Environmental Review Team Report

Karas / Mikael Subdivision

Sprague, Connecticut

RC&D

EASTERN CONNECTICUT RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.

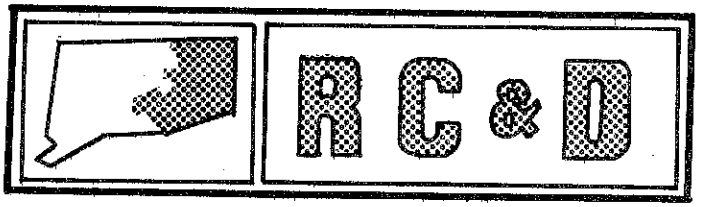
Environmental Review Team Report

on

Karas / Mikael Subdivision

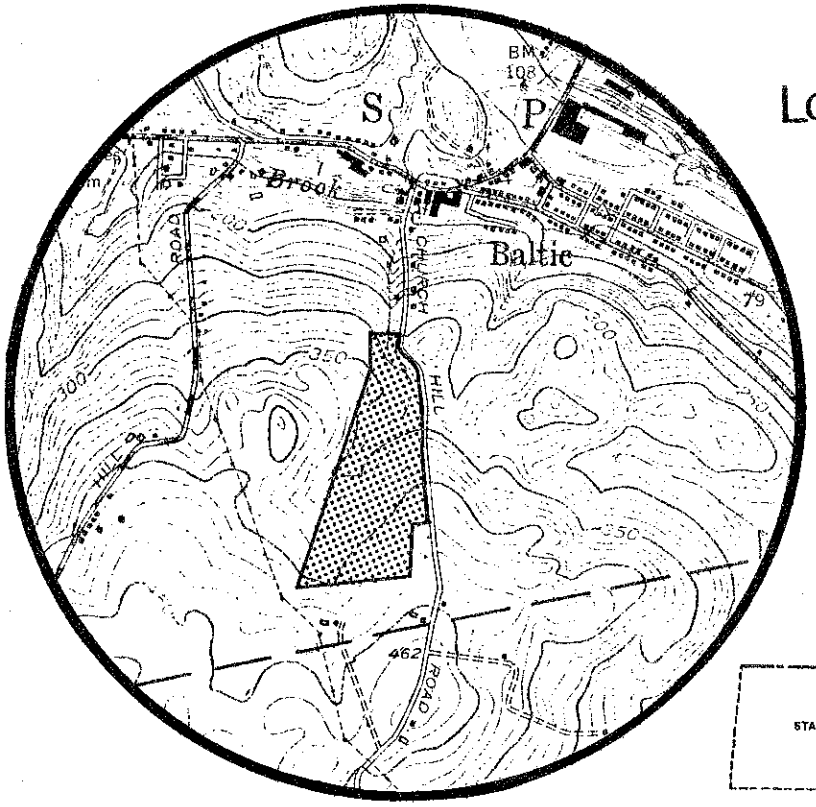
Sprague, Connecticut

May 1978



eastern connecticut resource conservation & development area

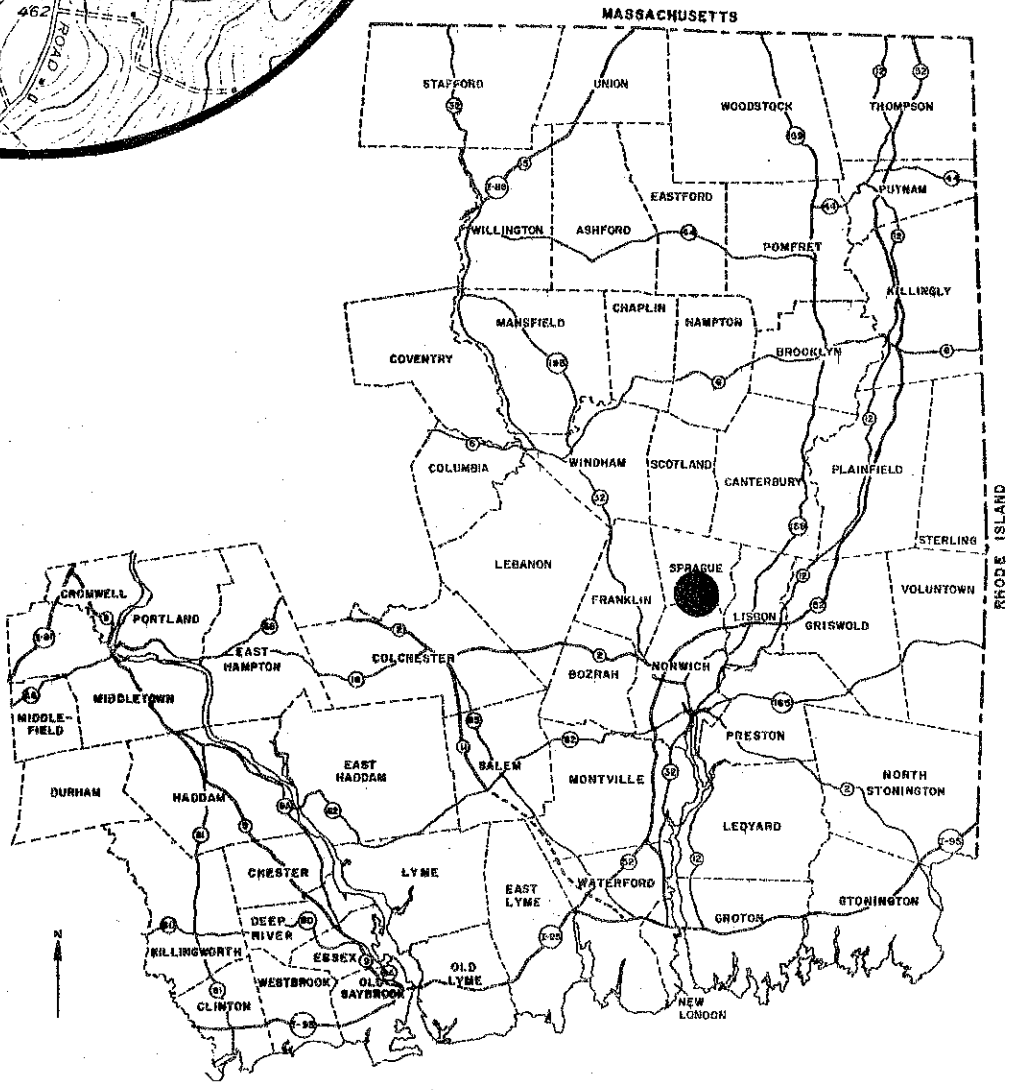
environmental review team
139 boswell avenue
norwich, connecticut 06360



Location of Study Site

KARAS/MIKAEL SUBDIVISION

SPRAGUE, CONNECTICUT



EASTERN CONNECTICUT

RESOURCE CONSERVATION AND DEVELOPMENT PROJECT

ENVIRONMENTAL REVIEW TEAM REPORT
ON
KARAS/MIKAEL SUBDIVISION
SPRAGUE, CONNECTICUT

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

The soils of the site were mapped by a soil scientist of the United States Department of Agriculture (USDA), Soil Conservation Service (SCS). Reproductions of the soil survey map as well as a topographic map of the site were distributed to all ERT participants prior to their field review of the site.

The ERT that field checked the site consisted of the following personnel: Gary Parker, District Conservationist, Soil Conservation Service (SCS), Mike Zizka, Geologist, Department of Environmental Protection (DEP), Donald Smith, Forester (DEP), Mark Traceski, Soil Conservationist (SCS). Donald Capellaro, Sanitarian, State Department of Health, Gerhard Amt, Regional Planner, Southeastern Connecticut Regional Planning Agency and Jeanne Shelburn, ERT Coordinator, Eastern Connecticut RC&D Area.

