tool production occurred at the site. The relatively low ratio by count of primary (4.8 percent) and secondary (1.8 percent) decortication flakes, as well as tertiary flakes (10.7 percent), within the debitage category indicates that early stage production was not as common at the site as late stage production and resharpening. In addition, the relatively high percentage of biface-2 flakes (27.3 percent by count) indicates that a strong emphasis was placed on biface maintenance. The presence of thermal shatter (20.1 percent by count) indicates that the heating of raw material occurred either intentionally or accidentally.

Heating and Cooking Debris

The large amount of cracked rock (N=2,155; 209,131.7 g) in the collection and the identification of the hearth (Feature 2) and the deep earth oven (Feature 3) indicate that rock cobbles were being utilized for both the direct and indirect heating of food at site 15Mu296. The recovery of baked clay (N=15; 43.2 g) and charcoal also support this inference.

Domestic Equipment

The presence of a pestle (Figure 5-3a), a hammerstone (Figure 5-3b), and multiple pitted stones (Figures 5-4a–b, 5-5a, and 5-6a)—some of which are very large and have multiple pits—suggest that the crushing of food, most likely nuts, was an important activity at site 15Mu296. All of these artifacts are made of sandstone. The large size of the multi-pitted stones (particularly Figures 5-5a and 5-6a) indicates that they were most likely permanent fixtures at the site. The hammerstone from the collection could have served a variety of functions, including flint knapping, the crushing of long bones for marrow, and the crushing of nuts.

Other Items

Both the ochre and limonite from site 15Mu296 may have been used as pigments for personal adornment. Both these minerals are iron oxides. Ochre commonly produces a reddish-colored pigment while limonite makes a yellow-brownish-colored one (Crelling n.d.). A fragment of a geode was recovered from the site as well; it is unknown what function it performed.

Chipped-stone Raw Material

The most common raw material type in the site chipped-stone assemblage was Wyandotte chert (Table 5-3). Wyandotte chert comprises 85.6 percent of the chipped-stone assemblage by weight. By weight, it also makes up 87.5 percent of the hunting and general utility tools as well as all of the fabricating and processing tools. Geographically, Wyandotte outcrops northeast of site 15Mu296 in Harrison and Crawford Counties, Indiana, and in Meade, Breckinridge, and Hardin Counties, Kentucky. There are reports of a source of chert that resembles Wyandotte chert from Harrison and Crawford counties, Indiana, that is located southwest of site 15Mu296, somewhere nearby (Shaffer 2000:15). This source was not field checked during the present investigation; however, considering how prominent Wyandotte chert is in the chipped-stone assemblage at site 15Mu296, it is reasonable to expect a source area for this chert closer than those in the above counties.

The second most common chert type in the assemblage was Holland chert; it comprises 6.4 percent of the chipped-stone assemblage by weight. Artifacts of Holland chert include an amorphous core and a large number of informal flake tools (N=48). Holland chert outcrops in Dubois and Spencer counties in Indiana, approximately 113 km (70 miles) north of site 15Mu296. Typical of other Pennsylvanian cherts, Holland chert is more commonly recovered from residual exposures than outcrops. Other identified chert types found at site 15Mu296 during the Phase II testing, in descending order by weight, include Perth, Mounds, Sonora, Haney, Allens Creek, Burlington, Muldraugh, Dover, and Mill Creek.

Figure 5-3. Selected prehistoric artifacts. (a) pestle, Test Unit 3, Level 1; (b) hammerstone, Trench 2.

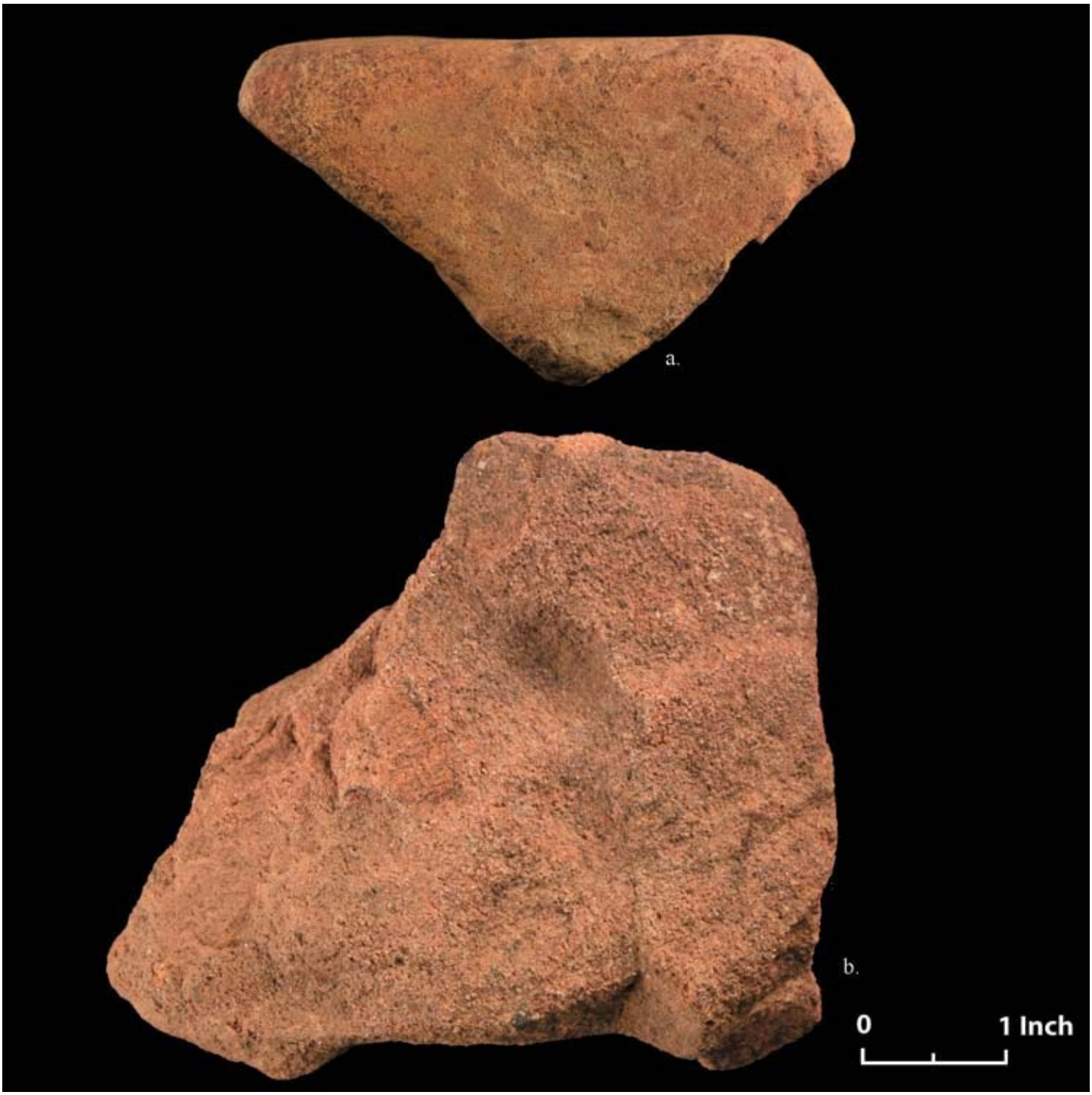

Figure 5-4. Selected prehistoric artifacts. (a) pitted sandstone, Trench 2; (b) pitted sandstone, Test Unit 1, Level 1.

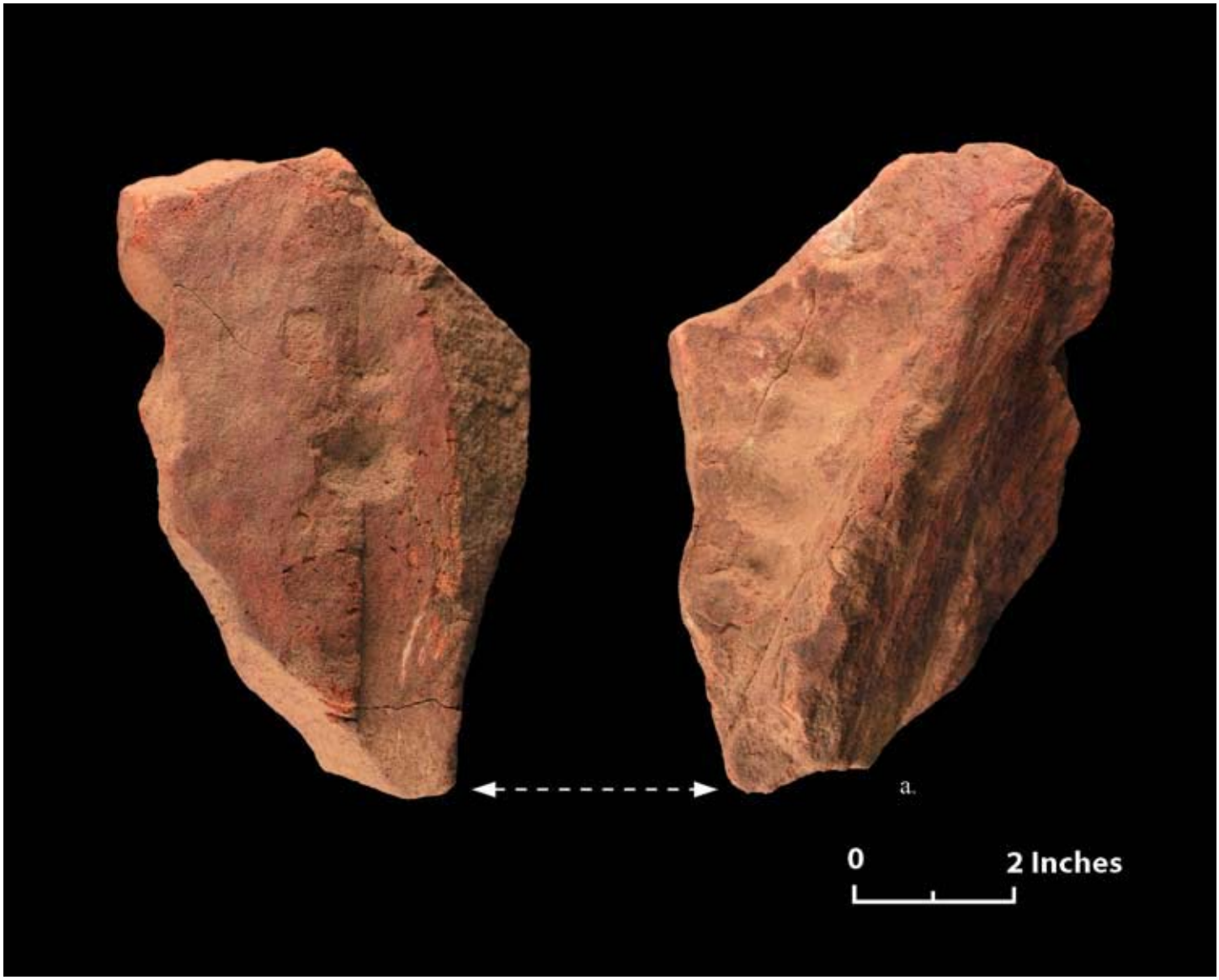

Figure 5-5. Selected prehistoric artifacts. (a) multi-pitted sandstone, Trench 3.

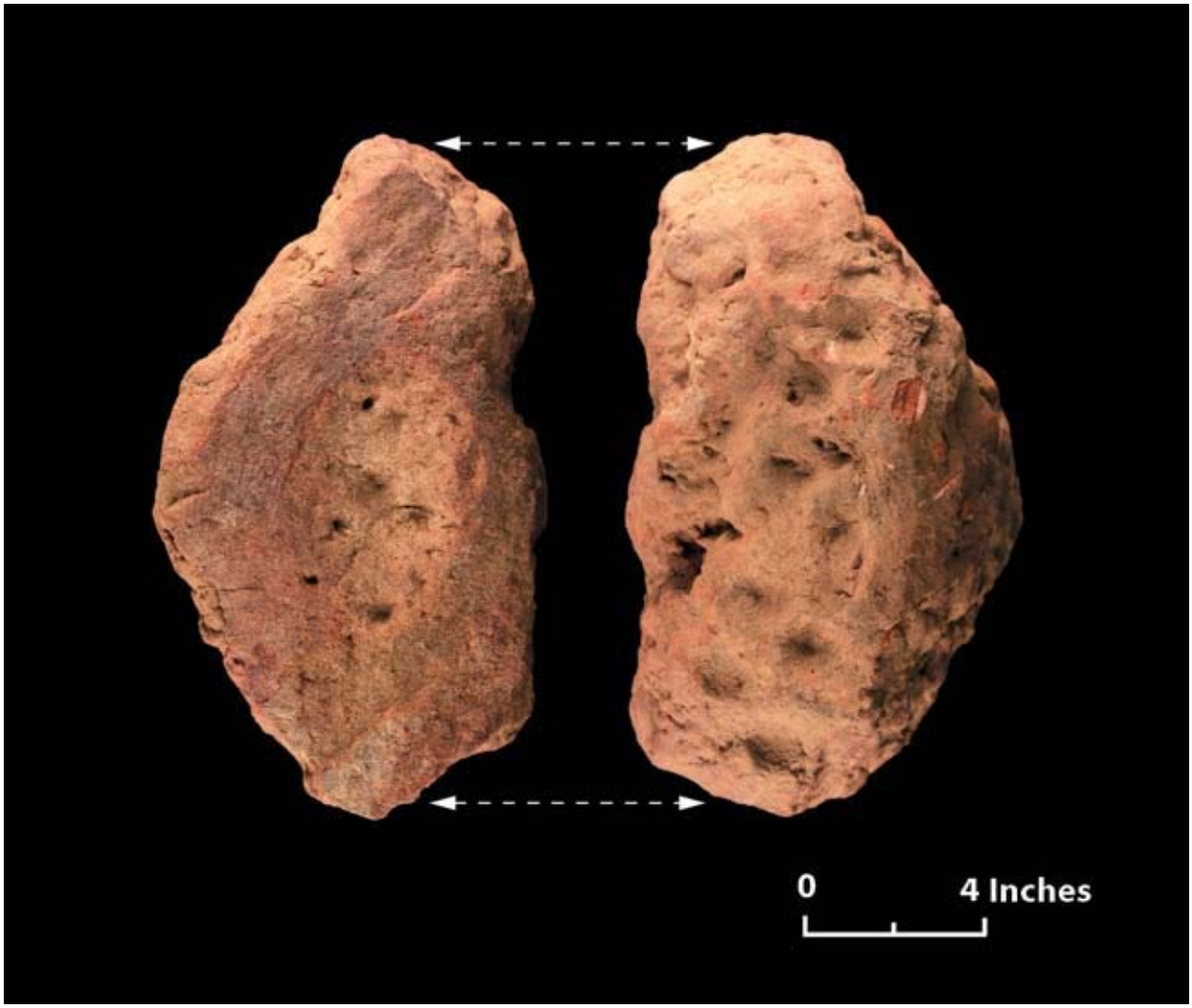

Figure 5-6. Selected prehistoric artifacts. (a) mortar/multi-pitted sandstone, Test Unit 6, Level 3.

Table 5-3. Chert Type Frequencies for Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Chert Type Frequencies																									
Chert Type	Allens Creek		Burlington		Dover		Haney (Ind.)		Holland		Mill Creek		Mounds		Muldraugh		Perth		Sonora		Wyandotte		Indeterminate		Total	
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools																										
Proj. Pts./Hafted Knives	[1]	0.9	[1]	0.5																	[21]	163.1	[2]	1.0	25	165.5
Hafted Scrapers																					[1]	2.4			1	2.4
Unspecified Bifaces															[1]	2.0					[28]	111.9			29	113.9
Informal Flake Tools	1	0.6	2	8.3	2	2.9	3	11.6	48	32.4			9	7.0	3	5.2	9	6.8	4	1.2	431	432.2	5	4.6	517	512.8
Blades																					[1]3	5.6			3	5.6
Fabricating & Processing Tools																										
Drills																					[6]	15.8			6	15.8
Spokeshaves																					[1]	1.6			1	1.6
Total by Count & Weight	2	1.5	3	8.8	2	2.9	3	11.6	48	32.4			9	7.0	4	7.2	9	6.8	4	1.2	491	732.6	7	5.6	582	817.6
Frequency	0.3%	0.2%	0.5%	1.1%	0.3%	0.4%	0.5%	1.4%	8.2%	4.0%			1.5%	0.9%	0.7%	0.9%	1.5%	0.8%	0.7%	0.1%	84.4%	89.6%	1.2%	0.7%	100%	100%
Stone Tool Production & Maintenance Debris																										
Cores																										
Amorphous									1	42.1											5	307.4			6	349.5
Blanks																	[1]	25.2							1	25.2
Debitage																										
Primary Decort. Flakes					2	1.7			2	13.1	1	1.2	2	7.7			1	0.7	3	10.2	43	79.9	1	0.3	55	114.8
Secondary Decort. Flakes	1	7.4							1	0.5			2	0.3	1	0.2					16	10.4			21	18.8
Tertiary Flakes	1	1.2							20	10.6											100	66.5	1	0.4	122	78.7
Biface-1 Flakes					2	0.6			2	0.6	1	0.4	1	0.4			1	0.4			46	21.3	1	0.3	54	24.0
Biface-2 Flakes	1	0.1	2	0.3	3	0.3	2	0.2	13	1.8			6	0.9	3	0.5			3	0.4	279	44.1			312	48.6
Broken Flakes	1	0.2	1	0.4			1	0.5	24	8.7	3	0.7	2	0.8	2	0.9	6	5.2	4	2.0	298	110.3			342	129.7
Angular Fragments									1	3.6							2	14.9			5	37.4			8	55.9
Thermal Shatter	2	0.7	1	2.1	1	0.3	1	0.9	14	10.4							5	8.3	3	1.7	202	251.6	1	1.1	230	277.1
Total by Count & Weight	6	9.6	4	2.8	8	2.9	4	1.6	78	91.4	5	2.3	13	10.1	6	1.6	16	54.7	13	14.3	994	928.9	4	2.1	1151	1122.3
Frequency	0.5%	0.9%	0.3%	0.2%	0.7%	0.3%	0.3%	0.1%	6.8%	8.1%	0.4%	0.2%	1.1%	0.9%	0.5%	0.1%	1.4%	4.9%	1.1%	1.3%	86.4%	82.8%	0.3%	0.2%	100%	100%
Overall Total	8	11.1	7	11.6	10	5.8	7	13.2	126	123.8	5	2.3	22	17.1	10	8.8	25	61.5	17	15.5	1485	1661.5	11	7.7	1733	1939.9
Overall Frequency	0.5%	0.6%	0.4%	0.6%	0.6%	0.3%	0.4%	0.7%	7.3%	6.4%	0.3%	0.1%	1.3%	0.9%	0.6%	0.5%	1.4%	3.2%	1.0%	0.8%	85.7%	85.6%	0.6%	0.4%	100%	100%

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments

Chapter 6 - Botanical Analysis by Kathryn Parker

This chapter presents the results of the botanical analysis of materials from site 15Mu296. As part of recovery strategy at the site, sediment samples were routinely collected for flotation during excavation of each cultural feature. Identified botanical materials from flotation sampling may illuminate plant use practices at specific localities, examined in the context of broad regional and temporal socio-economic adaptations. The botanical analysis for the Phase II investigation at site 15Mu296 was conducted by Kathryn Parker of Great Lakes Ecosystems, Indian River, Michigan; Kathryn Parker also wrote this chapter.

Methods of Botanical Analysis

Charred plant materials in each flotation sample were first separated into two size fractions with the aid of a No. 10 geological sieve (2-mm mesh). Using a standard binocular microscope at low magnification (10x), all carbonized materials in each large fraction (>2 mm) were extracted and sorted into categories (e.g. wood, nutshell, seed). The wood and nutshell categories were subsequently weighed, and the number of items in each was counted. An attempt was made to identify all nutshell and the first 20 randomly selected wood fragments (or all wood, if there were less than 20) in this large fraction.

In this analysis, wood fragments examined but found to be unidentifiable at least to family were grouped into one of two categories: ring porous hardwood or unidentifiable. Ring porous woods may be from any one of several native taxa commonly occurring in this region of western Kentucky, including various oaks (*Quercus* sp.), hickories (*Carya* sp.) and ash (*Fraxinus* sp.). Fragments in which all distinctive morphological traits had been distorted or destroyed during carbonization were classified as unidentifiable.

Wood and nutshell counts and weights were based on materials in the large fraction only. The small fraction (<2 mm) was examined carefully at 10-30x for seeds, grass stems, etc. However, none of these items were observed.

Plant materials from flotation samples as well as several hand-collected specimens were identified to the lowest possible taxon, usually to the level of genus. Nut and wood identifications were based on morphological characteristics, with reference to a collection of modern comparative specimens and standard pictorial guides (e.g. Hoadley 1990). Species identifications were attempted only when morphological comparisons ruled out other members of a genus (i.e., *Castanea dentata*). Scientific nomenclature follows the United States Department of Agriculture online database, http://www. plants.usda.gov/java/factsheet.

Results of Analysis

Macrobotanical remains consisting of charred wood and nutshell were recovered from flotation of sediments from three cultural features (Table 6-1). Mean botanical density in 50 liters of processed feature matrix was high at 0.6 g/ liter, or by count 53.7 fragments/ liter (nutshell and wood > 2.0 mm dia. only); this was largely a product of abundant nutshells. Nut fragments overwhelmingly outnumbered those of wood, as shown in the

Table 6-1. Botanical Remains from Flotation, site 15Mu296.

Sample Provenience	Feature 1, W1/2	Feature 2, zone I, W1/2	Feature 2, zone II, W1/2	Feature 3, zone I, W1/2	Feature 3, zone II, W1/2	Totals
Sample (AS) Number	1	2	3	4	5	
Sample Volume (l)	10.0	10.0	10.0	10.0	10.0	50.0
Total Wood (N)	16	85	48	28	27	204
Total Wood Wt. (g)	0.12	0.57	0.89	0.62	0.16	2.36
Breakdown by taxon (N)						
Carya sp. (hickory)		3	2	5	1	11
Castanea dentata (American chestnut)		1				1
Fraxinus sp. (ash)			3			3
Gledisia triacanthos/*Gymocladus dioica*						
(honey locust or Kentucky coffeetree)		2				2
Quercus sp. (oak)		1	3	1	4	9
Q. sp., subgenus *Erythrobalanus* (red oak subgroup)			1			1
Ulmaceae (elm family)	1	2				3
Ring porous	7	6	5	7	8	33
Unidentifiable	8	5	6	7	7	33
Total Nutshell (N)	825	606	395	492	163	2481
Total Nutshell Wt. (g)	8.47	6.94	4.76	5.23	2.59	27.99
Breakdown by taxon (N and wt.)						
Carya sp.	825	605	395	490	115	2430
(hickory)	8.47	6.93	4.76	5.22	2.23	27.61
Juglandaceae					48	48
(hickory/walnut family)					0.36	0.36
Quercus sp.		1		2		3
(acorn)		0.01		0.01		0.02

nutshell to wood ratio of 12.2:1 (comparing fragment counts).

Flotation samples from each of the three features had at least a minimal amount of wood but frequencies in each case were far less than those of nutshell. At least six tree taxa were represented in the 30 wood fragments identified, out of 96 examined and 204 total fragments recovered. In descending order of numerical abundance, wood types identified were hickory (*Carya* sp.), oak (*Quercus* sp.), including the red subgroup (*Q.* sp., subgenus *Erythrobalanus*), ash (*Fraxinu*s sp.), elm family (Ulmaceae), honey locust or Kentucky coffeetree (*Gleditsia triacanthos/ Gymnocladus dioica*), and American chestnut (*Castanea dentat*a). It is likely that most wood was collected from sources very near the Archaic encampment. Oak and hickory together accounted for 70 % of the wood fragments identified and occurred in two of the three features. Various oaks and hickories are dominant trees in upland forest communities in this region of western Kentucky, and they also grow on terraces and other well-drained areas within floodplains. A small amount of charred wood collected by hand in excavation of Features 2 and 3 included oak, hickory, and ash, fundamentally duplicating the results of flotation analysis (Table 6-2).

Nutshell in flotation samples totaled 2481 fragments (27.99 g), and consisted primarily of thick-shelled hickory (*Carya* sp.). Eroded, amorphous, thick-shelled pieces from Feature 3, zone II, identifiable only as walnut/hickory family (Juglandaceae) are also assumed to be hickory. If this assumption is correct, three thin acorn (*Quercus* sp.) shells were

Table 6-2. Hand-Collected Botanical Remains, site 15Mu296.

Sample Provenience	Sample Number	Type of Material Identified (all are carbonized)	Wt. (g)
Feature 1	Cat. #29	Hickory nutshell (5 fragments)	0.21
Feature 2	Cat. #31	Hickory, ash and ring porous wood	0.9
		Hickory nutshell (17 fragments)	0.77
		Giant cane (*Arundinaria gigantea*) (1 stem fragment)	0.07
		Eroded ovoid fruit or terrestrial tuber (1)	0.26
Feature 3	A.S. #6	Hickory nutshell (10 fragments)	0.39
		Oak wood	0.25

the only non-hickory nut remains from 15Mu296. An additional 32 hickory nutshell fragments were recovered by hand from Features 1, 2 and 3. The archaeobotanical evidence clearly demonstrates that hickory nuts were routinely collected from nearby trees and processed at site 15Mu296, and the byproducts of processing were used as high quality fuel.

Other than wood and nutshell, other materials included one giant cane (*Arundinaria gigantea*) stem fragment and an ovoid, acorn-sized fruit or terrestrial bulb/tuber, both collected by hand from Feature 2. Cane and grass stems were important to later prehistoric groups as the raw material in mats, pit lining, and thatch. It is probable they had similar technological uses among Archaic populations.

Summary

Botanical remains from Archaic components in the Eastern Woodlands often tend to be sparse and taxonomically limited, dominated by nutshell and wood, and with few seeds or other materials. However, mid-continent paleoethnobotanical research has also amply demonstrated that Archaic period economic strategies incorporated gardening/farming of incipient Eastern Complex cultigens. Harvest and processing of hickory nuts were principal economic activities at site 15Mu296, a finding that is consistent with one type of occupation in a larger Archaic settlement model: short-term encampment by small groups focused on resource extraction, with only limited, ad hoc involvement in other plant-related subsistence tasks.

Chapter 7 - Results of the Investigations

This chapter describes the results of the Phase II testing of prehistoric site 15Mu296 conducted within Oxford Mining Company's Mine Permit Area #889-0130, Muhlenberg County, Kentucky. Investigations were conducted in July 2011, by American Resources Group (ARG) Ltd. personnel. Site 15Mu296 was initially discovered during a Phase I survey of the area which was also conducted by ARG (Lence et al. 2011).

Site 15Mu296

Site Type: Prehistoric habitation; field camp
Component: Early Archaic, Middle Archaic, and Late Archaic.
UTM (NAD 83): 4116314N 478819E, Zone 16
Approximate Site Area: 3,700 m^2 (0.91 acre)
Topographic Location: Colluvial slope/terrace remnant
Elevation: 132 m (435 feet) amsl
Soil Type: Belknap silt loam
Nearest Water: Spurlins Creek is 75 m north of the site.
Survey Method: Hand excavation of test units, mechanical stripping, and excavation of deep-testing trenches.
Site Condition: The site has not been disturbed by cultivation. Some disturbance to the site surface has resulted from limited logging and by a bulldozed road. These disturbances are most evident in the northeastern and western edges of the site area.
NRHP Evaluation: Eligible.

Site Description

Site 15Mu296 is a moderately large and dense prehistoric lithic scatter situated on a colluvial slope/terrace remnant at the base of the bluff overlooking Spurlins Creek. This location is approximately 5.5 km (3.4 miles) southwest of Greenville, Kentucky (Figures 1-1 and 7-1) in an area covered by second growth saplings and greenbriers, approximately 800 m (2625 feet) northeast of the Sharon-Depoy road. The northeastern edge of the site has been slightly disturbed by logging activities, and the Western edge of the site has been disturbed by logging-related bulldozing.

Previous Investigations

A Phase I survey identified site 15Mu296 at the base of a ridge east of Spurlins Creek; a location well within the limits of the proposed surface mine project area (Lence et al. 2011). At the time of the initial survey, a majority of the ground surface was completely obscured by vegetation although the ground was bare in a small area disturbed by bulldozing along the western site boundary (Figure 7-2). The site was located through systematic shovel testing conducted on a 20-m grid. Once identified, site limits were determined through shovel testing on a 10-m grid and through surface survey of the bulldozer disturbed area. A total of 69 shovel tests was excavated at the site, and 29 of these yielded cultural material. The most productive shovel test contained 22 artifacts. A large amount of cracked rock was observed in the bulldozer disturbed area on the western edge of the site.

