

Site Selection and Evaluation Report

For the Proposed

The Villages of Elizabethtown Regional

Spray Irrigation Project

Milton, Delaware

January 8, 2007

Prepared for:

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INTRODUCTION

In order to determine the suitability for a spray irrigation system under the current Delaware Department of Natural Resources Guidance and Regulations for Land Treatment of Wastes, Laurel Oak, LLC, conducted a field inspection with the Department of Natural Resources on December 20, 2006 at the proposed land treatment site. The current properties under investigation total over 1,500 acres of agricultural and wooded lands. The property is currently owned by several different landowners north and west of Milton, Delaware. The site is 75 % clear with most of it in agricultural production, 25% is forestry production with the remainder in non tidal wetlands which are wooded. Topographically the site ranges in elevation between 20 to 35 feet above mean sea level. There are no known on-site improvements (buildings) on the properties, only several agricultural production wells.

The developers plan to initially construct a subdivision of approximately 3,700 to 5,000 dwelling units on a 753 acre^{0.000} of land to be known as "The Villages of Elizabeth". The area is located north and south of the Milton-Ellendale Highway border^{0.000} by Cedar Creek Road to the east and Route 30 (Issacs and Gravel Hill Roads) to the West, approximately 1 mile northwest of Milton located in Sussex County, Delaware. The eventual wastewater treatment and disposal capacity of the regional spray irrigation facility is 6 million gallons a day. The regional wastewater treatment facility will have the capability of handling numerous developments in^{0.000} the surrounding area.

During the investigation, Laurel Oak, LLC sampled numerous locations throughout the proposed spray irrigation properties. Soils encountered at the site were classified to the subgroup taxon. The Sussex County Soil Survey (2006) indicated these soils as ~~being~~ possibly being very suited for spray irrigation. The soil map showing the locations of the various study areas is included at the end of this report.

PURPOSE AND INTENT

The purpose and intent of this report is to identify areas favorable for spray irrigation as a means of wastewater disposal. Laurel Oak, LLC should be consulted regarding the applicability of this report and information for uses other than the intended purpose.

STRATIGRAPHY/HYDROLOGY

The Columbia Aquifer is a lithologically complex hydrologic unit generally comprised of two surficial and one subsurface geological formations (Fm.). These deposits were laid down in a number of depositional environments including marine delta, estuarine, fluvial, swamp, marsh, and lagoonal (Ramsey and Schenck, 1990). The major surficial units include the Pleistocene aged Lynch Heights and Scotts Corner Formations, the Pleistocene to Holocene aged Cypress Swamp Fm. and modern day Holocene deposits (Ramsey, 2001; Andres and Howard, 2000; and Andres and Duffy, 2003). These surficial units are very heterogeneous and are comprised of admixtures of sand, silt and clay.

Fine-grained beds within these formations can serve as leaky confining units which locally confine the Columbia Aquifer in some locations.

Sediments of the Beaverdam Fm. are generally orangish tan, orangish brown, to yellowish tan where sub aerially exposed and weathered. At deeper depths where the formation has not been weathered, the sands are typically white and gray. Unweathered fine-grained strata which occasionally occur in the upper Beaverdam Fm. sometimes have blue and green hues.

Permeable loamy sands and sandy loams are the dominant textures of the Beaverdam Fm. encountered at the site. As mentioned previously, fine-grained strata/horizons consisting of clay loams, sandy clay loams and silt loams do, however, occur in some locations at the site. These strata are fine grained enough in some localities to cause temporary localized shallow perched water tables. The relatively shallow depths to the seasonal high water table (limiting zone) in most areas is, however, likely due to the flat topography, low water-table gradients, and the lack of nearby major ground-water discharge areas to drain the site.

MAP UNITS IDENTIFIED

Eight mapping units were mapped in the study area. Delineations appearing on the soil survey map include:

- Fm – Fort Mott – Arenic Hapludult
- Dn – Downer – Typic Hapludult
- Sa – Sassafras – Typic Hapludult
- Ev – Evesboro – Typic Quartzipsamment
- Ig - Ingleside – Typic Hapludult-wet substratum
- Ro – Rosedale – Arenic Hapludult-wet substratum
- Wo – Woodstown – Aquic Hapludult
- Hm – Hammonton – Aquic Hapludult

SITE SOIL CHARACTERISTICS

Fort Mott Sandy Loam

These soil types consist of very deep; well-drained soils that formed in stratified sandy eolian and fluvial-marine sediments. These soil types can contain significant percentages of silt and clays. Soils are classified as “Arenic” due to the twenty inch (20”) loamy sand to coarse loamy veneer, which occurs over an argillic horizon or lamellae. These soil types have a coarse loamy particle size control section and subsoil is generally found to have a moderately rapid permeability.

Redoximorphic features occurred in these mapping units at depths greater than seventy-two inches (72") beneath the soil surface. This soil map unit is generally occurs on upland landscape position and is well suited for spray irrigation.

