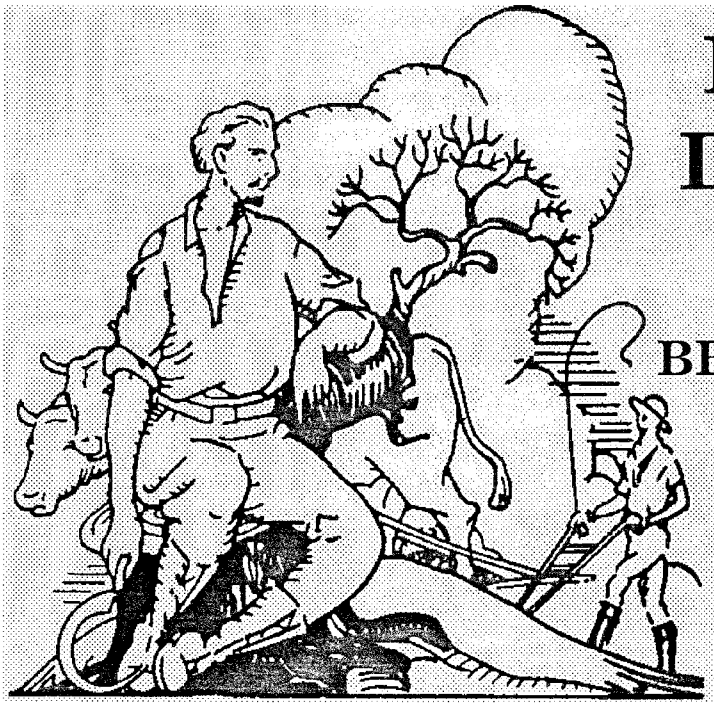

BARRETT HILL DEVELOPMENT

BROOKLYN, CONNECTICUT

JANUARY 1990

EASTERN CONNECTICUT ENVIRONMENTAL REVIEW TEAM REPORT

Eastern Connecticut
Resource Conservation and Development Area, Inc.

BARRETT HILL DEVELOPMENT

BROOKLYN, CONNECTICUT

REVIEW DATE: NOVEMBER 28, 1989

REPORT DATE: JANUARY 1990

Eastern Connecticut
Environmental Review Team

Eastern Connecticut Resource
Conservation and Development Area, Inc.
P.O. Box 70, Route 154
Haddam, Connecticut 06438
(203) 345-3977

ENVIRONMENTAL REVIEW TEAM REPORT
ON

BARRETT HILL DEVELOPMENT

BROOKLYN, CONNECTICUT

This report is an outgrowth of a request from the Brooklyn Planning and Zoning Commission and the Conservation and Inland Wetlands Commission to the Windham County Soil and Water Conservation District (SWCD). The S&WCD referred this request to the Eastern Connecticut Resource Conservation and Development (RC&D) Area Executive Council for their consideration and approval. The request was approved and the measure reviewed by the Eastern Connecticut Environmental Review Team (ERT).

The ERT met and field checked the site on Tuesday, November 28, 1989. Team members participating on this review included:

Peter Aarrestad	**Fisheries Resource Technician** **DEP - Eastern District Headquarters**
Nick Bellantoni	**State Archaeologist** **Connecticut Museum of Natural History**
Howard Denslow	**District Conservationist** **USDA - Soil Conservation Service**
Steve Hill	**Wildlife Biologist** **DEP - Eastern District Headquarters**
Dan Mayer	**Environmental Analyst** **DEP - Inland Water Resource Management**
Dick Raymond	**Forester** **Goodwin State Forest**
Elaine Sych	**ERT Coordinator** **Eastern Connecticut R C & D Area, Inc.**
Bill Warzecha	**Geologist/Sanitarian** **DEP - Natural Resources Center**

Prior to the review day, each Team member received a summary of the proposed project, a list of the town's concerns, a location map and topographic map. During the field review the Team members were given soils information and

subdivision plans. The Team met with, and were accompanied by the First Selectman, the Town Planner, the Chief Sanitarian for the NEDDOH, and the enginners for the proposed subdivisions. Following the review, reports from each Team member were submitted to the ERT Coordinator for compilation and editing into this final report.

This report represents the Team's findings. It is not meant to compete with private consultants by providing site designs or detailed solutions to development problems. The Team does not recommend what final action should be taken on a proposed project -- all final decisions rest with the Town and landowner. 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 developer and the Town. The results of this Team action are oriented toward the development of better environmental quality and the long-term economics of land use.

The Eastern Connecticut RC&D Executive Council hopes you will find this report of value and assistance in making your decisions on these proposals.

If you require additional information, please contact:

Elaine A. Sych
ERT Coordinator
Eastern Connecticut RC&D Area
P.O. Box 70
Haddam, Connecticut 06438
(203)345-3977

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1. SETTING, LAND USE AND ZONING

The study area, just under a square mile (about 628 acres), is located in the northern parts of Brooklyn not far from its boundary with Pomfret. From its southern boundary, the study area is about 1 mile north of Brooklyn Center. Frontage roads for the properties include, Route 169, Barrett Hill Road, Darby Road and Spaulding Road.

The ±628 acre study area is divided into four privately owned parcels. Parcels 1A, 1B and 1C, which consist of 212.4 acres are under the ownership of the Barrett Hill Limited Partnership. A 19-lot residential subdivision is presently proposed for parcel 1A (Splendid Oaks Heights, Phase I). No plans exist for parcel 1B, but residential development is likely, and because of physical constraints (wetlands and floodplains) no development is proposed on 1C. Parcel 2 about 109 acres in size comprises Stonehedge Estates Subdivision and will consist of 26 building lots. It is understood that Parcel 4, which comprises 126.4 acres, is under private conservation while Parcel 3, about 180 acres, is currently on the market.

Except for Parcels 1A, 1B and a portion of Parcel 4, which contain open fields, most of the study area is wooded.

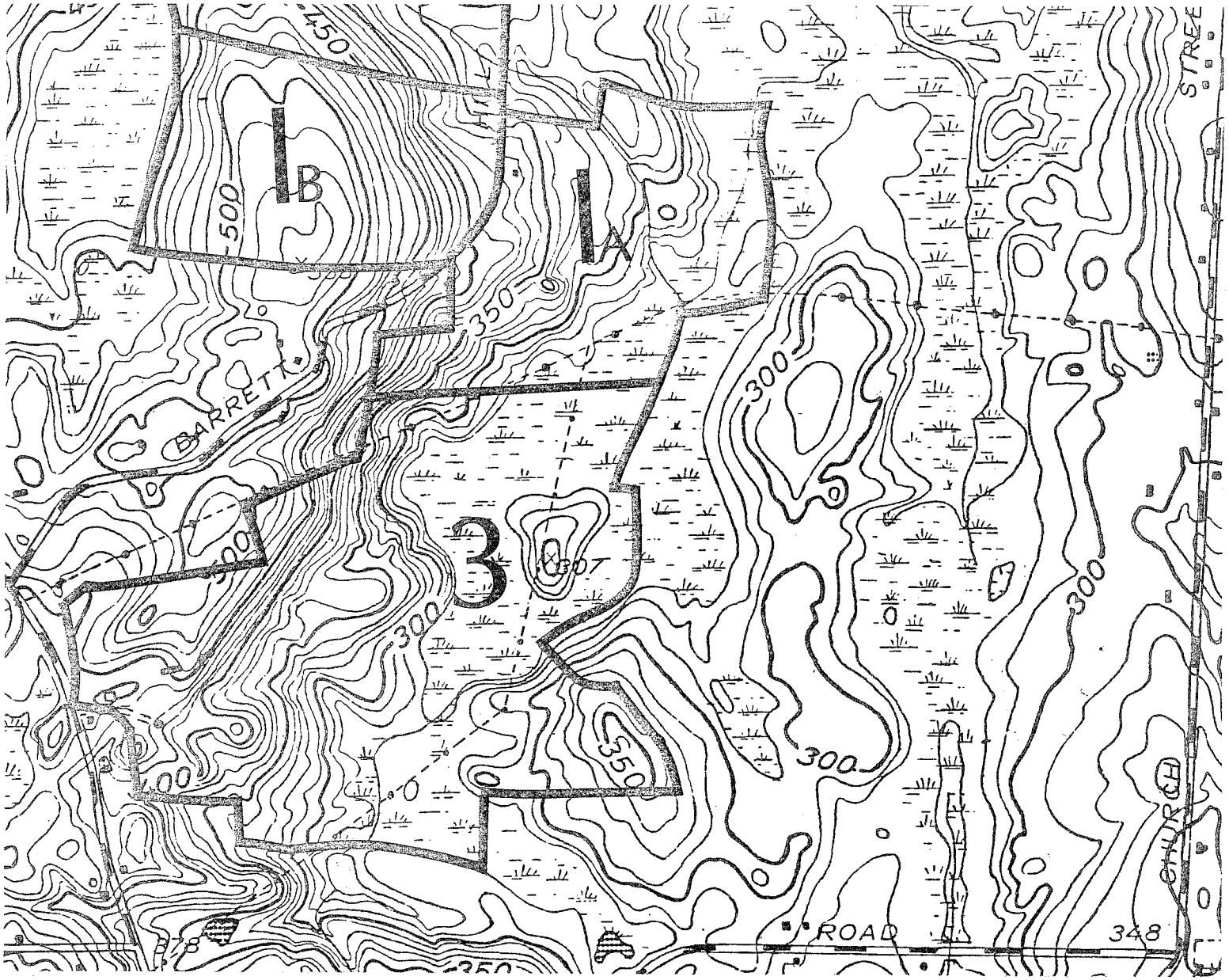
Land uses in the vicinity of the study area consist largely of low to moderately dense single-family residences and agriculture. According to town officials, the land is zoned R-40, which would permit single-family residences on 1 acre or 40,000 square foot lots.

Municipal sewer and water mains are not available to this part of Brooklyn at the present time. Therefore, any new developments that take place in the study area will need to be served by individual on-site septic systems and wells.

LOCATION MAP

Scale 1" = 2000'

—— Approximate Site Boundaries



PROPERTY LOCATIONS

Scale 1" = 1000'

1A - Barrett Hill Limited Partnership Phase I

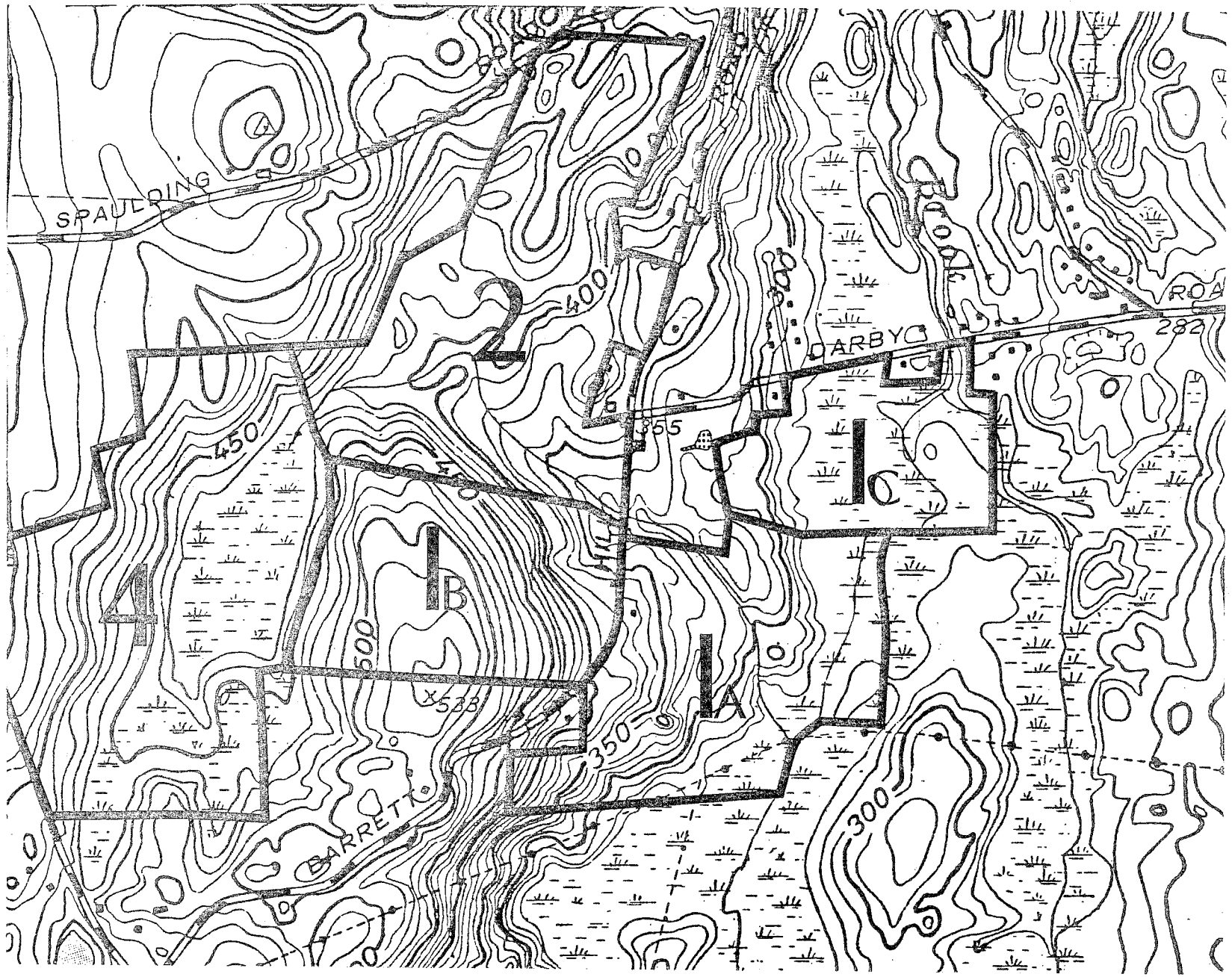
1B - Barrett Hill Limited Partnership Phase II

1C - Barrett Hill Limited Partnership No development at this time

2 - Stonehenge Estates Subdivision

3 - Land currently on the market

4 - Land under private conservation



PROPERTY LOCATIONS

Scale 1" = 1000'

1A - Barrett Hill Limited Partnership Phase I

1B - Barrett Hill Limited Partnership Phase II

1C - Barrett Hill Limited Partnership No development at this time

2 - Stonehenge Estates Subdivision

3 - Land currently on the market

4 - Land under private conservation

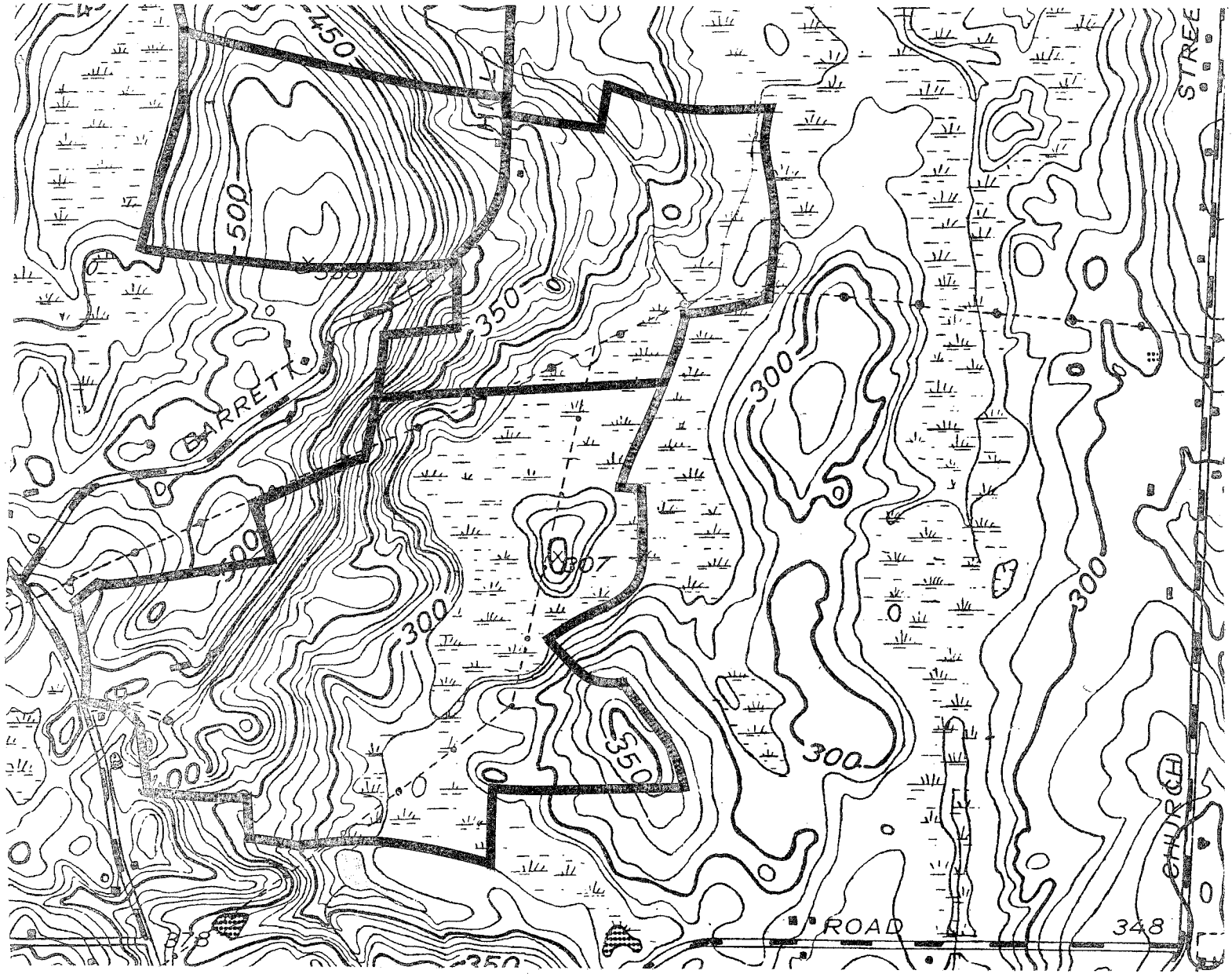
2. TOPOGRAPHY

The main topographical features of the study area include Barrett Hill, a rock-cored hill located on Parcel 1B and White Brook floodplain/wetland that occurs at the eastern limits of the study area. It encompasses Parcels 1A, 1B and 3. Also, a large wetland that includes a man-made pond about 4.6 acres in size is located on Parcel 4. The outlet stream for the pond/wetland which is tributary to White Brook is the only other principal streamcourse in the study area. The majority of slopes in the study area are moderate but gentle, while very steep slopes also occur in places. Steep slopes are concentrated in the central parts of the study area, and are largely associated with the shallow to bedrock soils. Gentle slopes occur on the tableland of Parcel 1B and in the northern and central parts of Parcel 2. The highest elevation, which is about 533 feet above mean sea level, occurs on top of Barrett Hill, while the lowest elevation, about 270 feet above mean sea level occurs at the intersection of Darby Road and White Brook at the northern limits.

