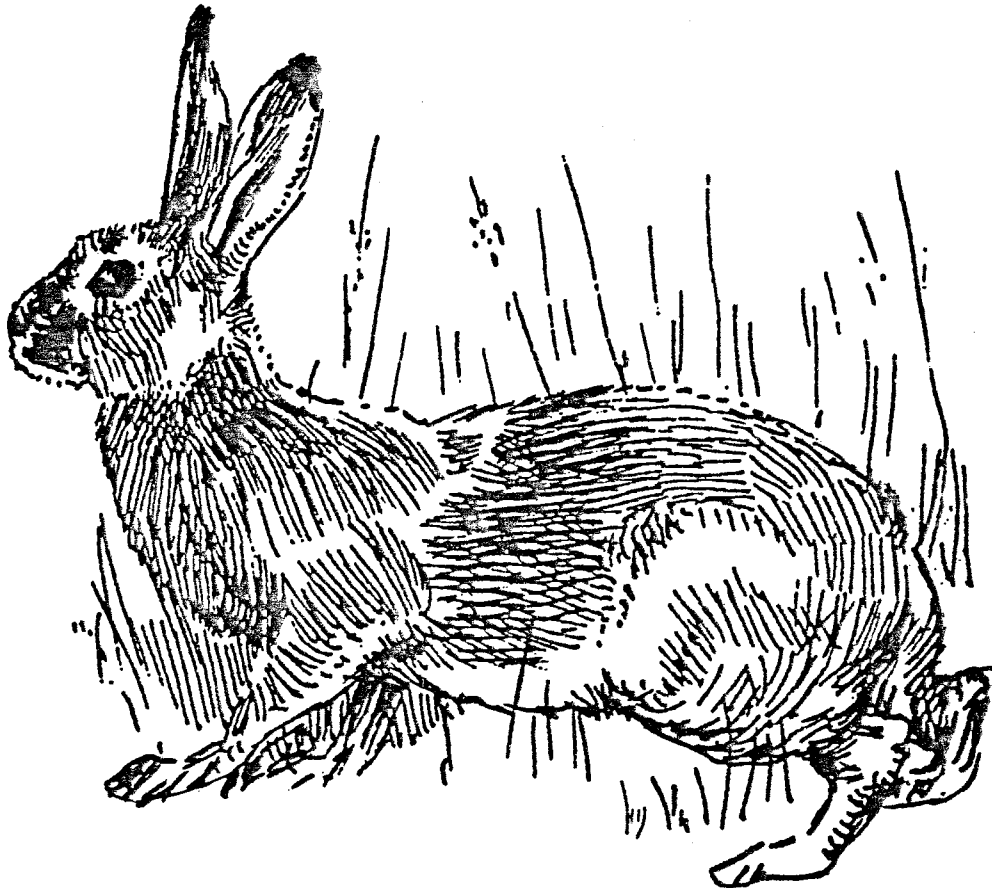


KING'S MARK ENVIRONMENTAL REVIEW TEAM



REPORT FOR

**WOOD CREEK
SUBDIVISION**

BETHLEHEM,
CONNECTICUT

King's Mark Resource Conservation and Development Area, Inc.

WOOD CREEK SUBDIVISION

BETHLEHEM, CONNECTICUT

Environmental Review Team Report

Prepared by the King's Mark Environmental Review Team
of the King's Mark Resource Conservation
and Development Area, Inc.

Wallingford, Connecticut

for the

Bethlehem Inland Wetlands Commission

This report is not meant to compete with private consultants by supplying site designs or detailed solutions to development problems. This report identifies the existing resource base and evaluates its significance to the proposed development and also suggests considerations that should be of concern to the Inland Wetlands Commission and the Town. The results of the Team action are oriented toward the development of a better environmental quality and long-term economics of the land use. The opinions contained herein are those of the individual Team members and do not necessarily represent the views of any regulatory agency with which they may be employed.

JANUARY 1989

ACKNOWLEDGMENTS

The King's Mark Environmental Review Team Coordinator, Nancy Ferlow, would like to thank and gratefully acknowledge the following Team members whose professionalism and expertise were invaluable to the completion of this study:

- * William Warzecha, Hydrogeologist
Department of Environmental Protection - Natural Resource Center
- * Alan Page, Soil Conservationist
USDA - Soil Conservation Service
- * Laura McNamara, Wetland Specialist
Department of Environmental Protection - Water Resources Unit
- * Judy Wilson, Wildlife Biologist
Department of Environmental Protection - Western District
- * Duncan Graham, Executive Director
Council of Governments of the Central Naugatuck Valley

I would also like to thank Susan Anderson, Secretary of the King's Mark Environmental Review Team for assisting in the completion of this report.

Finally, special thanks to Jean Donegan of the Bethlehem Inland Wetlands Commission, David Clark and Patricia King, owners, Curtis Smith, developer, Dudley Ashwood, engineer for the developer and Edward Hill, attorney for the developer, for their cooperation and assistance during this environmental review.

EXECUTIVE SUMMARY

Introduction

The Bethlehem Inland Wetlands Commission has requested that an environmental review be conducted on Wood Creek, a 75.35-acre site proposed for subdivision development. The site is located in central Bethlehem, west of the Weekepeemee River. The site contains second growth hardwood forest with some open areas. Several large areas of wetlands run through the property. A stream with a small pond bisects the property. The steepest slopes are found in the northeast corner of the property.

The proposed subdivision would encompass 6 house lots, ranging in size from 5.02 acres to 13.88 acres. An access driveway serving 5 lots and a single driveway serving Lot 3 are proposed. The access drive would follow an existing gravel road. One wetland crossing is proposed over an existing crossing. The subdivision would rely upon on-site septic and water.

The Town was primarily concerned with the potential impact that the proposed development would have on: (1) topography and geology; (2) water supply; (3) effects of erosion and sedimentation; (4) existing wetlands; (5) wildlife habitat; and (6) site design compatibility and open space. Therefore the Town asked the ERT to inventory on-site resources and determine their suitability for the proposed development.

The review process consisted of four phases: (1) inventory of the site's natural resources; (2) assessment of these resources; (3) identification of resource problem areas; and (4) presentation of planning and land use guidelines. Based on the review process, specific resources, areas of concern, development limitations and development opportunities were identified. The major findings of the ERT are presented below:

Setting, Zoning Land Use

The site abuts Double Hill Road on the north, Wood Creek Road on the south and private, undeveloped land to the east and west. Regulated wetlands are spread throughout the site forming 34 percent of the land area. According to the general ordinance, each lot should be at least 1.5 acres in size and have 200 feet of frontage. Back lots are an exception to the frontage. The development complies with these regulations and the regulations for setbacks from the wetlands and watercourses. The site was used in the past for agricultural purposes.

Topography

The site consists of an area of hummocky irregular terrain.. Maximum and minimum elevations range from 850 to 700 feet above sea level, respectively. Slopes range from gentle to moderate.

Geology

The bedrock that underlies the site has been classified as Ratlum Mountain Schist . Deep test hole information indicated that depth to bedrock is over 7 feet in most places. Lot 2 had bedrock at 30 to 52 inches. Overlying the bedrock on most of the site is a glacial sediment known as till. The texture of the till ranges from loose and sandy to compact. Till with a compact layer, called a hardpan, generally has a seasonally high water table. The interior areas of the site contain stratified drift. The thickness of the deposits is unknown but should not exceed 10 feet in most cases.

The geology of the site should pose no major problems for the subdivision as planned. The large lot sizes help to minimize the chances for problems. Deep test hole information indicated subsurface sewage disposal can be constructed but will need to be engineered. The major concern is the high water table. Proper fill materials and/or curtain drains should help alleviate problems. Footing drains might be required to keep basements dry. The septic systems should be approved by the Town engineer and the health district sanitarian.

Water Supply

The underlying bedrock is the likely source of water for the subdivision. Water from any given well is dependent on the number of fractures in the rock that the well intersects. The availability of water from the bedrock should be sufficient for domestic use. The initial quality of the ground water should be good. There is a chance for effluent contamination. Proper well construction and separating distances should allow for adequate protection of the bedrock aquifer. There is a chance of elevated iron and manganese levels which may necessitate appropriate treatment systems.

Hydrology

Drainage from the site is divided into three drainage areas: the Weekepeemee River, an unnamed tributary to the Weekepeemee and the unnamed stream flowing south towards the Weekepeemee. Because of the low density of development , the gravel packed drive and the size of the drainage area, the increase in runoff is not expected to be significant. It may be wise to prepare a hydrologic study particularly if there are flooding problem downstream. The Connecticut Guidelines for Erosion and Sediment Control should be followed for the stormwater management plan. This plan should be reviewed by the Town engineer. Of particular concern are the downstream culverts. Every effort should be made to protect the streamcourses on the site and the Weekepeemee River.

Soil Resources

The soils on the site have limitations such as wetness, high erosion hazard and a hardpan layer that seeps. These soils are further described in the Litchfield County Soil Survey.

Erosion and Sediment Control

Suggestions to improve the soil erosion and sediment control plan include: using silt fence instead of hay bales near the wetlands, maintaining the erosion controls until the disturbance has been stabilized, providing a filter blanket between the rip-rap and soil to prevent soil movement, providing a construction entrance to add stability to the road and reduce sediment tracking, providing "typical" details for each homesite on the plans and making sure the controls are properly installed and maintained.

Wetland Considerations

The wetlands on the site consist of Rumney soils and the Leister, Ridgebury and Whitman complex. The wetland impacts for the proposed development include one driveway crossing. Long term protection of the wetlands might be better served if the open space were expanded to include the streamcourse and wetlands on Lots 1 and 3.