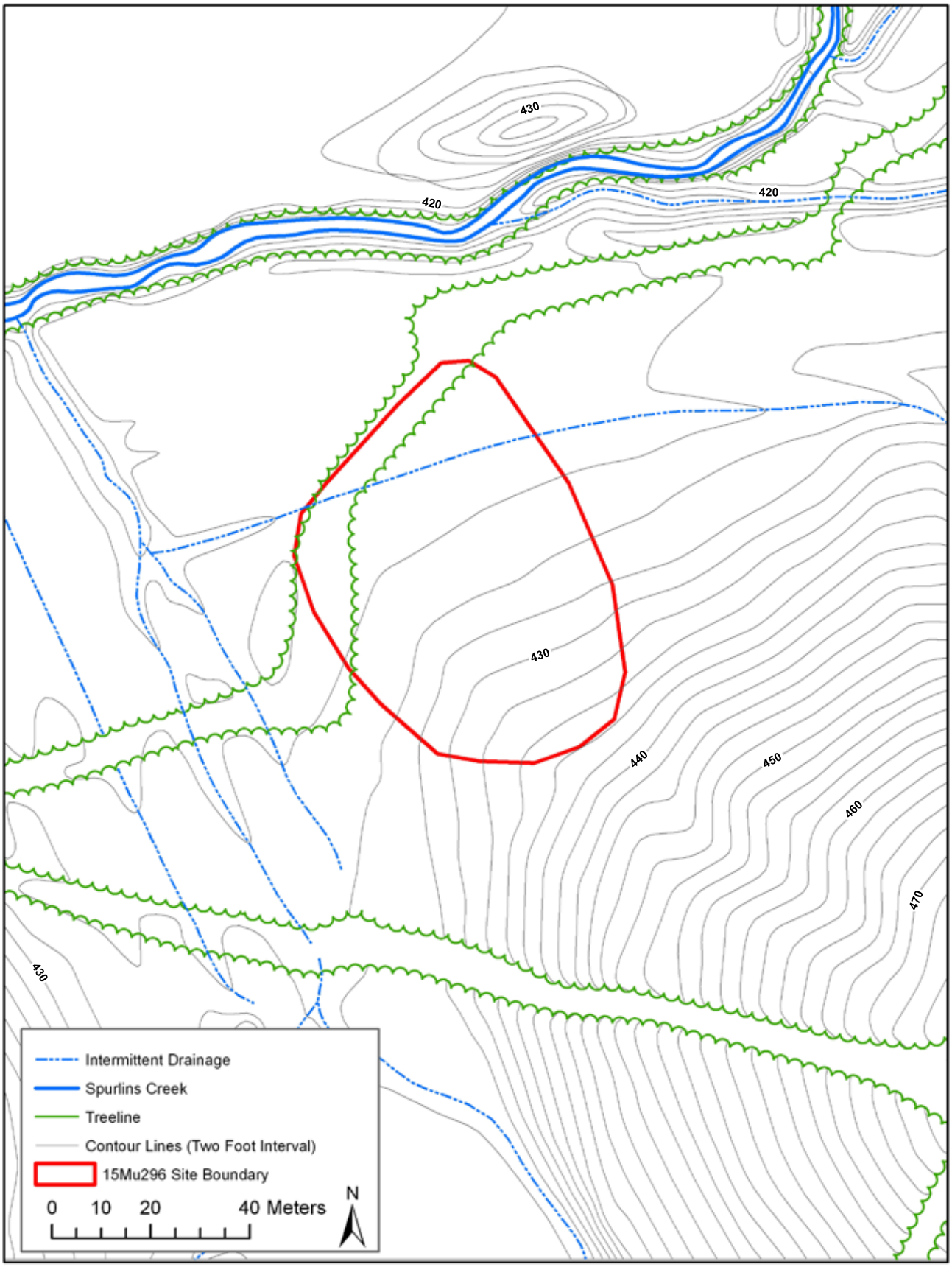

Figure 7-1. Map of site 15Mu296 showing topographic detail.

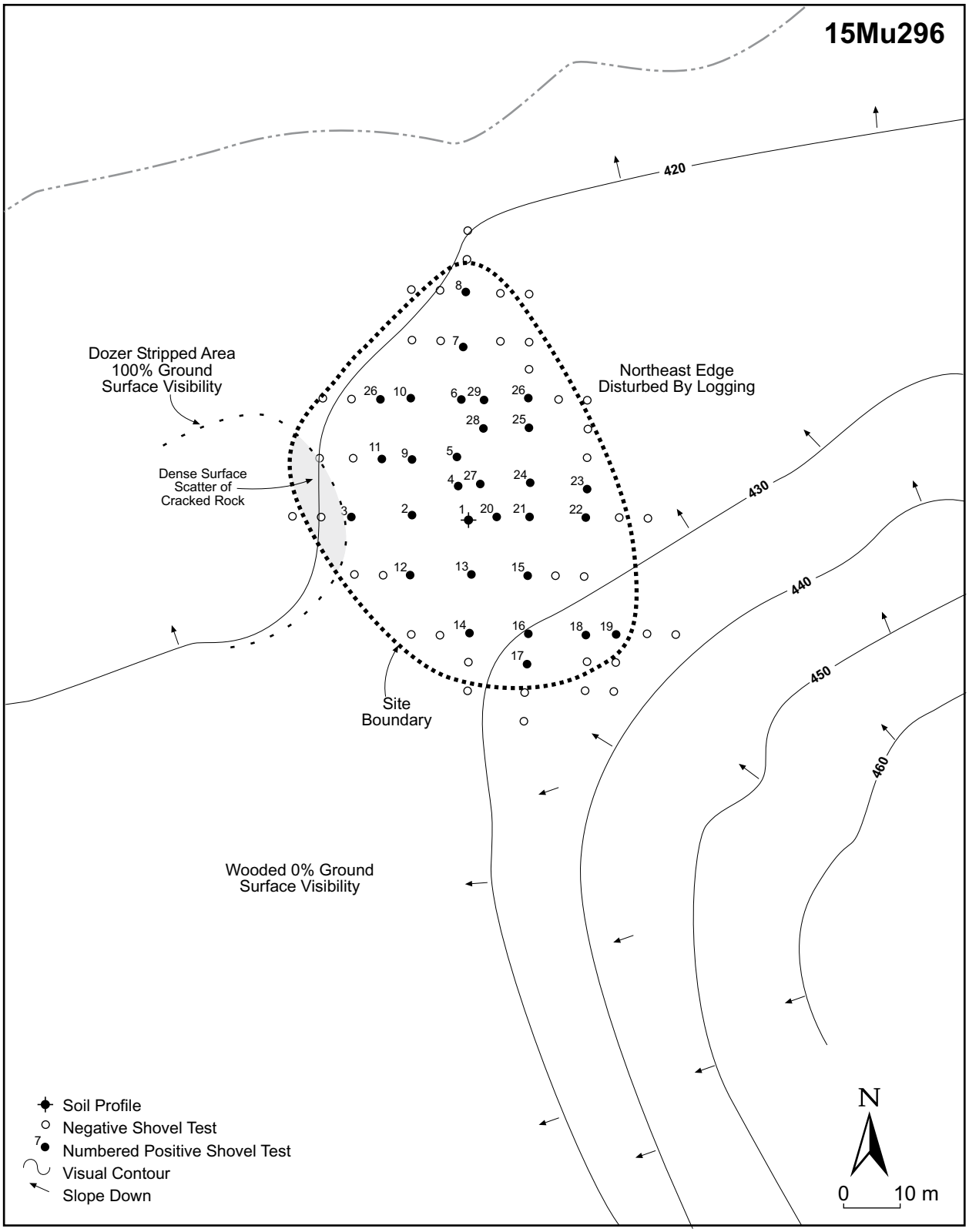

Figure 7-2. Phase I site map of 15Mu296.

Additional documentation of the site included the mapping of soil stratigraphy in a shovel test which was excavated in the estimated center of the site area. The soil profile observed in this test exhibited two distinct soil strata with no discernable plow zone. The upper strata consisted of a layer of dark brown (10YR 3/3) silt loam that extended from the surface to a depth of 27 cm below surface (bs). This soil was underlain by a yellowish brown (10YR 5/4) loessy silt loam subsoil that extended to the base of the shovel test (40 cm bs).

A possible prehistoric feature was observed in one of the shovel tests (Shovel Test 1) excavated at site 15Mu296 during this initial survey. The fill from this test consisted of very dark gray soil containing charcoal, flakes, and cracked rock (sandstone). This soil was also mottled with burned clay.

A total of 165 prehistoric artifacts was collected during the Phase I investigation of site 15Mu296. All of the material was collected from the shovel tests. Only a sample (49 percent) of the 112 cracked rocks recover from the shovel tests was collected, the remainder simply being counted before being discarded in the field. A large amount of cracked rock was observed on the disturbed surface along the western edge of the site; none of this material was collected.

Prehistoric artifacts in the Phase I assemblage include one unspecified biface fragment, 7 informal flake tools, 44 pieces of debitage, 112 pieces of cracked rock (sandstone), and one fragment of ochre. No temporally diagnostic artifacts were recovered at this time. The most common chert type in the Phase I chipped-stone assemblage is Wyandotte.

Based on the contents of the site collection, including a large amount of cracked rock and chipped-stone debris, it was concluded that the site was occupied for sufficient duration for the site occupants to have engaged cooking and or heating activities as well as intensive lithic reduction. Also, it was determined that the site likely contained intact cultural deposits, including pit features, a prospect made all the more likely given the fact that the site appears to have never been plowed. This conclusion was supported by the possible prehistoric feature identified in Shovel Test 1. Therefore, the prehistoric component at site 15Mu296 was determined to be potentially eligible for listing on the National Register and further archaeological investigations were recommended (Lence et al. 2011).

Results of Present Investigation

The Phase II investigation at site 15Mu296 included six hand-excavated test units (TU 1–6), shallow mechanical stripping of three trenches (MS 1–3), and mechanical excavation of two deep-testing trenches (Figure 7-3). A total of 87 m² of the site was excavated, or 2.4 percent of the total site area. Originally, the Phase II work plan called for a magnetometer scan of the site area to locate potential cultural anomalies. This survey technique was not used because vegetation at the site at the time of the investigation was so dense it could not be sufficiently removed without disturbing culturally bearing deposits (Figure 7-4). Although a systematic surface survey was not conducted during the Phase II investigations, three artifacts were identified and recovered from the surface; they are all informal flake tools (Appendix A, Table A-1).

Site Stratigraphy

The soil stratigraphy at site 15Mu296 was documented in the six test units and the two deep-testing trenches. A total of nine distinct soil zones were defined in these excavations, with variation being present between the two deep-testing trenches and one of the test units (TU 4). Soils included a surficial A horizon, an AE horizon, an E horizon, a Bt horizon, a BTE horizon, a BW horizon, and a B horizon. In addition, a gleyed (wetland) soil was uncovered during in TU 4, a unit located off the main landform in a low, flat region at the northern end of the site.

An A horizon, of varying thickness, was present in all excavations conducted at site 15Mu296. It was present as a dark yellowish brown (10YR 3/4) silt loam which ranged in thickness across the site from 10 cm bs (in TU 4) to 48 cm bs (in Deep Trench 3).

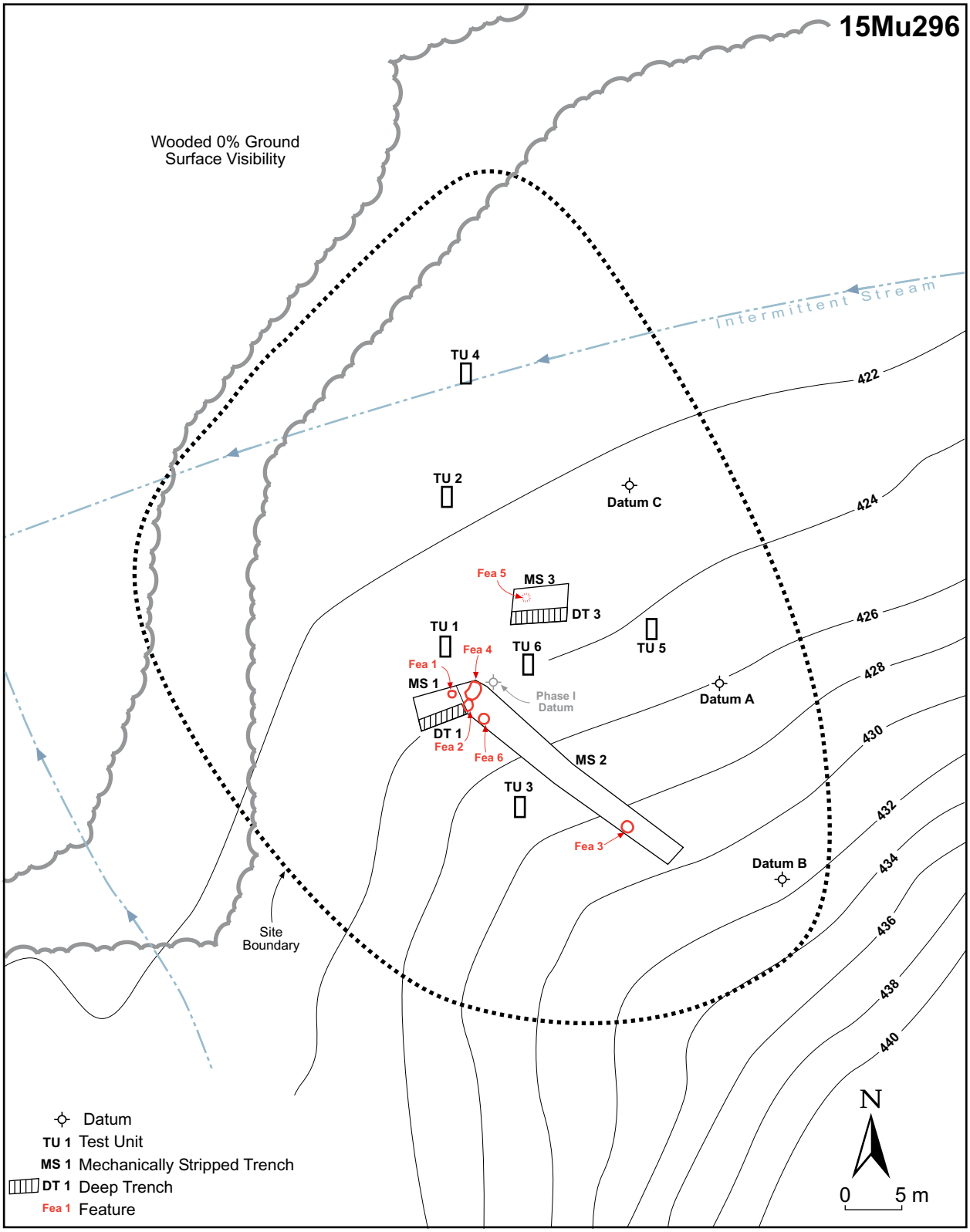

Figure 7-3. Phase II site map of 15Mu296, illustrating the location of test unit excavations, mechanically stripped trenches, deep-testing trenches, and features.

Figure 7-4. Site overview before Phase II excavations, site 15Mu296.

Cultural material was primarily found in this upper zone, with some material being found in the upper part of the lower E horizon in machine Deep Trench 3.

A detailed description of the lower, mainly non-cultural, soils at the site are described in the specific discussion of each excavation below.

Test Unit Excavation

Six 1-x-2-m test units were excavated during the Phase II testing of site 15Mu296 (Figure 7-3). The purpose of test unit excavations was to sample the nature and distribution of cultural material within the site limits and to determine the presence or absence of subsurface cultural deposits, including features. These excavations were placed either close to highly productive shovel tests from the Phase I survey or in locations of heavy surface material. Artifacts recovered by test unit and provenience along with chert type are presented in Appendix A, Tables A-2–A-14.

Test Unit 1

Test Unit 1 was placed just to the west of Shovel Test 4 from the Phase I investigation, in the center of the site on the site's slope (Figure 7-3). This shovel test produced the highest concentration of artifacts during the Phase I testing (N=959). Cultural material in this excavation was found to extend from the ground surface to a depth of 93 cm bs. Below this, cultural material was only recovered from the large tree burn which appeared at roughly 24 cm bs in the southern half of the unit and 40 cm bs in the northern half.

Two distinct soil strata, and the tree burn area, were defined during the excavation of TU 1 (Figures 7-5 and 7-6). The upper strata in TU 1 was a dark yellowish brown (10YR 3/4) silt loam A horizon extending to a depth of between 24 and 40 cm bs. The base of this stratum exhibited a diffuse boundary. The northern half of the unit was marked by the appearance of a dark yellowish brown (10YR 4/4) silt loam subsoil which contained no cultural material.

The southern half of the unit exhibited a dark brown (10YR 3/3) stain that was mixed with dark yellowish brown (10YR 4/4) patches as well as moderate amounts of charcoal and burned soil. This stain first appeared at 24 cm bs, a depth that was well within the A horizon. As the fill of this stain was followed down, it became increasingly mixed with a brownish yellow (10YR 6/6) silt loam subsoil. This soil was followed to 93 cm bs before excavation was terminated (Figure 7-5). Three lines

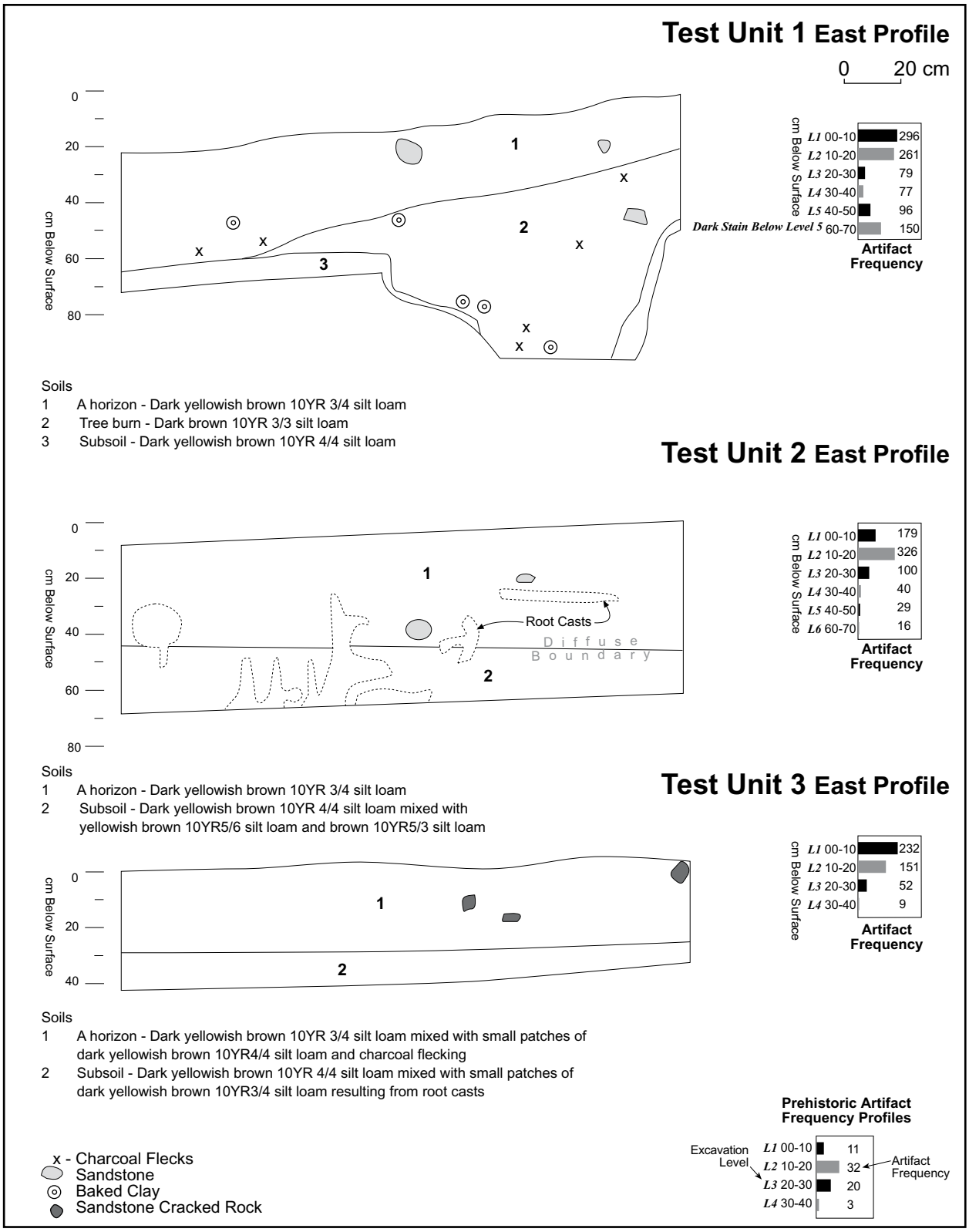

Figure 7-5. Test Units 1–3, east wall profiles, site 15Mu296.

Figure 7-6. Test Unit 1, east wall profile, site 15Mu296.

of evidence were considered in concluding that this stain was caused by a tree burn: its irregular shape in plan and profile; the recovery of the recent looking charcoal in the fill; and the presence of a "root halo" around the lower extensions of the anomaly.

Test Unit 1 had the second highest concentration of cultural material (819.7 artifacts/m^3) (Table 7-1). For most of the other units, the majority of artifacts were recovered from the upper 20 cm of soil (Figure 7-5).

Test Unit 2

Test Unit 2 was located in the northern half of the site area near Shovel Test 6 from the Phase I investigation which produced 16 artifacts (Figure 7-3). Excavation in TU 2 extended to a depth of 70 cm bs. Two distinct soil strata, separated by diffuse boundary, were defined during the excavation of TU 2 (Figures 7-5 and 7-7). The upper strata was a dark yellowish brown (10YR 3/4) silt loam A horizon, extending to a depth of between 44 and 46 cm bs. Severe root disturbance occurred throughout the unit which made it very hard to determine the base of the A horizon. The subsoil below this zone consisted of a dark yellowish brown (10YR 4/4) silt loam which was mixed with both a yellowish brown (10YR 5/6) and a brown (10YR 5/3) silt loam.

Cultural material (N=690) was most prevalent in the upper two levels of TU 2 within the A Horizon, with Level 2 having the highest concentration. Below Level 2, cultural material counts dropped off, and material that was found in the subsoil was present due to the numerous tree root casts (Figure 7-5).

Test Unit 3

Test Unit 3 was situated in the southern half of the site area, a location which produced a pestle on the surface during the Phase I investigation (Figure 7-3). Excavation in TU 3 extended to a depth of 40 cm bs before cultural material dropped off. Similar to TU 2, two distinct soil strata, separated by diffuse boundary, were defined in this test unit (Figure 7-5 and 7-8). The upper strata was a dark yellowish brown (10YR 3/4)

Table 7-1. Artifact Density Data by Test Unit, Site 15Mu296.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Total Surface Area (m^2)	2	2	2	2	2	2
Volume Excavated (m^3)	1.17	1.2	0.8	0.7	0.8	1.0
Artifacts Recovered (Ct)	959	690	444	88	496	856
Artifact Density (art/m^3)	819.7	575.0	555.0	125.7	620.0	856.0

Figure 7-7. Test Unit 2, east wall profile, site 15Mu296.

Figure 7-8. Test Unit 3, east wall profile, site 15Mu296.

silt loam A horizon which was mixed with small patches of dark yellowish brown (10YR 4/4) and charcoal flecking. This horizon extended to a depth of circa 30 cm bs and exhibited a diffuse boundary. The soil below this zone consisted of a dark yellowish brown (10YR 4/4) silt loam which was mixed with small patches of dark yellowish brown (10YR 3/4) resulting from root casts.

This unit contained a fairly average concentration of artifacts (N=444) for the site (555 artifacts/m^3) (Table 7-1). This material was recovered mainly within Level 1 and Level 2 of the A horizon with material amounts falling off quickly once the subsoil was reached (Figure 7-5).

Test Unit 4

Test Unit 4 was situated at the northern end of the site near Shovel Test 7 from the Phase I investigation which contained nine artifacts (Figure 7-3). This location was off the main slope at the start of the floodplain of Spurlins Creek. Excavation in TU 4 extended to a depth of 40 cm bs. The soils in this excavation different from the other, higher-elevated units at the site in that three distinct soil zones were defined (Figures 7-9 and 7-10). The upper zone was a dark yellowish brown (10YR 3/4) silt loam A horizon similar to the other profiles of the site, but this zone only extended to 10 cm bs. Below this zone was a dark yellowish brown (10YR 4/4) silt loam subsoil which was mixed with a very dark grayish brown (10YR 3/2) soil with mineral concretions. The base of this subsoil was 30 cm bs. The strata below this consisted of a light yellowish brown (10YR 6/4) silt loam which was mixed with patches of very dark grayish brown (10YR 3/2) soil along with a high concentration of mineral concretions. This strata was interpreted as representing a gleyed (i.e. wetland) soil. Given the lack of cultural material at this level and the fact that significant prehistoric occupations are not generally found in wetland areas, excavation in this unit was stopped once this soil was encountered.

Test Unit 4 had the lowest (N=88) concentration of cultural material of any unit at the site (125.7 artifacts/m^3) (Table 7-1). Within this unit, the highest number of artifacts was recovered from Level 3 (20–30 cm bs) suggesting that the upper soils represent recent deposits either from the creek or from erosion off the adjacent slope (Figure 7-9).

Test Unit 5

Test Unit 5 was positioned in the eastern portion of the site near Shovel Test 23 from the Phase I investigation which contained 7 artifacts (Figure 7-3). This unit extended to a depth of 40 cm bs before excavation stopped. Similar to Test Units 2 and 3, two distinct soil strata, separated by diffuse boundary, were defined (Figures 7-9 and 7-11). The upper strata was a dark yellowish brown (10YR 3/4) silt loam A horizon which was mixed with charcoal and oxidized soil flecking. This horizon extended to a depth of 32 cm bs and exhibited a diffuse boundary. The soil below this zone consisted of a dark yellowish brown (10YR 4/4) silt loam.

A fairly high concentration of cultural material (N=496) (620 artifacts/m^3) was collected during the excavation of TU 5 (Table 7-1). Similar to most of the other units, these artifacts occurred in Levels 1–3 within the A horizon (Figure 7-9).

Test Unit 6

The final hand-excavated test unit (TU 6) was situated between TU 1 and TU 5; a location adjacent to Shovel Test 20 from the Phase I investigation which contained eight artifacts (Figure 7-3). Excavation in TU 6 extended to a depth of 50 cm bs. Similar to Test Units 2, 3, and 5, two distinct soil strata were defined (Figures 7-9 and 7-12). The upper strata was a dark yellowish brown (10YR 3/4) silt loam A horizon which was mixed with charcoal and oxidized soil flecking. This horizon extended to a depth of 38-46 cm bs and exhibited a diffuse and uneven boundary. The subsoil below this zone consisted of a dark yellowish brown (10YR 4/4) silt loam.

This unit contained the highest concentration of material (N=856) of any excavation at site (856 artifacts/m^3); this material also occurred primarily in the upper three levels of the A horizon (Figure 7-9).

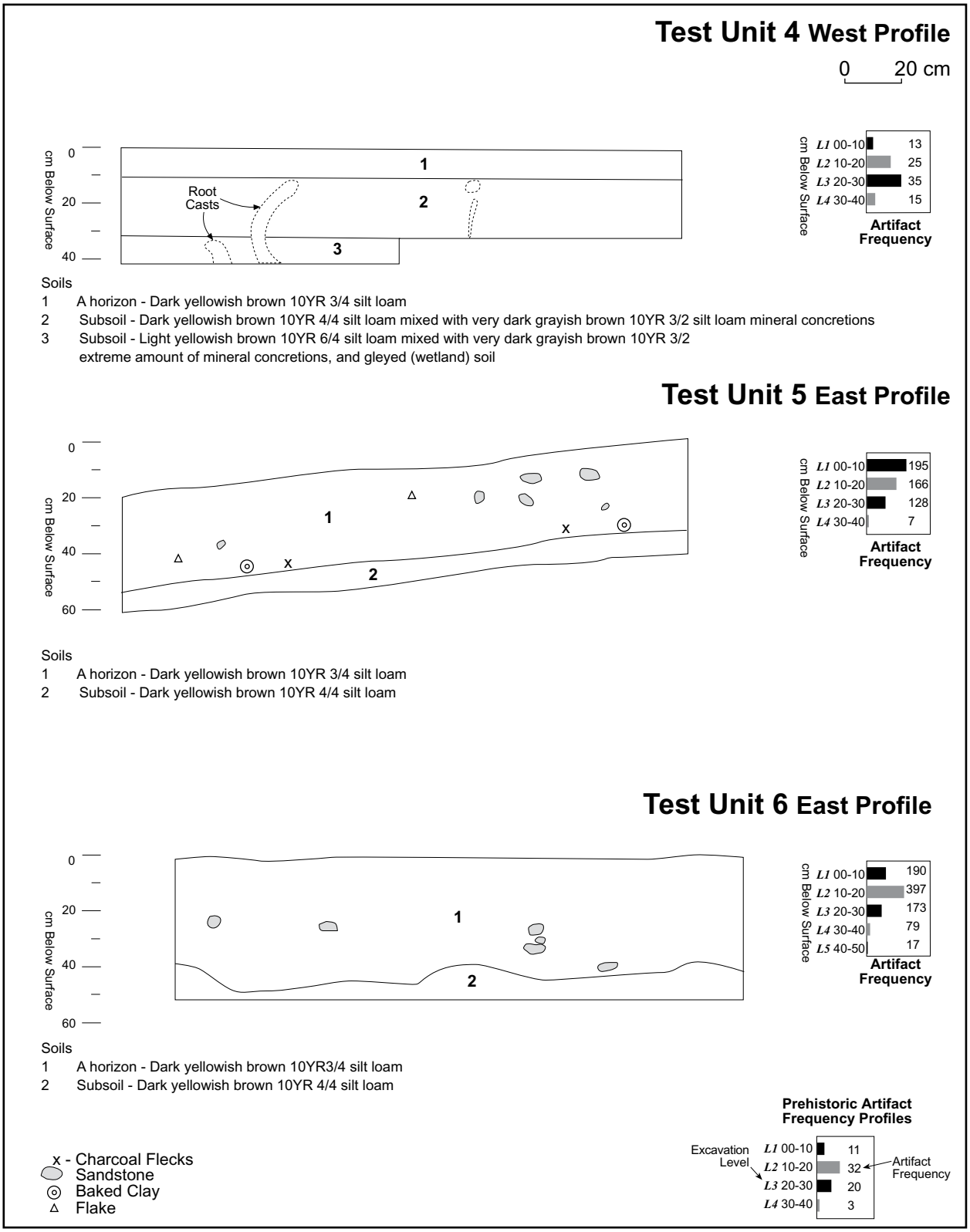

Figure 7-9. Test Units 4–6, wall profiles, site 15Mu296.

Figure 7-10. Test Unit 4, west wall profile, site 15Mu296.

Figure 7-11. Test Unit 5, east wall profile, site 15Mu296.

Figure 7-12. Test Unit 6, east wall profile, site 15Mu296.

Feature Excavation

A total of six cultural features—five pits and one rock cluster—were identified near the base or just below the A horizon during the Phase II investigation of site 15Mu296. All of these features were uncovered during mechanical stripping. Four of the features were found in a cluster near the center of the site at the conjunction of MS 1 and 2. The remaining features were isolates, one (Feature 5) was discovered in the northwestern portion of MS 3, and the other was uncovered during the shallow stripping at the southeast end of MS 2 (Figure 7-3).

Once a dark stain was noted during excavation, it was given an initial assessment by the supervising archaeologist as to origin (e.g. cultural or natural) based on regularity of shape, fill characteristics, and the presence or absence of cultural material.