Downer Sandy Loam

These soil types consist of very deep; well-drained soils that formed in stratified sandy eolian and fluvial-marine sediments. These soil types can contain significant percentages of silt and clays. These soil types have a coarse loamy particle size control section and subsoil is generally found to have a moderately rapid to rapid permeability. Redoximorphic features occurred in these mapping units at depths greater than seventy-two inches (72"). This soil map unit is generally occurs on upland landscape position and is well suited for spray irrigation.

Sassafras Sandy Loam

These soil types consist of very deep; well-drained soils that formed in stratified sandy eolian and fluvial-marine sediments. These soil types can contain significant percentages of silt and clays. These soil types have a fine loamy particle size control section and subsoil is generally found to have a moderately rapid to rapid permeability. Redoximorphic features occurred in these mapping units at depths greater than seventy-two inches (72"). This soil map unit is generally occurs on upland landscape position and is well suited for spray irrigation.

Evesboro Loamy Sand

These soil types consist of very deep; well-drained soils that formed in stratified sandy eolian and fluvial-marine sediments. They can contain significant percentages of sand. . Soils are classified as "These soils are characterized to have a loamy particle size control section and subsoil is generally found to have a very rapid permeability. Redoximorphic features occurred in these mapping units at depths greater than seventy-two inches (72") beneath the soil surface. This soil map unit is generally occurs on upland landscape position and is well suited for spray irrigation.

Rosedale Loamy Sand

The Rosedale sandy loam consists of deep, well drained, gently sloping soil on uplands. The surface layer is generally sandy loam to loamy sand which is greater than 20 inches thick. The subsoil is sandy loam to a fine sandy. Soils in this unit are very favorable for spray irrigation. Permeability is moderately rapid to rapid.

Ingleside Loamy Sand

The Ingleside sandy loam consists of deep, well drained, gently sloping soil on uplands. The surface layer is generally sandy loam and the subsoil is sandy loam. Soils in this unit are very favorable for spray irrigation. Permeability is moderately rapid to rapid.

Woodstown Sandy Loam

Soils in the Woodstown series has formed in sandy marine and old alluvial sediments. The moderately well drained agricultural drainage class of this unit indicates that the seasonal high water table occurs from twenty (20) to forty (40) inches of the soil surface. Soils in this unit are more suited to seasonal spray irrigation due to depth of seasonal high groundwater.

Hammonton Sandy Loam

Soils in the Hammonton series have formed in sandy marine and old alluvial sediments. . The moderately well drained agricultural drainage class of this unit indicates that the seasonal high water table occurs from twenty (20) to forty (40) inches of the soil surface. Soils in this unit are more suited to seasonal spray irrigation due to depth of seasonal high groundwater.

DEPTH TO AND TYPE OF LIMITING ZONES ENCOUNTERED

Limiting zones were inferred from low chroma colors, free water and topographic elevation. Erodibility at the site is slight due to the sandy surface textures and flat topography. The limiting zones identified consist mostly of seasonal saturation (high ground water table).

CONCLUSION

- The wastewater application rate via spray irrigation should not be limited to less than two and half inches per week during the summer months, but be limit to less than two inches per week during spring and fall application months based on the observed water table.
- Mounding of wastewater in^s a minor concern at the site, because the developer is providing approximately 1500 acres of suitable soil area for wastewater disposal.
- Build adequate wastewater storage facilities (60 days).

References

Andres, Scoot A. and Duffy, Cheryl A. 2003 Wellhead Protection Area Delineations for the Lewes-Rehoboth Beach Area, Delaware. Delaware Geological Survey, University of Delaware, Final Contract Report 03-01.

Andres, Scoot A. and Howard, Scott C. 2000 The Cypress Swamp Formation, Delaware. Delaware Geological Survey, University of Delaware, ROI #62.

Regulations Governing the Design, Installation, and Operation of On-Site Wastewater Treatment and Disposal Systems. State of Delaware, March 2001.

Ramsey, Kevin W. and Schneck, William S., June 1990. Geologic Map of Southern Delaware, Open File Report. No. 32: Delaware Geologic Survey.

Ramsey, Kevin W., June 1990. Geologic Map of Ellendale and Milton Quadrangles, Delaware, Geologic Map Series No. 11: Delaware Geologic Survey.