Wildlife Considerations

Habitat on the site includes hardwood forests, deciduous wetlands, open fields, old fields and a brook with an associated pond. The area offers a variety of food and cover to wildlife including deer, turkey, grouse, raccoon, fox, beaver, otter, mink, mice, various birds, reptiles and amphibians. Because the slope faces southeast, it receives maximum sunlight. This causes snow to melt early in the spring, which enables turkeys to utilize these areas for feeding. The site offers good to excellent wildlife habitat.

As with any development, the impact on wildlife habitat will be negative. Wildlife habitat will be broken up and lost with the construction of roads, driveways, walkways, parking areas and homes. Other impacts include the creation of lawns and the presence of humans, traffic, dogs and cats. Large houselots such as proposed are preferable to many small lots. Ideally, all of the wetlands and watercourses should be included in the open space in order to protect them from degradation. If this cannot be accomplished, deed restrictions prohibiting the use of or change of wetlands should be considered. Using the wetlands for pasturing animals, lawns or gardens should be restricted.

Open space areas should not be isolated. They should have natural pathways for wildlife to enter and exit the property. A combination of habitats in conjunction with wetlands is desirable. A corridor of land along the brook should be included in the open space to prevent roads or drives being built over it to provide access.

There are many steps that can be taken in order to make the area more suitable for wildlife. These include buffer strips, natural landscaping techniques, maintaining forest wildlife requirements and providing nesting boxes for birds.

Threatened and Endangered Plant and Animal Species

According to the DEP - Natural Diversity Database there are no Federally listed Endangered Species or Connecticut "Species of Special Concern" on the site.

Planning Considerations

The region is characterized by single-family homes. March Farms Orchard is located nearby. A few "cottage" businesses were noted. Much of the area is open space. The Plan of Regional Development recommends residential density of 0.5 dwellings or less per acre. A portion of the Weekepeemee River at its confluence with the unnamed streamcourse on the site is recommended as a natural open space area. The Bethlehem Plan of Development recommends Low Density Residential and Rural and Agricultural Watershed. The proposed use of the site is in accord with these plans.

The access for 5 of the lots is from Wood Creek Road. This road is designated a "primary collector road." The additional traffic from the development should not make a major impact on the existing road system. Double Hill Road is an unimproved road. The road is subject to washouts and continual erosion. It does not appear that Lot 3 will create a need to upgrade the road. However, if the other 4 lots fronting on the road are not prohibited from putting in driveways, road improvements might be considered.

The layout for the development attempts to meet the subdivision regulations by establishing frontage for Lots 2, 4, 5 and 6 on Double Hill Road. Since these legs are subject to conservation easements, their only apparent function is to provide the frontage. The access drive for the 5 lots is 15 feet wide. There are no proposed turning areas except in the driveway at each dwelling. While traffic movement will be minimal, the applicant might consider widening the beginning part of the driveway to 18 feet. Access for fire fighting equipment should be reviewed by the fire department. The fire department should also consider the need for a fire pond or dry hydrant system.

An alternative to the frontage/conservation easements would be to construct a private/public road from Wood Creek Road. This road could serve the lots with frontage and driveways and provide easy turn around for emergency and delivery vehicles. Trespass rights could be developed for parcels not abutting the open space. The conservation easements could be eliminated and become additions to the open space. The developer proposes to have the open space preserved by a homeowner's association. An alternative is to have the ownership held by the Town or a Land Trust. The Town would no longer have this land on the tax rolls and would bear the liability. Policing the property would be the Town's responsibility, and the lot owners could lose sense of privacy. If the open space is held by the homeowner's association it will remain on the tax rolls and the association would be responsible for policing and liability. A deed restriction could provide access along the stream corridor if desired.

TABLE OF CONTENTS

| | |
|--------------------|------|
| ACKNOWLEDGMENTS | ii |
| EXECUTIVE SUMMARY | iii |
| LIST OF APPENDICES | viii |
| LIST OF FIGURES | viii |

INTRODUCTION

| | |
|-----------------|---|
| Introduction | 1 |
| The ERT Process | 2 |

PHYSICAL CHARACTERISTICS

| | |
|-------------------------------|----|
| Setting, Zoning and Land-Use | 5 |
| Topography | 6 |
| Geology | 6 |
| Water Supply | 12 |
| Hydrology | 14 |
| Soil Resources | 15 |
| Erosion and Sediment Controls | 17 |

BIOLOGICAL RESOURCES

| | |
|------------------------------|----|
| Wetland Considerations | 19 |
| Wetlands | 19 |
| Wetland Impacts | 19 |
| Recommendations/Conclusions | 19 |
| Wildlife Considerations | 20 |
| Description of Ares/Habitats | 20 |
| Forest | 20 |
| Old Fields/Open Fields | 22 |
| Wetlands | 22 |

| | |
|--|----|
| Wildlife Resources/Recommendations | 23 |
| Subdivision Layout | 24 |
| Open Space | 24 |
| Conclusion | 25 |
| Threatened and Endangered Plant and Animal Species | 26 |

LAND USE AND PLANNING CONSIDERATIONS

| | |
|--------------------------------------|----|
| Planning Considerations | 28 |
| Land Use | 28 |
| Existing Official Plans | 28 |
| Existing Road Network | 29 |
| Existing Zoning Regulations | 30 |
| Existing Subdivision Regulations | 31 |
| Proposed Development Plans | 32 |
| Alternate Development Considerations | 32 |
| References Cited | 35 |

LIST OF APPENDICES

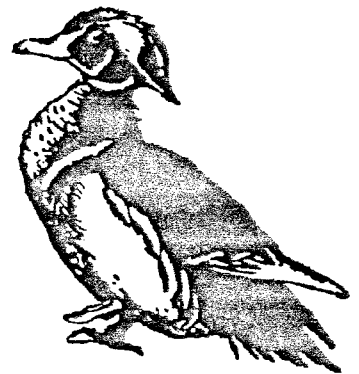
Appendix A: Soil Limitations Tables

Appendix B: Suitable planting materials for wildlife food and cover.

LIST OF FIGURES

| | |
|---------------------------|----|
| 1. Location of Study Site | 3 |
| 2. Proposed Site Plan | 4 |
| 3. Topography | 7 |
| 4. Bedrock Geology | 8 |
| 5. Surficial Geology | 11 |
| 6. Watershed Hydrology | 16 |
| 7. Revised Open Space | 21 |

INTRODUCTION



THE ERT PROCESS

Through the efforts of the Bethlehem Inland Wetlands Commission, the developer's representative and the King's Mark ERT, this environmental review and report was prepared for the Town. This report primarily provides a description of on-site natural resources, and presents planning and land use guidelines.

The review process consisted of four phases:

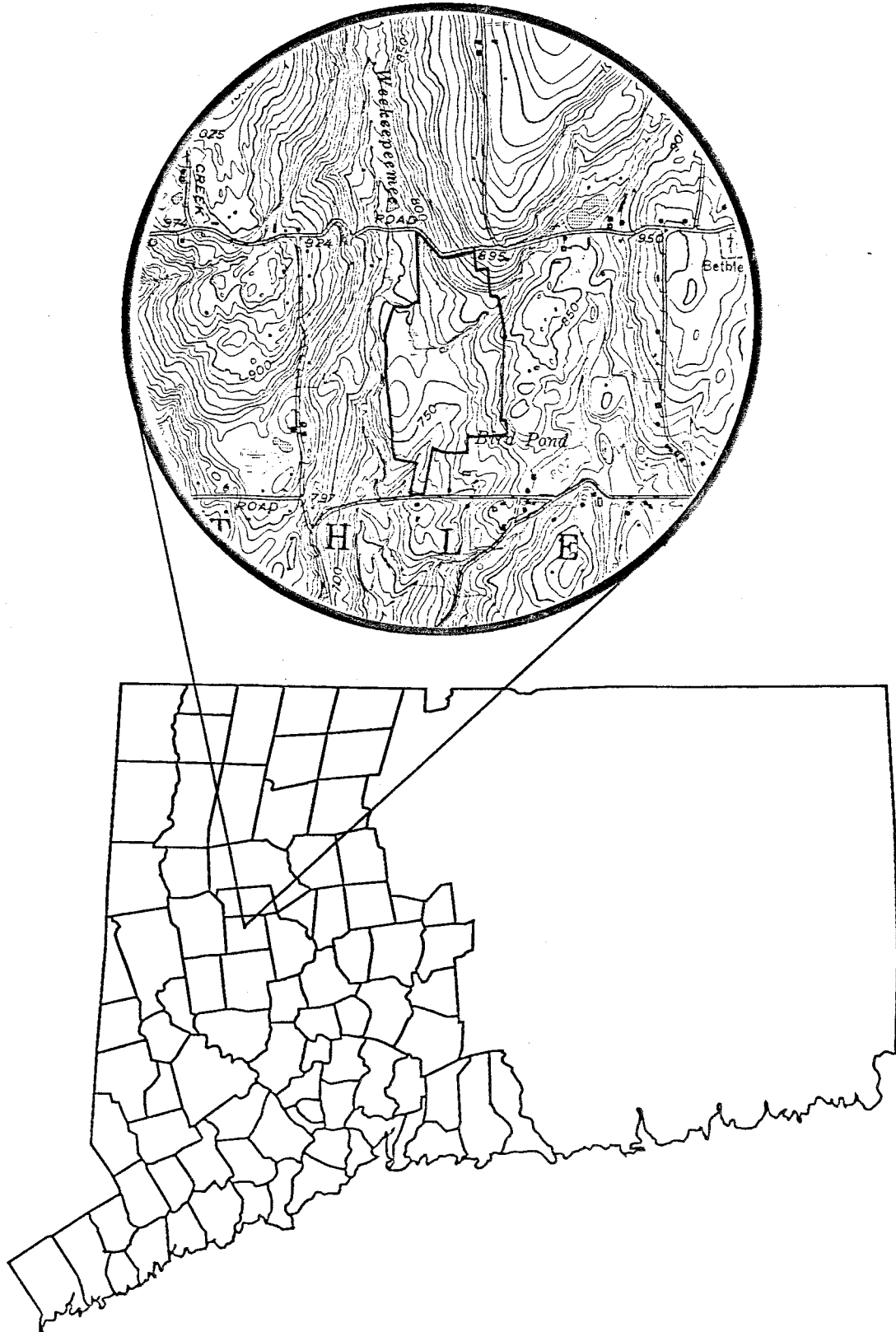
- 1) Inventory of the site's natural resources (collection of data).
- 2) Assessment of these resources (analysis of data).
- 3) Identification of resource problem areas.
- 4) Presentation of planning and land use guidelines.

