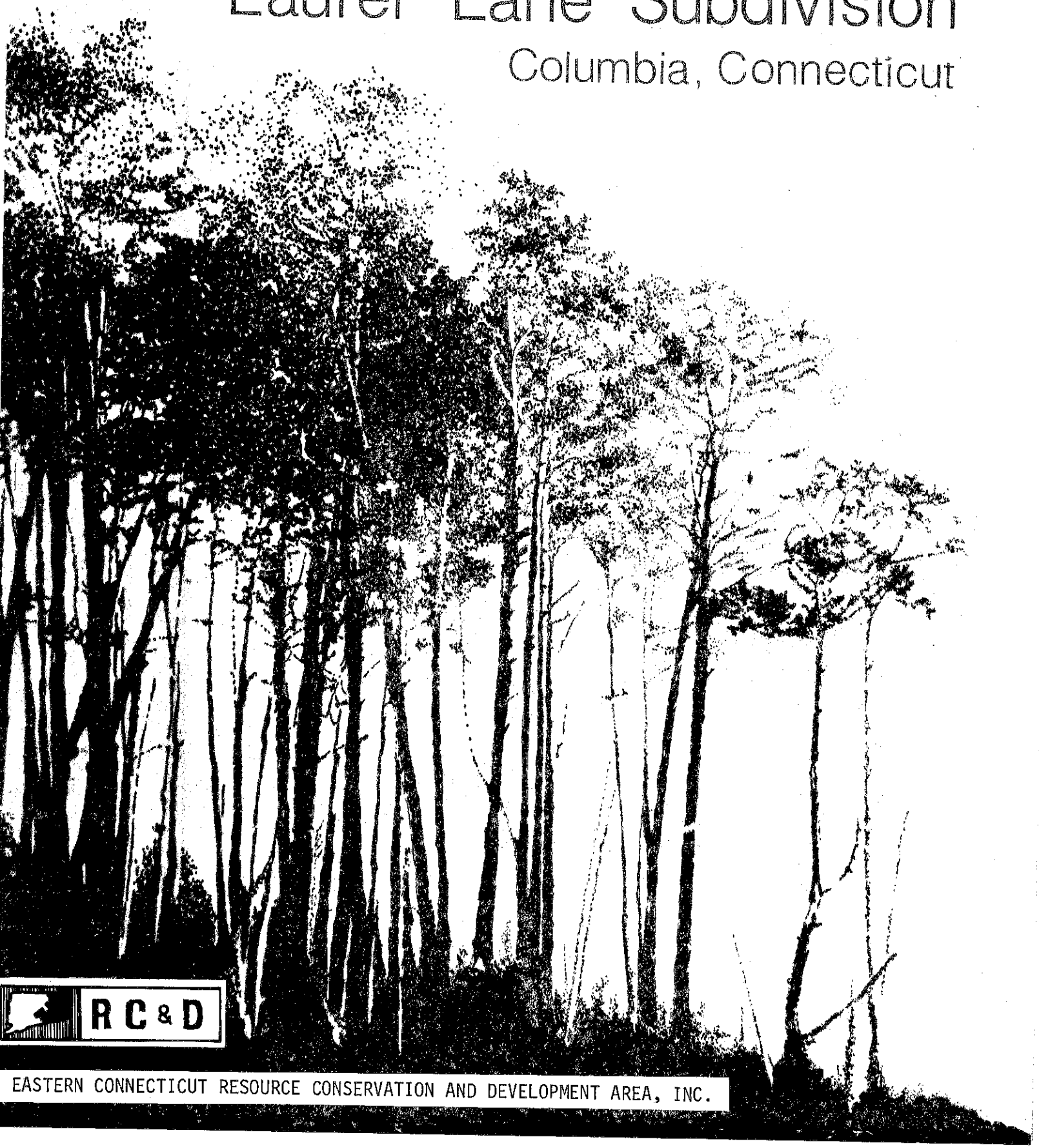
Environmental Review Team Report

Laurel Lane Subdivision

Columbia, Connecticut

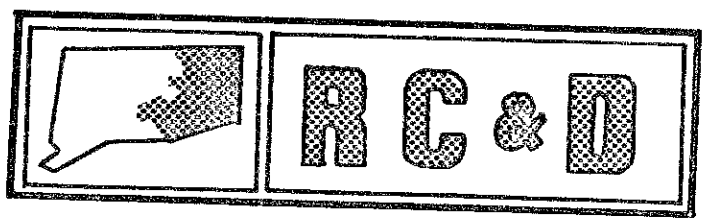


R C & D

EASTERN CONNECTICUT RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.

Environmental Review Team Report
on
Laurel Lane Subdivision
Columbia, Connecticut