The Team met and field-checked the site on Thursday, April 6, 1978. Reports from each Team member were sent to the ERT Coordinator for review and summarization for the final report.

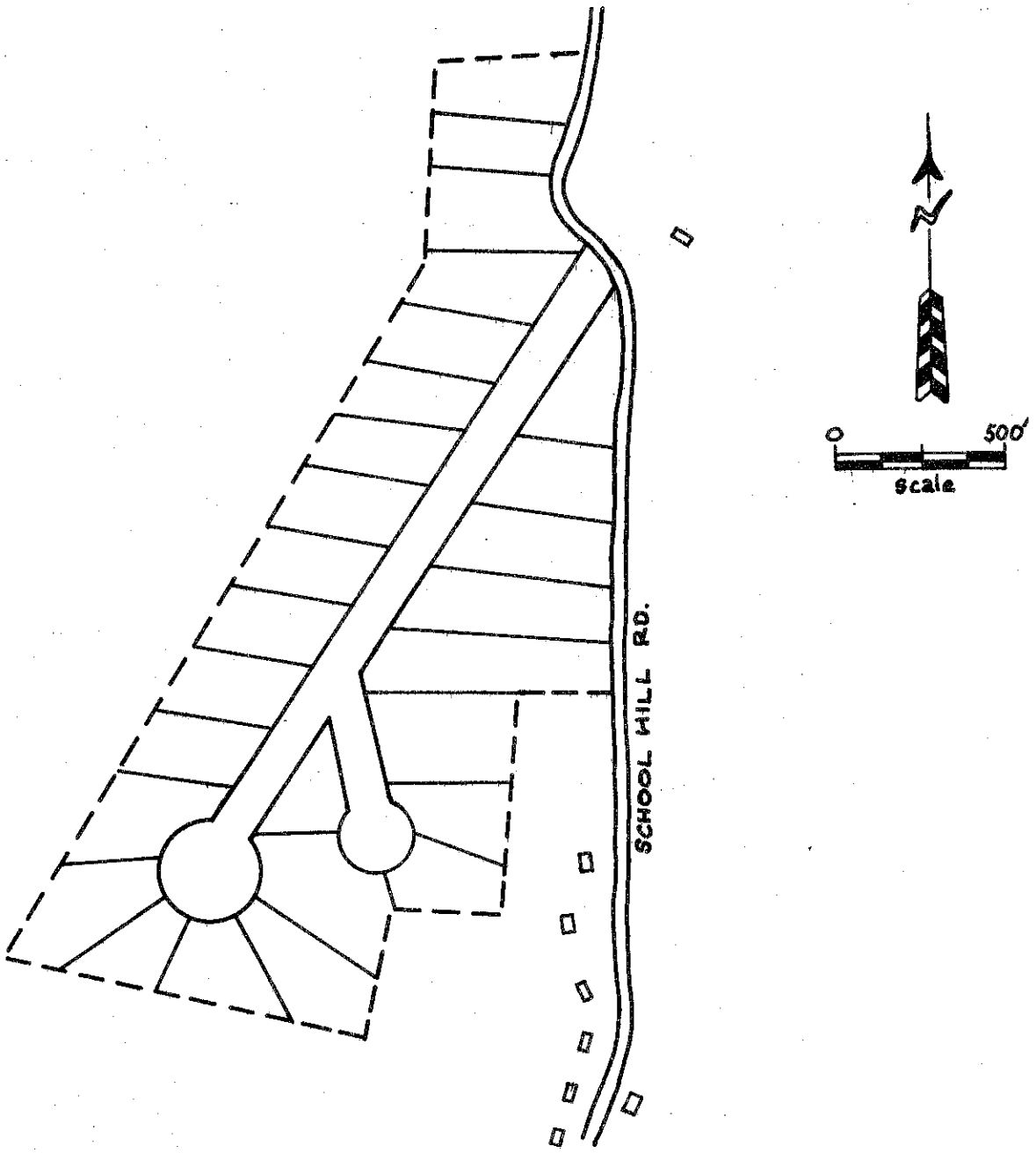
This report is not meant to compete with private consultants by supplying site designs or detailed solutions to development problems. This report identifies the existing resource base and evaluates its significance to the proposed development and also suggests considerations that should be of concern to the developer and the Town of Sprague. The results of this Team action are oriented toward the development of a better environmental quality and the long-term economics of the land use.

The Eastern Connecticut RC&D Project Committee hopes you will find this report of value and assistance in making your decisions on this particular site.

If you require any additional information, please contact: Ms. Jeanne Shelburn, Environmental Review Team Coordinator, Eastern Connecticut RC&D Area, 139 Boswell Avenue, Norwich, Connecticut 06360, 889-2324.

THE PRELIMINARY SUBDIVISION PLAN

KARAS/MIKAEL SUBDIVISION
Sprague, Connecticut



INTRODUCTION

The Eastern Connecticut Environmental Review Team was asked to review a 50 acre parcel, owned by Shawky and Lila Karas and Eliah Mikael of North Haven, for potential subdivision development. This parcel is located in the Town of Sprague, south of Route 97, on the western side of School Hill Road.

The site is presently an undeveloped, sloping woodland, containing a stream and its associated wetlands which extend along the entire length of the property from south to north. Part of the site contains large boulders, and ledge is prominent in the northern portion of the property. The Karas/Mikael property has about 1500 feet of frontage on School Hill Road, which descends steeply to Route 207 in Baltic, approximately 1500 feet north of the site. Some development has occurred along School Hill Road to the south of the site, but the character of the area is decidedly rural. This area may have once been used for agricultural purposes other than pasturing, as concrete foundations for a possible grist mill and a concrete sluiceway were found near one of the streams on the property.