The data collection phase involved both literature and field research. The ERT field review took place on November 20, 1988. Field review and inspection of the proposed development site proved to be a most valuable component of this phase. The emphasis of the field review was on the exchange of ideas, concerns or alternatives. Mapped data or technical reports were also perused and specific information concerning the site was collected. Being on site also allowed Team members to check and confirm mapped information and identify other resources.

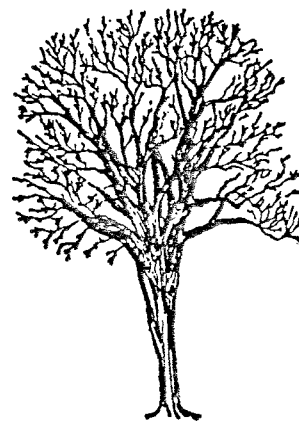
Once the Team members had assimilated an adequate data base, it was then necessary to analyze and interpret their findings. The results of this analyses enabled the Team members to arrive at an informed assessment of the site's natural resource development opportunities and limitations. Individual Team members then prepared and submitted their reports to the ERT Coordinator for compilation into the final ERT report.

Figure 1

LOCATION OF STUDY SITE



PHYSICAL CHARACTERISTICS



The site and vicinity have been used for agricultural and residential purposes in the past. The numerous stone walls delineate the boundaries of former pastures and confirm this past agricultural use of the land. Every effort should be made to preserve these land surface features where possible.

Based on review of air photos from 1934, changes in area land use include a decrease in farm land, an increase in forested land and an increase in residential density.

TOPOGRAPHY

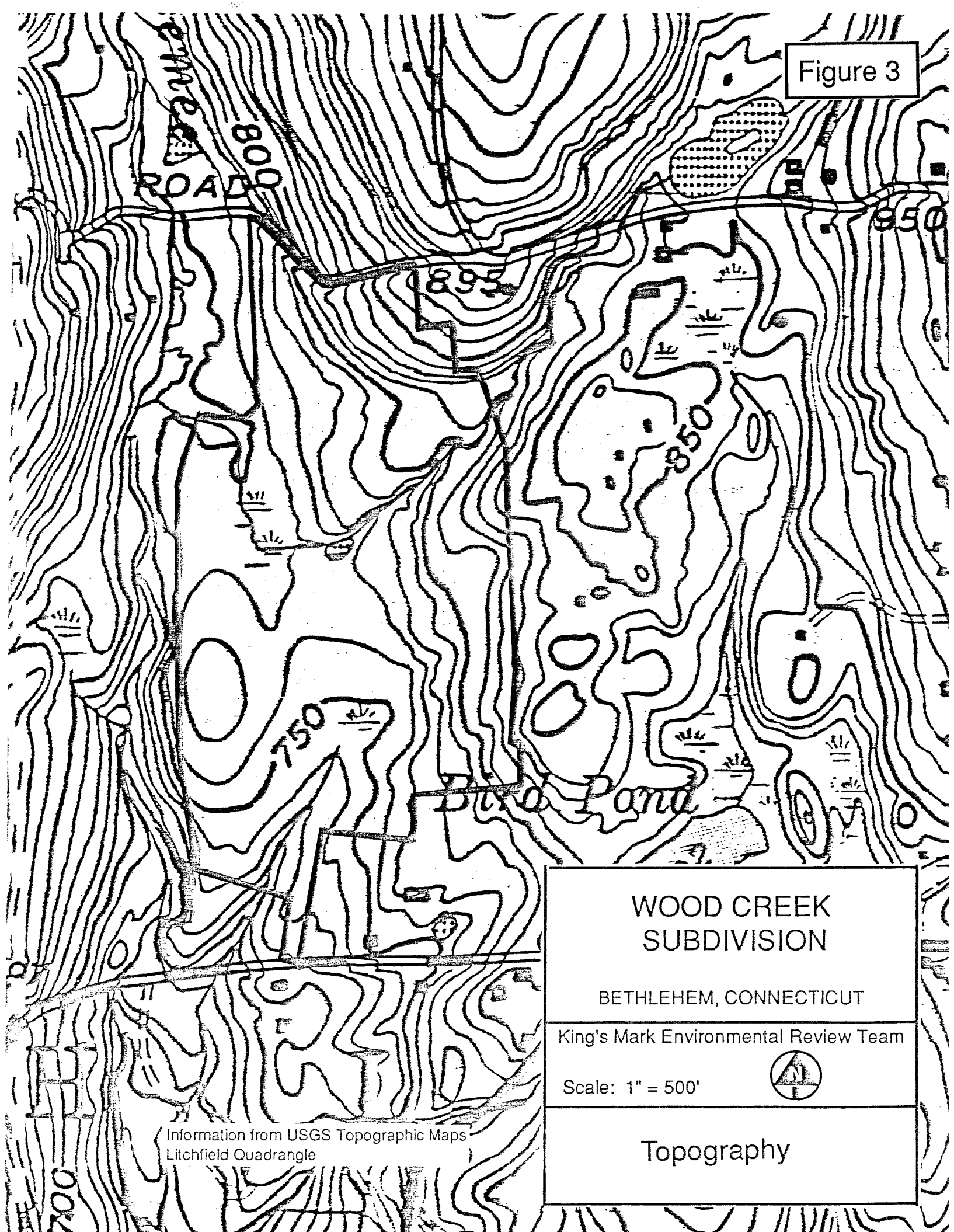
The site consists of an area of hummocky and irregular terrain northwest of Bird Pond. Site elevations range from about 850 feet above mean sea level at the northern limits to about 700 feet above mean sea level at the southern limits (see Figure 3). Slopes generally range from gentle to moderately steep (about 3 to 15 percent) across the site. Steepest slopes occur on Lot 3 at the northern limits.

GEOLOGY

Bedrock does not appear to be well exposed on the site. According to the Bedrock Geological Map of Connecticut, (Rodgers, 1985), bedrock underlying the site has been classified as Ratlum Mountain Schist (see Figure 4). In general, these rocks are described as a gray, medium-grained schists and granofels.

"Schists" and "granofels" are crystalline, metamorphic rocks that have been geologically altered by great heat and pressure within the earth's crust. These terms refer to the textural and structural aspects of the rocks. The rocks underlying the parcel have undergone deformation (metamorphism) one or more times during the period following their deposition as deep ocean sediments. The stresses of

Figure 3



WOOD CREEK
SUBDIVISION

BETHLEHEM, CONNECTICUT

King's Mark Environmental Review Team

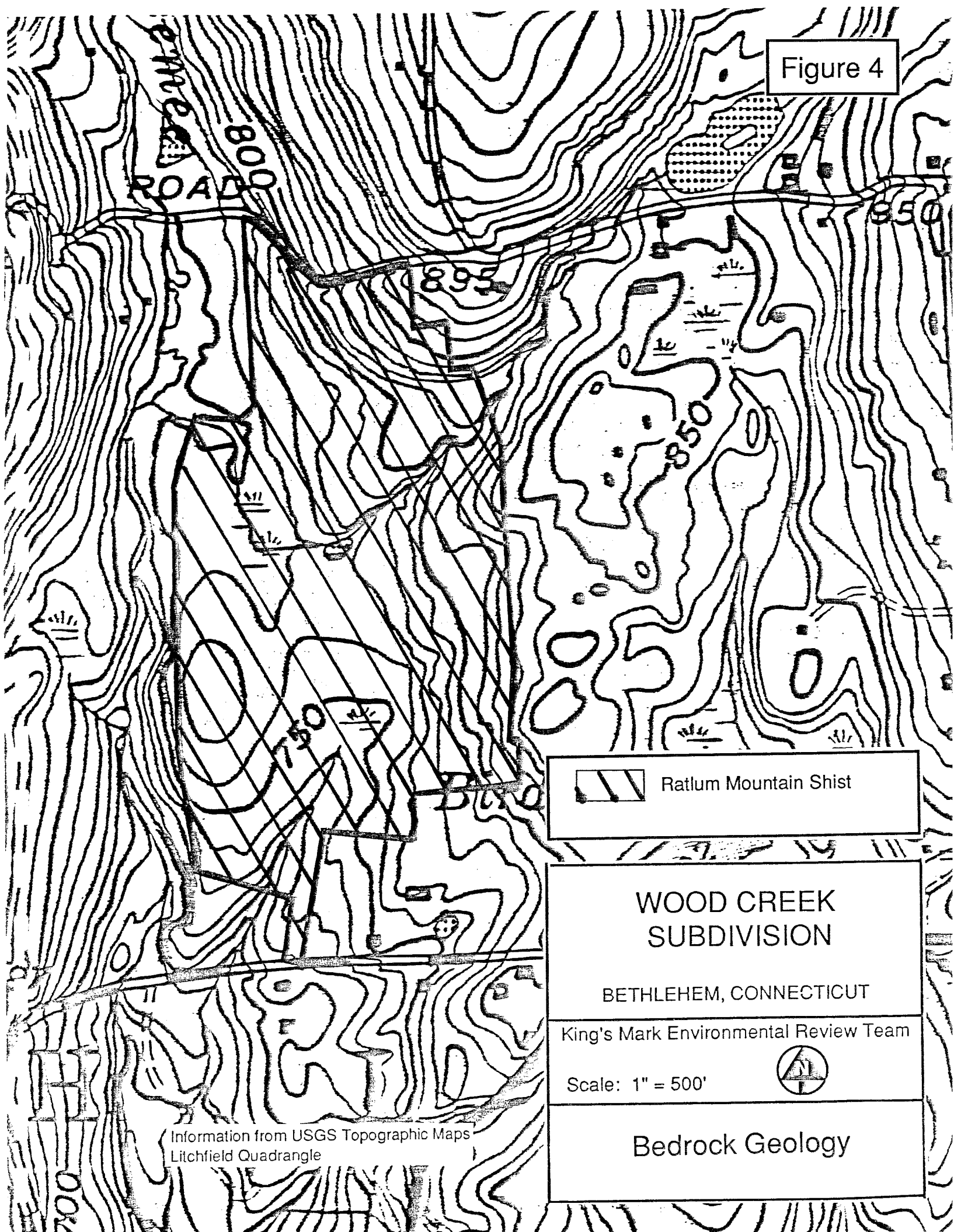
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Information from USGS Topographic Maps
Litchfield Quadrangle

