Stream Habitat Assessment and Wetland Delineation Report

Warden Waste Site

Ohio County, Kentucky

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I. INTRODUCTION

Introduction

This report is a description of streams and wetlands located within a 309.8 acre proposed permit area in Ohio County, Kentucky. Information contained within this document was compiled for the purpose of identifying potential environmental impacts that may be associated with a future coal mining facility. Please note that the amount of streams and wetlands located within the proposed permit area may not reflect final impact lengths and acreages associated with future permit applications. The report will focus on the physical assessment of streams and wetlands. The documentation of existing conditions will aid in determination of the amount of mitigation that will be required for potential impacts on jurisdictional waters of the United States.

The data presented in this report is based upon field investigation, general research, and information supplied by Armstrong Coal Company, Inc. The text body is limited to analysis, which may be further summarized, supported or illustrated by additional tables and exhibits. The exhibits and appendix include the following: project vicinity map, aerial map, National Wetlands Inventory map, soils map, USGS topographic quadrangle, floodplain map, cross sections of larger streams, stream habitat assessment forms, wetland delineation forms, and photographic documentation.

Location

The center of the proposed permit area is located approximately 3 miles west of Centertown, Kentucky, in Ohio County (Equality USGS 7.5 minute topographic quadrangle), at Latitude: 37° 24' 53" N, Longitude: 87° 03' 25" W. The site can be accessed from a haul road off the Matanzas-Equality Road, which runs north from State Route 69. The majority of the site is north of the haul road, but a small section lies to the south. See Exhibit 1 for project location.

Background and Description

Topography within the project area generally consists of hilly terrain, with some floodplain along the southwestern boundary (associated with Williams Creek and an unnamed tributary). Land features in the study area include forest and wetlands. Approximately 98 percent (302.6 acres) of the study area is forested. Forest age ranges from mature, second-growth forest to young forest comprised of saplings and thick undergrowth. Dominant tree species include maple species (*Acer* spp.), beech (*Fagus* spp.), oak species (*Quercus* spp.), hickory species (*Carya* spp.), and sweetgum (*Liquidambar styraciflua*).

Purpose of Project

The purpose of the project is for Armstrong Coal Company to establish a waste material site for existing coal mine operations.

II. STREAM ASSESSMENT AND WETLAND DELINEATION METHODS

Streams

The Environmental Protection Agency's (EPA*) Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers* (1999) was used to assess intermittent and perennial streams in the permit area. High gradient or low gradient field data sheets were completed for each intermittent stream. Documentation for ephemeral tributaries includes photographs, location and total length. The protocol matrix used to assess habitat quality is based on key physical characteristics of the water-body and surrounding land, particularly the catchment of the site under investigation. Habitat is defined as the quality of in-stream and riparian habitat that influences the structure and function of the aquatic community in a stream. This matrix provides an effective means of evaluating and documenting habitat quality at each site. Habitat parameters evaluated are related to overall aquatic life use and are a potential source of limitation to aquatic biota. Site selection for assessment was based upon a probabilistic approach to provide information about the overall status or condition of each site (Barbour, et al. 1999).

For this report, assessments focus on the matrix in which physical characteristics of each stream are evaluated on 10 parameters with scales from 0 to 20, in which 20 represents a pristine situation. Parameters address characteristics including substrate, flow regime, sediment deposition, and riparian zone quality, among others. The potential score for a pristine evaluation is 200 total, but a high habitat assessment score can still represent a poor stream when taking into account conductivity, which contributes to overall ecological integrity. The Corps of Engineers provided guidelines to be used to describe water quality within the assessed reach; as being optimal, suboptimal, marginal, or poor based on the habitat assessment score.

In addition, each stream was classified by "type", according to the Rosgen methodology, based on various geomorphic parameters (entrenchment ratios, width to depth ratios, slope, etc.) taken from cross-section and contour information.

Stream lengths, channel locations and limits were determined in the field utilizing manual measuring techniques including chaining, range finding, pacing, global positioning, and verification of mapping. Stream flow was determined in the field based upon stream status at

the time of visit. The final determination of stream quantity and jurisdiction will be decided by the United States Army Corps of Engineers (USACE). Although updated contour information within the study area was utilized, older USGS mapping was used to determine drainage areas for many of the streams; making those measurements approximate.

See Sections VI, VII and VIII each for a list of tables, exhibits, and items in the appendix.

Wetlands

Potential wetlands within the project area were evaluated for the presence of wetland characteristics during November 2012. See Table 2 for a summary of wetland information. On-site wetland determinations were conducted using criteria outlined in the 2010 USACE's *Draft Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region*. Hydrology, vegetation, and soils were evaluated. Soil characteristics were identified using soil borings, dug pits, and a Munsell soil color chart. Wetland boundaries were defined in the field, surveyed using a hand-held global positioning unit and transferred to project mapping in order to determine approximate wetland areas. Data on soils were taken from the Natural Resources Conservation Service's Web Soil Survey (USDA 2009) and the Soil Survey of Ohio County, Kentucky (USDA 1987). The National Wetland Inventory (NWI) geospatial data for the Equality Quadrangle (U.S. Fish and Wildlife Service 2010) was examined for existing Cowardin classifications (Cowardin et al. 1979). The Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (1989) was consulted for floodplain boundaries. Refer to Exhibits 2 and 3 for locations of delineated wetlands on project mapping. See the appendix for Wetland Delineation Forms and photographs.

III. EXISTING CONDITIONS: STREAMS

There are five intermittent, and thirty-six ephemeral streams located within the proposed permit area boundary. All assessed streams are identified on Exhibits 2 and 3. Three of the intermittent streams studied are tributaries to Williams Creek and generally flow southwest. The other two intermittent streams generally flow toward the north study limit and are tributaries to Elk Creek. A discussion of the data and exhibits are presented in this report.

Stream Assessments

Intermittent Streams

Intermittent Stream 1 (I-1) is located in the eastern section of the study area, flowing southwest for 3,547 feet to a culvert under an existing haul road, then another 106 feet before the boundary limit (total of 3,653 feet). The stream has a drainage area of approximately 169 acres at the downstream project limit. Due to its length, two assessments were performed. The stream has an average bottom width of 2.3 feet and an average bankfull width of 6.5 feet.

The stream habitat assessment (Low Gradient) for the upstream reach (I-1US) indicates the epifaunal substrate/available cover score is in the suboptimal range due to a 30 to 50 percent mix of stable substrate, suitable for full colonization. Streambed morphology consists of equal runs, and pools; with the majority of the pools present being shallow. The stream substrate consists of only silt/clay size material present. Little deposition of fine sediment is present, with less than 20 percent of the bottom affected. There is evidence of some past channelization, but sinuosity still scored as suboptimal. During the assessment, water was utilizing 25 to 75 percent of the channel bottom, but occurred mostly at pool sections. Banks were moderately stable (suboptimal score) iwith few areas of erosion. Vegetative protection and riparian zone width also scored as suboptimal, with the dominant riparian vegetation consisting of trees, shrubs, and herbaceous species.

The stream habitat assessment (Low Gradient) for the downstream reach (I-1DS) indicates the epifaunal substrate/available cover score is in the marginal range. Streambed morphology consists of only long runs. The stream substrate again consists of only silt/clay-sized material. Some deposition of fine sediment is present. Again, there is some evidence of past channelization, but this reach was less sinuous and scored poor. There was very little water present in this reach. Bank stability scored in the low suboptimal range. While vegetative cover scored marginally, the riparian zone width was suboptimal. The dominant riparian vegetation consisted of trees, shrubs, and herbaceous species.

I-1 has an average habitat score of 112, which corresponds to a stream quality rating of suboptimal. The conductivity value in the upper reach was 336 μS, but a reading could not be taken in the downstream reach due to a lack of sufficient flow. The channel was classified, according to Rosgen methodologies, as an “E” type in the upper reach, and an “F” type stream in the downstream reach.

Intermittent Stream 2 (I-2) is located in the western section of the permit boundary. It flows southwest for approximately 1869 feet to the study boundary. I-2 has a drainage area of

approximately 70 acres. Due to its length, two assessments were performed. The stream has an average bottom width of 4.0 feet, and an average bankfull width of approximately 4.4 feet.

The EPA stream habitat assessment (High Gradient) for the upstream reach (I-2US) indicates epifaunal substrate/available cover scored in the low suboptimal range. The streambed morphology consists of very short riffles, long runs, and short shallow pools. The stream substrate consisted of predominantly silt/clay-sized material, but sand and gravel sizes were also present. There was moderate deposition of fine sediment, with 30 to 50 percent of the bottom affected. There was little evidence of past channelization. At the time of assessment, water was utilizing 25 to 75 percent of the channel. Banks are moderately stable, with small areas of erosion present. Vegetative cover scored suboptimal, with 70 to 90 percent of the banks vegetated. Riparian zone width also scored in the suboptimal range (12 to 18 meters in width). The dominant riparian vegetation consisted of trees, shrubs, herbaceous, and grass species.

The stream habitat assessment (Low Gradient) for the downstream reach (I-2DS) indicates epifaunal substrate/available cover scored in the marginal range. Streambed morphology consists of long runs and short shallow pools. The stream substrate consists of predominantly gravel size material, with silt/clay and sand-sized material present. There was moderate deposition of fine sediment, affecting 50 to 80 percent of the bottom. There was some evidence of past channelization, with sinuosity scoring in the marginal range. Banks are moderately stable, with vegetative cover scoring suboptimal. Riparian zone width also scored suboptimal, with the dominant riparian vegetation again consisting of trees, shrubs, herbaceous, and grass species.

I-2 has an average total habitat score of 106, which corresponds to a stream quality rating near the lower limit of suboptimal. A conductivity reading of 837 μS was taken in the upper reach; insufficient flow existed downstream for a reading. This stream classified as a “G” type in the upper reach, and a type “E” in the downstream reach.

Intermittent Stream 3 (I-3), also located in the western section of the project boundary, is a tributary to I-2. It flows south for approximately 1305 feet to the confluence with I-2. This stream has a drainage area of approximately 26 acres. The stream has a bottom width of approximately 1.3 feet, and a bankfull width of approximately 3.0 feet.

The EPA stream habitat assessment (High Gradient) for I-3 indicates epifaunal substrate/available cover scored in the low suboptimal range. Streambed morphology consists of very short riffles, lone runs and short shallow pools. Stream substrate consists of predominantly silt/clay-sized material, with some sand present. There was moderate deposition

of fine sediment, affecting 50 to 80 percent of the bottom. There was little to no evidence of past channelization. The little water present at the time of assessment was mostly found in the pools. Banks are moderately stable, with vegetative cover scoring suboptimal. The riparian zone width scored suboptimal, with the dominant riparian vegetation consisting of trees, shrubs, herbaceous, and grass species.

I-3 has a total habitat score of 109, which corresponds to a stream quality rating of suboptimal. The conductivity reading taken was 204 μS. According to Rosgen methodologies, this is a type "A" stream.

Intermittent Stream 4 (I-4) is located along the northwestern study boundary. It flows north for approximately 1794 feet within the boundary and has a drainage area of approximately 53 acres. The stream has a bottom width of approximately 2 feet, and a bankfull width of approximately 7 feet.

The stream habitat assessment (Low Gradient) for I-4 indicates epifaunal substrate/available cover score is in the suboptimal range. Streambed morphology consists of long runs and short shallow pools. Stream substrate consists of a mix of silt/clay, sand, and gravel sized material. Some deposition of fine sediment is present. There is evidence of past channelization, however, sinuosity scored in the suboptimal range. During the assessment, water filled 25 to 75 percent of the channel bottom at pool sections. Banks are moderately unstable, with areas of erosion evident. Vegetative cover scored from mid-marginal to low suboptimal. Riparian zone width scored suboptimal, with the dominant riparian vegetation consisting of trees, shrubs, and herbaceous species.

I-4 has a total habitat score of 107, which corresponds to a stream quality rating of low suboptimal. A conductivity reading could not be taken due to dry conditions. This stream classified as a Rosgen type "F".

Intermittent Stream 5 (I-5) is located in the north-central section of the study area, and flows north for approximately 923 feet to the boundary limit, where it has a drainage area of approximately 24 acres. Due to distinct gradient changes, two assessments were performed. The stream has an average bottom width of approximately 2.5 feet, and a bankfull width average of approximately 4.0 feet.

The stream habitat assessment (How Gradient) for I-5US (upstream reach) indicates epifaunal substrate/available cover score is in the marginal range, with less than desirable conditions for colonization. The streambed morphology consists of long runs and very short shallow pools. Stream substrate consists of silt/clay and gravel-sized material; with gravel predominant in the runs, but not in the pools. Some new deposition of fine sediment is present.

There is some evidence of past channelization. Very little water was present during the assessment. Bank stability scored in the suboptimal range, with infrequent areas along the banks having erosion problems. Vegetative cover and the riparian zone width scored high suboptimal. The dominant riparian vegetation consisted of trees, shrubs, herbaceous, and grass species.

The stream habitat assessment (High Gradient) for the downstream reach (I-5DS) indicates epifaunal substrate/available cover scoring again as marginal. The streambed morphology consists of nearly equal runs and shallow pools. Stream substrate consists predominantly of silt/clay-sized material, but also has sand and gravel sized material present. Deposition of fine sediment is moderate. There is evidence of past channelization. In this reach, water was found filling 25 to 75 percent of the channel bottom. Bank stability again scored in the suboptimal range. Vegetative cover also scored suboptimal, as did the riparian zone width. The dominant riparian vegetation consisted of trees, shrubs, herbaceous species, and grasses.

I-5 has an average habitat score of 100, which corresponds to a stream quality rating of high marginal. A conductivity reading of 484 μS was taken in the downstream reach. This stream classified is a type “E” upstream and a type “F” in the downstream reach.

Ephemeral Streams

Ephemeral Streams (E-1 to E-36) are located throughout the permit study area, and for discussion purposes have been divided into two groups based on drainage area (which also generally reflects the length of the associated stream). In reviewing the data, it appears streams with drainage areas of 4 acres or less, and those above this limit, can be characterized together.

There are nineteen streams with drainage areas of **less than 4 acres** (E-4, 5, 8, 9, 13, 14, 16, 18, 19, 20, 23, 24, 25, and E-30 through E-35). The average length of channel is approximately 257 feet. They have an average bottom width of 0.9 feet and average bankfull width of 2.2 feet.

In general, the EPA stream habitat assessments indicate a marginal epifaunal substrate/available cover. The substrate consists of predominantly, or all, silt/clay sized material; with gravel being present in several streams. Streambed morphology consists primarily of runs only. A few also had very short shallow pool sections present. They are dominated by only one velocity/depth regime. Typically, there is some deposition of new material, with 5 to 30 percent of the bottom affected. Banks are moderately stable (only five

instances of moderately unstable conditions found). The vegetative protection ranking was generally in the low suboptimal range. On average, riparian zone width was also in the suboptimal range. Dominant riparian vegetation typically consists of trees, shrubs, and herbaceous species. A few instances had grasses present.

These streams have an average habitat score of 92, which indicates that stream quality is in the marginal range (one had a score that was low suboptimal). No conductivity readings were collected due to dry stream conditions. The majority (nine) of these streams classified as Rosgen type "G". Six classified as type "A", three as type "B", and one as type "F".

For the seventeen ephemeral streams with drainage areas of **greater than 4 acres** (all streams except those listed previously), the flow length is an average of approximately 803 feet within the permit boundary. The also have average bottom widths of 1 foot and average bankfull widths of 2.4 feet.

Generally, the stream habitat assessments indicate a marginal epifaunal substrate/available cover. Again, the substrate consists predominantly of silt/clay-sized materials, but the majority of these streams had a mix with larger sand and gravel sizes. Typically, streambed morphology consists of runs only, but several had short shallow pools sections. These streams were also dominated by one velocity/flow regime. There is some deposition of new material. On average, banks are moderately stable (however, nearly one-third scored as moderately unstable). Vegetative protection ranks in the suboptimal range, with 70 to 90 percent of the banks covered. The riparian zone width averaged as suboptimal. Dominant riparian vegetation consists of trees, shrub, and herbaceous species. Again, grasses were occasionally found.

These streams have an average habitat score of 95, which also corresponds to a stream quality rating of marginal (although six had scores that were low suboptimal). Again, conductivity readings were not typically collected due to dry stream conditions. However, one reading was taken where sufficient water was present (E-22). This yielded a conductivity reading of 193 μS. Of these streams, five classified as Rosgen type "B", four as type "A", four as type "G", three as type "E", and one as type "F".

Assessment sheets for all intermittent and ephemeral streams are found in the Appendix, along with photographs taken at assessment points. See Table 1 for a summary of the stream data.

IV. EXISTING CONDITIONS: WETLANDS

Three areas exhibiting indicators of hydric soils, wetland hydrology, and hydrophytic plant communities are located within the permit boundary; these areas will be referred to as "wetlands" for the remainder of the document, pending USACE confirmation. Tentative Cowardin classifications are assigned based on dominant vegetation and hydrologic conditions observed during delineations. These areas have a combined total area of 4.088 acres, with 4.036 acres occurring within the permit area. Refer to Exhibits 2 and 3 for locations of delineated wetlands, and the appendix for photographs of each wetland. Table 2 is a summary of wetland information, including the wetland impacts for the project. Descriptions of the delineated wetlands follow. It should be noted that although the areas are referred to as wetlands, these determinations are assigned pending final USACE verifications.

Wetland A is located immediately southwest of the haul road that transects the permit boundary. It is a palustrine forested wetland (PFO1A) that is mostly temporarily flooded, but is saturated next to the haul road. An old road running through the middle of Wetland A appears to be collecting water, thus making that area wetter than its surroundings. The wetland has a total area of 1.756 acres, with 1.709 acres within the study boundary, and drains to an unnamed tributary of Williams Creek. Forested vegetation is prevalent at the site dominated by sycamore (*Platanus occidentalis*), red maple (*Acer rubrum*), river birch (*Betula nigra*) and swamp chestnut oak (*Quercus michauxii*); the sapling stratum is dominated by pin oak (*Quercus palustris*) and red maple (A. rubrum); herbaceous vegetation was sparse, dominated by sensitive fern (*Onoclea sensibilis*). Hydrophytic vegetation is established by the Dominance Test, as all dominant species are FAC or wetter. The soil has a silt-clay loam texture, with a gleyed matrix color of 10YR 4/1, and a redox feature of 10YR 4/6 from 2 to 4 inches; a gleyed matrix color of 10YR 6/2 with a redox feature of 5YR 4/6 from 4 to 10 inches; and the top 2 inches consists of an organic layer this satisfies hydric soil indicator F3-Depleted Matrix. Sparsely vegetated concave surface, drainage patterns and crayfish burrows are secondary indicators of wetland hydrology.

Wetland B is located immediately north of the haul road that transects the permit boundary, and is a palustrine, forested wetland that is temporarily flooded (PFO1A). The wetland has a total area of 2.324 acres, with 2.319 acres within the study boundary, and drains into Williams Creek. Forested vegetation is prevalent at this site, dominated by river birch (*Betula nigra*), sycamore (*Platanus occidentalis*), red maple (*Acer rubrum*), and persimmon (*Diospyros virginiana*); the sapling stratum is dominated by sycamore (*P. occidentalis*) and red maple (*A. rubrum*); and the herbaceous vegetation is dominated by boneset (*Eupatorium*

perfoliatum), little white aster (*Doellinger umbellate*), seedbox (*Ludwigia alternifolia*) and switchgrass (*Panicum dichotomiflorum*). As all dominant species are FAC or wetter, a hydrophytic community is confirmed by the Dominance Test. The soil has a silt-clay loam texture, with a gleyed matrix color of 10YR 5/2 with a redox feature of 5YR 4/6 from 2 to 10 inches; and the top 2 inches consists of an organic layer, meeting requirements for hydric soil indicator F3. Wetland hydrology was confirmed by two secondary indicators, sparsely vegetated concave surface and drainage patterns.