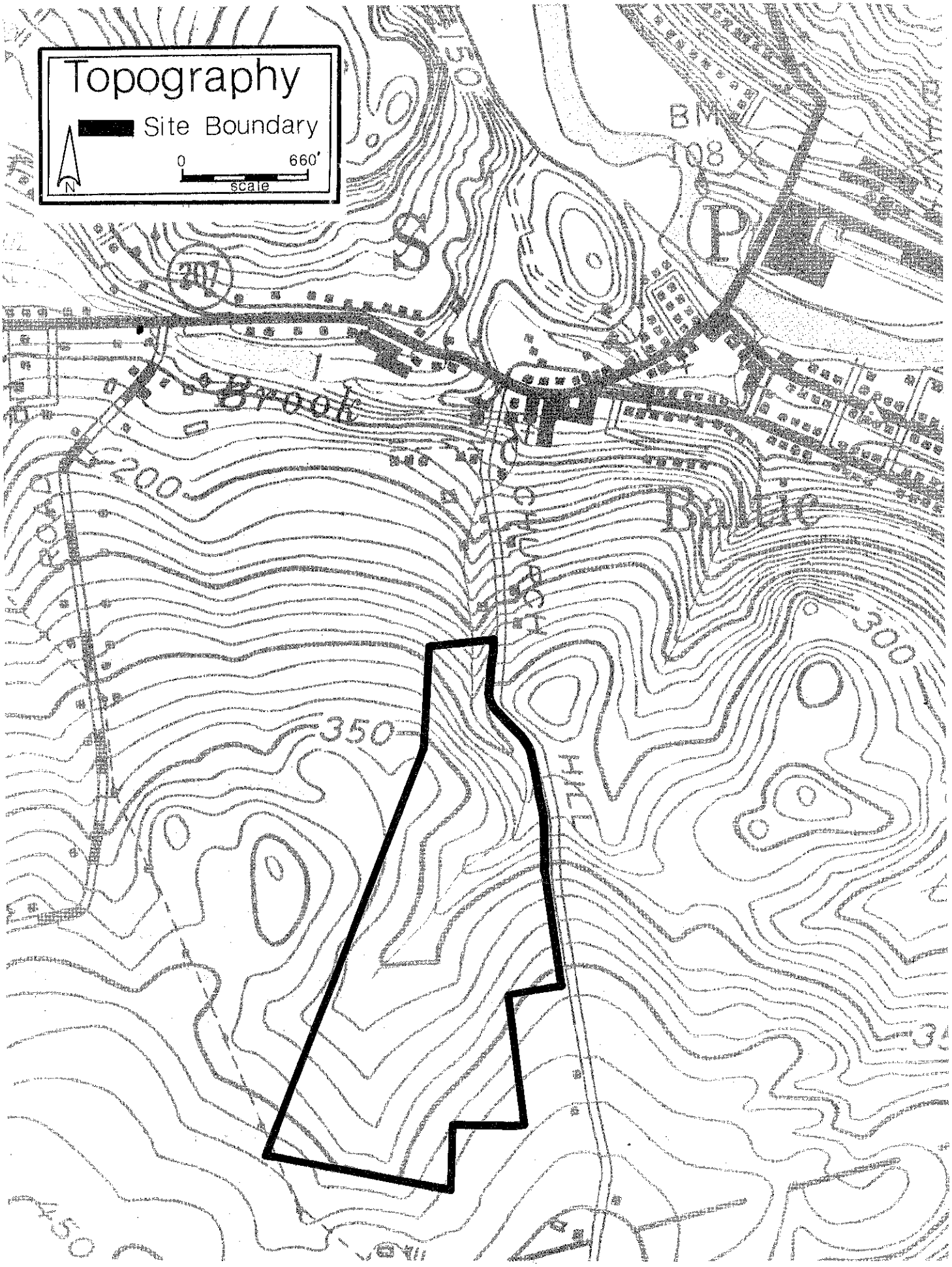
Dr. Karas has indicated that the landowners intend to subdivide the parcel into one acre lots, if possible, and sell these lots for construction of large single family homes. These homes would be served by on-site septic systems and on-site wells. The Team was asked to review Dr. Karas' sketch plan for the site, as seen in the accompanying illustration, as well as a hypothetical plan for the property which adheres to current zoning regulations.

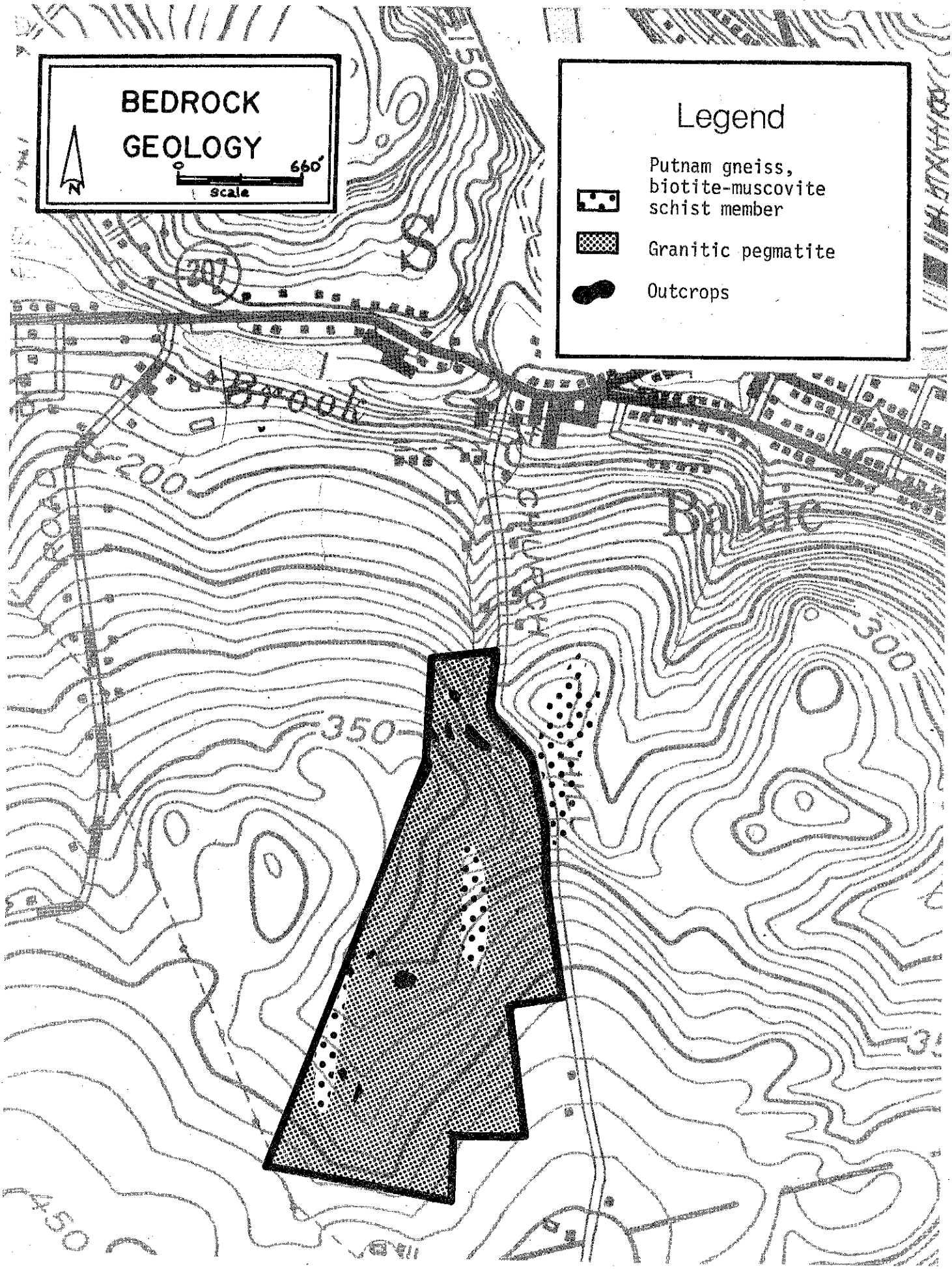
The Team is generally concerned with the wetlands and steep slopes on this site. The parcel has small areas of wetland soils which are too small to appear on the soil map. These small areas could cause problems if their presence is not recognized when locating roads, buildings and septic tank leaching fields. Much of the property also contains steep slopes, and bedrock outcrops. The southeastern portion of the parcel appears to present the fewest physical problems to development while the northern third presents the greatest number of problems. When a more detailed subdivision plan is prepared, consideration should be given to the size of the lots in relationship to the physical limitations of the site. Relocation of the access road would reduce impacts upon the stream system and associated wetland eco-system.

GEOLOGY

Bedrock either underlying or cropping out on the property is of two types: a biotite-muscovite schist phase of the Putnam gneiss, and a metamorphosed granitic pegmatite. The approximate distribution of these units, as mapped in "Bedrock Geology of the Norwich Quadrangle, Connecticut", 1961, by George L. Snyder (U.S. Geological Survey publication GQ-144), is shown in the accompanying illustration. Lenses of pegmatite too small to map are found within the area designated as Putnam gneiss. Outcrops observed on the property during the field review are also shown. Some outcrops may exist that were not seen or mapped during the review. In addition to outcrops, numerous large boulders were found scattered throughout the site.