Every effort should be made to avoid placing buildings or roads on steep slopes. Roadways and driveways should be constructed so that they cross slopes and conform to the contours rather than perpendicular to the hill. Hopefully, this will help reduce the amount of cuts and fills necessary to construct roads. Also, bedrock is inferred to be at or near ground surface in areas characterized by steep slopes. Avoiding these areas will help to reduce the amount of blasting that might otherwise be required.

Another concern with development of steeply sloping areas is the potential for sedimentation and erosion problems that may affect the quality of local water resources. A detailed soil erosion and sediment control plan, construction phasing and reduction in the amount of disturbed areas will help to lessen potential adverse impacts to on and off-site water resources.

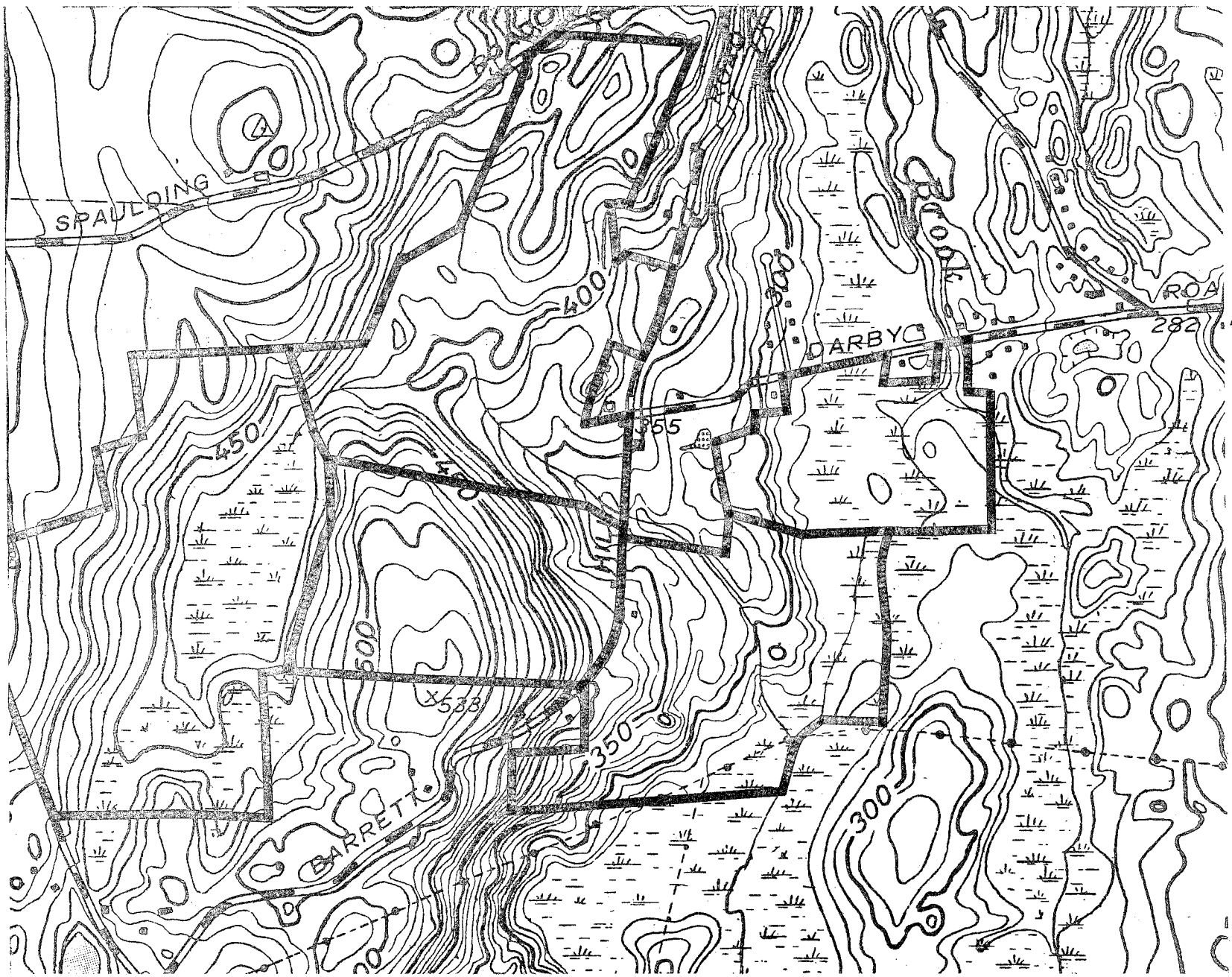
Development of steeply sloping areas are also more costly due to site improvements and engineering.



TOPOGRAPHIC MAP

Scale 1" = 1000'

Approximate Property Boundaries



TOPOGRAPHIC MAP

Scale 1" = 1000'

Approximate Property Boundaries

3. GEOLOGY

The study area is located entirely within the Danielson topographic quadrangle. A bedrock geologic map (GQ-696, by H. Roberta Dixon) and a surficial geologic map (GQ-660, by Allan D. Randall and Fred Pessl, Jr.) for the quadrangle have been prepared by the U.S. Geological Survey. .Other publications cited for the **GEOLOGY** Section of this report include the Bedrock Geological Map of Connecticut, Rodgers 1985, Soil Survey of Windham County Connecticut, as well as deep test hole information supplied for proposed subdivisions on Parcels 2, 1A and 1B.

Bedrock Geology

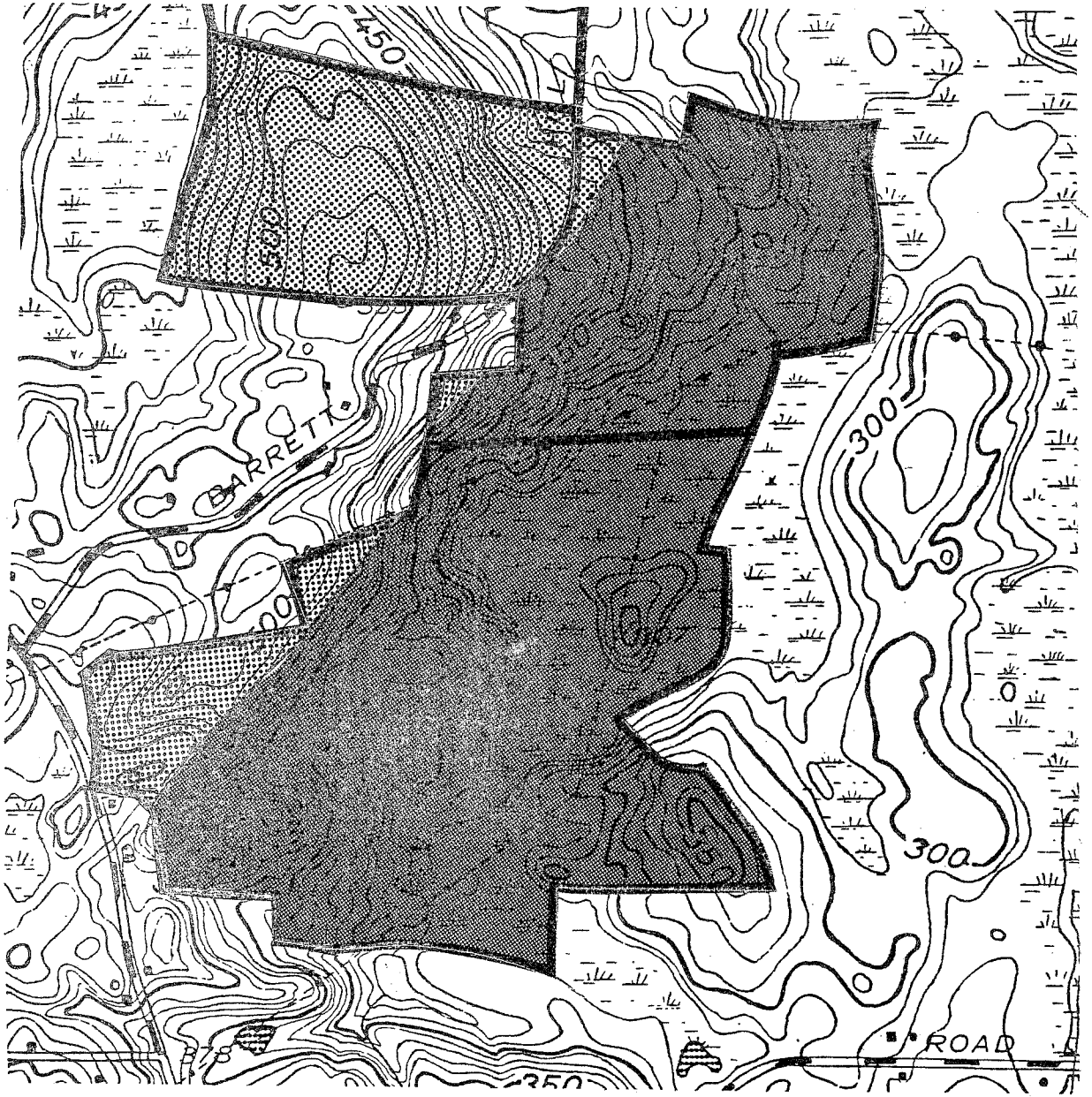
Bedrock outcrops (single or continuous) occur on all parcels except 1C. They are most widespread on Parcels 2 and 3. The two major bedrock types underlying the study area include Tatnic Hill Formation and Quinebaug Formation. The boundary between the two rock units, which nearly bisects the study area in half represents a major structural feature in eastern Connecticut. It separates rocks of the Merrimack Synclinoriun (Tatnic Hill Formation) from rocks of the Putnam-Nashoba Belt (Quinebaug Formation). As a result, they have different characteristics, i.e. mineralogy, nature of folds, orientation, etc. The Quinebaug Formation rocks are described as gray to dark gray, medium-grained well-layered gneisses while the Tatnic Hill Formation rocks are gray to dark gray, medium-grained gneisses and schists.

It should be pointed out that a northeast-southwest trending thrust fault and a northwest-southeast trending, medium to high angle fault transects the study area. These faults were mapped by the geologist on the basis of geologic offsets observed by bedrock exposures, topography, repetition of stratigraphy and anomaly trends on the aeromagnetic map for the quadrangle. Because of their (the faults) proximity to the site, it is expected that the faulting may have increased the secondary porosity (openings) of the bedrock in the area. This is important in terms of bedrock cored wells, since the yield of the well depends upon the number and size of water-bearing fractures that it intersects. In other words, because of the numerous faults transecting the study area, the bedrock aquifer in

the vicinity may be more productive from a water supply standpoint than in other areas where the bedrock is less fractured. (See **WATER SUPPLY** section)

Depth to the bedrock surface ranges from zero, where it is exposed at the ground surface to perhaps, greater than 40 feet on parts of Parcel 4 where thick till deposits occur and 1B where thick sand and gravel deposits may exist.

BEDROCK GEOLOGY MAP



Scale 1" = 1000'

Quinebaug Formation

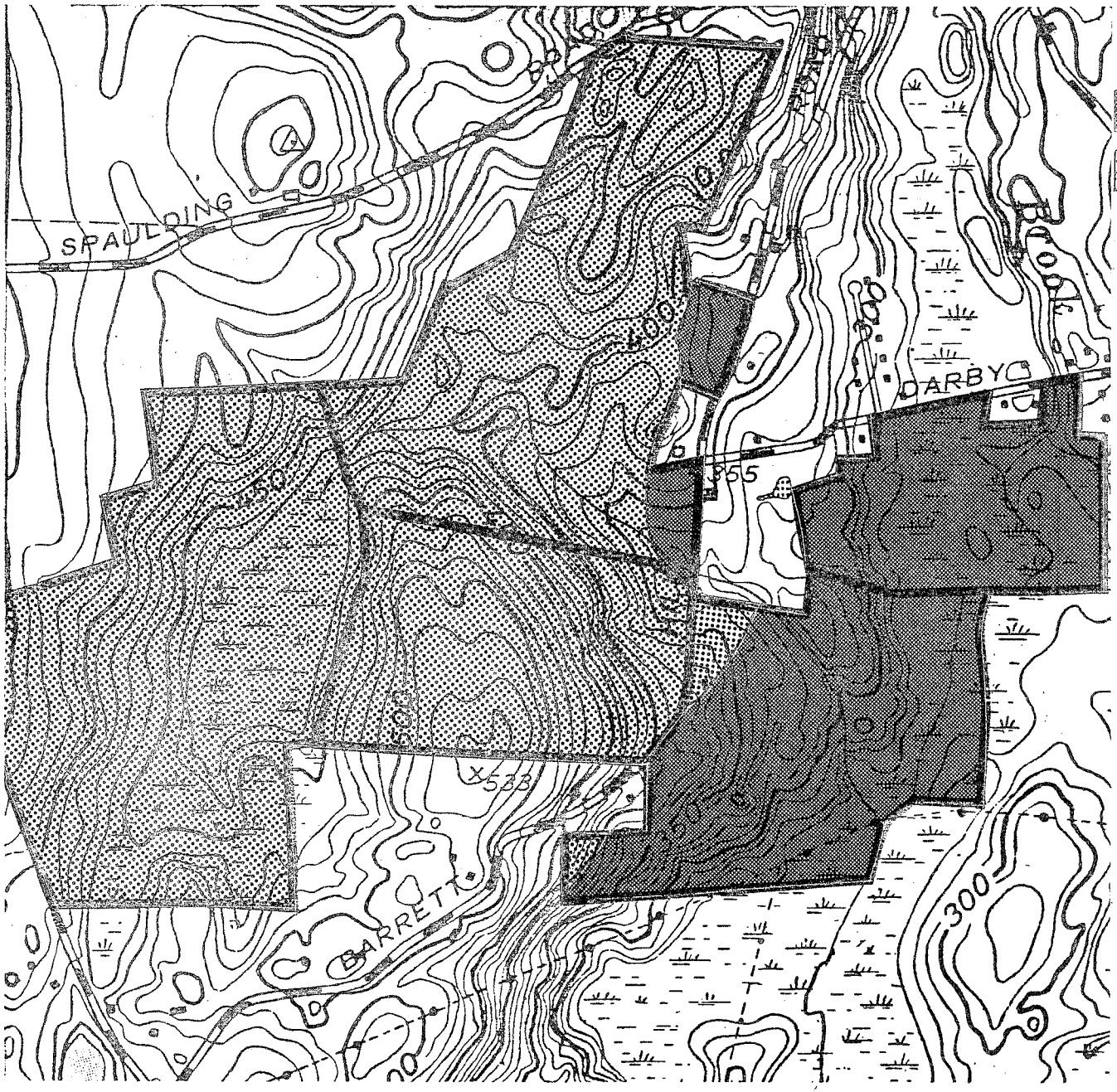
Tatnic Hill Formation

BEDROCK GEOLOGY MAP

Scale 1" = 1000'

Quinebaug Formation

Tatnic Hill Formation



Surficial Geology

The two major glacial deposits that occur in the study area are till and stratified drift. Till is the predominant deposit covering bedrock in the study area. It is composed of rock particles ranging in size from small clay particles to large boulders deposited directly by glacier ice. The textural components of the till are not sorted. For example, fine-grained particles are intermixed with coarse-grained particles. The upper portions of a till deposit are generally sandy, stony and loose. However, where till exceeds 8 feet in depth (i.e., usually the north sides of streamlined hills) a compact layer may underlie the friable till layer. In the study area, the latter type of till occurs on the west side of parcels 4 and 1B.

The presence of a compact soil zone in the till described in the preceeding paragraph usually results in a seasonally high water table condition, strong soil mottling (an indicator of high groundwater tables) just above the compact soil zone and moderately slow to slow percolation rates. The seasonally high water table is an important design constraint for on-site sewage disposal and road and driveway construction, particularly where cuts are required. Houses constructed on these soils should be protected by footing drains. This will hopefully keep basements dry.

The sandier variety of till which is usually less than 8 feet thick covers the remainder of the study area. Shallow to bedrock soils prevail in many places. As a result, there may be a need for blasting, particularly for the placement of roads, driveways and house foundations. Also, the shallow to bedrock soils are a constraint with respect to on-site sewage disposal. Development in areas of shallow to bedrock soils will raise site development and engineering costs.

Because the till soils may be characterized by fine-grained particles (silt, fine sand), they tend to be more susceptible to erosion if proper control measures are not implemented. For this reason, any development that takes place in the study area should be accompanied by a comprehensive soil erosion and sediment control plan.

Flanking and underlying the White Brook floodplain/wetland primarily on

Parcels 1A and 1C are stratified drift deposits. The major components of stratified drift are sand and gravel. According to surficial geologic maps for areas, the majority of the stratified drift deposits in the study area are comprised of fine-grained sand to clay but are capped by 3 to 20 feet of medium sand to pebble gravel. These deposits were laid down by glacial meltwater streams. Because of their highly permeable nature sand and gravel deposits are characterized by rapid percolation rates. The concern here is a potential for groundwater contamination by septic tank effluent which will have little opportunity to be renovated by the soil components. Special care should be taken in these areas to conservatively separate septic systems from on-site wells and the groundwater table. Since Parcel 1C will not be developed, only the proposed residential development on Parcel 1A may be affected by this potential problem. It should be pointed out that although surficial and soil mapping data for the study area indicates that the northern parts of Parcel 1A are covered by sandy till, deep test hole information supplied to Team members indicates the presence of sand and gravel deposits (stratified drift) in the area. Based on visual observations made during the field walk, this area has the distinct topography (hummocky, rounded knolls) of stratified drift deposits and remnant material left near deep test holes appeared to be sandy, gravelly material.