March 1980

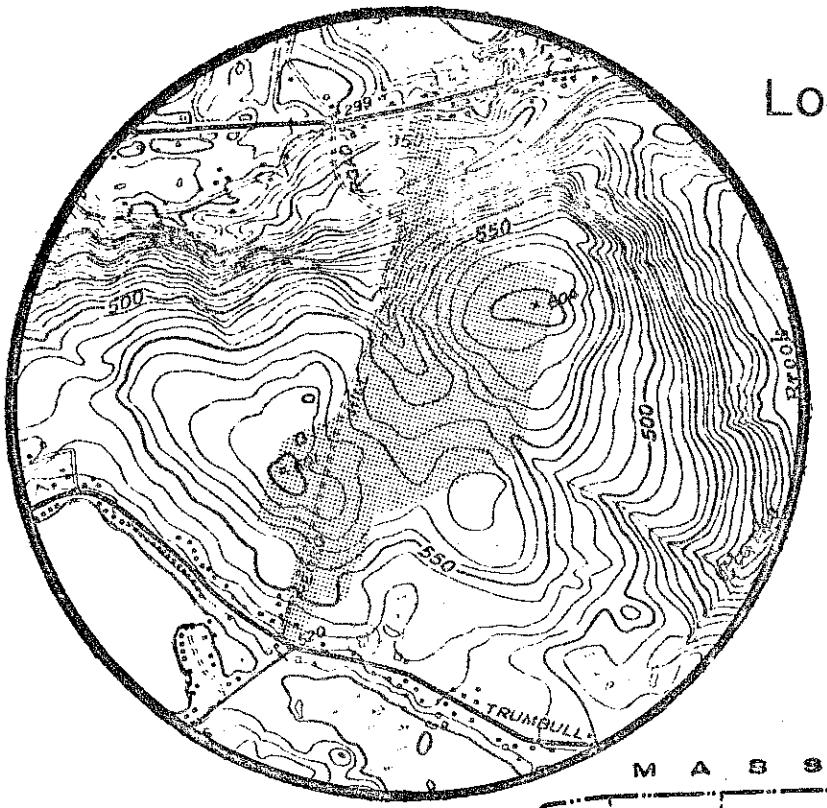


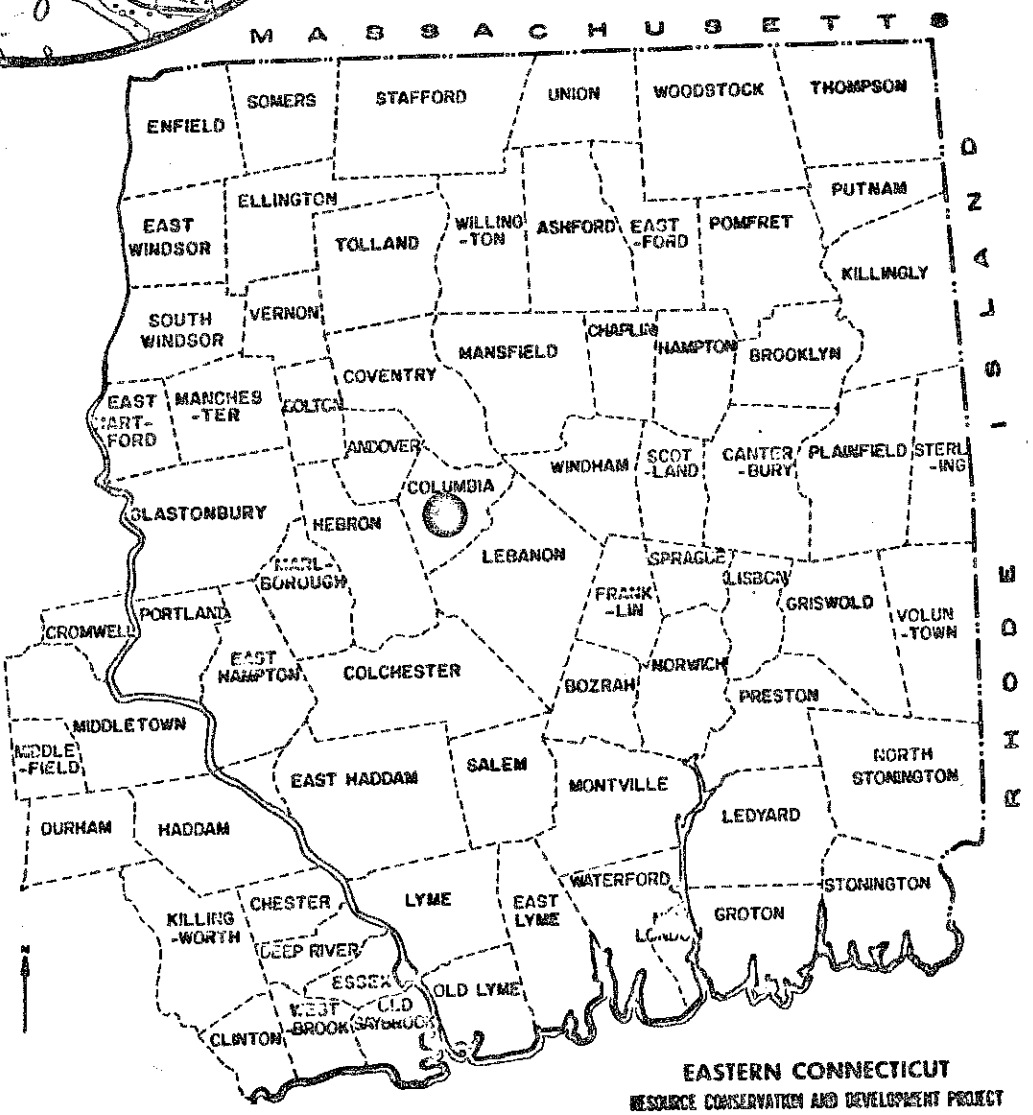
eastern connecticut resource conservation & development area

environmental review team
139 boswell avenue
norwich, connecticut 06360

Location of Study Site

LAUREL LANE SUBDIVISION
COVENTRY, CONNECTICUT





ENVIRONMENTAL REVIEW TEAM REPORT
ON
LAUREL LANE SUBDIVISION
COLUMBIA, CONNECTICUT

This report is an outgrowth of a request from the Columbia Planning and Zoning Commission to the Tolland 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. The request was approved, and the measure was reviewed by the Eastern Connecticut Environmental Review Team (ERT).

The soils of the site were mapped by a soil scientist from the United States Department of Agriculture, Soil Conservation Service (SCS). Reproductions of the soil survey map, a table of soils limitations for certain land uses and a topographic map showing property boundaries were distributed to all Team members prior to their review of the site.

The ERT that field-checked the site consisted of the following personnel: Joseph Neafsey, District Conservationist, Soil Conservation Service (SCS); Tom Ladny, Soil Conservationist, (SCS); Michael Zizka, Geologist, Connecticut Department of Environmental Protection (DEP); Rob Rocks, Forester, (DEP); Ernest Julian, State Department of Health; Chuck Phillips, Fisheries Biologist, (DEP); Lester Barber, Regional Planner, Windham Regional Planning Agency; and Jeanne Shelburn, ERT Coordinator, Eastern Connecticut RC&D Area.