The biotite-muscovite schist, in addition to these two minerals, contains major amounts of quartz and calcic oligoclase, minor amounts of garnet and potassium feldspar, and various accessory minerals. The pegmatite's major con-


Topography
Site Boundary
0
660'
scale
N
BM
108
P
207
Brook
200
Baltic
300
350
HILL
450


BEDROCK
GEOLOGY
N
0
660'
scale
Legend
Putnam gneiss, biotite-muscovite schist member
Granitic pegmatite
Outcrops
Brook
Bailey
150
200
250
300
350
450

stituents are microcline perthite, oligoclase, quartz, biotite, and muscovite; several accessory minerals are also present in the rock. No economic mineral concentrations are known or suspected to be in the area.

Overlying the bedrock on the property is a relatively thin layer of till, an unconsolidated material composed of varying percentages of clay, silt, sand, gravel, and boulders. Till varies from loose to highly compact, the latter variety is often responsible for poor groundwater drainage and high water tables throughout the year. No well or test-hole information was available for the property, but topographic evidence indicates that till is thickest in the southeast section. Elsewhere the till is estimated to be generally less than 15 feet thick. The hummocky landscape in the western part of the property reflects the proximity of the bedrock to the surface of the soil.

HYDROLOGY

The property is crossed by one main stream flowing north toward Beaver Brook. The stream is in part supplied by smaller tributaries and swampy areas which are scattered throughout the southern part of the site. The overall drainage area for the stream is approximately 240 acres.

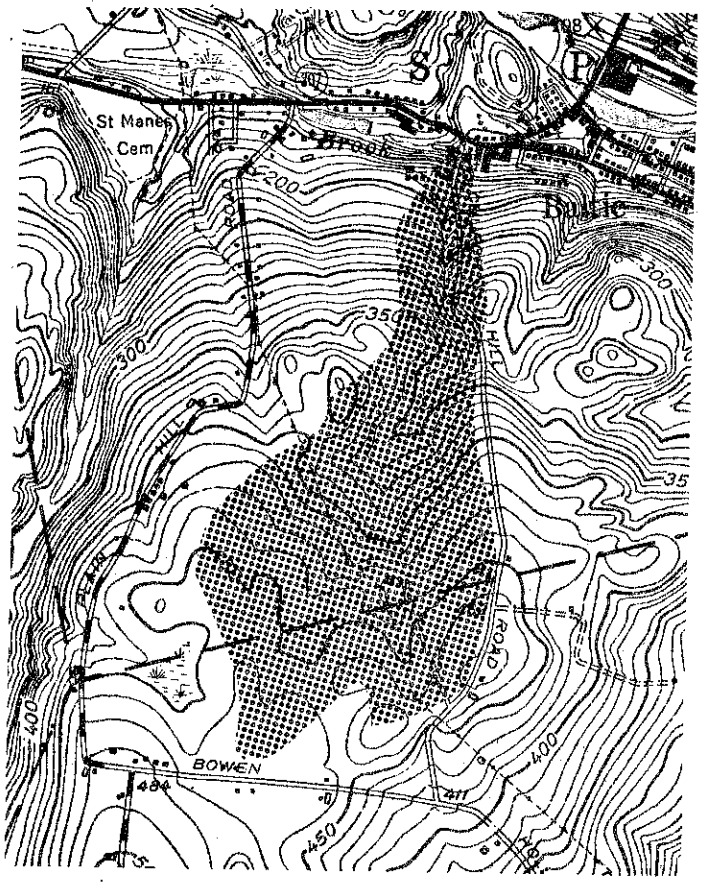
Development of the property for housing will increase the percentage of direct runoff to the stream for a given rainfall amount. This difference would arise mostly from the construction of impermeable surfaces, such as roofs and driveways, over formerly permeable areas, and from the removal of trees and other natural vegetation. Several methods exist for estimating the amount of increased runoff. The Soil Conservation Service method, detailed in that agency's Technical Release No. 55, involves the determination of runoff curve numbers for a given watershed. These numbers relate runoff to rainfall in the watershed on the basis of soil types and current and proposed land usages. Applying the numbers to rainfall data for given storm events, average slope of the watershed, and several other factors, an estimate of peak flow in a stream can be made.

Because no firm proposals for development were made by the landowners, a simplified calculation was performed using two different potential plans:

1) establishment of 40 houses, each on one-acre lots.
2) establishment of 20 houses, each on two-acre lots with one acre each left in forest.

It was assumed that the remainder of the watershed would be left as is. The overall runoff curve number for the watershed at present was estimated to be 65. Under plan 1, the runoff curve number would increase to 67; under plan 2, the curve number would increase to 66. Changes in runoff brought about by these new curve numbers were estimated for a 24-hour, 10-year storm event and for a 24-hour, 100-year event. The results are shown in Table 1.

The increases in peak flow would have two major effects: they would increase the potential for flooding, and would aggravate erosion along the stream course. The prospect of flooding would be most serious in the southwestern section of the property, where many wet areas are found and where the topography is more gentle. Erosion is more likely to be a problem in the northern section of the site and along School Hill Road, where the slopes and stream gradient are quite steep.



WATERSHED MAP

TABLE 1

Changes to peak flow in the stream draining the Karas/Mikael property under hypothetical development plans. Cfs equals cubic feet per second.

	24-Hr., 10-Yr. Storm	24-Hr., 100-Yr. Storm
Present conditions:	104 cfs	224 cfs
Plan 1 - 40 houses:	119 cfs (14% increase)	248 cfs (11% increase)
Plan 2 - 20 houses:	112 cfs (7% increase)	236 cfs (5% increase)

Downstream from the site, the stream passes through several culverts which seem adequate to handle heavy flows. As the stream discharges into Beaver Brook, the sediment removed by erosion upstream may be deposited in the more slowly moving water around the outlet.

Beaver Brook itself has been a source of considerable concern to Baltic residents, as it has been prone to frequent flooding. The overall effect that the increases in peak flow of the stream on the Karas/Mikael property would have on Beaver Brook's flooding pattern is unclear. Because the drainage area of Beaver Brook is much larger than that of the stream, a 10% flow increase along the stream might only represent a 1% increase to Beaver Brook; however, the problem can also be viewed from the standpoint of a slight increase in the frequency of flooding in certain areas. In summary, development of the Karas/Mikael property along the lines of plans 1 or 2 above is likely to have only a very small effect on flood flows in Beaver Brook, but even this small increase could be significant to local residents.

VEGETATION

The parcel is entirely forested by mixed Northern hardwood species. Red oak and American Beech predominate on the drier upland soils. Red maple is common in the wetland areas. Yellow birch, American chestnut and Canadian Hemlock are also present. The shrubby understory on this site was sparse, generally limited to mountain laurel and high bush blueberry on the upland and spicebush in the flood plain of the stream. Due to the moisture retaining quality of the soils and the amount of light reaching the forest floor, the herbaceous layer here is quite rich. Typical species found here include rattlesnake plantain, partridgeberry, striped pipsisewa, club mosses, Christmas fern, lady fern, wild strawberry and pink pyrola. Watercress was prevalent in the stream area.

WILDLIFE

No evidence of significant wetland wildlife was observed. Wildlife usage of wetland areas also appears to be light. Songbirds such as woodpeckers, thrushes, tanagers, and nut-hatches use the woodlands during the summer months. White-tailed deer and ruffed grouse may be present in small numbers. Gray squirrels are abundant over the entire parcel.