The exact thickness of the stratified drift in the study area is unknown but probably does not exceed 40 feet.

Post glacial deposits comprising swamp sediments and alluvium cover till and/or stratified drift in the study area. The principal swamp deposits which consist of partly decomposed organic matter that are usually mixed with silt and sand occur on parcel 4 and parallel White Brook on Parcels 1A, 1C and 3. Alluvium, consisting of sand, silt and gravel was deposited on the floodplain of White Brook on Parcels 1A and 1C.

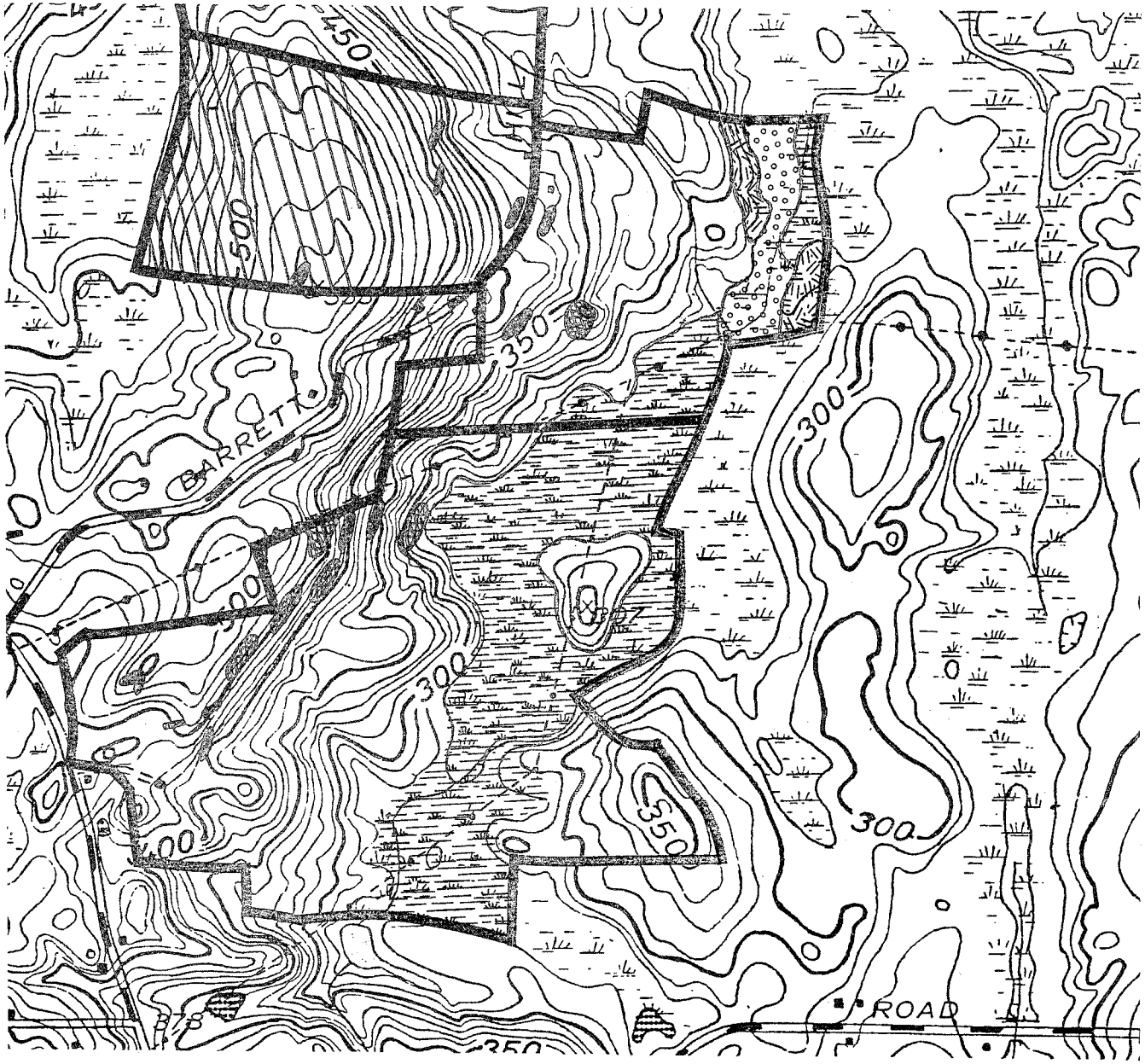
Soils mapping data indicates that regulated inland-wetland soils which comprise Ridgebury, Leicester, Whitman extremely stony, fine, sandy loams (Rn) parallel the permanent and intermittent watercourses in the study area, especially on Parcels 2 and 4.

This undifferentiated unit comprise very deep, loamy soils that formed in glacial

till. The Ridgebury and Whitman soils develop in the compact glacial till while the Leicester soils develop in the more friable till. They range from poorly drained (Leicester and Ridgebury) to very poorly drained (Whitman). In general, the Leicester and Ridgebury soils are nearly level or gently sloping soils in drainageways and low-lying positions of till covered uplands. The Whitman soils occur or nearly level to gently sloping depressions and drainageways on till covered uplands.

From an engineering standpoint, the major concern of these soils focuses on a seasonally high water table (wetness). A high water table condition is at or near ground surface in the Leicester and Ridgebury soils generally between November and May. In the Whitman soils, a high water table condition, at or above ground surface occurs September through June.

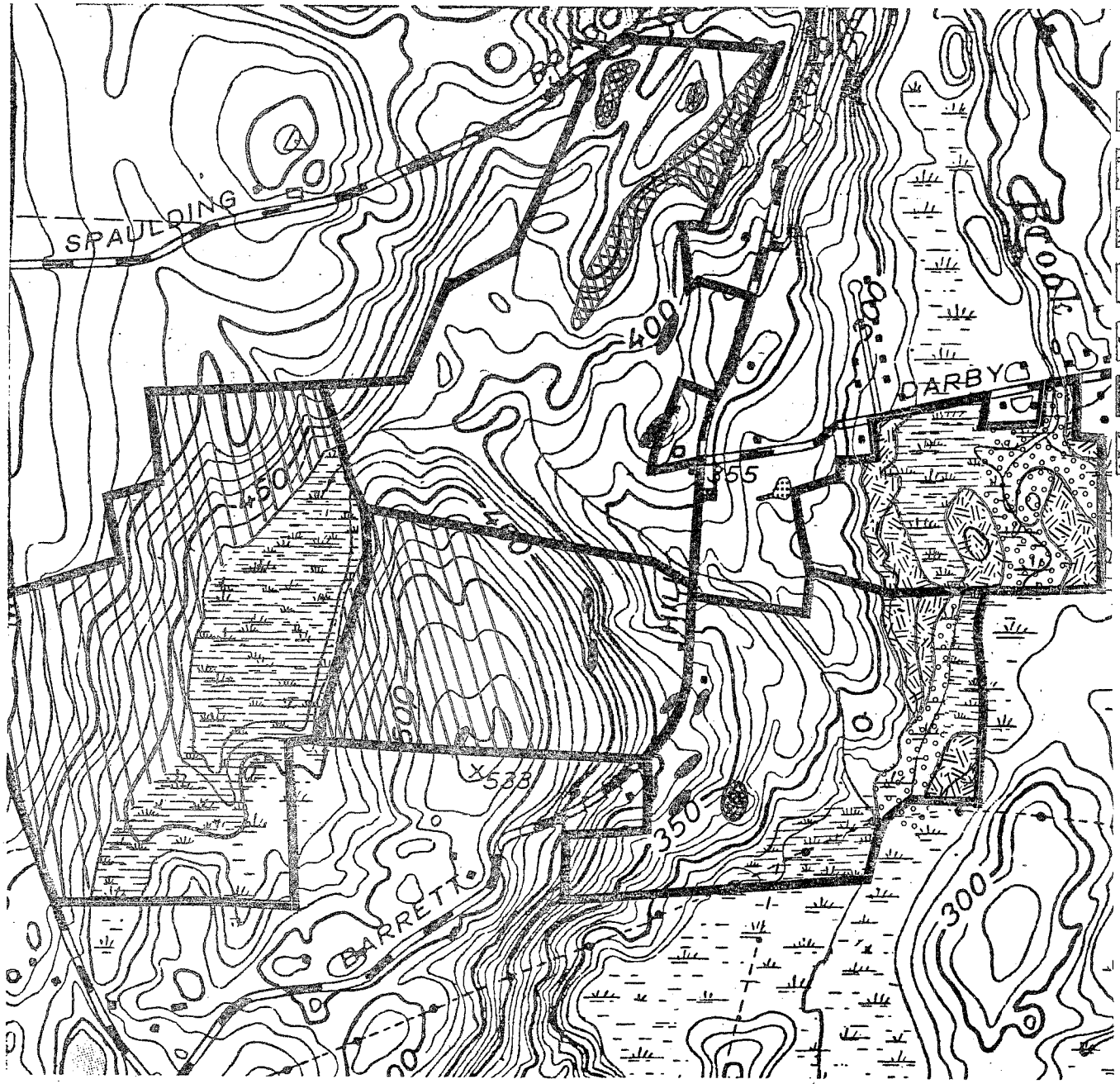
Wetlands are very important from an ecological, biological and hydrological standpoint. They maintain water quality through biochemical processes and reduce stormwater runoff. For these reasons as well as others, every effort should be made to protect the regulated wetlands in the study area.



SURFICIAL GEOLOGY MAP

Scale 1" = 1000'

- Swamp Deposits
- Alluvium
- Stratified Drift
- Thick Till
- Till
- Single Rock Outcrop Areas
- Areas where bedrock is at or near ground surface



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Scale 1" = 1000'

- Swamp Deposits
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- Stratified Drift
- Thick Till
- Till
- Single Rock Outcrop Areas
- Areas where bedrock is at or near ground surface

4. SOIL RESOURCES

General Comments

Presently two subdivisions, Splendid Oaks Heights Phase I (parcel A) with 19 lots on 100 acres, and Stonehedge Estates with 26 lots on 109 acres, are proposed. Both are proposing to build new roads. A third subdivision, Splendid Oaks Heights Phase II, projected to have up to 40 lots on some 72 acres, is expected. Two other properties, a 180 acre tract and a 41 acre tract may be developed in the future. A sixth parcel is privately owned (126 acres), and may remain undeveloped for conservation purposes. All these properties are contiguous and have in common a streambelt and wetlands corridor connection to White Brook. White Brook and its watershed drain to Mashamoquet Brook at Pomfret Landing before joining the Quinebaug River.

Splendid Oaks Heights Phase I was reviewed by Doug Cooper of the DEP - Inland Water Resource Management Unit and Howard Denslow and Fifi Scoufopoulos of the Windham County Conservation District in earlier (November) reports. [Those reports can be found at the end of this ERT report.] The common concern with the 19 lot subdivision (Splendid Oaks Heights Phase I, also referred as parcel 1A) was loss of open space and diverse wildlife habitat, and potential negative impact on the wetlands and White Brook tributaries.

Stonehedge Estates (parcel 2) is proposed in an upland wooded area unlike the open abandoned farmland of most of Splendid Oaks Heights I. Present plans call for 3000 feet of new road and road drainage to tributary streams of White Brook. Some lots proposed contain steep ledge escarpments. Placement of homes and driveways in such areas present construction problems and threaten water quality on the site. Specific resource concerns with this subdivision will be addressed further on.

Soils

A General Soil Map with the properties outlined is included within this report. A Soils Legend and Limitations Chart are also included. A rating of severe does not mean a certain soil cannot be used, rather that use is costly and may threaten water quality and other natural resources. Shallow to bedrock soils with exposed bedrock and ledge areas are obviously rated severe. It is difficult, costly, and threatening to water quality to build on these areas. A General Soil Map in this report shows the extent of these soils on the property. They include map units CrC, CrD, HrC, and HrD. These are soil complexes of Charlton and Hollis soils, the former being deeper and fine for residential use where there is enough area of this soil type. It is recommended that areas where there is exposed ledge, bedrock within 48 inches and where slopes are greater than 25% be identified on all subdivision plans. Brooklyn officials may want to add these limitations to their buildable area requirement in their zoning regulations (Sec.3. Lot Area Regs). Currently only wetlands and flood plain soils are excluded from the buildable area. Bare rock and ledge areas should also be located on the subdivision plan. Without enough Charlton fine sandy loam soil there is question as to their being enough soil to properly filter effluent from a septic system field. Also fissures in bedrock close to the surface may allow contaminated water from salts, lawn fertilizers/chemicals and septic effluent to percolate down to local bedrock aquifers from which the well water will be drawn.

Another General Soil Map included shows the extent of wetlands on these properties. The interconnection of wetlands and streams, all ultimately contributing to White Brook, is easily seen. It will be important to minimize impact to the streams and wetlands. It is the District Conservationist's opinion that Brooklyn officials should consider requiring undisturbed buffer areas of up to the 200 foot distance the IWC regulates, or at least that distance from a perennial stream. This would preserve the natural wetlands/wildlife habitat corridor and help prevent potential contamination of surface water. Stormwater drainage planned for road runoff should direct, slow, and filter storm flow in the direction it naturally flowed, as much as possible. This has been done with both Splendid Oaks Heights, phase I and Stonehedge Estates. Water detention and filtration through sediment basins or riprapped splash pools should not be in wetlands.

Although most wetlands inherently have the ability to filter contaminates from runoff they should not be impacted to do so.

Stonehedge Estates Comments

The majority of the subdivision lies on the shallow to bedrock soils discussed in the Soils section above. Although MBA, Engineering, Inc. has made an admirable effort to design the road and building lots the soils and topography present major problems. Understanding that Brooklyn has a limit of 12% slope on new driveways, driveways proposed on lots #4, 7, 8, 9, 16, and 26 are not acceptable. A driveway to lot #26 could come in off of the new road rather than from Spaulding Road. In some cases these driveways would need to be on gravel dumped on ledge rock areas with precipitous drops. Such is the case with lot #8. There are definite stabilization problems presented once areas like these are disturbed and the threat to ground water quality is greater here where there is naturally less soil medium than in deeper soils over larger areas. Even though the lots are all greater than the 1 acre minimum required by zoning, the steep slopes, shallow soils, and bedrock present dictate the suitability of the area for larger lots.

It is creditable that open space is proposed basically to protect wetland and stream corridors. The Town might consider not allowing the stream and wetlands to be crossed preventing creation of lots #15 and #16. These are both steep lots and access to these lots may harm the stream.

The fire pond, which would allow for silt and sediment accumulation during development, is a good idea if it is properly maintained. It would also allow for neighborhood recreation in the winter by acting as a skating pond.

In general, fewer and larger lots allowing buildings and septic systems in larger soil areas (away from bedrock and ledge) are more desirable for this subdivision.

GENERAL

SOIL MAP

Owner BARRETT HILL - BROOKLYN Operator

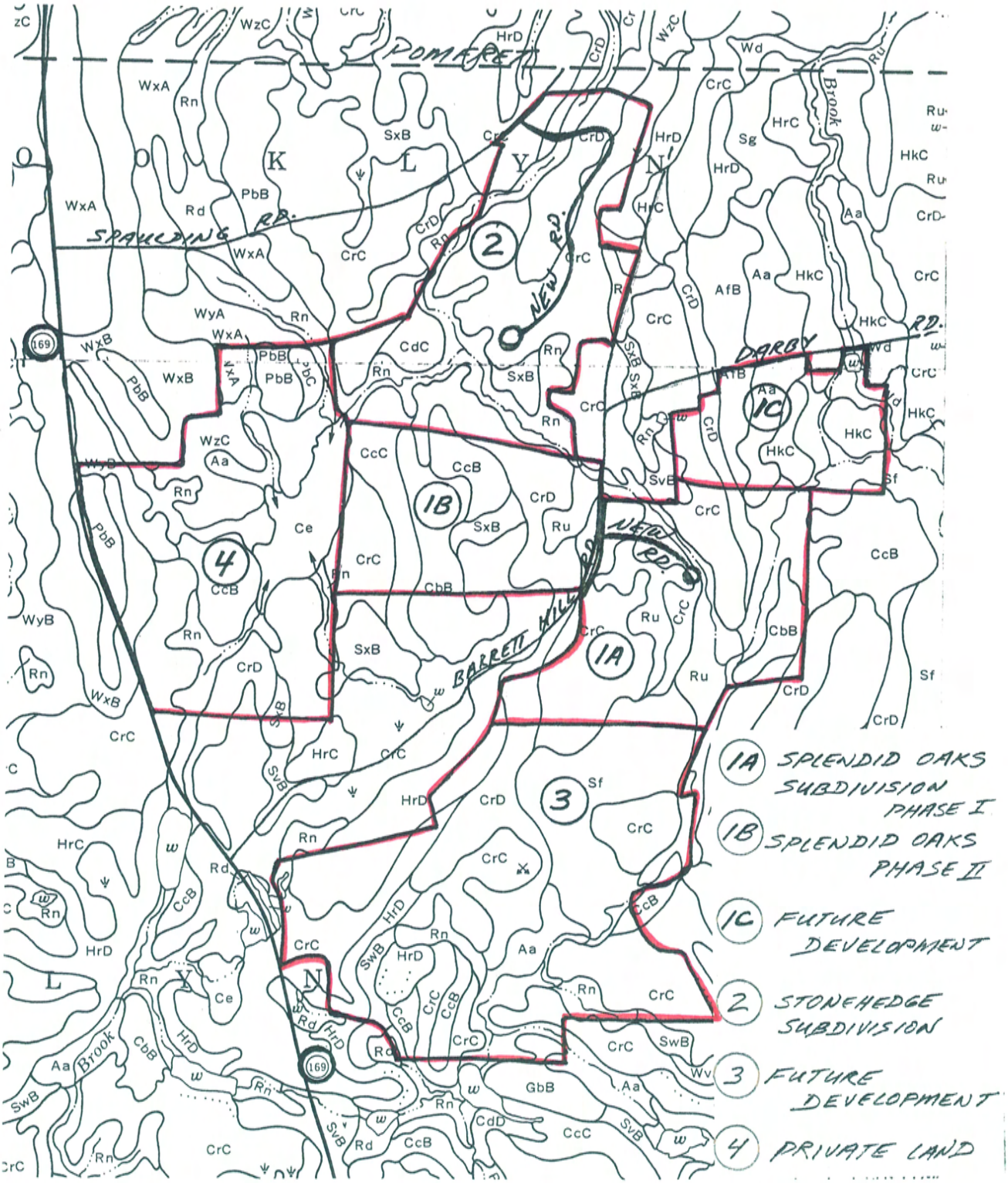
County WINDHAM State CONNECTICUT

Soil survey sheet (s) or code nos. 31 & 36 Approximate scale 1" = 1320'

N

Prepared by U. S. Department of Agriculture, Soil Conservation Service cooperating with WINDHAM COUNTY SOIL Conservation District

PARCEL AREAS — BOUNDARY DELINEATIONS ARE APPROXIMATE.