Sussex County Soil Survey, Soil Survey Staff, 2006

Soil Survey Map



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Geology Map

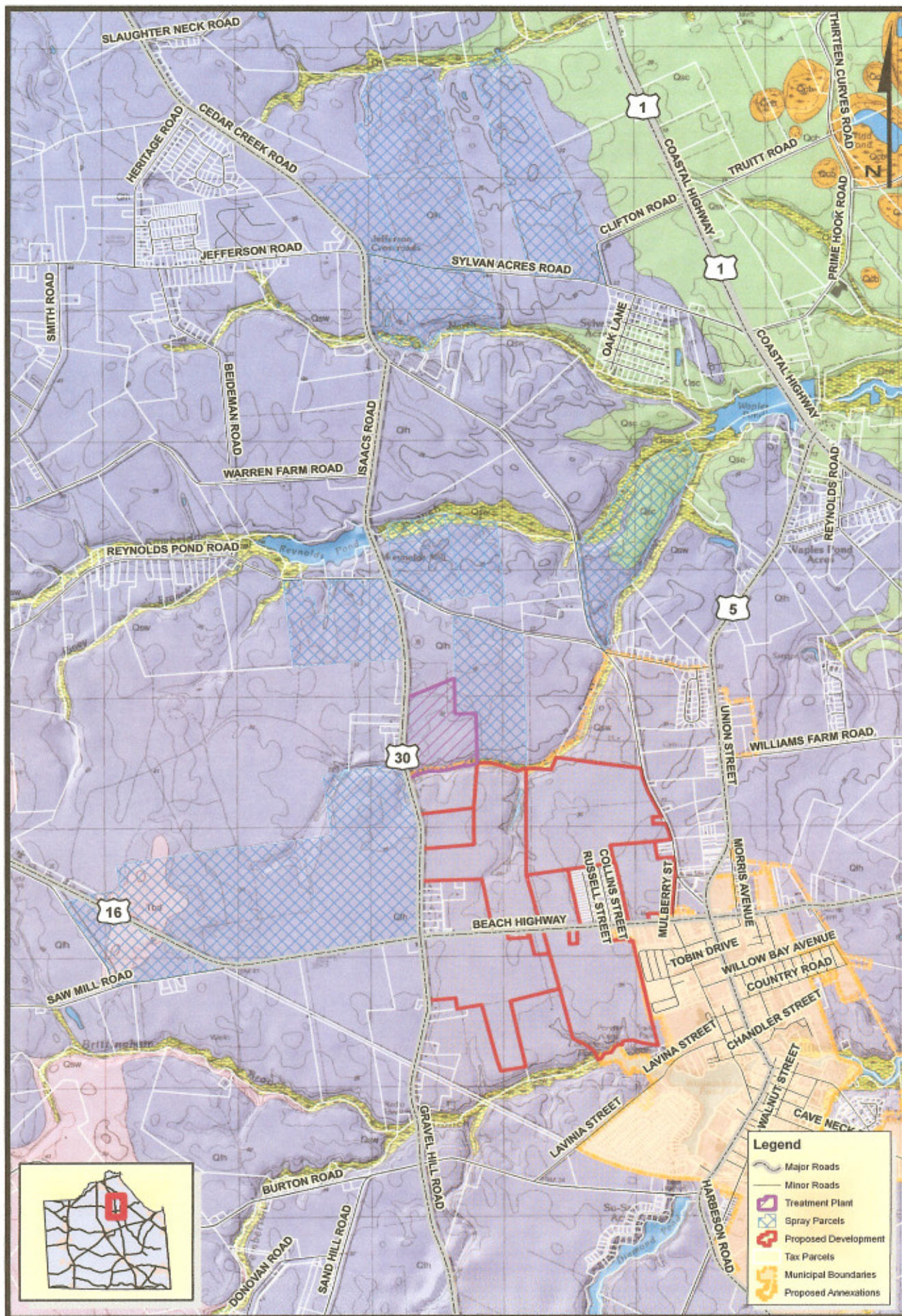


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Geology of the Proposed Elizabethtown Area



USGS Milton Quad



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USGS 4 km NE of Milton, Delaware, United States 01 Jul 1992

