New Castle County, Delaware
New Castle Hundred
Church Road (Wynnefield to S.R. 71) Improvements

Geomorphology Report

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ABSTRACT

Geomorphological investigations have been completed for the State of Delaware Department of Transportation's (DelDOT) proposed improvements to a segment of Church Road (Wynnefield to S.R. 71), New Castle Hundred, New Castle County, Delaware. DelDOT will improve the existing two-lane roadway by the construction of 1.5 m (5.0 ft) wide sidewalk/bicycle lanes. The project Area of Potential Effect (APE) includes all of the areas designed for ground disturbance within 1.5 m (5.0 ft) of existing Church Road along its length from Wynnefield to S.R. 71, a total of approximately 1.53 km (0.95 mi). The Church Road Improvements project APE is located in the Upper Coastal Plain physiographic province.

Geomorphological investigations conducted within the project APE assessed the nature of the landforms and soils, and determined *via* expedient auger borings if areas existed for the implementation of Phase I archaeological fieldwork. Based on stratigraphic profiles revealed during the geomorphology augering, all of the areas adjacent to existing Church Road and within the proposed 1.5 m (5.0 ft) wide sidewalk/bicycle lanes have been extensively disturbed by past roadway construction and maintenance, private driveways, landscaped yards, commercial paved parking lots, buried utilities, and drainage ditches. Only mixed and truncated soil profiles are present in the project APE. The lack of intact sediments with the potential to contain archaeological remains precludes the need for Phase I archaeological testing within the Church Road Improvements project APE.

TABLE OF CONTENTS

	Page
ABSTRACT	
TABLE OF CONTENTS	i
LIST OF FIGURES	i
LIST OF PHOTOGRAPHS	ii
LIST OF TABLES	ii
1.0 INTRODUCTION	1
2.0 RESULTS	7
2.1 Background Research	7
2.2 Geomorphology	15
3.0 RECOMMENDATIONS	22
4.0 REFERENCES CITED	23
APPENDIXES	
APPENDIX A SOIL PROFILES	

LIST OF FIGURES

Figure No.	Title	Page
1	Project Location	2
2	Plan View	6
3	Project Area in 1850	12
4	Project Area in 1868	13
5	Project Area in 1893	14
6	Project Area in 1904	16
7	Project Area in 1953	17
8	Soil Profiles, Auger Borings 1 and 2	19
9	Soil Profiles, Auger Borings 3 and 4	20

LIST OF PHOTOGRAPHS

Photograph No.	Title	Page
1	View of north end of Church Road Improvements project APE, facing north. Note construction on northern portion of Church Road	3
2	View of central portion of Church Road Improvements project APE, facing south	3
3	View of central portion of Church Road Improvements project APE near newer housing development at Grove Mansion Way, facing south. Note buried utilities and water lines in project APE	4
4	View of southern portion of Church Road Improvements project APE, facing south	4
5	View of south end of Church Road Improvements project APE, just north of Red Lion United Methodist Church, facing north	5

LIST OF TABLES

Table No.	Title	Page
1	Previously Recorded Pre-contact Period Archaeological Sites Located Within 0.8 Km (0.5 Mi) of the Church Road Improvements Project APE	8
2	Previously Recorded Pre-contact Period Archaeological Sites Located Within 2.4 Km (1.5 Mi) of the Church Road Improvements Project APE	8

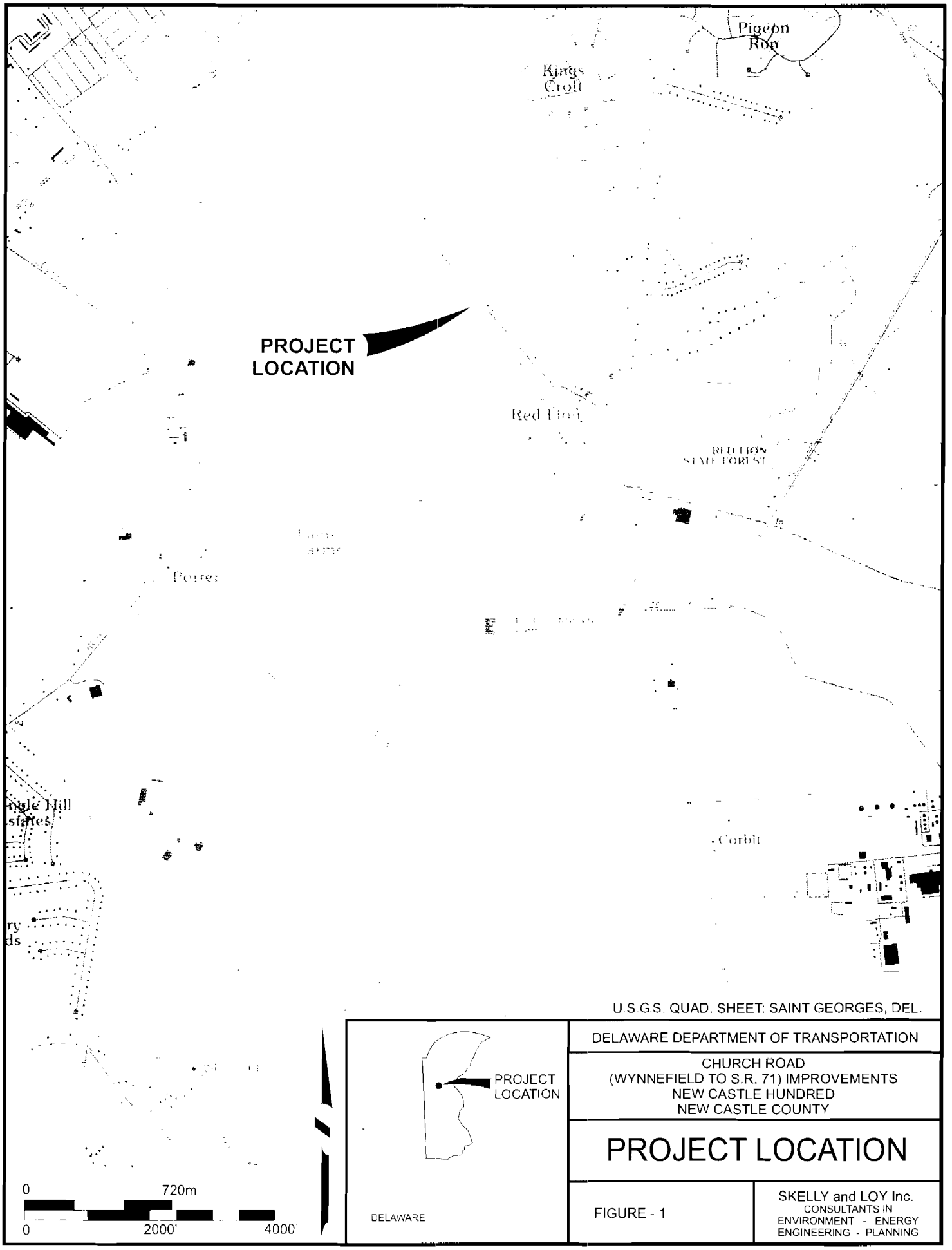
1.0 INTRODUCTION

This report summarizes the results of preliminary archaeological background research and the geomorphological reconnaissance performed for the proposed improvements to a segment of Church Road (Wynnefield to S.R. 71) located in New Castle Hundred, New Castle County, Delaware (Figure 1; Photographs 1, 2, 3, 4, and 5). The project Area of Potential Effect (APE) is located on the Saint Georges, Delaware 7.5 minute topographic quadrangle (United States Geological Survey [USGS] 1993) in the Upper Coastal Plain physiographic province. The State of Delaware Department of Transportation (DelDOT) will improve the existing two-lane roadway by the construction of 1.5 m (5.0 ft) wide sidewalk/bicycle lanes. Historic structures research is reported in a separate document (Kuncio 2003).

The project APE for these cultural resource studies includes the proposed 1.5 m (5.0 ft) wide corridor along each side of the existing roadway as described in a DelDOT letter dated March 6, 2003 to the Delaware State Historic Preservation Office (SHPO). Stormwater management areas are also discussed in the DelDOT letter; however, none have been specified to date and none are considered as part of this current investigation (Figure 2).