SOILS DESCRIPTIONS

*Aa - Adrian & Palms muck

#AfB - Agawam fine sandy loam, 3 to 8 percent slopes.

#CbB - Canton & Charlton fine sandy loams, 3 to 8 percent slopes.

CcB - Canton & Charlton very stony fine sandy loams,3 to 8 percent slopes.

CcC - Canton & Charlton very stony fine sandy loams,8 to 15 percent slopes.

CdC - Canton & Charlton extremely stony fine sandy loams, 3 to 15 percent slopes.

*Ce - Carlisle muck.

CrC - Chartlon-Hollis fine sandy loams, very rocky, 3 to 15 percent slopes.

CrD - Charlton-Hollis fine sandy loams, very rocky, 15 to 35 percent slopes.

GbB - Gloucester very stony sandy loam, 3 to 8 percent slopes.

HkC - Hinckley gravelly sandy loam, 3 to 15 percent slopes.

HrD - Hollis-Charlton Rock outcrop complex, 15 to 35 percent slopes.

#PbB - Paxton fine sandy loam, 3 to 8 percent slopes.

PbC - Paxton fine sandy loam, 8 to 15 percent slopes.

*Rd - Ridgebury fine sandy loam.

*Rn - Ridgebury, Leicester & Whitman extremely stony fine sandy loams.

*Ru - Rippowam fine sandy loam.

*Sf - Scarboro fine sandy loam.

SwB - Sutton very stony fine sandy loam, 3 to 8 percent slopes.

SxB - Sutton extremely stony fine sandy loam, 3 to 8 percent slopes.

*Wd - Walpole sandy loam.

#WxA - Woodbridge fine sandy loam, 0 to 3 percent slopes.

#WxB - Woodbridge fine sandy loam, 3 to 8 percent slopes.

WyA - Woodbridge very stony fine sandy loam, 0 to 3 percent slopes.

WyB - Woodbridge very stony fine sandy loam, 3 to 8 percent slopes.

WzC - Woodbridge extremely stony fine sandy loam, 3 to 15 percent slopes.

*Designated wetland soil by P.A. 155

#Prime farmland soil

SCS-CONS-15
OCTOBER 1974

GENERAL

SOIL MAP

Owner BARRETT HILL - BROOKLYN Operator

County WINDHAM State CONNECTICUT

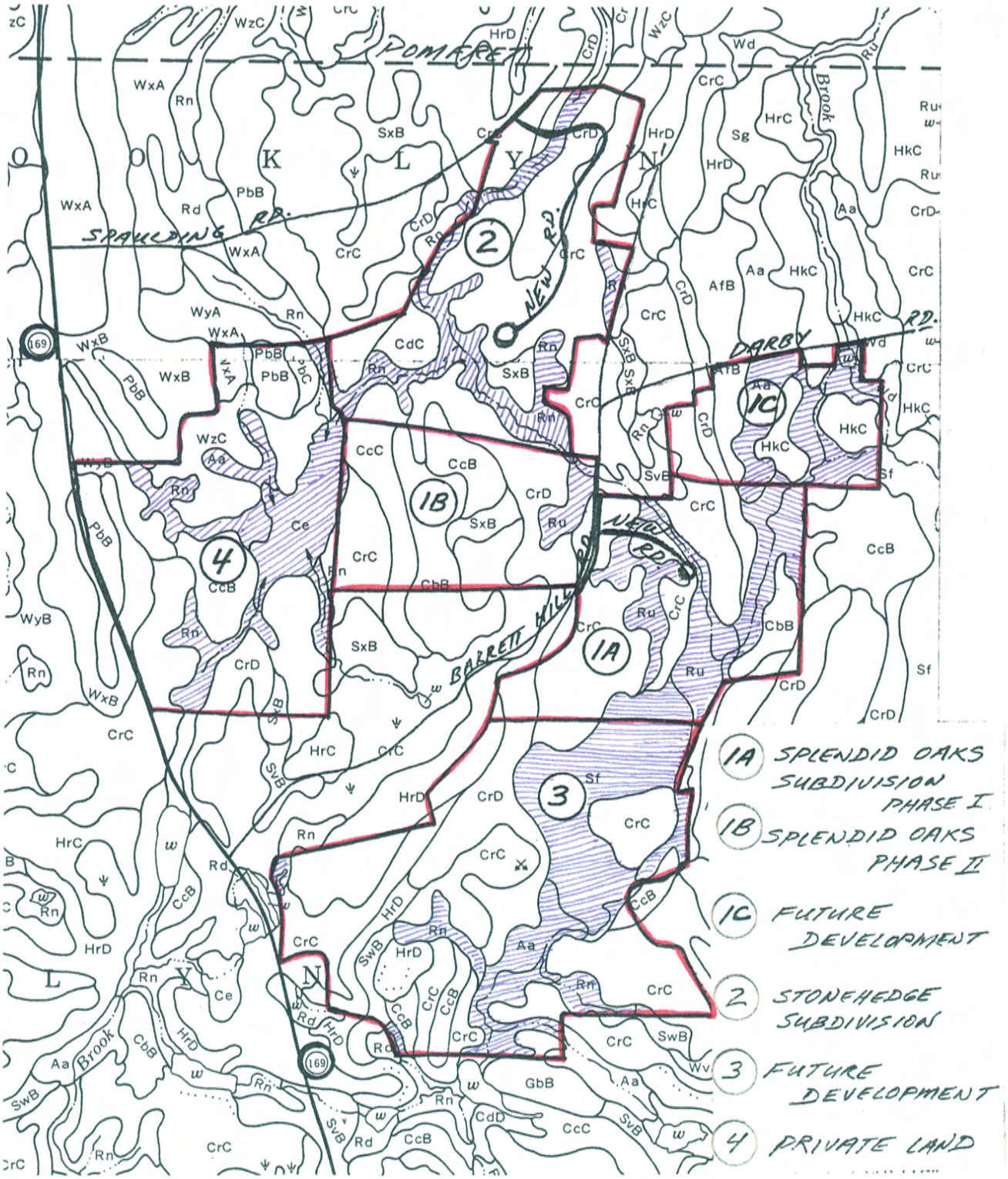
Soil survey sheet (s) or code nos. 31 & 36 Approximate scale 1" = 1320'

N

Prepared by U. S. Department of Agriculture, Soil Conservation Service cooperating with WINDHAM COUNTY SOIL Conservation District

NOTE: ONSITE DETAILED SOIL MAPPING BY SOIL SCIENTIST WILL GIVE EXACT LOCATION.

WETLANDS



GENERAL

SOIL MAP

Owner BARRETT HILL - BROOKLYN Operator

County WINDHAM State CONNECTICUT

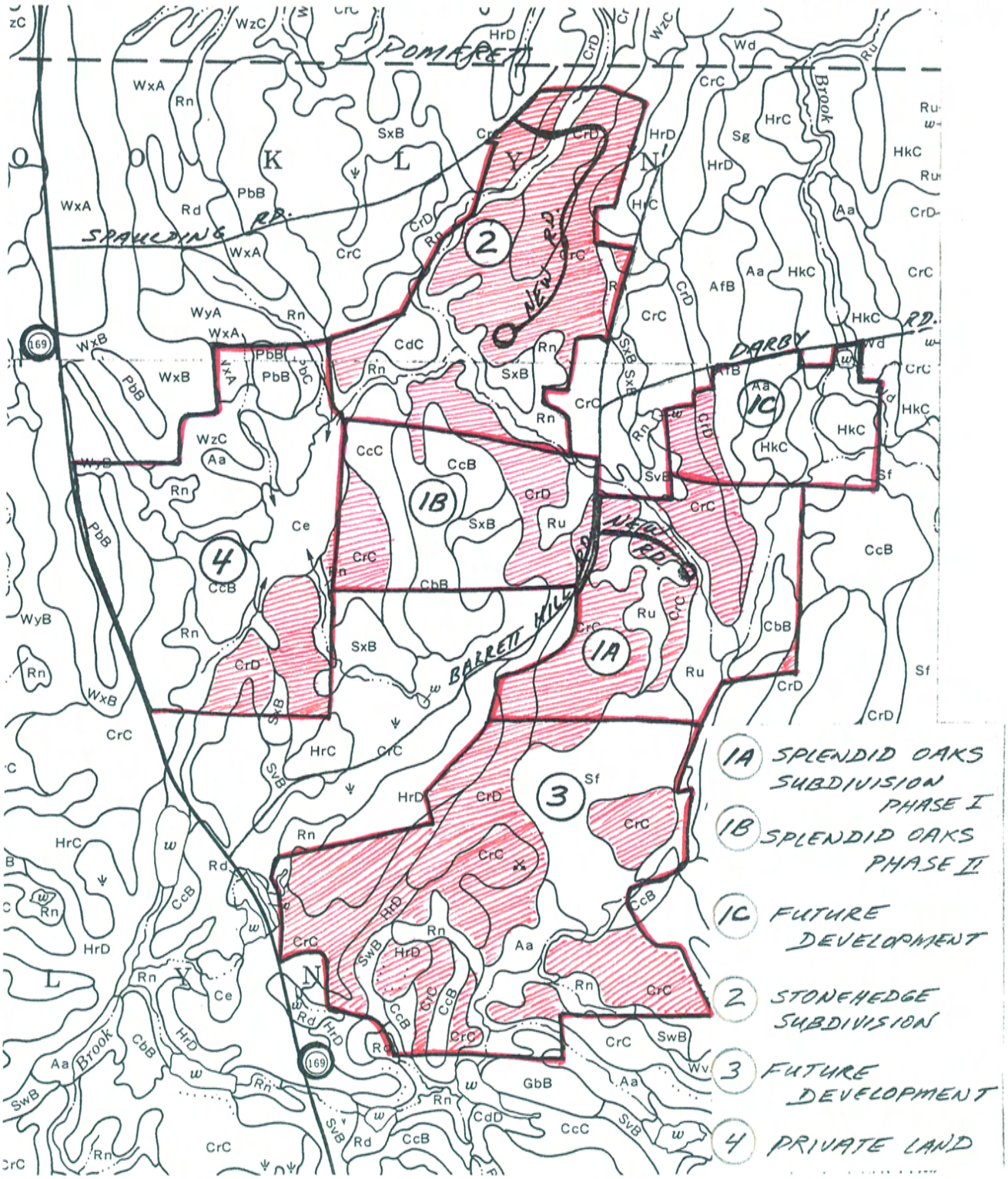
Soil survey sheet (s) or code nos. 31 & 36 Approximate scale 1" = 1320'

N

Prepared by U. S. Department of Agriculture, Soil Conservation Service cooperating with WINDHAM COUNTY SOIL Conservation District

NOTE: DEEPER AREAS OF WELL DRAINED CHARLTON SOILS ARE FOUND INTERSPERSED

SHALLOW TO BEDROCK SOILS



DEVELOPMENT LIMITATION CHART

Ratings and Limitations of Soils# for Residential Use *(Other than Wetlands)*

Symbol and Soil Name	Septic Absorption Fields	Dwellings with Basements	New Roads	Lawns and Landscaping
Crc (3-15% slope)				
Charlton 55%	moderate-slope	moderate-slope	moderate-slope	Moderate-lg stones-slope
Hollis 20%	severe-depth to bedrock	severe-depth to bedrock	severe-depth to bedrock	severe-thin layer
Exposed rock 10%				
*				
CrD (15-35% slope)				
Charlton 55%	severe-slope	severe-slope	severe-slope	severe-slope
Hollis 20%	severe-depth to bedrock-slope	severe-depth to bedrock-slope	severe-depth to bedrock-slope	severe-slope-thin layer
Exposed rock 10%				
*				
HrD (15-35% slope)				
Hollis 35%	severe-depth to bedrock-	severe-depth to bedrock-	severe-depth to bedrock-	severe-slope-thin layer
Charlton 30%	severe-slope	severe-slope	severe-slope	severe-slope
Rock 15%				
*				
HkC (3-15% slope)				
Hinckley	severe-poor filter	moderate-slope	moderate-slope	severe-droughty-slope

SxB (3-8% slope)				
Sutton	severe-wetness	severe-wetness	severe-frost action	moderate-wetness
CbB (3-8% slope)				
Canton 45%	severe-poor filter	slight	slight	slight
Charlton 40%	slight	slight	slight	slight
*				
CcB (3-8% slope)				
Canton 45%	severe-poor filter	slight	slight	slight
Charlton 40%	slight	slight	slight	slight
CcC (8-15% slope)				
Canton 45%	severe-poor filter	moderate-slope	moderate-slope	moderate-slope
Charlton 40%	moderate-slope	moderate-slope	moderate-slope	moderate-slope
*				
CdC (3-15% slope)				
Canton 45%	severe-poor filter	moderate-slope	moderate-slope	moderate-slope
Charlton 40%	moderate-slope	moderate-slope	moderate-slope	moderate-slope
*				

 # Soils rated cover majority of the property.

**** Remaining percentage of soil complexes consists of other soils in spot areas too small to map separately.***

SOIL LIMITATION RATINGS

The ratings of the soils for elements of Community and Recreational Development uses consists of three degrees of "limitations" slight or no limitations, moderate limitations, and severe limitations. In the interpretive scheme various physical properties are weighed before judging their relative severity of limitations.

Slight Limitations.

Areas rated as slight have relatively few limitations in terms of soil suitability for a particular use. The degree of suitability is such that a minimum of time or cost would be needed to overcome relatively minor soil lLnitations.

Moderate Limitations.

In areas rated moderate, it is relatively more difficult and more costly to correct the natural limitations of the soil for certain uses than for soils rated as having higher than average outlay when such areas are compared with areas rated as having slight limitations.

Severe Limitations.

Areas designated as having severe limitations would require more extensive and more costly measures than soils rated with moderate limitations in order to overcome natural soil limitations. The soil may have more than one limiting characteristic causing it to be rated severe.

The user is cautioned that the suitability ratings, degree of limitations and other interpretations are based on the typical soil in each mapping unit. At any given point the actural conditions may differ from the information presented here because of the inclusion of other soils which were inpractical to map separately at the scale of mapping used. On-site investigations are suggested where the proposed soil use involves heavy loads, deep excavations, or high cost.

5. HYDROLOGY

Two principal watercourses occur in the study area; White Brook and the unnamed outlet stream for the pond excavated in the large wetland on Parcel 4. The latter which has a drainage area of about 515.5 acres is tributary to White Brook. White Brook, a north flowing tributary to Mashamoquet Brook and its accompanying floodplain is located in the eastern limits of the study area on Parcels 1C, 1A and 3. At its point of outflow to Mashamoquet Brook, White Brook drains an area of 4.77 square miles or 3,053 acres. Additionally, there are numerous small watercourses, most of which are intermittent that occur in the study area. They are tributary to either of the two principal watercourses mentioned above.

The watercourses described above have not been classified by the Connecticut Department of Environmental Protection (DEP) and as such are considered as class "A" water resources, by default. Class "A" water resources may be suitable for drinking, recreational or other uses and may be subject to absolute restrictions on discharges, however, certain discharges may be allowed. White Brook becomes class "B/A" about 800' north of the intersection of Barrett Hill Road and Searles Road. Designated uses for this classification are: fish and wildlife habitat, recreational use, agricultutal and industrial supply and other legitimate uses. Long term DEP goals are to improve this classsification to class "A" where water quality would meet drinking water standards.

Precipitation, which takes the form of runoff, flows across the surface of the land in the study area until it reaches a streamcourse or other surface waterbodies. Precipitation may also be absorbed into the ground. Once absorbed, the water may either be returned to the atmosphere through evaporation and/or plant transpiration, or it may percolate downward to the water table and eventually becomes part of the groundwater. Once the water reaches the groundwater table it moves downslope by the force of gravity, ultimately discharging to the surface in the form of a spring, wetland area, stream, lake or directly into a river. To a large degree, groundwater flow within the site reflects the surface flow pattern.

Residential development of the study area would increase the amount of runoff during periods of rainfall. These increases would result from soil compaction, removal of vegetation, and placement of impervious surfaces (roofs, driveways, etc.) over the soil. The major concerns with increased runoff is the potential for flooding and streambank erosion. Each developer will need to do his or her part in controlling post-development increases from their respective properties so that downstream flooding is not created or further aggravated and local water resources protected from streambank erosion and siltation problems. This can be accomplished satisfactorily with proper implementation of a detailed stormwater management plan. Connecticut's Guidelines for Soil Erosion and Sediment Control should be followed closely with respect to stormwater management on each parcel.

In order to determine the need for on-site detention basins, each applicant's project engineer will need to complete hydrological computations for various storm events, check the potential for downstream flooding or see if existing flooding downstream will be further aggravated, and examine all downstream culverts. For example, the culverts passing under Darby Road and Searles Road should be examined to ensure they can adequately handle post-development flows.

The presence of moderate to steep slopes in the study area and the presence of silty soils suggests a potential for erosion and siltation problems if not properly addressed. Each developer should present a detailed soil and erosion plan that addresses site conditions. The plan should be properly enforced by the Town and checked regularly. Given the size of the study area and potential for high density developments, land disturbance seems inevitable. If issues such as flooding and soil erosion are not properly addressed in the study area as a whole, the potential impacts arising from imminent development projects may be severe and not easily rectified.