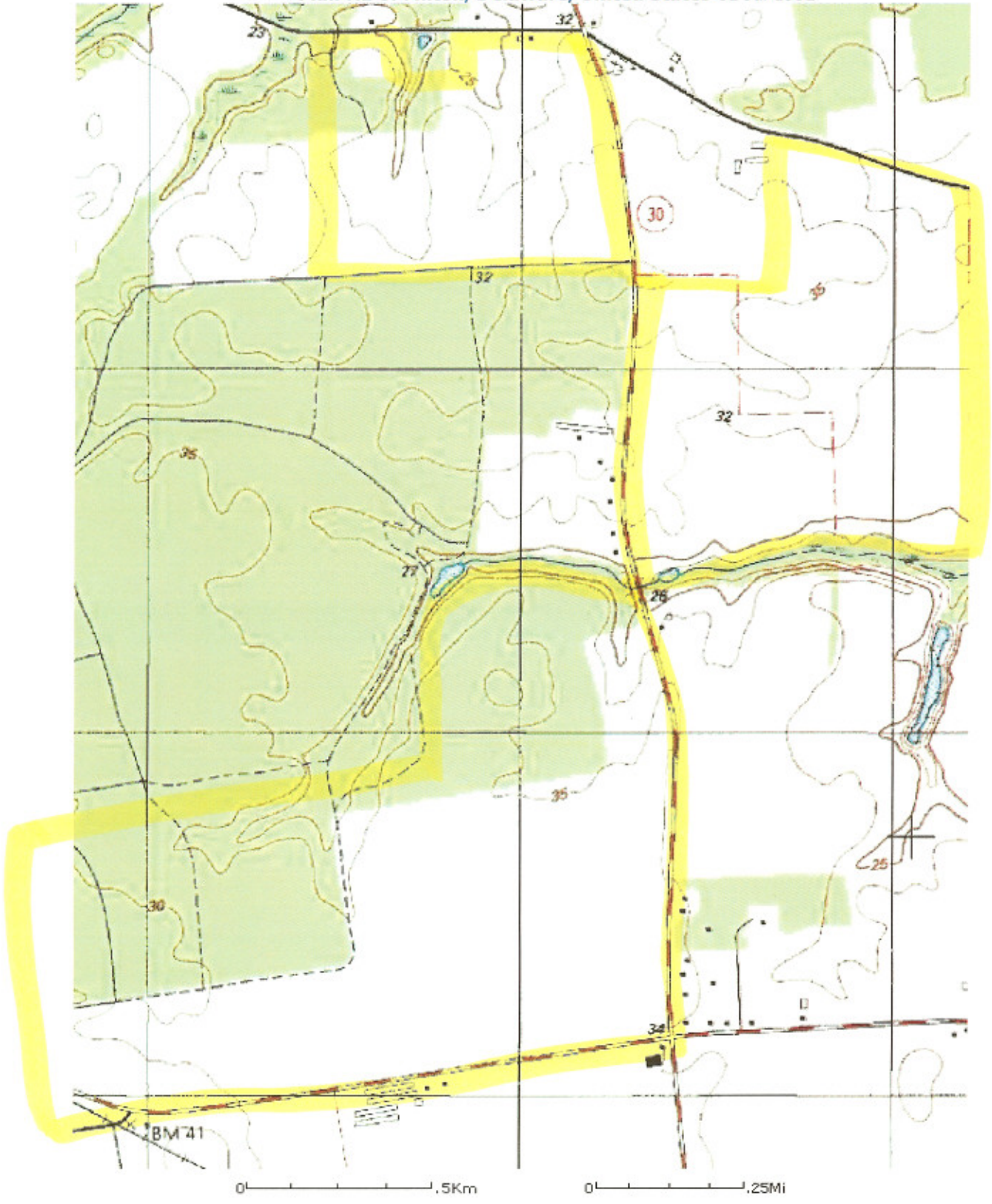


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USGS 237 km SW of New York, New York, United States 01 Jul 1992