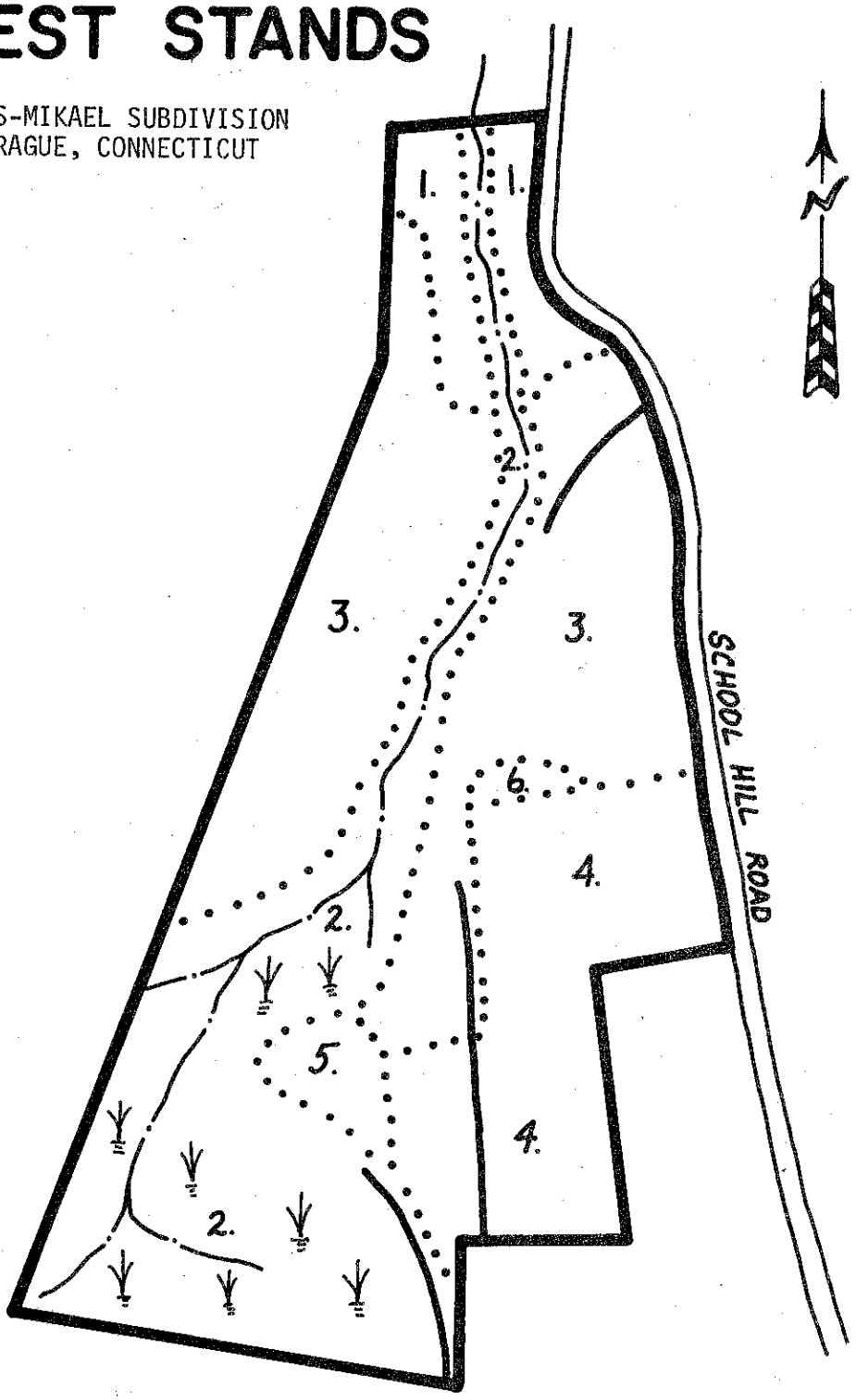
Low density development which does not disturb the wetlands will not adversely effect songbird or small mammal populations if effective erosion and sediment control measures are installed to prevent damage to the wetlands. Such development may actually improve the wildlife habitat for some species by increasing vegetative diversity. Development of this parcel will prevent any significant use by white-tailed deer or ruffed grouse.

FOREST RESOURCES

Forest resources for the Karas/Mikael property in Sprague can be divided into six separate stands. These stands are shown in the accompanying illustration.

FOREST STANDS

KARAS-MIKAEL SUBDIVISION
SPRAGUE, CONNECTICUT



LEGEND:

WOODS ROADS

STAND BOUNDARIES

WATERCOURSES AND WETLANDS

Prepared by D. Smith, D.E.P.

400'
Scale

Stand One: This 2.9 acre stand is populated by pole to saw log size mixed hardwoods. There are numerous steep slopes and rock outcrops in this area. Retention of this stand as open space would preserve these aesthetically appealing features and avoid problems commonly associated with developing such terrain (erosion control, expensive site modifications for basements and septic tanks).

Stand Two: This 17.1 acre area is primarily a wetland. It is populated by poor quality birch, red maple and oak of pole to sawlog size. Reproduction in this area is limited due to competition from heavy spicebush, witch hazel and viburnum.

Stand Three: Red oak, red and sugar maples, hickory and beech dominate this 19 acre area. Reproduction here is moderate and composed of black birch, maples and hickory. The health and vigor of the stand could be increased by a cordwood harvest of the poorest quality timber, yielding approximately five cords per acre.

Stand Four: This old field area of approximately 9.5 acres is populated primarily by black birch, yellow birch, sugar maple and hickory of sapling to pole size. Care should be taken during development to reserve at least six high quality saplings per acre for future shade trees.

Stand Five: American beech dominate this one acre stand. This area provides a valuable visual contrast to the surrounding area and also has considerable wildlife value. Removal of occasional birch or oak competition may be desirable.

Stand Six: This 1/2 acre Canadian hemlock stand is a valuable softwood asset to this site. Removal of surrounding hardwoods will increase the health and vigor of this stand.

SOILS

A detailed soils map of this site is included in the Appendix to this report, accompanied by a chart which indicates soil limitations for various urban uses. As the soil map is an enlargement from the original 1,320'/inch scale to 330'/inch, the soil boundary lines should not be viewed as absolute boundaries, but as guidelines to the distribution of soil types of the site. The soil limitation chart indicates the probable limitations for each of the soils for on site sewage disposal, buildings with basements, streets and parking, and landscaping. However, limitations, even though severe, do not preclude the use of the land for development. If economics permit large expenditures for land development and the intended objective is consistent with the objectives of local and regional development, many soils and sites with difficult problems can be used. The soils map, with the publication New London County, Connecticut: Interim Soils Report, can aid in the identification and interpretation of soils and their uses on this site. Know Your Land: Natural Soil Groups For Connecticut can also give insight to the development potentials of the soils and their relationship to the surficial geology of the site.

The soils most representative of this site are the Canton-Charlton series, and the Charlton-Hollis series, and the Woodbridge series, the Sutton series.

The Ridgebury, Leicester and Whitman series, a protected wetland soil under Public Act 155 is also present. This series generally limits development due to slope, shallow depth to bedrock, wetness and stony quality.

The Canton series consists of deep, well-drained soils on uplands. They formed in a fine sandy loam mantle underlain by gravelly sandy glacial till, derived mainly from granite and gneiss. Typically, these soils have a dark brown fine sandy loam surface layer, 2 inches thick. The subsoil, between 2 and 22 in. is very friable yellowish-brown and light yellowish-brown fine sandy loam. The substratum, from 22 to 60 in. is friable light olive gray and olive gray gravelly loamy sand. Slopes range from 0 to more than 35 percent.