Of the six features defined, three were fully excavated (Features 1–3) while the remaining three (Features 4–6) were mapped and photographed in plan view but not bisected. For these latter features the maximum thickness of feature fill was determined by using an Oakfield soil core. These features were not excavated because it was determine that sufficient evidence had been gained to recommend a Phase III investigation of the site, and it was decided that these features would be excavated during this later investigation. Therefore, once these features were documented and the location had been shot in with the total station, each was covered with plastic and then soil. A detailed description of each feature and its excavation is given below. Data from these features, such as recorded depths, the base of the features, provenience, morphology, dimensions, functions, and artifact table references are summarized and presented in Table 7-2. For those features that were not completely excavated, the data for this table has not been gathered.

As part of the analysis, the volume of each excavated pit was calculated (Table 7-3). Given that the excavated features from site 15Mu296 were all circular basins, the following formula was used to figure the volume (V): $V = 0.16\pi h\ (3ab+h2)$ (where a = maximum length of surface radius, b = maximum width of surface radius, and h = height [depth] [from Fortier et al. 1989:78]).

Once the volumes were calculated, the results are stated in decimeters cubed (dm^3) to allow comparison with previously analyzed features. Using the feature volume estimates and material counts, artifact density (artifacts/dm^3) in the fill was calculated for each feature. The results of this analysis are given in Table 7-3. All artifacts recovered from features are presented in Appendix A, Tables A-18–A-21.

Table 7-2. Feature Summary Data, Site 15Mu296.

Feature	Recorded Depth (cm bs)	Base of Feature (cm bs)	Provenience	Plan Form	Bottom Shape	Length (cm)	Width (cm)	Diam. (cm)	Function	Morphological Class
1	30	41	Trench MS 1	Circular	Basin	66	60	~	Unknown	Shallow basin
2	30	62	Trench MS 2	Circular	Irregular	104	86	~	Hearth	Deep pit
3	30	89	Trench MS 2	Circular	Pit	~	~	98	Deep earth oven	Deep basin
4	35	86*	Trench MS 2	Unknown	Unknown	160	110	~	Unknown	Unknown
5	40	N/A	Trench MS 3	N/A	N/A	45	35	~	Unknown	Unknown
6	20	55*	Trench MS 2	Circular	Unknown	~	~	92	Unknown	Unknown

*Estimated feature depth

Table 7-3. Artifact Density Data by Feature, Site 15Mu296.

	Feature 1	Feature 2	Feature 3	Feature 4	Feature 6
Volume (dm^3)	17.5	93.8	316.7	405.9*	133.2*
Number of Artifacts Recovered	35	283	163	NA	NA
Artiffact Density (art/dm^3)	2.00	3.02	0.51	NA	NA

* Estimated Volume

Feature 1

Feature 1 was defined at the base of the A horizon in the shallow portion of Trench 1 at 30 cm bs. When defined in plan view, this pit feature appeared as a relatively circular stain of brown (10YR 4/3) silt loam which measured 66 cm in length and 60 cm in width (Figures 7-13 and 7-14). The feature fill was mixed with charcoal and baked clay flecking. This feature contrasted in color with the surrounding yellowish brown (10YR 5/4) subsoil. Once defined and mapped in plan, Feature 1 was bisected on a north/south axis with the east half initially excavated. In profile, this feature exhibited a basin shape, 11 cm in depth, with in-sloping walls. Feature 1 had the smallest volume (17.5 dm^3) of the excavated features with a medium density of cultural material (N=35; 2.0 artifacts/dm^3) (Table7-3). Artifacts recovered from the fill included chipped stone, cracked rock, baked clay, ochre, and charcoal (including nutshell). All the lithic artifacts from Feature 1 were produced from Wyandotte chert, including an informal flake tool, biface-2 flakes, broken flakes, angular fragments, and thermal shatter. The cracked rock from the fill of Feature 1 consisted entirely of sandstone.

Botanical samples from Feature 1 contained both wood and nutshell, with the latter type predominating. The single identifiable wood specimen is of Elm, while all the nutshell is of Hickory (Tables 6-1 and 6-2).

Because of the lack of diagnostic morphological characteristics (e.g. a bell-shaped profile or the presence of a lens of oxidized soil), a function could not be determined for this pit; however, its location suggests that it may have been functionally associated with the nearby Feature 2.

Feature 2

Feature 2 was defined at the northwestern end of MS 2 at a depth of 30 cm bs (Figure 7-3). This location placed it in close association with Features 1, 4, and 6. When uncovered, this pit appeared as a brown to dark yellowish brown (10YR 4/3–3/4) oval stain measuring 104 cm long by 86 cm wide which contrasted in color with the surrounding yellowish brown (10YR 5/4) subsoil (Figures 7-13 and 7-15).

Following documentation of its surface, Feature 2 was bisected on a north/south axis and the east half was excavated first. In profile, the feature exhibited an irregular basin shape, with a maximum depth of 32 cm and two distinct interior fill zones. Zone 1 was located in the southern portion of the basin and consisted of a brown (10YR 4/3) silt loam mixed with baked clay and charcoal. Zone 2 was located in the northern portion of the feature and consisted of a dark yellowish brown (10YR 3/4) silt loam which was mottled with heavier concentrations of charcoal and baked clay. Zone 2 had a concentration of cracked sandstone that was observed, in some portions of the basin, to line the base of the feature.

Feature 2 had the second smallest volume (93.8 dm^3) of the excavated features but had the highest concentration of cultural material (N=283; 3.02 artifacts/dm^3) (Table 7-3). This high concentration of material was primarily the result of the large amount of cracked rock recovered from the fill. Artifact types recovered from the fill included chipped stone, cracked rock, and ochre. Chipped-stone artifacts were produced from Haney, Mill Creek, and Wyandotte chert. Artifacts in this category included informal flake tools (N=17), primary decortication flakes, tertiary flakes, biface-1 flakes, biface-2 flakes, broken flakes, and thermal shatter.

Similar to Feature 1, charcoal samples from this feature contained both wood and nutshell, with the latter type predominating. Identifiable wood species included Hickory, American Chestnut, Ash, Honey Locust, Oak, and Elm. Hickory nutshell predominated, with only a single acorn fragment noted. Other botanical remains of interest included a stem fragment from giant cane and a small fragment of an ovoid fruit or terrestrial tuber (Tables 6-1 and 6-2).

Based on the relatively shallow nature of this feature and the occurrence of cracked rock, including a concentration that was lining the feature base, Feature 2 is interpreted as representing a hearth.

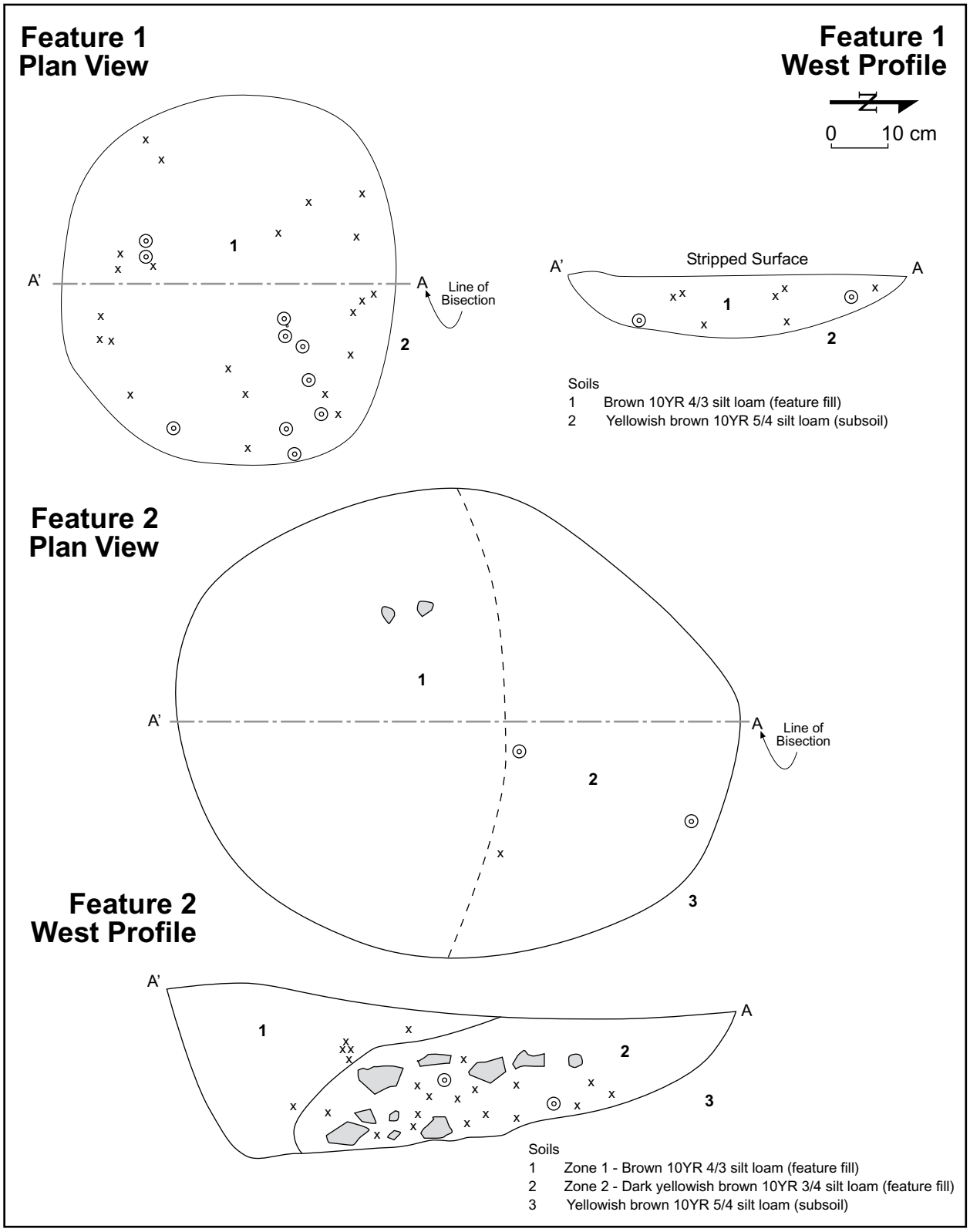

Figure 7-13. Features 1 and 2, profiles and plan views, site 15Mu296.

Figure 7-14. Feature 1, west profile, site 15Mu296.

Figure 7-15. Feature 2, west profile, site 15Mu296.

Feature 3

Feature 3 was defined at a depth of 30 cm bs at the base of the A horizon in MS 2, approximately 15 m southeast of the Features 1, 2, 4, and 6 (Figure 7-3). When uncovered, Feature 3 appeared as a circular stain of dark brown (10YR 3/3) silt loam measuring 98 cm in diameter with only a sparse amount of cultural material visible on the surface (Figures 7-16 and 7-17). This material included cracked sandstone, oxidized soil flecking, charcoal flecking, and baked clay.

Following documentation of its surface, Feature 3 was bisected on a north/south axis, with the east half being initially excavated. In profile, the feature was a fairly regularly shaped deep basin, with a maximum depth of 59 cm, and two distinct interior fill zones. Zone 1, extended from the feature surface to a depth of approximately 43 cm. This zone was a dark brown (10YR 3/3) silt loam mottled with light amounts of sandstone cracked rock, baked clay, and charcoal. Below this was Zone 2, which extended to the base of the feature at 59 cm bs. This zone appeared as a grayish brown (10YR 5/2) silt loam which was mixed with patches of dark brown (10YR 3/3) silt loam and yellowish brown (10YR 5/6) silt loam matrix. The grayish brown soil exhibited a very fine granular texture and was interpreted as being deposits of ash. The soil surrounding the feature was a yellowish brown (10YR 5/6) silt loam.

Because of its size in plan view and substantial depth, Feature 3 had the greatest volume (316.7 dm^3) of any of the excavated features, although it had the lowest concentration of cultural artifacts (N=163; 0.51 artifacts/dm^3) (Table 7-3).

Artifacts from four functional categories were recovered from the fill of Feature 3, including hunting and general utility tools, stone tool production and maintenance debris, hunting and cooking debris, and other items. Hunting and general utility tools include a fragment of a diagnostic projectile point/hafted knife base as well as six informal flake tools. The diagnostic point was a base fragment from a Late Archaic Matanzas side notched point, which have been dated from 3700 to 3000 BC (Justice 1987). Stone tool production and maintenance debris consisted of a variety of chipped-stone debitage including primary decortication flakes, secondary decortication flakes, tertiary flakes, biface-1 flakes, biface-2 flakes, broken flakes, and thermal shatter. The heating and cooking debris consisted of sandstone cracked rock along with baked clay fragments, while the other items consisted of fragments of ocher and limonite. All of the chipped-stone artifacts from Feature 3 were produced from Wyandotte chert.

Figure 7-16. Feature 3, west profile, site 15Mu296.

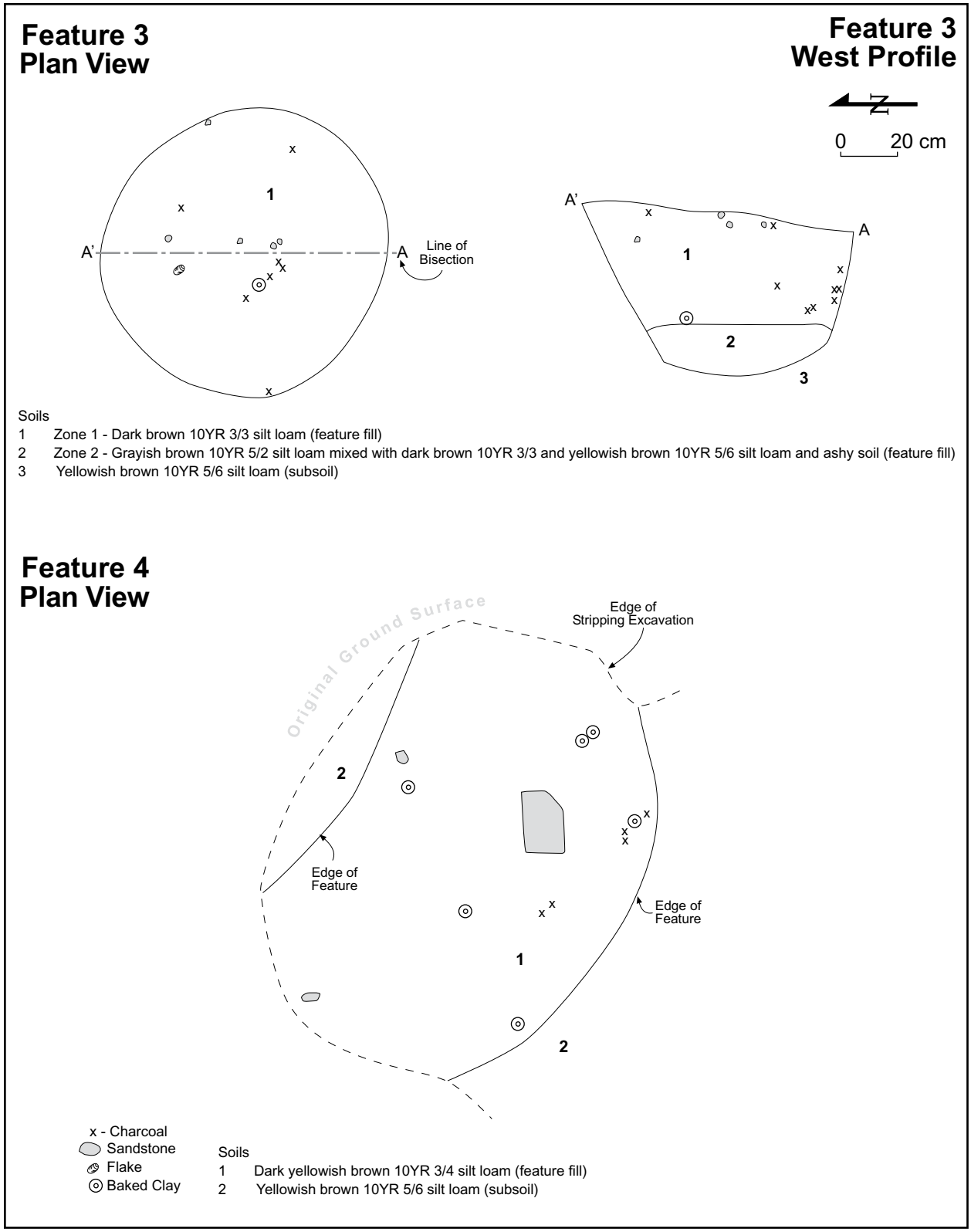

Figure 7-17. Features 3 and 4, profiles and plan views, site 15Mu296.

Similar to the above described features, charcoal samples from Feature 3 contained both wood and nutshell, with the latter type of charcoal predominating. Identifiable wood species from the sample was limited to Hickory and Oak. By far the most common nutshell was from Hickory with only two fragments of acorn present (Tables 6-1 and 6-2).

The large amount of charcoal in Feature 3, mainly from nutshell, allowed for a standard radiocarbon date to be run (Beta-303794). The nutshell returned a conventional date of 4950+/-60 BP (calibrated, 2-Sigma range of 3940 to 3850 B.C. and 3820 to 3640 B.C.) (see Appendix B). This date falls within the Late Archaic period in western Kentucky and fits well with the Matanzas point recovered from the fill.

Given the relatively large diameter and depth of this pit, along with the occurrence of ash deposits at its base, Feature 3 most likely functioned as a deep earth oven.

Feature 4

Feature 4 was defined at 35 cm bs in the northwestern edge of MS 2. Its location is in close association with Features 1, 2, and 6 (Figure 7-3). While attempting to define this feature in plan, it was found to extend into the east and west walls of the trench; therefore, it was not fully defined. The portion of the feature that was uncovered consisted of a large area measuring a minimum of 160 cm in length and 111 cm in width. The feature fill as an appeared on the surface consisted of a dark yellowish brown (10YR 3/4) silt loam that was mixed with a light amount of burnt soil, charcoal, and cracked sandstone. One large fragment of cracked sandstone was mapped in the southeast corner of the fill (Figures 7-17 and 7-18). Once the feature was mapped and photographed in plan, an Oakfield soil core was used to determine that the feature fill extended to a depth of 51 cm. Utilizing the surface and depth measurements, an estimated volume of 405.9 dm^3 was calculated for this feature (Table 7-3).

It is possible, because of its great size, that Feature 4 represents multiple overlapping pit features. Further investigation will need to be done to determine if that is the case. No artifacts were collected from this feature and no further excavation was conducted. No function could be determined for this feature.

Feature 5

Feature 5 was a fairly circular concentration of cracked rock (sandstone) which was defined at approximately 40 cm bs during the removal of the A horizon in MS 3 (Figure 7-3). This material, which consisted of 12 pieces of sandstone, was contained within an area about 45 cm long by 35

Figure 7-18. Feature 4, plan view, site 15Mu296.

cm wide (Figures 7-19 and 7-20). No distinct soil discoloration or mottling was present in association with these rocks to indicate the presence of a prepared pit. Consequently, a soil flotation sample was not taken from Feature 5 nor was a core taken. The soil in and around these rocks was a dark yellowish brown (10YR 3/4) silt loam similar to the surrounding A horizon. Once this feature was mapped and photographed, no additional investigation was conducted.

Feature 6

Feature 6 was identified in MS 2 within the lower portion of the A horizon at 20 cm bs. Its location is just south of Features 1, 2, and 4 (Figure 7-3). In plan view, this feature consisted of a circular patch of dark yellowish brown (10YR 3/4) silt loam having a maximum diameter of 92 cm. This soil was mixed with relatively high concentrations of charcoal and burnt soil (Figures 7-20 and 7-21). Six fragments of cracked sandstone were also present on the surface. Once the feature in plan was mapped and photographed, an Oakfield soil core was used to determine that the feature fill had a maximum thickness of 35 cm. Taking into consideration its surface measurements and its maximum thickness, a volume of 133.2 dm^3 was estimated for this feature (Table 7-3). No artifacts were collected from Feature 6 and no determination as to its function was possible.

Mechanical Stipping

Three mechanically stripped trenches (MS 1–3) were excavated during the Phase II investigation 15Mu296 and comprised 63 m^2 of the excavated site (Figure 7-3). The purpose of the shallowly excavated portions of the three mechanical trenches was to search for cultural features expected to be present at the base of the A horizon. However, portions of two of these trenches (MS 1 and 3) were deeply excavated to a depth of 2 m in order to determine the presence of culturally bearing paleosols (see Deep-Testing Trenches below). Artifacts recovered from Trench MS 2 are presented in Appendix A, A-15 and A-16.

Mechanically Stripped Trench 1

Mechanically stripped trench 1 was excavated directly south of TU 1 on a relatively flat surface near the center of the site. This trench was 5 m long and 3 m wide and contained Feature 1 near its northeast corner. No artifacts were recovered from MS 1.

Mechanically Stripped Trench 2

Mechanically stripped trench 2 began near the east edge of MS 1, at the center of the site and extended upslope to the southeast (Figure 7-3). This trench measured 24 m long by 2 m wide and was excavated

Figure 7-19. Feature 5, plan view, site 15Mu296.

Figure 7-20. Features 5 and 6, plan views, site 15Mu296.

Figure 7-21. Feature 6, plan view, site 15Mu296.

to the base of the A horizon at approximately 30 cm bs.

The excavation of these two trenches (MS 1 and 2) resulted in the identification of four pit features (see feature description above). Three of these features (Features 2, 4, and 6) were clustered at the western corner of the stripped area, and the other one (Feature 3) was located 15 m to the southeast (Figure 7-3). All these features were uncovered at the base of the A horizon. A total of 15 artifacts was also recovered from MS 2. Three diagnostic projectile point/hafted knife fragments were recovered from MS 2, including a Late Archaic Pickwick point, a Late Archaic to Early Woodland Saratoga Parallel Stemmed point, and an Early Woodland Kramer point.

Mechanically Stripped Trench 3

Mechanically stripped trench 3 was excavated north of TU 6 at the beginning of the slope which extends to the north. This trench was 5 m long and 2 m wide and contained Feature 5 in its northwestern portion.

Deep-Testing Trenches

The two deep trenches (Deep Trench 1 and 3) were excavated as expanded and deeper portions of mechanically stripped trenches 1 and 3. Deep-testing trenches 1 and 3 both measured 5 m long by 1 m wide and were placed along the southern edge of mechanically stripped trenches 1 and 3, respectively (Figure 7-3). In these two deep-testing trenches, the backhoe excavated soils down to a depth of 2 m as geomorphological investigations in order to determine the presence of culturally bearing paleosols.

Deep-Testing Trench 1

Deep-Testing Trench 1 measured 5 m long by 1 m wide and was located on the southern edge of MS 1. This trench was excavated to a depth of 2 m bs as a geomorphological investigation (Figure 7-3). Five distinct soil horizons were noted in this trench (Figures 7-22 and 7-23). The A horizon in this profile consisted of a dark yellowish brown (10YR 3/4) silt loam that extended to 20 cm bs. At the base of this zone was a light yellowish brown (10YR 6/4) silt loam extending to 50 cm bs. Below this strata, was a light yellowish brown (10YR 6/4) silty clay loam (BtE horizon) that was mixed with yellowish brown (10YR 5/6) patches along with

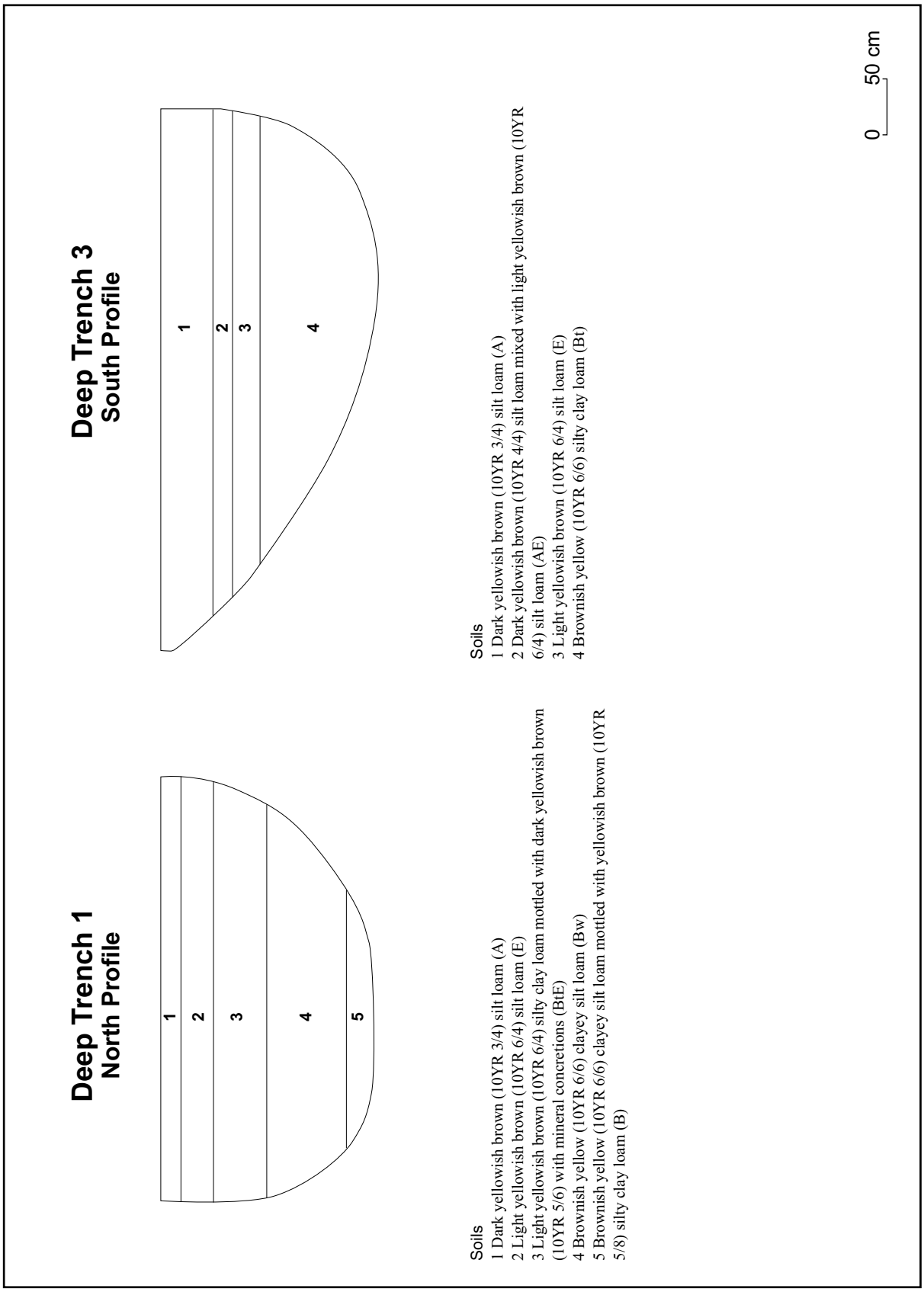

Figure 7-22. Deep-Testing Trenches 1 and 3, profiles, site 15Mu296.

Figure 7-23. Deep-Testing Trench 1, north profile, site 15Mu296.

heavy amounts of mineral concretions; this zone extended to 100 cm bs. Below the base of the BtE horizon was a Bw horizon which extends to 175 cm bs. This horizon was a brownish yellow (10YR 6/6) clayey silt loam. The deepest exposed soil in Trench 1—extending to the base of the excavation at 200 cm bs—was a brownish yellow (10YR 6/6) clayey silt loam B horizon exhibiting yellowish brown (10YR 5/8) mottling. Except for the surficial A horizon, none of the soils in the Deep-Testing Trench 1 profile contained cultural material or were determined to potentially contain cultural material.

Deep-Testing Trench 3

Deep-Testing Trench 3 measured 5 m long by 1 m wide and was located along the southern edge of MS 3 (Figure 7-3). This trench was excavated to a depth of 2 m bs as a geomorphological investigation. Four distinct soil horizons were defined, with cultural material being evident in the upper three zones (Figures 7-22 and 7-24). The lower zone was determined not to be cultural bearing. The uppermost soil is a dark yellowish brown (10YR 3/4) silt loam A horizon which extended to 47.5 cm bs. Below this zone was a dark yellowish brown (10YR 4/4) silt loam AE horizon mixed with patches of light yellowish brown (10YR 6/4) soil. This stratum extended to 65 cm bs. From the base of this zone to 90 cm bs was a light yellowish brown (10YR 6/4) silt loam E horizon. From 90 cm bs to the base of the excavation (200 cm bs) is a Bt horizon. This soil was a brownish yellow (10YR 6/6) silty clay loam. A total of eight artifacts was discovered in Deep-Testing Trench 3 (Appendix A, Tables A-15 and A-17).

Site Mapping

Once the Phase II testing was complete, all excavations and all surface material was mapped using a GTS-313 Electronic Total Station. During this activity, three permanent datums were created along the eastern edge of the site limits. These datums are to be used both to relocate Phase II excavations and to guide additional investigations if needed.

Site Summary

Data recovered at site 15Mu296 during the Phase II investigation were used to address the following topics.

Figure 7-24. Deep-Testing Trench 3, south profile, site 15Mu296.

Horizontal and Vertical Extent of Cultural Deposits

The horizontal extent of the cultural deposits at site 15Mu296 was determined by systematic screened shovel testing conducted during the Phase I survey (Lence et al. 2011). Within the project area, the site covers 3,700 m^2 (0.91 acre). Both the Phase I shovel testing and the Phase II test unit excavation indicated that the artifact density is highest near the center of the site near Test Units 1 and 6 and the cluster of four features (Features 1,2, 4 and 6).

The vertical extent of the cultural deposits present at the site was determined through test unit excavation and deep mechanical trenching. While non-feature cultural material was recovered to a depth of approximately 90 cm bs within Deep-Testing Trench 3, test unit excavations indicate that a majority of the cultural material is located in the upper 20 cm of the A horizon.

Site Integrity

Only minimal recent disturbance of the surface cultural deposits was noted during the Phase II testing, with no plowing of the area being evident. In addition, the Phase II investigations revealed that pit features and rock clusters with undisturbed deposits are present that extend below these surficial deposits. Some disturbance of the surface was caused by recent logging activities in the area, including the creation of a bulldozed road that affected the western edge of the site limits.