Prior to the initiation of the Church Road Improvements project, geomorphological reconnaissance and background research were conducted. The background research included the examination of the Delaware archaeological site files; the National Register of Historic Places (NRHP) on-line files; the historic resources inventory files; reports documenting previously conducted cultural resource studies; relevant state-wide historic contexts; historic maps; and historic as-built roadway plans housed at the Delaware SHPO and DelDOT office.

Geomorphological investigations were conducted within the project APE. The purpose of the geomorphological reconnaissance was to assess the nature of the landforms and soils within the project APE, and to determine if appropriate areas exist for the implementation of Phase I archaeological fieldwork. Geomorphological investigations included the examination of the soils/ sediments contained within the project APE *via* expedient auger borings for the potential to contain buried preserved archaeological resources. In addition, the assessment determined any disturbances to the soils/sediments that would preclude the preservation of buried *in situ* archaeological resources.



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DELAWARE DEPARTMENT OF TRANSPORTATION

CHURCH ROAD
(WYNNEFIELD TO S.R. 71) IMPROVEMENTS
NEW CASTLE HUNDRED
NEW CASTLE COUNTY

PROJECT LOCATION

FIGURE - 1

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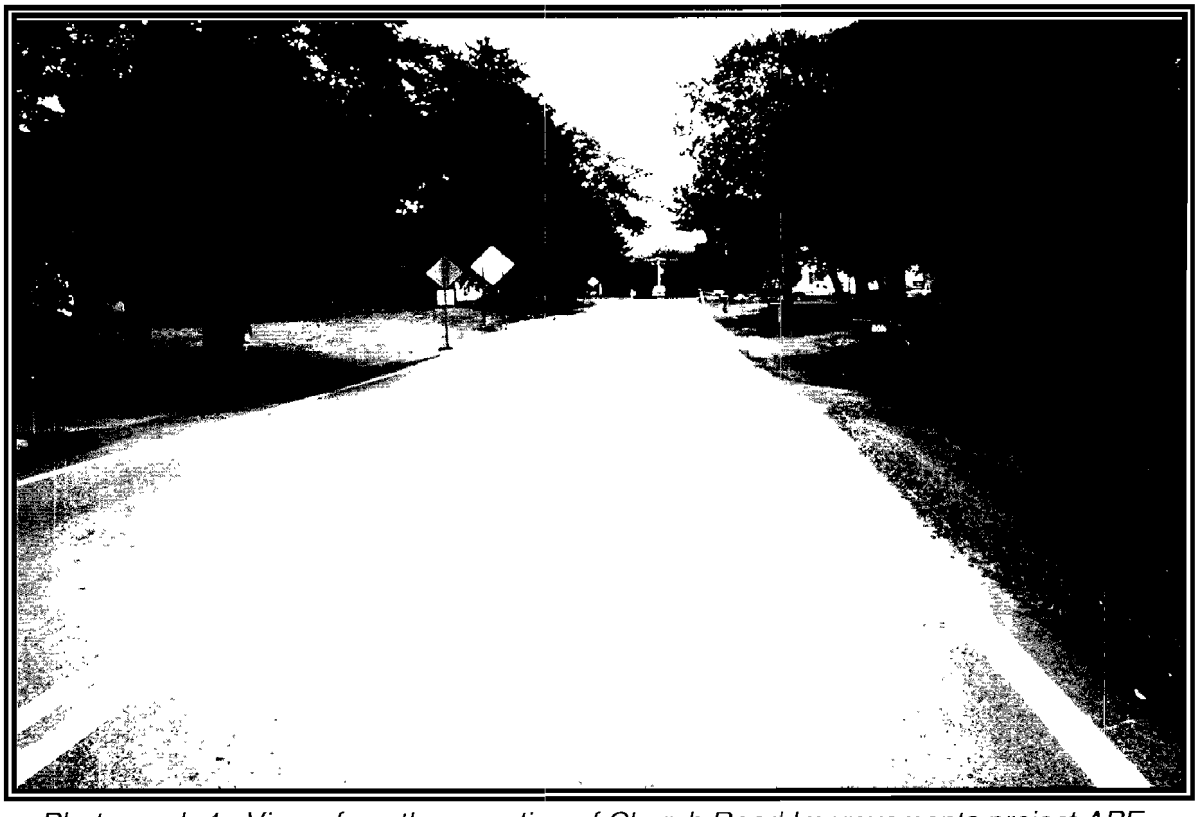
Photograph 1. View of north end of Church Road Improvements project APE, facing north. Note construction on northern portion of Church Road.

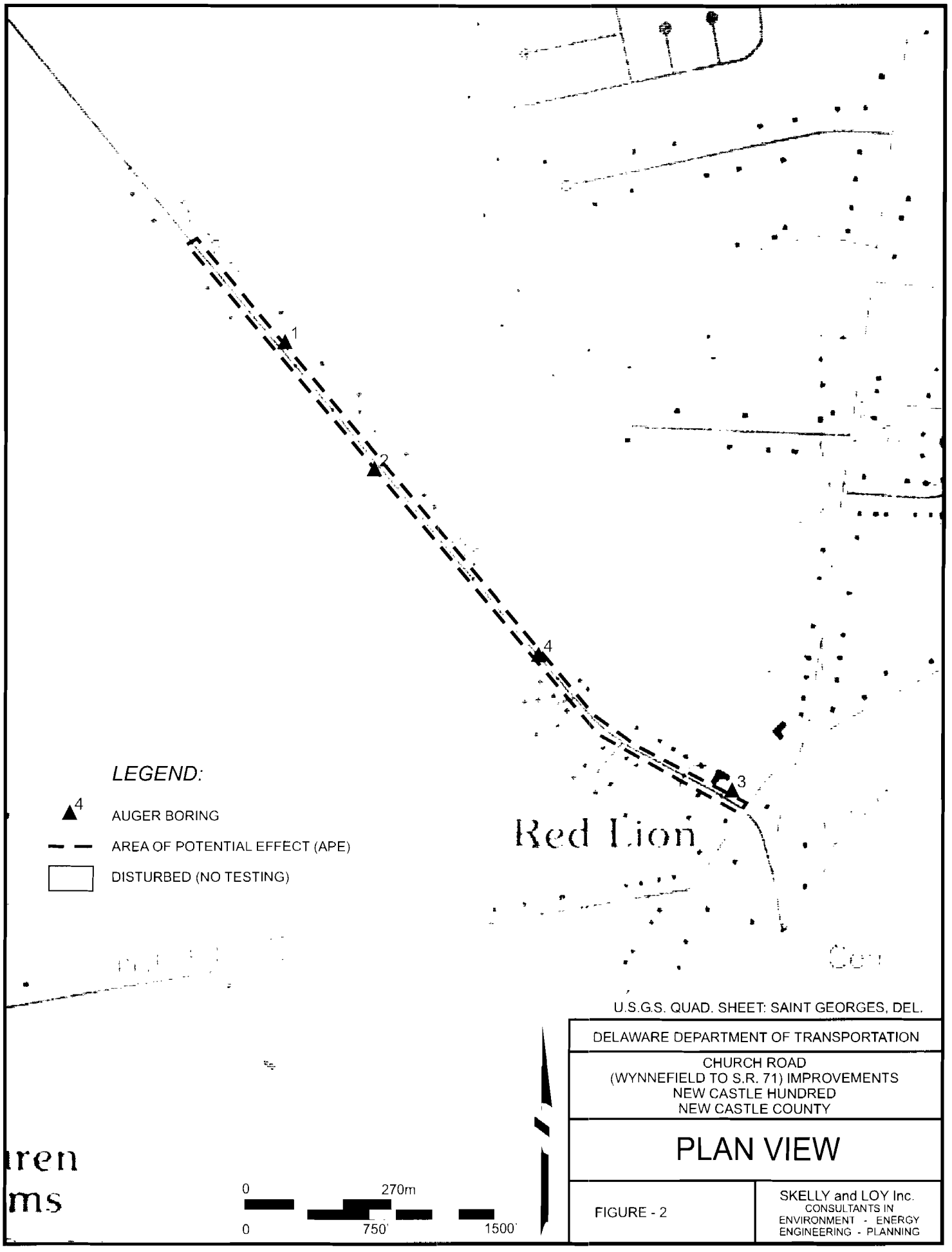
Photograph 2. View of central portion of Church Road Improvements project APE, facing south.