Topography

Figure 4



Ratlum Mountain Shist

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BETHLEHEM, CONNECTICUT

King's Mark Environmental Review Team

Scale: 1" = 500'



Bedrock Geology

Information from USGS Topographic Maps
Litchfield Quadrangle

deformation caused the alignment of platy, flaky and elongate minerals into thin sheets or bands. Where the alignment has resulted in a slabby rock (i.e., one that parts relatively easily along the surface of mineral alignment or foliation planes), the rock is termed "schist." Where there is little or no foliation or lineation but a more massive rock, the rock is termed "granofels."

Deep test hole information compiled for the parcel indicates that depths of about 84 inches (or 7 feet) were obtainable on all lots except Lot 2 where the bedrock surface was encountered between 30 and 52 inches below ground surface.

Since public water supply mains are not available in Town, most residences in Town rely on the underlying bedrock as a domestic water supply source. The proposed lots will be served by individual on-site wells that tap the underlying bedrock.

Except for the interior sections of the site, which contain sand and gravel deposits, a glacial sediment called till covers the site (see Figure 5). Till is a poorly sorted mixture of rock fragments and particles deposited directly by glacier ice. Rock fragments and particles found in the soil were derived from the local bedrock. Based on soil mapping data, it appears that two varieties of till cover the site. One variety is sandy, stony and loose, which probably is not much more than 10 feet deep in most places. The other variety is siltier and is characterized by a relatively shallow compact zone. The presence of a compact soil zone commonly results in seasonally high water tables, soil mottling (an indicator of high ground water tables) and slow percolation rates. It should be noted that subsurface exploration conducted for on-site sewage disposal indicates the presence of the siltier variety of till, which is characterized by a shallow, compact soil zone.

The other major surficial deposit of glacial origin found in the interior parts of the parcel is stratified drift. Stratified drift, which consists mainly of sand and gravel, was deposited by glacial meltwater streams that occupied the area during

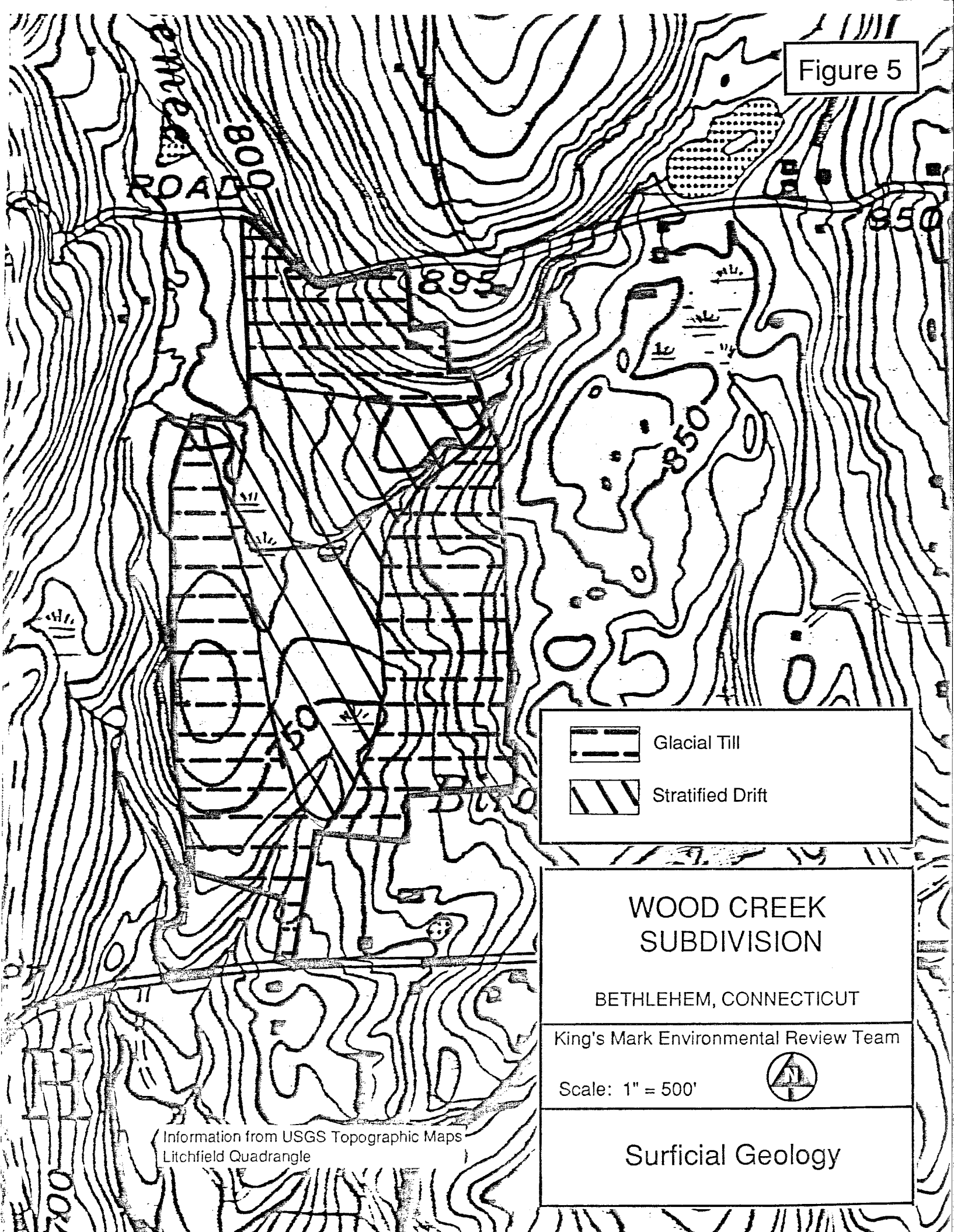
glacial ice retreat. The exact thickness of the stratified drift is unknown, but it probably is not much more than 10 feet deep in most cases.

The geology of the site should pose no major problems for the proposed 6 lot subdivision. The large lot sizes presently proposed help to minimize the chance for potential problems. Deep test hole information supplied by the project engineer indicates that subsurface sewage disposal systems can be constructed on all lots, but that all systems will need engineered design as required by the State Public Health Code. Except for Lot 2 which is characterized by shallow bedrock, the major design constraint on all lots is the presence of seasonally high water tables. The main concern relative to this type of subsurface condition is the ability of the naturally occurring soils to adequately absorb or disperse the expected volume of sewage effluent without overflow, breakout or detrimental effects on ground or surface waters.

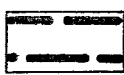

In general, proper fill material and/or intercepting curtain drains are used relative to construction of systems under these conditions. "Hardpan" soils usually allow for the installation of curtain drains as long as there is sufficient slope to outlet the drainage from the pipe. A properly designed and constructed curtain drain installed in accordance with all applicable codes can effectively lower the groundwater so it does not interfere with the proper functioning of the septic system. Ideally, curtain drains should be outletted to the storm drainage system when possible. If this is not possible, curtain drains should outlet at a point where they do not create water problems, (i.e., near septic systems, neighboring properties, etc.).

A curtain drain may be used in conjunction with building footing drains. Because of the potential for high groundwater levels throughout the site, footing drains should probably be required for all homes constructed in the subdivision. This should keep basements dry during the wet time of the year.

Figure 5



EMERSON ROAD


| | |
|--|------------------|
|  | Glacial Till |
|  | Stratified Drift |

WOOD CREEK
SUBDIVISION

BETHLEHEM, CONNECTICUT

King's Mark Environmental Review Team

Scale: 1" = 500'



Surficial Geology

Information from USGS Topographic Maps
Litchfield Quadrangle

within the first few hundred feet below the surface, it has been shown that the probability of increasing the yield of a well decreases with depth below this level.

Assuming the bedrock underlying the site is fractured and capable of transmitting groundwater to water supply wells, groundwater recharge on the upland site should far exceed the water demand for the proposed subdivision.

Ideally, each well should be located on a relatively high portion of a lot, properly separated from the sewage disposal system and any other potential pollutant (e.g., fuel oil storage tanks, etc.) and in a direction opposite the expected direction of groundwater movement. They should all be cased with steel pipe into the underlying bedrock. In order to provide adequate protection of the quality of the aquifer, all wells will need to be properly installed in accordance with applicable State Public Health Code and Connecticut Well Drilling Board regulations. In addition, the health district sanitarian will need to inspect and approve all well locations.