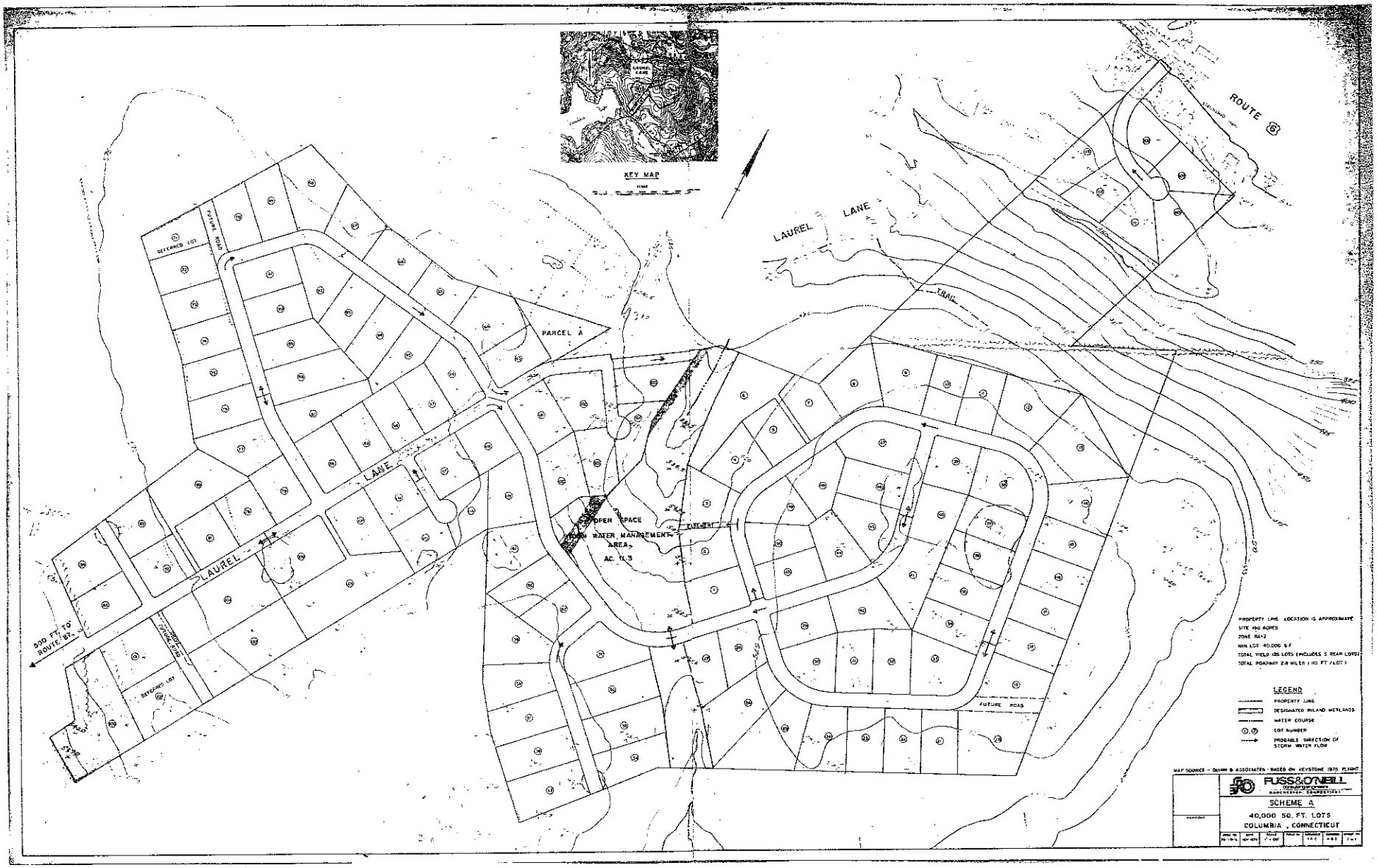
The Team met and field checked the site on Thursday, January 10, 1980. Reports from each contributing Team member were sent to the ERT Coordinator for review and summarization for the final report.

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 Columbia. The results of this Team action are oriented toward the development of a better environment quality and the long-term economics of the land use.

The Eastern Connecticut RC&D Area Committee hopes that this report will be of value and assistance in making any decisions regarding 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.

Preliminary Subdivision Plan



SCALE APPROXIMATELY 660 FEET/INCH

INTRODUCTION

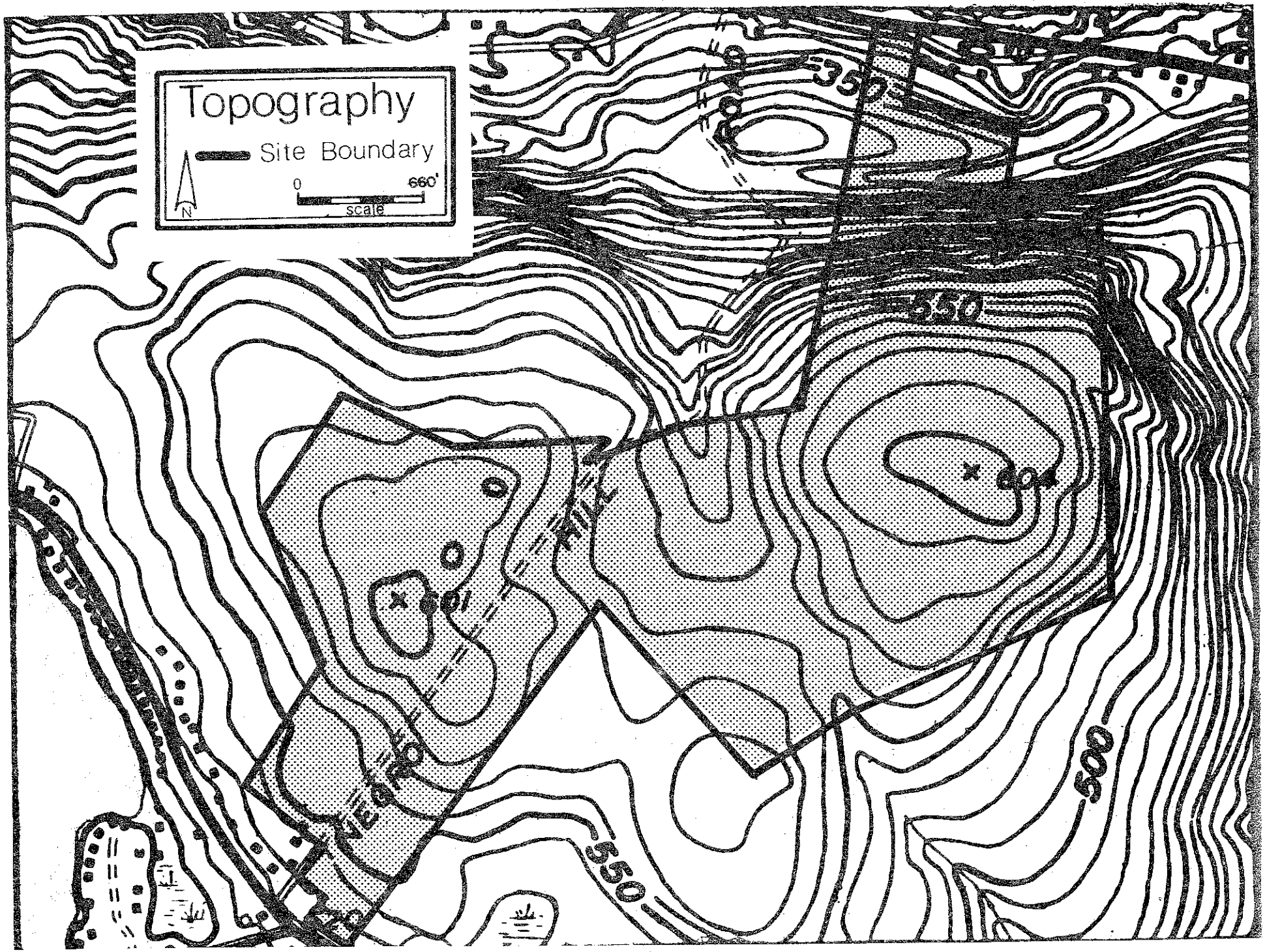
The Eastern Connecticut Environmental Review Team was asked to review a ±190 acre parcel located on Laurel Lane in the town of Columbia. The parcel is situated on top of a hill between Routes 6 and 87 in the watersheds of the Hop River and Columbia Lake. The site is proposed for subdivision into 125+ lots of one or more acres each. Fuss and O'Neill, an engineering firm from Manchester, has prepared preliminary plans for development of the property.