The Charlton series consists of deep, well drained soils on uplands. They formed in glacial till derived mainly from schist and gneiss. Typically these soils have a dark brown fine sandy loam surface layer 6 inches thick. The subsoil from 6 to 26 inches is yellowish-brown and light olive brown fine sandy loam. The substratum from 26 to 60 inches is grayish brown gravelly fine sandy loam. Slopes range from 0 to 45 percent. Most use problems are related to slopes and stoniness.

The Hollis series consists of shallow, well drained and somewhat excessively drained soils on uplands. They formed in acid glacial till derived mainly from schist and gneiss. Typically these soils have a very dark grayish brown fine sandy loam surface layer 2 inches thick. The subsoil between 2 inches and 15 inches is dark yellowish brown and yellowish brown friable fine sandy loam and gravelly fine sandy loam which overlies schist bedrock. Slopes range from 0 to 45 percent. Most use problems are related to the depth to bedrock, droughtiness, slope and rock outcrops.

The Woodbridge series consists of deep, moderately well drained soils on uplands. They formed in glacial till. Typically these soils have a dark brown fine sandy loam surface layer 7 inches thick. The fine sandy loam subsoil from 7 to 18 inches is dark yellowish brown in the upper part and yellowish brown in the lower part. A layer of olive sandy loam is at 18 to 21 inches. The substratum from 21 to 26 inches is olive fine sandy loam. From 26 to 42 inches is a very firm fragipan that is olive gravelly fine sandy loam. Slopes range from 0 to 35 percent. Most development problems are related to the very slow permeability, seasonal high water table and stoniness.

The Sutton series consists of deep, moderately well drained soils on uplands. They formed in glacial till. Typically these soils have a very dark grayish brown fine sandy loam surface layer 6 inches thick. The subsoil layers from 6 to 28 inches are dark brown and yellowish brown fine sandy loam with mottles below 12 inches. The mottled substratum from 28 to 36 inches is brown fine sandy loam and from 36 to 60 inches is light olive brown gravelly sandy loam. Slopes range from 0 to 25 percent. Most development problems are related to slope and seasonal high water table.

The Ridgebury series consists of nearly level, poorly drained soils on drumlins, and rounded or elongated hills of uplands. They were formed in compact glacial till. Ridgebury soils have moderate to moderately rapid permeability in the surface layer and subsoil, and a high water table at or near the surface 7 to 9 months of the year. Major limitations are related to stoniness, wetness and slow permeability in the substratum.

The Leicester series consists of deep, poorly and somewhat poorly-drained soils on uplands. They formed in glacial till. Typically, these soils in a wooded area have a black fine sandy loam surface layer 6 inches thick. The mottled subsoil from 6 to 23 inches is grayish-brown, light brownish-gray and pale brown fine sandy loam. The mottled substratum from 23 to 60 inches is dark yellowish-brown fine sandy loam. Slopes range from 0 to 8 percent. Major limitations are related to wetness and stoniness.

Canton-Charlton soils make up 37% of the site and are moderately limited for on site sewerage, dwellings with basements and local roads. Woodbridge, Sutton and Ridgebury soils, which severely limit development by their wetness, comprise 27% of the site. On site inspection, however, revealed several seasonal watercourses not previously included in soil mapping data, which account for a considerable portion of the site, further limiting development in that area. Other limiting factors on this site are related to steep slopes which directly affect the suitability of an area for on-site septic disposal systems. The excessive stoniness of these soils will increase site preparation costs.

Should any major construction occur on this site, the construction schedule should be phased to allow the smallest exposure of soils at one time, thereby limiting the amount of erosion on the site and sedimentation in the stream. Connecticut's Erosion and Sediment Control Handbook published by the Soil Conservation Service will aid both the developer and the Town in preparing and approving an adequate erosion and sediment control plan. Standards and specifications for both mechanical and vegetative practices listed within the Handbook are available at the New London County Soil Conservation Service office, Norwich, Connecticut.

FOUNDATION DEVELOPMENT AND GRADED CONDITIONS

This area contains many steep slopes, wet soils and shallow bedrock. Several intermittent streams flow north through the property. If developed as proposed in the preliminary sketch, extensive grading and filling will be required. Erosion resulting in downstream sedimentation will be inevitable.

Building locations will have to be chosen carefully to avoid expensive site preparation costs such as rock excavation, large amounts of grading and filling, and elaborate surface water control structures. The preliminary sketch does not provide for such selectivity.

WATER RESOURCES

At the present time there is no public water supply available for servicing this property. The Sprague Water Company which services the main area of Baltic is at the lower end of School Hill Road, approximately 1,300 feet from the beginning of the land in question. Should the public water be extended, elevation and obtaining adequate pressures would be definite factors to be considered. In terms of individual on site wells for the development, consideration must be given for proper location with respect to possible sources of pollution. The main source of possible pollution is from on site waste disposal systems, although pollution can occur from buried oil tanks, which develop leaks, and at times from road salt or brine introduced into the ground from the backwash of water softener

units. With large lots, such as 2 acres, it should be possible to properly locate wells without particular problems or concerns. For a number of years the State Health Department has made a general recommendation that where both an individual on-site well and a sewage disposal system are to be utilized, a minimum of one acre of land should be available. One acre lots should prove adequate in most cases where site conditions are favorable and no unsuitable conditions such as steep slope, shallow ledge rock or wetland exists. On this site, ideal conditions are not always in evidence.

Generally, drilled wells are preferred over dug wells as they are more reliable and allow for greater flexibility in their location. In Connecticut, individual domestic water supplies commonly are derived from one of two aquifers: stratified drift and bedrock. Till is normally too thin and too slowly permeable to provide an adequate and reliable water supply. Stratified drift, a deposit of silt, sand, and gravel left by glacial meltwater, is usually most common along large streams such as Beaver Brook; it was not seen on the property. Therefore, new wells on the site would probably have to tap bedrock. In the Shetucket River basin, according to Connecticut Water Resources Bulletin No. 11, a U.S. Geological Survey publication, 90% of 134 surveyed bedrock wells yielded 3 gallons per minute (gpm) or more, enough for an average family. However, the yield from any given well depends upon many factors, including the number, size, and water-transmission rates of bedrock fractures encountered by the well. Hence, yields may vary widely within the property, and well adequacy cannot be guaranteed for all lots.

The quality of water derived from the local metamorphic bedrock is generally good. Conn. W.R.B. No. 11 reports that one surveyed well within 0.5 mile of the southwest corner of the property had a troublesome concentration of manganese. Similar concentrations may therefore be found in water from wells drilled on the property, but several treatment methods are available to correct such problems.

SEWAGE DISPOSAL

As the town's municipal sewerage system does not extend to this area, sewage disposal for the development is to be attained by on-site subsurface sewage disposal systems.

Based on the topography, soil mapping information, and consideration of the chief physical features of the property, it is apparent that construction of on-site sewage disposal systems will require extensive site modification and elaborate designs in a sizeable portion of the property. Of particular concern are the wetlands which border the stream, especially the lower northern end of the site where the land is considerably below the elevation of the road. In general other areas of the property are less limited for sewage disposal, although in some of these sections depth to ledge rock or slope would impose limitations.

