APPENDIX G
WOOD ANALYSIS

Report on the Analysis of Wood Remains Associated with the Bridge 918 on S.R. 30 at Reynolds Pond Sussex County, Delaware

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Twenty pieces of uncarbonized wood were collected from submerged structural remains associated with Reynolds Mill and were submitted for taxonomic identification (Photograph 1). Samples of wooden construction elements (beam, peg, plank and frame sections) were secured during archaeological excavation within the bridge replacement location. Small samples of larger wooden elements were excised and removed for analysis. Small wooden artifacts (such as pegs) were submitted in their entirety. Samples were dried in vacuum bags, and stored prior to analysis.

Taxonomic identification was accomplished under low magnification (10X to 40X) with the aide of standard texts (Edlin 1969; Hoadley 1990; Panshin and deZeeuw 1980). Identifications were secured by comparison to modern plant specimens from a reference collection representative of the flora of the project area. The samples were examined on all surfaces, and small sections were removed for easier examination beneath the microscope. Clear cross-sections were obtained using a scalpel and examined under magnification to illuminate minute features.

Three wood types in addition to unidentified oak were identified from the Reynolds Mill Pond assemblage. Species of the white oak group *(Quercus spp. LEUCOBALANUS* group) were the most ubiquitous wood type encountered (45% of the 29 specimens examined were white oak). Pine *(Pinus spp.)* of the yellow or hard pine group (*Pinus taeda [loblolly pine], P. virginiana [Virginia pine] or P. serotina [pond pine]* in the vicinity of the project area) account for 24 percent of the analyzed wood, species of the red oak group *(Quercus spp. ERYTHROBALANUS* group) comprised 21 percent of the assemblage, and 10 percent of the wooden elements were identified as unspecified oak *(Quercus spp.).* All wood types identified were locally available from the Coastal Plain forests of Delaware, and were historically useful for building construction (Panshin and deZeeuw 1980:446, 568, 571-572). Table 1 provides a view of taxa identified by field sample and wood sample number.

The red and white oak species possess many similar properties which make them highly suitable for building construction (see Table 2). A major difference is that the heartwood pores of the white oaks (Photograph 2) are clogged with a frothy growth (tyloses) which make the wood impervious to liquid, while the red oaks (Photograph 3) usually lack tyloses and are therefore extremely porous. This distinguishing feature makes white oaks extremely durable and rot-resistant (when seasoned/dried properly), and red oaks less durable and more susceptible to decay (unless infused with a preservative treatment). White oaks are well-suited to applications in-contact with liquids, and historically the white oak species provided the most preferred wood for barrel staves and for ship building. The wood remains associated with Reynolds Mill contain a mix of red and white oak species which were used to construct elements which were in direct contact with the ground and water. The use of the less-appropriate red oak for fashioning culvert elements is less than ideal. The use of red oak may be explained by the economic constraints of mill operators (they used what was available), or by the use of preservative treatments [tar?]. More likely, the variety of wood types represented in the assemblage represent the re-use of timber salvaged from elsewhere, and considerations of taxonomic suitability were not foremost among construction decisions.

Table 1: Wood Taxa Identified.

Field Sample No.	Wood Sample No.	Piece	Comment	Taxon
8	1	AU	support piece	red oak
9	2	A	support frame east end	white oak
	peg 1		peg	white oak
	peg 2		peg	white oak
		AU	joint west end	red oak
11	4	AT	support frame west end	white oak
		AT	support frame west end surface	white oak
	peg 3		peg	oak
	peg 4		peg	oak
12	5	Q	beam	white oak
13	6	S	beam	white oak
14	7	AK	beam	white oak
15	8	AL (1)	beam	white oak
		AL (2)	insert	pine
16	9	AQ (1)	beam	red oak
		AQ (2)	insert	red oak
		AQ (3)	small insert	pine
17	10	BC	plank	pine
18	11	AE	plank with notch	pine
19	12	BA	plank	pine
20	13	I	with peg	white oak
21	14	E	with mortise hole	white oak
22	15	AR	with knot	pine
23	16	BW	support frame	oak
24	17	AQ	cookie	red oak
25	18	AV	cookie	white oak
26	19	AI	cookie	white oak
27	20	AU	cookie	red oak
28	21	AR	cookie	pine

The pine woods (Photograph 4) documented at Reynolds Mill Pond have been classified as yellow or southern pine species. These pines of the southern and eastern United States cannot be separated on the basis of minute wood structure (Panshin and deZeeuw 1970:456-457). Contemporary lumber trade classifies Southern pines according to structural density, with longleaf and slash pines frequently exhibiting multiple late-wood bands measuring up to 0.2 in in diameter in contrast to 0.1 in or less for other Southern pines (Kukachka 1960:43:887-896). Such classification does not translate well to pine specimens recovered from archaeological contexts, as considerable shrinkage of the wood structure over time is common. Although pine species are common throughout the project area today, it has been suggested (Brown *et al.* 1987:250-251) that pine was not a major component in Delaware's native forests. It is speculated that prevalence of pine species in the region has increased considerably as a result of historic clearing of native hardwood forests.

Some interesting patterns emerge in the mapping of wood types analyzed. The 5 heavy cross beams (FS12 through 16) are uniform in size and dimension (~20cm x 25 cm in cross section). Each of these elements was exceptionally well-preserved, and it appears that each was fashioned from a long bole or trunk of white oak. All planking elements were constructed of

milled pine. The pine pole (AR) at the eastern periphery of the excavation area bears similarity to a piling, consisting of a barked pole which is unique within the site assemblage.

Reynolds Pond is located on the Sowbridge Branch of Primehook Creek. Wood excavated within the bridge replacement area represent common, locally available forest taxa which were commonly used in building construction. The presence of worked features (pegs, joints), combined with the absence of many *in situ* articulated members, suggest that the recovered wood represents re-use of architectural timbers. The relationship between the excavated timber and the historic sawmill and gristmill located on Reynolds Pond remains unclear. However, the taxa recovered are consistent with wood types identified with building architecture at other historic mills in Sussex County, including Cubbage Mill (Heikkenen 2000) and Diamond Mill (McKnight 2005).

Table 2: Comparison of Oak Properties.

Properties	White Oak	Red Oak
specific gravity (important species)	0.57-0.81	0.52-0.60
average weight (approximate)	47 lbs per cubic foot	44 lbs per cubic foot
decay resistance	more	less
heartwood	non-porous	extremely porous
tyloses	abundant	absent or scattered
shrinkage during drying	significant	significant
decay resistance	high	low to moderate
drying	difficult - tendency to checking, splitting and casehardening	difficult - tendency to checking, splitting and casehardening
permeability to liquids	impermeable	permeable
holds nails		well, but splits along rays

(USDA 1981:8; Brown and Panshin 1940:456-461; Bishop 1999:122-125)

Photograph 1: Wood Samples Prepared for Taxonomic Identification.

Photograph 2: Element S (White Oak).

Photograph 3: Element AQ (Red Oak)

Photograph 4: Element BA (Pine)

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