In the lower Housatonic River Basin, 240 wells tapping crystalline, metamorphic bedrock (i.e., gneisses, schists, etc.) were surveyed for Connecticut Water Resources Bulletin No. 31. Of these, 90 percent yielded just under 2 gallons per minute or more, 50 percent yielded about 6 gallons per minute or more and 10 percent yielded about 17 gallons per minute or more. A well yield of 3 gallons per minute is generally satisfactory for most domestic uses.

The natural quality of groundwater should be satisfactory. However, the bedrock that underlies the site may contain elevated iron and manganese which would tend to lower the overall quality. If elevated iron and/or manganese levels are present in the water, it may be necessary to provide suitable treatment filters.

According to the Water Quality Classification Map of Connecticut (Murphy, 1987), groundwater in the area of the site is classified as GA, which means that it is suitable for drinking water supplies without need for treatment.

HYDROLOGY

The site can be divided into three drainage areas (see Figure 6). The western limits of the site drains westward to the Weekeepemee River. The leaching system areas for Lots 5 and 6 and parts of Lot 4 lie within this drainage area. The southeast corner of the site, which includes Lots 1 and 2 and parts of the open space and Lot 4, drain to an unnamed tributary to Weekeepemee River. The streamcourse flows in a southerly direction passing under the existing gravel road (proposed access road) on the site and Wood Creek Road enroute to the river.

The remainder of the site (northern parts) drains to the outlet stream for Long Meadow Pond, which flows in a southwesterly direction through the northcentral parts enroute to Weekeepemee River.

At its confluence with Wood Creek just south of the site, the Weekeepemee River drains an area of 3.95 square miles or 2,528 acres. The site, therefore, represents only about 3 percent of this drainage area.

Because of the low density of residential homes proposed, construction of gravel packed roads and the size of Weekeepemee drainage area, the increase in post-development runoff is not expected to be significant. As a matter of policy, it might be wise to prepare a hydrological study, particularly if there are flooding problems downstream areas. The broad, flat wetland areas in the northern and southern parts should have ample natural storage capabilities for handling post-development runoff increases. It is recommended that Connecticut Guidelines for Erosion and Sediment Control is followed closely with respect to stormwater management on the site.

The stormwater management plan and calculations should be carefully reviewed by the Town's engineer and other appropriate Town officials. The impacts of post-development runoff in the study area should be clearly understood in terms of

flooding and streambank erosion. Of particular concern will be the examination of all downstream culverts. Additionally, every effort should be made to protect the streamcourses on the site and Weekepeemee River.

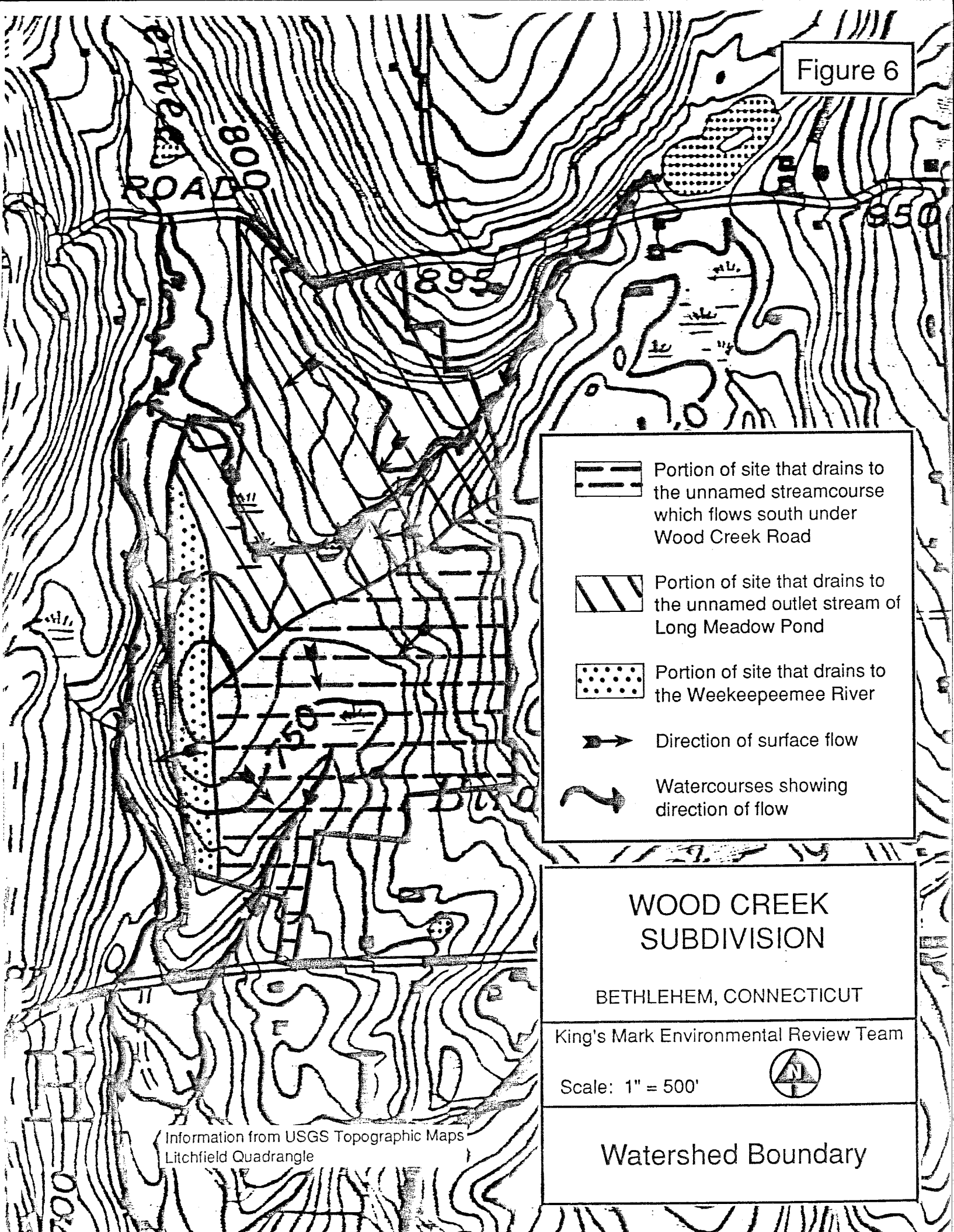
The surface water in the streamcourses on the site is designated Class A by the Department of Environmental Protection (DEP). This means these waters are presently uncontaminated, suitable for human consumption and treated wastewater discharges are not allowed.



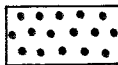


SOIL RESOURCES

The soils within the proposed Wood Creek Road Subdivision are mapped as CaB, CaC, CrC, CrD, GeC, HrE, Lg, Lm, PeC, PbB, PbC and Ru soil map units. These soils are described below:

- 1) Leicester (Lg), Limerick (Lm) and Rumney (Ru) are inland wetland soils. Flooding and wetness are the most limiting features of these soils for development.
- 2) Charlton (CaB, CaC, CrC and CrD) soil is a deep, well-drained soil. Permeability is moderate to moderately rapid in the surface layer and subsoil. Runoff is a hazard on this soil, and unprotected areas are subject to erosion. Slope is the most limiting feature of this soil for development. The erosion hazard on this soil is high due to steep slopes. CrC and CrD are very stony and on very steep slopes.
- 3) Gloucester (GeC) soil is somewhat excessively drained, permeability is moderately rapid, and the available moisture capacity is low. Slope and poor filtration are the most limiting features of this soil for development. The erosion hazard on this soil is high due to steep slopes.
- 4) Hollis (HrE) soil is well-drained or excessively drained, strongly sloping, hilly or steep and very shallow to shallow over bedrock. Slope and shallow depth are the most limiting features of this soil for development. The erosion hazard on this soil is high due to steep slopes.

Figure 6



-  Portion of site that drains to the unnamed streamcourse which flows south under Wood Creek Road
-  Portion of site that drains to the unnamed outlet stream of Long Meadow Pond
-  Portion of site that drains to the Weekepeemee River
-  Direction of surface flow
-  Watercourses showing direction of flow

**WOOD CREEK
SUBDIVISION**

BETHLEHEM, CONNECTICUT

King's Mark Environmental Review Team

Scale: 1" = 500'



Watershed Boundary

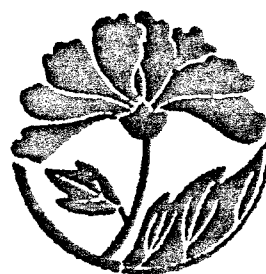
Information from USGS Topographic Maps
Litchfield Quadrangle

- 4) The recommended seeding dates for establishing permanent vegetation are:

April 15 through June 15

August 15 through September 15
- 5) Provide E&S details and "typical" E&S controls for each proposed homesite directly on the plan.
- 6) The key to successful E&S control is proper installation and maintenance.

BIOLOGICAL RESOURCES



WILDLIFE CONSIDERATIONS

Description of Area/Habitats

The 75.3-acre site proposed for development contains hardwood forest, deciduous wetlands, open fields and old fields regrowing with early successional stage vegetation. The area is bisected with a brook which forks and rejoins itself again. A small pond is fed by water diverted from the brook.

Generally, the greater the habitat diversity and degree of interspersions of these habitat types, the greater the variety of wildlife there will be using an area. The area offers a good variety of habitats and also offers some degree of interspersions of these habitat types. Because of this the area currently offers good to excellent wildlife habitat.