Wetland C is located within the channel of tributary E-2, and is a palustrine emergent wetland (PEM1H) of 0.008 acres, connected to Williams Creek via tributary E-2. This wetland appears to be an excavated pit within the stream channel, and consists of a vegetated fringe along the shoreline of the pit. This recent disturbance likely qualifies the area as an atypical situation; thus only two criteria were used for wetland determination. The soil has a silt-clay loam texture, with a high-chroma brown color from 1 to 10 inches; and the top inch consists of an organic layer. However, herbaceous vegetation is prevalent at the site, dominated by sedge (Carex sp.), rush (*Juncus effusus*) and seedbox (*Ludwigia alternifolia*). Broomsedge (*Andropogon virginicus*), spikerush (*Eleocharis obtusa*) and beggarsticks (*Bidens sp*.) also were observed. All dominant species are FACW, establishing hydrophytic vegetation by the rapid test. The presence of surface water and saturation are primary indicators of wetland hydrology.

V. REFERENCES

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VI. TABLES

Table 1: Summary of Stream Study Information

Stream	Latitude	Longitude	Habitat Score	Conductivity (μS)	Stream Type	Studied Length (ft)	Drainage Area (ac)	Rosgen Type*
I-1	37.40847	87.06056	112 (ave)	336	Intermittent	3653	168.9	E6, F6
I-2	37.41225	87.06269	106 (ave)	837	Intermittent	1869	70.0	G6, E3
I-3	37.41647	87.06028	109	204	Intermittent	1304	25.7	A6
I-4	37.42286	87.06031	107	-----	Intermittent	1794	53.1	F4/5
I-5	37.42106	87.05775	100 (ave)	484	Intermittent	923	24.5	E4, F6
E-1	37.40878	87.05744	113	-----	Ephemeral	699	6.6	B6
E-2	37.40931	87.05567	78	-----	Ephemeral	596	8.5	G6
E-3	37.41133	87.05728	112	-----	Ephemeral	629	12.2	B6/G6
E-4	37.41222	87.05742	95	-----	Ephemeral	660	3.8	G6
E-5	37.41194	87.05725	95	-----	Ephemeral	217	0.8	G6
E-6	37.41036	87.05469	86	-----	Ephemeral	780	5.4	F6
E-7	37.41161	87.05264	104	-----	Ephemeral	1606	19.6	E6
E-8	37.41192	87.05328	100	-----	Ephemeral	188	1.1	G6
E-9	37.41222	87.05217	98	-----	Ephemeral	370	3.3	B6
E-10	37.41347	87.05519	93	-----	Ephemeral	776	6.6	E6
E-11	37.41547	87.05342	108 (ave)	-----	Ephemeral	1603	46.2	B6, B6
E-12	37.41650	87.05508	91	-----	Ephemeral	1140	12.5	G6
E-13	37.41603	87.05464	79	-----	Ephemeral	281	1.2	G6
E-14	37.41689	87.05500	97	-----	Ephemeral	248	1.4	B6
E-15	37.41658	87.05306	98	-----	Ephemeral	627	4.8	B6
E-16	37.41692	87.05139	99	-----	Ephemeral	222	1	B6
E-17	37.41592	87.05150	100	-----	Ephemeral	632	6.6	B6
E-18	37.41586	87.05097	107	-----	Ephemeral	130	1.3	A6
E-19	37.41314	87.06119	92	-----	Ephemeral	276	2.1	G6
E-20	37.41364	87.06119	94	-----	Ephemeral	267	2.1	F6
E-21	37.41475	87.05892	96	-----	Ephemeral	512	4.9	A6
E-22	37.41550	87.05833	102	193	Ephemeral	648	10.3	A6
E-23	37.41600	87.06031	96	-----	Ephemeral	479	2.2	G6

E-24	37.41647	87.05928	85	-----	Ephemeral	159	0.8	G6
E-25	37.41703	87.05892	84	-----	Ephemeral	122	1.5	G6
E-26	37.41756	87.05808	96	-----	Ephemeral	502	4.5	A6
E-27	37.41828	87.05906	97	-----	Ephemeral	620	7.8	A6
E-28	37.41983	87.06133	98	-----	Ephemeral	794	10.7	G6
E-29	37.42011	87.05986	91	-----	Ephemeral	826	7.5	G6
E-30	37.42233	87.05808	92	-----	Ephemeral	156	1.3	A6
E-31	37.42200	87.05806	95	-----	Ephemeral	168	0.5	A4/6
E-32	37.42061	87.05828	87	-----	Ephemeral	197	0.9	A4/6
E-33	37.42003	87.05789	76	-----	Ephemeral	219	1.0	G6
E-34	37.42031	87.05722	94	-----	Ephemeral	283	1.0	A6
E-35	37.41911	87.05747	82	-----	Ephemeral	232	2.9	A6
E-36	37.41900	87.05725	65	-----	Ephemeral	654	7.0	E6
Intermittent Cumulative Total						**9543**		
Ephemeral Cumulative Total						**18518**		

* Rosgen classifications listed upstream to downstream for streams with multiple assessments.

1) Streams with multiple assessments have averages shown for habitat score and conductivity readings.

2) Data provided in this table is for baseline purposes only. The amount of stream located within the study area **does not reflect future impact lengths**.

Table 2. Summary of Wetlands

Wetland	Coordinates	Classification	Connectivity	Wetland Area (acres)	Area in Permit Boundary
A	37.40803 N 87.06214 W	PFO1A	Yes	1.756	1.709
B	37.40872 N 87.06114 W	PFO1A	Yes	2.324	2.319
C	37.40925 N 87.05669 W	PEM1H	Yes	0.008	0.008
			Totals	**4.088**	**4.036**

VII. EXHIBITS

Exhibit 1: Vicinity Map

Exhibit 2: USGS Topographic Map

Exhibit 3: Aerial Map

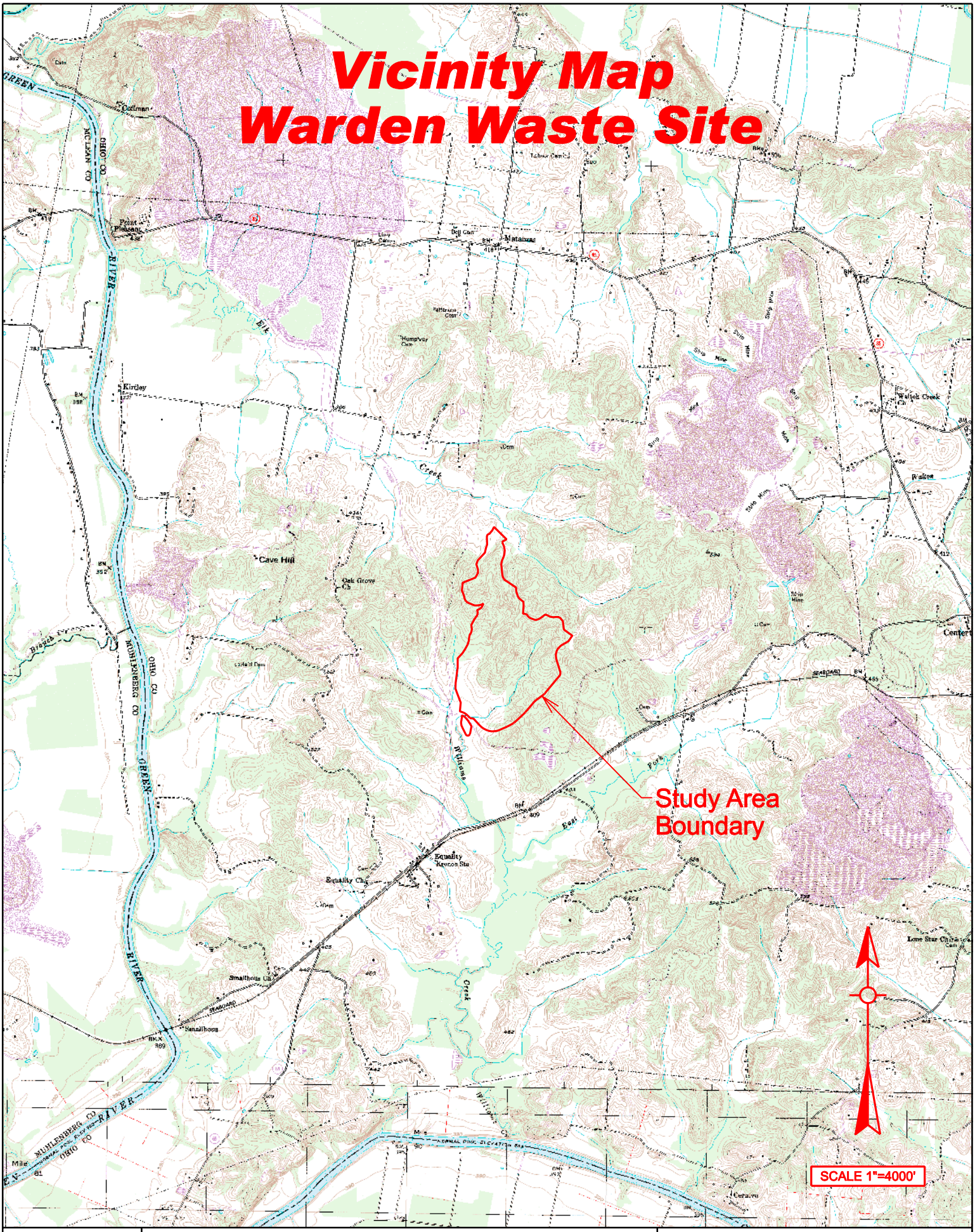
Exhibit 4: National Wetlands Inventory (NWI) Map

Exhibit 5: Soil Map

Exhibit 6: FEMA Flood Insurance Rate Map

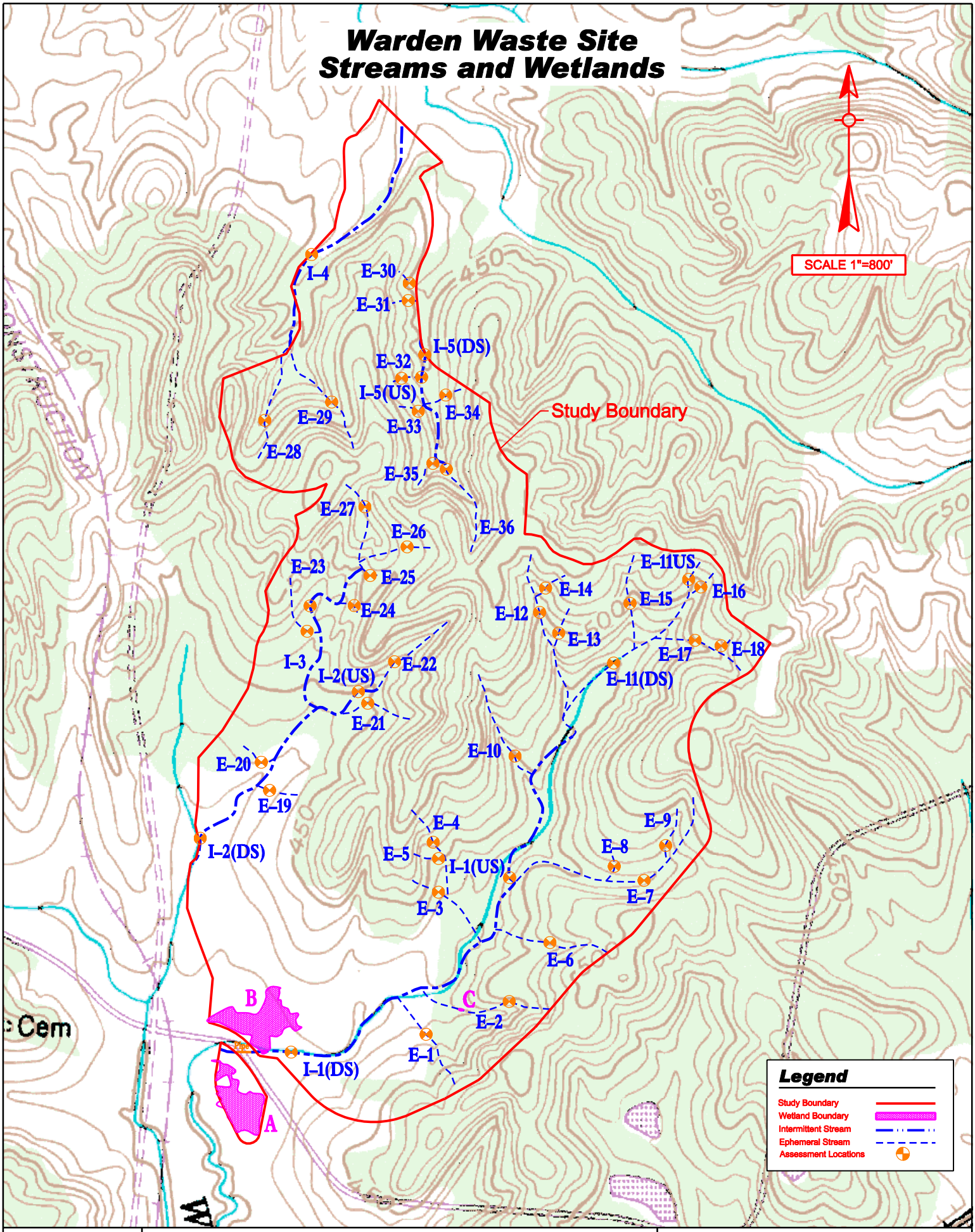
Exhibits 7-18: Existing Cross Sections of Streams

Vicinity Map
Warden Waste Site



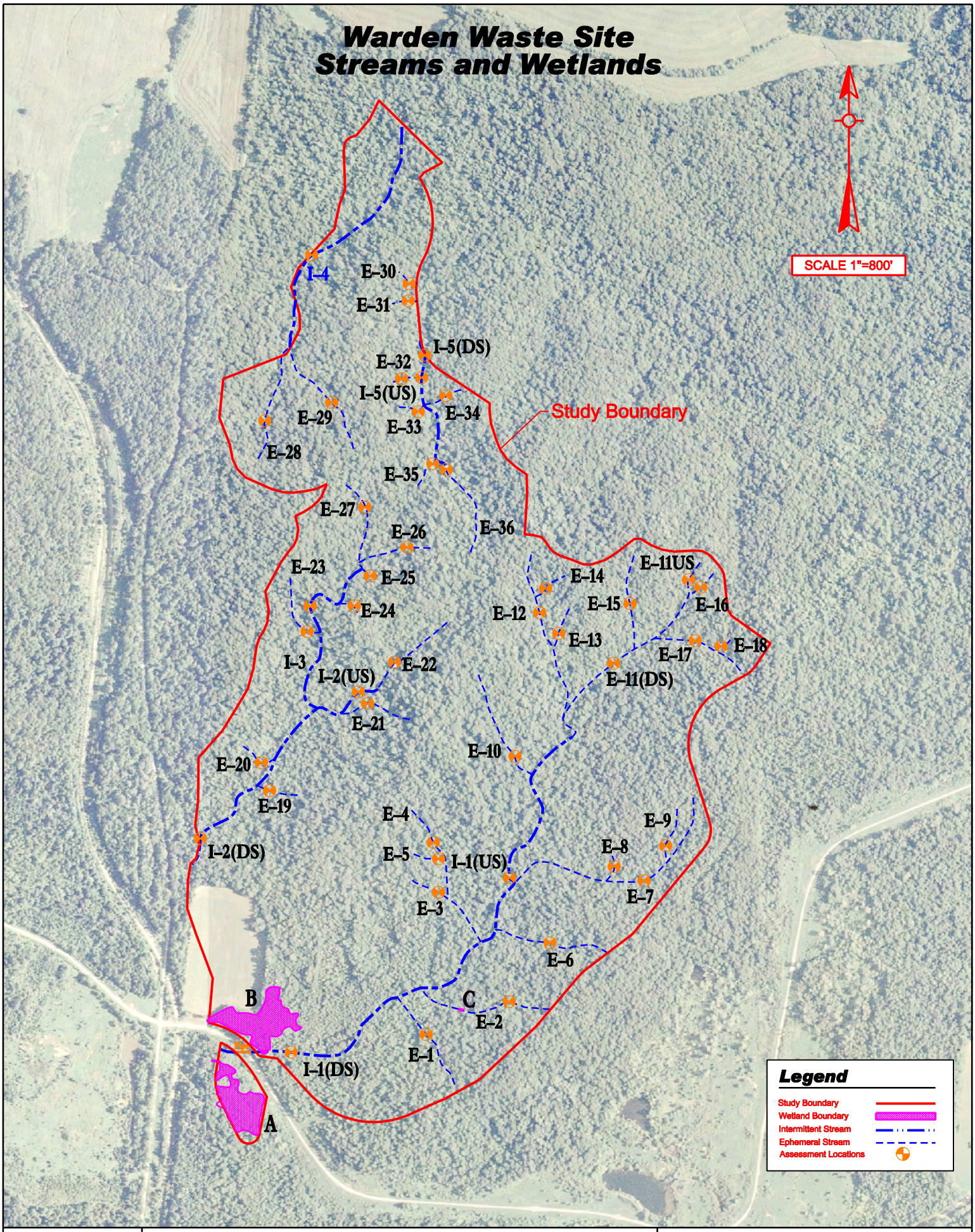
T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE - STUDY BOUNDARY			STREAMS: UT's OF WILLIAMS CREEK & ELK CREEK	
	COUNTY: OHIO	STATE: KY	NEAR: CENTERTOWN	ITEM: VICINITY MAP	EXHIBIT 1

DATE:



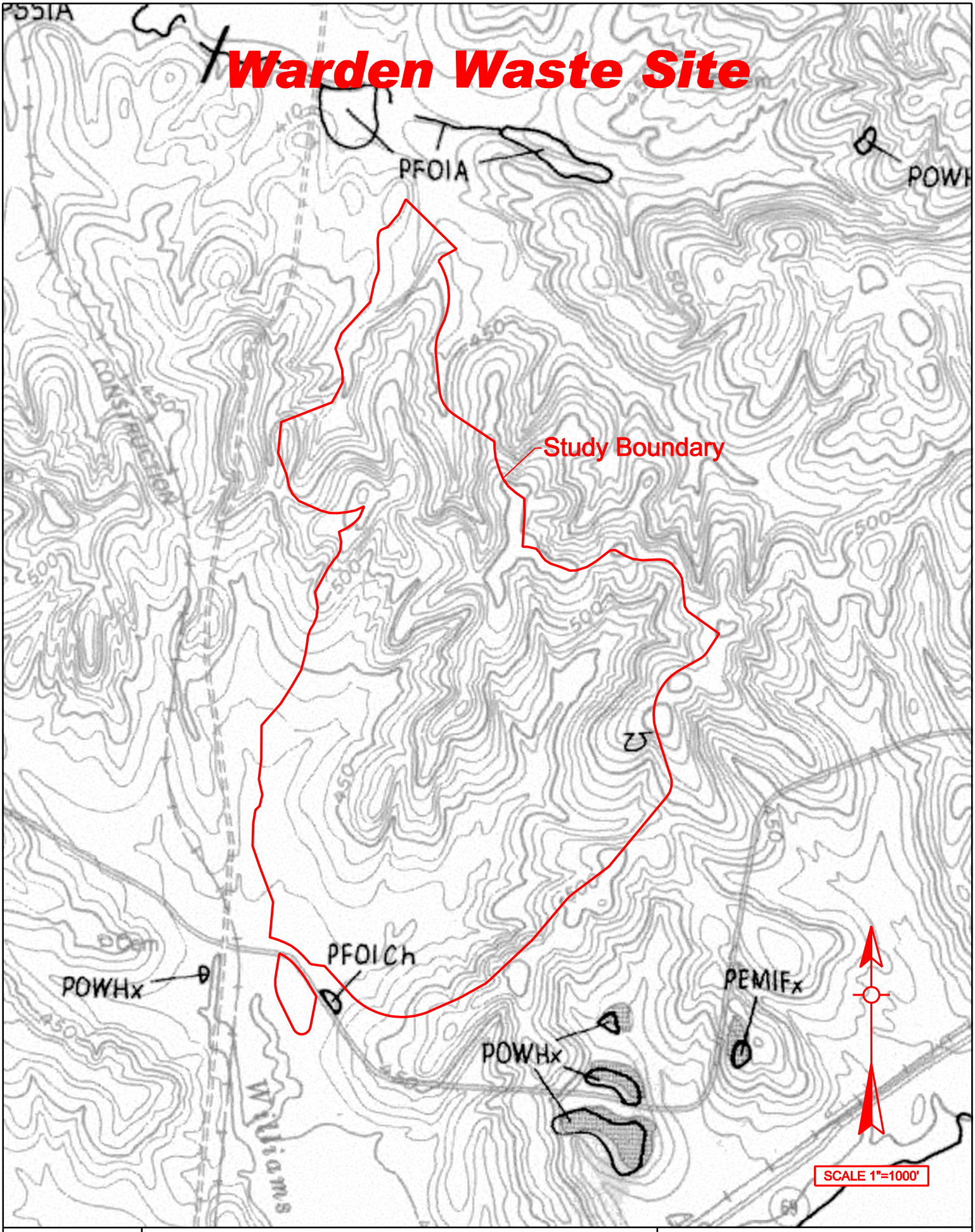
T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE - JURISDICTIONAL WATERS DELINEATION			STREAM: UT'S OF WILLIAMS CREEK & ELK CREEK	
	COUNTY: OHIO	STATE: KY	NEAR: CENTERTOWN	ITEM: QUAD MAP	EXHIBIT 2

DATE:



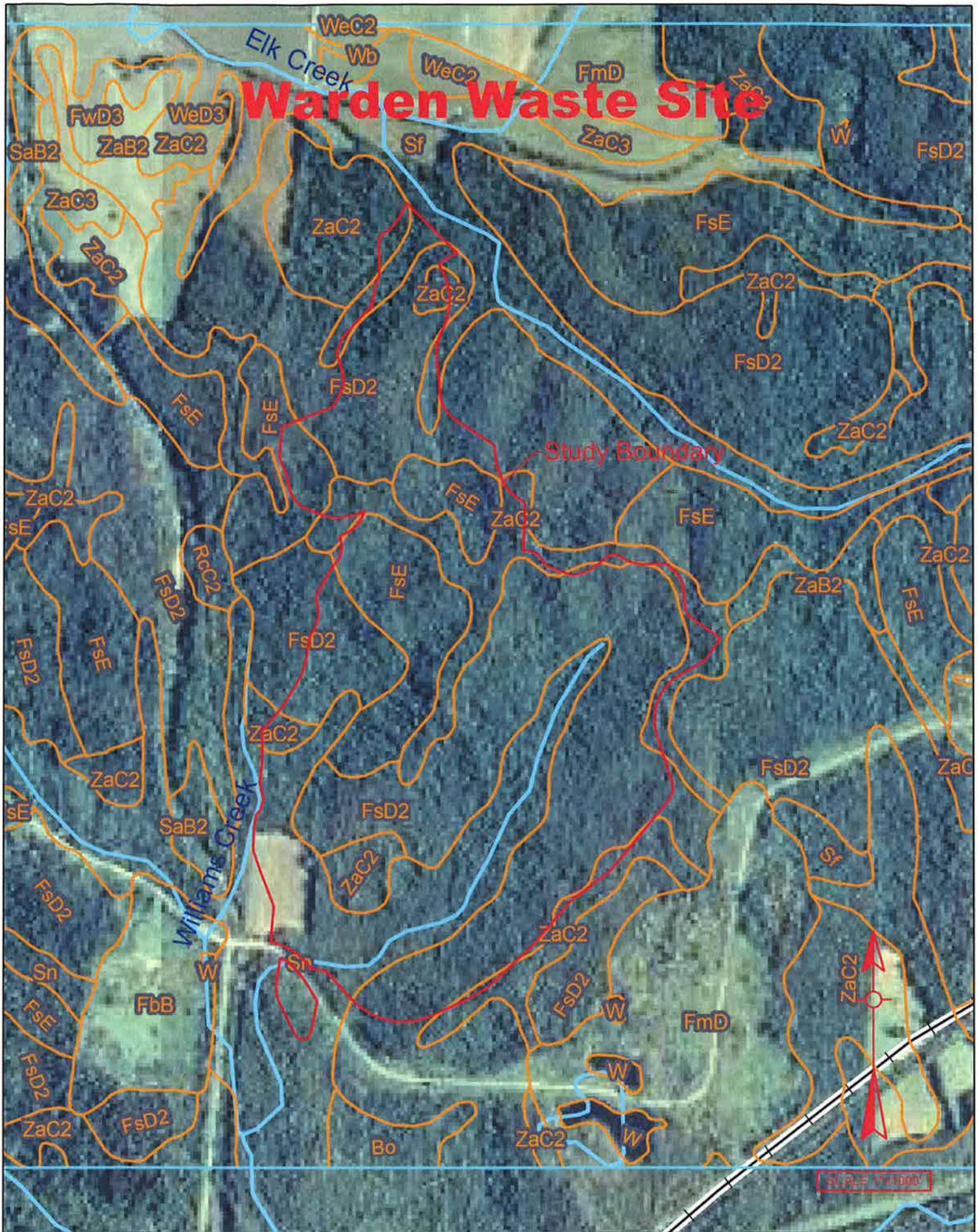
T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE - JURISDICTIONAL WATERS DELINEATION			STREAM: UT'S OF WILLIAMS CREEK & ELK CREEK	
	COUNTY: OHIO	STATE: KY	NEAR: CENTERTOWN	ITEM: AERIAL MAP	EXHIBIT 3

DATE:



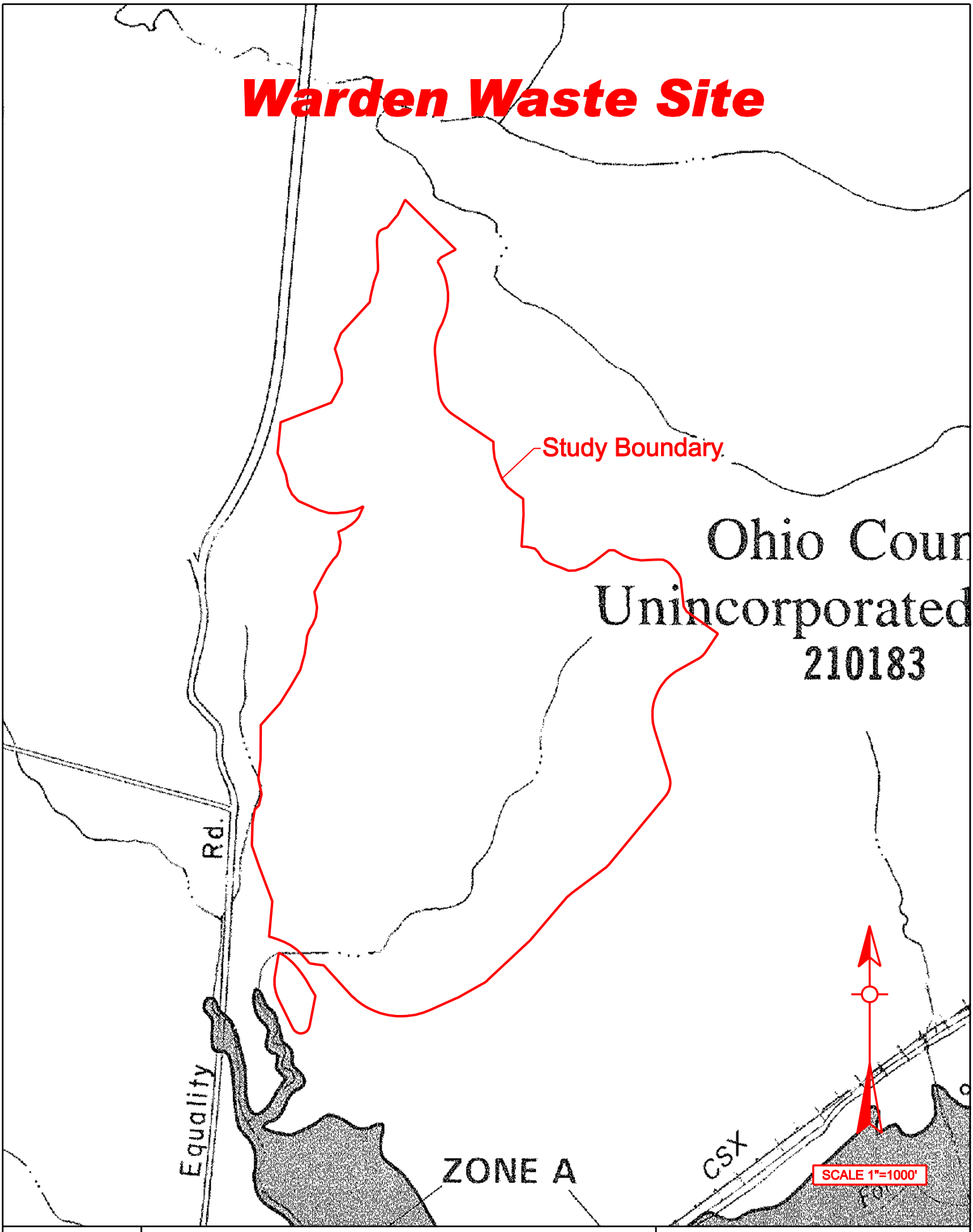
T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE - JURISDICTIONAL WATERS DELINEATION			STREAMS: UT'S OF WILLIAMS CREEK & ELK CREEK	
	COUNTY: OHIO	STATE: KY	NEAR: CENTERTOWN	ITEM: NWI MAP	EXHIBIT 4

DATE:



T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE - JURISDICTIONAL WATERS DELINEATION			STREAMS: UT'S OF WILLIAMS CREEK & ELK CREEK	
	COUNTY: OHIO	STATE: KY	NEAR: CENTERTOWN	ITEM: SOIL MAP	EXHIBIT 5

Warden Waste Site



T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE - JURISDICTIONAL WATERS DELINEATION			STREAMS: UT'S OF WILLIAMS CREEK & ELK CREEK	
	COUNTY: OHIO	STATE: KY	NEAR: CENTERTOWN	ITEM: FEMA MAP	EXHIBIT 6

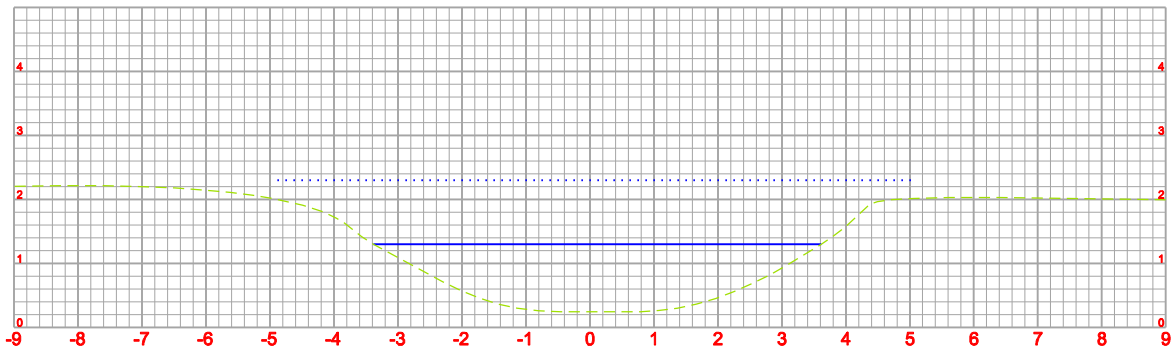
DATE:

Existing Intermittent (INT) Cross Sections

BF=Bankfull
FP= Floodprone
Existing Ground

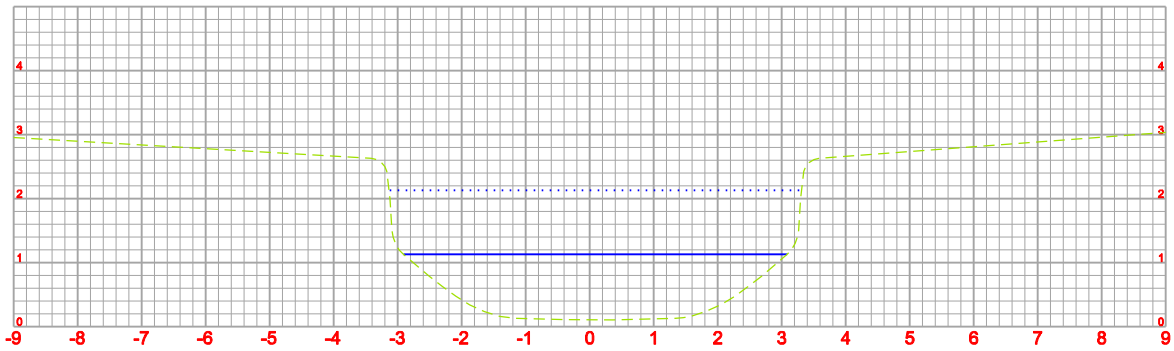
INT-1US

BFW = 7.0ft
BFD max = 1.0ft
FPW = ft



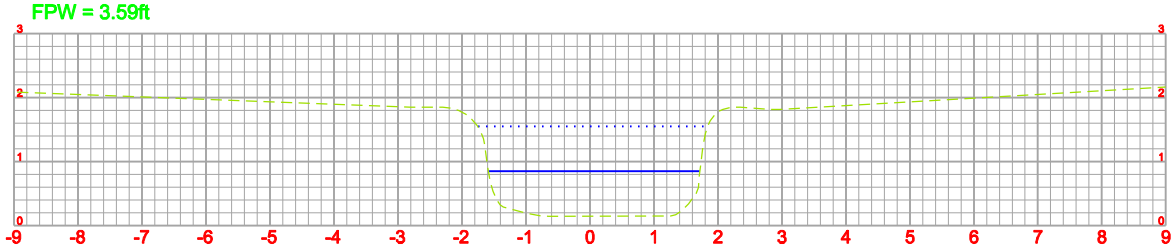
INT-1DS

BFW = 6.0ft
BFD max = 1.0ft
FPW = 6.42ft



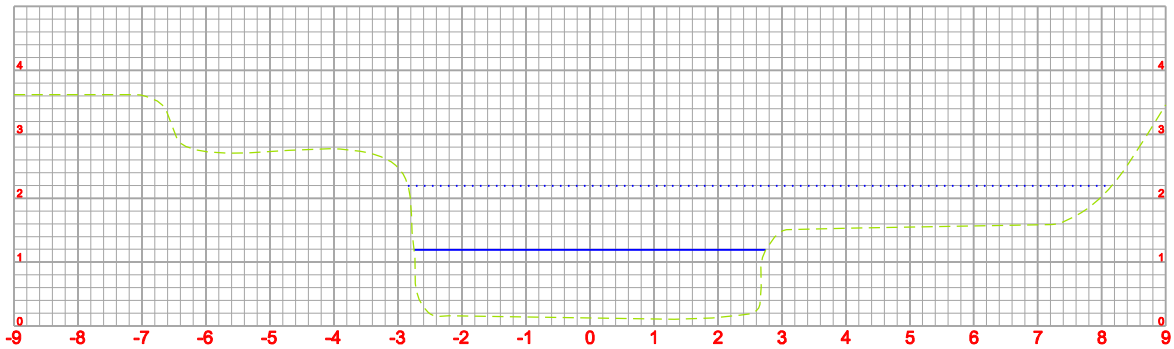
INT-2US

BFW = 3.3ft
BFD max = 0.7ft
FPW = 3.59ft



INT-2DS

BFW = 5.5ft
BFD max = 1.0ft
FPW = 11.0ft



Cross Section Scale: 1"=3'

T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE				
	COUNTY: OHIO	STATE: KENTUCKY	NEAR: CENTERTOWN	EXISTING CROSS SECTIONS	EXHIBIT 7

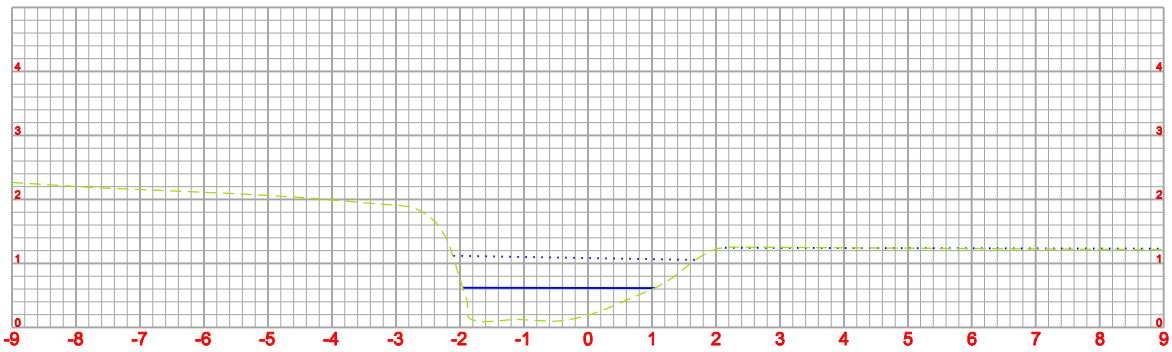
DATE:

Existing Intermittent (INT) Cross Sections

BF=Bankfull
FP= Floodprone
Existing Ground

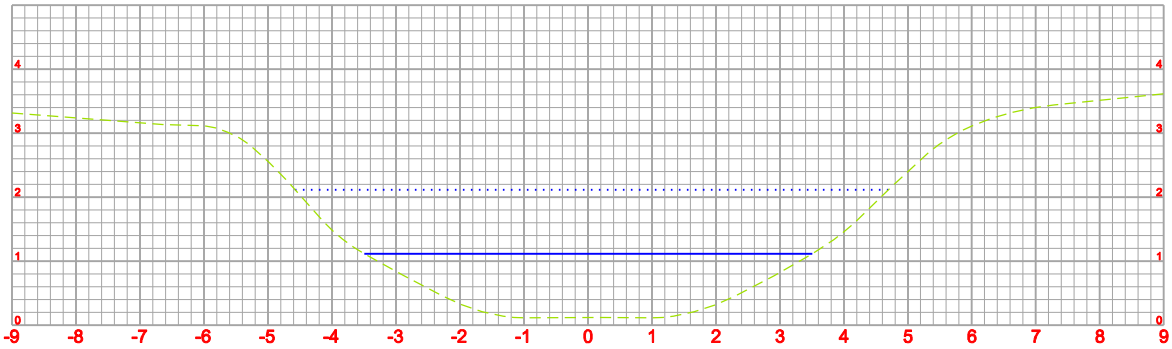
INT-3

BFW = 3.0ft
BFD max = 0.5ft
FPW = 3.79ft



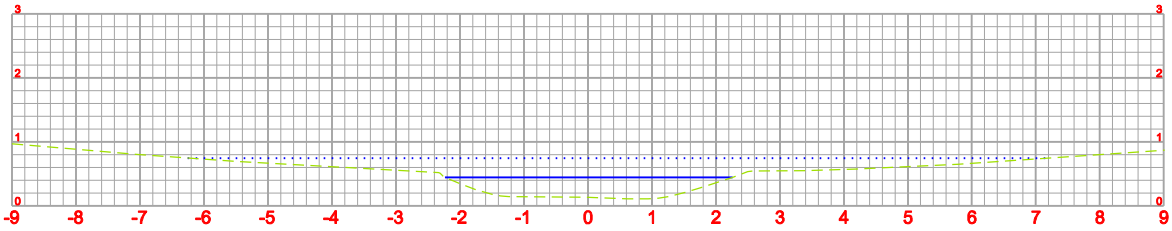
INT-4

BFW = 7.0ft
BFD max = 1.0ft
FPW = ft



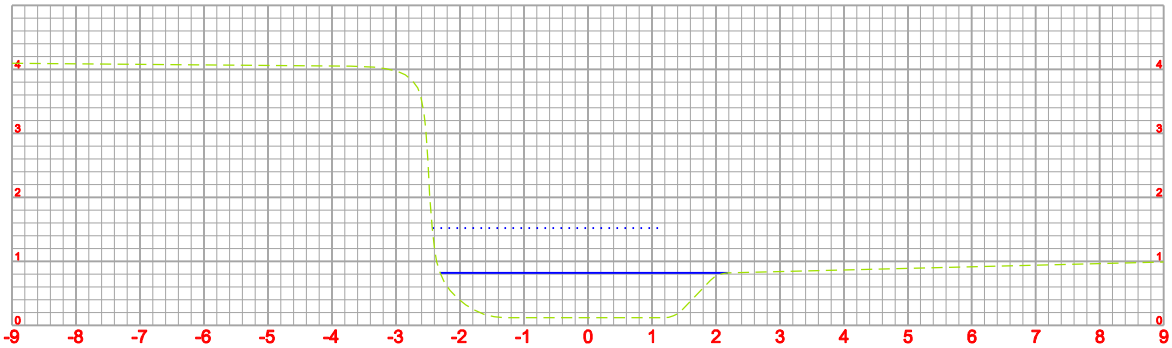
INT-5US

BFW = 3.5ft
BFD max = 0.3ft
FPW = 13.4ft



INT-5DS

BFW = 4.5ft
BFD max = 0.7ft
FPW = ft



Cross Section Scale: 1"=3'

T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE				
	COUNTY: OHIO	STATE: KENTUCKY	NEAR: CENTERTOWN	EXISTING CROSS SECTIONS	EXHIBIT 8

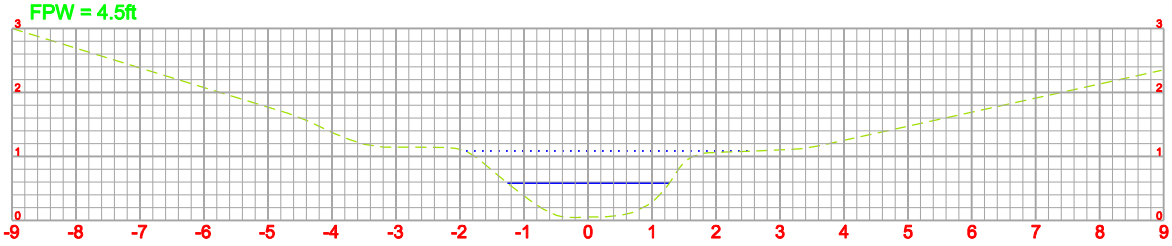
DATE:

Existing Ephermeral (EPH) Cross Sections

BF=Bankfull
FP= Floodprone
Existing Ground

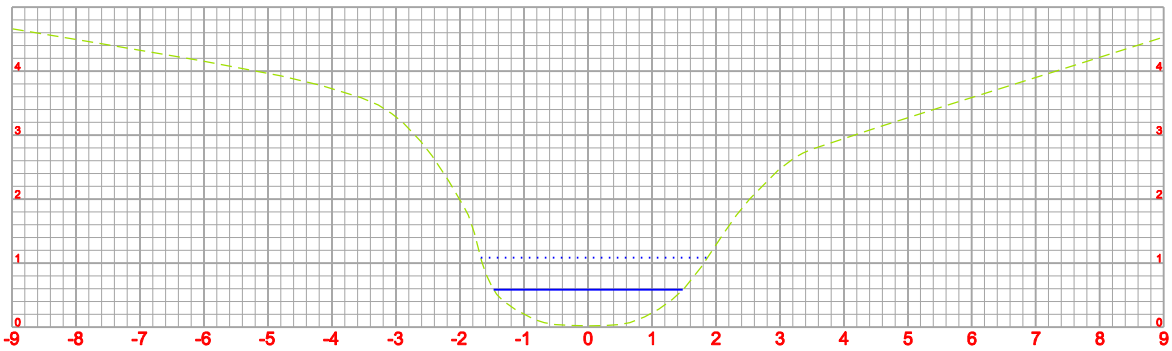
EPH-1

BFW = 2.5ft
BFD max = 0.5ft
FPW = 4.5ft



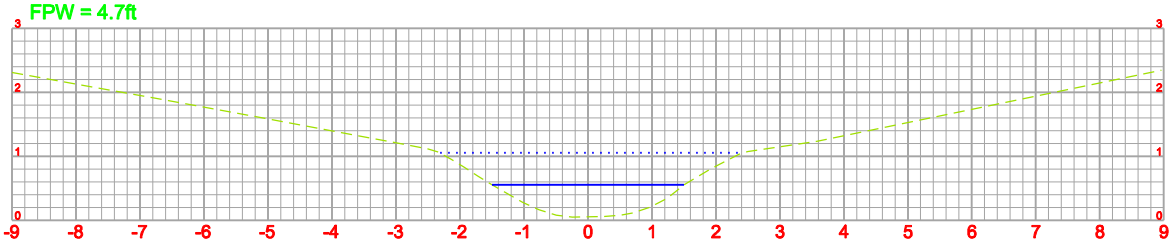
EPH-2

BFW = 3.0ft
BFD max = 0.5ft
FPW = 3.5ft



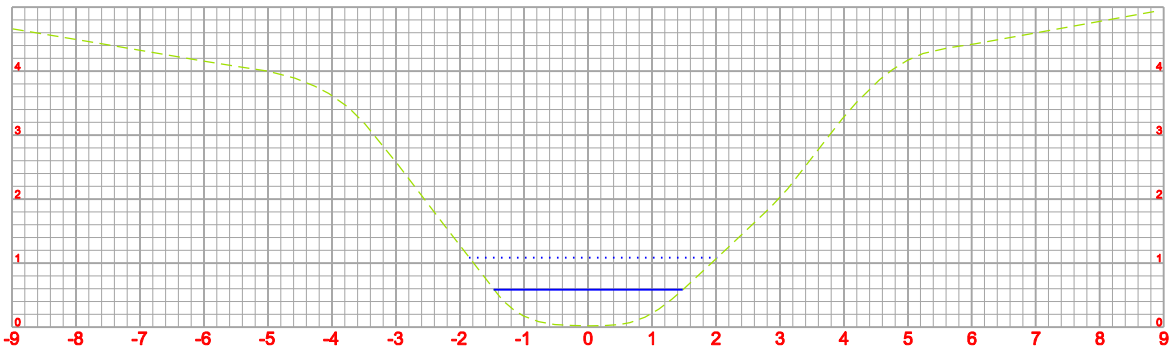
EPH-3

BFW = 3.0ft
BFD max = 0.5ft
FPW = 4.7ft



EPH-4

BFW = 3.0ft
BFD max = 0.5ft
FPW = 3.8ft



Cross Section Scale: 1"=3'

T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE				
	COUNTY: OHIO	STATE: KENTUCKY	NEAR: CENTERTOWN	EXISTING CROSS SECTIONS	EXHIBIT 9

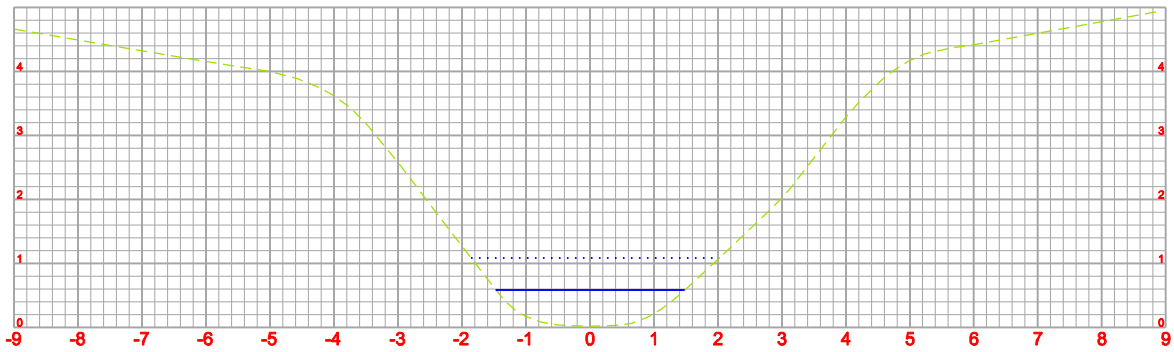
DATE:

Existing Ephemeral (EPH) Cross Sections

BF=Bankfull
FP= Floodprone
Existing Ground

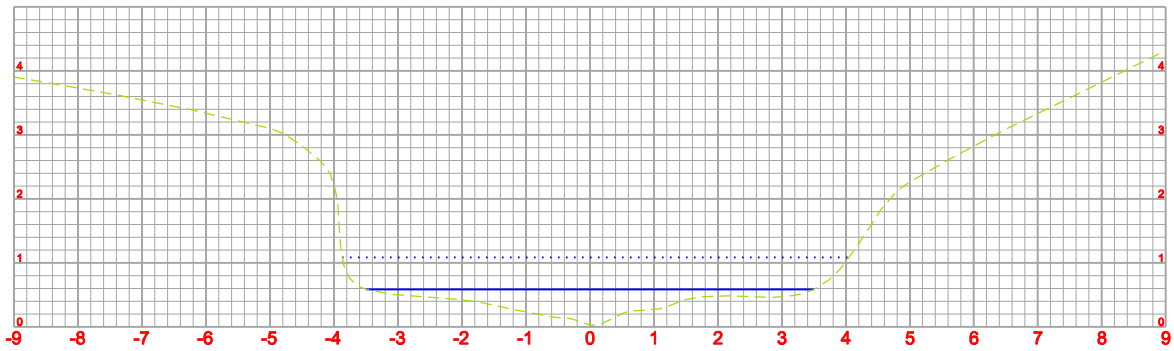
EPH-5

BFW = 3.0ft
BFD max = 0.5ft
FPW = 3.8ft



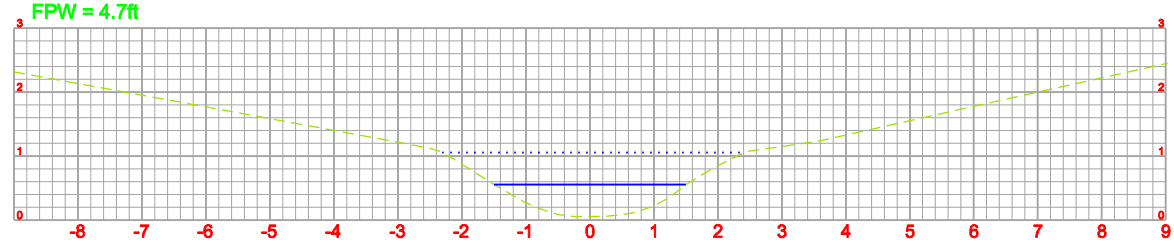
EPH-6

BFW = 7.0ft
BFD max = 0.5ft
FPW = 7.9ft



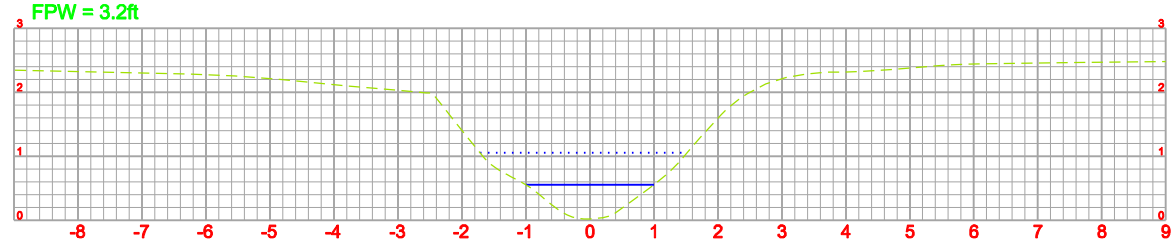
EPH-7

BFW = 2.5ft
BFD max = 0.5ft
FPW = 4.7ft



EPH-8

BFW = 2.0ft
BFD max = 0.5ft
FPW = 3.2ft



Cross Section Scale: 1"=3'

T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE				
	COUNTY: OHIO	STATE: KENTUCKY	NEAR: CENTERTOWN	EXISTING CROSS SECTIONS	EXHIBIT 10

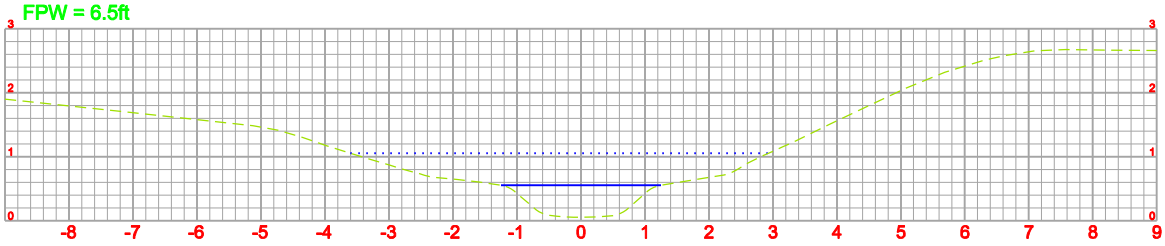
DATE:

Existing Ephemeral (EPH) Cross Sections

BF=Bankfull
FP= Floodprone
Existing Ground

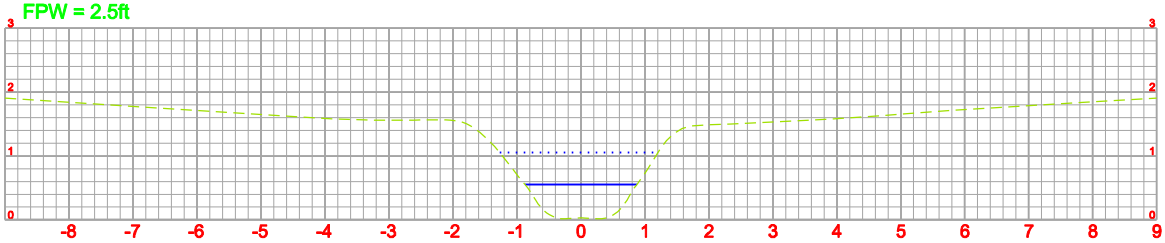
EPH-9

BFW = 2.5ft
BFD max = 0.5ft
FPW = 6.5ft



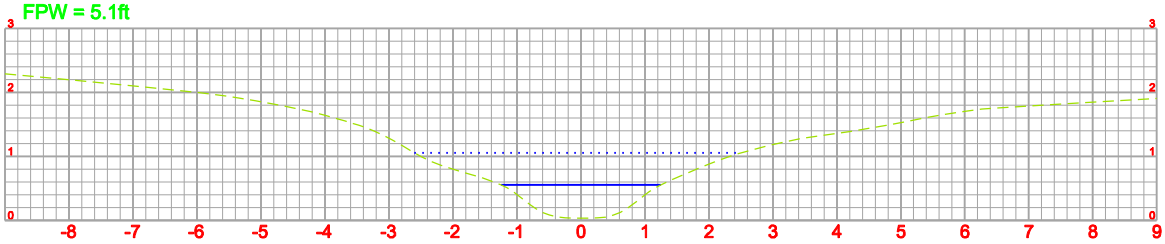
EPH-10

BFW = 1.75ft
BFD max = 0.5ft
FPW = 2.5ft



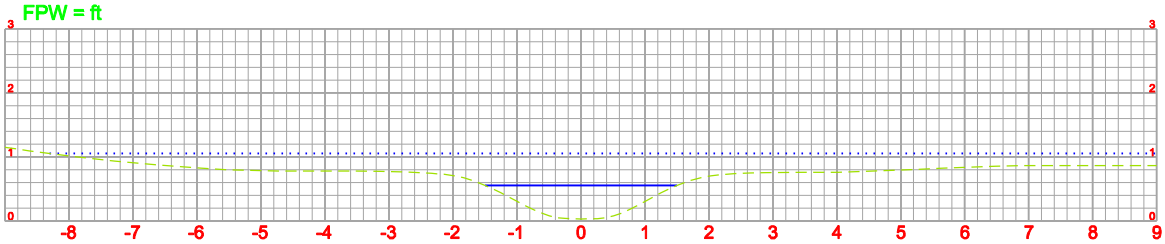
EPH-11 US

BFW = 2.5ft
BFD max = 0.5ft
FPW = 5.1ft



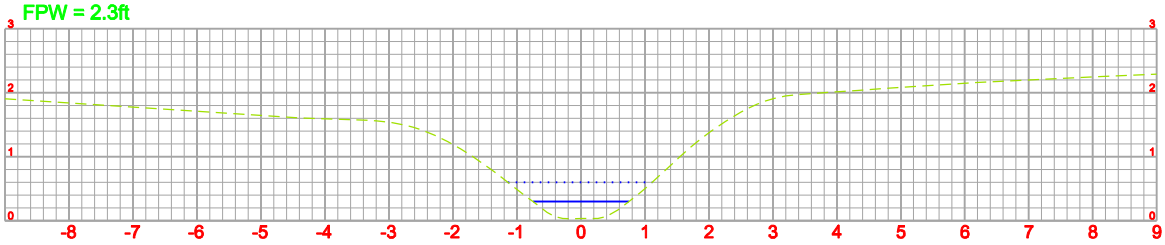
EPH-11 DS

BFW = 3.0ft
BFD max = 0.5ft
FPW = ft



EPH-12

BFW = 1.5ft
BFD max = 0.3ft
FPW = 2.3ft



Cross Section Scale: 1"=3'

T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE				
	COUNTY: OHIO	STATE: KENTUCKY	NEAR: CENTERTOWN	EXISTING CROSS SECTIONS	EXHIBIT 11

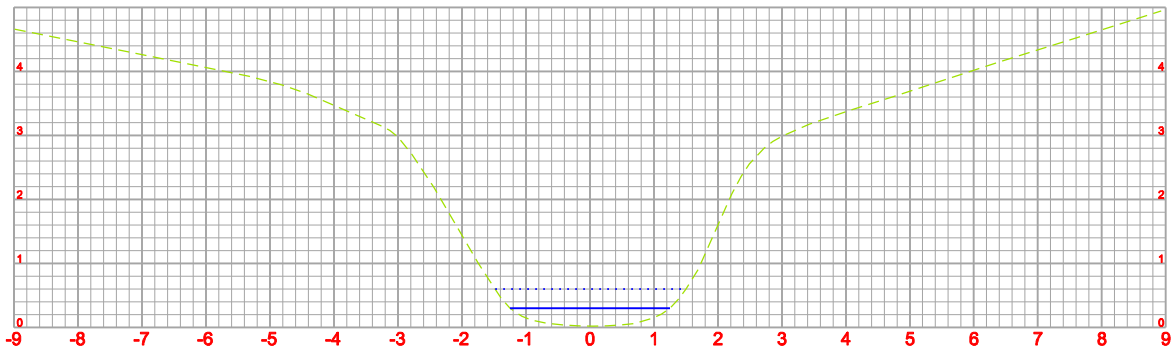
DATE:

Existing Ephemeral (EPH) Cross Sections

BF=Bankfull
FP= Floodprone
Existing Ground

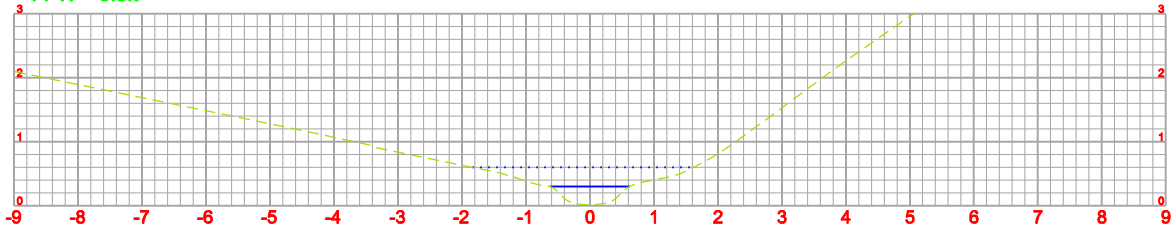
EPH-13

BFW = 2.5ft
BFD max = 0.3ft
FPW = 3.0ft



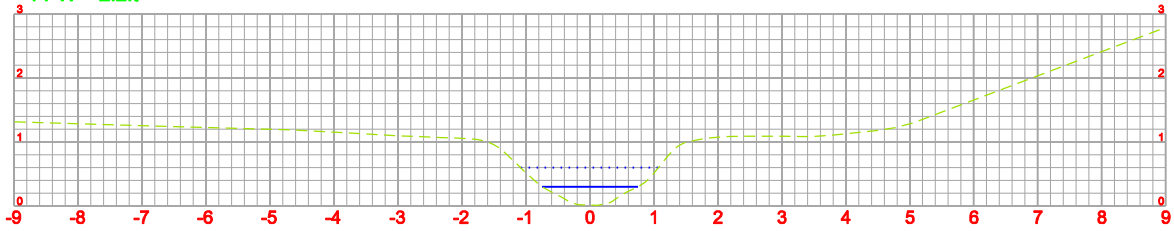
EPH-14

BFW = 1.25ft
BFD max = 0.3ft
FPW = 3.5ft



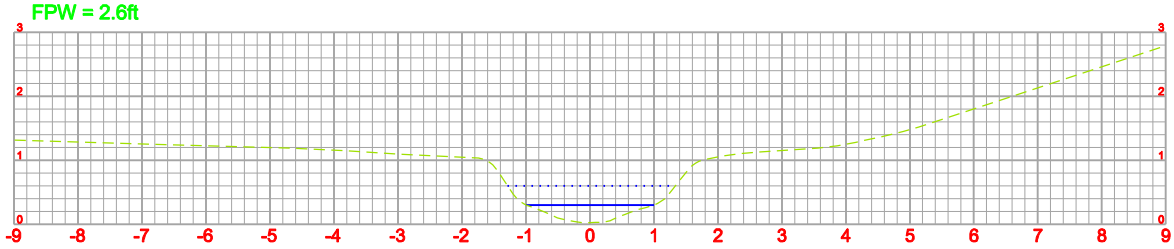
EPH-15

BFW = 1.5ft
BFD max = 0.3ft
FPW = 2.2ft



EPH-16

BFW = 2.0ft
BFD max = 0.3ft
FPW = 2.6ft



Cross Section Scale: 1"=3'

T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE				
	COUNTY: OHIO	STATE: KENTUCKY	NEAR: CENTERTOWN	EXISTING CROSS SECTIONS	EXHIBIT 12

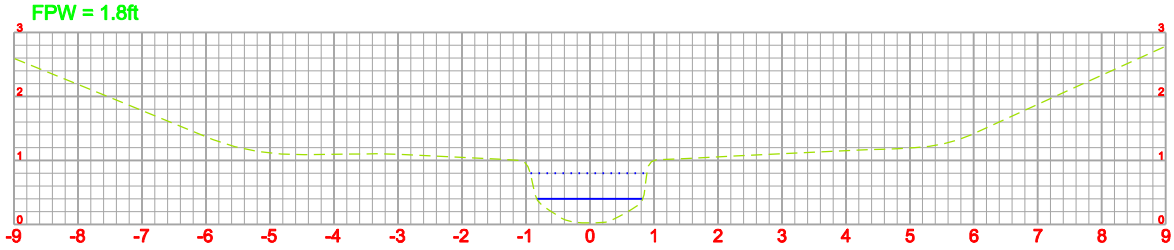
DATE:

Existing Ephemeral (EPH) Cross Sections

BF=Bankfull
FP= Floodprone
Existing Ground

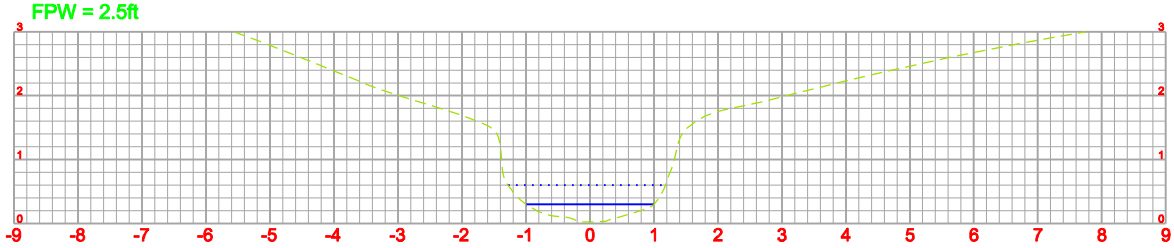
EPH-17

BFW = 1.5ft
BFD max = 0.4ft
FPW = 1.8ft



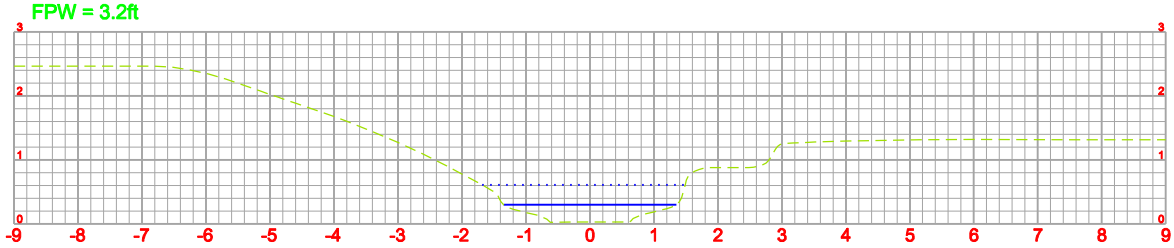
EPH-18

BFW = 2.0ft
BFD max = 0.3ft
FPW = 2.5ft



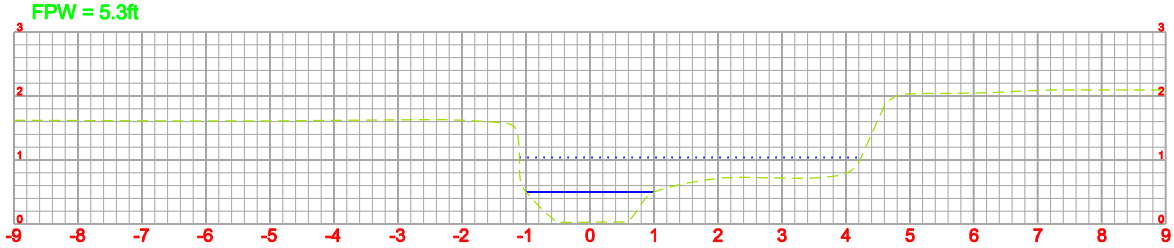
EPH-19

BFW = 2.7ft
BFD max = 0.3ft
FPW = 3.2ft



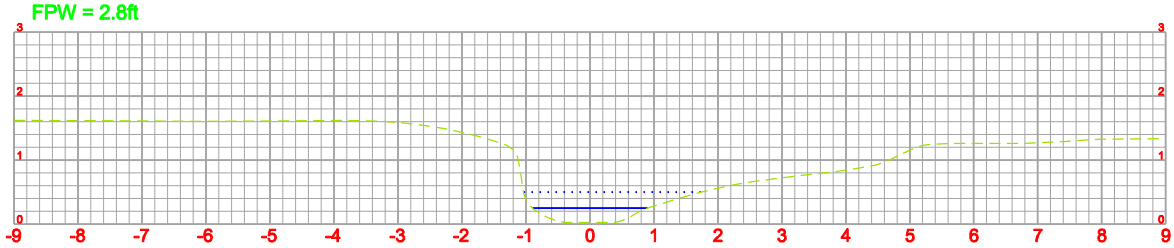
EPH-20

BFW = 2.0ft
BFD max = 0.5ft
FPW = 5.3ft



EPH-21

BFW = 1.8ft
BFD max = 0.25ft
FPW = 2.8ft



Cross Section Scale: 1"=3'

T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE				
	COUNTY: OHIO	STATE: KENTUCKY	NEAR: CENTERTOWN	EXISTING CROSS SECTIONS	EXHIBIT 13

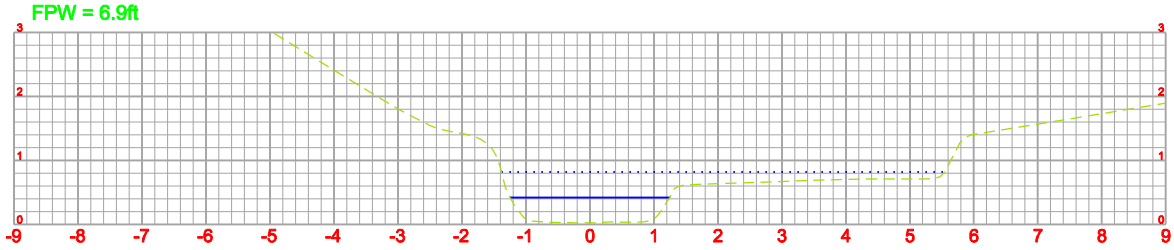
DATE:

Existing Ephemeral (EPH) Cross Sections

BF=Bankfull
FP= Floodprone
Existing Ground

EPH-22

BFW = 2.5ft
BFD max = 0.4ft
FPW = 6.9ft

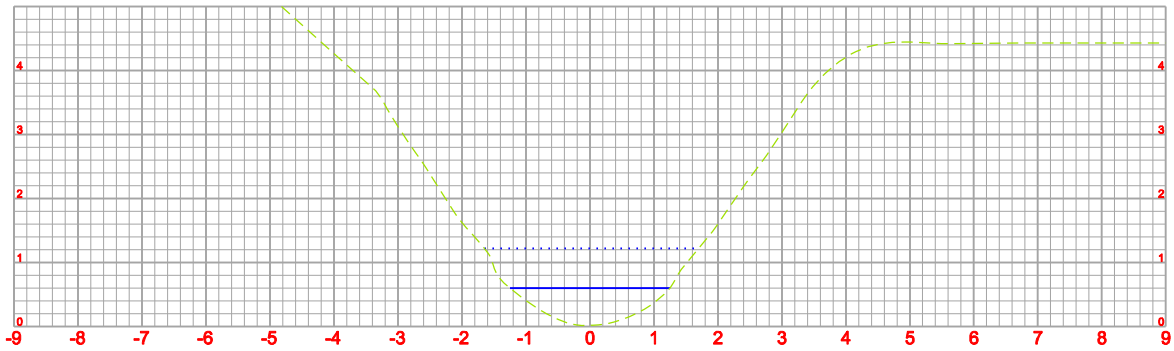


EPH-23

BFW = 2.5ft
BFD max = 0.5ft
FPW = 3.6ft

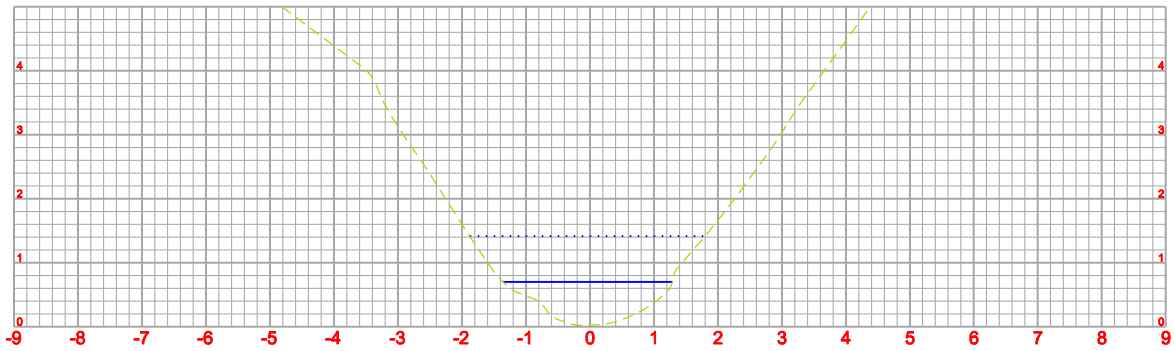
EPH-24

BFW = 2.5ft
BFD max = 0.6ft
FPW = 3.4ft



EPH-25

BFW = 1.5ft
BFD max = 0.7ft
FPW = 3.7ft



Cross Section Scale: 1"=3'

T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE				
	COUNTY: OHIO	STATE: KENTUCKY	NEAR: CENTERTOWN	EXISTING CROSS SECTIONS	EXHIBIT 14

DATE:

Existing Ephemeral (EPH) Cross Sections

BF=Bankfull
FP= Floodprone
Existing Ground

EPH-26

BFW = 1.4ft
BFD max = 0.5ft
FPW = 1.9ft

EPH-27

BFW = 1.5ft
BFD max = 0.25ft
FPW = 1.8ft

EPH-28

BFW = 3.0ft
BFD max = 0.5ft
FPW = 3.9ft

Cross Section Scale: 1"=3'

T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE				
	COUNTY: OHIO	STATE: KENTUCKY	NEAR: CENTERTOWN	EXISTING CROSS SECTIONS	EXHIBIT 15

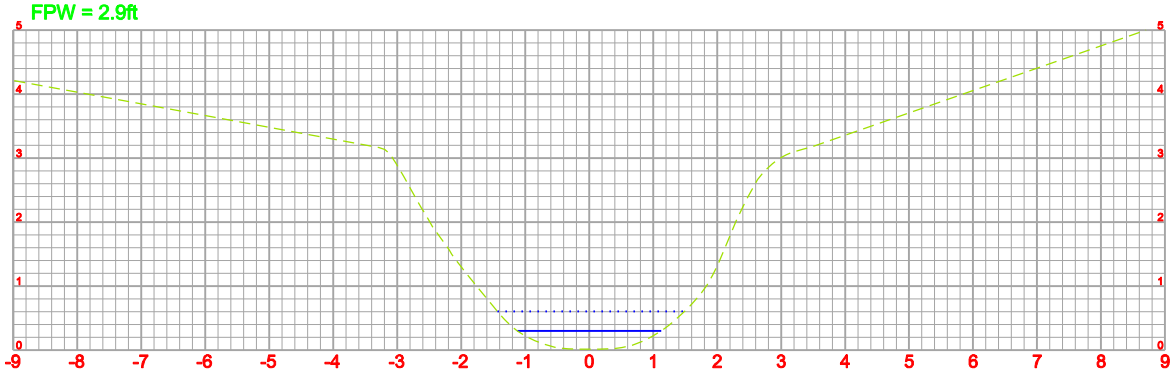
DATE:

Existing Ephemeral (EPH) Cross Sections

BF=Bankfull
FP= Floodprone
Existing Ground

EPH-29

BFW = 2.25ft
BFD max = 0.3ft
FPW = 2.9ft



EPH-30

BFW = 1.2ft
BFD max = 0.5ft
FPW = 2.4ft

EPH-31

BFW = 2.3ft
BFD max = 0.5ft
FPW = 2.6ft

Cross Section Scale: 1"=3'

T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE				
	COUNTY: OHIO	STATE: KENTUCKY	NEAR: CENTERTOWN	EXISTING CROSS SECTIONS	EXHIBIT 16

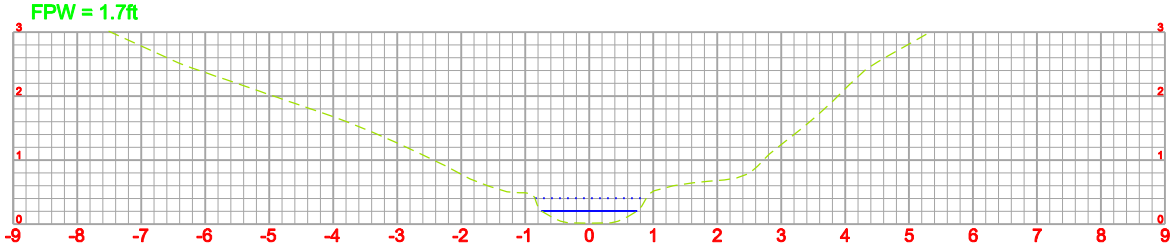
DATE:

Existing Ephemeral (EPH) Cross Sections

BF=Bankfull
FP= Floodprone
Existing Ground

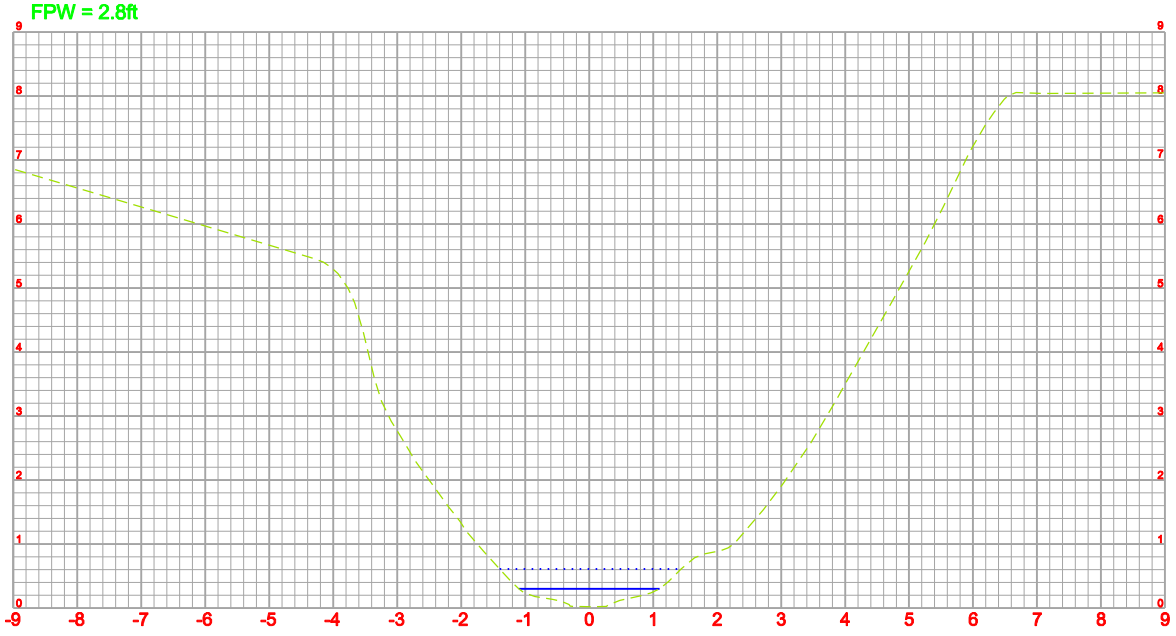
EPH-32

BFW = 1.5ft
BFD max = 0.2ft
FPW = 1.7ft



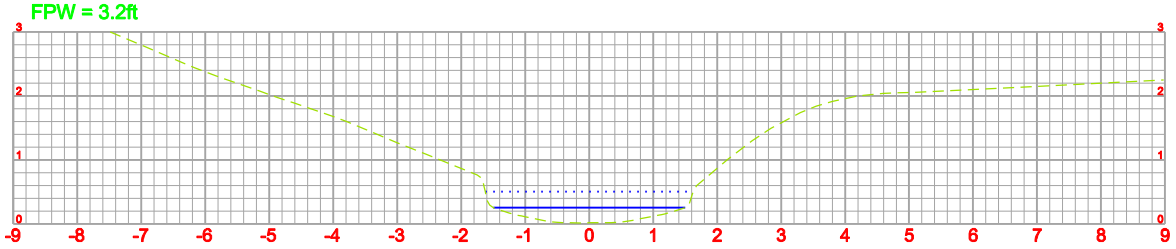
EPH-33

BFW = 2.2ft
BFD max = 0.3ft
FPW = 2.8ft



EPH-34

BFW = 3.0ft
BFD max = 0.25ft
FPW = 3.2ft



Cross Section Scale: 1"=3'