6. WETLANDS REVIEW

Site Description

At this time there are six major parcels of land either proposed for development, sale, or private conservation, which range in size from approximately ±41 acres to ±180.4 acres. This section of the report will look specifically at two parcels which are presently being proposed for the development of subdivisions, Splendid Oaks Heights Phase I and Stonehedge Estates.

The Stonehedge Estates Subdivision (parcel 2), is approximately ±108.8 acres in size and contains a significant watercourse and wetland system. This parcel presently has 26 lots proposed on it ranging in size from ±1.725 acres to ±11.887 acres. All lots will be served by a single 3,000 ft. cul-de-sac which enters the property off of Spaulding Road in Brooklyn. On site septic systems and water wells will serve each house lot and a fire pond is proposed within a finger of wetlands in the southeast corner of the parcel, adjacent to lots 11-14. The majority of the parcel is forested and contains considerable slopes, 15% grades and greater, over much of the site.

The second subdivision, Splendid Oak Heights (parcel 1A), is located to the southeast of Stonehedge Subdivision and is approximately ±100 acres in size with 19 proposed building lots. This parcel consists of abandoned agricultural fields and contains the continuation of the watercourse which runs through the Stonehedge Subdivision parcel. This watercourse ultimately flows into White Brook which runs through the southeastern portion of this parcel. The majority of the lots on this parcel will be accessed by a single cul-de-sac which enters the site off of Barrett Hill Road. The remaining lots will either be accessed off of Barrett Hill Road directly or will be served by rear lot access drives. Each lot will be served by individual on-site septic systems and wells.

Wetland Functions and Impacts

The wetlands located on the Stonehedge Subdivision site are associated with the

watercourse which originates from an adjacent wetland and open water area located to the southwest of the parcel. The wetlands primarily function to convey and store water during storm events and they provide good to excellent habitat. Due to the surrounding land uses and their location within the watershed functions such as water renovation and sediment trapping are of minimal significance. The opportunities and potential for interactive functions such as education, recreation and aesthetics are excellent but the limited access to this portion of the parcel inhibits greater public use.

The major impacts presented by this proposal consist of a driveway crossing of the watercourse, the construction of a fire pond within a vernal pond and wetland area and the impacts associated with sedimentation and erosion during the construction activities. The applicant has placed the majority of the most valuable wetland areas within designated open space areas. Due to the large lots the potential for significant impacts caused by nutrient loading from septic effluent would be expected to be relatively small. However, due to the steep slopes on much of the parcel, the presence of groundwater and the shallow to ledge conditions at some locations careful observation should be given to the final locations and design of all septic systems; (Please refer to the **GEOLOGY** and **SOIL RESOURCES** sections of this report for greater detail).

The wetlands located on the Splendid Oak Heights, Phase I parcel are primarily confined to the stream corridor which runs roughly through the center of the parcel, and the White Brook watercourse corridor on the southern and eastern portions of the site. Additionally, there are two drainage swales existing within some of the abandoned agricultural fields which feed into the watercourses. These wetlands possess excellent wildlife habitat values, especially along the stream corridors. Additionally, they provide storage of water during storm events, renovation of water from street runoff, agricultural land and excellent interactive use potential, (i.e. education. recreation and aesthetics).

The impacts associated with this proposal consist of a road crossing, a driveway crossing, potential nutrient loading from septic effluent and sedimentation and erosion associated with construction activities. The applicant has dedicated approximately ±3.9 acres to open space in the central portion of the site, roughly

1/3 to 1/4 of this open space area is wetland. Several of the septic leach fields are located within fifty (50) feet of the wetlands.

Final Comments and Recommendations

Stonehedge Estates Subdivision

1) The lot design and layout appears to be sensitive to the limitations and constraints of the site. However, it is recommended that the design of lot 18 be modified to eliminate the potential for a second stream crossing by a future property owner. Ideally, all portions of this lot located north of the watercourse which enters the parcel through this lot should be incorporated into the open space area. At a minimum it would be advisable to place this portion of the lot into a deed restriction which would prevent any future property owners from crossing the watercourse.

2) The proposed fire pond, while enhancing the public safety will still result in a significant modification to existing wetlands, and in the opinion of the DEP-Inland Water Resources Management office create a loss in functional value of the area. Additionally, the town should consider the maintenance liability aspects of such a feature especially if future possession is given to the town. If possession remains with the applicant a detailed maintenance and cleaning document should be included as a condition of the permit.

Splendid Oak Heights Subdivision

1) The impacts associated with this proposal are greatly reduced since much of the affected wetland area has been previously disturbed. Additionally, two of the proposed crossings of regulated areas are on existing structures or previously disturbed areas.

2) The town should consider placing deed restrictions on all lots which abut or contain any portion of the watercourses associated with this parcel. Such restrictions should prohibit any disturbance of modification of the watercourse or any adjacent lands within a designated distance from the watercourse edge.

3) With regard to the potential impacts associated with the proposed septic systems the commission should examine all alternative locations of these structures to determine the best location with the least impact. Refer to the soils and geology sections of this report to determine the capacities of the soil to renovate the expected effluent. After such review further consideration can be given to modifying setback distances to maximize the renovation capacities of the sites.

7. WATER SUPPLY

Because there are no public water supply lines accessible to the study area, all new residential development that takes place will probably need to rely on water supplied by individual on-site wells.

The bedrock appears to be the principal aquifer in the study area. An aquifer is a geologic formation that is capable of yielding a usable amount of water to a well. Because of its low hydraulic conductivity, the till covering the study area has low potential for groundwater development. Additionally, the water table in the till fluctuates significantly, making it unreliable as a water supply source, particularly during the summer and fall months. Stratified drift deposits (sand and gravel) may have high potential for yielding large amounts of water to wells, depending upon many factors such as texture and thickness of the deposits, the proximity of the deposits to streams and the size of those streams. The stratified drift deposits on Parcels 1A and 1C appear to have low potential for groundwater development because they are probably too fine (difficult materials in which to finish wells and relatively slowly permeable) and probably too thin (<40 feet). Hydrogeologic testing, including test wells, would be required to determine the potential of the stratified drift deposits in the study area for groundwater development.

Yields from bedrock wells depend upon the number and size of water-bearing fractures that are intersected by the wells. Density and size of fractures in different bedrock zones vary widely, but they generally occur within the first few hundred feet of the surface. Because the distribution of fractures in bedrock is irregular, there is no practical way, outside of expensive geophysical testing, of predicting the yield of a well drilled in a specific location.

The bedrock underlying the study area consist largely of gneisses and schists. The composition and texture of the rocks vary considerably across the various parcels and with depth. Gneisses are commonly characterized by the parallel orientation of the mineral grain with massive to platy appearance. Gneissic rock responds to movements and deformation stresses within the earth's crust by fracturing and forming distinct open joints and fractures. Schists are

characterized by parallel orientation and abundance of mica minerals and by the ease with which the rock parts into thin layers. Unlike the gneisses, the schist rock responds to geologic stresses by slipping and folding along the layered planes. The openings that develop in schists are generally small and discontinuous. As a result, studies have shown that the chances for obtaining water from bedrock wells that tap gneissic rock are slightly more productive than wells in schist rock.

In general, the bedrock aquifer should be adequate in terms of domestic water supply wells yielding 2-3 gallons per minute, which is enough for an average home. For an 18-hour pumping period, this equates to 2,160 gallons per day and 3240 gallons per day, respectively. The presence of faults transecting the study are may have increased the secondary porosity and hydraulic conductivity of the bedrock aquifer by creating interconnected fractures, cracks and openings in the rock.

Because of the potential for a large number of drilled bedrock wells in a concentrated area, there is a concern for mutual interference during pumping periods between neighboring wells. Generally speaking, a well spacing of about 200 feet or greater would be sufficient to avoid mutual interference. This results in a recharge area of about 40,000 square feet or about 1 acre. Assuming a recharge rate of about 8 inches per year for an upland till site, one can expect about 595 gallons of water per day for a one acre area. A family of five would use about 375 gallons per day. Therefore, groundwater recharge is about 1.5 times the groundwater demand. It should be kept in mind that the above assumes the underlying bedrock is fractured and capable of transmitting water to a well. This cannot be determined without drilling the well first. Usually lot sizes of 1.5 to 2 acres in size are necessary in order to accomplish the suggested 200 foot separation distance.

Since all lots will have on-site septic systems and since a high portion (about 95%) of the renovated domestic wastewater will percolate downward to recharge the underlying bedrock via on-site sewage disposal, one realizes the importance of proper septic system location, design, installation and maintenance.

The quality of natural groundwater on the site is good, although there may be elevated mineral levels, particularly iron and/or manganese, where wells tap the schistose zones. If well water contains elevated mineral levels, there are several filtration methods available. Groundwater on the site is classified by the DEP as GA, which means that it is suitable for private drinking water supplies without treatment.

Every effort should be made to locate wells on a relatively high portion of the lot, properly separated from the sewage disposal systems or any other potential pollutants (e.g., road drainage, curtain drain pipe, etc.) and in a direction opposite the expected groundwater movement. All wells should be cased with steel pipe into the underlying bedrock and properly installed in accordance with all applicable State Public Health Code and Connecticut Well Drilling Board regulations to provide adequate protection of the quality of bedrock water. In addition, the District sanitarian must inspect and approve well locations.

8. SEWAGE DISPOSAL

As public sewers are not available in the study area at the present time, any development that occurs in the study area will be served by on-site sewage disposal systems. It is understood that a sewer main is being extended through the center of Brooklyn to serve the State correctional facility on Route 6. This is roughly one mile from the study area. Because of topographic and subsurface constraints and distance, extension of a sewer main to the study area would probably not be economically feasible.

Based on visual observations, existing soils maps and the findings of a number of deep test holes for subsurface sewage disposal exploration on parcels 1A, 1B and 2, the study area is not particularly favorable for on-site sewage disposal purposes. While some areas are limited by slope and wetlands, the major concern or important design constraint will be; (1) areas of shallow to bedrock soils (CrC, CrD, HrD soils) which occur on all parcels except 1C; and (2) till soils (mainly the PbB, PbC, WxA, WxB, WyA, WyB, WzC soils) characterized by seasonally high water table conditions and slow percolation rates. Although the latter soil types predominate on Parcel 4, seasonally high water table conditions were observed in deep test holes excavated on Parcels 2, 1A and 1B.

The Public Health Code requires the bottom area of any leaching system to be a minimum of 4 feet above ledge rock and at least 1.5 feet above maximum groundwater level. In general, when ledge rock is found at less than 4-5 feet below ground surface, the areas would certainly be of special concern. In particular where both on-site wells and sewage systems are utilized there is greater possibility for well contamination or water quality problems. Sewage effluent may not receive adequate filtration and renovation before the sewage reaches the rock where it may enter fractures or seams, traveling to nearby wells.

Where topography permits, the installation of curtain drains may be required on some lots to protect septic systems from a seasonally high water table condition. Curtain drains are installed to intercept groundwater above the leaching field so that it does not rise up into the leaching system and impair its hydraulic capacity. When properly installed, curtain drains tend to provide fail-safe protection from

this potential type of malfunction. Prior to approving a lot for subsurface sewage disposal the applicant may first have to install the curtain drain to demonstrate that it will effectively lower the water table on a particular lot during the wet time of year.

Ideally, curtain drains should be outletted to the storm drainage system when possible. If this is not possible, it should outlet at a point where it does not create water problems with nearby septic systems, neighboring properties, wells, etc. Depending upon the layout of the house, well, and septic system (and its size). it may be difficult to install a curtain drain on a one acre lot and meet all the separating distances required by the Public Health Code.

Considering the quantity of sewage discharged for single family residences (200-300 gallons per day), one acre lots would normally be considered of sufficient size to accommodate both a well and septic system. However, where unfavorable soil conditions and/or terrain exists, considerably larger lots (i.e. lower density of development) should be provided. Also, large lots themselves do not necessarily assure the availability of sufficient suitable area for sewage disposal purposes. This can only be demonstrated by adequate on-site testing.

Due to the soil types, steep slopes, and groundwater conditions, it is probable that a high percentage of the proposed and future lots in the study area will require detailed plans prepared by a registered professional engineer.

9. VEGETATION

The ±628 acre Barrett Hill Development Area may be divided into six (6) vegetation cover types. In addition to the 593.6 acres occupied by these types, water covers 14.5 acres and a former gravel extraction area occupies 8.3 acres.

General Vegetation Types

Mixed Hardwoods - 345.1 acres

The mixed hardwoods type is composed of 60% or more hardwoods and not over 40% softwoods. The hardwoods are the so-called Connecticut or transition hardwoods, white, red, black, scarlet and chestnut oaks, white ash, hickory, beech, black and yellow birch and sugar and red maples. Softwoods will be either white pine or hemlock. The understory contains hardwood and softwood tree seedlings and saplings along with many shrub species including blue beech, hazelnut, mountain laurel and flowering dogwood. Ground cover is dominated by mosses, grasses and ferns.

Many of the tree species present in the mixed hardwoods type have high commercial value for sawtimber and fuelwood. The condition of the trees is quite variable, as dictated by site conditions, past land use and past vegetation management. The high productivity potential of certain areas of this type may be increased significantly through proper forest management. Trees in these areas will respond well to periodic thinnings, aimed at reducing competition between desirable species resulting in a healthier high quality stand. Overall management should be primarily for the hardwoods.

Softwoods - Hardwoods - 22.1 acres

The softwoods-hardwoods type is one composed of any combination of percentages, from 60% softwoods and 40% hardwoods to 40% softwoods and 60% hardwoods. White pine, hemlock, oaks, white ash, hickory, birch, beech and maple in combinations are the usual species occurring in this type. Softwood and hardwood tree seedlings and saplings, mountain laurel, lowbush blueberry and huckleberry are the most abundant

vegetation in the understory. Ground cover consists of mosses, ferns, and grasses.

The tree species present in this type also have commercial value. However, due to site conditions, the hardwoods may be lower quality than those in the mixed hardwood type. Management should be for a mixed stand.

Hardwood Swamp - 35.2 acres

The hardwood swamp type is composed of at least 60% hardwoods and not over 40% softwoods. The type is usually composed of red maple, with elm, black ash, white ash, yellow birch and black gum. The softwood, when it occurs, is usually hemlock. The understories in these areas vary widely in both species composition and diversity. Hardwood tree seedlings and saplings, highbush blueberry, spicebush, sweet pepperbush and several species of viburnum are common throughout. Skunk cabbage, tussock sedge, cinnamon fern, sensitive fern and sphagnum moss are widespread as groundcover.

The commercial utility of the trees in this type must be made on an individual basis. Generally, tree growth potential is somewhat limited by the high water table and the saturated soils which are present. Under these conditions, trees are shallow rooted and unable to become securely anchored, causing high potential for windthrow. These soil conditions also limit access and operability. Depending on the severity of the limitations, the feasibility of implementing forest management practices may be severely reduced or completely eliminated.

Old Field - 71.3 acres

The old field type is largely gray birch, red cedar or both, bird cherry or scattered other trees and brush species such as alder, laurel, hardtack and multiflora rose. It is in reality a temporary type composed of relatively worthless growth. It is always abandoned pasture, mowing or farmland which is reverting to a poor hardwood stand.

Eventually, these areas will become commercial forestland as the stocking of desirable tree species increases. Planting softwoods such as white pine,

Norway spruce or larch in the openings will shorten the time needed for these areas to become fully stocked.

Old Field - 73.4 acres

This type is farm pasture or other open land which is still in active use or has not yet become covered with tree growth,

Open Swamp - 46.4 acres

The open swamp type is a swampy area not yet producing forest tree growth. It is usually a swamp meadow composed of bunch grass, possibly with a scattering of alder or other species.

Limitations to Forest Management

Parts of the study area may present limitations to forest management. These limitations may be divided into two major categories: those that restrict operability as related to forest management and those that restrict tree growth.

Operability as related to forest management may be limited by poor access, proximity to residential development, woodlot size, extremely steep slopes and/or severe rockiness. These obstacles may restrict or even preclude the actual implementation of forest management practices.

Included in the second form of limitation are excessively well drained soils, shallow to bedrock soils and wetland soils. These soils may limit or restrict tree growth, quality and health to a point where the trees that are present have little or no commercial value.

It should be recognized that the limitations described above may not preclude forest management. However, proper planning and implementation is essential in these areas to ensure an effective, efficient and environmentally sound operation.

Management Considerations

The Department of Environmental Protection's Division of Forestry encourages all woodland owners to mange their forestland. When properly prescribed and executed, forest management practices will increase the production of forest products, improve wildlife habitat and enhance the overall condition of the woodland with minimal environmental impact.

To reach a healthy and productive state, individual forest stands should be periodically evaluated to determine present and future management needs. A public service forester from the Department of Environmental Protection may be contacted to provide basic advice and technical assistance in forest management. These services are provided free of charge. Services of a more intensive nature such as timber marking and sales administration are available from private consulting foresters.

Effects of Development on Forest Management

Trees are very sensitive to the condition of the soil within the area under their crowns. Development practices near trees, such as excavating, filling and grading for the construction of roadways and buildings may disturb the balance between soil aeration, soil moisture and soil composition. These disturbances may cause a decline in tree health and vigor, potentially resulting in tree mortality within 3 to 5 years. Mechanical injury to trees may cause the same results. Dead trees reduce the aesthetic quality of an area and may become hazardous and expensive to remove if near roadways, buildings or utility lines.

Care should be taken during construction not to disturb the trees that are to be retained. In general, healthy and vigorous trees should be retained as they are more resistant to the environmental stresses brought about by construction. Where feasible, trees should be saved in small groups or "islands". This practice lowers the possibility of soil disturbance and mechanical injury to the residual trees. "Islands" and individual trees should be temporarily but clearly marked so that they may be avoided during construction.

The poorly drained soils present within the hardwood swamp type limit the vegetative growth to species that are able to tolerate high moisture conditions. The trees present are able to tolerate the present site conditions, however, any adverse change in drainage conditions could change the species composition of the area.