Photograph 3. View of central portion of Church Road Improvements project APE near newer housing development at Grove Mansion Way, facing south. Note buried utilities and water lines in project APE.



Photograph 4. View of southern portion of Church Road Improvements project APE, facing south.

Photograph 5. View of south end of Church Road Improvements project APE, just north of Red Lion United Methodist Church, facing north.



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DELAWARE DEPARTMENT OF TRANSPORTATION

CHURCH ROAD
(WYNNEFIELD TO S.R. 71) IMPROVEMENTS
NEW CASTLE HUNDRED
NEW CASTLE COUNTY

PLAN VIEW

FIGURE - 2

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2.0 RESULTS

2.1 Background Research

According to the predictive modeling accomplished by Custer (n.d.) for pre-contact period archaeological resources in Delaware, the project APE is contained within low probability areas (Custer *et al.* 1984). This is mostly due to its upland topographic setting and the lack of large streams, stream confluences, and/or marshes in the Church Road Improvements project APE. More specifically, Custer (1986:195) indicates that the research significance for the project APE is moderate and that the project APE "includes areas with medium to high significant site probabilities and medium numbers of sites and data quality."

Background research revealed several previously completed cultural resources surveys in the vicinity of the Church Road Improvements project APE (e.g., Bowen *et al.* 2001; Catts and Custer 1990; Espenshade and Sams 2002; Hoffman *et al.* 2002; Parsons Engineering Science, Inc. 1999; Petraglia *et al.*1998). Specifically, the northern portion of Church Road, between S.R. 40 and just south of the railroad track crossing was surveyed as part of improvements to that portion of the road (Hoffman *et al.* 2002). This survey identified one archaeological site, the Wynnefield site (7NC-D-219). Site 7NC-D-219 "contains an early to late nineteenth century homestead/farmstead consisting of at least one residential structure, and buried prehistoric materials evidencing multiple prehistoric occupations during the Woodland I period, and potentially during the Contact period ca. A.D. 1700" (Hoffman *et al.* 2002:III-1). Site 7NC-D-219 was recommended eligible for listing in the NRHP and appears to represent a base camp with multiple activities (i.e., procurement and processing of lithic materials, food resources, and plant materials as well as the maintenance of lithic tools) occurring there prehistorically (Hoffman *et al.* 2002:III-1).

Review of the Delaware archaeological site files did not yield any previously recorded pre-contact period archaeological sites located within the project APE; however, several previously recorded archaeological sites are located near the project APE. A summary of these sites is included in Table 1.

Table 1.
Previously Recorded Pre-contact Period Archaeological Sites Located Within 0.8 Km (0.5 Mi) of the Church Road Improvements Project APE

Site	Distance and Direction from Church Road Improvements Project APE	Description
7NC-D-35	*ca.* 121.9 m (400.0 ft) northeast	gently sloping ground adjacent to and running into a swamp formed by headwaters of Red Lion Creek; woods; *ca.* 0.1 ha (0.3 ac) in size; excavated 1970 and 1971 by Archaeological Society of Delaware.
7NC-D-36	*ca.* 167.6 m (550.0 ft) northeast	Indian Mound; slight rise above a large swamp; woods; tested in 1970 by Archaeological Society of Delaware.
7NC-D-219	*ca.* 61.0 m (200.0 ft) northeast	Wynnefield site; southeast of railroad crossing of Church Road; Phase I and II surface collection, excavations, and mechanical stripping in 2001; projectile points, flakes, and fire cracked rock; Early Woodland; prehistoric component is recommended eligible for listing in NRHP.

Additionally, numerous pre-contact period archaeological sites are located within 2.4 km (1.5 mi) of the Church Road Improvements project APE. A summary of these sites is included in Table 2.

Table 2.
Previously Recorded Pre-contact Period Archaeological Sites Located Within 2.4 Km (1.5 Mi) of the Church Road Improvements Project APE

Site	Distance and Direction from Church Road Improvements Project APE	Description
7NC-E-2	*ca.* 0.3 km (0.2 mi) east	knoll; *ca.* 3.2-4.1 ha (8.0-10.0 ac); destroyed.
7NC-E-12	*ca.* 1.5 km (0.9 mi) east	surface collection; triangular projectile point and fragments.
7NC-E-28	*ca.* 1.6 km (1.0 mi) east-southeast	plowed and weedy agricultural field.
7NC-E-29	*ca.* 2.1 km (1.3 mi) east-southeast	plowed and weedy agricultural field.

Table 2.
Previously Recorded Pre-contact Period Archaeological Sites Located Within 2.4 Km (1.5 Mi) of the Church Road Improvements Project APE (Continued)

Site	Distance and Direction from Church Road Improvements Project APE	Description
7NC-E-34	*ca.* 2.1 km (1.3 mi) north-northeast	soybean field (new housing development); heat altered rock, flakes, projectile points, bifaces, battered stone, pitted stones, cores, and quartz chunks.
7NC-E-39	*ca.* 2.1 km (1.3 mi) north-northeast	cultivated; housing development; surface collection; heat altered rock, flakes, bifaces, unifaces, groundstone, battered stone, cores, and argillite and quartz chunks.
7NC-E-81	*ca.* 2.6 km (1.6 mi) northeast	lithic concentration in plowed field, just east of a small drainage; surface collection; red argilite, jasper, and quartz projectile points (notched and stemmed) and flakes.
7NC-E-94	*ca.* 1.8 km (1.1 mi) south	small knoll/ridge adjacent to an ephemeral drainage; surface collection; fire cracked rock and quartz biface.
7NC-E-95	*ca.* 1.6 km (1.0 mi) south	gentle downslope northwest of a small knoll; surface collection; fire cracked rock, flake, and stemmed projectile point; projectile point is fragmentary but suggests a Woodland I style.
7NC-E-96	*ca.* 1.6 km (1.0 mi) south	west edge of a small knoll/ridge; surface collection; flakes.
7NC-E-97	*ca.* 1.0 km (0.6 mi) east-southeast	terrace above Dall Run on east side of stream; excavation; wooded; fire cracked rock, ironstone biface and flakes; hearth.
7NC-E-106	*ca.* 2.6 km (1.6 mi) east-southeast	fallow field and woods; hazardous waste present; surface collection; fire cracked rock and flakes.

Table 2.
Previously Recorded Pre-contact Period Archaeological Sites Located Within 2.4 Km (1.5 Mi) of the Church Road Improvements Project APE (Continued)

Site	Distance and Direction from Church Road Improvements Project APE	Description
Red Lion Inn Site	adjacent to southern end of project APE	site of Red Lion Inn now covered by Red Lion United Methodist Church parking lot; the reconstructed facade of the inn forms one of the period settings at Winterthur in Wilmington.

Based on the presence of numerous previously recorded pre-contact period archaeological sites adjacent to or nearby the project APE, and the information contained in the state-wide contexts including a categorization of the area as having good site potential in concert with a need for research, the Church Road Improvements project APE should be considered to have a moderate potential to contain pre-contact period archaeological remains.

A single historic period archaeological site is recorded near the Church Road Improvements project APE. It is the Red Lion Inn site, located adjacent to the southern terminus of the Church Road Improvements project APE. It is the site of the former Red Lion Inn but is now covered by the Red Lion United Methodist Church parking lot. The parking lot was established in 1958, paved in 1962, and expanded and re-paved in 1966. There is little potential for remains of the inn to be preserved under the parking lot due to the lengthy use-history of the lot especially prior to paving, and grading for paving. The reconstructed facade of the inn forms one of the period settings at Winterthur Museum in Wilmington.