T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE				
	COUNTY: OHIO	STATE: KENTUCKY	NEAR: CENTERTOWN	EXISTING CROSS SECTIONS	EXHIBIT 17

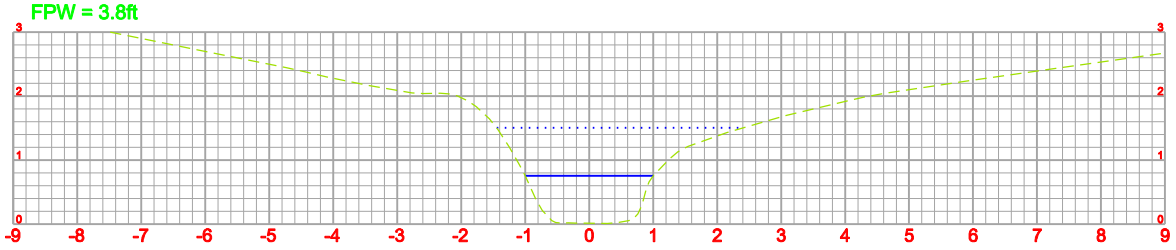
DATE:

Existing Ephemeral (EPH) Cross Sections

BF=Bankfull
FP= Floodprone
Existing Ground

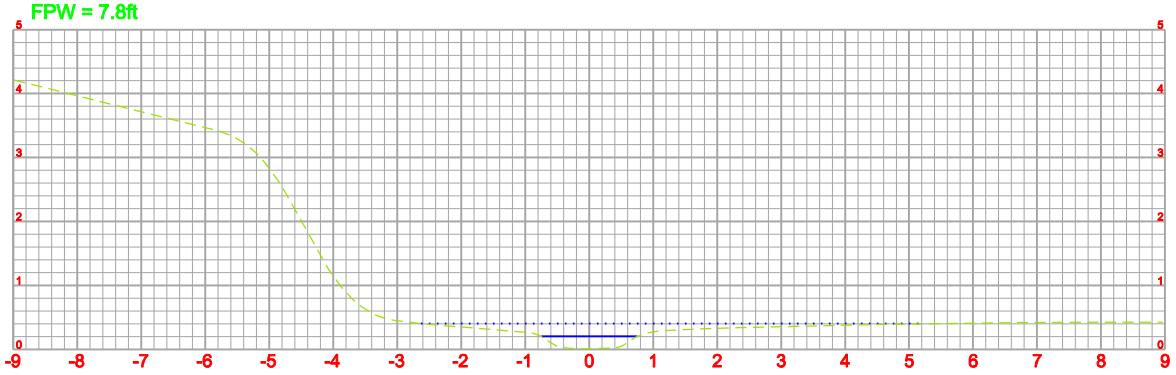
EPH-35

BFW = 2.0ft
BFD max = 0.75ft
FPW = 3.8ft



EPH-36

BFW = 1.5ft
BFD max = 0.2ft
FPW = 7.8ft



Cross Section Scale: 1"=3'

T.H.E. Engineers, Inc.	PROJECT: WARDEN WASTE SITE				
	COUNTY: OHIO	STATE: KENTUCKY	NEAR: CENTERTOWN	EXISTING CROSS SECTIONS	EXHIBIT 18

DATE:

VIII. APPENDIX

- EPA Rapid Bioassessment Protocol Field Data Sheets
  - Photographs
- Wetland Delineation Forms
  - Photographs

Low Gradient Stream Data Sheet

STREAM NAME: *I-1 (US)* | LOCATION: *Warden Waste Site*

STATION: *WP 1569* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek, Elk Creek*

LAT: *37-24-41.7* LONG: *87-03-20.3* | COUNTY; *Ohio* USGS 7.5 TOPO; *Equality*

DATE: *11-27-12* TIME: 3:38 ET ☐AM ☑PM | INVESTIGATORS; *Laura Heil, Bill Sampsonl*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4

☑ Yes ☐ No

Air temperature *47* °F. Inches rainfall in past 24 hours *0* in

45 % Cloud Cover

P-Chem: Temp (°F) *45.7* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. *336* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW	*3.5*	ft
Stream Width BF	*7.0*	ft
Stream Bottom Width	*2.5*	ft
Avg. Bankfull Depth	*1.0*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☐ Dry ☑ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☑ Intermittent
☐ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:

☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous

Number of Strata *3*

Dom. Tree/Shrub Taxa

Beech
Sycamore
Sugar Maple

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;

☐ Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *50* %	Pool *50* %
Silt/Clay (<0.06 mm)		*100*	*100*
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	**Condition Category**			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Pool Substrate/ Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Pool Availability	Even mix of large shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy despoits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7. Channel Sinuosity	The bends in the stream increase the stream length 3-4 times longer than if it was a straight line. (Note – channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 2-3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2-1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities has inpacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 129

NOTES/COMMENTS; E6

Low Gradient Stream Data Sheet

STREAM NAME: *I-1 (DS)* | LOCATION: *Warden Waste Site*

STATION: *WP 1547* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek, Elk Creek*

LAT: *37-24-30.5* LONG: *87-03-38.0* | COUNTY; *Ohio* USGS 7.5 TOPO; *Equality*

DATE: *11-27-12* TIME: 9:00 ET ☑AM ☐PM | INVESTIGATORS; *Laura Heil, Bill Sampsonl*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4

☑Yes ☐No

Air temperature *35* °F. Inches rainfall in past 24 hours *0* in

30 % Cloud Cover

P-Chem: Temp (°F) *N/A* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. *N/A* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*6.0*	ft
Stream Bottom Width	*2.0*	ft
Avg. Bankfull Depth	*1.0*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☐ Dry ☐ Pooled ☐ Low ☑ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☑ Intermittent
☐ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
River Birch
Sycamore
Sweetgum
Red maple

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;

☐ Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*100*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10** 9 8 7 6	**5 4 3 2 1 0**
2. Pool Substrate/ Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8** 7 6	**5 4 3 2 1 0**
3. Pool Availability	Even mix of large shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3** 2 1 0

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy despoits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7. Channel Sinuosity	The bends in the stream increase the stream length 3-4 times longer than if it was a straight line. (Note – channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 2-3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2-1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities has inpacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 95

NOTES/COMMENTS; Slightly insised &braided, F 6e

High Gradient Stream Data Sheet

STREAM NAME: *I-2 (US)* | LOCATION: *Warden Waste Site*

STATION: *WP 31* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-53.8* LONG: *87-03-32.9* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *4:30* ☐ AM ☑ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now ☐ ☐ ☐ ☑ | Past 24 hours ☐ Heavy rain ☐ Steady rain ☐ Intermittent showers ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *47* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *48.7* D.O. (mg/l) ____ % Saturation ____ pH(S.U.) ____ Cond.µs *837* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW	*0-3.0*	ft
Stream Width BF	*3.3*	ft
Stream Bottom Width	*3.0*	ft
Avg. Bankfull Depth	*0.7*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☐ Dry ☑ Pooled ☐ Low ☑ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☑ Intermittent
☐ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☑ Grasses ☑ Herbaceous
Number of Strata *4*

Dom. Tree/Shrub Taxa
White Oak
Shagbark Hickory
Red Oak
Beech
Sweet Gum

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle *5* %	Run; *85* %	Pool *15* %
Silt/Clay (<0.06 mm)	*65*	*65*	*75*
Sand (0.06-2 mm)	*10*	*10*	*15*
Gravel (2-64 mm)	*25*	*25*	*10*
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 (11)**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**(10) 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 (8) 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **117**

NOTES/COMMENTS;

Low Gradient Stream Data Sheet

STREAM NAME: *I-2 (DS)* | LOCATION: *Warden Waste Site*

STATION: *WP 8* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek, Elk Creek*

LAT: *37-24-44.1* LONG: *87-03-45.7* | COUNTY; *Ohio* USGS 7.5 TOPO; *Equality*

DATE: *11-28-12* TIME: 9:50 ET ☑AM ☐PM | INVESTIGATORS; *Rick Heil, Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

- ☐ / ☐ Heavy rain
- ☐ / ☐ Steady rain
- ☐ / ☐ Intermittent showers
- ☑ / ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4

☑Yes ☐No

Air temperature *30* °F. Inches rainfall in past 24 hours *0* in

10 % Cloud Cover

P-Chem: Temp (°F) *N/A* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. *N/A* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*5.5*	ft
Stream Bottom Width	*5.0*	ft
Avg. Bankfull Depth	*1.0*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☑ Intermittent
☐ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:

☑ Trees ☑ Shrubs
☑ Grasses ☑ Herbaceous

Number of Strata *4*

Dom. Tree/Shrub Taxa

Beech
Red Cedar
Black Cherry
Red maple

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;

☐ Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *80* %	Pool *20* %
Silt/Clay (<0.06 mm)		*20*	*20*
Sand (0.06-2 mm)		*20*	*20*
Gravel (2-64 mm)		*60*	*60*
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 (8) 7 6**	**5 4 3 2 1 0**
2. Pool Substrate/ Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 (7) 6**	**5 4 3 2 1 0**
3. Pool Availability	Even mix of large shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 (3) 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy despoits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7. Channel Sinuosity	The bends in the stream increase the stream length 3-4 times longer than if it was a straight line. (Note – channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 2-3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2-1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities has inpacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 95

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: *I-3* | LOCATION: *Warden Waste Site*

STATION: *WP 30* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-59.3* LONG: *87-03-37.0* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *3:30* ☐ AM ☑ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *44* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *50* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *204* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW	*0-2.0*	ft
Stream Width BF	*3.0*	ft
Stream Bottom Width	*1.3*	ft
Avg. Bankfull Depth	*0.5*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☐ Dry ☑ Pooled ☐ Low ☑ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☑ Intermittent
☐ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:

☑ Trees ☑ Shrubs
☑ Grasses ☑ Herbaceous

Number of Strata *4*

Dom. Tree/Shrub Taxa

Tulip Poplar
Shagbark Hickory

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☑ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☐ Channelization (☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle *5* %	Run; *60* %	Pool *35* %
Silt/Clay (<0.06 mm)	*85*	*85*	*85*
Sand (0.06-2 mm)	*15*	*15*	*15*
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 (11)**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**(10) 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 (8) 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **109**

NOTES/COMMENTS;

Low Gradient Stream Data Sheet

STREAM NAME: *I-4* | LOCATION: *Warden Waste Site*

STATION: *WP 1611* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek, Elk Creek*

LAT: *37-25-22.3* LONG: *87-03-37.1* | COUNTY; *Ohio* USGS 7.5 TOPO; *Equality*

DATE: *11-28-12* TIME: 3:40 ET ☐AM ☑PM | INVESTIGATORS; *Laura Heil, Bill Sampsonl*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4
☑ Yes ☐ No
Air temperature *49* °F. Inches rainfall in past 24 hours *0* in
10 % Cloud Cover

P-Chem: Temp (°F) *N/A* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. *N/A* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*7.0*	ft
Stream Bottom Width	*2.0*	ft
Avg. Bankfull Depth	*1.0*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:
Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☐ Dry ☐ Pooled ☐ Low ☑ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☑ Intermittent
☐ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
Sycamore
Pin Oak
Red maple

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;
☐ Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *90* %	Pool *10* %
Silt/Clay (<0.06 mm)		*20*	*20*
Sand (0.06-2 mm)		*40*	*40*
Gravel (2-64 mm)		*40*	*40*
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 (14) 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Pool Substrate/ Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	**20 19 18 17 16**	**15 14 13 12 (11)**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Pool Availability	Even mix of large shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 (7) 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy despoits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7. Channel Sinuosity	The bends in the stream increase the stream length 3-4 times longer than if it was a straight line. (Note – channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 2-3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2-1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities has inpacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 107

NOTES/COMMENTS; Entrenched F 4/5

High Gradient Stream Data Sheet

STREAM NAME: *I-5 (US)* | LOCATION: *Warden Waste Site*

STATION: *WP 55* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-25-14.3* LONG: *87-03-28.2* | COUNTY; *Ohio* USGS 7.5 TOPO; *Equality*

DATE: *11-29-12* TIME: *11:30* ☑ AM ☐ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *45* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW	*0-1.8*	ft
Stream Width BF	*3.5*	ft
Stream Bottom Width	*2.5*	ft
Avg. Bankfull Depth	*0.3*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☐ Dry ☑ Pooled ☐ Low ☑ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☑ Intermittent
☐ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:
☑ Trees ☑ Shrubs
☑ Grasses ☑ Herbaceous
Number of Strata *4*

Dom. Tree/Shrub Taxa
Tulip Poplar
Red Maple
White Oak
Red Oak

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☑ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☑ Channelization
(☐ Full ☑ Partial)

Past Logging

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *90* %	Pool *10* %
Silt/Clay (<0.06 mm)		*30*	*60*
Sand (0.06-2 mm)			
Gravel (2-64 mm)		*70*	*40*
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	**Condition Category**			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **96**

NOTES/COMMENTS; Falled trees in much of stream from past timbering.

High Gradient Stream Data Sheet

STREAM NAME: *I-5 (DS)* | LOCATION: *Warden Waste Site*

STATION: *WP 59* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-25-15.8* LONG: *87-03-27.9* | COUNTY; *Ohio* USGS 7.5 TOPO; *Equality*

DATE: *11-29-12* TIME: *12:10* ☐ AM ☑ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now ☐ ☐ ☐ ☑ | Past 24 hours ☐ Heavy rain ☐ Steady rain ☐ Intermittent showers ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *48* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *45* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *484* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW	*2.5*	ft
Stream Width BF	*4.5*	ft
Stream Bottom Width	*2.5*	ft
Avg. Bankfull Depth	*0.7*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☐ Dry ☑ Pooled ☐ Low ☑ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☑ Intermittent
☐ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☑ Grasses ☑ Herbaceous
Number of Strata *4*

Dom. Tree/Shrub Taxa
Tulip Poplar
Red Maple
Beech

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☑ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *80* %	Pool *40* %
Silt/Clay (<0.06 mm)		*60*	*70*
Sand (0.06-2 mm)		*10*	*10*
Gravel (2-64 mm)		*30*	*20*
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10** 9 8 7 6	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10** 9 8 7 6	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.		Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**		**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.		Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**		**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.		Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**		**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.		Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**		**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.		Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**		**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**		**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.		Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**		**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**		**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.		Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**		**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**		**2 1 0**

Total Score **103**

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: *E-1* | LOCATION: *Warden Waste Site*

STATION: *WP 1549* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-31.6* LONG: *87-03-26.8* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-27-12* TIME: *11:00* ☑ AM ☐ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now: ☐ ☐ ☐ ☑ — Past 24 hours: ☐ Heavy rain ☐ Steady rain ☑ Intermittent showers ☐ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *38* °F. Inches rainfall in past 24 hours *0* in

60 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*2.5*	ft
Stream Bottom Width	*1.0*	ft
Avg. Bankfull Depth	*0.3*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
Dogwood
Pinoak
Swetgum
Beech
Red Oak

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*100*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	**Condition Category**			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 (13) 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 (16)**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 (4) 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 113

NOTES/COMMENTS; B6

High Gradient Stream Data Sheet

STREAM NAME: *E-2* | LOCATION: *Warden Waste Site*

STATION: *WP 1553* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-33.5* LONG: *87-03-20.4* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-27-12* TIME: *11:42* ☑ AM ☐ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☑ Intermittent showers
☑	☐ Clear/sunny

Has there been a heavy rain in the last 7 days? .4
☑ Yes ☐ No
Air temperature *40* °F. Inches rainfall in past 24 hours *0* in
100 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*3.0*	ft
Stream Bottom Width	*1.0*	ft
Avg. Bankfull Depth	*0.5*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
White Oak
Pinoak
Cherry
Beech
Red Oak

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *90* %	Pool *10* %
Silt/Clay (<0.06 mm)		*100*	*95*
Sand (0.06-2 mm)			*5*
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	**Condition Category**			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10** 9 8 7 6	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8** 7 6	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 78

NOTES/COMMENTS; Incised/entrenched G6

High Gradient Stream Data Sheet

STREAM NAME: *E-3* | LOCATION: *Warden Waste Site*

STATION: *WP 1560* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-40.8* LONG: *87-03-26.2* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-27-12* TIME: *1:30* ☐ AM ☑ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

- ☐ / ☐ Heavy rain
- ☐ / ☐ Steady rain
- ☐ / ☑ Intermittent showers
- ☑ / ☐ Clear/sunny

Has there been a heavy rain in the last 7 days? .4

☑ Yes ☐ No

Air temperature *47* °F. Inches rainfall in past 24 hours *.4* in

95 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*3.0*	ft
Stream Bottom Width	*1.0*	ft
Avg. Bankfull Depth	*0.5*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:

☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous

Number of Strata *3*

Dom. Tree/Shrub Taxa

Pin Oak
White Oak
Sugar Maple
Beech

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*100*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 112

NOTES/COMMENTS; B6 to G6

High Gradient Stream Data Sheet

STREAM NAME: *E-4* | LOCATION: *Warden Waste Site*

STATION: *WP 1574* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-44.0* LONG: *87-03-26.7* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-27-12* TIME: *5:15* ☐ AM ☑ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

- ☐ / ☐ Heavy rain
- ☐ / ☐ Steady rain
- ☐ / ☑ Intermittent showers
- ☑ / ☐ Clear/sunny

Has there been a heavy rain in the last 7 days? .4

☑ Yes ☐ No

Air temperature *45* °F. Inches rainfall in past 24 hours *.4* in

30 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*3.0*	ft
Stream Bottom Width	*1.1*	ft
Avg. Bankfull Depth	*0.4*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:

☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous

Number of Strata *3*

Dom. Tree/Shrub Taxa

White Oak
Red Oak
Beech

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*100*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10** 9 8 7 6	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 95

NOTES/COMMENTS; Incised G6

High Gradient Stream Data Sheet

STREAM NAME: *E-5* | LOCATION: *Warden Waste Site*

STATION: *WP 1571* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-43.9* LONG: *87-03-26.1* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-27-12* TIME: *5:00* ☐ AM ☑ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

- ☐ / ☐ Heavy rain
- ☐ / ☐ Steady rain
- ☐ / ☑ Intermittent showers
- ☑ / ☐ Clear/sunny

Has there been a heavy rain in the last 7 days? .4

☑ Yes ☐ No

Air temperature *45* °F. Inches rainfall in past 24 hours *.4* in

40 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*3.0*	ft
Stream Bottom Width	*1.0*	ft
Avg. Bankfull Depth	*0.5*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:

☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous

Number of Strata *3*

Dom. Tree/Shrub Taxa

Red Oak
Hickory
Beech

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*100*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 95