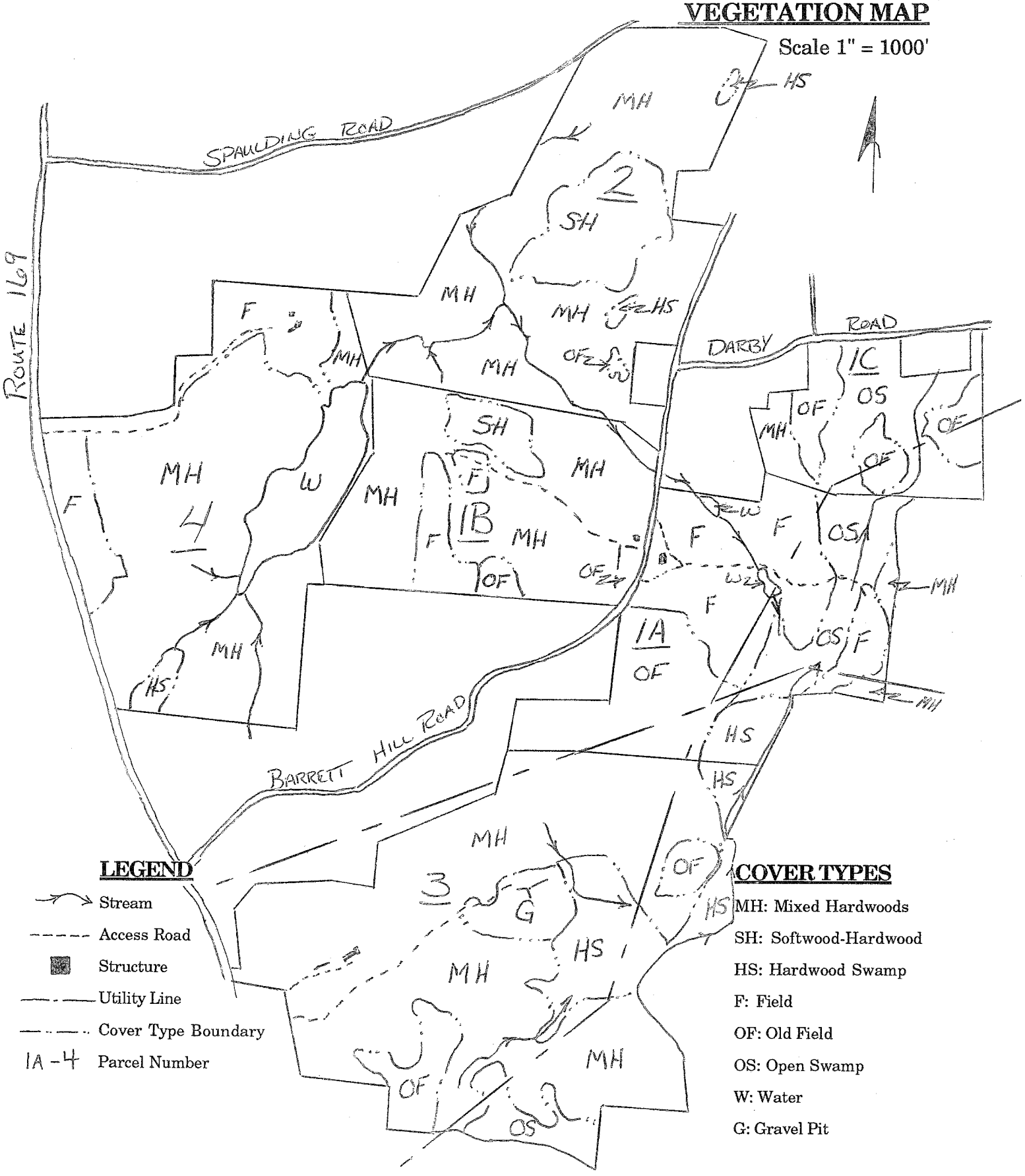
Development may reduce woodlot size to the extent that forest management activities such as timber harvesting is no longer economically feasible or aesthetically acceptable. In effect, this action could remove this acreage from the available timber resource.

Other Considerations : Proposed Fire Pond

If the small hardwood swamp in Parcel 2 is developed into a fire pond, it should be designed for year round use with a dry hydrant and gravelled access road. The pond should be constructed with a depth of at least 6 feet to allow for an adequate pumping volume and seasonal fluctuations in the water table. Should storm drain water be used to recharge the fire pond, sediment must be first filtered out in a holding pond to prevent siltation of the fire pond. The road, preferably gated, must be plowed in the winter to allow access.

VEGETATION MAP

Scale 1" = 1000'



LEGEND

- Stream
- Access Road
- Structure
- Utility Line
- Cover Type Boundary
- 1A-4 Parcel Number

COVER TYPES

- MH: Mixed Hardwoods
- SH: Softwood-Hardwood
- HS: Hardwood Swamp
- F: Field
- OF: Old Field
- OS: Open Swamp
- W: Water
- G: Gravel Pit

10. WILDLIFE RESOURCES

Habitat Type Descriptions

The habitat types on these properties include mixed hardwood forest, open field, and wetland area. The variety of habitat types provides for a diversified wildlife population. Examples of wildlife species in each habitat is provided along with a list of species likely to be found in these areas.

Mixed Hardwood Forest

This habitat consists of a variety of hardwood species including red maple, beech, red oak, elm, hickory and birch. Understory vegetation includes witchhazel, elderberry, multiflora rose, grape, blackberry and hardwood regeneration. Wildlife frequenting such habitat types include deer, fox, raccoon, gray squirrel, woodpeckers (pileated, hairy and downy), ovenbirds, scarlet tanangers, black-throated blue and green warblers, barred owls, broad-winged hawks and various nongame species such as porcupines, shrews, voles and snakes.

Open Field

Open land habitat is very beneficial to wildlife. Vegetation provides food as well as structural diversity, creating cover for a great array of wildlife ranging from mice and shrews to deer. Fields also attract numerous insects, a major food item of various wildlife species such as birds and small mammals including bats. Another important feature of fields is the edge created where fields meet forest. This valuable zone for food and cover consists of dense berries, shrubs and grasses. Wildlife utilizing open field habitat include deer, woodcock, woodchuck, fox, raccoon, skunk, mourning dove, bluebirds, eastern kingbirds, mockingbirds, flycatchers, blue and golden-winged warblers, robins, kestrels, red-tailed hawks, eastern screech owls and cottontail rabbits.

Wetland/Riparian Zone

This habitat type consists of various combinations of intermittent streams/brooks and a red maple/oak wetland area. Associated vegetation includes red maple, birch, alder, dogwood, jewel-weed, spicebush, sweet pepper bush, skunk cabbage, false helebore, and various grasses and sedges. Wildlife using such sites include

deer, fox, raccoon, skunk, muskrat, mink, woodducks, swallows, red-winged blackbirds, grackles, kingbirds, cedar waxwings, hooded and wilson's warblers, titmice, woodpeckers, and numerous amphibians and reptiles including water and garter snakes, salamanders, and spotted and painted turtles.

Impacts of Development

Wetland/Riparian Zones

Wetlands support a high diversity of wildlife due to the complexity of the vegetative structure, high productivity and abundant food supply which allow for a high carrying capacity (Brown et. al. 1978). There are many species that require access to streams or water body margins for survival even though they may spend much of their time in other habitats (Milligan and Raedeke 1986). Part of the food supply for many vertebrates is the high abundance and diversity of insect populations that are typical of wetland ecosystems (Brown et al. 1978).

Wetlands presently provide important habitat for a variety of wildlife species and function as areas for absorption of natural runoff. Any planned diversion of stormwater into wetlands will increase water flow, sedimentation and pollution. This will alter the present ecological structure of the wetland and reduce species diversity. Even though stormwater retention and filtration plans may alleviate some of these problems, the long term effects of stormwater diversion into wetlands tend to be negative. Retention and filtration systems may still allow fine silt and pollutants to enter.

Not only are wetlands important to wildlife, they are also important to humans. Various functions of wetlands include flood control, ecological integrity, fish and wildlife habitat, nutrient and sedimentation trappings, educational potential, visual/esthetic quality, recreation, groundwater use potential and botanical sites. There are usually inherent limitations in developing wetlands due to poorly drained and unstable soil types.

Vegetation removal in wetlands may have severe impacts on wildlife, especially reptiles and amphibians. One or several of the cover, food, breeding habitat, and hibernation areas may be altered. Species dependent on specialized habitat are

eliminated and more adaptable species are reduced in numbers (Campbell 1973). Barriers, such as roads, to seasonal movement and population dispersal are also serious threats (Campbell 1973). To minimize impact maintain a 100 foot wide buffer zone of vegetation around wetland/riparian areas. This buffer zone will help filter and trap silt and sediments, provide excellent wildlife cover and be an aesthetic and educational asset to the community.

The diversified habitats at this site provide for the needs of a wide variety of wildlife species that inhabit the general area. As the demand for land increases and land is developed, there will be an immediate and lasting negative impact on wildlife. The primary impact is the direct loss of habitat due to buildings, roads, driveways, parking areas, walkways, recreational facilities and other structures. Loss of habitat also occurs where cover is cleared for lawns and landscaping. Additional impact occurs with increased human presence, vehicular traffic and the number of free roaming cats and dogs. Development of this area will decrease the amount of habitat simply because the land will be occupied by physical buildings and roads. Human activity in the area will greatly increase, even after construction is completed. Some species of wildlife will not tolerate increased human activity and will emigrate from the area. Other species, tolerant of human activity, might be attracted to the area, and may become a nuisance to area residents (i.e. raccoons, skunks, moles).

Upland Wooded Areas

Fragmentation of habitat may lead to a decline in species diversity and richness. Sensitive, interior species that require large tracts of undisturbed forest, such as veeries, ovenbirds and scarlet tanangers may decrease and no longer occupy the area.

Mitigation of Disturbances

There are several management guidelines which should be considered during the planning process in order to minimize adverse impacts on wildlife:

1. Make use of natural landscaping techniques (avoid and/or minimize lawns and chemical applications) to lessen acreage of lost habitat and possible wetland contamination.

2. Maintain a 100 foot wide buffer zone of natural vegetation around wetland/riparian areas to help filter and trap silt and sediments. These vegetated zones provide excellent wildlife cover and travel corridors.

3. Stone walls, shrubs and trees should be maintained along field borders.

4. During land clearing care should be taken to maintain certain forestland wildlife requirements:

a. Encourage mast producing trees (oak, hickory, beech).
b. Leave 3-5 snag/den trees per acre as they are used by many birds and mammals for nesting, roosting and feeding.
c. Exceptionally tall trees are used by raptors as perching and nesting sites and should be encouraged.
d. Trees with vines (fruit producers) should be encouraged.
e. Brush debris could be windrowed to provide cover for small mammals, birds and amphibians and reptiles.
f. Removal of dead and down woody material should be discouraged where possible. The existence of many wildlife species (salamanders, snakes, mice, shrews and insects) depends on the presence of dead trees (Hassinger 1986).

5. Implementation of backyard wildlife habitat management practices should be encouraged. Such activities involve providing food, water, cover and nesting areas.

On small acreages with many buildings, landscaping can do a great deal to provide habitat and make an area attractive to wildlife. First, leave as many safe trees as possible around the buildings. This will not only benefit wildlife by providing food, cover and nesting sites (i.e. especially for songbirds), but will also be more aesthetically pleasing for the residents of the development. Plant trees and shrubs which are useful to wildlife and landscaping. Large expanses of lawn with no trees or shrubs present should be discouraged.

Planting shrubs that are less palatable to deer may lessen problems with nuisance deer. Shrubs less palatable to deer include evergreen hybrid rhododendrons, American Holly, Scotch pine, White and Norway Spruce, Japanese cedar, Flowering dogwood, mountain laurel, Common lilac and White pine. Taxus spp. (yews) experience a greater degree of damage as they are preferred winter foods of deer (Conover, 1988).

6. In most cases, natural marshes are of more value than constructed ponds and ditches because of vegetative composition, gentle sloping edges

and shallow water depths (6"-3'). If any pond work is planned they should be small (1/4) acre, shallow ponds to remove some of the thick cattail stands.

Specific Site Recommendations

1. Fire Pond Construction

This area is a wetland depression located near the eastern property boundary. Standing water was present with an overstory consisting of red maple, understory of highbush blueberry and winterberry shrubs. This area provides habitat for a variety of reptile and amphibian species. To preserve and create a variety of habitats at this site it is recommended that excavation of the depression reserve approximately 1/3 of the area in wooded/shrub wetland cover. Water depths should then gradually grade into deeper water depths. A diversity of habitat types in this specific area will allow for a greater variety of wildlife.

2. Wildlife Corridors

In any proposed development the delineation of open space/wildlife corridors should be identified early in the planning process. The proper selection of habitats for incorporation into the open space system can make a major difference in the wildlife benefits to be incurred. A variety of habitat types should be retained to increase species diversity. Due to the impracticality of retaining one large area to include all the desired habitats, it is logical for an open space system to be based on a network of corridors. A corridor configuration essentially "hooks up" the different habitats into one contiguous system. This system enables wildlife species to utilize the different habitat components as required. The logical base for the wildlife corridor/open space system are the stream/wetland corridors. Woodlands are of importance to wildlife and the ecotones formed at wetland and woodland edges provide an additional habitat where a dense understory provides cover and screening from human disturbance. There should also be ancillary corridors that extend from this system into, and through, the developed area, thereby encouraging the movement of wildlife into and through the residential development.

The proposed open space for Barrett Hill developments coupled with the wetland areas and buffers where vegetation should not be drastically altered will provide for a good wildlife corridor system. A review of open space on future adjacent

developments should be arranged to all for contiguous connections and a compliment of habitat types.

References

Adams, Lowell W., and Louise E. Dove. 1989. Wildlife Reserves and Corridors in the Urban Environment: A Guide to Ecological Landscape Planning and Resource Conservation. National Institute for Urban Wildlife. 91pp.

Best, L.B., D.F. Stauffer, and A.R. Geier. 1978. Evaluating the effects of habitat alteration on birds and small mammals occupying riparian communities. Pages 117-124. in (Strategies For Protection and Management of Floodplain and Other Riparian Communities). Proc. symp. Dec. 11-13, 1978, Gallaway, GA. Gen. Tech. Rep. W0-12, Forest Serv., U.S. Dep. Agric., Wash. D.C. 410pp.

Brown, S., M.M. Brinson and A.E. Lugo. 1978. Structure and functions of riparian wetlands. Pages 17-31. in (Strategies For Protection and Management of Floodplain and Other Riparian Communities). Proc. symp. Dec. 11-13, 1978, Gallaway, GA. Gen. Tech. Rep. W0-12, Forest Serv., U.S. Dep. Agric., Wash. D.C. 410pp.

Campbell, C.A. 1973. Survival of reptiles and amphibians in urban environments. Pages 61-66. in (Wildlife In An Urbanizing Environment). Proc. symp. Nov. 27-29, 1973, Springfield, Mass. Coop. Extn. Serv., Univ. of Mass., U.S. Dep. Agric., Cnty. Extn. Serv. 182pp.

Conover, Michael R. and Gary S. Kania 1988. Browsing preference of White-tailed deer for different ornamental species. Wildlife Society Bulletin vol. 16, pp. 175-179.

Devlin, D. 1985. Woodland wildlife management. Pennsylvania Woodlands. Penn. State Univ., Col. of Agric., Coop. Exten. Serv. 6:1-6.

Geis, A.D. 1986. Wildlife habitat considerations in Columbia, Maryland and vicinity. Pages 97-99. in (Wildlife Conservation and New Residential Development). Proc. symp. Jan. 20-22, 1986. Tucson, Ariz., Estes Co., Cottonwood Prop., Nat. Wildl. Fed. 203pp.

Hassinger, J. 1986. Dead wood for wildlife. Pennsylvania Woodlands. Penn. State Univ., Col. of Agric., Coop. Exten. Serv. 7:1-6.

Milligan, D.A. and K.J. Raedeke. 1986. Incorporation of a wetland into an urban residential development. Pages 162171. in (Wildlife Conservation and New Residential Developments). Proc. symp. Jan. 20-22, 1986. Tucson, Ariz. 203 pp.

