ag, Developed (res and comm)	yes	>100 ft.	<25 ft.	4	2
WFCC4	3/26/05	Public	Field/Ag, Developed (res) slopes, straights, both sides	no	<25 ft.	<25 ft.	2	3

Miscellaneous Data Summary

Description		Restoration
West Fork Clear Creek		
WFCC1	11/13/04 BOD5 sample collected 3/26/05	NA

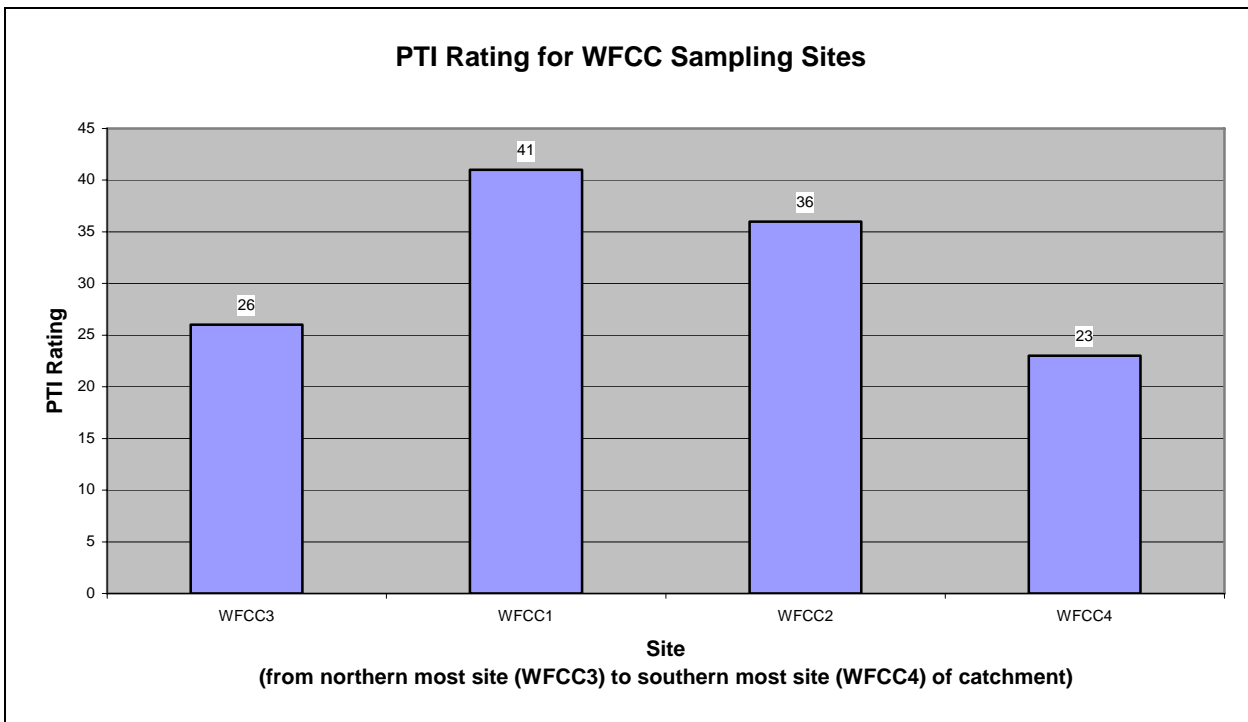
Biological and Chemical Data Summary

		PTI Rating	Dissolved Oxygen (mg/L)	% Saturation	Water Temperature (degrees C)	pH	E. coli (colonies /100 mL)	BOD5 (mg/L)	Orthophosphate (mg/L)	Total Phosphate (mg/L)	Nitrate (NO3-mg/L)	Nitrite (NO2-mg/L)	Turbidity (NTU)
West Fork Clear Creek													
WFCC1	03/26/05	41	15	119	9.44	--	--	NA	--	NA	--	--	--
WFCC1	11/19/04	0	10	96	14	8	0	--	0.16	NA	0.51	--	<15
WFCC2	03/26/05	36	12	97	8.89	7.5	0	0	0.04	NA	0.044	--	<15
WFCC3	03/30/05	26	11	87	7.5	7	100	0	0.04	NA	0.396	--	<15
WFCC4	03/26/05	23	12	94	7.78	7	100	0	0.02	NA	0.044	--	<15