Site Function

It is not evident whether the prehistoric occupants at site 15Mu296 used the area in a similar function throughout its occupation. The results of the current testing indicate that, at least during the Late Archaic period occupation, site 15Mu296 was an intensively occupied field camp with activities that focused on the processing of Hickory nuts. Other indicated activities include the processing of faunal resources and the maintenance of associated chipped-stone tools.

Cultural Affiliation

Site 15Mu296 contains occupations dating to the Early Archaic, Middle Archaic, and Late Archaic periods.

Stratigraphic Placement of Components

During the present investigation, artifacts diagnostic of Early Archaic to Late Archaic period occupations were recovered from the A horizon. This suggests that no stratigraphic differentiation is present between the components at site 15Mu296.

Presence of Subsurface Features

Six features were defined within or at the base of the A horizon during the Phase II testing of site 15Mu296. These features include three pits, two possible pits, and a rock cluster. It is highly likely that many additional features are present in the unexcavated portions of the site.

Chapter 8 - Evaluations and Recommendations

The Phase II investigations at site 15Mu296 resulted in the recovery of a relatively large amount of data pertaining to the Middle and Late Archaic periods in the Western Coal Fields of Kentucky. Using a combination of test unit excavation, deep trenching, and limited shallow trenching, the site was tested to determine NRHP eligibility.

Six 1-x-2-m test units and two 5-m-long by 2-m-deep testing trenches were excavated, along with limited shallow mechanical stripping, as part of the Phase II testing. These excavations represent 2.4 percent of the total site area. Additional stripping was not conducted because of concerns related to intact cultural deposits within the uncultivated surficial A horizon.

During these excavations, site 15Mu296 produced evidence suggesting that the site functioned as a Middle to Late Archaic field camp with an ephemeral Early Archaic component. Temporally diagnostic prehistoric artifacts from the Phase II testing consisted of eleven projectile points. No prehistoric pottery was recovered during the investigation. Projectile point types in the assemblage include Kirk Corner Notched, Matanzas Side Notched, Etley, Pickwick, Saratoga Parallel Stemmed, Kramer Stemmed, and McWhinney Heavy Stemmed.

The single Kirk Corner Notched point from the 15Mu296 collection is a blade fragment which exhibits a portion of one notch. It is made of Wyandotte chert. This artifact was recovered from Level 1 in Test Unit 6. Kirk Corner Notched points are associated with Early Archaic period components from across the Eastern United States and range in date from 7500 to 6900 B.C. (Justice 1987).

Four Matanzas Side Notched point fragments were recovered during the Phase II testing. Three of these points were recovered during test unit excavation, and the remaining one was recovered during the excavation of Feature 3. Three of these points are snapped at the neck, while the remaining fragment is whole except for a blade fracture. Matanzas points are common across much of central and southern Indiana and Illinois (Justice 1987). The production of these artifacts is indicated at other locations in the Midwest, such as the Koster site, where they are recovered from Late Archaic period deposits dating from 3700 to 3000 B.C. (Justice 1987).

One Etley point and one possible Etley point fragment are included in the Phase II collection at site 15Mu296. The point that is definitely an Etley point was recovered from Level 3 of Test Unit 5. The diagnostic portion of this artifact is whole. It is made of Wyandotte chert and exhibits cortex on the stem and a portion of the blade. The point stem is ground along most edges. A second fragment of a possible Etley point was recovered in Level 3 of Test Unit 6. This point exhibits a lateral break of the blade that extends from the notch. It is possible that this artifact is the fragment of a corner notched variant within the Etley cluster (Justice 1987). Etley points are primarily associated with Late Archaic components in western Illinois, southeastern Iowa, and eastern Missouri. In the lower Illinois River Valley, these points are associated with Titterington phase sites that date between 3000 and 1000 B.C. (Justice 1987).

One possible Pickwick point was recovered during excavation of Trench 2. This artifact, which is also made of Wyandotte chert, is very fragmentary and is missing portions of the base and the blade. Pickwick points are included in the Ledbetter cluster (Justice 1987). These projectile points are common throughout the Tennessee River Valley and range in distribution from southern Illinois and Indiana to northern Florida and southern Louisiana. Chronologically, Pickwick points are associated with Late Archaic period components which date from 2500 to 1000 B.C. (Justice 1987).

A single Saratoga Parallel Stemmed point was recovered from the A Horizon in Trench 2 while attempting to uncover the plan view of Feature 4. This point is almost whole except for its missing tip. The basal edge of the point stem is un-worked, representing either the original striking platform or a snapped base. The lateral edges of the stem exhibit grinding. Saratoga cluster projectile points are found at sites in southern Illinois and Indiana and throughout most of Kentucky and Tennessee. These artifacts are associated with components dating from the Late Archaic period to the Early Woodland period where they are found in deposits thought to date after 2000 B.C. (Justice 1987).

A single point fragment recovered during the excavation of Trench 2 is identified as an Early Woodland Kramer point. This point is a midsection exhibiting a portion of the blade and stem; it is made of Wyandotte chert. Justice (1987) places Kramer points in the Early Woodland stemmed cluster. These diagnostics are the predominant point style found at Late Archaic to Early Woodland sites in southern Illinois; these sites also produced Marion thick pottery (Justice 1987). The lack of any ceramics at site 15Mu296 suggest at this point may date to the Late Archaic period in this instance.

A single point fragment was identified as a McWhinney Heavy Stemmed point fragment. This point is only represented by a portion of the stem. It is made of Wyandotte chert and was recovered from Level 5 in Test Unit 1. McWhinney points are common diagnostics of Late Archaic period components in the Ohio River Valley where they date from about 4000 to 1000 B.C. (Justice 1987).

The large amount of the chipped-stone debitage (N=1,144) suggests that chipped-stone-tool production and maintenance were an important activity at site 15Mu296. The presence of many debitage types also suggests that all stages of stone-tool production occurred at the site. The relatively low ratio by count of primary (4.8 percent) and secondary (1.8 percent) decortication flakes, as well as tertiary flakes (10.7 percent), within the debitage category indicates that early stage production was not as common at the site as late stage production and resharpening. In addition, the relatively high percentage of biface-2 flakes (27.3 percent by count) indicates that a strong emphasis was placed on biface maintenance. The presence of thermal shatter (20.1 percent by count) indicates that the heating of raw material occurred either intentionally or accidentally.

The most common raw material type in the site chipped-stone assemblage was Wyandotte chert. Wyandotte chert comprises 85.6 percent of the chipped-stone assemblage by weight. By weight, it also makes up 87.5 percent of the hunting and general utility tools as well as all of the fabricating and processing tools. Geographically, Wyandotte outcrops northeast of the site in Harrison and Crawford counties, Indiana, and in Meade, Breckinridge, and Hardin counties, Kentucky.

Six features were identified near or just below the base of the A horizon, and three were completely excavated. Of the excavated features, one was determined to be a hearth, another was interpreted as a deep earth oven, and the function of the other could not be determined. Botanicals from these features consisted primarily of thick-shelled hickory (*Carya* sp.) suggesting that the harvesting and processing of this resource was a principal economic activity at site 15Mu296. A radiocarbon date taken from the deep earth oven (Feature 3) returned a conventional date of 4950+/-60 BP (calibrated, 2-Sigma range of 3940 to 3850 B.C. and 3820 to 3640 B.C.) This date placed the use of this feature at the end of the Middle Archaic; this matches the date of the Matanzas Side Notched point recovered from the Feature 3 fill.

Site 15Mu296 exhibited an intact A horizon on the surface that had not been plowed. During the present investigation, artifacts diagnostic of Early Archaic to Late Archaic period occupations were recovered from near the surface of the A horizon. This suggests that no stratigraphic differentiation is present between the components at site 15Mu296.

Prehistoric Context and Evaluation of site 15Mu296

Site 15Mu296 is located in the Western Coal Field segment of the Green River Management Area (Pollack 2008). The Western Coal Fields cultural landscape and the Green River watershed have been subjected to some of the most intensive archaeological research and study of any portion of the Commonwealth of Kentucky. The Green River Management Area is the largest study unit and has the highest number of recorded archaeological sites (N=5,834 in 2008). The Western Coal Field Section has been heavily investigated with more than 488 reports prepared and over 1,223 sites recorded; 66 of these sites have been tested or excavated, and more than 40 of them have been listed on the NRHP. The long history of archaeological research of the Green River shell mound sites has contributed significantly to the history of archaeology in America. Moreover, as of 2006, nearly a third of all recorded Archaic sites in Kentucky, and nearly one in five sites excavated or tested in Kentucky, were in the Green River Management Area (Pollack 2008:214).

A series of research topics have been put forth to serve as an organizational tool for studying archaeological sites in Kentucky (Pollack 1990, 2008). These topics include chronology and cultural history, material culture and technology, subsistence systems, settlement patterns, exchange systems, biological anthropology, mortuary practices, social organization, and ideology. Within each of these topic areas, an extensive, detailed, and specific listing of research questions has been identified for the Middle and Late Archaic subperiods (Jefferies 2008:292–301). Considering the cultural material recovered from site 15Mu296, the following discussion regarding these topics will focus on the Middle Archaic and Late Archaic periods. The Early Archaic period of occupation, identified by a single Kirk corner notched point, represents an ephemeral presence at the site sometime from 7500 to 6900 B.C. that holds very little research potential. For this reason, the following discussion will not include the Early Archaic

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Middle Archaic

Because of environmental shifts, the Middle Archaic was a time of major cultural change for the hunter gatherer groups living in the lower Ohio River Valley region (Jefferies 2009). By the Middle Archaic (ca. 7000 B.C. to 3000 B.C.), the environmental remnants of the Pleistocene were gone, with evidence of drier and warmer conditions, known as the Hypsithermal interval, peaking around 4500 B.C. By about 3000 B.C., conditions more similar to modern climates emerged.

During the first half of the Middle Archaic, groups were largely made up of small, highly mobile hunter gatherers. In organization and adaptation, these groups were similar to the previous Early Archaic inhabitants in the area (Jefferies 2009) with site distribution and size suggesting short-term occupation. The early Middle Archaic subperiod is relatively poorly known in Kentucky, particularly in the Midwest region due to a relative lack of investigated sites. This is at least partially due to difficulties in identifying and assigning diagnostic point types to this period. Some projectile points that have been associated with these occupations in Western Kentucky include Stanley Stemmed, Cypress Creek I and II, Eva I and II, and Morrow Mountain (Jefferies 2009).

Later, by approximately 5400 B.C., many western Kentucky Middle Archaic groups were adapting to the drier and warmer conditions of the Hypsithermal. These adaptations lead to decreased group mobility, a reorganization of settlement and subsistence strategies, use of formal mortuary areas, elaboration of interregional exchange networks, and increased importance of cultivated plants (Jefferies 2009). Sites increasingly seem to concentrate along waterways and lower areas over time. By the Late

Middle Archaic, after 4500 B.C., larger sites with features, deep middens, high tool type diversity, and burials indicate some locations were occupied on a long-term basis. Projectile points associated with these assemblages include the side notched types of Big Sandy II, Matanzas, and Salt River as well as Benton, White Springs, and Karnak varieties (Jefferies 2009). These later Middle Archaic artifact assemblages also included assortment of ground stone items such as grooved axes, pitted cobbles, pestles, grinding stones, abraders, pendants, and beads (Jefferies 2009:649). This increased abundance of informal pitted cobbles and grinding stones indicate more extensive exploitation of plant foods such as nuts and starchy seeds. Additionally, the faunal and floral remains associated with Middle Archaic components, along with the location of sites containing these components, suggest increased focus on riverine, wetlands, and floodplain resource zones. The presence of Matanzas projectile points and the radiocarbon date from Feature 3, a conventional date of 4950+/-60 BP (calibrated, 2-Sigma range of 3940 to 3850 B.C. and 3820 to 3640 B.C.) indicate that substantial occupations during this later Middle Archaic subperiod occurred at site 15Mu296.

Middle Archaic occupations comprise only 11.6 percent of all recorded Archaic period sites in Kentucky, and, in the Green River Management Unit, only 9 percent of the known sites are identified as Middle Archaic (Pollack 2008: 214). Most known components of this subperiod occur on sites mixed with other occupations. Although the Middle Archaic subperiod is known to have been a time of increasing regionalization and specialization—that lead to increased sedentism and longer site occupation intervals—additional research, especially on smaller upland occupations, is needed to address the full range of seasonal resource utilization.

Middle Archaic phases have been identified for other regions. In the North Carolina Piedmont region, Coe (1964) defines three phases: Stanley (before 5000 B.C.), Morrow Mountain (5000 B.C. to 4000 B.C.), and Guilford (4500 B.C. to 3200 B.C.). In Western Tennessee, Lewis and Lewis (1961) defined three similarly dated phases: Eva (ca. 5000 B.C.), Three Mile (4200 to 2000 B.C.), and Big Sandy (circa 2000 B.C.). Late Middle Archaic occupations in southern Illinois and southern Indiana contain a variety of side notched projectile point forms, including Faulkner, Godar, and Matanzas types (Fowler 1959, Jefferies and Lynch 1983).

Late Archaic

Late Archaic (3000–1000 B.C.) populations in western Kentucky were adapted to essentially modern environmental conditions and vegetation patterns which were found throughout the Ohio River Valley at this time (Jefferies 2009). This subperiod is relatively well known in Kentucky, and many sites from this time in the Green River Management Area have been extensively researched.

Late Archaic assemblages suggest a similar range of activities occurred that were present during the late Middle Archaic, but, in many cases, formal tools replaced informal ones to conduct the same types of activities (Jefferies 2009). The most notable change in the lithic technology was the transition from side notched to stemmed projectile points, which occur in a variety of forms and styles. The significance of this change is not clear but may indicate an increase use of the atlatl (Jefferies 2009:653). Late Archaic point types found in western Kentucky include Karnak Stemmed, McWhinney Heavy Stemmed, Ledbetter Stemmed, Pickwick, Saratoga Broad Bladed, Parallel Stemmed and Expanding Stem, and Rowlett (Jefferies 2009). Smaller, stemmed and notched Merom-Trimble types are also associated with lower Ohio River Valley Late Archaic occupations that date from approximately 1900 to 1200 B.C. (Jefferies 2009).

Late Archaic chipped-stone tools include projectile point/hafted knives and hafted drills, along with end scrapers, side scrapers, gravers, choppers, and reamers. Ground-stone artifacts include atlatl weights, three-quarter grooved and full-grooved axes, grooved mauls, pestles, hoes, hammerstones, and abraders. Along with these stone implements, a number of bone and shell tools were also produced during this time (Jefferies 2009). The occurrence of these various artifacts, along with the diversity of burials and features, suggest Late Archaic

populations were participating in a broad range of activities.

A total of 651 Late Archaic sites have been recorded in the lower Ohio River Valley in Kentucky (Jefferies 2009). This is twice as many as known Middle Archaic sites and suggests a significant increase in overall population during this time. The location of these Later sites is similar to the earlier Middle Archaic pattern with 37.9 percent occurring on the floodplains and 33.9 percent found on the uplands (Jefferies 2009:654). This similarity in occupation suggests a continuation of the settlement subsistence practice started in the late Middle Archaic. Variation of settlement intensity between the Middle and Late Archaic is present at some multi-component sites (Jefferies 2009). At some intensively occupied Middle Archaic sites, such as the Morrisroe site, occupations become more sporadic during the Late Archaic (Jefferies 2009).

Research Topics

A review of the literature, the updated Kentucky state preservation plan (Pollack 2008), and data from previous investigations indicated that a number of site specific research goals may be pursued with regard to archaeological components identified at sites in the Western Coal Fields of Kentucky.

The present Phase II investigations have determined that cultural material at site 15Mu296 is present in an undisturbed A horizon on the surface of the site as well in undisturbed cultural features below it. The distribution of diagnostic artifacts indicates that no stratigraphic separation of components is present within the surficial A horizon, with Early Archaic, Middle Archaic, and Late Archaic occupations represented in it. The single diagnostic Matanzas Side Notched projectile point base fragment recovered from Feature 3, and the associated radiocarbon date, indicates that at least some of the features at site 15Mu296 are associated with a late Middle Archaic occupation. Due to the presence of the undisturbed, culturally bearing A horizon deposits, as well as cultural features, site 15Mu296 has great potential to address research topics developed as part of the Kentucky State Preservation Plan.

Jefferies (1990; 2008) has identified research topics for the Archaic period in western Kentucky. Crucial to these research topics is the objective to locate sites with unmixed Archaic deposits that have retained their spatial and temporal integrity. While multi-component sites have added to the knowledge of Archaic site distribution, mixed assemblages on such sites tend to obscure specific results about Archaic adaptation. Identification and excavation of well preserved sites would help to clarify synchronic and diachronic changes in all research areas; this includes smaller sites and short term camps, despite their limited artifact diversity and midden deposits. Additional Phase II testing to identify such sites is essential and should include the point plotting of surface artifacts as well as extensive test unit excavation to gather detailed data on both the horizontal and vertical distribution of cultural material.

Studying lithic technologies and distribution patterns will help address issues of site placement, mobility strategy, activity diversity, and tool repair and replacement process (Jefferies 1990:221). Determining the range of plant and animal species that were exploited will also contribute to understanding human adaptation to environmental changes during the Archaic period (Jefferies 2008). Finally, addressing the type and location of chert resources is important in understanding mobility, external contact, and the evolution of trade relations during the Archaic period in western Kentucky.

The presence of undisturbed deposits, along with the occurrence of diagnostic lithic artifacts primarily from the Middle to Late Archaic, suggests that site 15Mu296 has great potential to address the specific research topics mentioned above. Additional investigations at site 15Mu296, including both test unit and feature excavations, would provide data pertaining to relatively uninvestigated upland Archaic adaptations. Further excavations may also find the separation of distinct occupations within the deposits which would allow diachronic comparisons of cultural adaptations between the Middle and Late Archaic.

The current Phase II investigation at site 15Mu296 documented the presence of an undisturbed surficial A horizon along with pit features and a rock cluster. Future Phase III archaeological investigations should include the hand excavation of a block of test units covering at least the central portion of the site area that was found to contain a significant amount of cultural material and a cluster of features. These test units would be excavated in arbitrary 10-cm levels with the horizontal distribution of artifacts being maintained in 1-x-1-m squares to provide detailed information pertaining to intra-site activity areas. Away from this central area, a number of mechanically excavated blocks should be dug to investigate below the A horizon to reveal additional cultural features. All in situ diagnostic artifacts uncovered as part of these investigations should be piece plotted to facilitate the definition of stratigraphically distinct components.

Project Recommendations

Due to the results of the present Phase II archaeological testing, the prehistoric component at site 15Mu296 is evaluated as eligible for listing to the NRHP. Avoidance is recommended for site 15Mu296. If avoidance is not feasible for the proposed undertaking, Phase III mitigation should be conducted. Further work would likely contribute new, significant, information important in addressing the research topics discussed above.

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Appendix A - Artifact Inventory Tables

Table A-1. Prehistoric Artifacts from the Surface, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Surface					
Chert Type	Holland		Wyandotte		Total	
Count & Weight	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools						
Informal Flake Tools	*1	0.7	2	19.1	3	19.8
Total by Count & Weight	1	0.7	2	19.1	3	19.8
Frequency	33.3%	3.5%	66.7%	96.5%	100%	100%
Overall Total	1	0.7	2	19.1	3	19.8
Overall Frequency	33.3%	3.5%	66.7%	96.5%	100%	100%

Key: # = Count; Wt. = Weight in Grams; * = Heat Altered

Table A-2. Prehistoric Artifact Inventory by Test Unit, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Test Unit 1		Test Unit 2		Test Unit 3		Test Unit 4		Test Unit 5		Test Unit 6		Total	
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools														
Proj. Pts./Hafted Knives	[8]	39.6	[3]	15.2	[2]	0.6			[3]	18.8	[4]	24.0	20	98.2
Hafted Scrapers	[1]	2.4											1	2.4
Unspecified Bifaces	[14]	26.6	[7]	33.9	[1]	2.0			[1]	2.4	[5]	15.0	28	79.9
Informal Flake Tools	132	143.6	99	82.5	92	58.0	12	10.5	64	62.2	83	86.5	482	443.3
Blades							[1]	2.0	1	1.6	1	2.0	3	5.6
Fabricating & Processing Tools														
Drills			[1]	0.4	[1]	0.7	[1]	4.5	[2]	9.3	[1]	0.9	6	15.8
Spokeshaves	[1]	1.6											1	1.6
Stone Tool Production & Maintenance Debris														
Cores														
Amorphous	2	97.4	1	10.7			1	17.5			1	161.6	5	287.2
Blanks					[1]	25.2							1	25.2
Debitage														
Primary Decort. Flakes	17	24.6	5	4.3	8	17.2	1	1.9	7	18.2	6	20.2	44	86.4
Secondary Decort. Flakes	3	0.9	3	8.1			2	0.7	5	4.1	7	4.3	20	18.1
Tertiary Flakes	23	15.4	16	5.7	8	3.1	5	5.6	24	16.1	32	13.0	108	58.9
Biface-1 Flakes	9	4.5	12	5.1			1	0.5	9	4.0	18	7.3	49	21.4
Biface-2 Flakes	69	10.8	46	7.3	39	7.0	4	0.6	33	6.1	77	11.5	268	43.3
Broken Flakes	85	39.5	50	17.5	24	6.1	12	3.2	67	24.5	69	27.2	307	118.0
Angular Fragments	1	9.2	3	21.2			1	9.3	1	10.0	1	3.6	7	53.3
Thermal Shatter	64	98.2	44	46.2	24	14.6	8	4.5	22	11.1	45	71.8	207	246.4
Heating & Cooking Debris														
Cracked Rock														
Sandstone	478	45400.0	371	37500.0	238	18490.0	39	1950.0	245	15620.0	490	67710.0	1861	186670.0
Igneous/Metamorphic			1	10.0							2	25.8	3	35.8
Baked Clay	5	4.5	2	2.6							4	34.1	11	41.2
Domestic Equipment														
Pestles					1	396.8							1	396.8
Pitted Sandstone	1	666.8											1	666.8
Mortars/Multi-Pitted Sandstone											1	7711.1	1	7711.1
Other Items														
Ochre	41	45.1	17	22.3	3	1.6			12	17.4	9	13.0	82	99.4
Limonite	5	73.6	9	13.0	1	0.3							15	86.9
Other - Small Geode					1	0.9							1	0.9
Overall Total by Count & Weight	959	46704.3	690	37806.0	444	19024.1	88	2010.8	496	15825.8	856	75942.9	3533	197313.9

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments

Table A-3. Prehistoric Artifact Inventory, Test Unit 1, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Test Unit 1												Total	
	Level 1		Level 2		Level 3		Level 4		Level 5		Dark Stain ↓ Level 5			
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools			diag.		non diag. mid				1 diag.		all non diag.			
Proj. Pts./Hafted Knives			[1]	10.6	[1]	5.0			[3]	8.3	[3]	15.7	8	39.6
Hafted Scrapers									[1]	2.4			1	2.4
Unspecified Bifaces	[7]	18.9	[2]	2.7	[2]	2.9	[1]	1.1	[1]	0.7	[1]	0.3	14	26.6
Informal Flake Tools	43	36.6	39	57.6	13	8.1	7	10.7	15	19.8	15	10.8	132	143.6
Fabricating & Processing Tools														
Spokeshaves					1	1.6							1	1.6
Stone Tool Production & Maintenance Debris														
Cores														
Amorphous	1	55.3					1	42.1					2	97.4
Debitage														
Primary Decort. Flakes	10	19.3	4	4.0	1	0.3			2	1.0			17	24.6
Secondary Decort. Flakes					1	0.4	1	0.2			1	0.3	3	0.9
Tertiary Flakes	8	2.5	5	1.9	3	5.7	2	1.0	1	1.2	4	3.1	23	15.4
Biface-1 Flakes	7	3.5	1	0.4					1	0.6			9	4.5
Biface-2 Flakes	19	3.6	18	2.5	10	1.2	4	0.5	5	0.7	13	2.3	69	10.8
Broken Flakes	30	11.6	23	8.4	9	6.4	6	2.4	6	1.6	11	9.1	85	39.5
Angular Fragments					1	9.2							1	9.2
Thermal Shatter	23	41.9	14	33.6	6	5.8	4	2.2	5	8.9	12	5.8	64	98.2
Heating & Cooking Debris														
Cracked Rock														
Sandstone	140	13200.0	150	17600.0	25	1300.0	45	4500.0	48	3800.0	70	5000.0	478	45400.0
Baked Clay			1	0.5					1	0.7	3	3.3	5	4.5
Domestic Equipment														
Pitted Sandstone	1	666.8											1	666.8
Other Items														
Ochre	6	5.6	3	1.8	5	6.6	6	4.7	6	15.4	15	11.0	41	45.1
Limonite	1	2.0			1	1.2			1	69.6	2	0.8	5	73.6
Overall Total by Count & Weight	296	14067.6	261	17724.0	79	1354.4	77	4564.9	96	3930.9	150	5062.5	959	46704.3

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments

Table A-4. Chert Type Identification, Test Unit 1, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Test Unit 1																					
	Level 1												Level 2									
Chert Type	Dover		Haney (Ind.)		Holland		Mounds		Perth		Wyandotte		Burlington		Holland		Mounds		Perth		Sonora	
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools																						
Proj. Pts./Hafted Knives																						
Hafted Scrapers																						
Unspecified Bifaces											[(*5)7]	18.9										
Informal Flake Tools	1	1.8	*1	0.1	*4	1.4	*1	0.4	*1	0.3	(*19)35	32.6	*1	8.1	2	0.6	2	0.4	*1	0.5		
Fabricating & Processing Tools																						
Spokeshaves																						
Total by Count & Weight	1	1.8	1	0.1	4	1.4	1	0.4	1	0.3	42	51.5	1	8.1	2	0.6	2	0.4	1	0.5		
Frequency	0.6%	0.8%	0.6%	0.05%	2.6%	0.7%	0.6%	0.2%	0.6%	0.1%	26.9%	24.1%	0.6%	3.8%	1.3%	0.3%	1.3%	0.2%	0.6%	0.2%		
Stone Tool Production & Maintenance Debris																						
Cores																						
Amorphous											1	55.3										
Debitage																						
Primary Decort. Flakes	1	0.7							1	0.7	(*4)8	17.9					*1	0.4				
Secondary Decort. Flakes																						
Tertiary Flakes											(*5)8	2.5			*1	0.2						
Biface-1 Flakes	1	0.3									(*4)6	3.2										
Biface-2 Flakes											(*12)19	3.6	*1	0.1							*2	0.3
Broken Flakes					*1	0.2					(*16)29	11.4			(*1)3	2.0					*1	0.2
Angular Fragments																						
Thermal Shatter									1	3.3	22	38.6										
Total by Count & Weight	2	1.0			1	0.2			2	4.0	93	132.5	1	0.1	4	2.2	1	0.4			3	0.5
Frequency	0.7%	0.3%			0.4%	0.1%			0.7%	1.3%	34.1%	44.1%	0.4%	0.0%	1.5%	0.7%	0.4%	0.1%			1.1%	0.2%
Overall Total	3	2.8	1	0.1	5	1.6	1	0.4	3	4.3	135	184.0	2	8.2	6	2.8	3	0.8	1	0.5	3	0.5
Overall Frequency	0.7%	0.5%	0.2%	0.02%	1.2%	0.3%	0.2%	0.1%	0.7%	0.8%	31.5%	35.8%	0.5%	1.6%	1.4%	0.5%	0.7%	0.2%	0.2%	0.1%	0.7%	0.1%

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments; * = Heat Altered

Table A-4. Continued

15Mu296, Oxford Coal-Ph. I	Test Unit 1 (Cont.)																			
	Level 2 (Cont.)		Level 3										Level 4						Level 5	
Chert Type	Wyandotte		Burlington		Holland		Mounds		Sonora		Wyandotte		Holland		Muldraugh		Wyandotte		Allens Creek	
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools	diag.										non diag. mid									
Proj. Pts./Hafted Knives	[1]	10.6									[1]	5.0								
Hafted Scrapers																				
Unspecified Bifaces	[*2]	2.7									[*2]	2.9					[*1]	1.1		
Informal Flake Tools	(*18)33	48.0			*1	0.8			*1	0.5	(*3)11	6.8	3	1.6			(*3)4	9.1		
Fabricating & Processing Tools																				
Spokeshaves											[1]	1.6								
Total by Count & Weight	36	61.3			1	0.8			1	0.5	15	16.3	3	1.6			5	10.2		
Frequency	23.1%	28.7%			0.6%	0.4%			0.6%	0.2%	9.6%	7.6%	1.9%	0.7%			3.2%	4.8%		
Stone Tool Production & Maintenance Debris																				
Cores																				
Amorphous													1	42.1						
Debitage																				
Primary Decort. Flakes	(*2)3	3.6							*1	0.3										
Secondary Decort. Flakes											1	0.4			*1	0.2				
Tertiary Flakes	4	1.7			*1	0.6					(*1)2	5.1					(*1)2	1.0	*1	1.2
Biface-1 Flakes	*1	0.4																		
Biface-2 Flakes	(*6)15	2.1			2	0.2	*1	0.1	*1	0.1	(*5)6	0.8	1	0.2			(*1)3	0.3		
Broken Flakes	(*13)19	6.2	*1	0.4							(*3)8	6.0	1	0.4			(*1)5	2.0		
Angular Fragments											*1	9.2								
Thermal Shatter	14	33.6									6	5.8					4	2.2		
Total by Count & Weight	56	47.6	1	0.4	3	0.8	1	0.1	2	0.4	24	27.3	3	42.7	1	0.2	14	5.5	1	1.2
Frequency	20.5%	15.8%	0.4%	0.1%	1.1%	0.3%	0.4%	0.03%	0.7%	0.1%	8.8%	9.1%	1.1%	14.2%	0.4%	0.1%	5.1%	1.8%	0.4%	0.4%
Overall Total	92	108.9	1	0.4	4	1.6	1	0.1	3	0.9	39	43.6	6	44.3	1	0.2	19	15.7	1	1.2
Overall Frequency	21.4%	21.2%	0.2%	0.1%	0.9%	0.3%	0.2%	0.02%	0.7%	0.2%	9.1%	8.5%	1.4%	8.6%	0.2%	0.04%	4.4%	3.1%	0.2%	0.2%