NOTES/COMMENTS; Incised G6

High Gradient Stream Data Sheet

STREAM NAME: *E-6* | LOCATION: *Warden Waste Site*

STATION: *WP 1556* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-37.3* LONG: *87-03-16.9* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-27-12* TIME: *12:20* ☐ AM ☑ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now ☐ ☐ ☐ ☑ | Past 24 hours ☐ Heavy rain ☐ Steady rain ☑ Intermittent showers ☐ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *43* °F. Inches rainfall in past 24 hours *.4* in

95 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*7.0*	ft
Stream Bottom Width	*1.25*	ft
Avg. Bankfull Depth	*0.5*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
White Oak
Basswood
Sugar Maple
Beech
Red Oak

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C | Riffle _____ % | Run; *100* % | Pool _____ %

Silt/Clay (<0.06 mm)		*100*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	**Condition Category**			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 86

NOTES/COMMENTS; Incised F6

High Gradient Stream Data Sheet

STREAM NAME: *E-7* | LOCATION: *Warden Waste Site*

STATION: *WP 1566* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-41.8* LONG: *87-03-09.5* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-27-12* TIME: *2:50* ☐ AM ☑ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now ☐ ☐ ☐ ☑ | Past 24 hours ☐ Heavy rain ☐ Steady rain ☑ Intermittent showers ☐ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *47* °F. Inches rainfall in past 24 hours *.4* in

50 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*2.5*	ft
Stream Bottom Width	*.75*	ft
Avg. Bankfull Depth	*0.5*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☑ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
White Oak
Red Oak
Beech
Sugar Maple

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *90* %	Pool *10* %
Silt/Clay (<0.06 mm)		*100*	*100*
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **104**

NOTES/COMMENTS; E6f

High Gradient Stream Data Sheet

STREAM NAME: *E-8* | LOCATION: *Warden Waste Site*

STATION: *WP 1568* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-42.9* LONG: *87-03-11.8* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-27-12* TIME: *3:15* ☐ AM ☑ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now ☐ ☐ ☐ ☑ | Past 24 hours ☐ Heavy rain ☐ Steady rain ☑ Intermittent showers ☐ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *47* °F. Inches rainfall in past 24 hours *.4* in

40 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*2.0*	ft
Stream Bottom Width	*.75*	ft
Avg. Bankfull Depth	*0.5*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments ☐ Island ☐ Waterfalls ☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal ☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent ☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs ☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
White Oak
Red Oak
Black Cherry
Sugar Maple

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization (☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*100*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **100**

NOTES/COMMENTS; Incised G6

High Gradient Stream Data Sheet

STREAM NAME: *E-9* | LOCATION: *Warden Waste Site*

STATION: *WP 1564* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-44.0* LONG: *87-03-09.5* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-27-12* TIME: *2:35* ☐ AM ☑ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now ☐ ☐ ☐ ☑ | Past 24 hours ☐ Heavy rain ☐ Steady rain ☑ Intermittent showers ☐ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *48* °F. Inches rainfall in past 24 hours *.4* in

80 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*2.5*	ft
Stream Bottom Width	*1.0*	ft
Avg. Bankfull Depth	*0.5*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
White Oak
Red Oak
Hickory sp.
Sugar Maple

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*100*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **98**

NOTES/COMMENTS; B6

High Gradient Stream Data Sheet

STREAM NAME: *E-10* | LOCATION: *Warden Waste Site*

STATION: *WP 1602* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-48.5* LONG: *87-03-18.7* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *1:40* ☐ AM ☑ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now ☐ ☐ ☐ ☑ | Past 24 hours ☐ Heavy rain ☐ Steady rain ☐ Intermittent showers ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *48* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*1.75*	ft
Stream Bottom Width	*1.0*	ft
Avg. Bankfull Depth	*0.4*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
Herc Club
Red Oak
Beech
Sugar Maple

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☑ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*90*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)		*10*	
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	**Condition Category**			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **93**

NOTES/COMMENTS; E6g

High Gradient Stream Data Sheet

STREAM NAME: *E-11 (US)* | LOCATION: *Warden Waste Site*

STATION: *WP 1584* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-25-01.4* LONG: *87-03-05.8* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *10:30* ☑ AM ☐ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4
☑ Yes ☐ No
Air temperature *30* °F. Inches rainfall in past 24 hours *0* in
10 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		Ft
Stream Width BF	*2.5*	ft
Stream Bottom Width	*1.0*	ft
Avg. Bankfull Depth	*0.5*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:
Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
Hickory sp.
Red Oak
White Oak
Sugar Maple

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*95*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)		*5*	
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 (11)**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 (16)**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 (2) 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **111**

NOTES/COMMENTS; B6a

High Gradient Stream Data Sheet

STREAM NAME: *E-11 (DS)* | LOCATION: *Warden Waste Site*

STATION: *WP 1590* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-55.7* LONG: *87-03-12.3* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *11:30* ☑ AM ☐ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

- ☐ / ☐ Heavy rain
- ☐ / ☐ Steady rain
- ☐ / ☐ Intermittent showers
- ☑ / ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4

☑ Yes ☐ No

Air temperature *40* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*3.0*	ft
Stream Bottom Width	*1.0*	ft
Avg. Bankfull Depth	*0.5*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:

☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous

Number of Strata *3*

Dom. Tree/Shrub Taxa

Shagbark Hickory
White Oak
Sugar Maple
Beech
Red Oak

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*80*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)		*20*	
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	**Condition Category**			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 (12) 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 (16)**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 (4) 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **106**

NOTES/COMMENTS; Sinuous for Headwater Stream B6

High Gradient Stream Data Sheet

STREAM NAME: *E-12* | LOCATION: *Warden Waste Site*

STATION: *WP 1595* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-59.4* LONG: *87-03-18.3* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *12:30* ☐ AM ☑ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *43* °F. Inches rainfall in past 24 hours *0* in

10 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*1.5*	ft
Stream Bottom Width	*0.7*	ft
Avg. Bankfull Depth	*0.3*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:

☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous

Number of Strata *3*

Dom. Tree/Shrub Taxa

Red Oak
White Oak
Sugar Maple

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*95*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)		*5*	
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15** 14 13 12 11	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2** 1 0
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10** 9 8 7 6	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2** 1 0
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5** 4 3	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5** 4 3	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7** 6	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7** 6	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8** 7 6	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8** 7 6	**5 4 3**	**2 1 0**

Total Score **91**

NOTES/COMMENTS; G6b

High Gradient Stream Data Sheet

STREAM NAME: *E-13* | LOCATION: *Warden Waste Site*

STATION: *WP 1593* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-57.7* LONG: *87-03-16.7* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *12:15* ☐ AM ☑ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now ☐ ☐ ☐ ☑ | Past 24 hours ☐ Heavy rain ☐ Steady rain ☐ Intermittent showers ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *42* °F. Inches rainfall in past 24 hours *0* in

10 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*2.5*	ft
Stream Bottom Width	*1.0*	ft
Avg. Bankfull Depth	*0.3*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
Red Oak
White Oak
Sugar Maple
Beech

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*90*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)		*10*	
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 79

NOTES/COMMENTS; Incised G6

High Gradient Stream Data Sheet

STREAM NAME: *E-14* | LOCATION: *Warden Waste Site*

STATION: *WP 1598* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-25-00.8* LONG: *87-03-18.0* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *1:00* ☐ AM ☑ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

- ☐ / ☐ Heavy rain
- ☐ / ☐ Steady rain
- ☐ / ☐ Intermittent showers
- ☑ / ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4

☑ Yes ☐ No

Air temperature *47* °F. Inches rainfall in past 24 hours *0* in

10 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		Ft
Stream Width BF	*1.25*	ft
Stream Bottom Width	*0.6*	ft
Avg. Bankfull Depth	*0.3*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:

☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous

Number of Strata *3*

Dom. Tree/Shrub Taxa

Tulip Poplar
Red Maple
White Oak
Sugar Maple
Beech

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*100*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **97**

NOTES/COMMENTS; B6

High Gradient Stream Data Sheet

STREAM NAME: *E-15* | LOCATION: *Warden Waste Site*

STATION: *WP 1588* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-59.7* LONG: *87-03-11.0* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *11:10* ☑ AM ☐ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *35* °F. Inches rainfall in past 24 hours *0* in

10 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		Ft
Stream Width BF	*1.5*	ft
Stream Bottom Width	*0.7*	ft
Avg. Bankfull Depth	*0.3*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
Pin Oak
Red Maple
White Oak
Sugar Maple
Beech

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*95*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)		*5*	
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **98**

NOTES/COMMENTS; B6g

High Gradient Stream Data Sheet

STREAM NAME: *E-16* | LOCATION: *Warden Waste Site*

STATION: *WP 1582* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-25-00.9* LONG: *87-03-05.0* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *10:25* ☑ AM ☐ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4

☑ Yes ☐ No

Air temperature *28* °F. Inches rainfall in past 24 hours *0* in

10 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		Ft
Stream Width BF	*2.0*	ft
Stream Bottom Width	*0.7*	ft
Avg. Bankfull Depth	*0.3*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:

☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous

Number of Strata *3*

Dom. Tree/Shrub Taxa

Beech
Red Oak
White Oak
Sugar Maple

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*95*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)		*5*	
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **99**

NOTES/COMMENTS; B6g

High Gradient Stream Data Sheet

STREAM NAME: *E-17* | LOCATION: *Warden Waste Site*

STATION: *WP 1579* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-57.3* LONG: *87-03-05.4* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *10:00* ☑ AM ☐ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4
☑ Yes ☐ No
Air temperature *26* °F. Inches rainfall in past 24 hours *0* in
10 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		Ft
Stream Width BF	*1.5*	ft
Stream Bottom Width	*0.7*	ft
Avg. Bankfull Depth	*0.4*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:
Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
Beech
Red Oak
White Oak

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*95*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)		*5*	
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **100**

NOTES/COMMENTS; B6g

High Gradient Stream Data Sheet

STREAM NAME: *E-18* | LOCATION: *Warden Waste Site*

STATION: *WP 1578* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-57.1* LONG: *87-03-03.5* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *9:45* ☑ AM ☐ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

- ☐ / ☐ Heavy rain
- ☐ / ☐ Steady rain
- ☐ / ☐ Intermittent showers
- ☑ / ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4

☑ Yes ☐ No

Air temperature *25* °F. Inches rainfall in past 24 hours *0* in

10 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		Ft
Stream Width BF	*2.0*	ft
Stream Bottom Width	*0.7*	ft
Avg. Bankfull Depth	*0.3*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:

☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous

Number of Strata *3*

Dom. Tree/Shrub Taxa

Beech
Red Oak
White Oak
Sugar Maple

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☐ Channelization (☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*95*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)		*5*	
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **107**

NOTES/COMMENTS; A6

High Gradient Stream Data Sheet

STREAM NAME: *E-19* | LOCATION: *Warden Waste Site*

STATION: *WP 10* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-47.3* LONG: *87-03-40.3* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-26-12* TIME: *10:35* ☑ AM ☐ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now ☐ ☐ ☐ ☑ | Past 24 hours ☐ Heavy rain ☐ Steady rain ☐ Intermittent showers ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *30* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*2.7*	ft
Stream Bottom Width	*1.3*	ft
Avg. Bankfull Depth	*.30*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☑ Grasses ☑ Herbaceous
Number of Strata *4*

Dom. Tree/Shrub Taxa
Red Oak
Beech
Red Maple
Sycamore

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization (☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *80* %	Pool *20* %
Silt/Clay (<0.06 mm)		*90*	*90*
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)		*10*	*10*
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0** (5)
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7** (6)	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5** (4) **3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **92**

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: *E-20* | LOCATION: *Warden Waste Site*

STATION: *WP 13* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-49.1* LONG: *87-03-40.3* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *12:35* ☐ AM ☑ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now ☐ ☐ ☐ ☑ | Past 24 hours ☐ Heavy rain ☐ Steady rain ☐ Intermittent showers ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *33* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*2.0*	ft
Stream Bottom Width	*1.0*	ft
Avg. Bankfull Depth	*0.5*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☑ Grasses ☑ Herbaceous
Number of Strata *4*

Dom. Tree/Shrub Taxa
Maple sp.
Beech
Red Cedar

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *90* %	Pool *10* %
Silt/Clay (<0.06 mm)		*90*	*90*
Sand (0.06-2 mm)			*5*
Gravel (2-64 mm)		*10*	*5*
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	**Condition Category**			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0** (5)
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10** 9 8 7 6	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5** 4 3 2 1 0

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **94**

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: *E-21* | LOCATION: *Warden Waste Site*

STATION: *WP 35* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-53.1* LONG: *87-03-32.1* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *4:30* ☐ AM ☑ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4
☑ Yes ☐ No
Air temperature *43* °F. Inches rainfall in past 24 hours *0* in
0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*1.8*	ft
Stream Bottom Width	*.75*	ft
Avg. Bankfull Depth	*.75*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:
Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☑ Grasses ☑ Herbaceous
Number of Strata *4*

Dom. Tree/Shrub Taxa
Red Oak
Beech
Red Maple

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☑ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *80* %	Pool *20* %
Silt/Clay (<0.06 mm)		*75*	*75*
Sand (0.06-2 mm)		*5*	*5*
Gravel (2-64 mm)		*20*	*20*
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **96**

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: *E-22* | LOCATION: *Warden Waste Site*

STATION: *WP 32* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-55.8* LONG: *87-03-30.0* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *4:05* ☐ AM ☑ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *43* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *46.4* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *193* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW	*0-2.0*	ft
Stream Width BF	*2.5*	ft
Stream Bottom Width	*2.0*	ft
Avg. Bankfull Depth	*0.4*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☑ Dry ☑ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:
☑ Trees ☑ Shrubs
☑ Grasses ☑ Herbaceous
Number of Strata *4*

Dom. Tree/Shrub Taxa
Sycamore
Beech
Red Maple
Yellow Polar

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☑ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☐ Channelization (☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *90* %	Pool *10* %
Silt/Clay (<0.06 mm)		*50*	*70*
Sand (0.06-2 mm)		*40*	*30*
Gravel (2-64 mm)		*10*	
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 (8) 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**(10) 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 (7) 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **102**

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: *E-23* | LOCATION: *Warden Waste Site*

STATION: *WP 17* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-57.6* LONG: *87-03-37.1* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *12:35* ☐ AM ☑ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

- ☐ / ☐ Heavy rain
- ☐ / ☐ Steady rain
- ☐ / ☐ Intermittent showers
- ☑ / ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4

☑ Yes ☐ No

Air temperature *40* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*2.5*	ft
Stream Bottom Width	*1.5*	ft
Avg. Bankfull Depth	*0.5*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:

☑ Trees ☑ Shrubs
☑ Grasses ☑ Herbaceous

Number of Strata *4*

Dom. Tree/Shrub Taxa

Maple sp.
Beech
Shagbark Hickory

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *80* %	Pool *20* %
Silt/Clay (<0.06 mm)		*80*	*80*
Sand (0.06-2 mm)		*15*	*20*
Gravel (2-64 mm)		*5*	
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **96**

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: *E-24* | LOCATION: *Warden Waste Site*

STATION: *WP 20* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-24-59.3* LONG: *87-03-33.4* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *1:15* ☐ AM ☑ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *43* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*2.5*	ft
Stream Bottom Width	*0.6*	ft
Avg. Bankfull Depth	*0.6*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
Sweet Gum
Beech
White Oak

Canopy Cover;
☐ Fully Exposed (0-25%)
☑ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*100*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0** (5)
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11** (11)	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0** (4)

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 85

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: *E-25* | LOCATION: *Warden Waste Site*

STATION: *WP 23* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-25-01.3* LONG: *87-03-32.1* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *1:10* ☐ AM ☑ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

- ☐ ☐ Heavy rain
- ☐ ☐ Steady rain
- ☐ ☐ Intermittent showers
- ☑ ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *44* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*1.5*	ft
Stream Bottom Width	*0.5*	ft
Avg. Bankfull Depth	*0.7*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:

☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous

Number of Strata *3*

Dom. Tree/Shrub Taxa

Shagbark Hickory
Beech
White Oak

Canopy Cover;

☐ Fully Exposed (0-25%)
☑ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☑ Channelization
(☐ Full ☑ Partial)

Past Logging

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*100*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **84**

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: *E-26* | LOCATION: *Warden Waste Site*

STATION: *WP 28* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-25-03.2* LONG: *87-03-29.1* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *2:30* ☐ AM ☑ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4
☑ Yes ☐ No
Air temperature *44* °F. Inches rainfall in past 24 hours *0* in
0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*1.4*	ft
Stream Bottom Width	*1.0*	ft
Avg. Bankfull Depth	*0.5*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
Shagbark Hickory
Beech
White Oak

Canopy Cover;
☐ Fully Exposed (0-25%)
☑ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☑ Channelization
(☐ Full ☑ Partial)

Past Logging

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *90* %	Pool *10* %
Silt/Clay (<0.06 mm)		*90*	*90*
Sand (0.06-2 mm)		*5*	*5*
Gravel (2-64 mm)		*5*	*5*
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	**Condition Category**			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **96**

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: *E-27* | LOCATION: *Warden Waste Site*

STATION: *WP 26* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-25-05.8* LONG: *87-03-32.6* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *2:00* ☐ AM ☑ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

- ☐ ☐ Heavy rain
- ☐ ☐ Steady rain
- ☐ ☐ Intermittent showers
- ☑ ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *44* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*1.5*	ft
Stream Bottom Width	*0.6*	ft
Avg. Bankfull Depth	*0.25*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:

☑ Trees ☑ Shrubs
☑ Grasses ☑ Herbaceous

Number of Strata *4*

Dom. Tree/Shrub Taxa

Red Maple
Beech
White Oak

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☑ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *95* %	Pool *5* %
Silt/Clay (<0.06 mm)		*100*	*100*
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 (6)**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 (7) 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 (7) 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **97**

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: *E-28* | LOCATION: *Warden Waste Site*

STATION: *WP 1605* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-25-11.4* LONG: *87-03-40.8* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *2:55* ☐ AM ☑ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4
☑ Yes ☐ No
Air temperature *48* °F. Inches rainfall in past 24 hours *0* in
0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*3.0*	ft
Stream Bottom Width	*1.5*	ft
Avg. Bankfull Depth	*0.5*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:
Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
White Oak
Sugar Maple
Beech

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*100*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10** 9 8 7 6	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **98**

NOTES/COMMENTS; G6

High Gradient Stream Data Sheet

STREAM NAME: *E-29* | LOCATION: *Warden Waste Site*

STATION: *WP 1607* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-25-12.4* LONG: *87-03-35.5* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-28-12* TIME: *3:10* ☐ AM ☑ PM | INVESTIGATORS; *Laura Heil /Bill Sampson*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4
☑ Yes ☐ No
Air temperature *48* °F. Inches rainfall in past 24 hours *0* in
0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*2.25*	ft
Stream Bottom Width	*1.0*	ft
Avg. Bankfull Depth	*0.3*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:
Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
Hickory sp.
White Oak
Sugar Maple
Beech

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*90*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)		*10*	
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	**Condition Category**			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **91**

NOTES/COMMENTS; Entrenched G6

High Gradient Stream Data Sheet

STREAM NAME: *E-30* | LOCATION: *Warden Waste Site*

STATION: *WP 38* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-25-20.4* LONG: *87-03-29.1* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-29-12* TIME: *9:50* ☑ AM ☐ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

- ☐ ☐ Heavy rain
- ☐ ☐ Steady rain
- ☐ ☐ Intermittent showers
- ☑ ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4

☑ Yes ☐ No

Air temperature *30* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*1.2*	ft
Stream Bottom Width	*1.0*	ft
Avg. Bankfull Depth	*0.5*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:
☑ Trees ☑ Shrubs
☑ Grasses ☑ Herbaceous
Number of Strata *4*