Major natural features of the site include its varied topography, stream, wetlands, forest and rocky shallow to bedrock soils. Slopes on the parcel range from flat to moderate to extremely steep (possibly in excess of 20%). A full flowing stream was found in the central portion of the parcel. The existance of a stone culvert which allowed the stream to pass under the old woods road led the Team to believe that this stream was not intermittent, but flowed year round. Small wetland areas are present on the parcel in the vicinity of the stream and at the bottom of the excessively steep slope. A small upland wetland/pond area was discovered north of the crest of the hill on the site. Most of the parcel is currently wooded, although some haphazard cordwood removal has taken place. Generally, soils found on the property have development limitations related to their stoniness, shallow depth to bedrock, wetness and perched watertable.

The preliminary plan shows 125+ lots on the parcel which would be served by on-site wells and on-site septic systems. An area shown as Open Space/Storm Water Management has been set aside in the wetlands area on-site. No lots have been shown in the area of excessively steep slopes. Access to the property would be provided by a single road (Laurel Lane) extending from Route 87 and a single access from Route 6 which ends in a cul-de-sac. Interior roads branching from Laurel Lane will form loops or end in cul-de-sacs. Most lots are directly fronting on one of these roads, however,several "back lots" do exist with a narrow frontage to the access road.

The Team is concerned with the effect of this proposal on the natural resource base of the site. Although difficult limitations on some sites can be overcome with proper engineering techniques, these measures are often costly, making a project economically unfeasible for a developer or landowner. The most critical problems evident from field review of this site are related to increase in storm water runoff, stoney and shallow to bedrock soil conditions, potential ground water contamination and traffic increases produced by the proposed development. Many of these potential problems can be controlled or avoided by lowering the density of the proposal.

As noted previously, sections of this parcel lie within the watershed of Columbia Lake and Clarks Brook which is a tributary of the Hop River. Protection of both of these water bodies is a concern of the Town. The drainage of fourteen actual lots will remain in the Columbia Lake watershed. Surface flow from lots 79 through 83 (also located within the watershed) will be removed through piping measures and therefore will not contribute additional runoff to the lake. As shown in the Hydrology Section of this report, the proposed development will cause major increases in peak flow rates. These increases could cause considerable erosion and sediment problems if control measures are not planned for properly. These control measures should be in place when construction begins and carefully


Topography
Site Boundary
N
0
660'
scale
350
350
350

maintained during the construction process. The Soil Conservation Service field office in Tolland County would provide technical assistance to the developer or town in preparing a sediment and erosion control plan for the proposal. Increases in sedimentation of the Hop River may cause difficulties with food production for fish and also promote excessive vegetative growth which would choke the river in time.

Areas of shallow to bedrock soils, stoniness and seasonal high water table will pose problems with installation and the proper functioning of septic systems. The greatest concern would be for contamination of the water supply on-site by unrenovated septic effluent reaching the bedrock fracture system which supplies the wells. The use of specially designed septic systems, a decrease in housing density and careful attention to well locations as related to septic system locations may alleviate potential problems.

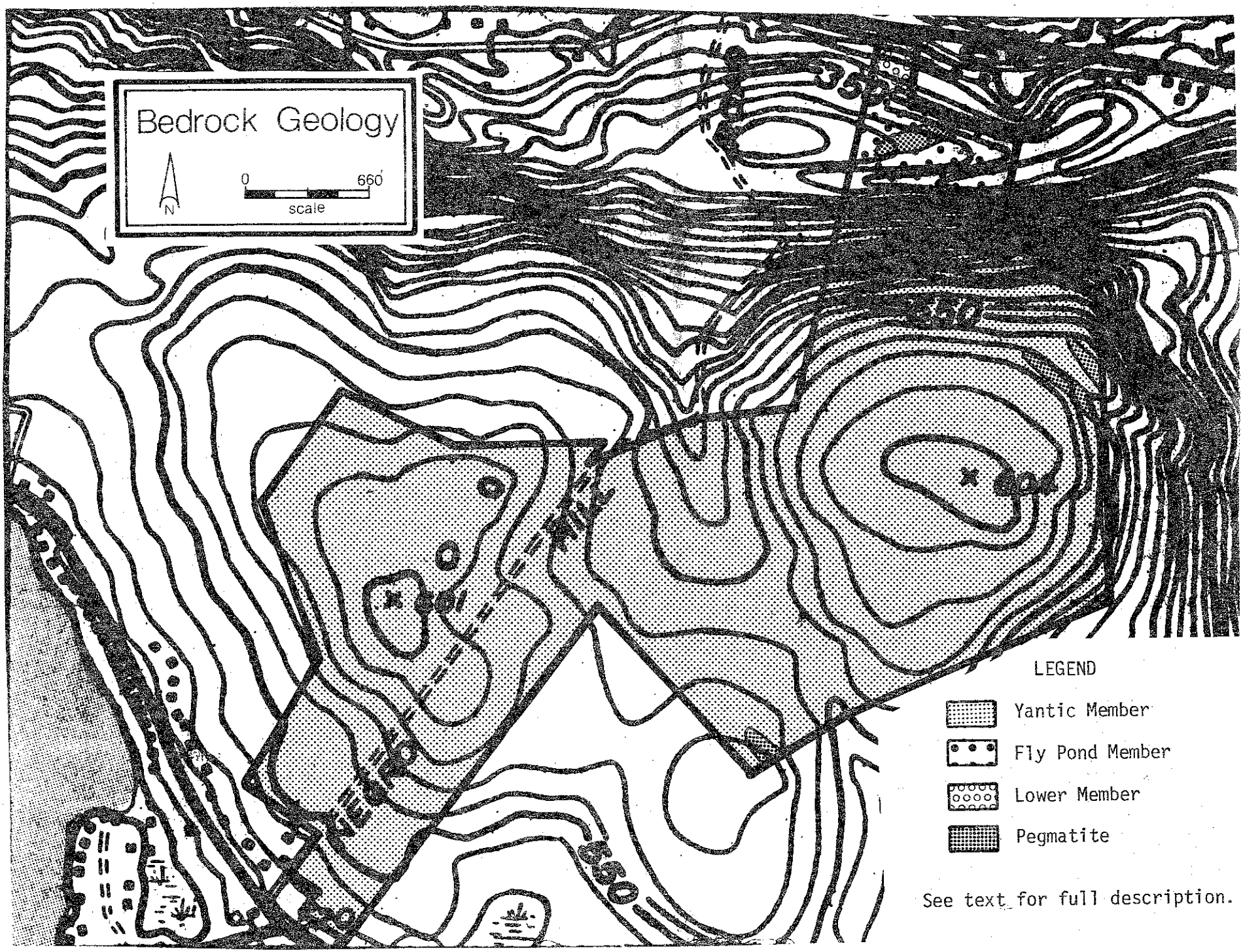
Should this proposal be built as planned, there will be a traffic increase on Route 87. The intersection of Laurel Lane and Route 87 is located on a curve and its sight distance is limited, this may cause collision problems as traffic volume increases. The Team planner suggests that a detailed traffic study be prepared by the developer, which would help to alert the Town as to potential traffic volumes and problems, before final action is taken on this subdivision plan.