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments; * = Heat Altered

Table A-4. Continued

15Mu296, Oxford Coal-Ph. I	Test Unit 1 (Cont.)																				Total	
	Level 5 (Cont.)								Dark Stain Below Level 5													
Chert Type	Holland		Mounds		Sonora		Wyandotte		Mounds		Dover		Muldraugh		Perth		Wyandotte		Indeterminate			
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools							1 diag.										all non diag.					
Proj. Pts./Hafted Knives							[(*1)3]	8.3									[*3]	15.7			8	39.6
Hafted Scrapers							[*1]	2.4													1	2.4
Unspecified Bifaces							[1]	0.7									[*1]	0.3			14	26.6
Informal Flake Tools	*1	0.8					(*3)14	19.0	1	1.3							(*4)13	9.0	1	0.5	132	143.6
Fabricating & Processing Tools																						
Spokeshaves																					1	1.6
Total by Count & Weight	1	0.8					19	30.4	1	1.3							17	25.0	1	0.5	156	213.8
Frequency	0.6%	0.4%					12.2%	14.2%	0.6%	0.6%							10.9%	11.7%	0.6%	0.2%	100%	100%
Stone Tool Production & Maintenance Debris																						
Cores																						
Amorphous																					2	97.4
Debitage																						
Primary Decort. Flakes							(*1)2	1.0													17	24.6
Secondary Decort. Flakes																	*1	0.3			3	0.9
Tertiary Flakes																	(*3)4	3.1			23	15.4
Biface-1 Flakes							1	0.6													9	4.5
Biface-2 Flakes			2	0.3			(*2)3	0.4			*1	0.1	*1	0.1			(*5)11	2.1			69	10.8
Broken Flakes					*1	0.4	(*3)5	1.2							*1	0.1	(*4)10	9.0			85	39.5
Angular Fragments																					1	9.2
Thermal Shatter							5	8.9									12	5.8			64	98.2
Total by Count & Weight			2	0.3	1	0.4	16	12.1			1	0.1	1	0.1	1	0.1	38	20.3			273	300.5
Frequency			0.7%	0.1%	0.4%	0.1%	5.9%	4.0%			0.4%	0.03%	0.4%	0.03%	0.4%	0.03%	13.9%	6.8%			100%	100%
Overall Total	1	0.8	2	0.3	1	0.4	35	42.5	1	1.3	1	0.1	1	0.1	1	0.1	55	45.3	1	0.5	429	514.3
Overall Frequency	0.2%	0.2%	0.5%	0.1%	0.2%	0.1%	8.2%	8.3%	0.2%	0.3%	0.2%	0.02%	0.2%	0.02%	0.2%	0.02%	12.8%	8.8%	0.2%	0.1%	100%	100%

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments; * = Heat Altered

Table A-5. Prehistoric Artifact Inventory, Test Unit 2, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Test Unit 2												Total	
	Level 1		Level 2		Level 3		Level 4		Level 5		Level 6			
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools	non diag. tip & mid										non diag. mid			
Proj. Pts./Hafted Knives	[2]	6.4									[1]	8.8	3	15.2
Unspecified Bifaces	[3]	15.8	[4]	18.1									7	33.9
Informal Flake Tools	29	24.5	44	30.5	15	17.7	6	5.1	5	4.7			99	82.5
Fabricating & Processing Tools					non diag. tip									
Drills					[1]	0.4							1	0.4
Stone Tool Production & Maintenance Debris														
Cores														
Amorphous			1	10.7									1	10.7
Debitage														
Primary Decort. Flakes	2	0.5	1	0.2	1	2.9	1	0.7					5	4.3
Secondary Decort. Flakes	1	7.4	1	0.5							1	0.2	3	8.1
Tertiary Flakes	2	0.6	7	3.6	4	0.9			2	0.5	1	0.1	16	5.7
Biface-1 Flakes	5	2.1	5	1.9	2	1.1							12	5.1
Biface-2 Flakes	7	1.4	13	1.8	16	2.8	7	0.9	1	0.2	2	0.2	46	7.3
Broken Flakes	9	2.2	26	11.5	10	1.7			5	2.1			50	17.5
Angular Fragments	1	12.4	1	5.6							1	3.2	3	21.2
Thermal Shatter	18	15.6	18	20.4	6	9.7	1	0.2	1	0.3			44	46.2
Heating & Cooking Debris														
Cracked Rock														
Sandstone	86	11000.0	200	13000.0	44	9000.0	21	3000.0	10	1000.0	10	500.0	371	37500.0
Igneous/Metamorphic									1	10.0			1	10.0
Baked Clay							2	2.6					2	2.6
Other Items														
Ochre	6	4.9	4	9.8	1	0.6	2	2.0	4	5.0			17	22.3
Limonite	8	11.7	1	1.3									9	13.0
Overall Total by Count & Weight	179	11105.5	326	13115.9	100	9037.8	40	3011.5	29	1022.8	16	512.5	690	37806.0

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments

Table A-6. Chert Type Identification, Test Unit 2, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Test Unit 2																			
	Level 1																		Level 2	
Chert Type	Allens Creek		Dover		Holland		Mill Creek		Mounds		Muldraugh		Perth		Wyandotte		Indeterminate		Burlington	
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools															non diag. tip & mid					
Proj. Pts./Hafted Knives															[*2]	6.4				
Unspecified Bifaces															[(*2)3]	15.8				
Informal Flake Tools											*2	2.4			(*10)26	19.7	1	2.4	*1	0.2
Fabricating & Processing Tools																				
Drills																				
Total by Count & Weight											2	2.4			31	41.9	1	2.4	1	0.2
Frequency											1.8%	1.8%			28.2%	31.7%	0.9%	1.8%	0.9%	0.2%
Stone Tool Production & Maintenance Debris																				
Cores																				
Amorphous																				
Debitage																				
Primary Decort. Flakes															*2	0.5				
Secondary Decort. Flakes	*1	7.4																		
Tertiary Flakes															(*1)2	0.6				
Biface-1 Flakes							1	0.4	1	0.4					(*1)3	1.3				
Biface-2 Flakes											*1	0.2			(*4)6	1.2				
Broken Flakes					*1	0.1	1	0.1					1	0.3	(*4)6	1.7				
Angular Fragments															1	12.4				
Thermal Shatter			1	0.3	2	6.7							1	0.5	14	8.1				
Total by Count & Weight	1	7.4	1	0.3	3	6.8	2	0.5	1	0.4	1	0.2	2	0.8	34	25.8				
Frequency	0.6%	5.9%	0.6%	0.2%	1.7%	5.4%	1.1%	0.4%	0.6%	0.3%	0.6%	0.2%	1.1%	0.6%	18.9%	20.5%				
Overall Total	1	7.4	1	0.3	3	6.8	2	0.5	1	0.4	3	2.6	2	0.8	65	67.7	1	2.4	1	0.2
Overall Frequency	0.3%	2.9%	0.3%	0.1%	1.0%	2.6%	0.7%	0.2%	0.3%	0.2%	1.0%	1.0%	0.7%	0.3%	22.4%	26.2%	0.3%	0.9%	0.3%	0.1%

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments; * = Heat Altered

Table A-6. Continued

15Mu296, Oxford Coal-Ph. I	Test Unit 2 (Cont.)																			
	Level 2 (Cont.)														Level 3					
Chert Type	Dover		Holland		Mounds		Muldraugh		Perth		Sonora		Wyandotte		Dover		Haney (Ind.)		Holland	
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools																				
Proj. Pts./Hafted Knives																				
Unspecified Bifaces													[*4]	18.1						
Informal Flake Tools			(*1)5	2.3							*1	0.1	(*16)37	27.9			*1	0.7	1	0.5
Fabricating & Processing Tools																				
Drills																				
Total by Count & Weight			5	2.3							1	0.1	41	46.0			1	0.7	1	0.5
Frequency			4.5%	1.7%							0.9%	0.1%	37.3%	34.8%			0.9%	0.5%	0.9%	0.4%
Stone Tool Production & Maintenance Debris																				
Cores																				
Amorphous													1	10.7						
Debitage																				
Primary Decort. Flakes													1	0.2						
Secondary Decort. Flakes			*1	0.5																
Tertiary Flakes			(*1)2	0.4									(*1)5	3.2						
Biface-1 Flakes	*1	0.3											4	1.6						
Biface-2 Flakes			1	0.1			*1	0.2					(*4)11	1.5	*1	0.1			2	0.3
Broken Flakes			(*2)3	0.7	1	0.1	*1	0.5	2	3.9			(*8)19	6.3					*1	0.1
Angular Fragments									*1	5.6										
Thermal Shatter			1	0.1							1	0.8	16	19.5						
Total by Count & Weight	1	0.3	8	1.8	1	0.1	2	0.7	3	9.5	1	0.8	57	43.0	1	0.1			3	0.4
Frequency	0.6%	0.2%	4.4%	1.4%	0.6%	0.1%	1.1%	0.6%	1.7%	7.5%	0.6%	0.6%	31.7%	34.1%	0.6%	0.1%			1.7%	0.3%
Overall Total	1	0.3	13	4.1	1	0.1	2	0.7	3	9.5	2	0.9	98	89.0	1	0.1	1	0.7	4	0.9
Overall Frequency	0.3%	0.1%	4.5%	1.6%	0.3%	0.04%	0.7%	0.3%	1.0%	3.7%	0.7%	0.3%	33.8%	34.5%	0.3%	0.04%	0.3%	0.3%	1.4%	0.3%

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments; * = Heat Altered

Table A-6. Continued

15Mu296, Oxford Coal-Ph. I	Test Unit 2 (Cont.)																				Total	
	Level 3 (Cont.)				Level 4								Level 5				Level 6					
Chert Type	Mounds		Wyandotte		Dover		Mounds		Sonora		Wyandotte		Holland		Wyandotte		Mounds		Wyandotte			
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools																			non diag. mid			
Proj. Pts./Hafted Knives																			[1]	8.8	3	15.2
Unspecified Bifaces																					7	33.9
Informal Flake Tools			(*4)13	16.5							(*2)6	5.1	*1	2.3	(*2)4	2.4					99	82.5
Fabricating & Processing Tools			non diag. tip																			
Drills			[1]	0.4																	1	0.4
Total by Count & Weight			14	16.9							6	5.1	1	2.3	4	2.4			1	8.8	110	132.0
Frequency			12.7%	12.8%							5.5%	3.9%	0.9%	1.7%	3.6%	1.8%			0.9%	6.7%	100%	100%
Stone Tool Production & Maintenance Debris																						
Cores																						
Amorphous																					1	10.7
Debitage																						
Primary Decort. Flakes			1	2.9					*1	0.7											5	4.3
Secondary Decort. Flakes																	*1	0.2			3	8.1
Tertiary Flakes			(*2)4	0.9											2	0.5			*1	0.1	16	5.7
Biface-1 Flakes			2	1.1																	12	5.1
Biface-2 Flakes	1	0.1	(*3)12	2.3	1	0.1	1	0.2			(*4)5	0.6			1	0.2			2	0.2	46	7.3
Broken Flakes			(*5)9	1.6									1	1.0	(*2)4	1.1					50	17.5
Angular Fragments																			*1	3.2	3	21.2
Thermal Shatter			6	9.7							1	0.2			1	0.3					44	46.2
Total by Count & Weight	1	0.1	34	18.5	1	0.1	1	0.2	1	0.7	6	0.8	1	1.0	8	2.1	1	0.2	4	3.5	180	126.1
Frequency	0.6%	0.1%	18.9%	14.7%	0.6%	0.1%	0.6%	0.2%	0.6%	0.6%	3.3%	0.6%	0.6%	0.8%	4.4%	1.7%	0.6%	0.2%	2.2%	2.8%	100%	100%
Overall Total	1	0.1	48	35.4	1	0.1	1	0.2	1	0.7	12	5.9	2	3.3	12	4.5	1	0.2	5	12.3	290	258.1
Overall Frequency	0.3%	0.04%	16.6%	13.7%	0.3%	0.04%	0.3%	0.1%	0.3%	0.3%	4.1%	2.3%	0.7%	1.3%	4.1%	1.7%	0.3%	0.1%	1.7%	4.8%	100%	100%

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments; * = Heat Altered

Table A-7. Prehistoric Artifact Inventory, Test Unit 3, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Test Unit 3								Total	
	Level 1		Level 2		Level 3		Level 4			
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools			non diag. tips							
Proj. Pts./Hafted Knives			[2]	0.6					2	0.6
Unspecified Bifaces	[1]	2.0							1	2.0
Informal Flake Tools	41	28.9	29	18.3	19	10.1	3	0.7	92	58.0
Fabricating & Processing Tools	non diag. mid									
Drills	[1]	0.7							1	0.7
Stone Tool Production & Maintenance Debris										
Blanks	[1]	25.2							1	25.2
Debitage										
Primary Decort. Flakes	6	5.7	2	11.5					8	17.2
Tertiary Flakes	2	0.6	5	2.3			1	0.2	8	3.1
Biface-2 Flakes	18	3.3	13	2.6	6	0.8	2	0.3	39	7.0
Broken Flakes	13	3.5	8	1.9	3	0.7			24	6.1
Thermal Shatter	8	5.5	7	5.0	6	2.9	3	1.2	24	14.6
Heating & Cooking Debris										
Cracked Rock										
Sandstone	136	9290.0	84	7240.0	18	1960.0			238	18490.0
Domestic Equipment										
Pestles	1	396.8							1	396.8
Other Items										
Ochre	2	1.3	1	0.3					3	1.6
Limonite	1	0.3							1	0.3
Other - Small Geode	1	0.9							1	0.9
Overall Total by Count & Weight	232	9764.7	151	7282.5	52	1974.5	9	2.4	444	19024.1

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments

Table A-8. Chert Type Identification, Test Unit 3, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Test Unit 3																					
	Level 1														Level 2							
Chert Type	Allens Creek		Dover		Holland		Mounds		Muldraugh		Perth		Wyandotte		Burlington		Holland		Sonora		Wyandotte	
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools															non diag. tip							
Proj. Pts./Hafted Knives															[*1]	0.5						
Unspecified Bifaces									[*1]	2.0												
Informal Flake Tools	*1	0.6	1	1.1			(*1)2	2.1	*1	2.8			(*16)36	22.3			(*2)5	2.2			(*14)24	16.1
Fabricating & Processing Tools													non diag. mid									
Drills													[*1]	0.7								
Total by Count & Weight	1	0.6	1	1.1			2	2.1	2	4.8			37	23.0	1	0.5	5	2.2			24	16.1
Frequency	1.0%	1.0%	1.0%	1.8%			2.1%	3.4%	2.1%	7.8%			38.5%	37.5%	1.0%	0.8%	5.2%	3.6%			25.0%	26.3%
Stone Tool Production & Maintenance Debris																						
Blanks											[*1]	25.2										
Debitage																						
Primary Decort. Flakes			1	1.0	1	0.6							(*1)4	4.1							1	11.2
Tertiary Flakes													(*1)2	0.6			(*1)3	1.4			(*1)2	0.9
Biface-2 Flakes	1	0.1			2	0.2							(*10)15	3.0							(*8)13	2.6
Broken Flakes	*1	0.2			(*1)2	0.3			*1	0.4			(*6)9	2.6					*1	0.3	(*5)7	1.6
Thermal Shatter											1	1.5	7	4.0	1	2.1	1	0.2			5	2.7
Total by Count & Weight	2	0.3	1	1.0	5	1.1			1	0.4	2	26.7	37	14.3	1	2.1	4	1.6	1	0.3	28	19.0
Frequency	1.9%	0.4%	1.0%	1.4%	4.8%	1.5%			1.0%	0.5%	1.9%	36.5%	35.6%	19.5%	1.0%	2.9%	3.8%	2.2%	1.0%	0.4%	26.9%	26.0%
Overall Total	3	0.9	2	2.1	5	1.1	2	2.1	3	5.2	2	26.7	74	37.3	2	2.6	9	3.8	1	0.3	52	35.1
Overall Frequency	1.5%	0.7%	1.0%	1.6%	2.5%	0.8%	1.0%	1.6%	1.5%	3.9%	1.0%	19.9%	37.0%	27.7%	1.0%	1.9%	4.5%	2.8%	0.5%	0.2%	26.0%	26.1%

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments; * = Heat Altered

Table A-8. Continued

15Mu296, Oxford Coal-Ph. I	Test Unit 3 (Cont.)																				Total	
	Level 2 (Cont.)		Level 3												Level 4							
Chert Type	Indeterminate		Allens Creek		Holland		Mounds		Perth		Sonora		Wyandotte		Holland		Mounds		Wyandotte			
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools	non diag. tip																					
Proj. Pts./Hafted Knives	[*1]	0.1																			2	0.6
Unspecified Bifaces																					1	2.0
Informal Flake Tools					*1	1.4	1	1.6	1	0.2	1	0.3	(*4)15	6.6			1	0.4	2	0.3	92	58.0
Fabricating & Processing Tools																						
Drills																					1	0.7
Total by Count & Weight	1	0.1			1	1.4	1	1.6	1	0.2	1	0.3	15	6.6			1	0.4	2	0.3	96	61.3
Frequency	1.0%	0.2%			1.0%	2.3%	1.0%	2.6%	1.0%	0.3%	1.0%	0.5%	15.6%	10.8%			1.0%	0.7%	2.1%	0.5%	100%	100%
Stone Tool Production & Maintenance Debris																						
Blanks																					1	25.2
Debitage																						
Primary Decort. Flakes	1	0.3																			8	17.2
Tertiary Flakes																			*1	0.2	8	3.1
Biface-2 Flakes							1	0.2					(*1)5	0.6					(*1)2	0.3	39	7.0
Broken Flakes													*3	0.7							24	6.1
Thermal Shatter			2	0.7	1	0.7					1	0.4	2	1.1	1	0.3			2	0.9	24	14.6
Total by Count & Weight	1	0.3	2	0.7	1	0.7	1	0.2			1	0.4	10	2.4	1	0.3			5	1.4	104	73.2
Frequency	1.0%	0.4%	1.9%	1.0%	1.0%	1.0%	1.0%	0.3%			1.0%	0.5%	9.6%	3.3%	1.0%	0.4%			4.8%	1.9%	100%	100%
Overall Total	2	0.4	2	0.7	2	2.1	2	1.8	1	0.2	2	0.7	25	9.0	1	0.3	1	0.4	7	1.7	200	134.5
Overall Frequency	1.0%	0.3%	1.0%	0.5%	1.0%	1.6%	1.0%	1.3%	0.5%	0.1%	1.0%	0.5%	12.5%	6.7%	0.5%	0.2%	0.5%	0.3%	3.5%	1.3%	100%	100%

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments; * = Heat Altered

Table A-9. Prehistoric Artifact Inventory, Test Unit 4, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Test Unit 4								Total	
	Level 1		Level 2		Level 3		Level 4			
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools										
Informal Flake Tools	1	0.2	2	1.6	6	4.3	3	4.4	12	10.5
Blades					[1]	2.0			1	2.0
Fabricating & Processing Tools					non diag. tip					
Drills					[1]	4.5			1	4.5
Stone Tool Production & Maintenance Debris										
Cores										
Amorphous					1	17.5			1	17.5
Debitage										
Primary Decort. Flakes					1	1.9			1	1.9
Secondary Decort. Flakes			1	0.1	1	0.6			2	0.7
Tertiary Flakes	1	0.2	2	4.9	2	0.5			5	5.6
Biface-1 Flakes	1	0.5							1	0.5
Biface-2 Flakes	1	0.1	2	0.3	1	0.2			4	0.6
Broken Flakes	2	0.4	3	0.6	5	1.1	2	1.1	12	3.2
Angular Fragments			1	9.3					1	9.3
Thermal Shatter	3	2.9	2	0.8	2	0.6	1	0.2	8	4.5
Heating & Cooking Debris										
Cracked Rock										
Sandstone	4	200.0	12	600.0	14	700.0	9	450.0	39	1950.0
Overall Total by Count & Weight	13	204.3	25	617.6	35	733.2	15	455.7	88	2010.8

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments

Table A-10. Chert Type Identification, Test Unit 4, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Test Unit 4																		Total	
	Level 1				Level 2						Level 3						Level 4			
Chert Type	Holland		Wyandotte		Mounds		Perth		Wyandotte		Holland		Mounds		Wyandotte		Wyandotte			
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools																				
Informal Flake Tools			1	0.2					(*1)2	1.6			*1	0.8	(*3)5	3.5	(*2)3	4.4	12	10.5
Blades															[*1]	2.0			1	2.0
Fabricating & Processing Tools															non diag. tip					
Drills															[1]	4.5			1	4.5
Total by Count & Weight			1	0.2					2	1.6			1	0.8	7	10.0	3	4.4	14	17
Frequency			7.1%	1.2%					14.3%	9.4%			7.1%	4.7%	50.0%	58.8%	21.4%	25.9%	100%	100%
Stone Tool Production & Maintenance Debris																				
Cores																				
Amorphous															*1	17.5			1	17.5
Debitage																				
Primary Decort. Flakes															1	1.9			1	1.9
Secondary Decort. Flakes					*1	0.1									1	0.6			2	0.7
Tertiary Flakes			1	0.2					(*1)2	4.9					(*1)2	0.5			5	5.6
Biface-1 Flakes			*1	0.5															1	0.5
Biface-2 Flakes			1	0.1					*2	0.3					1	0.2			4	0.6
Broken Flakes			(*1)2	0.4					(*1)3	0.6					(*2)5	1.1	2	1.1	12	3.2
Angular Fragments							1	9.3											1	9.3
Thermal Shatter	1	0.2	2	2.7					2	0.8	1	0.1			1	0.5	1	0.2	8	4.5
Total by Count & Weight	1	0.2	7	3.9	1	0.1	1	9.3	9	6.6	1	0.1			12	22.3	3	1.3	35	43.8
Frequency	2.9%	0.5%	20.0%	8.9%	2.9%	0.2%	2.9%	21.2%	25.7%	15.1%	2.9%	0.2%			34.3%	50.9%	8.6%	3.0%	100%	100%
Overall Total	1	0.2	8	4.1	1	0.1	1	9.3	11	8.2	1	0.1	1	0.8	19	32.3	6	5.7	49	60.8
Overall Frequency	2.0%	0.3%	16.3%	6.7%	2.0%	0.2%	2.0%	15.3%	22.4%	13.5%	2.0%	0.2%	2.0%	1.3%	38.8%	53.1%	12.2%	9.4%	100%	100%

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments; * = Heat Altered

Table A-11. Prehistoric Artifact Inventory, Test Unit 5, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Test Unit 5								Total	
	Level 1		Level 2		Level 3		Level 4			
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools	diag.		non diag. mid		diag.					
Proj. Pts./Hafted Knives	[1]	0.9	[1]	3.6	[1]	14.3			3	18.8
Unspecified Bifaces	[1]	2.4							1	2.4
Informal Flake Tools	43	39.5	13	14.9	8	7.8			64	62.2
Blades	1	1.6							1	1.6
Fabricating & Processing Tools	non diag. mid				non diag. tip					
Drills	[1]	7.6			[1]	1.7			2	9.3
Stone Tool Production & Maintenance Debris										
Debitage										
Primary Decort. Flakes	3	14.3	2	2.0	2	1.9			7	18.2
Secondary Decort. Flakes	1	0.6	3	2.9	1	0.6			5	4.1
Tertiary Flakes	11	7.9	9	4.3	3	2.4	1	1.5	24	16.1
Biface-1 Flakes	2	0.7	4	1.8	3	1.5			9	4.0
Biface-2 Flakes	9	1.4	17	3.7	6	0.9	1	0.1	33	6.1
Broken Flakes	15	3.7	27	9.9	22	10.3	3	0.6	67	24.5
Angular Fragments			1	10.0					1	10.0
Thermal Shatter	7	3.5	10	4.3	5	3.3			22	11.1
Heating & Cooking Debris										
Cracked Rock										
Sandstone	100	6730.0	74	4000.0	69	4770.0	2	120.0	245	15620.0
Other Items										
Ochre			5	8.6	7	8.8			12	17.4
Overall Total by Count & Weight	195	6814.1	166	4066.0	128	4823.5	7	122.2	496	15825.8

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments

Table A-12. Chert Type Identification, Test Unit 5, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Test Unit 5																																		Total	
	Level 1										Level 2										Level 3										Level 4					
Chert Type	Allens Creek		Holland		Perth		Wyandotte		Indeterminate		Haney (Ind.)		Holland		Mill Creek		Perth		Wyandotte		Burlington		Holland		Mounds		Perth		Wyandotte		Holland		Wyandotte			
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools	diag.																		non diag. mid										diag.							
Proj. Pts./Hafted Knives	[*1]	0.9																	[*1]	3.6									[1]	14.3					3	18.8
Unspecified Bifaces							[*1]	2.4																											1	2.4
Informal Flake Tools			(*12)15	11.7	*2	1.9	(*12)25	25.6	1	0.3			(*3)4	2.3			(*2)3	2.9	(*3)6	9.7			*2	1.8					(*2)6	6.0					64	62.2
Blades							1	1.6																											1	1.6
Fabricating & Processing Tools							non diag. mid																						non diag. tip							
Drills							[*1]	7.6																					[1]	1.7					2	9.3
Total by Count & Weight	1	0.9	15	11.7	2	1.9	28	37.2	1	0.3			4	2.3			3	2.9	7	13.3			2	1.8					8	22.0					71	94.3
Frequency	1.4%	1.0%	21.1%	12.4%	2.8%	2.0%	39.4%	39.4%	1.4%	0.3%			5.6%	2.4%			4.2%	3.1%	9.9%	14.1%			2.8%	1.9%					11.3%	23.3%					100%	100%
Stone Tool Production & Maintenance Debris																																				
Debitage																																				
Primary Decort. Flakes			*1	12.5			2	1.8							1	1.2			*1	0.8									(*1)2	1.9					7	18.2
Secondary Decort. Flakes							*1	0.6											(*2)3	2.9									*1	0.6					5	4.1
Tertiary Flakes			*5	3.7			(*4)6	4.2					(*2)3	1.0					(*1)6	3.3									3	2.4	*1	1.5			24	16.1
Biface-1 Flakes			*1	0.3			1	0.4											(*2)4	1.8									(*2)3	1.5					9	4.0
Biface-2 Flakes			*2	0.2			(*4)7	1.2											(*7)17	3.7	*1	0.2	*1	0.2					(*1)4	0.5			1	0.1	33	6.1
Broken Flakes			*1	0.3			(*8)14	3.4			*1	0.5	(*2)4	1.3					(*10)22	8.1			*3	1.1	1	0.7	*1	0.2	(*11)17	8.3			(*2)3	0.6	67	24.5
Angular Fragments																			1	10.0															1	10.0
Thermal Shatter			1	0.6			5	1.8	1	1.1			4	1.0			1	1.2	5	2.1			1	0.5					4	2.8					22	11.1
Total by Count & Weight			11	17.6			36	13.4	1	1.1	1	0.5	11	3.3	1	1.2	1	1.2	59	32.7	1	0.2	5	1.8	1	0.7	1	0.2	34	18.0	1	1.5	4	0.7	168	94.1
Frequency			6.5%	18.7%			21.4%	14.2%	0.6%	1.2%	0.6%	0.5%	6.5%	3.5%	0.6%	1.3%	0.6%	1.3%	35.1%	34.8%	0.6%	0.2%	3.0%	1.9%	0.6%	0.7%	0.6%	0.2%	20.2%	19.1%	0.6%	1.6%	2.4%	0.7%	100%	100%
Overall Total	1	0.9	26	29.3	2	1.9	64	50.6	2	1.4	1	0.5	15	5.6	1	1.2	4	4.1	66	46.0	1	0.2	7	3.6	1	0.7	1	0.2	42	40.0	1	1.5	4	0.7	239	188.4
Overall Frequency	0.4%	0.5%	10.9%	15.6%	0.8%	1.0%	26.8%	26.9%	0.8%	0.7%	0.4%	0.3%	6.3%	3.0%	0.4%	0.6%	1.7%	2.2%	27.6%	24.4%	0.4%	0.1%	2.9%	1.9%	0.4%	0.4%	0.4%	0.1%	17.6%	21.2%	0.4%	0.8%	1.7%	0.4%	100%	100%

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments; * = Heat Altered

Table A-13. Prehistoric Artifact Inventory, Test Unit 6, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Test Unit 6										Total	
	Level 1		Level 2		Level 3		Level 4		Level 5			
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools	diag.		diag.		diag.		non diag. mid					
Proj. Pts./Hafted Knives	[1]	7.9	[1]	0.9	[1]	12.3	[1]	2.9			4	24.0
Unspecified Bifaces	[1]	9.4	[1]	1.4	[3]	4.2					5	15.0
Informal Flake Tools	20	16.6	35	36.1	16	25.6	10	6.3	2	1.9	83	86.5
Blades	1	2.0									1	2.0
Fabricating & Processing Tools							non diag. mid					
Drills							[1]	0.9			1	0.9
Stone Tool Production & Maintenance Debris												
Cores												
Amorphous			1	161.6							1	161.6
Debitage												
Primary Decort. Flakes			2	17.1	4	3.1					6	20.2
Secondary Decort. Flakes	4	2.7	3	1.6							7	4.3
Tertiary Flakes	3	1.0	16	6.9	6	3.1	7	2.0			32	13.0
Biface-1 Flakes	1	0.3	10	4.4	6	2.3	1	0.3			18	7.3
Biface-2 Flakes	17	2.7	29	4.8	27	3.5	2	0.1	2	0.4	77	11.5
Broken Flakes	13	6.6	38	16.1	15	4.1	1	0.2	2	0.2	69	27.2
Angular Fragments			1	3.6							1	3.6
Thermal Shatter	11	20.4	23	15.5	5	33.8	5	1.8	1	0.3	45	71.8
Heating & Cooking Debris												
Cracked Rock												
Sandstone	117	9910.0	234	16900.0	82	35000.0	48	4900.0	9	1000.0	490	67710.0
Igneous/Metamorphic	1	24.7	1	1.1							2	25.8
Baked Clay					4	34.1					4	34.1
Domestic Equipment												
Mortars/Multi-Pitted Sandstone					1	7711.1					1	7711.1
Other Items												
Ochre			2	4.5	3	3.7	3	4.1	1	0.7	9	13.0
Overall Total by Count & Weight	190	10004.3	397	17175.6	173	42840.9	79	4918.6	17	1003.5	856	75942.9