The proximity of bedrock to the surface and the slow percolation rates found in much of the till restrict the downward movement of water, as shown by the many wet areas on the site. Proper action of septic drainage fields is thus inhibited. Upon reaching firm bedrock or a compact layer of till, the effluent will tend to flow laterally, and may either break out at the surface or filter into one of the

streams. The steep slopes enhance this potential. Moreover, groundwater levels may rise locally during some wet seasons, causing backup in certain systems. Some of these problems can be corrected by proper engineering and the use of permeable fill, but the characteristics of the property indicate that such measures would need to be extensive and probably very costly in many places.

With the exception of the wetlands, large 2 acre lots would allow flexibility in locating sewage disposal systems while also affording greater protection to well water supplies and to surface and subsurface waters in general. While one acre lots should be suitable to meet the requirements for both facilities (water and sewage) in most cases where conditions are regarded as ideal or highly favorable, such conditions appear to be lacking or are limited in the parcel under review. For more intensive development of this property, serious consideration should be given to the possible extension of public sewers.

On-site testing (deep pits and percolation tests) needs to be conducted in order to have more specific information (ground water levels, ledge rock, seepage ability of the soils) available on the feasibility for sewage disposal. Ideally the testing should be done in the area where the actual sewage disposal system will be located.

ROADS AND UTILITIES

The proposed road locations would involve piping the main stream on the property. The main access appears to be located in a streambed. Extensive grading, filling and rock excavation will be required.

ALTERNATIVE LAND USES

There are few alternative uses for this parcel. The physical problems that complicate residential development would be the same for any use involving roads and buildings. Furthermore, the location with respect to other developed uses, major roads and utilities make it an unlikely prospect for commercial or industrial use. Although agricultural uses, in the form of pasturing, appears to have been a use at some point in the past, modern methods of dairy farming make it obsolete for that use as well. Conservation practices are recommended in the stream and wetland area but there is little here of unique quality which would warrent public acquisition. In summary, the site is usable for residential purposes, but the various physical limitations suggest the need for professional guidance in making the best use of the property with as little adverse impact as possible.

SUITABILITY OF THE SITE FOR THE PROPOSED USES

The Sprague Zoning Regulations (Section 12) allows single-family residences on 80,000 square foot lots with a required 250 feet of road frontage for each lot in this area. Regulations allow lots to be clustered and reduced to 20,000 square feet with 100 feet of road frontage (Section 14.17). However, clustering requires tie in with the public sewer system, which presently extends along Route 207 from Baltic to Plain Hill Road. Extending the sewer line up School Hill Road to the site is possible but would cost approximately $50,000 or more in order to reach

the site. It is conceivable that the soils in this area will cause problems with on-site sewerage for present and future homeowners, but the 80,000 square-foot minimum lot size would provide most homeowners with the possibility of finding relief for problems on their house lots.

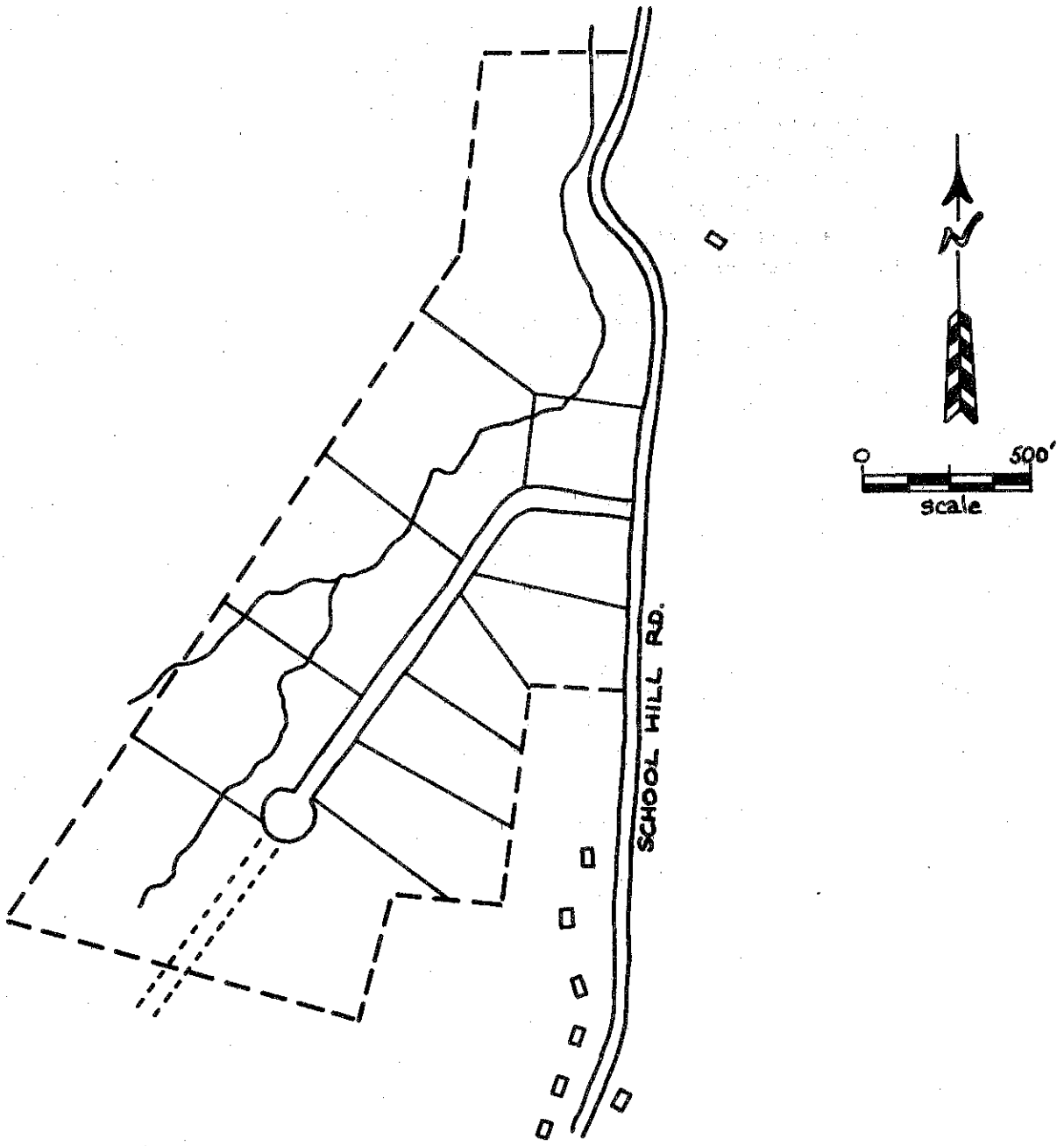
The physical characteristics of the land preclude its use for conventional house lots. The combination of ledge, slope, wetlands and the stream suggest that the narrower northerly end of the site might best be retained in open space.

As shown in the accompanying illustration, dividing the remainder of the tract into 80,000 square foot lots would be complicated by the stream which runs about 300 feet from, and parallel to the western border of the site. Lots fronting on the west side of a new road extending from School Hill Road toward the southern part of the site, would be accessible only from driveways which crossed the stream. Perhaps three or four house sites could be located along this margin, but careful site planning and construction would be required to prevent damage to the streambelt. Four or five acre lots could be sited on the east side of such an access road.

Approximately 800 feet of the frontage on School Hill Road will accommodate house lots with buildable land of sufficient depth for 80,000 square foot lots. Therefore, only three lots appear feasible on this existing road. Extensive wetland and stream alterations would be required to properly construct houses fronting directly on School Hill Road at the very northern portion of the site.