ENVIRONMENTAL ASSESSMENT

GEOLOGY

The Laurel Lane parcel is located in the Columbia topographic quadrangle. A bedrock geologic map (U.S. Geological Survey Map GQ-592, by G.L. Snyder, 1967) of that quadrangle has been published. A surficial geologic map of the quadrangle (by M.A. Zizka, 1978) is available for inspection at the Department of Environmental Protection's Natural Resources Center.

Most bedrock cropping out on or underlying the site is classified as part of the Tatnic Hill Formation (named after a locality in the town of Brooklyn, Connecticut). Three subunits of this formation may be found on the property. The first is a silvery weathering, medium-grained biotite-muscovite gneiss, which locally contains garnet and sillimanite, and which locally grades into rusty weathering, muscovite-graphite schist. (Gneiss is a term used for a crystalline rock in which thin bands of rounded minerals alternate with thin bands of elongate or platy minerals; schist is a term used for a crystalline rock composed largely of platy minerals which have been aligned to form thin slabs or layers.) The first subunit comprises most of the site, and is termed the Yantic Member. The second subunit is composed largely of gray-green, medium-grained, calcium-silicate rock; this subunit is called the Fly Pond Member. The third subunit, known simply as the Lower Member, is composed of gray-brown, medium- to coarse-grained schist containing the minerals biotite, garnet, sillimanite, kyanite, and locally graphite. A coarse-grained intrusive rock known as pegmatite appears in scattered lenses or layers throughout the site. This rock is composed of oligoclase, microcline, quartz, and biotite. A map showing the approximate distribution of the various rock types on the property accompanies this report.


Bedrock Geology
N
0
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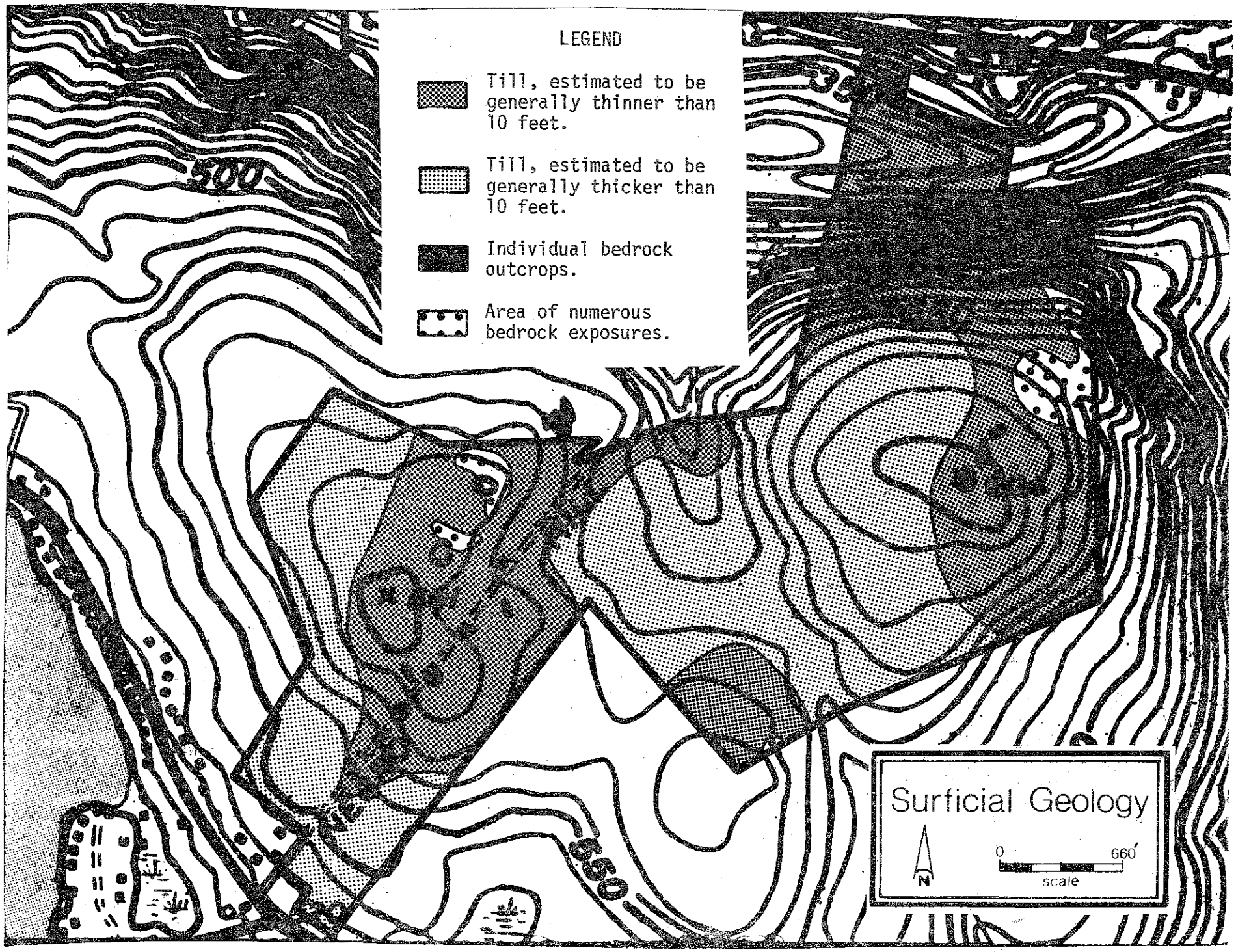
scale
LEGEND
Yantic Member
Fly Pond Member
Lower Member
Pegmatite
See text for full description.