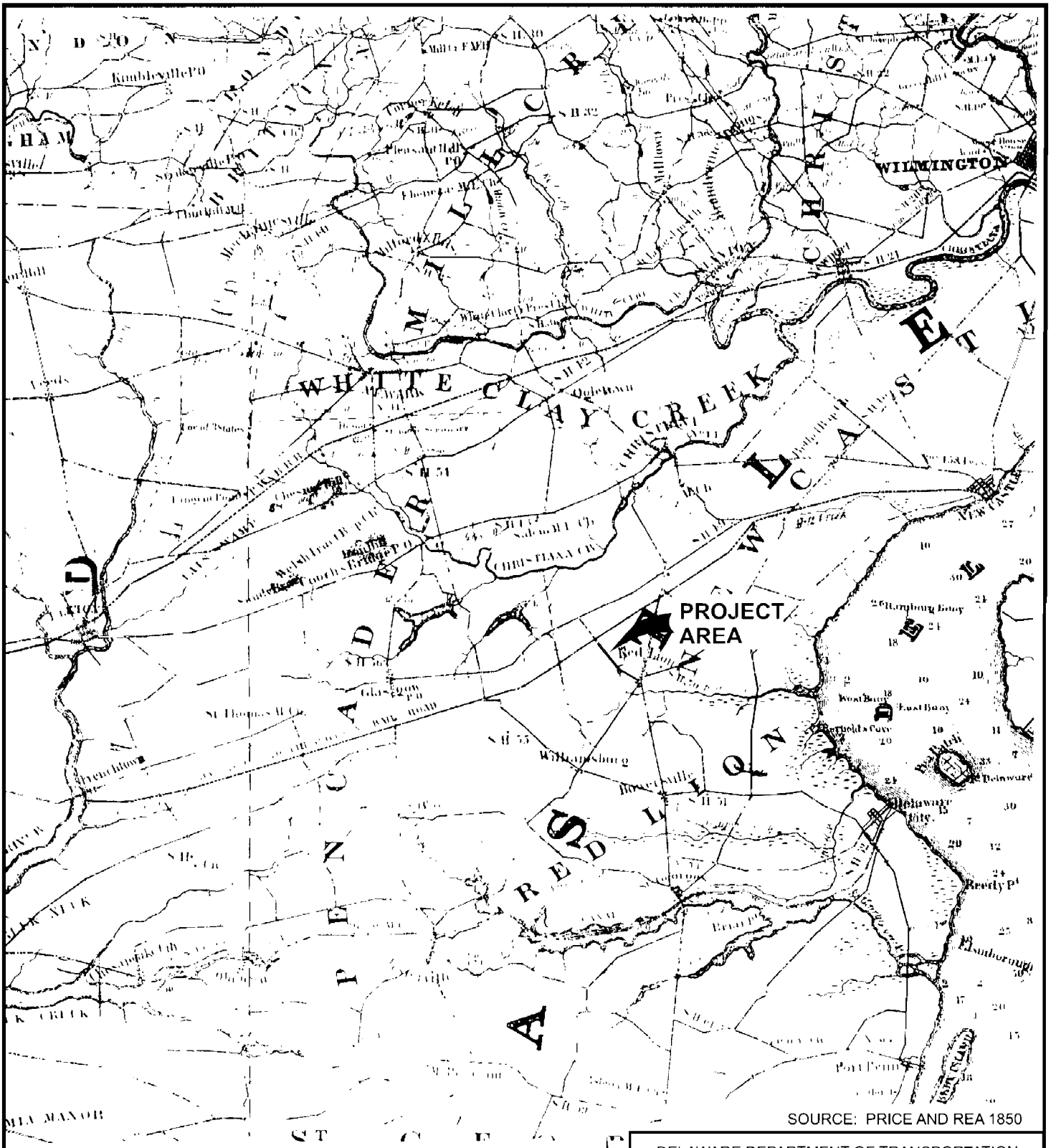
Three previously recorded historic structures are located adjacent to the project APE. The Red Lion United Methodist Church (N-498) is located along the northeastern side of Church Road at the southern terminus of the project APE. The church was originally built on the site in 1819; however, the current building dates from 1853. There is no indication that remains from the earlier building would be present in the project APE, and there is no indication in the historic documentary record that a cemetery was ever associated with this

church. The proposed roadway construction will impact only previously disturbed property along the front of the church; therefore, no potential for archaeological resources associated with the church exists within the currently designed Church Road Improvements project APE.

A second previously recorded historic property (N-5065), consisting of a house and barn, was located along the southwest side of Church Road but set back off of the road outside of the width of the project APE. The structures are no longer extant and a new house is located on the property. Due to the location of this complex well outside of the project APE, and the construction of a new structure on the site, there is no potential to recover archaeological remains associated with this resource inside the Church Road Improvements project APE, as it is currently designed.

A third previously recorded historic property is located on the southwest side of Church Road near the southern terminus of the project APE. This house and barn (N-1237) do not retain architectural integrity that would make them eligible for listing in the NRHP. In addition, the portion of the property within the project APE is the front yard of the house where deep historic period features such as wells and/or privies would not be expected, and this area has been totally disturbed during the modern period. No historic archaeological resources associated with this property would be expected within the Church Road Improvements project APE, as it is currently designed.

Historic period mapping of the Church Road Improvements project APE indicates that the area has remained essentially rural throughout the historic period, but has been subject to increased development since the 1950s. On an 1850 map (Price and Rea 1850) of the project APE, the only structures shown adjacent to Church Road in the project APE are located at the northeast and southwest corners of the intersection of Church Road with S.R. 71 (Figure 3). The structure on the northeast side of the roadway should be the Methodist Church although it is not labeled. By 1868, mapping (Beers 1868) shows these same two structures as well as five or six others (Figure 4). Landowners in the project APE included J. Biddle, G.B. Rodney, and Rhodes. Baist's 1893 map of New Castle County indicates several of the same and several additional landowners for the project APE, including S.M. Porter, Dr. Sunderlamb, and S. Silver (Figure 5). The 1904 USGS Wilmington, Delaware topographic quadrangle shows five structures adjacent to the roadway, while by 1953 (USGS 1953), over 20 structures are shown located adjacent to



SOURCE: PRICE AND REA 1850

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CHURCH ROAD
(WYNNEFIELD TO S.R. 71) IMPROVEMENTS
NEW CASTLE HUNDRED
NEW CASTLE COUNTY