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments

Table A-14. Chert Type Identification, Test Unit 6, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Test Unit 6																															
	Level 1										Level 2										Level 3						Level 4		Level 5		Total	
Chert Type	Haney (Ind.)		Holland		Perth		Sonora		Wyandotte		Holland		Perth		Sonora		Wyandotte		Indeterminate		Haney (Ind.)		Holland		Wyandotte		Wyandotte		Wyandotte			
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools									diag.										diag.						diag.		non diag. mid					
Proj. Pts./Hafted Knives									[*1]	7.9									[1]	0.9					[1]	12.3	[*1]	2.9			4	24.0
Unspecified Bifaces									[*1]	9.4							[*1]	1.4							[(*2)3]	4.2					5	15.0
Informal Flake Tools			(*1)2	2.0			1	0.3	(*4)17	14.3			1	1.0			(*11)32	33.7	*2	1.4					(*7)16	25.6	(*3)10	6.3	*2	1.9	83	86.5
Blades									*1	2.0																					1	2.0
Fabricating & Processing Tools																											non diag. mid					
Drills																											[*1]	0.9			1	0.9
Total by Count & Weight			2	2.0			1	0.3	20	33.6			1	1.0			33	35.1	3	2.3					20	42.1	12	10.1	2	1.9	94	128.4
Frequency			2.1%	1.6%			1.1%	0.2%	21.3%	26.2%			1.1%	0.8%			35.1%	27.3%	3.2%	1.8%					21.3%	32.8%	12.8%	7.9%	2.1%	1.5%	100%	100%
Stone Tool Production & Maintenance Debris																																
Cores																																
Amorphous																	1	161.6													1	161.6
Debitage																																
Primary Decort. Flakes																	(*1)2	17.1							(*2)4	3.1					6	20.2
Secondary Decort. Flakes									(*2)4	2.7							(*2)3	1.6													7	4.3
Tertiary Flakes									(*1)3	1.0	(*1)3	1.2					(*7)12	5.3	1	0.4			1	0.6	(*4)5	2.5	(*2)7	2.0			32	13.0
Biface-1 Flakes									1	0.3			1	0.4			(*4)8	3.7	*1	0.3			1	0.3	(*4)5	2.0	*1	0.3			18	7.3
Biface-2 Flakes									(*9)17	2.7	1	0.3					(*12)28	4.5			*1	0.1	1	0.1	(*6)25	3.3	(*1)2	0.1	2	0.4	77	11.5
Broken Flakes			*1	0.8	*1	0.7	1	1.1	(*4)10	4.0	(*1)2	0.4					(*19)36	15.7							(*6)15	4.1	*1	0.2	2	0.2	69	27.2
Angular Fragments											1	3.6																			1	3.6
Thermal Shatter	1	0.9							10	19.5			1	1.8	1	0.5	21	13.2							5	33.8	5	1.8	1	0.3	45	71.8
Total by Count & Weight	1	0.9	1	0.8	1	0.7	1	1.1	45	30.2	7	5.5	2	2.2	1	0.5	111	222.7	2	0.7	1	0.1	3	1.0	59	48.8	16	4.4	5	0.9	256	320.5
Frequency	0.4%	0.3%	0.4%	0.2%	0.4%	0.2%	0.4%	0.3%	17.6%	9.4%	2.7%	1.7%	0.8%	0.7%	0.4%	0.2%	43.4%	69.5%	0.8%	0.2%	0.4%	0.0%	1.2%	0.3%	23.0%	15.2%	6.3%	1.4%	2.0%	0.3%	100%	100%
Overall Total	1	0.9	3	2.8	1	0.7	2	1.4	65	63.8	7	5.5	3	3.2	1	0.5	144	257.8	5	3.0	1	0.1	3	1.0	79	90.9	28	14.5	7	2.8	350	448.9
Overall Frequency	0.3%	0.2%	0.9%	0.6%	0.3%	0.2%	0.6%	0.3%	18.6%	14.2%	2.0%	1.2%	0.9%	0.7%	0.3%	0.1%	41.1%	57.4%	1.4%	0.7%	0.3%	0.0%	0.9%	0.2%	22.6%	20.2%	8.0%	3.2%	2.0%	0.6%	100%	100%

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments; * = Heat Altered

Table A-15. Prehistoric Artifact Inventory, Mechanically Stripped Trenches (MS) and Deep-Testing Trenches, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	MS 2		Deep-Testing Trench 3		Total	
Count & Weight	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools	3 diag.					
Proj. Pts./Hafted Knives	[4]	66.2			4	66.2
Unspecified Bifaces	[*1]	34.0			1	34.0
Informal Flake Tools	5	8.0	3	16.0	8	24.0
Stone Tool Production & Maintenance Debris						
Cores						
Amorphous	1	62.3			1	62.3
Debitage						
Primary Decort. Flakes	2	12.1	2	12.1	4	24.2
Broken Flakes	1	0.3			1	0.3
Thermal Shatter			1	4.3	1	4.3
Domestic Equipment						
Hammerstones	1	441.7			1	441.7
Pitted Sandstone			1	368.2	1	368.2
Multi-Pitted Sandstone			1	1956.7	1	1956.7
Overall Total by Count & Weight	15	624.6	8	2357.3	23	2981.9

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments

Table A-16. Chert Type Identification, MS 2, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	MS 2					
Chert Type	Sonora		Wyandotte		Total	
Count & Weight	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools			3 diag.			
Proj. Pts./Hafted Knives			[4]	66.2	4	66.2
Unspecified Bifaces			[*1]	34.0	1	34.0
Informal Flake Tools			(*3)5	8.0	5	8.0
Total by Count & Weight			10	108.2	10	108.2
Frequency			100%	100%	100%	100%
Stone Tool Production & Maintenance Debris						
Cores						
Amorphous			1	62.3	1	62.3
Debitage						
Primary Decort. Flakes	1	9.2	1	2.9	2	12.1
Broken Flakes			1	0.3	1	0.3
Total by Count & Weight	1	9.2	3	65.5	4	74.7
Frequency	25.0%	12.3%	75.0%	87.7%	100%	100%
Overall Total	1	9.2	13	173.7	14	182.9
Overall Frequency	7.1%	5.0%	92.9%	95.0%	100%	100%

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments; * = Heat Altered

Table A-17. Chert Type Identification, Deep-Testing Trench 3, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Deep-Testing Trench 3							
Chert Type	Haney (Ind.)		Mounds		Wyandotte		Total	
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools								
Informal Flake Tools	*1	10.8			2	5.2	3	16.0
Total by Count & Weight	1	10.8			2	5.2	3	16.0
Frequency	33.3%	67.5%			66.7%	32.5%	100%	100%
Stone Tool Production & Maintenance Debris								
Debitage								
Primary Decort. Flakes			1	7.3	*1	4.8	2	12.1
Thermal Shatter					1	4.3	1	4.3
Total by Count & Weight			1	7.3	2	9.1	3	16.4
Frequency			33.3%	44.5%	66.7%	55.5%	100%	100%
Overall Total	1	10.8	1	7.3	4	14.3	6	32.4
Overall Frequency	16.7%	33.3%	16.7%	22.5%	66.7%	44.1%	100%	100%

Key: # = Count; Wt. = Weight in Grams; * = Heat Altered

Table A-18. Prehistoric Artifact Inventory, Features, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Feature 1		Feature 2		Feature 3		Total	
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools					diag.			
Proj. Pts./Hafted Knives					[1]	1.1	1	1.1
Informal Flake Tools	1	1.0	17	19.9	6	4.8	24	25.7
Stone Tool Production & Maintenance Debris								
Debitage								
Primary Decort. Flakes			6	2.5	1	1.7	7	4.2
Secondary Decort. Flakes					1	0.7	1	0.7
Tertiary Flakes			7	14.9	7	4.9	14	19.8
Biface-1 Flakes			1	0.3	4	2.3	5	2.6
Biface-2 Flakes	3	0.3	20	2.1	21	2.9	44	5.3
Broken Flakes	2	0.3	17	8.1	15	3.0	34	11.4
Angular Fragments	1	2.6					1	2.6
Thermal Shatter	1	0.2	14	3.3	7	22.9	22	26.4
Heating & Cooking Debris								
Cracked Rock								
Sandstone	16	651.6	183	19176.2	92	2598.1	291	22425.9
Baked Clay	2	0.9			2	1.1	4	2.0
Other Items								
Ochre	9	1.9	18	9.5	5	25.8	32	37.2
Limonite					1	0.3	1	0.3
Overall Total by Count & Weight	35	658.8	283	19236.8	163	2669.6	481	22565.2

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments

Table A-19. Chert Type Identification, Feature 1, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Feature 1		Total	
Chert Type	Wyandotte			
Count & Weight	#	Wt.	#	Wt.
Hunting & General Utility Tools				
Informal Flake Tools	*1	1.0	1	1.0
Total by Count & Weight	1	1.0	1	1.0
Frequency	100%	100%	100%	100%
Stone Tool Production & Maintenance Debris				
Debitage				
Biface-2 Flakes	3	0.3	3	0.3
Broken Flakes	2	0.3	2	0.3
Angular Fragments	*1	2.6	1	2.6
Thermal Shatter	1	0.2	1	0.2
Total by Count & Weight	7	3.4	7	3.4
Frequency	100%	100%	100%	100%
Overall Total	8	4.4	8	4.4
Overall Frequency	100%	100%	100%	100%

Key: # = Count; Wt. = Weight in Grams; * = Heat Altered

Table A-20. Chert Type Identification, Feature 2, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Feature 2						Total	
Chert Type	Haney (Ind.)		Mill Creek		Wyandotte			
Count & Weight	#	Wt.	#	Wt.	#	Wt.	#	Wt.
Hunting & General Utility Tools								
Informal Flake Tools					(*8)17	19.9	17	19.9
Total by Count & Weight					17	19.9	17	19.9
Frequency					100%	100%	100%	100%
Stone Tool Production & Maintenance Debris								
Debitage								
Primary Decort. Flakes					6	2.5	6	2.5
Tertiary Flakes					(*5)7	14.9	7	14.9
Biface-1 Flakes					*1	0.3	1	0.3
Biface-2 Flakes	1	0.1			(*5)19	2.0	20	2.1
Broken Flakes			2	0.6	(*5)15	7.5	17	8.1
Thermal Shatter					14	3.3	14	3.3
Total by Count & Weight	1	0.1	2	0.6	62	30.5	65	31.2
Frequency	1.5%	0.3%	3.1%	1.9%	95.4%	97.8%	100%	100%
Overall Total	1	0.1	2	0.6	79	50.4	82	51.1
Overall Frequency	1.2%	0.2%	2.4%	1.2%	96.3%	98.6%	100%	100%

Key: # = Count; Wt. = Weight in Grams; * = Heat Altered

Table A-21. Chert Type Identification, Feature 3, Site 15Mu296.

15Mu296, Oxford Coal-Ph. I	Feature 3		Total	
Chert Type	Wyandotte			
Count & Weight	#	Wt.	#	Wt.
Hunting & General Utility Tools	diag.			
Proj. Pts./Hafted Knives	[*1]	1.1	1	1.1
Informal Flake Tools	(*2)6	4.8	6	4.8
Total by Count & Weight	7	5.9	7	5.9
Frequency	100%	100%	100%	100%
Stone Tool Production & Maintenance Debris				
Debitage				
Primary Decort. Flakes	1	1.7	1	1.7
Secondary Decort. Flakes	*1	0.7	1	0.7
Tertiary Flakes	(*1)7	4.9	7	4.9
Biface-1 Flakes	4	2.3	4	2.3
Biface-2 Flakes	(*3)21	2.9	21	2.9
Broken Flakes	(*3)15	3.0	15	3.0
Thermal Shatter	7	22.9	7	22.9
Total by Count & Weight	56	38.4	56	38.4
Frequency	100%	100%	100%	100%
Overall Total	63	44.3	63	44.3
Overall Frequency	100%	100%	100%	100%

Key: # = Count; Wt. = Weight in Grams; [ ] = Fragments; * = Heat Altered

Appendix B - Radiocarbon Dating Assay

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DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Steve Titus

Report Date: 8/23/2011

American Resources Group, Ltd.

Material Received: 8/9/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 303794	4950 +/- 60 BP	-24.4 o/oo	4960 +/- 60 BP

SAMPLE : F3 15Mu296
ANALYSIS : Radiometric-Standard delivery (with extended counting)
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 3940 to 3850 (Cal BP 5890 to 5800) AND Cal BC 3820 to 3640 (Cal BP 5770 to 5590)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

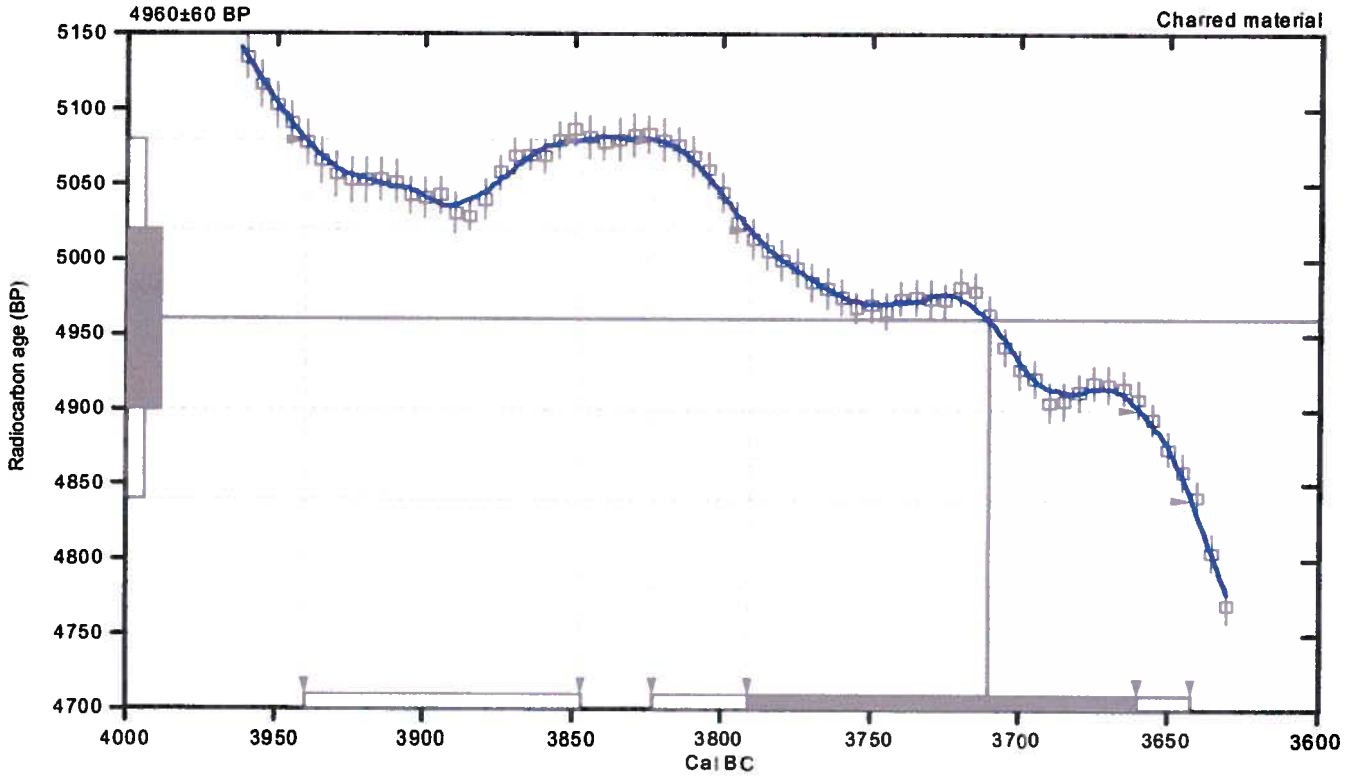
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.4:lab. mult=1)

Laboratory number:	**Beta-303794**
Conventional radiocarbon age:	**4960±60 BP**
2 Sigma calibrated results: (95% probability)	**Cal BC 3940 to 3850 (Cal BP 5890 to 5800) and Cal BC 3820 to 3640 (Cal BP 5770 to 5590)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 3710 (Cal BP 5660)
1 Sigma calibrated result: (68% probability)	Cal BC 3790 to 3660 (Cal BP 5740 to 5610)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

COMMONWEALTH OF KENTUCKY
ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER

APPLICATION FOR PERMIT TO CONSTRUCT ACROSS OR ALONG A STREAM AND / OR WATER QUALITY CERTIFICATION

Chapter 151 of the Kentucky Revised Statutes requires approval from the Division of Water prior to any construction or other activity in or along a stream that could in any way obstruct flood flows or adversely impact water quality. *If the project involves work in a stream, such as bank stabilization, dredging or relocation, a 401 Water Quality Certification (WQC) from the Division of Water will be required.* This completed form will be forwarded to the Water Quality Branch for WQC processing. The project may not start until all necessary approvals are received from the KDOW. For questions concerning the WQC process, contact the WQC section at 502/564-3410.

If the project will disturb more than 1 acre of soil, A Notice of Intent for Storm Water Discharges will also be required. Both forms must be returned to the Floodplain Management Section of the Division of Water.

1. **OWNER:** Oxford Mining Company - Kentucky, LLC / Sean Jones
   Give name of person(s), company, governmental unit, or other owner of proposed project.
   MAILING ADDRESS: PO Box 427, 544 Chestnut St. Coshockton, OH 43812
   TELEPHONE #: (270) 754-2815 **EMAIL:** sjones@oxfordresources.com
2. **AGENT:** Aquatic Resources Management / Nick Baker
   Give name of person(s) submitting application, if other than owner.
   ADDRESS: 2265 Harrodsburg Rd. Suite 210 Lexington, KY 40504
   TELEPHONE #: (859) 388-9595 **EMAIL:** nbaker@aquaticresources.us
3. **ENGINEER:** _____ **P.E. NUMBER:** _____
   Contact Division of Water if waiver can be granted.
   TELEPHONE #: _____ **EMAIL:** _____
4. **DESCRIPTION OF CONSTRUCTION:** Surface mining techniques and sediment control structures are
   List the items to be constructed in the floodplain
   proposed for construction within the 100 year floodplain of an unnamed tributary to Elk Pond Creek. The proposed project will impact approximately 1896.5 linear feet of stream that utilizes this floodplain. Please refer to attached mapping for locations of project as well as streams and FEMA designated 100 year floodplain.
5. **COUNTY:** Muhlenberg **NEAREST COMMUNITY:** Greenville
6. **USGS QUAD NAME** Greenville **LATITUDE/LONGITUDE:** 37-12-42, -87-12-44
7. **STREAM NAME:** UT to Elk Pond Creek **WATERSHED SIZE (in acres):** 1655
8. **LINEAR FEET OF STREAM IMPACTED:** 18,814.6
9. **DIRECTIONS TO SITE:** Entrance to site at 37° 12' 42"N & -87° 13' 44"W, off of US Highway 62, approximately 3.0 miles west of Greenville Kentucky.

10. **IS ANY PORTION OF THE REQUESTED PROJECT NOW COMPLETE?** ☐ Yes ■ No If yes, identify the completed portion on the drawings you submit and indicate the date activity was completed. DATE: _____

11. **ESTIMATED BEGIN CONSTRUCTION DATE:** December 2012

12. **ESTIMATED END CONSTRUCTION DATE:** December 2016

13. **HAS A PERMIT BEEN RECEIVED FROM THE US ARMY, CORPS of ENGINEERS?** ☐ Yes ■ No If yes, attach a copy of that permit.

14. **THE APPLICANT *MUST* ADDRESS PUBLIC NOTICE:**

(a) PUBLIC NOTICE HAS BEEN GIVEN FOR THIS PROPOSAL BY THE FOLLOWING MEANS:

X **Public notice in newspaper having greatest circulation in area** (provide newspaper clipping or affidavit)

____ **Adjacent property owner(s) affidavits** (Contact Division of Water for requirements.)

(b) ____ **I REQUEST WAIVER OF PUBLIC NOTICE BECAUSE:**

_____

Contact Division of Water for requirements.

15. **I HAVE CONTACTED THE FOLLOWING CITY OR COUNTY OFFICIALS CONCERNING THIS PROJECT:**

Keith Putnam, Muhlenberg County Local Floodplain Coordinator.

Give name and title of person(s) contacted and provide copy of any approval city or county may have issued.

16. **LIST OF ATTACHMENTS:** USGS topographic map, Mining and Reclamation Plan Map, and FEMA 100-year floodplain location map.

List plans, profiles, or other drawings and data submitted. Attach a copy of a 7.5 minute USGS topographic map clearly showing the project location.

17. **I,** _____ **(owners Initials) CERTIFY THAT THE OWNER OWNS OR HAS EASEMENT RIGHTS ON ALL PROPERTY ON WHICH THIS PROJECT WILL BE LOCATED OR ON WHICH RELATED CONSTRUCTION WILL OCCUR** (for dams, this includes the area that would be impounded during the design flood).

18. **REMARKS:** _____

I hereby request approval for construction across or along a stream as described in this application and any accompanying documents. To the best of my knowledge, all the information provided is true and correct.

SIGNATURE: _____

Owner or Agent sign here. (If signed by Agent, a Power of Attorney should be attached.)

DATE: 3/5/2018

SIGNATURE OF LOCAL FLOODPLAIN COORDINATOR:

_____

Permit application will be returned to applicant if not properly endorsed by the local floodplain coordinator.

DATE: _____

SUBMIT APPLICATION AND ATTACHMENTS TO:

Floodplain Management Section
Division of Water
200 Fair Oaks Lane
Frankfort, KY 40601

Appendix E Impact Resources Summary Table

Impact Resource Summary Table

Permit: 889-0130

Resource Impacted: Stream

Impact Duration: Permanent

Impact Type: Mine Through

Impact Resource Name	Permanancy	Impact Length (ft)	Rosgen Stream Type	Watershed (ac)	Stream Width (ft)	Stream/ Wetland Area (ac)	RBP Score	Stream Quality	SFSQR	AMU's	Latitude	Longitude	Cowardin Class
Stream Flow Regime: Ephemeral													
s1a7e3	Ephemeral	560.80	A4	25.00	2	0.0257	61	Marginal	0.5	280.40	37.2017	-87.2293	R6
s1a5	Ephemeral	1,077.90	B5	91.00	4.5	0.1114	92	Marginal	0.5	538.95	37.1937	-87.2398	R6
s1a6a	Ephemeral	345.00	B5	26.00	2.8	0.0222	88	Marginal	0.5	172.50	37.1947	-87.2342	R6
s1a6a1	Ephemeral	494.00	B6	11.00	3.5	0.0397	94	Marginal	0.5	247.00	37.1938	-87.2338	R6
s1a6a2	Ephemeral	904.00	B6	11.00	3.3	0.0685	82	Marginal	0.5	452.00	37.1938	-87.2338	R6
s1a7a	Ephemeral	319.00	E4	4.00	3.8	0.0278	63	Marginal	0.5	159.50	37.1942	-87.2379	R6
s1a7b	Ephemeral	461.30	B5	25.00	4.6	0.0487	90	Marginal	0.5	230.65	37.1961	-87.2349	R6
s1a7c	Ephemeral	766.40	G6	39.00	4.6	0.0809	69	Marginal	0.5	383.20	37.1974	-87.2316	R6
s1a7d	Ephemeral	435.10	B6	27.00	2.9	0.0290	83	Marginal	0.5	217.55	37.1991	-87.231	R6
s1a7e	Ephemeral	715.80	B6	87.00	5.5	0.0904	103	Suboptimal	0.5	357.90	37.2011	-87.2292	R6
s1a7e1	Ephemeral	426.60	B6	37.00	3	0.0294	91	Marginal	0.5	213.30	37.2011	-87.2292	R6
s1a7e2	Ephemeral	183.10	B6	14.00	2.4	0.0101	81	Marginal	0.5	91.55	37.2026	-87.2301	R6
Totals for Ephemeral:		**6,689.00**				**0.5837**				**3,344.50**			
Stream Flow Regime: Intermittent													
s1a6	Intermittent	2,497.00	G4	267.00	7.3	0.4185	97	Marginal	1	2,497.00	37.1938	-87.2387	R4SB4
s1a7g	Intermittent	313.00	G4	374.00	13.1	0.0941	94	Marginal	1	313.00	37.202	-87.2271	R4SB3
s1a	Intermittent	1,896.50	G4	1,655.00	18.6	0.8098	87	Marginal	1	1,896.50	37.193	-87.244	R4SB3
s1a6b	Intermittent	720.00	B5	116.00	8.1	0.1339	95	Marginal	1	720.00	37.1946	-87.2309	R4SB4
s1a6c	Intermittent	666.00	B6	94.00	10.1	0.1544	94	Marginal	1	666.00	37.1946	-87.2309	R4SB4
s1a7	Intermittent	5,042.30	G4	929.00	14.4	1.6669	87	Marginal	1	5,042.30	37.1938	-87.2387	R4SB4
s1a7f	Intermittent	770.80	G4	290.00	8.8	0.1557	98	Marginal	1	770.80	37.202	-87.2271	R4SB3
Totals for Intermittent:		**11,905.60**				**3.4333**				**11,905.60**			
Totals for Mine Through:		**18,594.60**				**4.0170**				**15,250.10**			

Impact Type: Road Crossing

Impact Resource Name	Permanancy	Impact Length (ft)	Rosgen Stream Type	Watershed (ac)	Stream Width (ft)	Stream/ Wetland Area (ac)	RBP Score	Stream Quality	SFSQR	AMU's	Latitude	Longitude	Cowardin Class
Stream Flow Regime: Intermittent													
s1a3	Intermittent	220.00	G4	262.00	14.7	0.0742	96	Marginal	1	220.00	37.1916	-87.2452	R4SB3
Totals for Intermittent:		**220.00**				**0.0742**				**220.00**			
Totals for Road Crossing:		**220.00**				**0.0742**				**220.00**			
Totals for Permanent:		**18,814.60**				**4.0913**				**15,470.10**			
Totals for Stream:		**18,814.60**				**4.0913**				**15,470.10**			

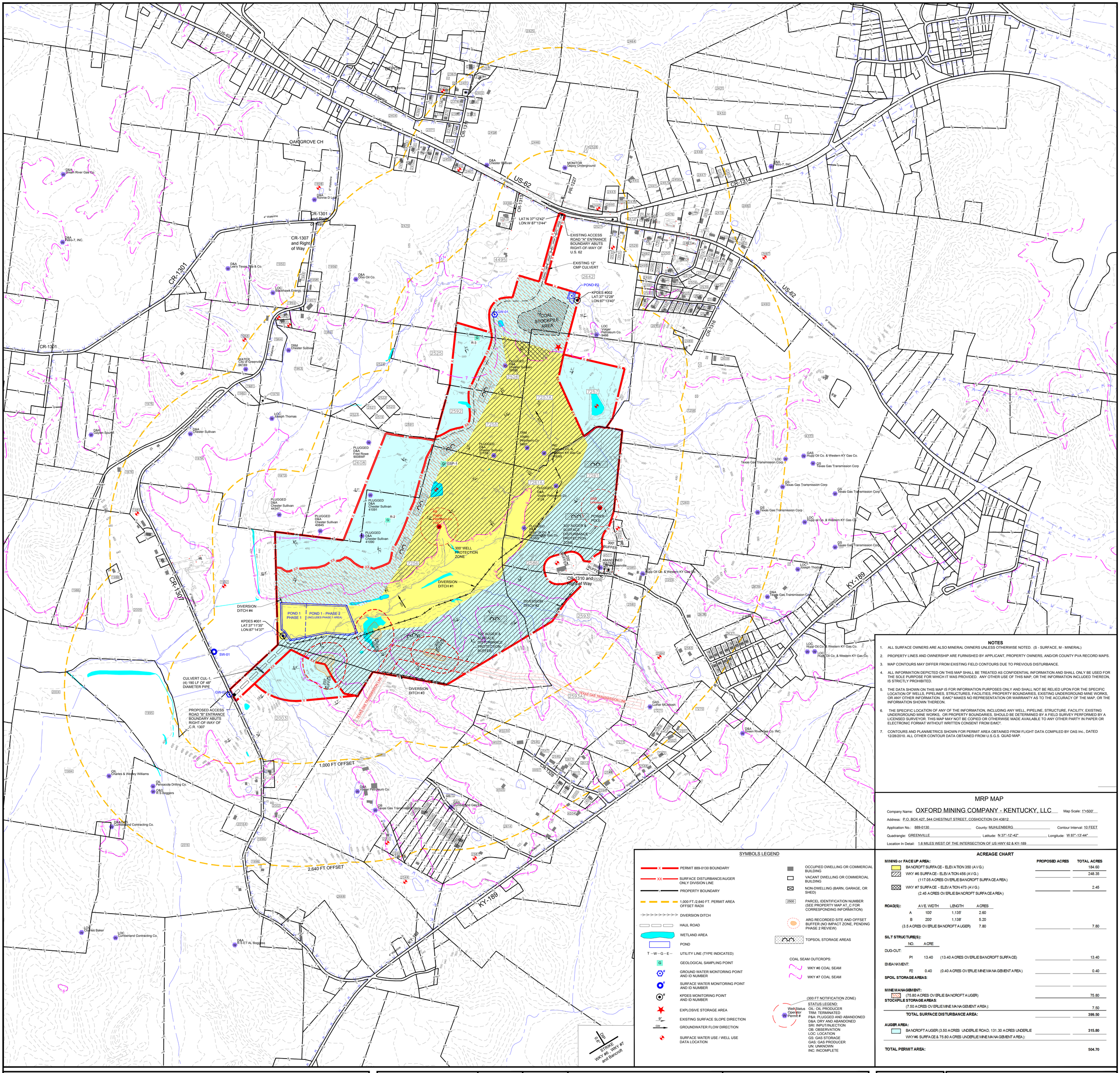
Resource Impacted: Wetland

Impact Duration: Permanent

Impact Type: Mine Through

Stream Flow Regime: Emergent													
14	Emergent					0.1400				0.28			PEM
30	Emergent					0.1600				0.32			PEM
29	Emergent					0.0800				0.16			PEM
28	Emergent					1.7900				3.58			PEM
15	Emergent					0.0500				0.10			PEM
12	Emergent					0.0500				0.10			PEM
10	Emergent					0.1900				0.38			PEM
32	Emergent					0.1600				0.32			PEM
Totals for Emergent:						**2.6200**				**5.24**			
Stream Flow Regime: Open Water													
4	Open Water					0.1600				0.32			Open Water
7	Open Water					0.8800				1.76			Open Water
Totals for Open Water:						**1.0400**				**2.08**			
Stream Flow Regime: Shrub													
8	Shrub					0.0900				0.18			PSS
11	Shrub					0.0600				0.12			PSS
9	Shrub					0.4000				0.80			PSS
31	Shrub					0.1100				0.22			PSS
13	Shrub					0.0200				0.04			PSS
Totals for Shrub:						**0.6800**				**1.36**			
Totals for Mine Through:						**4.3400**				**8.68**			

Impact Resource Name	Permanancy	Impact Length (ft)	Rosgen Stream Type	Watershed (ac)	Stream Width (ft)	Stream/ Wetland Area (ac)	RBP Score	Stream Quality	SFSQR	AMU's	Latitude	Longitude	Cowardin Class
Totals for Permanent:						4.3400				8.68			
Totals for Wetland:						4.3400				8.68			



NOTES

1. ALL SURFACE OWNERS ARE ALSO MINERAL OWNERS UNLESS OTHERWISE NOTED. (S - SURFACE, M - MINERAL)
2. PROPERTY LINES AND OWNERSHIP ARE FURNISHED BY APPLICANT, PROPERTY OWNERS, AND/OR COUNTY PVA RECORD MAPS.
3. MAP CONTOURS MAY DIFFER FROM EXISTING FIELD CONTOURS DUE TO PREVIOUS DISTURBANCE.
4. ALL INFORMATION DEPICTED ON THIS MAP SHALL BE TREATED AS CONFIDENTIAL INFORMATION AND SHALL ONLY BE USED FOR THE SOLE PURPOSE FOR WHICH IT WAS PROVIDED. ANY OTHER USE OF THIS MAP, OR THE INFORMATION INCLUDED THEREON, IS STRICTLY PROHIBITED.
5. THE DATA SHOWN ON THIS MAP IS FOR INFORMATION PURPOSES ONLY AND SHALL NOT BE RELIED UPON FOR THE SPECIFIC LOCATION OF WELLS, PIPELINES, STRUCTURES, FACILITIES, PROPERTY BOUNDARIES, EXISTING UNDERGROUND MINE WORKS, OR ANY OTHER INFORMATION. ErMC² MAKES NO REPRESENTATION OR WARRANTY AS TO THE ACCURACY OF THE MAP, OR THE INFORMATION SHOWN THEREON.
6. THE SPECIFIC LOCATION OF ANY OF THE INFORMATION, INCLUDING ANY WELL, PIPELINE, STRUCTURE, FACILITY, EXISTING UNDERGROUND MINE WORKS, OR PROPERTY BOUNDARIES, SHOULD BE DETERMINED BY A FIELD SURVEY PERFORMED BY A LICENSED SURVEYOR. THIS MAP MAY NOT BE COPIED OR OTHERWISE MADE AVAILABLE TO ANY OTHER PARTY IN PAPER OR ELECTRONIC FORMAT WITHOUT WRITTEN CONSENT FROM ErMC².
7. CONTOURS AND PLANIMETRICS SHOWN FOR PERMIT AREA OBTAINED FROM FLIGHT DATA COMPILED BY OAS Inc., DATED 12/28/2010. ALL OTHER CONTOUR DATA OBTAINED FROM U.S.G.S. QUAD MAP.