REPTILES

Common Snapping Turtle
Painted Turtle
Spotted Turtle
Wood Turtle
Eastern Box Turtle
Eastern Worm Snake
Eastern Ribbon Snake
Northern Black Racer
Northern Ringneck Snake
Black Rat Snake
Eastern Milk Snake
Eastern Smooth Green Snake
Northern Redbelly Snake
Eastern Garter Snake

AMPHIBIANS

Jefferson's Salamander
Spotted Salamander
Marbled Salamander
Northern Dusky Salamander
Northern Two-lined Salamander
Northern Spring Salamander
Four-toed Salamander
Redback Salamander
Slimy Salamander
Mudpuppy
Red-spotted newt
Eastern American Toad
Northern Spring Peeper
Gray Treefrog
Bullfrog
Green Frog
Pickerel Frog
Northern Leopard Frog
Wood Frog

MAMMALS

Opossum
Masked Shrew
Water Shrew
Smoky Shrew
Short-tailed Shrew
Least Shrew
Hairy-tailed Mole
Eastern Mole
Star-nosed Mole
Little Brown Bat
Keen's Myotis
Silver-haired Bat
Eastern Pipistrelle
Big Brown Bat
Red Bat
Hoary Bat
Eastern Cottontail
Eastern Chipmunk
Woodchuck
Gray Squirrel
Red Squirrel
Southern Flying Squirrel
White-tailed Deer
Beaver
Deer Mouse
White-footed Mouse
Boreal Red-backed Vole
Meadow Vole
Woodland Vole
Muskrat
Southern Bog Lemming
Norway Rat
House Mouse
Meadow Jumping Mouse
Woodland Jumping Mouse
Porcupine
Coyote
Red Fox
Gray Fox
Raccoon
Short-tailed Weasel
Long-tailed Weasel
Mink
Striped Skunk
River Otter

BIRDS

Northern Goshawk
Broad-winged Hawk
Rough-legged Hawk
American Kestrel
Ring-necked Pheasant
Wild Turkey

Killdeer
Mourning Dove
Yellow-billed Cuckoo
Eastern Screech Owl
Barred Owl
Short-eared Owl
Common Nighthawk
Whip-poor-will
Ruby-throated Hummingbird
Red-headed Woodpecker
Yellow bellied Sapsucker
Hairy Woodpecker
Pileated Woodpecker
Eastern Wood-Pewee
Acadian Flycatcher
Willow Flycatcher
Eastern Phoebe
Eastern Kingbird
Purple Martin
Northern Rough-winged Swallow
Cliff Swallow
American Crow
Black-capped Chickadee
Red-breasted Nuthatch
Brown Creeper
House Wren
Marsh Wren
Northern Mockingbird
Eastern Bluebird
Gray-cheeked Thrush
Hermit Thrush
American Robin
Ruby-crowned Kinglet
Cedar Waxwing
Loggerhead Shrike
White-eyed Vireo
Yellow-throated Vireo
Philadelphia Vireo
Blue-winged Warbler
Tennessee Warbler

Red-shouldered Hawk
Red-tailed Hawk
Sharp-shinned hawk

Ruffed Grouse
Northern Bobwhite
American Woodcock

Common Barn-Owl
Great Horned Owl
Long-eared Owl
Northern Saw-whet Owl
Chuck-will's-widow
Chimney Swift
Belted Kingfisher
Red-bellied Woodpecker
Downy Woodpecker
Northern Flicker
Olive-sided Flycatcher
Yellow-bellied Flycatcher
Alder Flycatcher
Least Flycatcher
Great Crested Flycatcher
Horned Lark
Tree Swallow
Bank Swallow
Blue Jay
Fish Crow
Tufted Titmouse
White-breasted Nuthatch
Carolina Wren
Winter Wren
Gray Catbird
Brown Thrasher
Veery
Swainson's Thrush
Wood Thrush
Golden-crowned Kinglet
Blue-gray Gnatcatcher
Northern Shrike
European Starling
Solitary Vireo
Warbling Vireo
Red-eyed Vireo
Golden-winged Warbler
Orange-crowned Warbler

Nashville Warbler
Yellow Warbler
Yellow-rumped Warbler
Magnolia Warbler
Black-throated Blue Warbler
Pine Warbler
Palm Warbler
Blackpoll Warbler
Black-and-White Warbler
Prothonotary Warbler
Ovenbird
Louisana Waterthrush
Connecticut Warbler
Common Yellowthroat
Wilson's Warbler
Yellow-breasted Chat
Northern Cardinal
Indigo Bunting
Rufous-sided Towhee
Chipped Sparrow
Vesper Sparrow
Fox Sparrow
Lincoln's Sparrow
White-throated Sparrow
Dark-eyed Junco
Red-winged Blackbird
Rusty Blackbird
Brown-headed Cowbird
Northern Oriole
Purple Finch
Red Crossbill
Common Redpoll
American Goldfinch
House Sparrow

Northern Parula
Chestnut-sided Warbler
Black-throated Green Warbler
Cape May Warbler
Blackburnian Warbler
Prairie Warbler
Bay-breasted Warbler
Cerulean Warbler
American Redstart
Worm-eating Warbler
Northern Waterthrush
Kentucky Warbler
Mourning Warbler
Hooded Warbler
Canada Warbler
Scarlet Tanager
Rose-breasted Grosbeak
Dickcissel
American Tree Sparrow
Field Sparrow
Sharp-tailed Sparrow
Song Sparrow
Swamp Sparrow
White-crowned Sparrow
Bobolink
Eastern Meadowlark
Common Grackle
Orchard Oriole
Pine Grosbeak
House Finch
White-winged Crossbill
Pine Siskin
Evening Grosbeak

Species potentially inhabiting habitats of study area.

*** Connecticut Wildlife checklist of birds, mammals, reptiles and amphibians.**

11. FISH RESOURCES

Site Description

The north central portion of Brooklyn Connecticut is currently lightly developed with residential housing that is interspersed with agricultural areas. The entire study area is located within the White Brook watershed. White Brook enters Mashamoquet Brook approximately 1,000 feet upstream of its junction with the Quinebaug River in the town of Pomfret. An unnamed stream, hereafter referred to as Barrett Hill Brook, is tributary to White Brook and flows through the study area. The total land area of approximately 628 acres is divided into 6 separate parcels. The parcels are summarized as follows:

Parcel	Acreage	Status
1A	100	19 lot subdivision presently before the Inland Wetland and Watercourses Agency (IWWCA) [Splendid Oaks Heights-I]
1B	71	40 lot subdivision (application pending) [Splendid Oaks Heights-II]
1C	41	no plans presently
2	109	26 lot subdivision (application pending) [Stonehedge Estates]
3	180	vacant land for sale
4	124	the Team was told that this land is in private conservation

Site plans were reviewed for parcel 1A (15 sheets dated 9-6-89) and parcel 2 (32 sheets dated 8-11-89). Site inspections took place on these two parcels as well as parcel 1B. General comments will be offered for the entire area. Specific comments will be directed toward parcels 1A and 2.

Aquatic Resources

White Brook and Barrett Hill Brook support viable stream fish communities. White Brook is annually stocked by the DEP Inland Fisheries Division with more than 200 yearling (6 8") brook trout. Fishes expected to inhabit the typical riffle habitats of these streams include tessellated darter, native (wild) brook trout,

longnose dace, blacknose dace, American eel, fallfish, common shiner and white sucker. Areas impounded by beavers or man would be expected to contain species more typical of slow moving streams or warmwater ponds such as brown bullhead, golden shiner, chain and or grass pickerel, and various species of sunfish (bluegill, pumpkinseed, redbreast sunfish) and largemouth bass.

General Impacts

The following impacts can result during the construction of subdivisions if proper mitigation measures are not implemented:

1. Construction site soil erosion and sedimentation of watercourses through increased runoff from unvegetated areas:

During construction topsoil will be exposed and susceptible to runoff events, especially if suitable erosion and sediment controls are not properly installed and maintained. Erosion and sedimentation due to construction has long been regarded as a major cause of stream degradation. Silt is considered a major stream pollutant. Excessive sediment deposition could damage aquatic ecosystems in the following ways:

> *(**A**) Sediment reduces the survival of resident fish eggs and hinders the emergence of newly hatched fry. Adequate water flow, free of sediment is required for fish egg respiration and successful hatching.*
>
> *(**B**) Sediment reduces the amount of usable habitat required for spawning purposes. Excessive fines can clog spawning gravels causing fish to disperse to other areas.*
>
> *(**C**) Sediment reduces the survival of aquatic insects. Since aquatic insects are important food items in fish diets, reduced insect populations levels will adversely affect fish growth and survival as fish expend excess energy locating prey.*
>
> *(**D**) Sediment reduces stream pool depth. Pools are invaluable stream components since they provide necessary cover, shelter, and resting areas for resident fish. A reduction of usable fish habitat can result in reduced population levels.*
>
> *(**E**) Turbid waters impair normal gill function and feeding activities fish. High concentrations of sediment can cause mortality by clogging gills.*
>
> *(**F**) Sediment encourages the growth of filamentous algae and nuisance*

proportions of aquatic weeds (CT DEP I989). Eroded soils contain plant nutrients such as phosphates and nitrates. Once introduced into aquatic habitats, these nutrients function as fertilizers resulting in accelerated plant growth. Presently, both streams support very sparse aquatic weed communities.

(G) Sediment contributes to the depletion of dissolved oxygen (CT DEP 1989). Organic matter associated with soil particles is readily decomposed by microorganisms thereby effectively reducing oxygen levels.

2. Road construction :

Placement of box culverts in streams may prevent resident fish passage due to:

(1) increased water velocities within the culvert during periods of high river flows, and/or

(2) insufficient water depth within the culvert during summer low flow conditions. Moreover, cu)vert placement results in the direct loss of instream fisheries habitat since the local stream bottom will be replaced with concrete. Instream culvert placement in concert with placement of fill alongside the river will inevitably result in stream sedimentation problems if proper erosion and sedimentation controls are not followed.

3. Percolation of septic effluent into watercourses :

A failure of individual septic systems to operate properly function (refer to **SEWAGE DISPOSAL** section) may be potentially dangerous to stream environments. Nutrients and assorted chemicals that may be placed in septic systems may enter stream waters in the event of a septic system failure or infiltrate the groundwater during the spring when water tables are near the surface. Effluent may also stimulate the growth of nuisance aquatic vegetation and algae that are currently absent from White Brook and Barrett Hill Brook.

4. Aquatic habitat degradation in streams due to the influx of stormwater drainage :

Stormwaters from road systems can contain a variety of pollutants that are detrimental to aquatic organisms. Pollutants commonly found in stormwaters are: hydrocarbons (gasoline and oil), herbicides, heavy metals, road salt, fine silts, and coarse sediment. Nutrients in stormwater runoff can fertilize stream waters causing water quality degradation. Additionally, fine silts in stormwaters that remain in suspension for prolonged periods of time often cannot be effectively removed from roadway catch basins and/or stormwater detention basins.

Accidentally spilled petroleum based chemicals or other toxicants can precipitate partial or complete fishkills if introduced in high concentrations. Stormwater drainage can also result in increased stream flows.

5. Transport of lawn fertilizers and chemicals to watercourses :
Runoff and leaching of nutrients from fertilizers on lawns will stimulate filamentous algae growth in these streams and degrade water quality. Introduction of lawn herbicides can result in "fish kills" and overall water quality degradation. Rooted or floating aquatic vegetation may proliferate in slower moving stream reaches.

6. Degradation of wetland habitat :
Wetlands serve to protect stream water quality by:

> *(1) controlling flood waters by acting as a water storage basin,*
>
> *(2) trapping sediments from natural and man-made sources of erosion, and*
>
> *(3) filtering out pollutants from runoff before they enter watercourses. Development which brings about polluted stormwaters, excessive stream sedimentation, lawn fertilizers, and lawn herbicides can negatively impact wetlands by hindering their ability to properly function.*

7. Impacts to downstream environments :
Any water quality problems and habitat degradation that occurs within this area will eventually be observed in downstream areas. In addition to resident stream fish populations, the lower section of White Brook is potentially utilized by some of the more than 1,800 adult (9-12") brown, brook, and rainbow trout that are stocked into Mashamoquet Brook annually.

Recommendations

The following recommendations should be considered by Brooklyn land use commissions to mitigate impacts to local aquatic resources.

1. Discourage residential development on lots that immediately abut White Brook or Barrett Hill Brook :
Impacts such as soil erosion, septic effluent, stormwater runoff, and wetland

degradation can be more effectively minimized if these areas are left in their natural condition. It may be appropriate to designate some of these lots as "open space".

2. It is recommended that at the minimum, a 100 foot open space buffer zone be maintained along the wetland boundary of all streams :

Research has shown that 100 foot buffer zones help prevent damage to wetlands and stream ecosystems that support diverse fish and aquatic insect life (USFWS 1984;USFWS 1986;0DFW 1985). These buffers will absorb surface runoff and other pollutants before they can enter wetlands, ponds, and stream ecosystems. Additionally, buffer zones can improve the quality of instream habitat for fishes. For example, research has shown that brook trout habitat units can increase 2,400% when well vegetated buffer zones are used for stream corridor protection (HEP Notes, 1988).

3. Perennial streams should be crossed with span bridges rather than with box culverts :

Span bridge will allow trout and other resident fish species to move freely and unimpeded within the river and also preserve natural instream substrate. A viable alternative to span bridging is the pre-cast arch culvert which also preserves the natural stream substrate.

4. All instream work and land grading/filling near streams should take place during low flow periods :

This will help minimize the impact to the aquatic resources. Reduced streamflows and rainfall during the summer and early fall provide the least hazardous conditions in which to work near sensitive aquatic environments.

5. Install and maintain proper erosion and sedimentation controls during site construction activities :

Past stream siltation disturbances in Connecticut associated with residential housing developments have occurred when individual contractors either improperly deployed mitigation devices or failed to maintain these devices on a regular basis. Proper installation and maintenance of these devices is critical to environmental well being.

6. Proper watercourse setbacks for septic systems (refer to SEWAGE DISPOSAL section) :

Septic systems must be properly located and designed to effectively renovate septic effluent. Septic effluent can be one of the greatest threats to the ecology of streams. When septic leach fields are proposed to be located within 100 feet of wetlands or watercourses, the town sanitarian or IWWCA should require analyses of phosphate and nitrate transport to ensure that leachate does not interfere with aquatic resources. Doing this may go beyond the standards of the State health code but is warranted to protect surface waters from avoidable sources of eutrophication. The most sensitive streams are those whose riparian zones are totally devoid of or severely lacking functioning wetlands. Systems located on steep slopes adjacent to streams are also dangerous due to the increased potential of leachate "breakout". All septic systems should be maintained on a regular basis. Residents should be encouraged to utilize non-phosphate laundry detergents.

7. Limit liming, fertilization, and the introduction of chemicals to subdivision lawns :

This will help abate the amount of additional nutrients to aquatic resources Non-phosphorus lawn fertilizers are currently available from various lawn care distribution centers.

8 All developers should submit detailed stormwater management plans for town review :

The effective management of stormwaters and roadway runoff can only be accomplished through proper design, location, and maintenance of catch basins. When possible, stormwaters should only be outletted into non-wetland habitat; thus avoiding direct contact with wetlands. Timely maintenance of catch basins is of critical importance. Roadway catch basins should be regularly maintained to minimize adverse impacts to riverine/wetland habitats. The use of road salt to deice roads should be minimized when possible.

9. Open Space :

Due to the rural character and generally high environmental quality of this area, the Planning and Zoning Commission (PZC) should maximize its authority when extracting open space from subdivisions. Since CGS sect 8-18(4) allows the

commission to designate the location of open space, efforts should be made to secure environmentally sensitive areas. Since wetlands are generally afforded legal protection, the PZC has the flexibility to minimize using wetland areas as open space unless it feels that special protection is warranted. Appropriate locations for open space acquired for the purpose of environmental protection include areas adjacent to streams and wetlands. Steep slopes adjacent to these resources are especially appropriate. The acquisition of space should be a well-thought-out coordinated effort to maximize corridors between individual parcels. Using streams as the focal point of open space acquisition usually fosters this concept.

10. Zoning Regulations :

Notwithstanding the intentions of local commissions to acquire open space areas, current 1 acre zoning may not fully allow for the adequate protection of stream and wetland resources. The PZC may wish to explore alternative forms of "open space" or "cluster" zoning to better allow for the protection of critical resources. By doing so, the PZC could better protect the rural ambiance and environmental resources by redistributing the same number of residential units more harmoniously with the local landscape.

Parcel Specific Comments

Parcel 1A. Splendid Oak Heights Phase I

This parcel consists of 96 acres which is proposed to be subdivided into 19 lots. Plans show that 3.9 acres will be designated as open space (approximately 4% of total area). Total wetland and watercourse coverage of this parcel is considerable. Barrett Hill Brook joins White Brook within this parcel. No new road crossings are planned over these streams but one wetland area will be crossed by the 900 foot cul-de-sac road (Brookview Terrace). An existing stone bridge will be used to access lots 3-8.

The steep stream bank (approaching 35% slope) adjacent to lots 3 and 4 is an area of major concern. The well location for lot 3 is situated in this steep area and is approximately 40 feet from Barrett Hill Brook. Significant erosion and sedimentation problems could arise while installing this well. The plans do not

show any regrading for well installation but this is an activity that will necessarily take place when platforms area constructed for the drilling and drill supply vehicles. A hay bale silt barrier is shown downslope of the well location. This entire steep slope area should be considered as an additional open space area to increase the 3.9% open space currently proposed. Ideally, this "open space" should encompass some land on the southwest side of Barrett Hill Brook, but at the bare minimum it should extend from the brook to the top of the ridge. This additional open space would be contiguous with that already shown on the plan thereby creating an effective stream corridor.

The existing stone bridge should be utilized as planned if possible. If engineering analysis deems it unsafe for vehicular traffic and a new crossing is required, a span bridge should be used rather than a box culvert.

Septic systems within 100 feet of either stream should only be approved if testing of phosphate and nitrate transport is undertaken and the results indicate that renovation is complete prior to the leachate reaching these streams.

Parcel 1B. Splendid Oak Heights Phase II

A limited site walk revealed some areas of steep slopes on this site. If this parcel is developed, special attention should be given to stormwater management to minimize degradation of nearby streams. The topography of this parcel is ideally suited to cluster zoning if soil types can accommodate the necessary septic systems. Local commissions may wish to consider concentrating "open space" in the area adjacent to parcel 4 since this parcel is may already be a conservation area.

Parcel 1C.

This parcel has extremely limited potential for development since the eastern three fourths appear to be wetlands, and development on the western boundary would be hampered by steep slopes.

Parcel 2. Stonehedge Estates

Fifteen percent (16 acres) of this tract is regulated wetlands. Plans show 26 lots averaging 2.9 acres in size which are served by 3000 feet of cul-de-sac road (Greystone Drive). The upper reaches of Barrett Hill Brook flow though the

southern portion of this property. Twenty eight percent of this parcel will be designated as open space. Much of this area is wetlands.

The area of greatest concern relative to aquatic resources is lot 15 and 16 and the proposed stream crossing to access them. Lot 16 is especially sensitive since it is trisected by two streams, one of which is Barrett Hill Brook just downstream of Parcel 4 (Conservation Area). The other stream is intermittent. Since the proposed house location of lot 16 is shown in the eastern one third of the lot, the overall open space plan could be greatly improved if the western two thirds of this lot were designated as open space. Doing this would provide a nearly contiguous open space corridor along Barrett Hill Brook within this subdivision and would greatly improve the overall stream corridor as this would be contiguous with Parcel 4.

Stream protection could be maximized if lots 15 and 16 were eliminated altogether. This would eliminate the stream crossing and remove the concerns associated with locating house lots on steep slopes. All of lot 15 and the eastern half of lot 16 is on terrain greater than 15% slope (see **Recommendations**; **#2** and **#7**). Doing this would require major modifications to the open space layout however since more than 10% open space is already provided.

It is proposed that the driveway crossing for lots 15 and 16 be served by triple reinforced concrete pipes. Since these will cause major fish passage problems during periods of high and low flow, it is recommended that a span bridge or arch culvert be installed. If this is not possible, a single large sunken box culvert would also bc adequate.

Any septic systems located within 100 feet of Barrett Hill Brook should only be allowed if nutrient transport testing demonstrates total renovation of effluent prior to entering the stream.

Construction of the fire pond should be done during periods of low precipitation and all appropriate erosion and sedimentation controls be implemented to protect Barrett Hill Brook.