PROJECT AREA IN 1850

FIGURE - 3
NOT TO SCALE

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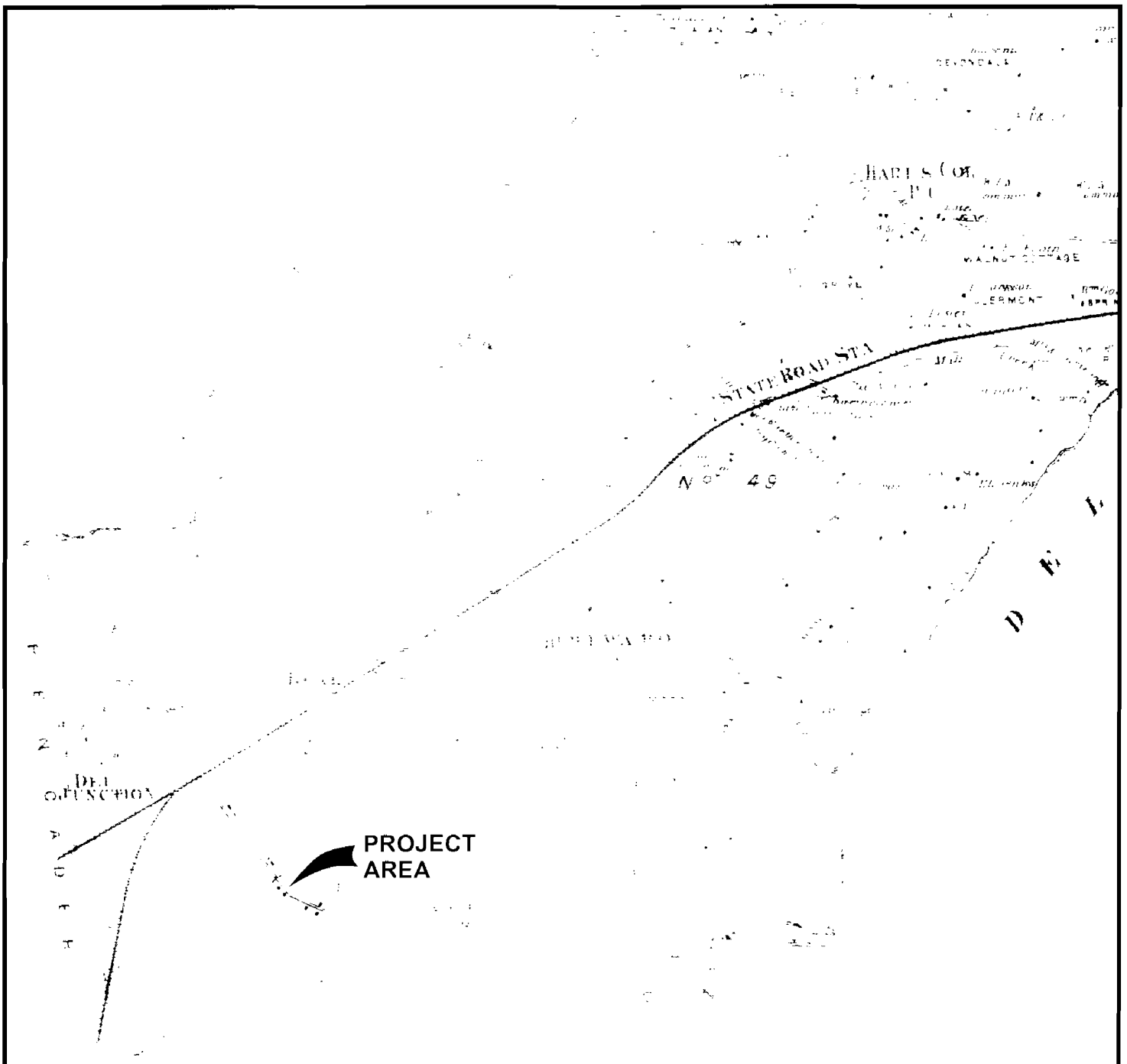

SOURCE: BEERS 1868

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CHURCH ROAD
(WYNNEFIELD TO S.R. 71) IMPROVEMENTS
NEW CASTLE HUNDRED
NEW CASTLE COUNTY

PROJECT AREA IN 1868

FIGURE - 4
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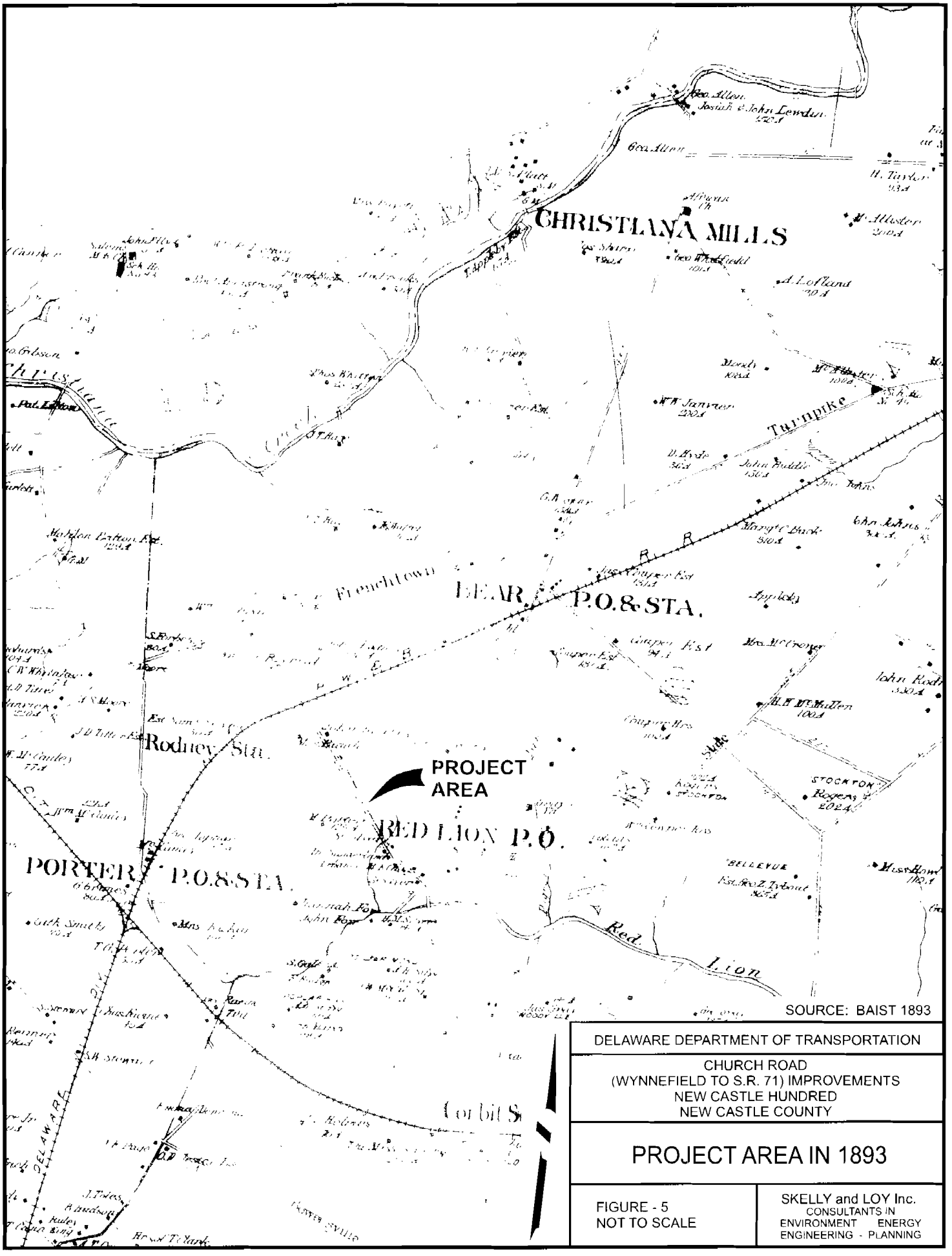

SOURCE: BAIST 1893

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CHURCH ROAD
(WYNNEFIELD TO S.R. 71) IMPROVEMENTS
NEW CASTLE HUNDRED
NEW CASTLE COUNTY