MRP MAP

Company Name: OXFORD MINING COMPANY - KENTUCKY, LLC — Map Scale: 1"=500'

Address: P.O. BOX 427, 544 CHESTNUT STREET, COSHOCTION OH 43812

Application No.: 889-0130 — County: MUHLENBERG — Contour Interval: 10 FEET

Quadrangle: GREENVILLE — Latitude: N 37°-12'-42" — Longitude: W 87°-13'-44"

Location In Detail: 1.6 MILES WEST OF THE INTERSECTION OF US HWY 62 & KY-189

SYMBOLS LEGEND

- PERMIT 889-0130 BOUNDARY
- SURFACE DISTURBANCE/AUGER ONLY DIVISION LINE
- PROPERTY BOUNDARY
- 1,000 FT./2,640 FT. PERMIT AREA OFFSET RADII
- DIVERSION DITCH
- HAUL ROAD
- WETLAND AREA
- POND
- T —W—G—E— UTILITY LINE (TYPE INDICATED)
- GEOLOGICAL SAMPLING POINT
- GROUND WATER MONTORING POINT AND ID NUMBER
- SURFACE WATER MONITORING POINT AND ID NUMBER
- KPDES MONITORING POINT AND ID NUMBER
- EXPLOSIVE STORAGE AREA
- EXISTING SURFACE SLOPE DIRECTION
- GROUNDWATER FLOW DIRECTION
- SURFACE WATER USE / WELL USE DATA LOCATION
- OCCUPIED DWELLING OR COMMERCIAL BUILDING
- VACANT DWELLING OR COMMERCIAL BUILDING
- NON-DWELLING (BARN, GARAGE, OR SHED)
- 2500 PARCEL IDENTIFICATION NUMBER (SEE PROPERTY MAP AT_C FOR CORRESPONDING INFORMATION)
- ARG RECORDED SITE AND OFFSET BUFFER (NO IMPACT ZONE, PENDING PHASE 2 REVIEW)
- TOPSOIL STORAGE AREAS

COAL SEAM OUTCROPS:
- WKY #6 COAL SEAM
- WKY #7 COAL SEAM

(300 FT NOTIFICATION ZONE)

Well Status / Operator / Permit #

STATUS LEGEND:
OIL: OIL PRODUCER
TRM: TERMINATED
P&A: PLUGGED AND ABANDONED
D&A: DRY AND ABANDONED
SRI: INPUT/INJECTION
OB: OBSERVATION
LOC: LOCATION
GS: GAS STORAGE
GAS: GAS PRODUCER
UN: UNKNOWN
INC: INCOMPLETE

ACREAGE CHART

	PROPOSED ACRES	TOTAL ACRES
MINING or FACE UP AREA:		
BANCROFT SURFACE - ELEVATION 350 (AVG.)		184.60
WKY #6 SURFACE - ELEVATION 456 (AVG.) (117.05 ACRES OVERLIE BANCROFT SURFACE AREA)		248.35
WKY #7 SURFACE - ELEVATION 473 (AVG.) (2.45 ACRES OVERLIE BANCROFT SURFACE AREA)		2.45
ROAD(S): AVE. WIDTH / LENGTH / ACRES		
A 100' 1,135' 2.60		
B 200' 1,138' 5.20		
(3.5 ACRES OVERLIE BANCROFT AUGER) 7.80		7.80
SILT STRUCTURE(S): NO. / ACRE		
DUG-OUT: P1 13.40 (13.40 ACRES OVERLIE BANCROFT SURFACE)		13.40
EMBANKMENT: P2 0.40 (0.40 ACRES OVERLIE MINE MANAGEMENT AREA)		0.40
SPOIL STORAGE AREAS:		
MINE MANAGEMENT: (75.80 ACRES OVERLIE BANCROFT AUGER)		75.80
STOCKPILE STORAGE AREAS: (7.50 ACRES OVERLIE MINE MANAGEMENT AREA):		7.50
TOTAL SURFACE DISTURBANCE AREA:		399.50
AUGER AREA: BANCROFT AUGER (3.50 ACRES UNDERLIE ROAD, 131.30 ACRES UNDERLIE WKY#6 SURFACE & 75.80 ACRES UNDERLIE MINE MANAGEMENT AREA):		315.80
TOTAL PERMIT AREA:		504.70

0' 500' 1000' 1500'

Drawn by: RBE — Date: 2/23/2012

Job #: 080-002 — Scale: 1"= 500'

File Location: M:\080 Oxford\002 Geibel Property 889-0130\CAD\AT_A

SEAL

I, R. Dale Davis — Signature — 9675 Registration — 2/23/2012 Date

Hereby Certify, In Accordance With 405 KAR 7:040, Section 10 That This Document Is Correct As determined By Accepted Engineering Practices And Includes All The Information Required Of It By KRS Charpter 350 And KAR Title 405

Environmental Resources Management Consulting Company, LLC

LEXINGTON LOCATION
2265 Harrodsburg Rd., Suite 200
Lexington, KY 40504
(859) 381-1000

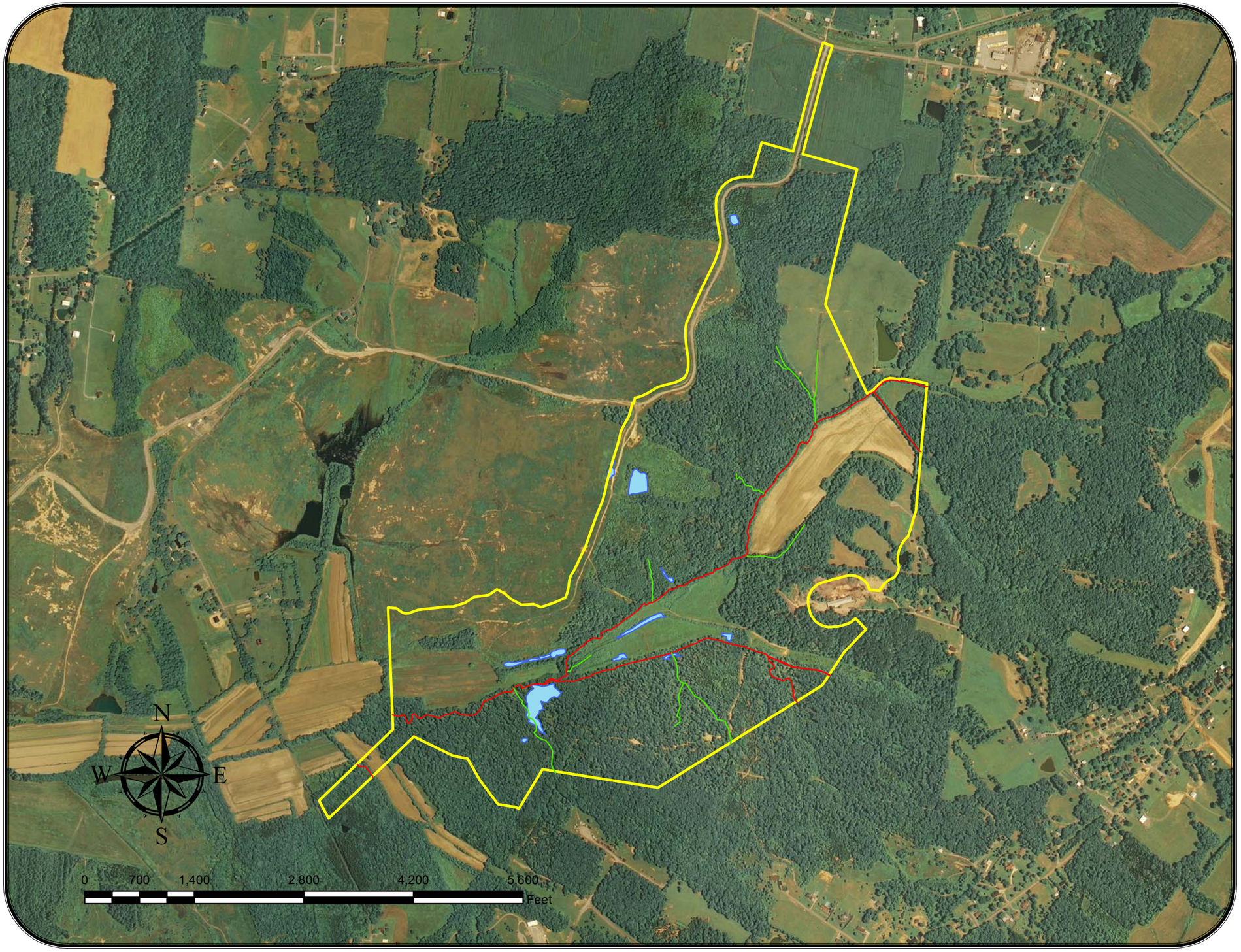
MADISONVILLE LOCATION
229 Madison Square Drive
Madisonville, KY 42431
(270) 452-2740

Website: www.ermc2.us Email: engineering@ermc2.us

Oxford Mining Company - Kentucky, LLC
889-0130
Mining and Reclamation Plan
AT_A

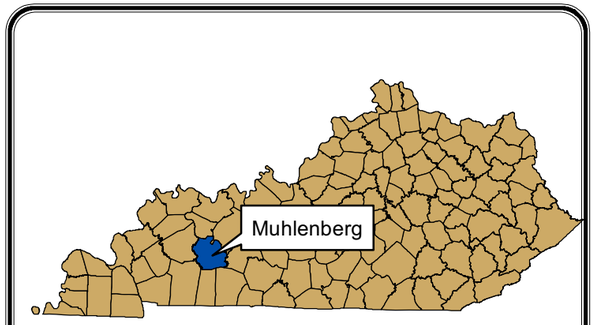
Appendix G Aerial Maps-2006, 2008, 2010

2006 Aerial Location Map



Legend

- Ephemeral
- Intermittent
- Permit Boundary
- Wetland



Oxford Mining Company

889-0130

Oxford Resource Partners

Reliability Matters

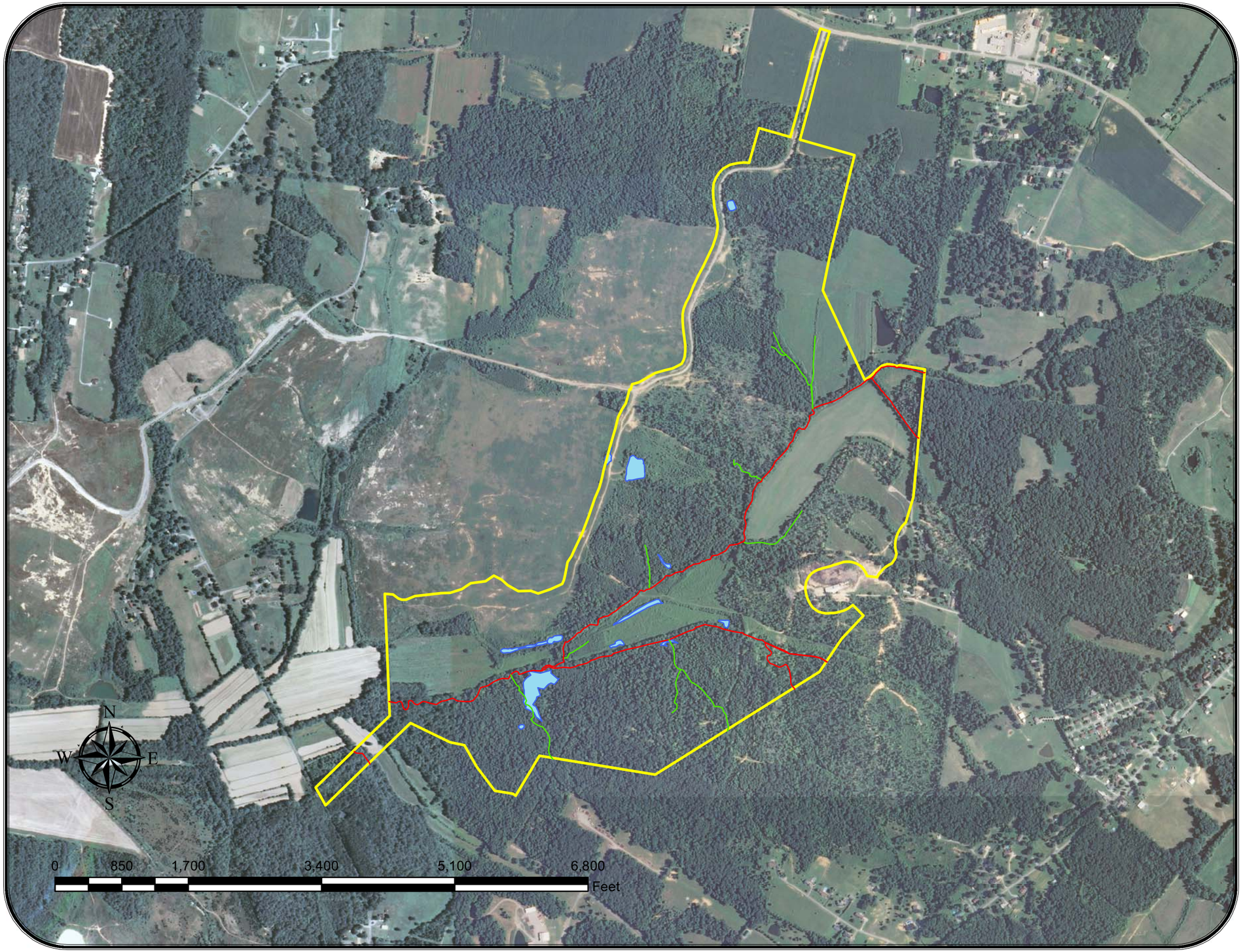
P.O. Box 427, 544 Chestnut Street, Coshoctin, OH 43812

Date: 2/3/2012 Drawn By: CJR

ARM Project #: 080-502

Aquatic Resources Management
2265 Harrodsburg Rd., Suite 210
Lexington, KY 40504
(859) 388-9595

2008 Aerial Location Map



Legend

- Ephemeral
- Intermittent
- Permit Boundary
- Wetland

Oxford Mining Company

889-0130

Oxford Resource Partners

Reliability Matters

P.O. Box 427, 544 Chestnut Street, Coshoctin, OH 43812

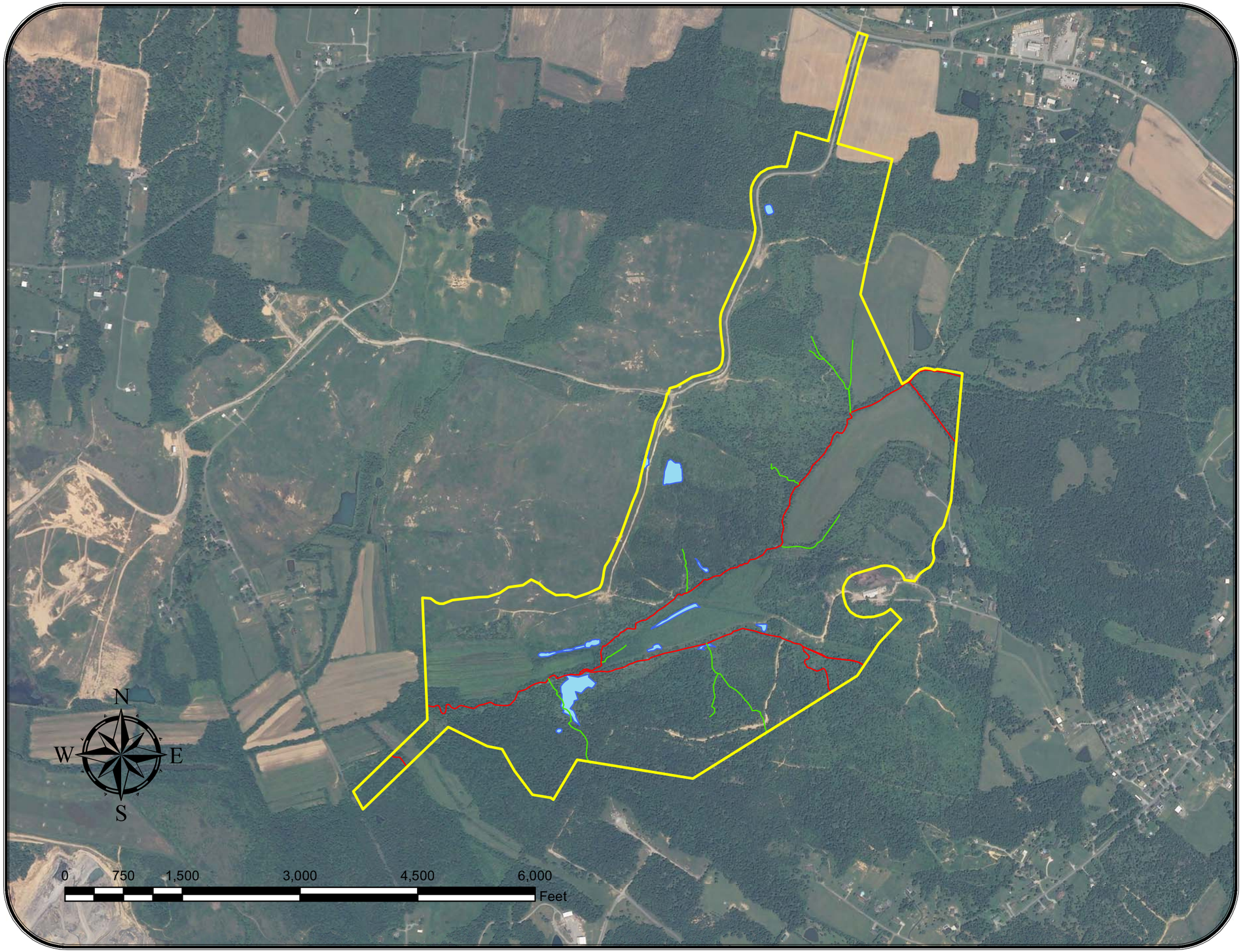
Date: 2/3/2012 Drawn By: CJR

ARM Project #: 080-502

Aquatic Resources Management

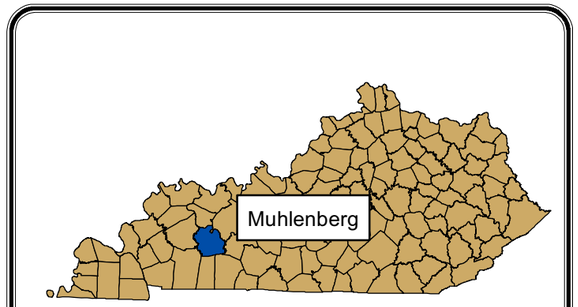
2265 Harrodsburg Rd., Suite 210
Lexington, KY 40504
(859) 388-9595

2010 Aerial Location Map



Legend

- Ephemeral
- Intermittent
- Permit Boundary
- Wetland



Oxford Mining Company
889-0130

Oxford Resource Partners
Reliability Matters

P.O. Box 427, 544 Chestnut Street, Coshoctin, OH 43812

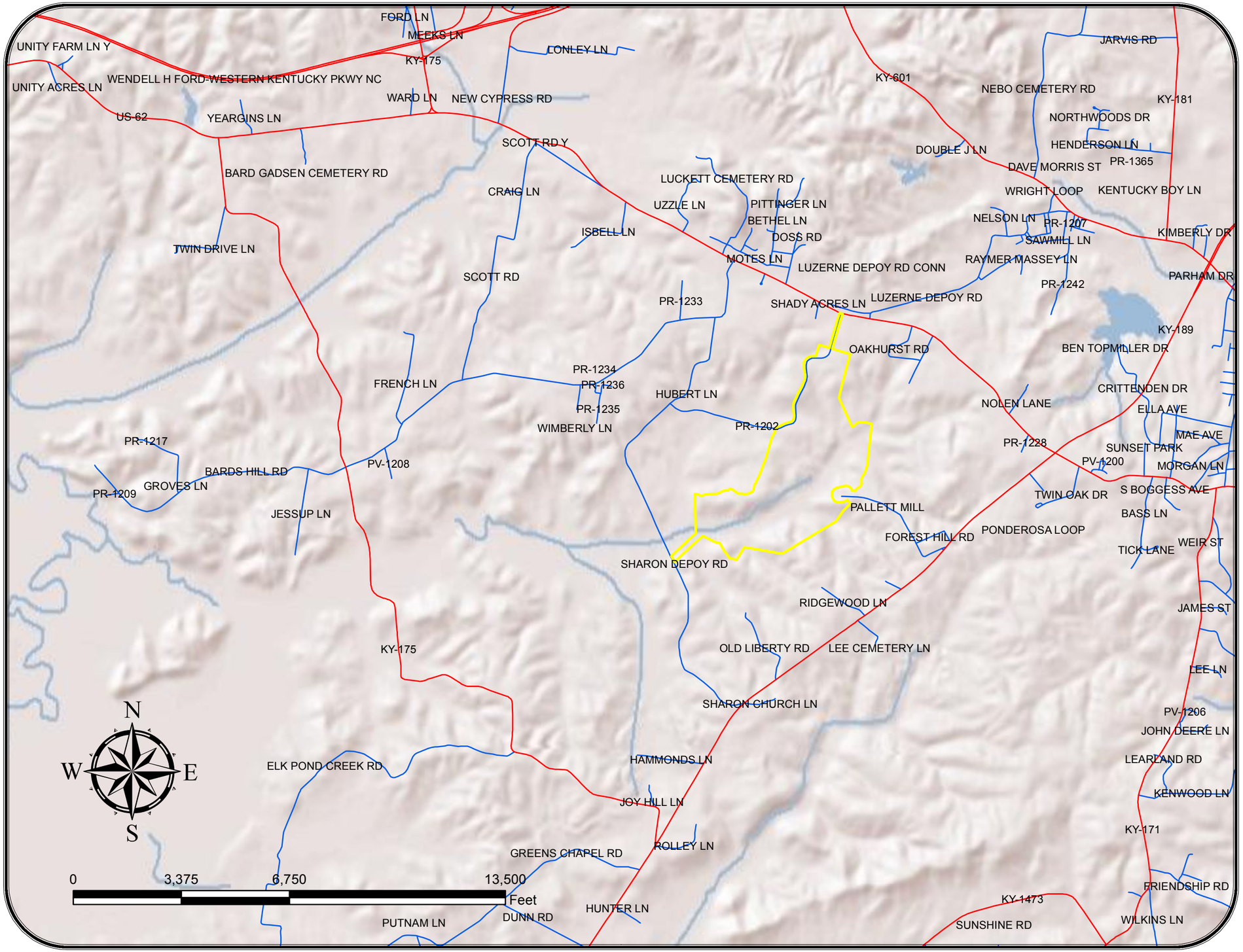
Date: 2/3/2012 Drawn By: CJR

ARM Project #: 080-502

Aquatic Resources Management
2265 Harrodsburg Rd., Suite 210
Lexington, KY 40504
(859) 388-9595

Appendix H Road Map

County Road Location Map



Legend

- Permit Boundary
- State Roads
- Local Roads

U.S. Coal Corporation

889-0130

Oxford Resource Partners

Reliability Matters

P.O. Box 427, 544 Chestnut Street, Coshoctin, OH 43812

Date: 3/27/2012

Drawn By: CJR

ARM Project #: 080-502

Aquatic Resources Management

2265 Harrodsburg Rd., Suite 210
Lexington, KY 40504
(859) 388-9595

Appendix I Typical Stream Restoration Plans

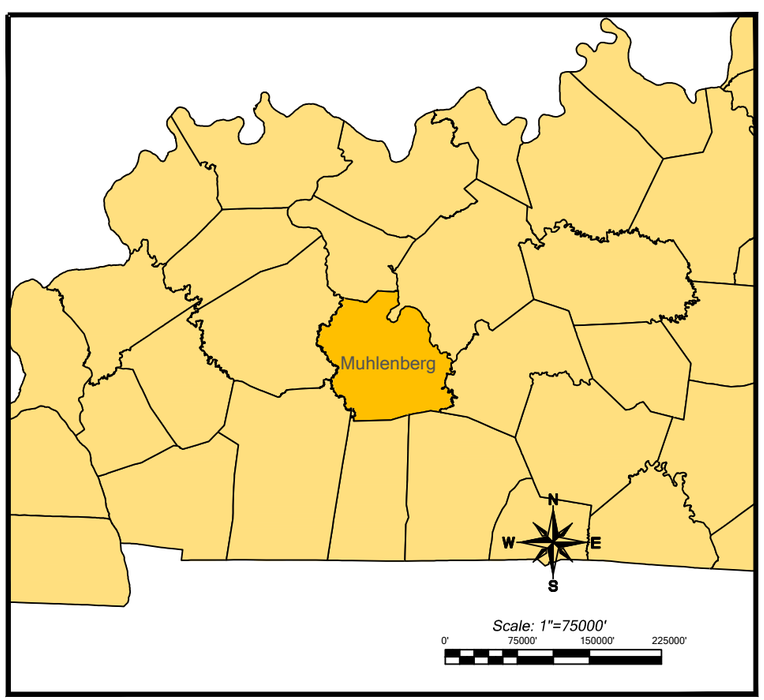
STREAM RESTORATION
S1A and S1A7
PERMIT NO. 889-0130

FOR

Oxford Mining Company - Kentucky, LLC

P.O. Box 427, 544 Chestnut St. Coshockton, OH 43812

County Map

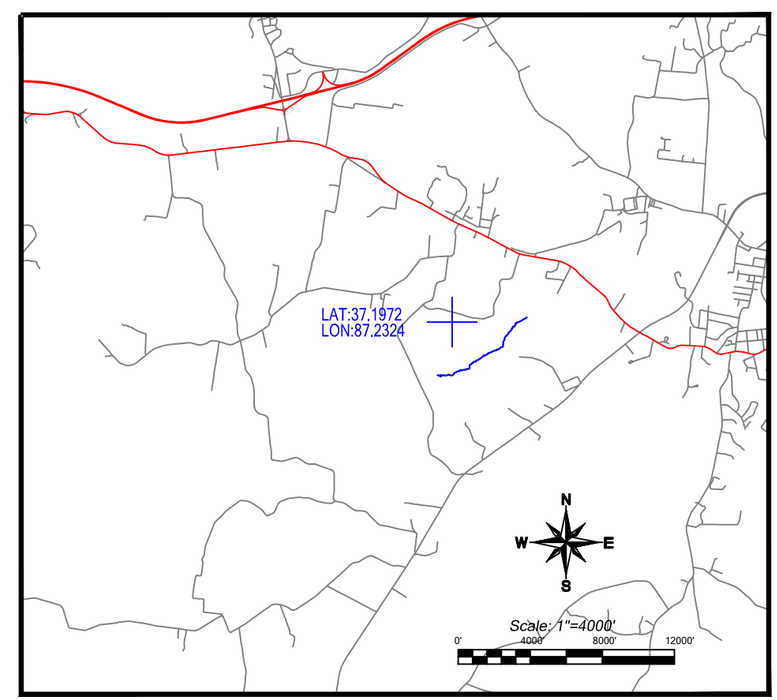


Oxford Resource Partners
Reliability Matters

Aquatic Resources Management
2265 Harrodsburg Rd., Suite 210
Lexington, KY 40504
(859) 388-9595

February 2, 2012

Vicinity Map



General Notes

Geomorphology

This stream restoration project has one stream classification (C4) utilized in the stream geomorphology natural channel design. Specifically this reach/type of stream will be constructed to meet the classification of the Stream Type. Once the final regrade has been completed slopes will be determined for the final stream design. Since so many parameters depend on the slope of the channel, the plans are only typical design parameters for the restoration. Final plans will be submitted after completion of the mining.