Forest: The majority of the area is mixed hardwood forest (including the deciduous wetlands). Species composing the forest include red maple, oak, ash, hickory, beech and birch along with others. In addition to providing cover, nesting and roosting places, the oak, beech and hickory provide a valuable food source in the form of mast.

Parts of the forest have thick understory, especially where the moister soils occur. A thick understory provides cover and nesting sites and can provide food in the form of berries which are produced by various shrubs. A variety of shrubs and trees in the understory provide vertical diversity. In general, the greater the vertical diversity, the greater the diversity of bird species there will be using an area.

The snag trees (dead trees) on the property provide insects for a variety of wildlife such as woodpeckers, chickadees and other insect eating birds. The den trees (trees with holes) found scattered throughout the property provide cavities for nesting owls, swallows, etc. The cavities also provide denning sites for raccoons, etc.

Figure 7

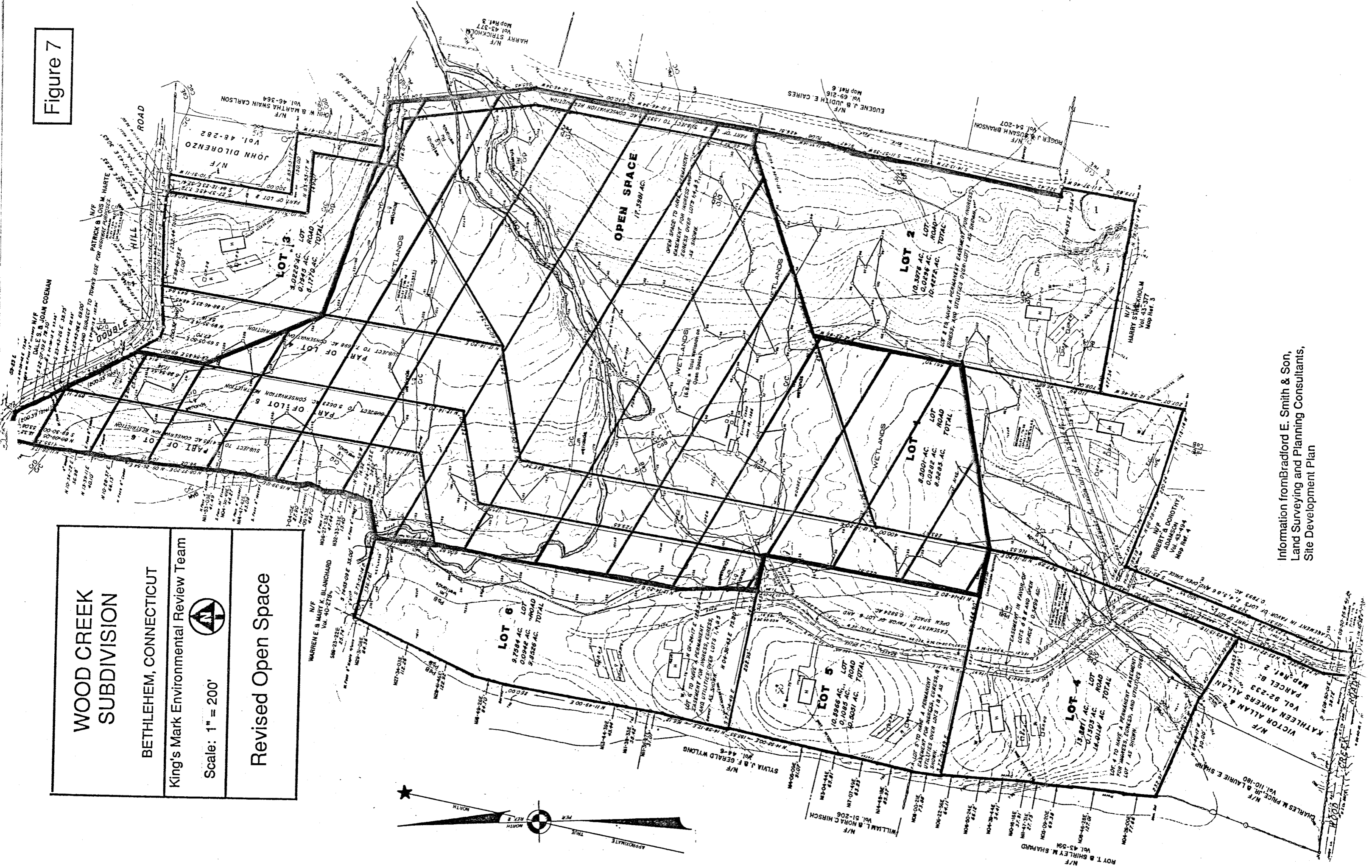
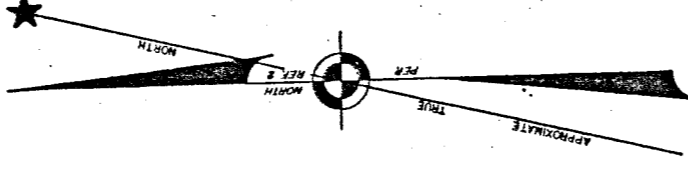
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BETHLEHEM, CONNECTICUT

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Scale: 1" = 200'

Revised Open Space



Information from Bradford E. Smith & Son,
Land Surveying and Planning Consultants,
Site Development Plan

brooks and standing water in various places can be important habitat for reptiles and amphibians.

In addition to providing habitat for a variety of species, the brook system probably attracts various predators such as raccoons and foxes which could feed on insects, reptiles and amphibians utilizing the brook. The larger main brook which drains into the Weekepeemee River would probably attract otter and mink making their way from one brook/pond/wetland to another during their travels in search of food.

There is evidence of beaver activity in the brook near the pond. Although not ideal beaver habitat for a number of reasons (topography, tree species, etc.), the brook system could provide temporary food and space for a beaver pushed out of its present colony at maturity. Possibly the beaver traveled up from some established colony along the Weekepeemee Brook to look for a suitable place to establish its own territory. It appears the animal is not inhabiting the area currently.

The pond provides an additional water source and a source for food for various species of wildlife. Emergent vegetation and additional cover around the perimeter of the pond would increase its use by wildlife.

Wetland areas are limited in quantity in the state and continue to dwindle on an almost daily basis, another important factor in considering their preservation. Their value increases as the quantity of the resource diminishes. A buffer of at least 100 feet is recommended around any wetland to preserve its value and use by wildlife.

Wildlife Resources/Recommendations

As with any development the impact on wildlife in general will be negative. A sizable area will be broken up and lost with the construction of roads, driveways, walkways, parking areas and homes. Another impact is the loss of habitat where cover is cleared for lawns and landscaping. A third impact is the increased human presence, vehicular traffic and a number of free roaming dogs and cats. This could

drive the less tolerant species from the site, even in areas where there has been no physical change.

Certain species which are adaptable to man's activities may increase due to his presence and associated nuisances may occur. Typical species which can become a nuisance include pigeons, starlings and raccoons.

Subdivision Layout: Large houselots as proposed for in this development are preferable to many small houselots. Numerous houses set on small lots augment the negative impact to wildlife habitat. Large houselots leave more habitat intact for wildlife to utilize.

Several of the houselots contain sizeable amounts of wetlands. Ideally, all the wetlands now encompassed in the house lots should be part of the open space in order to prevent their degradation and to preserve most of their function as wildlife habitat. If this recommendation cannot be met then placement of a deed restriction, covenant, etc., prohibiting any use of or change of the wetlands within houselots would be useful in preserving the integrity of the wetlands. Such activities as pasturing animals in a wetland or filling them in for extra lawn and/or garden should be restricted. Additionally, a buffer of 100 feet around a wetlands to preserve the vegetation can increase the usefulness of a wetlands after the area has been broken up by development.

Open Space: Whatever type or combination of types of areas are set aside, setting aside an "island of open space" surrounded by development is the least desirable for wildlife. The area should have natural travel pathways for wildlife (such as streams, valleys and ridgetops) to enter and exit to other open space areas outside the development. The open space area is more valuable to wildlife if not traversed by roads which may impede the movements of wildlife at times. A combination of habitat types in conjunction with wetlands for open space is desirable.

The area proposed to be left as open space does contain a variety of habitats, which is desirable for providing habitat diversity. The main brook and its branch, the pond, wetlands and some upland area are included in the 17 acres of open space. Ideally, a corridor of land (100 feet on either side) along the entire brook (the area of the 2300 foot easements of Lots 4, 5 and 6) should be included in the open space area. In addition to being an important habitat type, brooks can often function as travel corridors for many species of wildlife. This brook serves as a connection to Weekepeemee River for species using these brooks and the habitat they provide as travel corridors. If this section of brook were included as open space it would assure that the brook would not have roads built over it (to allow access from Double Hill Road) and the vegetation would not be disturbed. Insuring that there would be no habitat disturbance to the brook system would help lessen the impact of the development.

Conclusion

In a small but heavily developed and populated state like Connecticut, where available habitat continues to decline on a daily basis, it is critical to maintain and enhance where possible existing wildlife habitat. In planning and constructing a development there are steps that should be considered that may help somewhat to minimize the adverse impacts on wildlife.

- 1) Maintain a 100 foot (minimum) wide buffer zone of natural vegetation around all wetland/riparian areas to filter and trap silt and sediments and to provide some habitat for wildlife.
- 2) Utilize natural landscaping techniques (avoiding lawns and chemical runoff) to lessen acreage of habitat lost and possible wetland contamination.
- 3) Stone walls, shrubs and trees should be maintained along field borders.
- 4) Early successional stage vegetation (i.e., field) is a habitat type and should be maintained if possible.