Dom. Tree/Shrub Taxa
Maple
White Oak
Red Oak
Beech

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☑ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *85* %	Pool *15* %
Silt/Clay (<0.06 mm)		*100*	*100*
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	**Condition Category**			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 (7) 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 (8) 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 (4) 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **92**

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: *E-31* | LOCATION: *Warden Waste Site*

STATION: *WP 41* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-25-19.2* LONG: *87-03-29.0* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-29-12* TIME: *9:50* ☑ AM ☐ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

- ☐ ☐ Heavy rain
- ☐ ☐ Steady rain
- ☐ ☐ Intermittent showers
- ☑ ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4

☑ Yes ☐ No

Air temperature *32* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*2.3*	ft
Stream Bottom Width	*1.4*	ft
Avg. Bankfull Depth	*0.5*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:

☑ Trees ☑ Shrubs
☑ Grasses ☑ Herbaceous

Number of Strata *4*

Dom. Tree/Shrub Taxa

Maple
White Oak
Red Oak
Black Oak

Canopy Cover;

☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *80* %	Pool *20* %
Silt/Clay (<0.06 mm)		*50*	*50*
Sand (0.06-2 mm)			
Gravel (2-64 mm)		*50*	*50*
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	**Condition Category**			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 (8) 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 (8) 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 (4) 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **95**

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: *E-32* | LOCATION: *Warden Waste Site*

STATION: *WP 58* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-25-14.2* LONG: *87-03-29.8* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-29-12* TIME: *12:00* ☐ AM ☑ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now ☐ ☐ ☐ ☑ | Past 24 hours ☐ Heavy rain ☐ Steady rain ☐ Intermittent showers ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *48* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*1.5*	ft
Stream Bottom Width	*0.7*	ft
Avg. Bankfull Depth	*0.2*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☐ Shrubs
☑ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
Maple
White Oak
Red Oak
Shagbark Hickory

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☑ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☑ Channelization
(☐ Full ☑ Partial)

Past Logging

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*40*	
Sand (0.06-2 mm)		*10*	
Gravel (2-64 mm)		*45*	
Cobble (64-256 mm)		*5*	
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	**Condition Category**			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **87**

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: *E-33* | LOCATION: *Warden Waste Site*

STATION: *WP 50* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-25-12.1* LONG: *87-03-28.4* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-29-12* TIME: *1:36* ☐ AM ☑ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *44* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*2.2*	ft
Stream Bottom Width	*0.6*	ft
Avg. Bankfull Depth	*0.3*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:

☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;

☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;

☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:

Dominate Type:
☑ Trees ☐ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *2*

Dom. Tree/Shrub Taxa
White Oak
Beech
Red Oak

Canopy Cover;

☐ Fully Exposed (0-25%)
☑ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;

Dredging
☑ Channelization
(☐ Full ☑ Partial)

Past Logging

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*100*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 (8) 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 (11)**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 (3) 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 76

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: *E-34* | LOCATION: *Warden Waste Site*

STATION: *WP 53* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-25-13.1* LONG: *87-03-26.0* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-29-12* TIME: *11:45* ☑ AM ☐ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now ☐ ☐ ☐ ☑ | Past 24 hours ☐ Heavy rain ☐ Steady rain ☐ Intermittent showers ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *45* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*3.0*	ft
Stream Bottom Width	*1.0*	ft
Avg. Bankfull Depth	*0.25*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
Maple
White Oak
Red Oak

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☑ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*100*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	**Condition Category**			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **94**

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: *E-35* | LOCATION: *Warden Waste Site*

STATION: *WP 47* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-25-08.8* LONG: *87-03-26.9* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-29-12* TIME: *11:00* ☑ AM ☐ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4 ☑ Yes ☐ No

Air temperature *42* °F. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*2.0*	ft
Stream Bottom Width	*1.4*	ft
Avg. Bankfull Depth	*0.75*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☐ Shrubs
☑ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
Maple
Beech
Yellow Poplar

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☑ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☑ Channelization
(☐ Full ☑ Partial)

Past Logging

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *70* %	Pool *30* %
Silt/Clay (<0.06 mm)		*60*	*70*
Sand (0.06-2 mm)		*40*	*30*
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	**Condition Category**			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 (6)**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 (6)**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**(5) 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **82**

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: *E-36* | LOCATION: *Warden Waste Site*

STATION: *WP 44* | DRAINAGE AREA (AC) | BASIN/WATERSHED *Williams Creek & Elk Creek*

LAT: *37-25-08.4* LONG: *87-03-26.1* | COUNTY; *Ohio* USGS 7.5 TOPO; Equality

DATE: *11-29-12* TIME: *10:50* ☑ AM ☐ PM | INVESTIGATORS; *Rick Heil /Peggy Measel*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? .4
☑ Yes ☐ No
Air temperature *35* °F. Inches rainfall in past 24 hours *0* in
0 % Cloud Cover

P-Chem: Temp (°F) *NA* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond.µs *NA* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width EOW		ft
Stream Width BF	*1.5*	ft
Stream Bottom Width	*1.0*	ft
Avg. Bankfull Depth	*0.2*	ft
Avg. H²O Depth Riffle		ft

LOCAL WATERSHED FEATURES:
Predominant Surrounding Land Use:

☑ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☐ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *2*

Dom. Tree/Shrub Taxa
White Oak
Red Oak
Beech

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☑ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
Dredging
☑ Channelization
(☐ Full ☑ Partial)
Past Logging

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; *100* %	Pool _____ %
Silt/Clay (<0.06 mm)		*90*	
Sand (0.06-2 mm)			
Gravel (2-64 mm)		*10*	
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 65

NOTES/COMMENTS;

Intermittent 1 (I-1 US) – Upstream reach, looking upstream

Intermittent 1 (I-1 DS) – Downstream reach, looking downstream

Intermittent 2 (I-2 US) – Upstream reach, looking upstream

Intermittent 2 (I-2 DS) – Downstream reach, looking downstream

Intermittent 3 (I-3) – looking upstream

Intermittent 3 (I-3) – looking downstream

Intermittent 4 (I-4) – looking upstream

Intermittent 4 (I-4) – looking downstream

Intermittent 5 (I-5) – Upstream reach, looking upstream

Intermittent 5 (I-5) – Downstream reach, looking downstream

Ephemeral 1 (E-1)

Ephemeral 2 (E-2)

Ephemeral 3 (E-3)

Ephemeral 4 (E-4)

Ephemeral 5 (E-5)

Ephemeral 6 (E-6)

Ephemeral 7 (E-7)

Ephemeral 8 (E-8)

Ephemeral 9 (E-9)

Ephemeral 10 (E-10)

Ephemeral 11 (E-11 US)

Ephemeral 11 (E-11 DS)

Ephemeral 12 (E-12)

Ephemeral 13 (E-13)

Ephemeral 14 (E-14)

Ephemeral 15 (E-15)

Ephemeral 16 (E-16)

Ephemeral 17 (E-17)

Ephemeral 18 (E-18)

Ephemeral 19 (E-19)

Ephemeral 20 (E-20)

Ephemeral 21 (E-21)

Ephemeral 22 (E-22)

Ephemeral 23 (E-23)

Ephemeral 24 (E-24)

Ephemeral 25 (E-25)

Ephemeral 26 (E-26)

Ephemeral 27 (E-27)

Ephemeral 28 (E-28)

Ephemeral 29 (E-29)

Ephemeral 30 (E-30)

Ephemeral 31 (E-31)

Ephemeral 32 (E-32)

Ephemeral 33 (E-33)

Ephemeral 34 (E-34)

Ephemeral 35 (E-35)

Ephemeral 36 (E-36)

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont (DRAFT)

Project/Site: Wetland A	City/County: Ohio County	Sampling Date: 11/26/12
Applicant/Owner: Armstrong Coal – Warden Waste Site	State: Kentucky	Sampling Point: WP 1456
Investigator(s): Bill Sampson, & Laura Heil	Section, Township, Range:	
Landform (hillslope, terrace, etc.): Bottom	Local Relief: ☒ concave ☐ convex ☐ none Flat	

Slope: < 2%	Lat: 37° 24' 28.9"	Long: 87° 03' 43.7"	Datum: WGS 84

Soil Map Unit: Stendal silt loam	Cowardin Classification: PFOIA
Are climatic/hydrologic conditions on the site typical for this time of year? ☒ Yes ☐ No (if no, explain in Remarks.)	
Are Vegetation, Soil, or Hydrology significantly disturbed? ☐ Yes ☒ No	Are "Normal Circumstances" present? ☒ Yes ☐ No
Are Vegetation, Soil, or Hydrology naturally problematic? ☐ Yes ☒ No	(If needed, explain in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? ☒ Yes ☐ No Hydric Soil Present? ☒ Yes ☐ No Wetland Hydrology Present? ☒ Yes ☐ No	**Is the Sampled Area within a Wetland?** ☒ **Yes** ☐ **No**
Remarks: Appears to be an old road	

VEGETATION – Use scientific names of plants

Tree Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Sycamore *(Platanus occidentalis)*	5	No	FACW
2. Red maple *(Acer rubrum)*	50	Yes	FAC
3. River birch *(Betula nigra)*	5	No	FACW
4. Swamp chesnut oak *(Quercus michauxii)*	5	No	FACW
5.			
Sapling/Shrub Stratum (Plot Size: 15')			
1. Pin oak *(Quercus palustris)*	3	No	FACW
2. Red maple *(Acer rubrum)*	15	Yes	FAC
3.			
4.			
5.			
Herbaceous Stratum (Plot Size: 5')			
1. Sensitive fern *(Onoclea sensibilis)*	2	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Woody Vine (Plot Size: 5')			
1. Honeysuckle *(Lonicera japonica)*	2	Yes	FAC
2.			
Remarks:			

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across all Strata: 4 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species:		X 1=	
FACW Species:		X 2 =	
FAC Species:		X 3 =	
FACU Species:		X 4 =	
UPL Species:		X 5 =	
Column Totals:(A)			(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

☐ Rapid Test for Hydrophytic Vegetation

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide Supporting Data)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be

Hydrophytic Vegetation Present? ☒ **Yes** ☐ **No**

SOIL

Sampling Point:

Profile Description (Describe to the depth needed to document the indicator of confirm the absence of indicators.)

Depth (in)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-2								Organic Layer
2-4	10YR 4/1		10YR 4/6	25				
4-10	10YR 6/2		5YR 4/6	20				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2cm Muck (A10) **(LRR N, MLRA 147,148)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7)
- ☐ Polyvalue Below Surface (S8)**(MLRA 147,148)**
- ☐ Thin Dark Surface (S9)**(MLRA 147,148)**
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Fe-Mn Masses (F12)**(LRR N, MLRA 136)**
- ☐ Umbric Surface (F13)**(LRR N, MLRA 136)**
- ☐ Piedmont Floodplain Soils (F19)**(MLRA 148)**

Indicators for Problematic Hydric Soils[3]

- ☐ 2 cm Muck (A10)**(MLRA 147)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 136,147)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if ovserved):

Type: None

Depth (in):

Hydric Soil Present? ☒ **Yes** ☐ **No**

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☒ Sparsely Vegetated Concave Surface (B8)
- ☒ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☒ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? ☐ Yes ☐ No Depth (in):

Water Table Present? ☐ Yes ☐ No Depth (in):

Saturation Present? (includes capillary fringe) ☐ Yes ☐ No Depth (in):

Wetland Hydrology Present? ☒ **Yes** ☐ **No**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont (DRAFT)

Project/Site: Wetland B	City/County: Ohio County	Sampling Date: 11/26/12
Applicant/Owner: Armstrong Coal – Warden Waste Site	State: Kentucky	Sampling Point: WP 1505
Investigator(s): Bill Sampson, & Laura Heil	Section, Township, Range:	
Landform (hillslope, terrace, etc.): Bottom	Local Relief: ☒ concave ☐ convex ☐ none Flat	

Slope: < 2%	Lat: 37° 24' 31.4"	Long: 87° 03' 40.1"	Datum: WGS 84

Soil Map Unit: Stendal silt loam	Cowardin Classification: PFOIA
Are climatic/hydrologic conditions on the site typical for this time of year? ☒ Yes ☐ No (if no, explain in Remarks.)	
Are Vegetation, Soil, or Hydrology significantly disturbed? ☐ Yes ☒ No	Are "Normal Circumstances" present? ☒ Yes ☐ No
Are Vegetation, Soil, or Hydrology naturally problematic? ☐ Yes ☒ No	(If needed, explain in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? ☒ Yes ☐ No Hydric Soil Present? ☒ Yes ☐ No Wetland Hydrology Present? ☒ Yes ☐ No	**Is the Sampled Area within a Wetland?** ☒ **Yes** ☐ **No**
Remarks: Appears to be an old road	

VEGETATION – Use scientific names of plants

Tree Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Sycamore *(Platanus occidentalis)*	10	No	FACW
2. Red maple *(Acer rubrum)*	15	Yes	FAC
3. River birch *(Betula nigra)*	25	Yes	FACW
4. Persimmon *(Diospyros virginiana)*	5	No	FAC
5.			
Sapling/Shrub Stratum (Plot Size: 15')			
1. Sycamore *(Platanus occidentalis)*	30	Yes	FACW
2. Red maple *(Acer rubrum)*	10	No	FAC
3.			
4.			
5.			
Herbaceous Stratum (Plot Size: 5')			
1. Boneset *(Eupatorium perfoliatum)*	20	No	FACW
2. Little white aster *(Doellingersa umbellata)*	20	No	FACW
3. Seedbox *(Ludwigia alternifolia)*	2	No	FACW
4. Switchgrass *(Panicum dichotomiflorum)*	40	Yes	FACW
5.			
6.			
7.			
8.			
Woody Vine (Plot Size:)			
1.			
2.			
Remarks:			

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across all Strata: 4 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species:		X 1=	
FACW Species:		X 2 =	
FAC Species:		X 3 =	
FACU Species:		X 4 =	
UPL Species:		X 5 =	
Column Totals:(A)			(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

☐ Rapid Test for Hydrophytic Vegetation

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide Supporting Data)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be

Hydrophytic Vegetation Present? ☒ **Yes** ☐ **No**

SOIL

Sampling Point:

Profile Description (Describe to the depth needed to document the indicator of confirm the absence of indicators.)

Depth (in)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-2								Organic Layer
2-6	10YR 5/2	90	5YR 4/6	10				
6-10	10YR 5/2	75	5YR 4/6	25				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2cm Muck (A10) **(LRR N, MLRA 147,148)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7)
- ☐ Polyvalue Below Surface (S8)**(MLRA 147,148)**
- ☐ Thin Dark Surface (S9)**(MLRA 147,148)**
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Fe-Mn Masses (F12)**(LRR N, MLRA 136)**
- ☐ Umbric Surface (F13)**(LRR N, MLRA 136)**
- ☐ Piedmont Floodplain Soils (F19)**(MLRA 148)**

Indicators for Problematic Hydric Soils[3]

- ☐ 2 cm Muck (A10)**(MLRA 147)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 136,147)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if ovserved):

Type: None

Depth (in):

Hydric Soil Present? ☒ **Yes** ☐ **No**

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☒ Sparsely Vegetated Concave Surface (B8)
- ☒ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? ☐ Yes ☐ No Depth (in):

Water Table Present? ☐ Yes ☐ No Depth (in):

Saturation Present? (includes capillary fringe) ☐ Yes ☐ No Depth (in):

Wetland Hydrology Present? ☒ **Yes** ☐ **No**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont (DRAFT)

Project/Site: Wetland C	City/County: Ohio County	Sampling Date: 11/27/12
Applicant/Owner: Armstrong Coal – Warden Waste Site	State: Kentucky	Sampling Point: WP 1552
Investigator(s): Bill Sampson, & Laura Heil	Section, Township, Range:	
Landform (hillslope, terrace, etc.): Pool	Local Relief: ☒ concave ☐ convex ☐ none	

Slope: < 2%	Lat: 37° 24' 33.3"	Long: 87° 03' 24.1"	Datum: WGS 84
Soil Map Unit: Frondorf-Wellston-Rosine silt loam	Cowardin Classification: PEMIH		

Are climatic/hydrologic conditions on the site typical for this time of year? ☒ Yes ☐ No (if no, explain in Remarks.)

Are Vegetation, Soil, or Hydrology significantly disturbed? ☐ Yes ☒ No	Are "Normal Circumstances" present? ☐ Yes ☒ No
Are Vegetation, Soil, or Hydrology naturally problematic? ☐ Yes ☒ No	(If needed, explain in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? ☒ Yes ☐ No Hydric Soil Present? ☐ Yes ☒ No Wetland Hydrology Present? ☒ Yes ☐ No	**Is the Sampled Area within a Wetland?** ☒ **Yes** ☐ **No**

Remarks: Excavated pool in channel of E-2

VEGETATION – Use scientific names of plants

Tree Stratum (Plot Size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
Sapling/Shrub Stratum (Plot Size: 15')			
1. Sycamore *(Platanus occidentalis)*	1	No	FACW
2.			
3.			
4.			
5.			
Herbaceous Stratum (Plot Size: 5')			
1. *Carex* sp.	15	Yes	FACW
2. Rush *(Juncus effuses)*	5	No	FACW
3. Seed box *(Ludwigia alternifolic)*	10	Yes	FACW
4. Broom sedge *(Andropogon virginicus)*	7	No	FACU
5. Spikerush *(Elcocharis obtusa)*	1	No	OBL
6. Beggar ticks *(Bidens sp.)*	5	No	FAC+
7.			
8.			
Woody Vine (Plot Size:)			
1.			
2.			

Remarks:

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC: _ (A)

Total Number of Dominant Species Across all Strata: _(B)

Percent of Dominant Species that are OBL, FACW, or FAC: _ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species:	_____	X 1=	_____
FACW Species:	_____	X 2 =	_____
FAC Species:	_____	X 3 =	_____
FACU Species:	_____	X 4 =	_____
UPL Species:	_____	X 5 =	_____
Column Totals:(A)	_____		_____(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

☒ Rapid Test for Hydrophytic Vegetation

☐ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide Supporting Data)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be

Hydrophytic Vegetation Present? ☒ **Yes** ☐ **No**

SOIL

Sampling Point:

Profile Description (Describe to the depth needed to document the indicator of confirm the absence of indicators.)

Depth (in)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-1								Organic Layer
1-10								Brown soils

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2cm Muck (A10) **(LRR N, MLRA 147,148)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7)
- ☐ Polyvalue Below Surface (S8)**(MLRA 147,148)**
- ☐ Thin Dark Surface (S9)**(MLRA 147,148)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Fe-Mn Masses (F12)**(LRR N, MLRA 136)**
- ☐ Umbric Surface (F13)**(LRR N, MLRA 136)**
- ☐ Piedmont Floodplain Soils (F19)**(MLRA 148)**

Indicators for Problematic Hydric Soils[3]

- ☐ 2 cm Muck (A10)**(MLRA 147)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 136,147)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if ovserved):

Type: None

Depth (in):

Hydric Soil Present? ☐ **Yes** ☒ **No**

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☒ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? ☒ Yes ☐ No Depth (in):

Water Table Present? ☐ Yes ☒ No Depth (in):

Saturation Present? (includes capillary fringe) ☒ Yes ☐ No Depth (in):

Wetland Hydrology Present? ☒ **Yes** ☐ **No**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland A

Wetland B

Wetland C

I have reviewed the soil, hydrology, and plant community descriptions of the potential wetlands on the Warden Waste site and found them to be acceptable. In my professional opinion, Wetlands A, B, and C satisfy the criteria to be wetlands pursuant to the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual or Eastern Mountains and Piedmont Interim Regional Supplement with subsequent clarification memoranda, subject to confirmation by the USACE Newburgh Office.

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