PROJECT AREA IN 1893

FIGURE - 5
NOT TO SCALE

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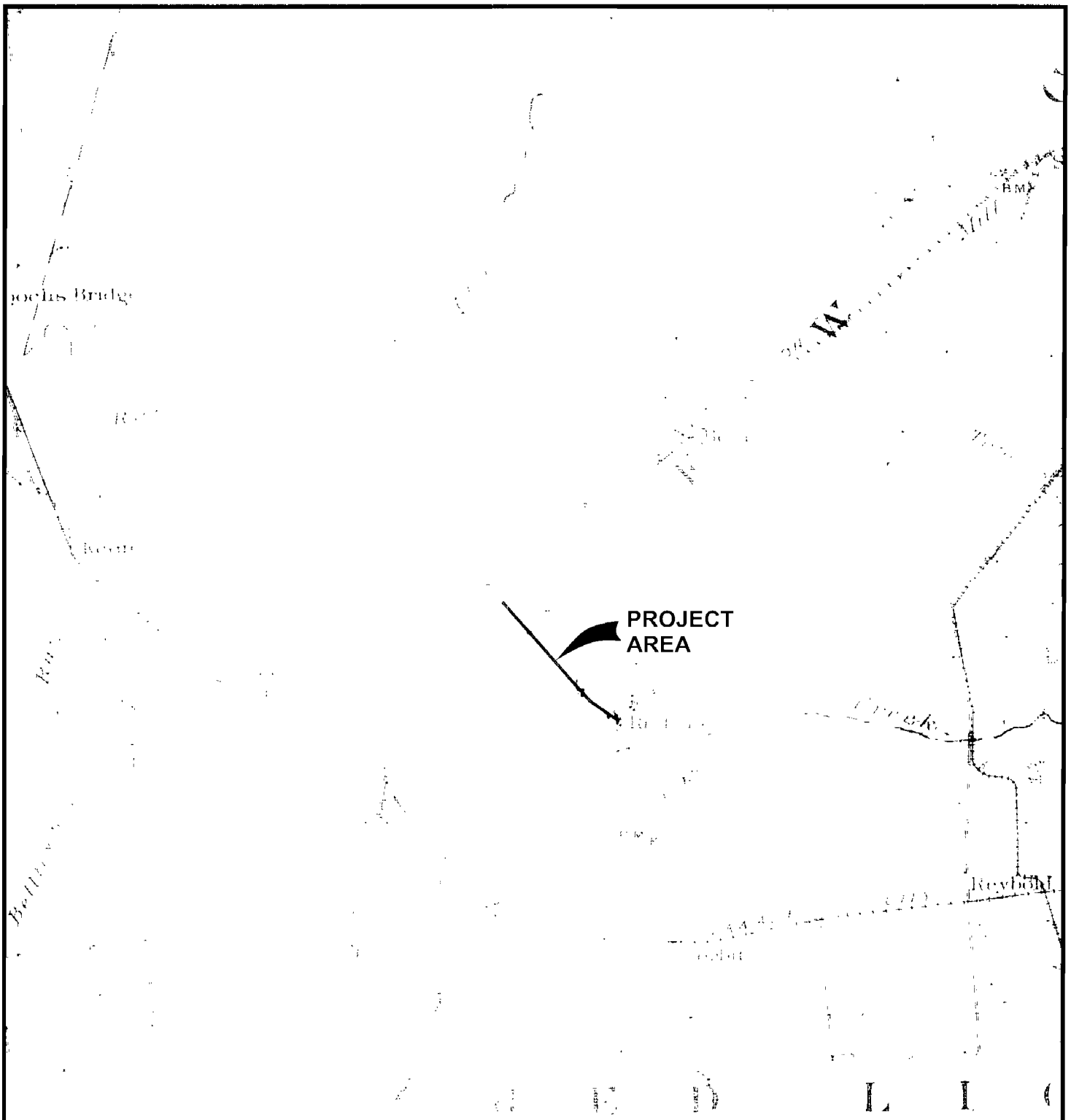
Church Road within the project APE (Figures 6 and 7). This map (USGS 1953) shows the beginnings of the suburbanization and development of the project APE.

Catts *et al.* (1988) and De Cunzo and Catts (1990) present an in-depth discussion of the history of the project area, as well as the statewide historic contexts within which identified historic period resources may be evaluated. De Cunzo and Catts (1990:28, 172) place the Church Road Improvements project APE within the Ft. Casimir/New Amstel/New Castle areas of seventeenth and early eighteenth century exploration and frontier settlement. The project APE is also squarely located in the New Castle/Christiana Bridge/ Cantwell's Bridge triangle of overland transportation networks, and the New Castle urbanization/suburbanization area (De Cunzo and Catts 1990:173,176). The Church Road Improvements project APE is also threatened by modern development by virtue of its location adjacent to the S.R. 40 corridor. Based on the information contained in historic mapping, and Catts *et al.* (1988) and De Cunzo and Catts (1990), it appears that the area surrounding the Church Road Improvements project APE has a low potential to contain historic period archaeological resources dating from the early seventeenth century to the recent past. Based on the project APE's location and general land-use history, if historic period archaeological remains are identified, they will most likely represent rural litter and/or agricultural activities.

2.2 Geomorphology

The Church Road Improvements project APE is located within the Upper Coastal Plains physiographic province, where the majority of soils have formed in old coastal alluvium, which has been deeply weathered and leached of many minerals and nutrients. These Coastal Plain soil profiles contain varying amounts of sand, silt, and clay particles according to the conditions of sediment deposition and their location on the landscape. These soil profiles also include a well developed argillic subsoil horizon, which indicates that they have been stable and exposed to *in situ* weathering throughout at least the Holocene period.

The following soil information is taken from Matthews and Lavoie (1970). Soils mapped within the Church Road Improvements project APE belong to the Matapeake-Sassafras Association. These soils are nearly level to steep, well-drained, medium textured



SOURCE: USGS 1904

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CHURCH ROAD
(WYNNEFIELD TO S.R. 71) IMPROVEMENTS
NEW CASTLE HUNDRED
NEW CASTLE COUNTY

PROJECT AREA IN 1904

FIGURE - 6
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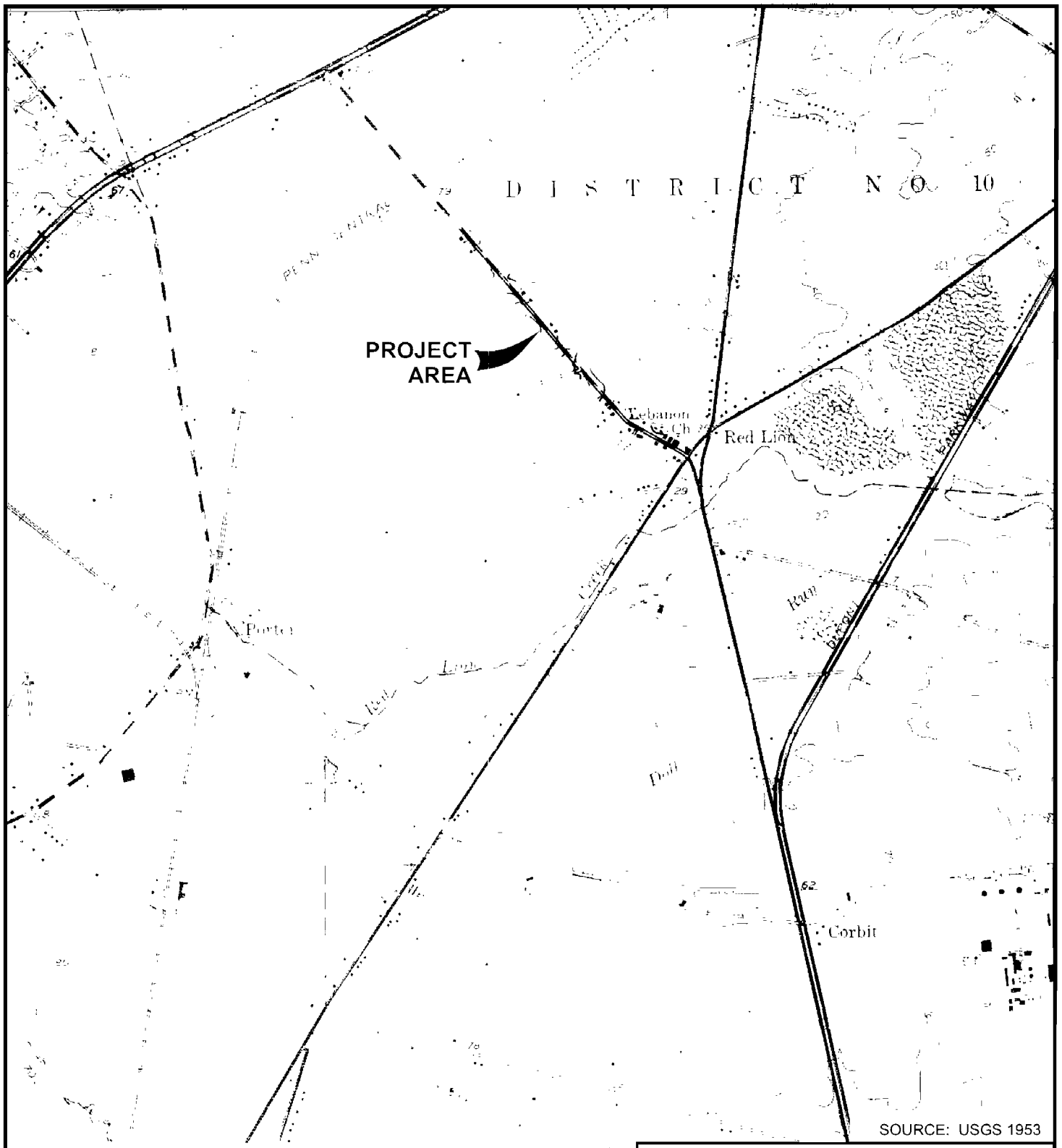