Stream Definitions & Characteristics

Stream orientation and geomorphology will always be constructed in the direction of looking downstream at all times unless other wise directed.

1. Bankfull Discharge: The discharge and corresponding stage at the incipient point of flooding begins.

2. Bankfull Width: the width of the channel is measured at this elevation. (See Typical)

3. Bankfull Mean Depth: The mean depth of flow at the Bankfull stage, determined by the cross-sectional area of the riffle or the pool. (See Typical)

4. Bankfull Max Depth: The max depth of flow at the Bankfull stage, determined by the cross-sectional area of the riffle or the pool. (See Typical)

5. Flood-prone area width: the width associated with a value of twice the Bankfull depth. it is the area including the flood plain of the stream.

6. Riffle: The shallow section of a stream that is characterized by increased velocities and gradients.

8. Step: The shallow section of a high gradient stream that is short in length and shallow in depth. Typically the steps are much more narrow than the pools found in a specific reach.

9. Pool: The deep section of a stream that is characterized by decreased velocities and gradient.

10. Low Flow Channel: A channel created to increase shear stress and enable flows in low periods to transport suspended sediment efficiently.

11. Thalweg: The lowest elevation found within the stream channel. This may be the basis for the stream stationing also.

12. Right Bank: Looking downstream the bank immediately to the right side.

13. Left Bank: Looking downstream the bank immediately to the left side.

14. Sinuosity: The ratio of stream length to down valley distance. Sinusity is the stream length X valley length

15. Cross-Vane: The objectives of this structures are to: (1) create in-stream cover/holding water; (2) take excess shear stress away from the "near bank" region and direct the water to the center of the stream to maintain lateral stability; (3) increase stream depth by decreasing width/depth ratio; (4) increase sediment transport capacity; (5) provide a natural sorting of gravel on the up-welling portion on the downstream side of structure for spawning; (6) create grade control to prevent down cutting.

15. J-Hook: This structure is designed to re-direct velocity distribution and high velocity gradient in the near-bank region, stabilize stream banks, dissipate energy in deep, wide and long pools created below the structure, create holding cover for fish and spawning habitat in the tail-out of the structure.

16. Footer Rock: The rock place on the bottom of the structure underneath the surface rock. This rock shall be larger than surface rocks and flat (not rounded).

17. Surface Rock: This rock is placed on top of the footer rock. The rock shall be smaller than the footer rock and flat (not rounded).

18. Log Weir: This structure is designed to control grade and decrease velocity on the downstream side by creating a scour pool.

Tree & Shrub Planting

Trees and shrubs should be planted on 12' centers.
Trees and shrubs should be planted with their top major roots even with the soil line.
Trees and shrubs planted at the wrong depth do not develop well and may have shortened life spans. Excess soil should be removed before planting.
Planting will begin at the ordinary high water mark and extend 50' on each side of the restored stream.

The planting Hole:
Dig a pit at least twice the diameter of the root mass and deep enough to place the root flare even with or up to one inch higher than the soil line. Handle the tree or shrub by the root mass and not by the trunk. Ensure the root mass or container is on solid ground to prevent settling.

Backfill Soil:
Make sure the tree or shrub is straight before backfilling. Use the same soil that came out of the pit. Chop the soil and remove any stones or debris. Avoid potting soil, peat moss or other amendments. Fill the hole halfway, watering thoroughly as you go, then finish backfilling. Work the soil around the ball gently so that no air pockets are left. Firm the soil so the tree is vertical and adequately supported, but do not compact the soil.

Water:
Saturate the entire backfilled soil with water. A slow gently soaking is best. Add more soil if need to compensate for settling.

Stakes:
Stakes may be used to prevent shifting of the root mass. The tree or shrubs shall be allowed to sway six (6) to eight (8) inches. Drive the stakes near the tree or shrub, but not through the roots.

General Construction Sequence

Stream construction should proceed in an upstream to downstream manner to avoid disrupting restored sections. All substrate will be durable, non-toxic, non-acidic, and a minimum of six inched deep.
Whenever possible create the new stream channel via survey in the low/no flow periods or in a newly excavated channel. The dimension, pattern, and profile along with stream structures shall be in place prior to water flow in the newly created channel. If possible the channel should be allowed one (1) growing season prior to water flow.

1. Contractor shall locate and identify the thalweg/centerline via survey prior to excavation of stream channel.

2. Contractor shall identify and locate areas to be utilized as riffles, pools, and structures via survey prior to construction. (See Plan, Grading and Detail sheets)

3.Excavate the riffle Bankfull Channels as indicated on the profile and cross-section. (See Typical)

4. Excavate and place structures within the Bankfull Channel in the appropriate locations located by survey prior to construction. (See Plan View & Grading)

5. Excavate pools within the Bankfull Channel located via survey prior to construction. (See Profile and/or Plan View).

6. Construct the Flood-prone area width while grading the side slopes. (See Typical)

7. Prepare the side slopes for seeding and the riparian vegetation.

8. Seed the riparian area while planting the riparian trees and shrubs. (See Riparian Detail Sheet)

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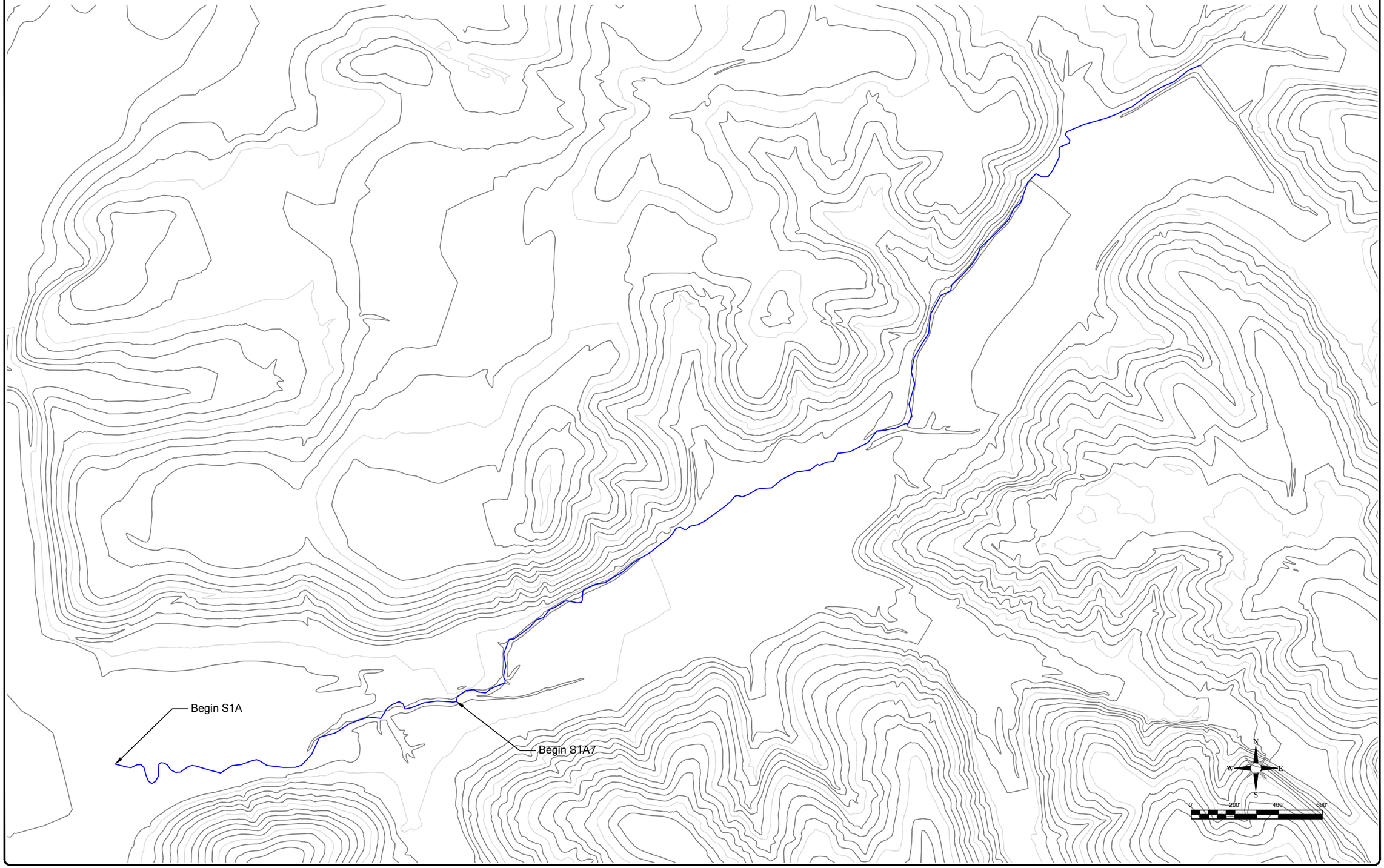
Stream S1A and S1A7
Permit No. 889-0130
for
Oxford Mining Company - Kentucky, LLC
P.O.Box 427, 544 Chestnut St. Coshocton, OH 43812

REVISIONS

SCALE: As Shown
JOB #: 080-502
DESIGNED BY: NKB
DETAILED BY: NKB
CHECKED BY: JDH
DATE: 2/2/12

SHEET: 1

S1A & S1A7 Site Location



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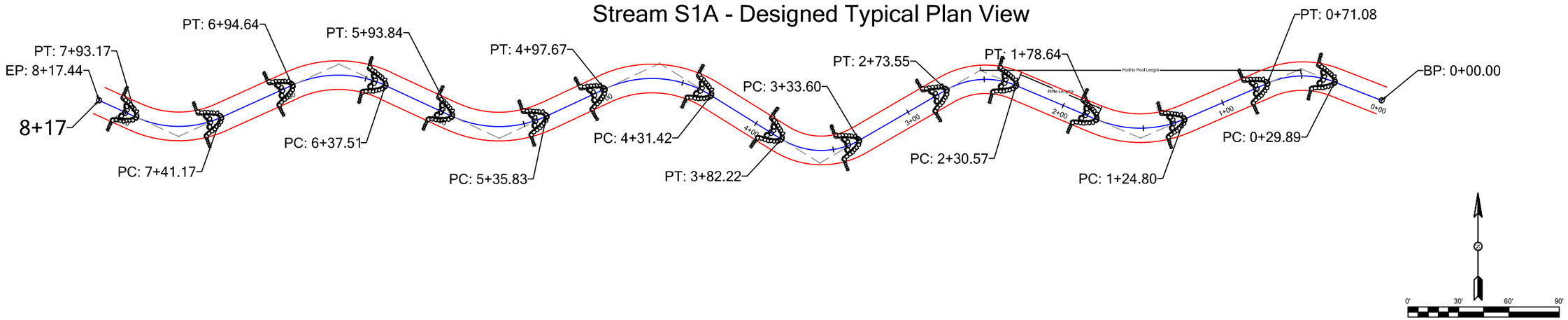
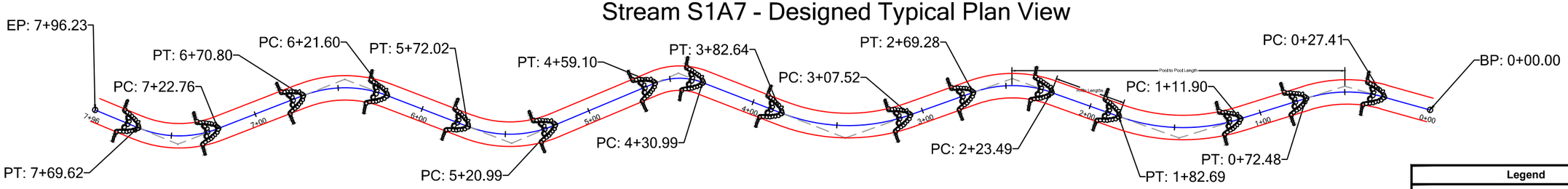
SHEET:
2

Stream S1A - Designed Typical Plan View



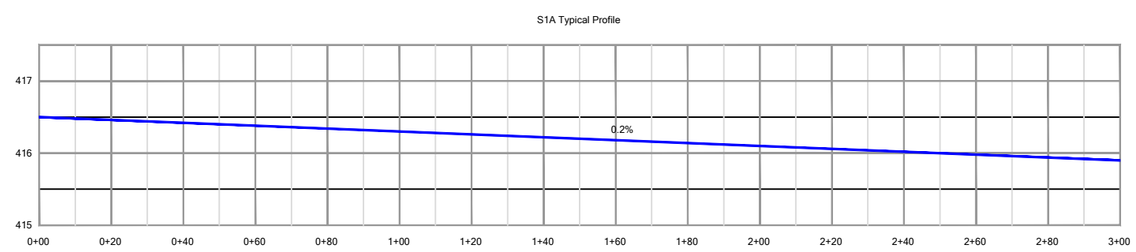
Stream S1A7 - Designed Typical Plan View

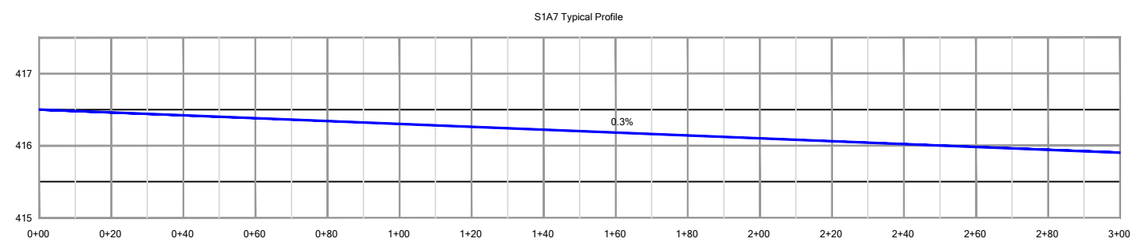


Legend

- DESIGNED CENTERLINE/THALWEG
- DESIGNED BANKFULL
- CONSTRUCTION CONSTRAINTS

Designed Typical Profile





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Cross-Vane Details

1. All structural material must be obtained prior to excavation of structure.

2.Contractor may, if the stream designer is not present , designate how the available material will be constructed prior to excavation.

3.The Footer Rock(s) in the middle 1/3 (center) of the channel shall be excavated and placed. Check to ensure spacing of Footer Rock(s) does not allow water to flow "under" or "between" the rocks.

4.The Footer Rock(s) of the Vane Arm furthest from the material shall be excavated and placed. Check to ensure arm "angle" and "slope" is within the specifications. Check to ensure spacing of Footer Rock(s) does not allow water to flow "under" or "between" the rocks.

5.The Footer Rock(s) for the Vane Arm closest to the material shall be excavated and placed. Check to ensure arm "angle" and "slope" is within the specifications. Check to ensure spacing of Footer Rock(s) does not allow water to flow "under" or "between" the rocks.

6. Place the Surface Rock(s) in the middle 1/3 (center) of the channel on top of the Footer Rock(s). Check to ensure there is no "pooling" of water behind the Surface Rock(s). Check to ensure spacing of Surface Rock(s) does not allow water to flow "under" or "between" Surface Rock(s). Check to ensure 1/4 of the Footer Rock(s) is exposed on the downstream end of the Surface Rock(s).

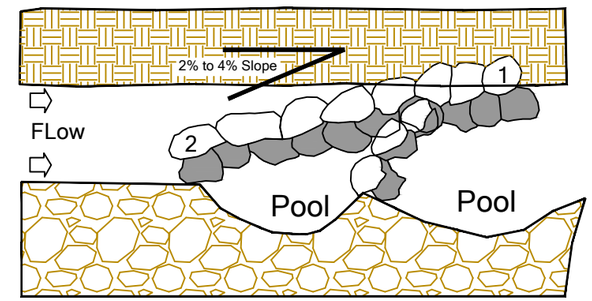
7. Place Surface Rock(s) on the Vane Arm Footer Rock(s) furthest from the material. Check to ensure spacing of Surface Rock(s) does not allow water to flow "under" or "between" Surface Rock(s). Check to ensure 1/4 of the Footer Rock is exposed on the downstream end of the Surface Rock(s). Surface Rock shall tie into the Bankfull elevation. Place sills into the Bankfull Bench and bury with channel material excavated from the pool.

8. Place Surface Rock(s) on the Vane Arm Footer closest to the material. Check to ensure spacing of Surface Rock(s) does not allow water to flow "under" or "between" Surface Rock(s). Check to ensure 1/4 of the Footer Rock is exposed on the downstream end of the Surface Rock(s). Surface Rock shall tie into the Bankfull elevation. Place sills into the Bankfull Bench and bury with channel material excavated from the pool.

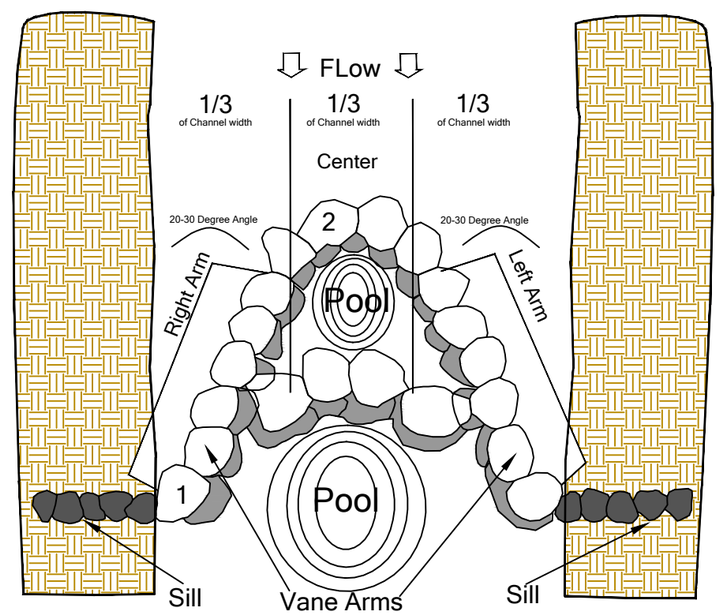
9. Excavate the "pool" area to the specified depth. The deepest section of the pool shall be within the first 15% of the length of the Vane Arm and gradually rising in elevation to the end of the Vane arms. Utilize the excavated material to backfill each Vane arm. The material shall be placed evenly with the Surface Rock and the Bankfull elevation.

10. Contractor or stream designer (if present) shall check water surface elevation to ensure water will be "pooled" to the middle of the Surface Rock(s) located on the middle 1/3 of the channel.

Profile View

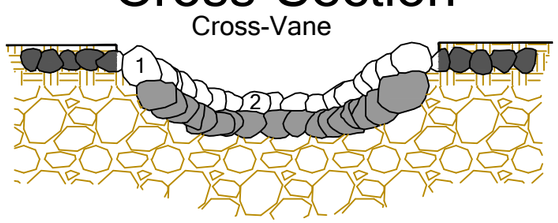


Plan View



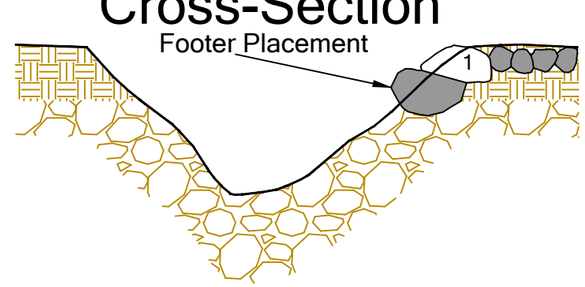
Cross-Section

Cross-Vane



Cross-Section

Footer Placement



Cross-Vane Specifications and Sizing

Note: All sizes in Feet

Location:	See Plan View		
Width=W	Thickness=T		Length=L
Center Footer Rock	Min W/T/L 2.0/0.8/2.5	Max W/T/L 2.5/1.0/3.0	Length of Center 2.5
Center Surface Rock	Min W/T/L 2.0/0.5/2.0	Max W/T/L 2.5/0.8/2.5	Length of Center 2.5
Left or Right Arm Footer Rock	Min W/T/L 2.0/0.8/2.5	Max W/T/L 2.5/1.0/3.0	Length of Arm 3.5
Left or Right Arm Surface Rock	Min W/T/L 2.0/0.5/2.0	Max W/T/L 2.5/0.8/2.5	Length of Arm 3.5
Left & Right Arm Sill	Min W/T/L 0.5/0.3/0.8	Max W/T/L 0.8/0.5/1.0	Length of Sill 1.0
Left & Right Arm Slope	2% to 4%		

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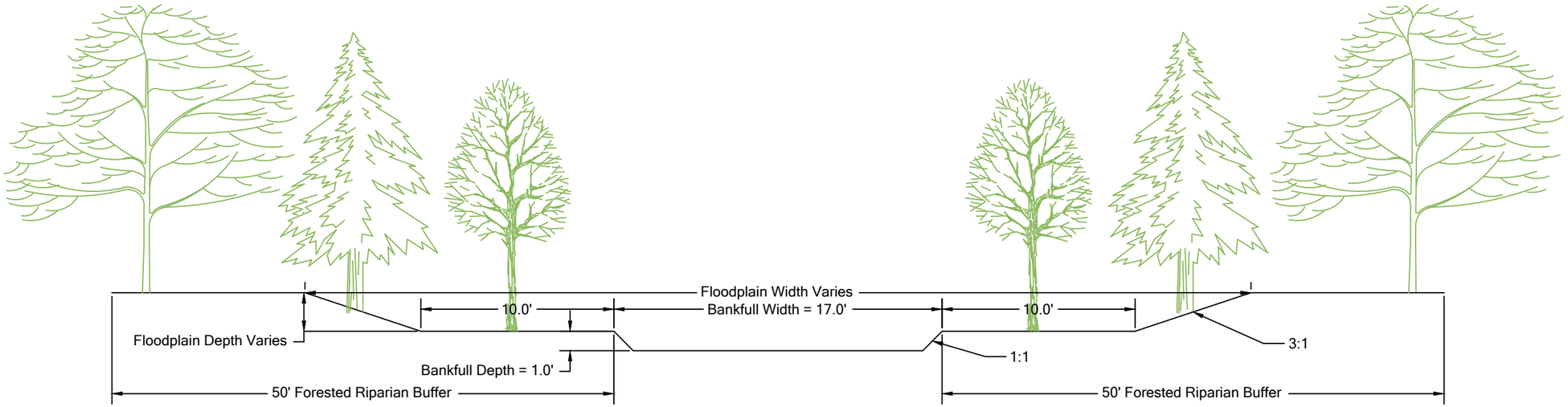
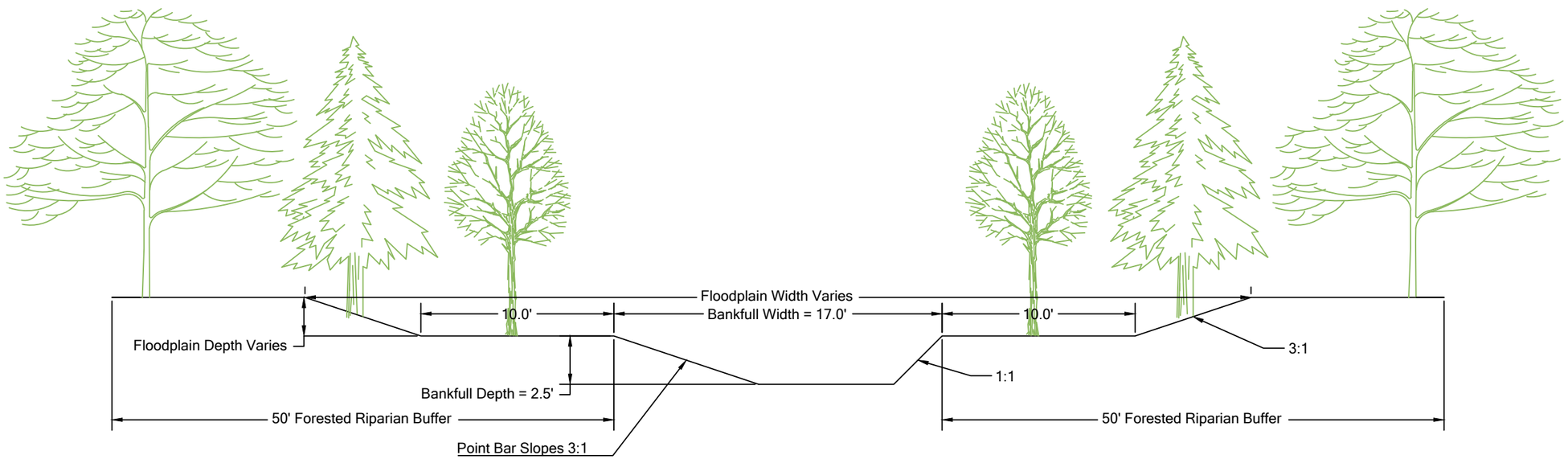
S1A Typical Designed Cross-Sections



Stream S1A - Typical Riffle Section



Stream S1A - Typical Pool Section

0' 3' 6' 9'

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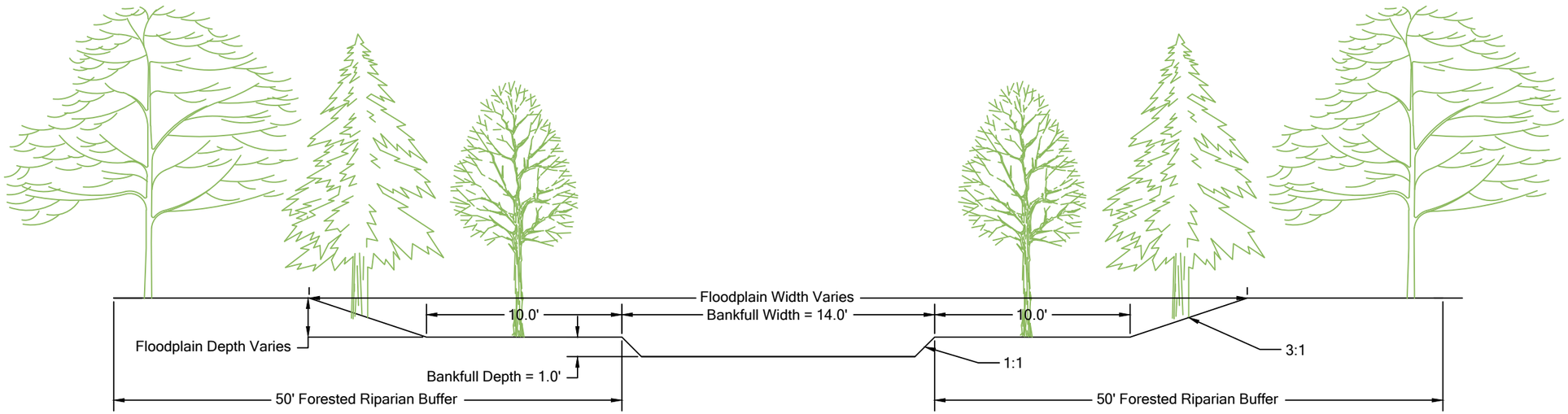
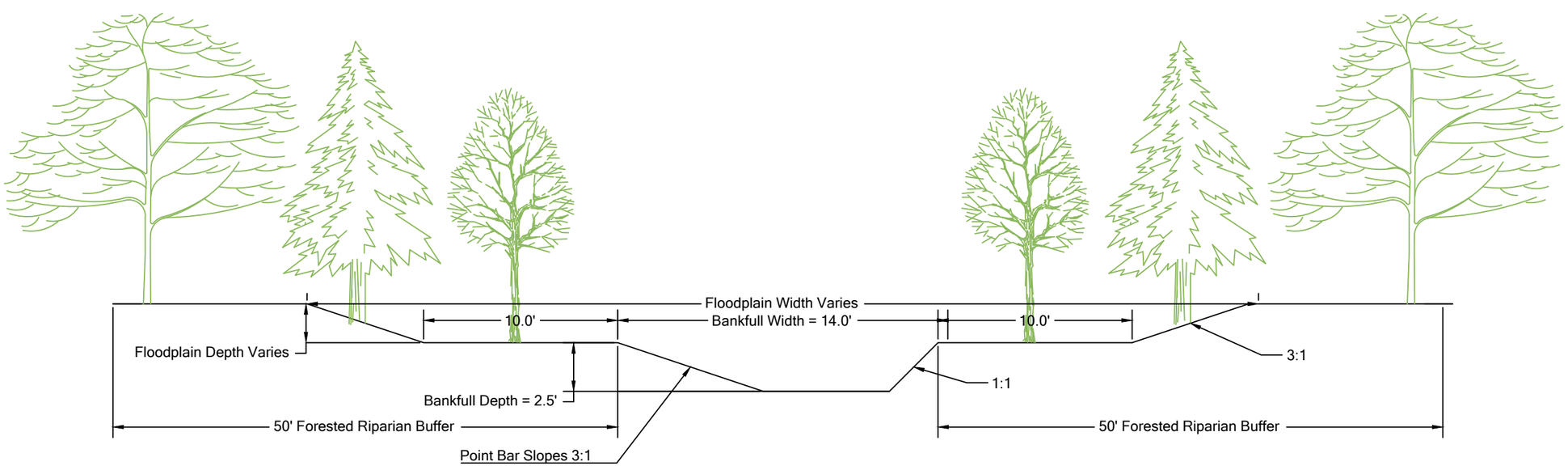
S1A7 Typical Designed Cross-Sections



Stream S1A7 - Typical Riffle Section



Stream S1A7 - Typical Pool Section

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