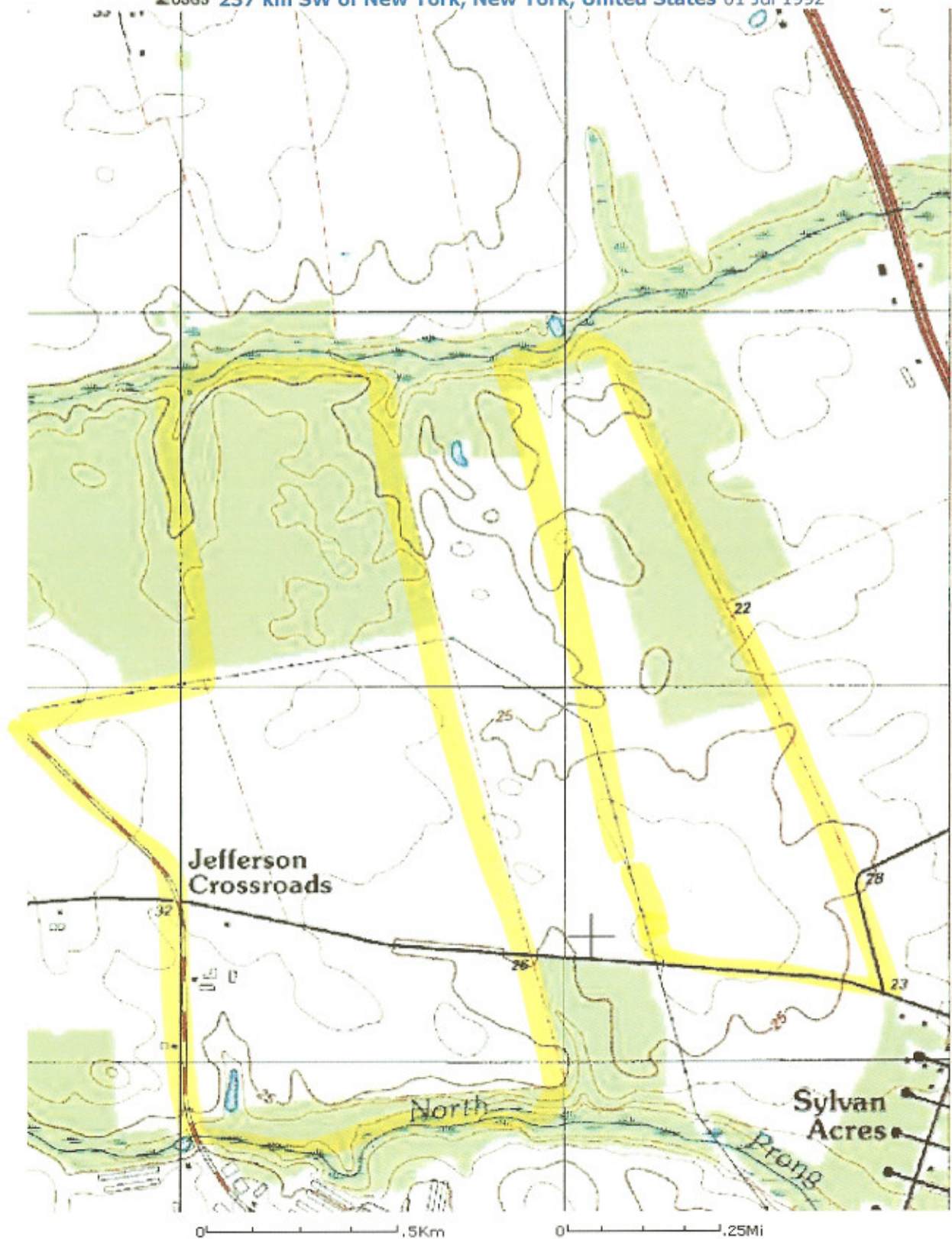


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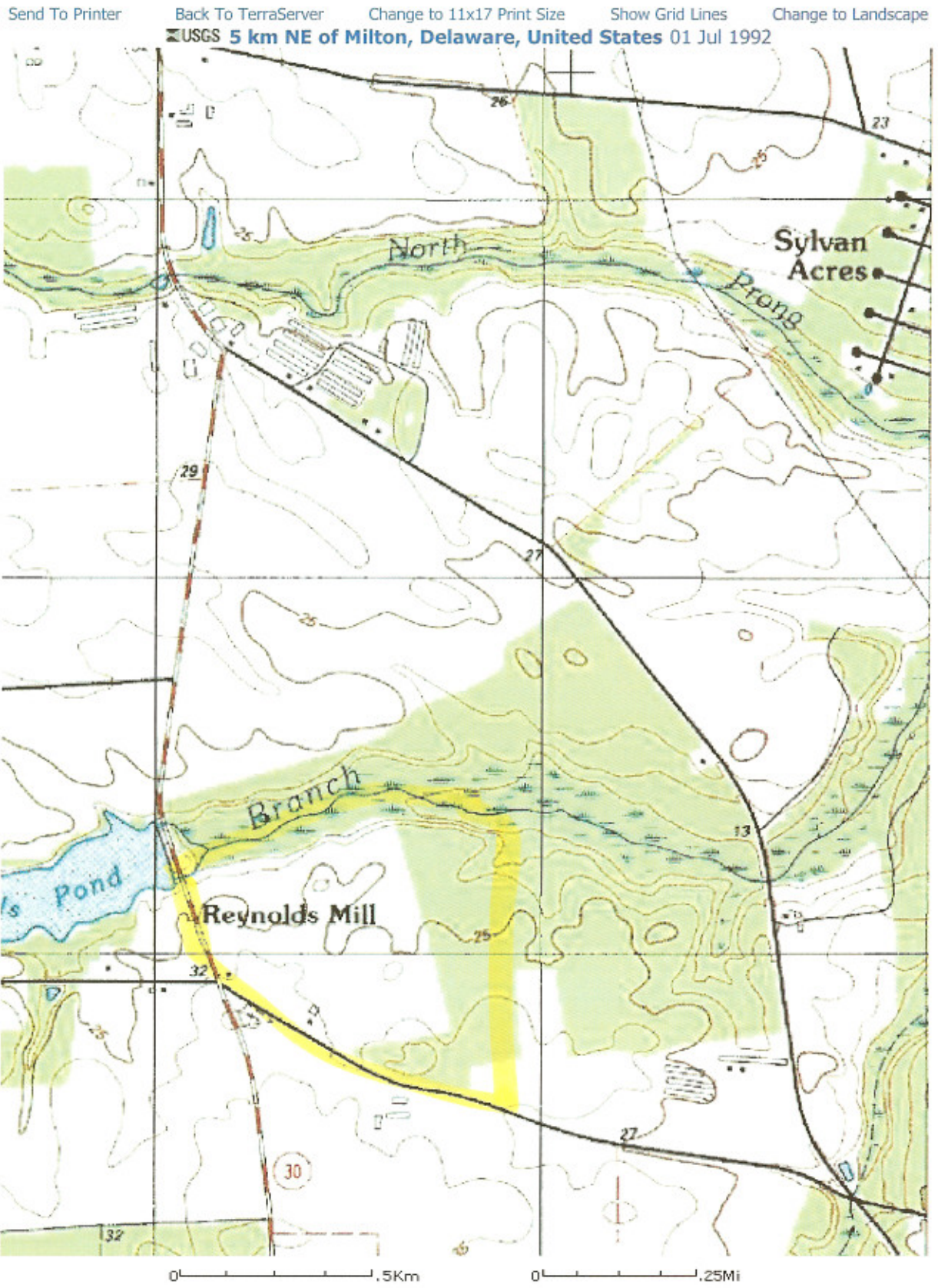