SOURCE: USGS 1953

DELAWARE DEPARTMENT OF TRANSPORTATION

CHURCH ROAD
(WYNNEFIELD TO S.R. 71) IMPROVEMENTS
NEW CASTLE HUNDRED
NEW CASTLE COUNTY

PROJECT AREA IN 1953

FIGURE - 7
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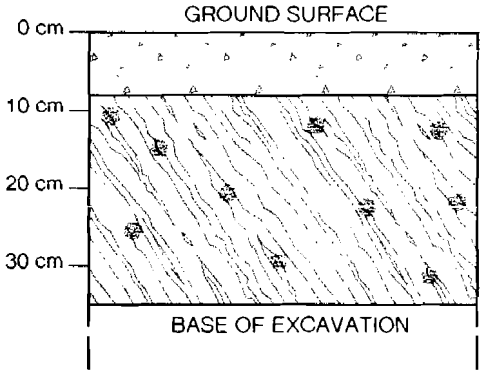
and moderately coarse textured, and are found in uplands. Specific soil types found within the project APE include Matapeake silt loam, 0-2 percent slope (MeA) and 2-5 percent slope, moderately eroded (MeB2); Sassafras sandy loam, 10-15 percent slopes, severely eroded; and Keyport silt loam, 2-5 percent slopes, moderately eroded. Matapeake soils are fine-silty, mixed mesic Hapludults and Ultisols. They are the most extensive soils in New Castle County. They are deep (although some surface has been lost to erosion), well-drained, and found on uplands of the Coastal Plain. The native vegetation of Matapeake soils is mixed hardwoods, chiefly oak. Sassafras soils are fine-loamy, mixed, mesic Typic Hapludults and Ultisols. This soil type is deep, well drained, and found on uplands of the Coastal Plain. The native vegetation is mostly mixed hardwoods, but some shortleaf pine and Virginia pine are also common. Keyport soils are clayey, mixed, mesic, Aquic Hapludults and Ultisols, which are susceptible to erosion. These soils are deep, moderately well drained, and found on uplands of the Coastal Plain. The native vegetation is mixed hardwoods that are tolerant of excessive moisture. Based ontheir topographic positions, drainage, and age, these soil profiles have the potential to contain archaeological resources when found intact. Since the mapping of the soils by the soil survey, however, much suburban/urban development has occurred within the project APE. The original soils have been extensively disturbed or completely excavated during the construction activities of the present roadway, as well as residential structures and the associated driveways and buried subsurface utilities and stormwater drainage networks.

The Church Road Improvements project APE was investigated for the presence of landforms and soils that might have the potential to contain intact archaeological resources. Many soil auger borings were taken within the project APE, and all exhibited disturbed or truncated stratigraphic soil profiles. Several of these stratigraphic profiles are described in detail according to the methods and nomenclature prescribed by the United States Department of Agriculture-Natural Resources Conservation Service (Schoeneberger 2002). Tabular descriptions of the auger boring stratigraphic profiles are included in Appendix A.

All soil auger borings exhibit a truncated profile of Coastal Plain sediment covered with a shallow layer of roadside fill. Soil profiles within Auger Borings 1, 2, and 3 are typical of this type of disturbance (Figures 8 and 9). In each profile, the original surface and upper subsoil have been replaced by a layer of loose loamy fill with road gravels, asphalt fragments, and debris. A well developed argillic horizon, normally found deep within the

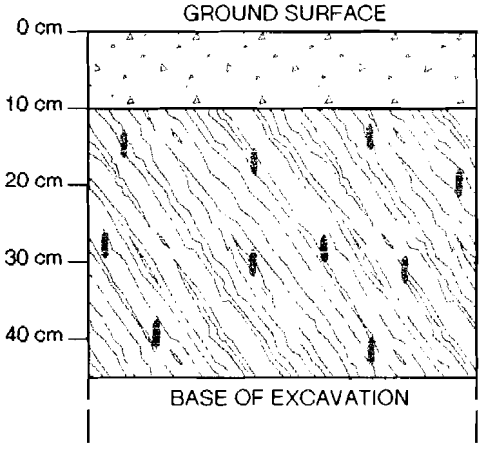
SOIL PROFILE
AUGER BORING 1



Fill — 10YR 5/3 Brown fine road gravels, asphalt fragments, and debris mixed with loose loam.

Bt — 10YR 5/4 Yellowish brown sandy clay loam, with few fine road gravels.

SOIL PROFILE
AUGER BORING 2

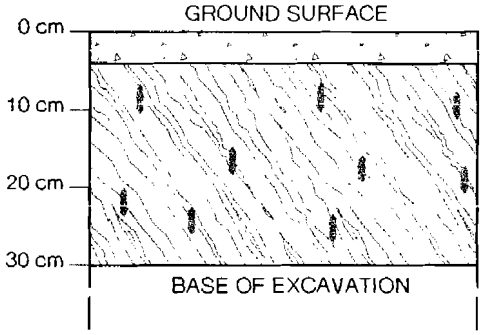


Fill — 10YR 5/3 Brown fine road gravels and asphalt fragments mixed with loose loam.

Bt — 10YR 5/4 Yellowish brown sandy clay loam, with few fine road gravels and quartz pebbles.

DELAWARE DEPARTMENT OF TRANSPORTATION
CHURCH ROAD (WYNNEFIELD TO S.R. 71) IMPROVEMENTS NEW CASTLE HUNDRED NEW CASTLE COUNTY
SOIL PROFILES AUGER BORINGS 1 AND 2
FIGURE - 8 / SKELLY AND LOY, INC. CONSULTANTS IN ENVIRONMENT - ENERGY ENGINEERING - PLANNING

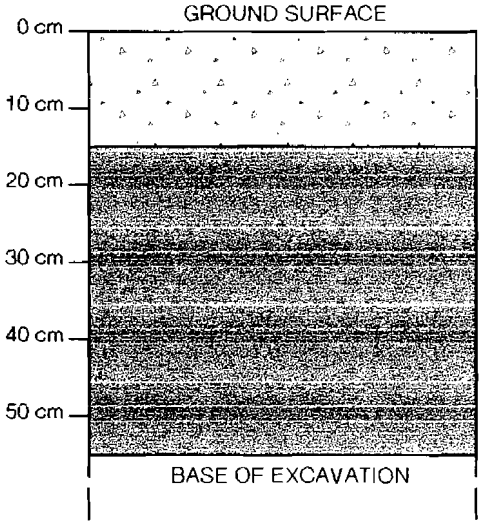
SOIL PROFILE
AUGER BORING 3



Fill — 10YR 5/3 Brown fine road gravels, debris, quartz pebbles, and asphalt fragments mixed with loose loam.

Bt — 10YR 5/4 Yellowish brown sandy clay loam, with few fine quartz pebbles.

SOIL PROFILE
AUGER BORING 4



Fill — 10YR 4/1 Dark gray loose sandy clay loam, with fine road gravels and quartz pebbles.

Cg — N5/0 Gray sandy loam.

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CHURCH ROAD (WYNNEFIELD TO S.R. 71) IMPROVEMENTS NEW CASTLE HUNDRED NEW CASTLE COUNTY
SOIL PROFILES AUGER BORINGS 3 AND 4
FIGURE - 9 / SKELLY AND LOY, INC. CONSULTANTS IN ENVIRONMENT - ENERGY ENGINEERING - PLANNING

subsoil, was noted immediately under the roadside fill. The profiles of all of the auger borings taken throughout the project area are similar if not identical to these borings, with only minor differences in sediment texture and color present.