LEGEND
Till, estimated to be generally thinner than 10 feet.
Till, estimated to be generally thicker than 10 feet.
Individual bedrock outcrops.
Area of numerous bedrock exposures.
500
660
Surficial Geology
N
0
660'
scale

Bedrock on most of the property is covered with a thin to thick blanket of glacial sediment known as till. Till consists of rock particles ranging in size from clay to large boulders and in shape from round to angular to flat. The non-sorted nature of the sediment reflects the bulldozer-like process by which the ice collected and transported the particles, and the indiscriminate manner in which it redeposited them over the local terrain. The ice did not greatly modify most features of the landscape, but it did smooth out irregularities in the pre-glacial bedrock surface by filling them with till. Consequently, till thicknesses range from less than one foot near bedrock outcrops to several tens of feet in other areas. The location of bedrock outcrops observed on the site and the approximate distribution of thin till areas (less than 10 feet to bedrock) is shown on an accompanying illustration. Till textures may range from sandy and loose (generally in the upper 3 to 5 feet) to silty and very compact. Additionally, lenses of relatively clean sand and gravel may be scattered throughout the till.

HYDROLOGY

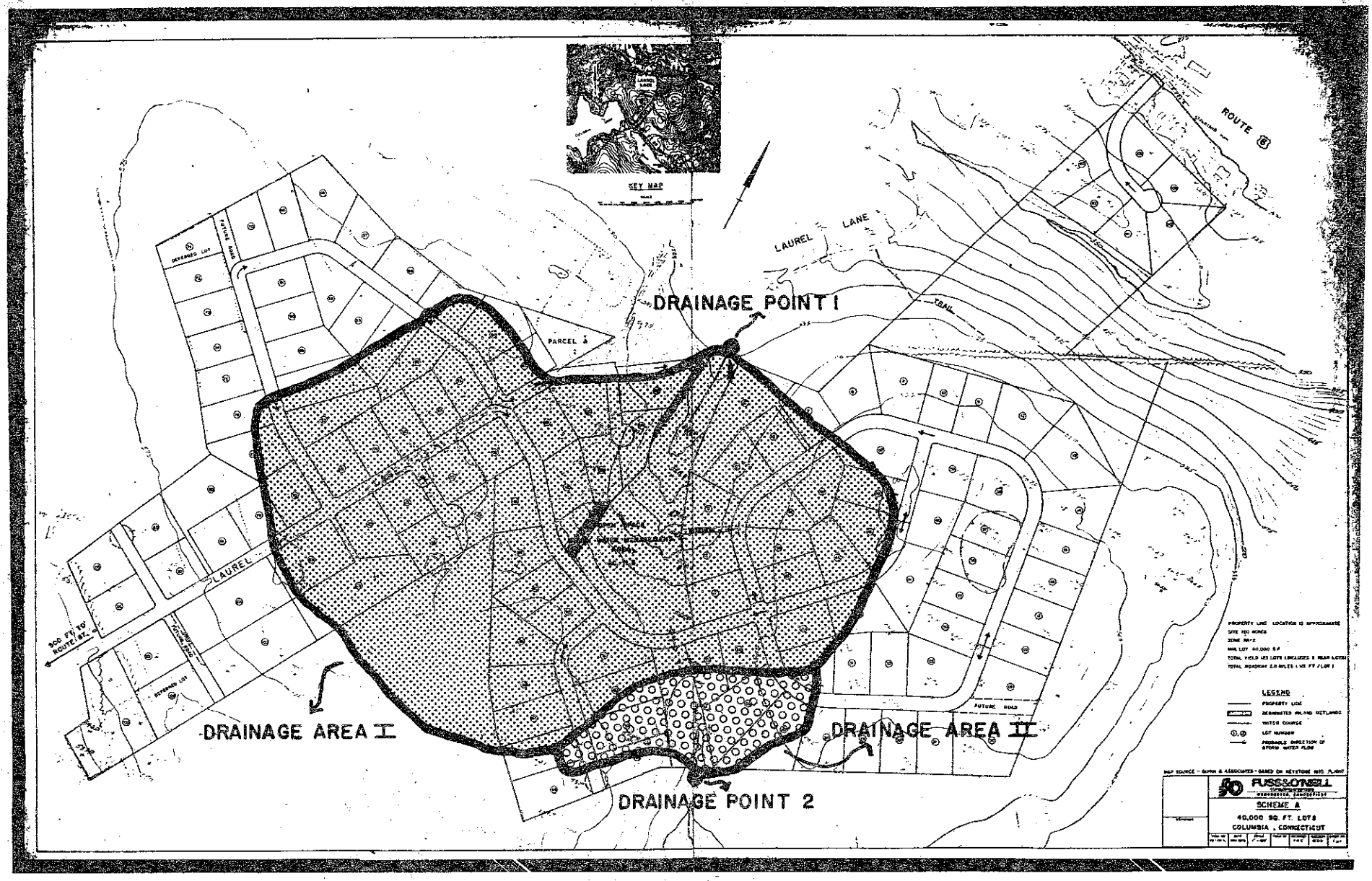
The proposed development is located on a hilltop that includes three broad peaks. Consequently, drainage flows in several directions from the site. Drainage to the north flows diffusely or in small channels, ultimately entering Hop River. Drainage to the east flows into Clarks Brook, a Hop River tributary that passes through a man-made pond approximately one mile downstream from the property. Drainage to the south flows either into Columbia Lake or into the wetland that forms the source of Dam Brook. Columbia Lake is tributary to Hop River, but Dam Brook is not.