CONCEPTUAL SUBDIVISION PLAN

KARAS/MIKAEL SUBDIVISION
Sprague, Connecticut



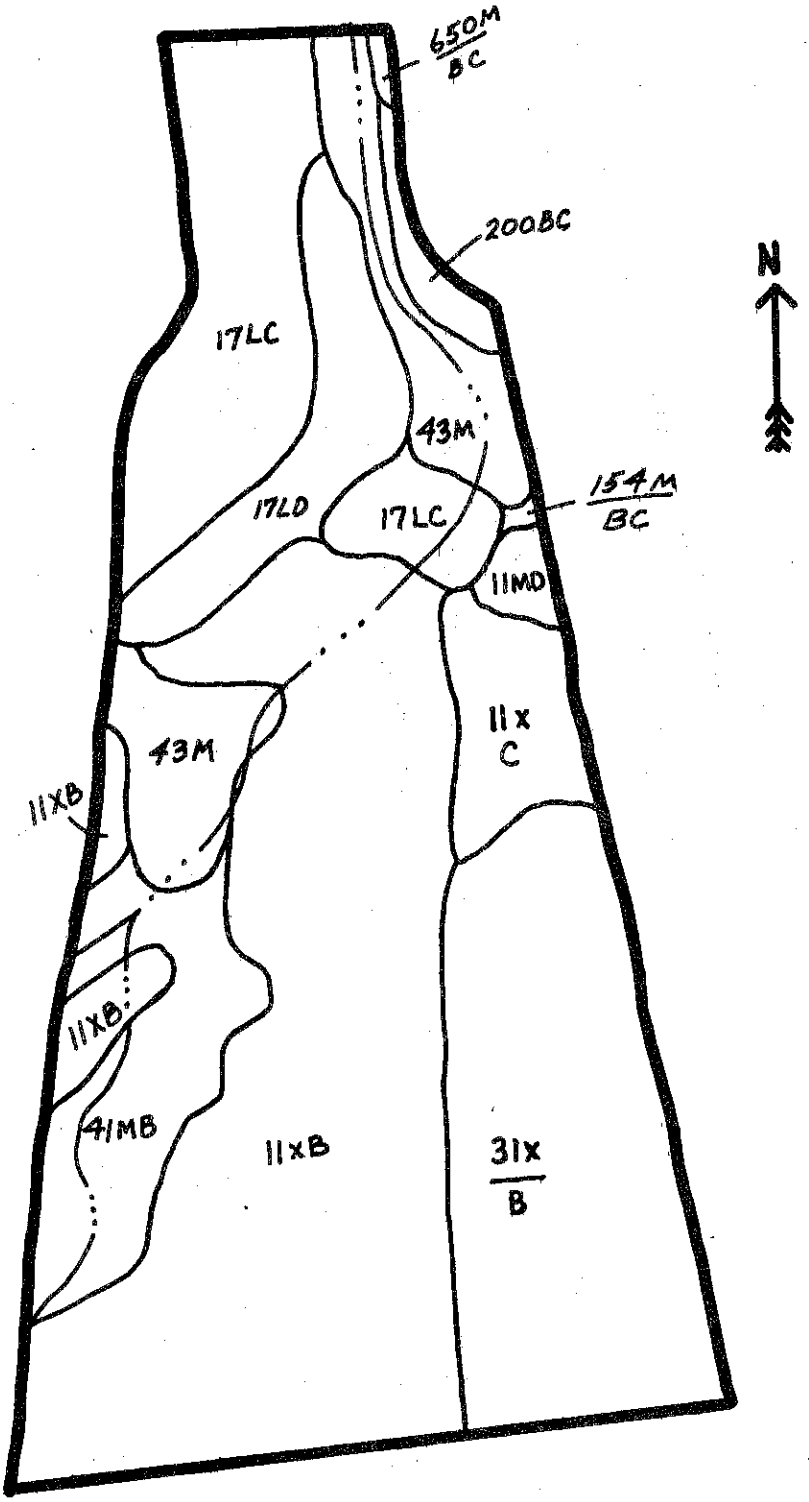
* This illustration is conceptual in nature and is not meant to show the only environmentally sound alternative to the proposed preliminary plan submitted by the land owners.

Appendix

SOILS

KARAS/MIKAEL SUBDIVISION
SPRAGUE, CONNECTICUT

The map is an enlargement from the original 1,320'/inch scale to 330'/inch.



Information taken from: New London County Interim Soil Survey Report, 1978; Soil Survey Sheet No. 34 61 ; prepared by United States Department of Agriculture, Soil Conservation Service. Advance copy, subject to change.

KARAS/MIKAEL SUBDIVISION
SPRAGUE, CONNECTICUT

Symbol	Mapping Unit Name	Acreage	Septic Tank Absorption Field	Dwelling with Basement	Local Roads and Streets	Lawns and land-scaping
11MD	Canton and Charlton extremely stony fine sandy loams, 15 to 35% slopes	.5	severe slope large stones	severe slope large stones	severe slope large stones	severe slope large stones
11XB	Canton and Charlton very stony fine sandy loams, 3 to 8% slopes	17.3	moderate large stones	moderate large stones	moderate large stones	moderate large stones
11XC	Canton and Charlton very stony fine sandy loams, 8 to 15% slopes	2	moderate slope large stones	moderate slope large stones	moderate slope large stones	moderate slope large stones
17LC	Charlton-Hollis fine sandy loams, 3 to 15% slopes	5.7				
	Charlton part		moderate slope large stones	moderate slope large stones	moderate slope large stones	moderate slope large stones
	Hollis part		severe depth to rock	severe depth to rock	severe depth to rock	severe depth to rock
17LD	Charlton-Hollis fine sandy loams, 15 to 35% slopes	3				
	Charlton part		severe slope	severe slope	severe slope	severe slope
	Hollis part		severe slope depth to rock	severe slope depth to rock	severe slope depth to rock	severe slope depth to rock

KARAS/MIKAEL SUBDIVISION
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Symbol	Mapping Unit Name	Acreage	Septic Tank Absorption Field	Dwelling with Basement	Local Roads and Streets	Lawns and land-scaping
31XB	Woodbridge very stony fine sandy loam, 0 to 8% slopes	8.5	severe percs slowly wetness	severe wetness	severe frost action	moderate large stones
41MB	Sutton extremely stony fine sandy loam, 0 to 8% slopes	5.3	severe wetness	severe wetness	moderate frost action	slight
43M	Ridgebury, Leicester and Whitman extremely stony fine sandy loams	3.7				
	Leicester		severe large stones wetness	severe large stones wetness	severe large stones wetness frost action	severe large stones wetness
154M-BC	Sutton extremely stony fine sandy loam, 0 to 8%slopes		severe wetness	severe wetness	moderate frost action	slight
200BC	Narragansett-Hollis complex, 3 to 15% slopes	.7				
	Narragansett		moderate slope	moderate slope	moderate frost action	moderate slope
	Hollis		severe depth to rock; slope	severe depth to rock; slope	severe depth to rock; slope	severe depth to rock; slope
650M-BC	Narragansett extremely stony silt loam, 3 to 15% slopes	.25	moderate stones slope	moderate stones slope	moderate slope frost action	moderate slope large stones

SOIL INTERPRETATIONS FOR URBAN USES

The ratings of the soils for elements of community and recreational development uses consist 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.

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 actual conditions may differ from the information presented here because of the inclusion of other soils which were impractical 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. Limitations, even though severe, do not always preclude the use of land for development. If economics permit greater expenditures for land development and the intended land use is consistent with the objectives of local or regional development, many soils and sites with difficult problems can be used.

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 limitations.

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 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.