Parcel 3

This parcel appears to have severe limitations to development due to the extensive wetland areas to the east and steep slopes to the west. Dry land areas to the east of the wetlands should not be accessible from the west since doing so could cause major irreversible damage to White Brook and its associated wetlands. This is another parcel where clustering could prove to be a viable alternative to conventional development.

Parcel 4

The Team members were told that this parcel is a private conservation area. Since it is unclear as to what mechanism protects this land (i.e. conservation easement, PA 490, land trust ownership, etc.) it is recommended that appropriate measures be taken to ensure the protection of this parcel in perpetuity for passive recreation if this has not been done. This is an important headwater area and its continued protection is vital to the health of downstream aquatic resources.

Summary

This review encompassed an area of over 600 acres in a lightly developed area of Brooklyn, Connecticut. The major aquatic resources in this area are White Brook and Barrett Hill Brook. White Brook is stocked with yearling brook trout and both streams are expected to contain viable populations of resident stream fishes. The area is currently zoned for 1 acre residential lots. This section of the report contained a summary of potential impacts to aquatic resources that can often result from land development. It also provided a general listing of appropriate mitigative measures, and parcel specific recommendations.

Bibliography

CT DEP (Connecticut Department of Environmental Protection). 1989. Non Point Source Pollution: An Assessment an Management Plan, CT DEP, Hartford.

Habitat Evaluation Notes. 1988. Nonpoint Source Pollution: Linking Land Use and Fisheries Potential in the Upper Milwaukee River. Vol. 1 No 4.

ODFW (Oregon Department of Fish and Wildlife) 1985. The Effects of Stream Alterations on Salmon and Trout Habitat in Oregon. Oregon Department of

Fish and Wildlife, Portland, Oregon. 70 pp.

USFWS (United States Fish and Wildlife Service) 1984. Habitat Suitability Information: Rainbow Trout. United States Fish and Wildlife Service, Biological Report FWS/OBS-82(10.124). 64pp.

USFWS (United States Fish and Wildlife Service) 1986. Habitat Suitability Index Models and Instream Flow Suitability Curves: Brown Trout. United States Fish and Wildlife Service, Biological Report FWS/OBS-82/(10.60). 65pp.

12. ARCHAEOLOGICAL REVIEW

The proposed Barrett Hill development project area is within the site of one of the earliest settlements in the Town of Brooklyn. This settlement or manor was known as Mortlake, and it was originally surveyed and laid out in 1714. Mortlake encompassed land south of Mashamoquet (Pomfret) to present-day Route 6, east from the existing state forests, which was at that time the main road from Canterbury to Woodstock, to the falls on the Quinnebaug River (See enclosed map). Two noble farms or manors called Kingswood and Wiltshire were laid out and large tracts were sold for settling the land. Connecticut Governor Saltonstall obtained fourteen hundred acres and William Foye, brother-in-law of Massachusetts Governor Jonathan Belcher, bought three hundred acres. A public training field was reserved amid the farmlands.

In 1714, the vacant land between Pomfret and Canterbury was divided between these townships, and Mortlake came under the jurisdiction of Promfret. However, Mortlake residents gave Pomfret much trouble. This independent community was lawless and unsettled. Mortlake had a unique legal status and they didn't take to the demands of other parishes or townships. They had no government, no public officers and all public improvements depended entirely on the willingness of its owners. These residents paid no taxes and were not always manageable and agreeable. These problems continued until legal action was taken against Mortlake. A final decision was rendered by the Connecticut General Assembly in May 1731. It was ordered that a society be set off bounded on the east by the Quinnebaug River, west with the Windham line, north with the original bounds of Pomfret, and south to Canterbury. The Mortlake Society set up a meeting house on two and a half acres of land, now included in the Brooklyn Green, and worshipped near Brooklyn Center. After many years of independent existence, Mortlake manor was divided between Pomfret and the new parish of Brooklyn in 1753.

The Barrett Hill development projects are in the area of Mortlake manor encompassing Governor Saltonstall's and William Foye's tracts, as well as the training field (See map). The archaeological remnants of this historic area may well be preserved. The land had been used for farming until the Second World

War when residential development began. As a result, open space has been maintained in many areas and this increases the likelihood of archaeological features remaining intact. For example, many of the stone walls on the property are part of the original boundary markers and were built by black and Indian slaves during the 18th century. It is most important to the history of the Town of Brooklyn to preserve as much of these cultural features as possible. Every feasible effort should be made to ensure the preservation and conservation of these historic resources.

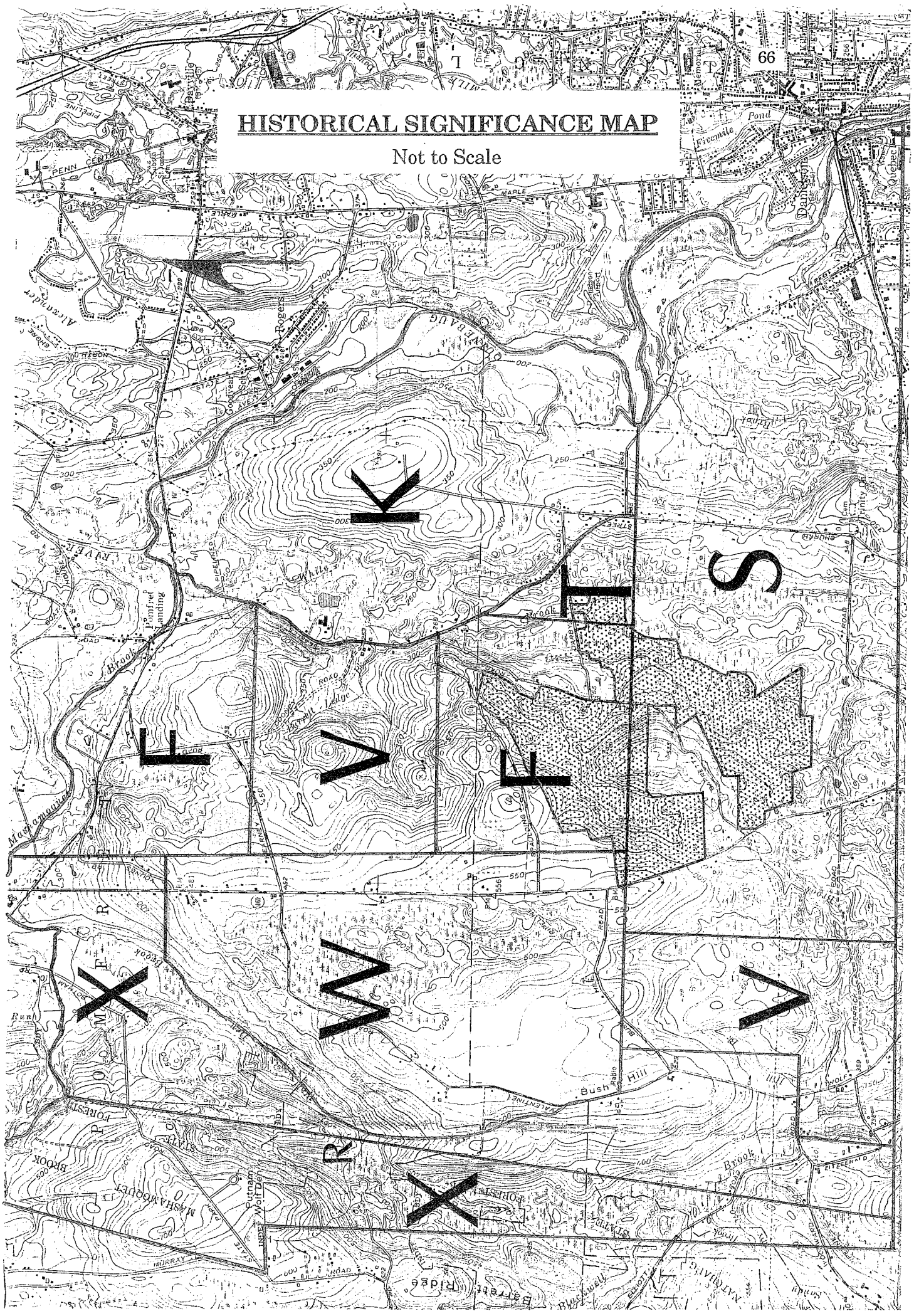
In addition, there is a high possibility of locating prehistoric and historic Indian settlements, especially on the knolls of well drained soils along the brook system. The project area offers many environmental features attractive to prehistoric populations. Historically, we know that Native Americans were living throughout the 18th century at Adam's Tract, which was located immediately south of Mortlake. They could well have utilized the Barrett Hill area in their subsistence rounds.

The Office of State Archaeology recommends strongly that a reconnaissance survey be conducted to locate and identify all prehistoric and historic sites and features in the project area. All archaeological studies should be undertaken in accordance with the Connecticut Historical Commission's Environmental Review Primer for Connecticut's Archaeological Resources. The Office of State Archaeology is prepared to offer technical assistance to the Town of Brooklyn and the developer to ensure the preservation of the cultural resources in the project area.

In summary, the project area is located on a critical property of historical significance to the Town of Brooklyn. Archaeological deposits of the town's early history would be adversely effected by the proposed developments. An archaeological survey is recommended to identify all sites prior to construction activities. All feasible efforts should be maintained to preserve the stone walls and other stone structures on the property, some which may have been constructed by black slaves during the 18th century. The project area may also be of importance to prehistoric and historic Indian lifeways.

HISTORICAL SIGNIFICANCE MAP

Not to Scale



KEY TO MORTLAKE MANOR

 ERT Study Area

K. Kingswood

T. Training Field

F. Foye's Land

S. Saltonstall's Land

W. Wiltshire

X. William's Land

V. Vacant Land

R. Road to Woodstock

From: **History of Windham County, Connecticut**
Ellen Larned (1888:195)

APPENDIX

1. Splendid Oaks Heights Phase I
Windham County SWCD/SCS Letter - 11/13/89

2. Splendid Oaks Heights Phase I
DEP-Water Resources Unit Letter - 11/15/89

3. Splendid Oaks Heights Phase I
Windham County SWCD Letter - 11/27/89

SCS file copy

Agricultural Center
Brooklyn, CT 06234
774-0224

Assisting the Windham County Soil and Water Conservation District

November 13, 1989

Karen Johnson, Town Planner
Town of Brooklyn
P.O. Box 356
Brooklyn, CT 06234

RE: Splendid Oak Heights - 19 lot subdivision
off Barrett Hill Road, Brooklyn

Dear Karen,

I have reviewed this subdivision in the field with you and Brad Cheney, and others, on two different occasions. Relative to the specific concerns you wanted addressed - in your initial request for an environmental review - I offer the following comments and suggestions in areas of my expertise. These could be shared with the Planning and Zoning Commission and the Inland Wetlands Commission.

Concerning town officials' reasons for a review, certainly development of this particular parcel with its open rolling farmland will destroy a natural and aesthetic resource - the scenic pastoral view. This parcel is a prime candidate for open space preservation with the trade-off being denser development in wooded areas.

SOILS - Basically the soils are well drained fine sandy loams with some gravel, and bedrock and ledge - especially near Barrett Hill Road. Lots 4-16,17, and 18 all have ledge and piles of rock. The area of these lots has been disturbed by past mining and excavation. I recommend on lot 16 that the proposed house location be moved to the base of the steep rocky slope, rather than built on the slope as shown. On lot 18 I recommend the house location be moved downhill to allow more separating distance from uphill ledge and the rear of the Kaulback's property. Lots 16 and 18 are tight constricted lots due to ledge and steep topography. They are the most marginal lots I have ever evaluated.

The only prime farmland soil is located along the rear of lots 4-7,8. It is a fine sandy loam (CbB), a hay field. Access for agricultural use will still be provided by the cart path across the wetland which is attimes flooded over.

Septic systems are to be located in fine sandy loam Canton and Charlton soils, which are rated moderate for absorption fields. They are being kept back from watercourses and wetlands within guidelines of the Health Department. Neither Doug Cooper of the DEP Wetlands Unit, Soil Specialist Al Roberts, or I anticipate a contamination problem to wetlands or watercourses from properly installed systems as located.

WATER QUALITY - as subdivided and planned I do not see a threat to surface or groundwater. However the planned erosion and sediment control treatment which includes proper outlet of storm drainage, needs to be implemented in a timely sequence. It will be important to disturb as little sloping ground as necessary, especially stable non-vegetated slopes to watercourses and wetlands. With the low density of development planned relative to the total 95 acre parcel and its wetlands, the increase in runoff due to the new road and houses should not negatively impact the wetlands and White Brook tributaries.

STORM WATER DRAINAGE - The plan has been modified to outlet storm drainage, at the new road cul-de-sac, thru a 18" RCP, and then armored drainage swale to an existing wetlands. The swale should be constructed and well-vegetated before pipe runoff is allowed to flow thru it. With the 15" RCP under the new road, the natural existing vegetation should not be disturbed below the riprap splash pad.

Along Barrett Hill Road - where the 18" storm culvert exists just above proposed lot 4-13, it is recommended new storm drainage be installed along the west side of the road to pick up this drainage and carry it down Barrett Hill Road to the brook. Otherwise road drainage onto lot 13 will be a problem.

EROSION AND SEDIMENT CONTROL - On sheet 13 of 15 ESC Narrative and Details for the subdivision are provided. Other plan sheets give additional oppropriate details. As stated under House Site Development, plot plans for each lot should be submitted for ZEO review to show exact erosion control measures, locations, etc. on a lot. A pre-disturbance on-site meeting should be held between the ZEO (or other designated official) and the contractor at least when the new road is to be installed. Follow-up and inspection will be important. For the individual lot development, it is important to know and then stake-out limits of disturbance before a bulldozer rips up the lot. If water quality is to be protected disturbing a minimum area of each lot is important especially where there are slopes to wetlands and watercourses.

Overall Brad Cheney of CME Associates has prepared a good plan, adequate to protect natural resources, except of course for the pastoral open space vista which will be lost.

Sincerely,

Howard B. Denslow
District Conservationist

scw

HD

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

November 15, 1989

Town of Brooklyn
Inland Wetlands Agency
Town Hall
Brooklyn, CT 06234

Attn: Karen Johnson, Town Planner

Re: Splendid Oak Heights PHASE I
Brooklyn, CT

Dear Ms. ~~James~~: JOHNSON

This is to confirm the results of my October 26, 1989 site inspection of the above property and my review of subdivision plans as prepared by CME Associates and dated revised 9/29/89. My findings and recommendations are as follows:

Findings:

1) The wetland boundaries on the property have been delineated by a certified soil scientist and flagged in the field. These boundaries appear to accurately represent the extent of regulated areas on the property.

2) The design of the proposed subdivision is one which is sensitive to the natural resources on the site and has avoided significant impacts to wetlands and watercourses.

3) The proposed stormwater discharge should provide adequate dissipation of runoff velocities and the discharge of the waters will allow for considerable overland flow prior to introduction into the wetland area. The wetland itself will accommodated he anticipated flows without adverse impact.

4) Considerable open space dedication is possible for this property. The major wetland area which constitutes the easterly portion of the property is a significant resource for protection and preservation. Every effort should be made to preserve this area for its habitat value as well as its scenic, hydrologic, and water quality and supply values.

Recommendations:

1) All earthmoving activities should be subject to careful implementation of the specified erosion control measures.

2) The stormwater discharge swale should be constructed early in the development process so that stabilization and seeding measures can be well established prior to introduction of stormwater from paved roadway surfaces.

3) The dam which forms the small pond in the center of the site should be inspected and cleared of brush. At present, restriction of the spillway by accumulated vegetation causes some storm flows to circumvent the spillway and flow over unprotected embankments. Some cleaning activity would improve the integrity of the dam and also enhance the aesthetics in this locale.

I hope this information proves useful to you. If I can be of further assistance, please feel free to contact me at 566-7280.

Sincerely,

Doug Cooper

Doug Cooper
Principal Environmental Analyst
Water Resources Unit

DC:ps

cc: Windham Co. SWCD attn: Fifi Sconfopolous
CME Assoc.

WINDHAM COUNTY SOIL AND WATER CONSERVATION DISTRICT
P.O. BOX 112 - WOLF DEN ROAD BROOKLYN, CT 06234 - TELEPHONE (203) 774-0224

November 27, 1989

TO: Karen Johnson
Brooklyn Town Planner

FROM: Fifi Scoufopoulos
District Manager

RE: Barrett Hill Splendid Oak Heights Subdivision Proposal

The proposed subdivision site consists of a diversity of habitat types, scenic views, a valuable wetlands and brook complex, some well drained soils and some rough, steep, ledgy areas. The development plan appears to be sensitive to wetland protection, storm water runoff and road placement. However even the best, most attractive development will negatively impact the wildlife habitat values and aesthetic open space values of this site. Proper implementation and maintenance of septic systems and erosion and sediment control measures during construction are necessary for protecting environmental quality.

Juxtaposition of fields, hedgerows, streambanks, ponds, different wetland types and early sucessional stages of forest provide a broad variety of basic wildlife needs including appropriate food plants, water, and space for both wetland and upland species. Residential development will naturally disrupt the continuity of habitat and landscape as well as change the vegetation to a probably less productive, more uniform suburban house site type. The more secretive and sensitive species, unable to live in close proximity to habitation, will disappear. As is, the area is also providng a corridor or transition zone for movement from wetland to upland habitats.

There is a unique opportunity for creative, attractive and conservation oriented development in this area. Several parcels, including parts of the "Splendid Oaks" were suggested as open space land in the (1969?) town plan of development.

Adjoining land parcels, all under the same ownership, are planned for development. Common woodlands adjacent to "Splendid Oak Heights" with well drained soil types are earmarked for future subdivision. The Splendid Oak parcel has some excellent values that justify designation as aesthetic, wildlife and permanent open space. Where the soils, topography and overall land composition are suitable cluster development with mandatory open space designation is a desirable and reasonable alternative to standard development.

The greatest advantage would be the resulting contiguous open space, designated as a permanent undisturbed natural resource. This type of development would enhance the value of the new and existing homes and protect some of the rural character and the open space values. The resulting subdivision would provide a much more attractive, camouflaged, and overall pleasing visual impact than any traditional single family subdivision.