Concern was expressed at the pre-review meeting about the potential effects of drainage from the proposed development, particularly in regards to Columbia Lake. Under the present topographic configuration of the property, a maximum of 14 of the proposed lots (lots 71-77 and 79-85) may lie within the Columbia Lake watershed. Drainage from lots 100-104 also flows southwestward along Laurel Lane, but this flow is intercepted by one or more catch basins along Route 87 and transmitted via a concrete conduit to the southeastern corner of the intersection of Route 87 and Lake Road, where it enters the Dam Brook watershed. Although the details of the road drainage network have not been submitted, it appears that surface flow from lots 79-83 will be effectively removed from the Columbia Lake watershed by piping the runoff from those lots to the eastern side of Laurel Lane. Groundwater in those lots would continue to be transmitted to the lake.

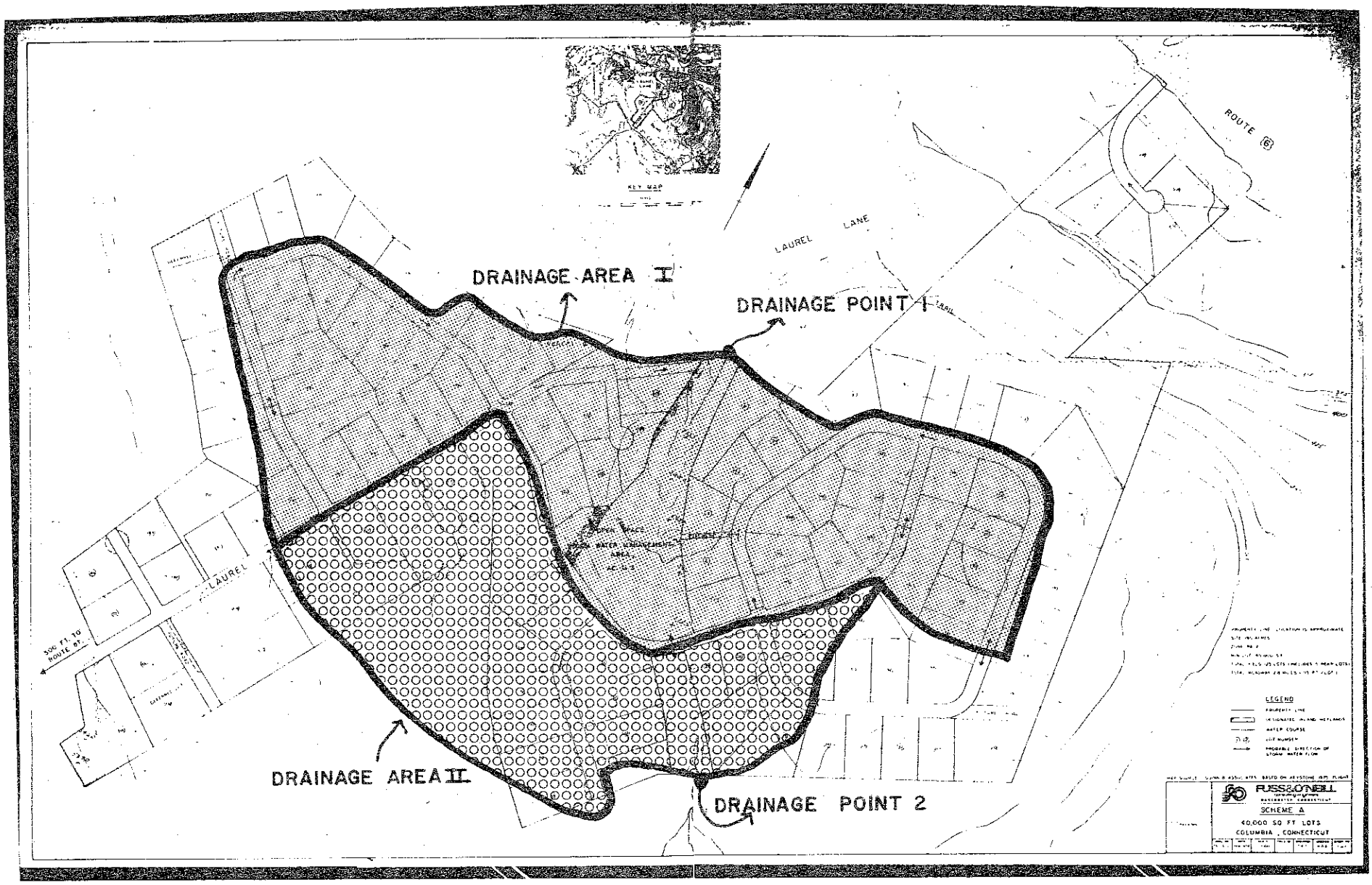
Because only generalized storm drainage flow patterns are shown on the development scheme submitted by the landowner's engineering firm (Fuss and O'Neill, Scheme A), it is not clear which way runoff from some lots would be piped. In particular, it is uncertain whether surface flow from a small drainage area consisting of lots 78, 86, 87, 95-99, and parts of lots 77, 88, and 94 would be channeled to the north or to the south. Peak flow estimates discussed below include both alternatives.

A representative from Fuss and O'Neill requested comments from the Team concerning the proposed storm water management areas. In response, the Team's hydrologist has estimated present and future peak flows for the 10-year, 24-hour storm and the 100-year, 24-hour storm at the points at which runoff from the northern

WATERSHEDS - NO STORM DRAINAGE SYSTEM



WATERSHEDS-STORM DRAINAGE SYSTEM, PLAN A



and southern management areas leaves the site. These estimates are based on incomplete data and are intended only to provide guidelines as to the anticipated magnitude of the peak flow changes; specific individual estimates are not intended to serve as the basis for engineering design purposes (e.g. pipe diameters). A table of the estimates follows. Maps accompanying this report show the approximate drainage areas for the two discharge points. All peak flows are given in cubic feet per second (cfs). Numbers in parentheses to the right of the developed condition peak flows indicate percentage increases in peak flows from the undeveloped condition.

Peak flow estimates for the 10-year, 24-hour storm.

	Undeveloped	Developed, no storm drainage	Developed, Plan A	Developed, Plan B
Drainage Point 1	44	85 (93%)	79 (44%)	62 (41%)
Drainage Point 2	9	14 (56%)	61(578%)	88(878%)

Peak flow estimates for the 100-year, 24-hour storm.