- 5) During land clearing, care should be taken to maintain certain forest wildlife requirements:
 - a) Encourage mast producing trees (i.e., oak, hickory, beech). A minimum of five oaks per acre, 14 inches dbh or greater should remain.
 - b) Leave 5 to 7 snag/den trees per acre for they are used by birds and mammals for nesting, roosting and feeding.
 - c) Exceptionally tall trees, used by raptors as perching and nesting sites, should be encouraged.
 - d) Trees with vines (i.e., fruit producers) should be encouraged.
 - e) Brush debris from tree clearing should be piled to provide cover for small mammals, birds, amphibians and reptiles.
 - f) Shrubs and trees which produce fruit should be encouraged (or can be planted as part of the landscaping in conjunction with the development), especially those that produce fruit which persists through the winter (winterberry, autumn olive). See Appendix B for a list of suggested shrub and tree species that can be encouraged and/or planted to benefit wildlife.
- 6) Nesting sites can be provided for a great variety of birds with placement of artificial nest boxes. Implementation of backyard wildlife habitat management practices should be encouraged. Such activities include providing food, water, cover and nesting areas.

Implementation of the suggested guidelines may help to minimize the adverse impacts to local wildlife populations.

THREATENED AND ENDANGERED PLANT AND ANIMAL SPECIES

According to the Natural Diversity Data Base, there are no known extant populations of Federally Endangered and Threatened species or Connecticut "Species of Special Concern" occurring at the site in question.

Natural Diversity Data Base information includes all information regarding critical biologic resources available to us at the time of request. This information is a compilation of data collected over the years by the Natural Resources Center's

Geological and Natural History Survey and cooperating units of DEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultation with the Data Base should not be substituted for on-site surveys required contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Data Base as it becomes available.

LAND USE AND PLANNING CONSIDERATIONS



these features is analyzed to find positive potential and, from the inventory and analyses, the best use of the land can be recommended." In their Land Use Guide map, accompanying the plan report, the major portion of the study area is recommended as Low Density Residential (1 dwelling per 2 acres minimum). The smaller western portion of the parcel is defined Rural and Agricultural-Watershed with a recommended density of 1 dwelling per 3-4 acres minimum.

It is concluded that the proposed use of the property for residential purposes at a very low density for single-family units is in accord with the Regional and Town Plans of Development.

Proposed conservation restrictions are also in agreement in concept with the plans.

Existing Road Network

Principal access to the area is from Route 132, 1500 feet to the east of the site. Route 132 is a two lane, 22 foot paved asphalt surface capable of 1700 vehicles at peak hour capacity. 1987 Connecticut Department of Transportation volumes show approximately 1,000 vehicles average daily traffic. Wood Creek Road, from which direct property access is proposed, has an 18 foot paved asphalt surface. Other boundary roads with the exception of Double Hill Road on the north are 18 to 24 feet paved width. Wood Creek Road in the Bethlehem Plan of Development is designed as a "primary collector road" between Route 132 and Judge Lane (Wood Creek Road north). The proposed subdivision of 5 lots for (assumed) 5 single-family dwellings accessing Wood Creek Road will generate a maximum of 1.2 vehicles each for the a.m. peak out and the p.m. peak in. Thus a maximum of 6 vehicles will be moving out/in at peak hours. Volumes on the local roads are not documented. However review of adjacent land uses and the collector function of Wood Creek Road lead to the conclusion that the proposed 5 dwellings will make no traffic impact on the existing road system.

Double Hill Road bordering the property to the north is a winding/steep/narrow dirt road signed at one end "no thru traffic." The road is passable, contains a crude drainage system/leak offs and obviously is subject to periodic washouts and continual erosion. The applicant proposes fronting Lot 3 on this road. Adjacent property fronting on the same dirt road has a residential structure on it.

Four of the other 5 parcels have proposed frontage on Double Hill by virtue of the conservation restriction strips abutting the road for an estimated 665 linear feet.

Since Double Hill is dirt to Munger Lane and already has an existing dwelling on the dirt road, it does not appear that an additional lot (Lot 3) would create any necessity to reconstruct the road to municipal standards. However, if the proposed conservation restrictions (easement) for the four other fronting parcels does not specifically exclude driveway access to Double Hill Road, the Bethlehem Land Use Boards should consider requesting Double Hill Road improvements by the developer.

Existing Zoning Regulations

The Town of Bethlehem has not adopted Chapter 124 of the General Statutes creating a Zoning Commission, regulations and a Zoning Board of Appeals. Instead, the Town lobbied and was successful in the 1982 legislative approval establishing Chapter 125a Sec. 8-17a Land Use Ordinances. Under this Chapter, known as the "Bethlehem Law," a municipality not adopting Chapter 124 may, by ordinance, prescribe minimum land use regulations. In Bethlehem's application of this statute, the basic result is the establishment of a minimum lot size of 65,000 square feet or about 1.5 acres per dwelling unit. There are no land use areal controls on the locations of business, industry or residential development.

The proposed development in terms of minimum lot size does meet this regulation. However, other observations are made in the following subdivision section.

Existing Subdivision Regulations

The proposed subdivision of 75.354 acres is to be divided into 6 building lots ranging in size from 5.1770 acres to 14.0114 acres. Lots 2, 4, 5 and 6 propose a "conservation restriction" over significant strips of these four lots eventually creating frontage on the Double Hill (dirt) Road. In addition, permanent open space of 17.3981 acres is proposed in the east central portion of the total parcel. (Refer to Figure 2, Proposed Site Plan, for a clearer understanding of the proposed division of land.)

In addition to the very unusual lot layout, it is proposed that Lots 1, 2, 4, 5 and 6 be accessed by a 15 foot driveway easement over other lot(s). The 15 foot drive width originates on Wood Creek Road within a 60 foot width right-of-way which is part of Lot 1 and over which 5 lots will have access rights.

Review of the Bethlehem Subdivision Regulation November 17, 1983 in terms of lot size, frontage, etc. states in part the following in Sec. 3.7.3: "...In addition, each lot shall have either a frontage of 200 feet or more on an existing or proposed public street or, if approved by the Commission, shall have a private accessway which is everywhere 40 feet or more in width to such a street." That section further states, "The Commission, at its discretion, may approve a lot served by such private accessway when a) the lot has a minimum area of 100,000 square feet or more, b) the establishment of such accessway is not the typical pattern of subdivision of the tract, c) there will be only one (1) lot served by the accessway and d) there are significant natural features which will be preserved by establishment of such accessway." (underlines added)

It appears that the applicant is attempting to meet the above requirements by establishing frontage for Lots 2, 4, 5 and 6 on Double Hill Road. Lots 4, 5 and 6 have frontage of less than 200 feet but more than the minimum required 40 feet for a private accessway. Since the applicant is proposing that portions of Lots 2, 4, 5 and 6 will be subject to conservation easements and assumedly would not provide vehicular

access to the lots (through wetlands) the only apparent function of these "legs" is as previously stated.

Proposed Development Plan

The 15 foot wide driveway within the 60 foot leg of Lot 1 provides access/egress to Wood Creek Road for Lots 1, 2, 4, 5 and 6. Maximum driveway length to Lot 6 approximates 1,700 feet! There are no proposed turning areas except in the immediate driveway at each dwelling. While traffic movement within the subdivision will be minimal, the applicant should consider widening the driveway to a minimum of 18 feet at least within the 60 foot leg of Lot 1, if the Planning Commission can accommodate the proposed land division within their regulations. Access for Bethlehem fire fighting equipment should be reviewed by those officials. They should also determine if a fire pond and dry hydrant systems would be necessary/desirable for this and future adjacent development. The existing pond might be used for this purpose.

It is understood that the proposed 17.3981 acres of open space will be owned in common by the 6 lot owners. Trespass rights over the individual lot conservation easements provide access by lot owners to the open space. The conservation easement of Lot 2 (40 feet wide) effectively precludes any non owner trespass into the open space.

Alternate Development Considerations

With conservation easements and frontage established on Double Hill Road, the applicant is apparently minimizing development costs by not constructing public/private roads to Town specifications. It is questionable whether the applicant, by fronting conservation easements on Double Hill Road and providing 5 lots access over a single driveway, is meeting the requirements or intent of the subdivision regulations. Another solution, although more costly, would be to construct a cul-de-sac from Wood Creek Road into the interior of the parcel possibly terminating near

the existing cabin with an adequate turn around. All vehicles including delivery, service and emergency would be more easily and safely accommodated. At least 3 lots could be provided frontage on the new street and the other two could be accessed by driveways. Regulations call for a 50 foot right-of-way, therefore the 60 foot wide leg of Lot 1 can readily permit the road construction.

Trespass rights to open space areas could be developed for the parcels not abutting the open space. The conservation easements for Lots 4, 5 and 6 could be eliminated and become additions to the main open space area. Elimination of these easements would still leave these 3 lots with land area exceeding the subdivision requirements. As noted, the 40 foot conservation easement strip on Lot 2 effectively eliminates any public access to the stream or open space area. The municipal opportunity to effectively link permanent stream belts or open space to the east would be lost. The Commission should encourage provision for this eastward access minimally 100 feet each side of the existing stream from Long Meadow Pond.

The developer plans to have the open space preserved by a homeowners association. There is another option available that might be considered. The open space easement could be held either by the Town or by the Bethlehem Land Trust. Under public ownership, the land would be withdrawn from the tax base, however, such withdrawal would have a minimal effect on the grand list. Also the Town or Land Trust would bear the liability. One might argue that public access could create problems with policing the property and may decrease the sense of privacy that the lot owners would feel. Given a 1986 population density of 0.22 persons per gross acre (the lowest in the CNV region) and a total population of 2,573, that concern is not significant. Access could be provided through an easement or the road described as an alternative. If the open space is held by a homeowners association, it would remain a part of the tax base. The taxes may be reduced if it is held as open space

under Public Act 490. The homeowners would be responsible for any liability and the policing of the area. The deed for the open space could provide access along the streambelt for fishing if such access is desired.