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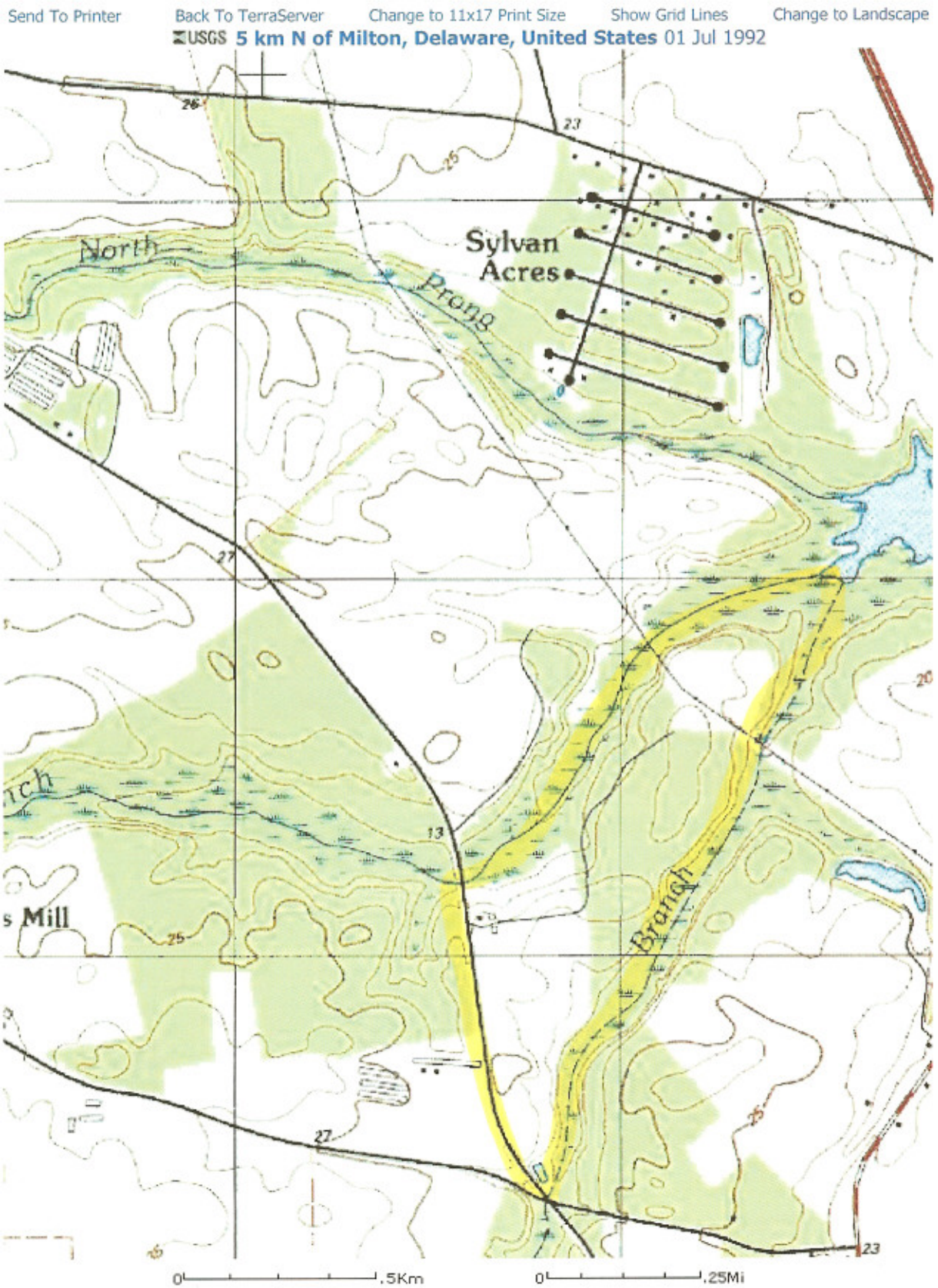