Auger Boring 4 was located along a small stream within the project APE. Flow within this drainage has been placed into an artificial channel. The profile of Auger Boring 4 is comprised of undeveloped, gleyed, sandy sediment covered with 15.0 cm (5.9 in) of fill (see Figure 9). Gleyed conditions (gray, often mottled soil) occur when a soil profile is saturated for the majority of the growing season. This area appears to have been a broad wetland with minor flow and no distinct stream channel before development of the area. Water flow was collected into a defined channel to accommodate the width of the culvert under the roadway. The wetland was then covered with fill, most likely to raise the elevation of the wetland surface and contain the flow, now concentrated within the artificial channel. The gleyed sandy sediments in Auger Boring 4 are the deep, saturated subsoil of the former wetland profile. No intact former wetland surface or upper subsoil horizons were found within auger borings taken along this drainage.

No intact surface or upper subsoil horizons with the potential to contain *in situ* archaeological remains were found in any portions of the Church Road Improvements project APE, as it is currently defined; therefore, no archaeological testing is warranted.

In general, primary (i.e., bedrock) sources of lithic raw materials are uncommon in the vicinity of the project APE as the majority of the Upper Coastal Plain physiographic province is covered by a think mantle of Pleistocene sediments. While this situation virtually excludes surficial bedrock exposures of raw material, the same processes that resulted in the deposition of these sediments also transported a variety of knappable stone from primary outcrops located to the north. Thus, Native American knappers could have selected from a variety of lithic raw materials, including chalcedony, chert, quartz, and quartzite from secondary deposits (e.g., stream terraces, lag deposits, gravel bars) for stoneworking (Catts *et al.* 1988:14). Common in Delaware lithic assemblages is quartz, a tenacious stone of variable flaking quality. While quartz is suitable for the manufacture of flaked stone tools, its ubiquity in the region and its propensity to shatter when struck during plowing or other earthmoving activities makes the attribution of some quartz specimens as pre-contact period artifacts problematic.

In many areas of the eastern United States, the precise definitionof chert or other raw material types can be used to pinpoint the procurement location (outcrop) and allow for a rough approximation of territorial range of a group to be determined. In Delaware, however, most artifacts of chert, quartzite, and chalcedony consist of materials derived from secondary deposits; thus, many regional specialists do not assign the raw material to a specific named type (e.g., Jacoby *et al.* 1997; Petraglia *et al.* 1998).

Occasionally, artifacts from primary bedrock sources are found on sites in the region. Sources of Iron Hill Jasper are located to the west of the project area near Newark. This distinctive material varies in color from yellow to dark brown and ranges in quality from excellent to poor. When good to excellent quality jasper is found, a wide variety of lithic tool forms are easily made (Petraglia and Knepper 1996). In addition to being found in primary outcrops, jasper cobbles can be found as secondary sources in certain streams on the Delmarva Peninsula.

Primary sources of ironstone, an iron cemented sandstone, are located along the Elk River and Herring Island at the upper end of Chesapeake Bay (Ward 1988:7). This material is noted with some frequency from site assemblages located in the general vicinity of the project APE and Ward notes a cluster of sites with relatively high proportions of ironstone in the vicinity of Churchman's Marsh, to the northeast of the project APE (Ward 1988:15).

Exotic raw materials occasionally encountered on archaeological sites in the region include argillite and rhyolite, both with primary outcrops located to the north and west of the project APE, respectively.

3.0 RECOMMENDATIONS

The Church Road Improvements project APE, as it is currently designed, consists of a narrow 1.5 m (5.0 ft) wide corridor along both sides of the existing roadway where sidewalks and bicycle lanes are proposed. Geomorphological investigations conducted within the project APE assessed the nature of the landforms and soils, and determined if areas existed for the implementation of Phase I archaeological fieldwork. Based on stratigraphic profiles revealed during the geomorphology augering, all of the areas adjacent to existing Church Road and within the proposed 1.5 m (5.0 ft) wide sidewalk/bicycle lanes have been extensively disturbed by past roadway construction and maintenance, private driveways, landscaped yards, commercial paved

parking lots, buried utilities and water lines, and drainage ditches. The location of the project APE along an existing transportation and utilities corridor, the constricted areal size of the proposed improvements, and the position of the project APE along a historically sparsely populated rural road in concert with the verified disturbed and truncated stratigraphic profiles, make the potential for *in situ* pre-contact and/or historic period archaeological resources non-existent. Only mixed and truncated soil profiles are present in the project APE. This lack of intact sediments with the potential to contain archaeological remains precludes the need for Phase I archaeological testing within the Church Road Improvements project APE. At the time of this geomorphological survey, no stormwater management areas had been designated. If stormwater management areas are designated or other design changes occur that are located outside of the currently proposed 1.5 m (5.0 ft) wide sidewalk/bicycle lanes, additional geomorphological and/or archaeological investigations may be necessary.

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APPENDIX A

SOIL PROFILES

SOIL PROFILE
Auger Boring 1

Date: July 28, 2003
Soil Description By: M.G. Sams, CPSS

County: New Castle, Delaware
Project Location: Church Road (Wynnefield to S.R. 71)

Horizon/Depth	SOIL COLOR		Texture	Structure	Consistence	Boundary	Comments
	Matrix	Mottling					
fill / 0-8.0 cm (0-3.2 in)	10YR 5/3 Brown		fine road gravels, asphalt fragments, and debris mixed with loose loam	single grained	loose	clear	
Bt / 8.0-35.0 cm+ (3.2-13.8 in+)	10YR 5/4 Yellowish brown		sandy clay loam, with few fine road gravels	weak fine subangular blocky	firm		

Additional Notes: Broad uplands position; well developed, well drained profile of coastal plain sediments. Original soil profile has been truncated (topsoil removed), and the subsoil has been covered with loose gravelly fill.

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SOIL PROFILE
Auger Boring 2

Date: July 28, 2003
Soil Description By: M.G. Sams, CPSS

County: New Castle, Delaware
Project Location: Church Road (Wynnefield to S.R. 71)

Horizon/Depth	SOIL COLOR		Texture	Structure	Consistence	Boundary	Comments
	Matrix	Mottling					
fill / 0-10.0 cm (0-3.9 in)	10YR 5/3 Brown		fine road gravels and asphalt fragments mixed with loose loam	single grained	loose	clear	
Bt / 10.0-45.0 cm+ (3.9-17.7 in+)	10YR 5/4 Yellowish brown		sandy clay loam, with few fine road gravels and quartz pebbles	weak fine subangular blocky	firm		

Additional Notes: Broad uplands position; well developed, well drained profile of coastal plain sediments. Original soil profile has been truncated (topsoil removed), and the subsoil has been covered with loose gravelly fill.

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SOIL PROFILE
Auger Boring 3

Date: July 28, 2003
Soil Description By: M.G. Sams, CPSS
County: New Castle, Delaware
Project Location: Church Road (Wynnefield to S.R. 71)

Horizon/Depth	SOIL COLOR		Texture	Structure	Consistence	Boundary	Comments
	Matrix	Mottling					
fill / 0-4.0 cm (0-1.6 in)	10YR 5/3 Brown		fine road gravels, debris, quartz pebbles, and asphalt fragments mixed with loose loam	single grained	loose	clear	
Bt / 4.0-30.0 cm+ (1.6-11.8 in+)	10YR 5/4 Yellowish brown		sandy clay loam, with few fine quartz pebbles	weak fine subangular blocky	firm		

Additional Notes: Broad uplands position; well developed, well drained profile of coastal plain sediments. Original soil profile has been truncated (topsoil removed), and the subsoil has been covered with loose gravelly fill.

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SOIL PROFILE
Auger Boring 4

Date: July 28, 2003
Soil Description By: M.G. Sams, CPSS

County: New Castle, Delaware
Project Location: Church Road (Wynnefield to S.R. 71)

Horizon/Depth	SOIL COLOR		Texture	Structure	Consistence	Boundary	Comments
	Matrix	Mottling					
fill / 0-15.0 cm (0-5.9 in)	10YR 4/1 Dark gray		loose sandy clay loam, with fine road gravels and quartz pebbles	single grained	loose	clear	
Cg / 15.0-55.0 cm+ (5.9-21.7 in+)	N 5/0 Gray		sandy loam	massive	plastic, slightly flowing		wet

Additional Notes: Drainageway with channelized creek bed; gleyed coastal plain sediments. Former wetland soil, truncated of original surface. Exposed subsoil sediments covered with fill from channelization and road construction.

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