***PTI: Pollution Tolerance Index**
 >23 Excellent
 17-22 Good
 11-16 Fair
 <10 Poor

Macroinvertebrate species count-West Fork Clear Creek

	WFCC1	WFCC2	WFCC3	WFCC4
Intolerant Species				
Stonefly Nymph	0	0	0	0
Mayfly Nymph	14	36	0	8
Caddisfly Larvae	1	0	0	0
Dobsonfly Larvae	0	0	0	0
Riffle Beetle	4	2	1	3
Water Penny	8	2	23	0
Right-handed Snail	3	0	14	3
Moderately Intolerant				
Damselfly Larvae	0	1	0	0
Dragonfly Larvae	0	0	0	0
Sowbug	21	1	140	24
Scud	7	1	53	7
Cranefly Larvae	3	1	0	0
Clams/Mussels	6	1	2	0
Crayfish	1	1	0	1
Fairly Tolerant				
Midges	5	30	0	12
Blackfly Larvae	0	0	0	0
Planaria	7	1	2	0
Leech	0	0	4	0
Very Tolerant				
Left-handed Snail	0	0	0	0
Aquatic Worms	2	1	1	0
Blood Midge	6	16	0	0
Rat-tailed Maggot	0	0	0	0

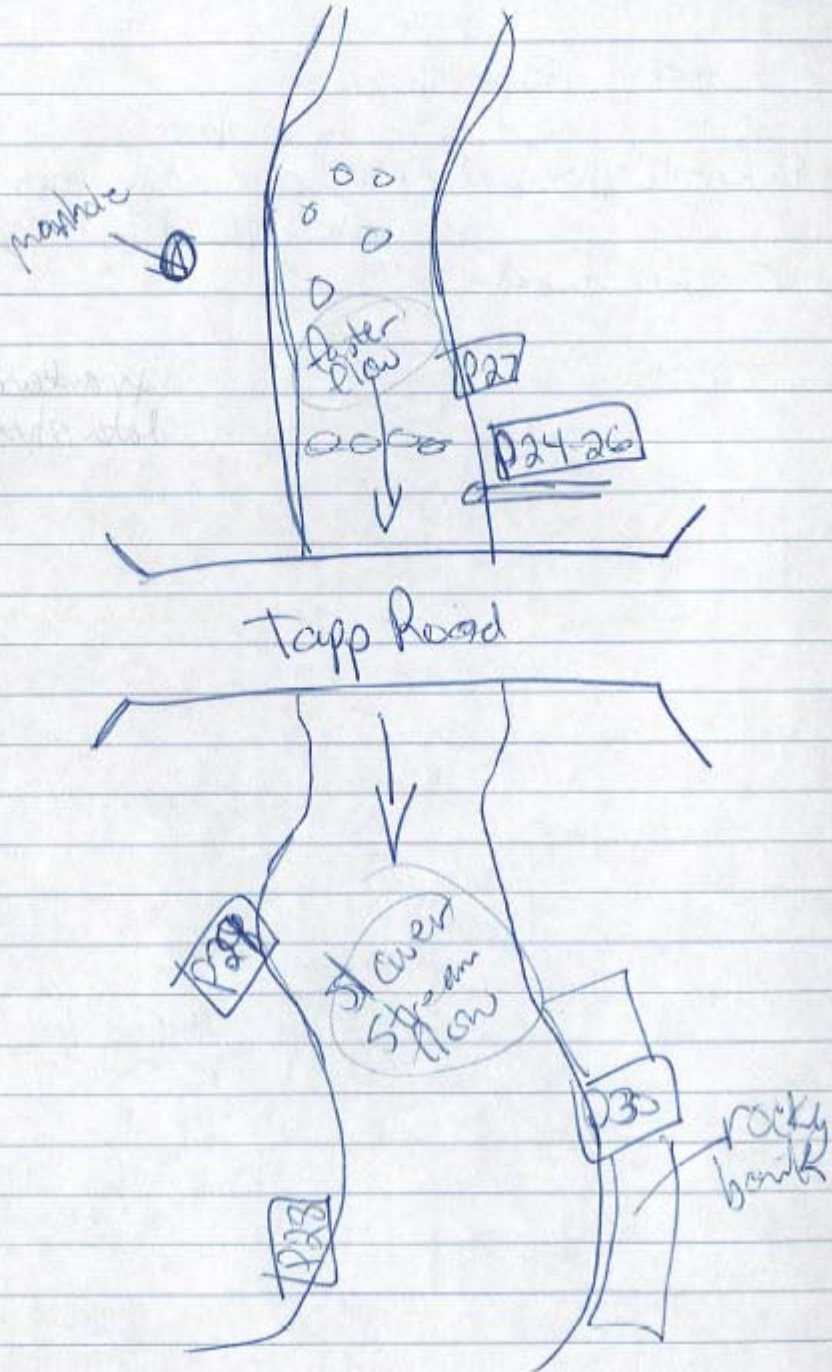


Site 1

Sunny 41°

all day rain - 11/11/04

11/13/04 1:40
1:10 PM - ~~1:40 PM~~



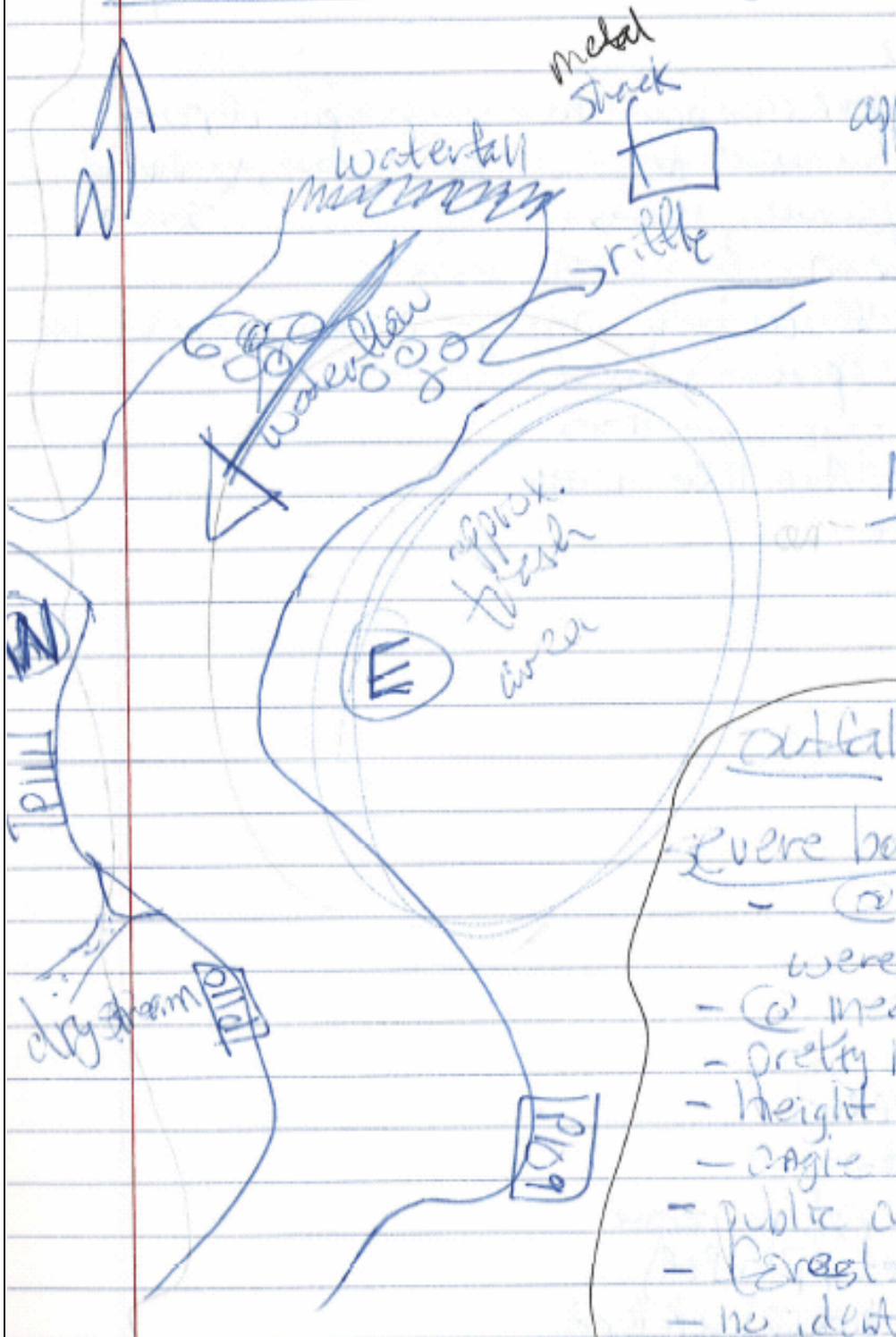
West Fork
Clear Creek - Jackson Creek

1st trial site
developmental

11/13/04

Site 2

Sunny 41°



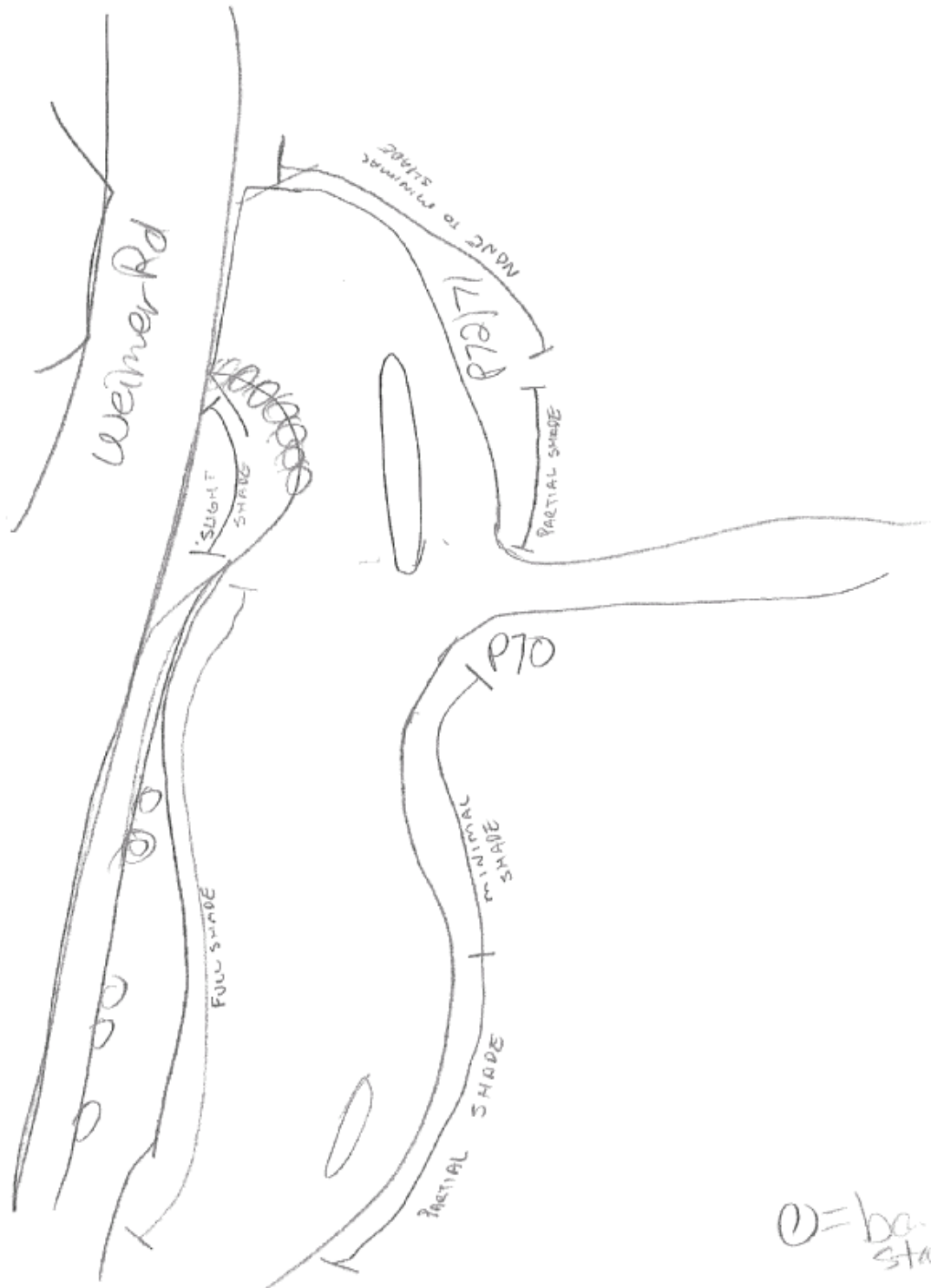
HRW Site ID# 939

Site Sketch

SS

WATERSHED/SUBSHED: <u>WFC</u>	DATE: <u>3/30/05</u>	ASSESSED BY: <u>EM/CG</u>
SITE ID: <u>03</u>	TIME: <u>8:30</u> AM/PM	PHOTO ID: (Camera-Pic #) <u> </u> #
SS- <u> </u>	LAT <u>39° 08' 88"</u> LONG <u>086° 33' 828"</u>	LMK <u> </u> GPS: (Unit ID)

(NOTE: Be sure to include any outfalls and photograph locations.)



HRW
Site #: 832
2:00am Site Sketch

SS

WATERSHED/SUBSHED: <i>WFCC</i>	DATE: <i>3/26/05</i>	ASSESSED BY: <i>EM/CG</i>
SITE ID: <i>04</i>	TIME: ___:___ AM/PM	PHOTO ID: (Camera-Pic #) #
SS- _____	LAT <i>39° 07.051'</i> LONG <i>08° 33.019'</i> LMK _____	GPS: (Unit ID)

(NOTE: Be sure to include any outfalls and photograph locations.)