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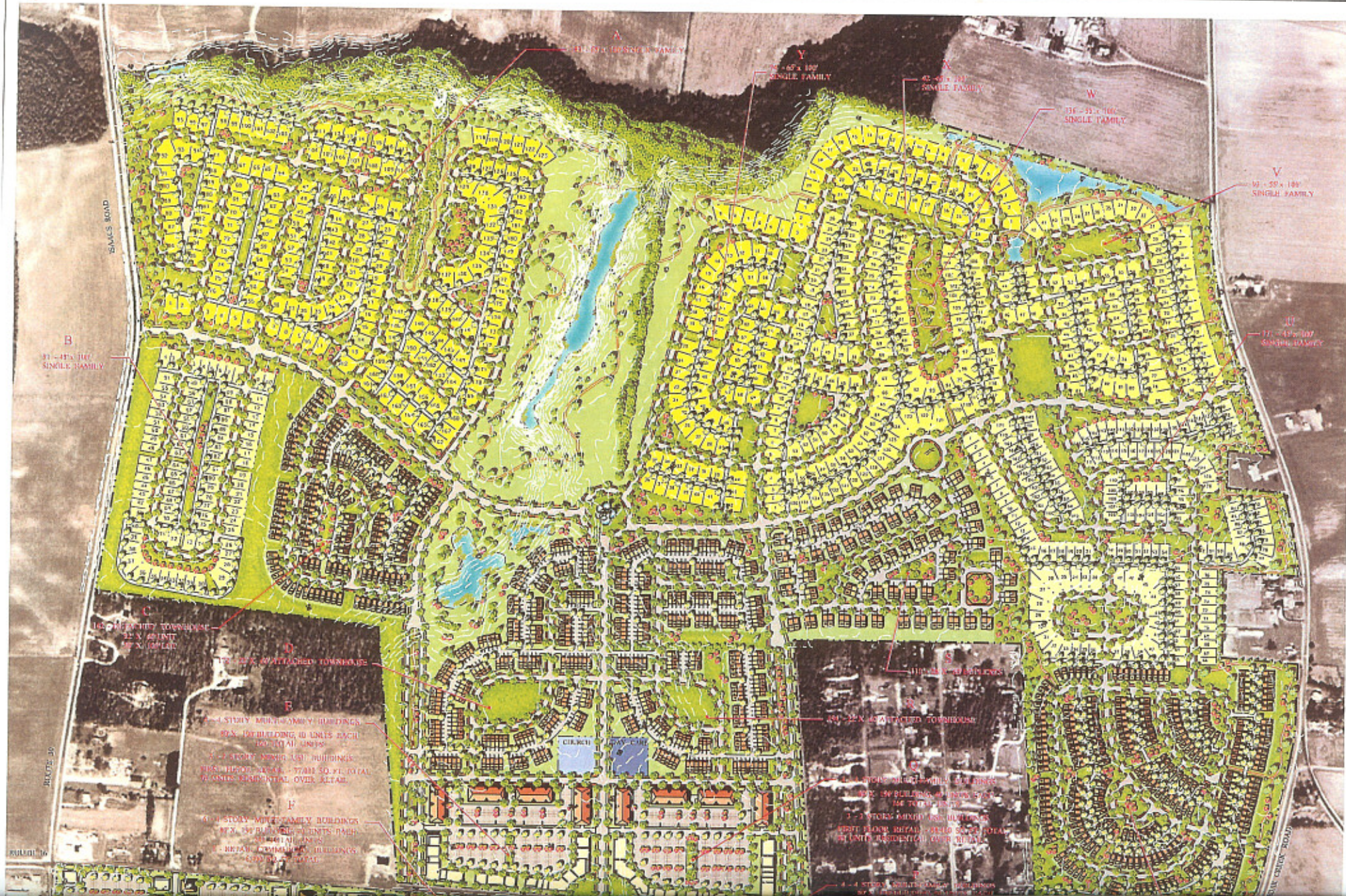
Site Map



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A
41 - 47A 100' SINGLE FAMILY