REFERENCES CITED

Bedrock Geological Map of Connecticut, John Rodgers, 1985.

Surficial Geologic Map for the Litchfield, CT Quadrangle, Charles R. Warren, 1970.

Municipal Regulations Implementing the Inland Wetlands and Water Courses Act, Town of Bethlehem, CT, 2/25/74.

Subdivision Regulations of the Town of Bethlehem, CT, 11/17/83.

Plan of Development Bethlehem, CT, 4/18/78.

Subdivision Map Prepared for Patricia King & David Jay Clark, Wood Creek Road, Bethlehem, CT, 10/26/88.

ERT Field Review, 12/20/88.

Site Inspection, 1/10/89.

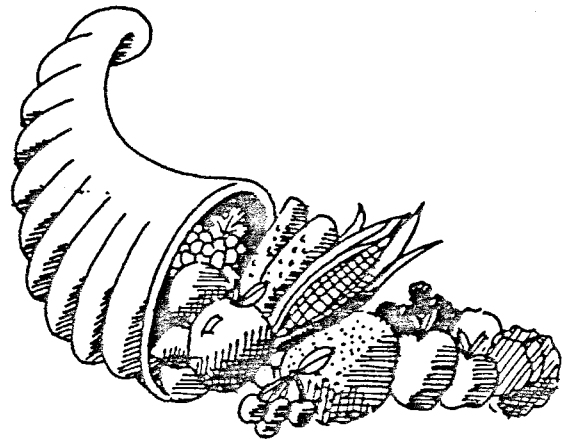
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Trip Generation 4th Edition, Institute of Traffic Engineers, 1987.

General Plan of Regional Development, CNVRPA, 1978.

APPENDICIES



Appendix A: Soil Limitations Tables

TABLE 1: Soil Symbols and Mapping Unit Names

| Soil Symbol | Soil Mapping Unit Name |
|-------------|--|
| CaB | Charlton fine sandy loam, 3-8% slopes |
| CaC | Charlton fine sandy loam, 8-15% slopes |
| CrC | Charlton very stony fine sandy loam, 3-15% slopes |
| CrD | Charlton very stony fine sandy loam, 15-35% slopes |
| GeC | Gloucester very stony sandy loam, 3-15% slopes |
| HrE | Hollis very rocky fine sandy loam, 15-35% slopes |
| Lg | Leicester, Ridgebury, and Whitman very stony fine sandy loam |
| Lm | Limerick silt loam |
| PeC | Paxton stony fine sandy loam, 3-15% slopes |
| PbB | Paxton fine sandy loam, 3-8% slopes |
| PbC | Paxton fine sandy loam, 8-15% slopes |
| Ru | Rumney fine sandy loam |

TABLE 2: Soil Characteristics Important to Development

| Soil Symbol | Permeability (in/hr) | K | Corrosivity to Steel Conc. | Flooding | Water Table Depth (ft.) | Water Table Kind | High Water Months | Depth to Rock (in.) | Frost Action |
|-------------|----------------------|------|----------------------------|----------|-------------------------|------------------|-------------------|---------------------|--------------|
| CaB | 0.6-6.0 | 0.24 | low | none | >6.0 | --- | --- | >60 | low |
| CaC | 0.6-6.0 | 0.24 | low | none | >6.0 | --- | --- | >60 | low |
| CrC | 0.6-6.0 | 0.20 | low | none | >6.0 | --- | --- | >60 | low |
| CrD | 0.6-6.0 | 0.20 | low | none | >6.0 | --- | --- | >60 | low |
| GeC | 6.0-20.0 | 0.17 | low | none | >6.0 | --- | --- | >60 | low |
| HrE | 0.6-6.0 | 0.17 | low | none | >6.0 | --- | --- | >60 | low |
| Lg | 0.6-6.0 | 0.20 | low | none | >6.0 | --- | --- | >60 | low |
| Lm | 0.6-2.0 | 0.49 | high | none | 0-1.5 | apparent | Nov-May | 10-20 | mod |
| PeC | 0.6-6.0 | 0.20 | low | freq | 0-1.5 | apparent | Nov-Jun | >60 | high |
| PbB | 0.6-2.0 | 0.24 | low | none | 1.5-2.5 | perched | Feb-Apr | >60 | high |
| PbC | 0.6-2.0 | 0.24 | low | none | 1.5-2.5 | perched | Feb-Apr | >60 | mod |
| Ru | 0.6-6.0 | 0.20 | high | freq | 1.5-2.5 | perched | Feb-Apr | >60 | mod |
| | | | | | 0-1.5 | apparent | Sep-Jun | >60 | high |

K-Erodibility Factor
 .10 - .24 - Low Erodibility
 .28 - .37 - Medium Erodibility
 .43 - .64 - High Erodibility

Flooding Classes
 None
 Occasional
 Common
 Frequent

---no data available

TABLE 3: Major Soil Limitations for Development

| Soil Symbol | Septic Systems | Excavations | Dwellings | Basements | Commercial | Roads | Lawns | Fill | Ponds |
|-------------|----------------|-------------|-----------|-----------|------------|---------|-----------|-----------|-------|
| CaB | A | A | A | A | B-9 | A | A | A | C-11 |
| CaC | B-9 | B-9 | B-9 | B-9 | B-9 | B-9 | B-9 | A | C-11 |
| CrC | B-9 | B-9 | B-9 | B-9 | C-9 | B-9 | B-16,9 | A | C-11 |
| CrD | C-9 | C-9 | C-9 | C-9 | C-9 | C-9 | C-9 | C-9 | C-11 |
| GeC | C-3 | C-5 | B-16,9 | B-16,9 | C-9 | B-9,16 | B-9,17,22 | B-16 | C-11 |
| HrE | C-15,9 | C-15,9 | C-9,15 | C-15,9 | C-9,15 | C-15,9 | C-9,15 | C-23,15,9 | C-11 |
| Lg | C-2 | C-2 | C-2 | C-2 | C-2 | C-2,8 | C-2 | C-2 | B-18 |
| Lm | C-7,2 | C-2 | C-7,2 | C-7,2 | C-7,2 | C-7,2,8 | C-7,2 | C-2 | B-18 |
| PeC | C-6 | B-13,2,9 | B-2,9 | B-2,9 | C-9 | B-2,9,8 | B-16,9 | A | C-11 |
| PbB | C-6 | B-13,2 | B-2 | B-2 | B-2,9 | B-2,8 | A | A | C-11 |
| PbC | C-6 | B-13,2,9 | B-2,9 | B-2,9 | C-9 | B-2,9,8 | B-9 | A | C-11 |
| Ru | C-7,2,3 | C-5,2 | C-7,2 | C-7,2 | C-7,2 | C-2,7,8 | C-2,7 | C-2 | C-5 |

Degree of Limitation:

- A - Soil properties and site features are generally favorable for indicated use and limitations are easily overcome.
- B - Soil properties are not favorable for indicated use and special planning, design or maintenance is needed.
- C - Soil properties or site features are so unfavorable to overcome that special design, increases in costs, and possible increased maintenance are required.

Types of Limitations:

- 1 Seepage 2 Wetness 3 Poor Filtration 4 Ponding 5 Banks Cave
- 6 Slow Perc 7 Flooding 8 Frost Action 9 Slope 10 Low Strength
- 11 No Water 12 Subsites 13 Dense Layer 14 Humus 15 Shallow Depth
- 16.Lrg.Stone 17 Sm.Stones 18 Slow Refill 19 Piping 20 Dam Seepage
- 21 Erosion 22 Droughty 23 Area Reclaim

NOTES

ABOUT THE TEAM

The King's Mark Environmental Review Team (ERT) is a group of environmental professionals drawn together from a variety of federal, state and regional agencies. Specialists on the Team include geologists, biologists, soil scientists, foresters, climatologists, landscape architects, recreational specialists, engineers and planners. The ERT operates with state funding under the aegis of the King's Mark Resource Conservation and Development (RC&D) Area - an 83-town area serving western Connecticut.

As a public service activity, the Team is available to serve towns and/or developers within the King's Mark RC&D Area - free of charge.

Purpose of the Environmental Review Team

The Environmental Review Team is available to assist towns and/or developers in the review of sites proposed for major land use activities. For example, the ERT has been involved in the review of a wide range of significant land use activities including subdivisions, sanitary landfills, commercial and industrial developments and recreational/open space projects.

Reviews are conducted in the interest of providing information and analysis that will assist towns and developers in environmentally sound decision-making. This is done through identifying the natural resource base of the site and highlighting opportunities and limitations for the proposed land use.

Requesting an Environmental Review

Environmental Reviews may be requested by the chief elected official of a municipality or the chairman of an administrative agency such as planning and zoning, conservation or inland wetlands. Environmental Review Request Forms are available at your local Soil and Water Conservation District and through the King's Mark ERT Coordinator. This request form must include a summary of the proposed project, a location map of the project site, written permission from the land owner/developer allowing the Team to enter the property for purposes of review and a statement identifying the specific areas of concern the Team should investigate. When this request is approved by the local Soil and Water Conservation District and King's Mark RC&D Executive Committee, the Team will undertake the review. At present, the ERT can undertake approximately two (2) reviews per month.

For additional information regarding the Environmental Review Team, please contact your local Soil and Water Conservation District or Nancy Ferlow, ERT Coordinator, King's Mark Environmental Review Team, King's Mark RC&D Area, 322 North Main Street, Wallingford, Connecticut 06492. King's Mark ERT phone number is 265-6695.