Y
42 - 45 100' SINGLE FAMILY

X
46 - 49 100' SINGLE FAMILY

W
50 - 51 100' SINGLE FAMILY

V
52 - 59 100' SINGLE FAMILY

U
60 - 63 100' SINGLE FAMILY

B
64 - 67A 100' SINGLE FAMILY

C
68 - 71 100' ATTACHED TOWNHOUSE
22X 100' LOT

D
72 - 75 100' ATTACHED TOWNHOUSE

E
76 - 79 100' 4-STORY MULTIFAMILY BUILDINGS
20X 100' BUILDING IN UNITS EACH
20' TO 24' UNITS

F
80 - 83 100' 3-STORY TOWNHOME BUILDINGS
20X 100' LOT - 27' TO 30' LOT
IN UNITS RESIDENTIAL OVER RETAIL

G
84 - 87 100' 4-STORY MULTIFAMILY BUILDINGS
20X 100' BUILDING IN UNITS EACH
20' TO 24' UNITS

H
88 - 91 100' RETAIL COMMERCIAL BUILDINGS
20' TO 24' UNITS

I
92 - 95 100' 4-STORY MULTIFAMILY BUILDINGS

J
96 - 99 100' 4-STORY ATTACHED TOWNHOUSE

K
100 - 103 100' 3-STORY MULTIFAMILY BUILDINGS
20X 100' BUILDING IN UNITS EACH
20' TO 24' UNITS

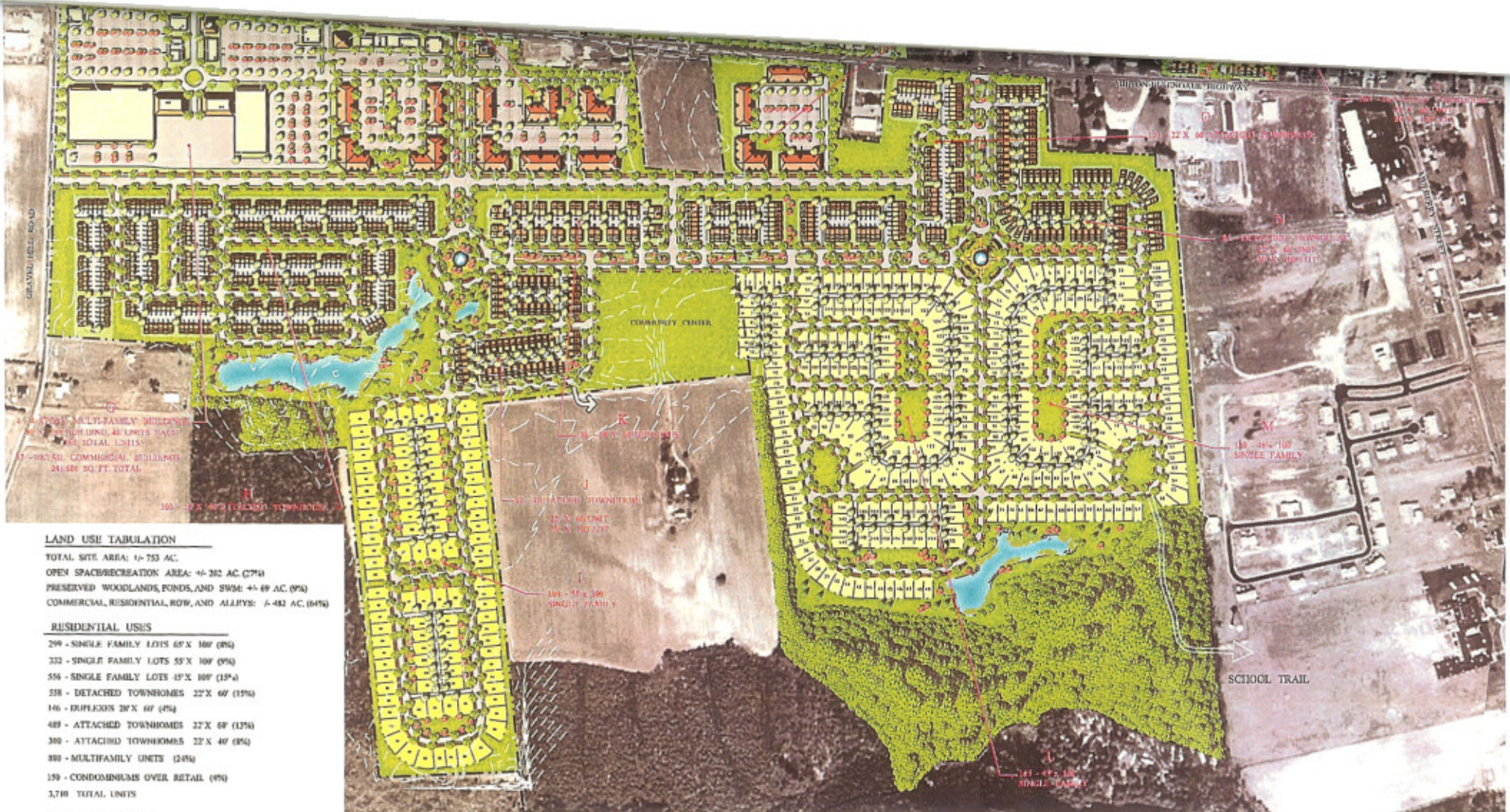
L
104 - 107 100' 3-STORY TOWNHOME BUILDINGS
20X 100' LOT - 27' TO 30' LOT
IN UNITS RESIDENTIAL OVER RETAIL

M
108 - 111 100' 4-STORY MULTIFAMILY BUILDINGS
20X 100' BUILDING IN UNITS EACH
20' TO 24' UNITS

PLATE 30

PLATE 36

CLARK CREEK ROAD



LAND USE TABULATION

TOTAL SITE AREA: 1,753 AC.
 OPEN SPACE/RECREATION AREA: 44,262 AC. (2.5%)
 PRESERVED WOODLANDS, PONDS, AND SWM: 44.69 AC. (2.5%)
 COMMERCIAL, RESIDENTIAL ROW, AND ALLEYS: 6,482 AC. (3.7%)

RESIDENTIAL USES

- 299 - SINGLE FAMILY LOTS 65' X 100' (8%)
- 332 - SINGLE FAMILY LOTS 55' X 100' (5%)
- 556 - SINGLE FAMILY LOTS 45' X 100' (31%)
- 558 - DETACHED TOWNHOMES 22' X 60' (15%)
- 146 - DUPLEXES 28' X 60' (8%)
- 489 - ATTACHED TOWNHOMES 22' X 60' (27%)
- 300 - ATTACHED TOWNHOMES 22' X 40' (17%)
- 880 - MULTIFAMILY UNITS (24%)
- 159 - CONDOMINIUMS OVER RETAIL (9%)
- 3,710 TOTAL UNITS

RETAIL/COMMERCIAL

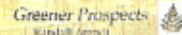
20 BUILDINGS - 412,400 SQ. FT.



September 10, 2006

The Villages of Elizabethtown
 Sussex County, Delaware

"CONCEPTUAL SITE PLAN"



Soils of the Proposed Elizabethtown Area



Legend

- Major Roads
- Minor Roads
- Treatment Plant
- Spray Parcels
- Proposed Development
- Tax Parcels
- Municipal Boundaries
- Proposed Annexations

NRCS SSURGO Soils 1 inch equals 1,000 feet

2,000 1,000 0 2,000 4,000 6,000 8,000 10,000 Feet

Proposed Elizabethtown Area



- Legend**
- Major Roads
 - Minor Roads
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NRCS SSURGO Soils Feet
 2,000 1,000 0 2,000 4,000 6,000 8,000 10,000 1 inch equals 1,000 feet