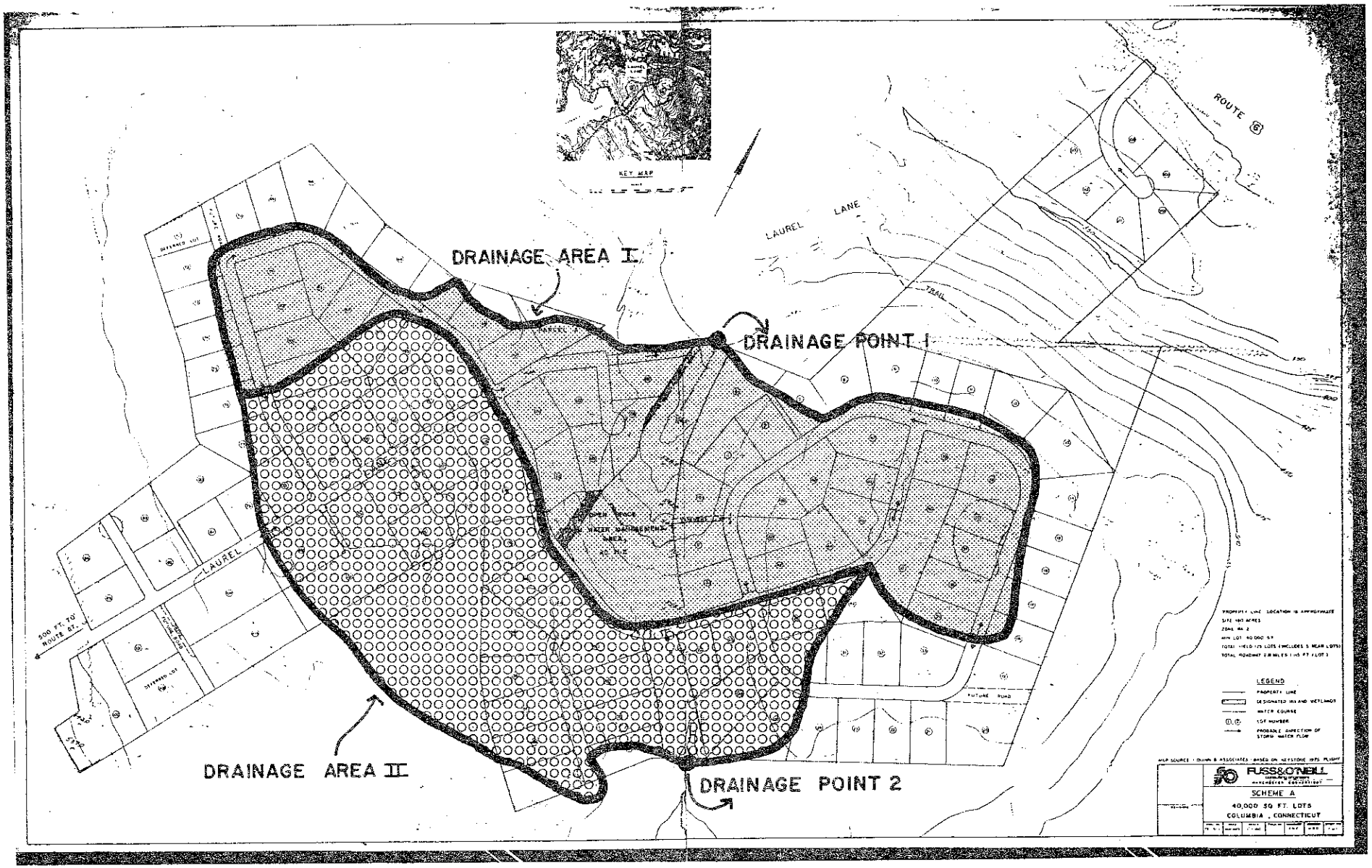
	Undeveloped	Developed no storm drainage	Developed, Plan A	Developed, Plan B
Drainage Point 1	116	198 (71%)	157 (35%)	126 (9%)
Drainage Point 2	24	33 (38%)	120(400%)	171(613%)

As the estimates above indicate, the proposed development may lead to substantial peak-flow percentage increases. In particular, with the suggested storm drainage system in place, discharges at Drainage Point 2 may be approximately six to nine times greater for a 10-year storm and four to six times greater for a 100-year storm than they are at present. These very large increases would result in part from the redirecting of drainage from many of the lots. The storm drainage system would also, in turn, reduce the percentage increase in runoff at Drainage Point 1 from that which would occur under developed conditions in the absence of such a system.

Since the land immediately downstream from both discharge points is undeveloped, flooding hazards may not be as problematic as erosion and sedimentation. Nevertheless, the magnitude of the increases warrant consideration of retention basins in the stormwater management areas. Of particular concern are the present house lots on Oakwood Lane (north of the site) that are proximate to the discharge stream from the northern stormwater management area, and the house lots east of Thompson Hill Road (east of the site) that are proximate to Clarks Brook.

Erosion and sedimentation are clearly serious problems that, in themselves, warrant engineered flow-restriction techniques. On the steep slope north of the site, an enormous ravine has been eroded in the path of the unimproved section of Laurel Lane. The large peak flow increases generated by development may be expected to lead to similar problems unless some type of mitigating measures are

WATERSHEDS - STORM DRAINAGE SYSTEM, PLAN B



used. In addition to retention basins, slope stabilization methods should be considered for those areas in the immediate vicinity of any piped-discharge outlet.

Another consideration with respect to subdivision drainage would be the amount of road salts that would be carried into the stormwater management areas. According to a study prepared by the U.S. Geological Survey, the town of Columbia applied an average of 4.7 tons of salt to each mile of town road during the winter of 1976-1977. Since slightly more than 2 miles of new subdivision roads would lie within the watershed of the management areas, it may be estimated that approximately 11 tons of salt may be dispersed through those areas.

VEGETATION

The 190± acre parcel proposed for subdivision is almost completely forested and consists of five major vegetation types. Included are mixed hardwoods, hardwood swamp, open swamp, and old field species types. (See Vegetation type map and Vegetation type discription chart). Efforts should be made to preserve the largest, healthiest trees and patches of mountain laurel, for aesthetic quality. The open swamp has high value for wildlife habitat, and should be considered for preservation. The fully stocked mixed hardwood stand would become healthier and more stable if thinned. If a thinning in this area is not desirable at this time, lot owners could improve the condition of their vegetation by thinning for fuelwood in the future. The hardwood swamp area designated as an open space/storm water management area would also benefit from a light thinning.

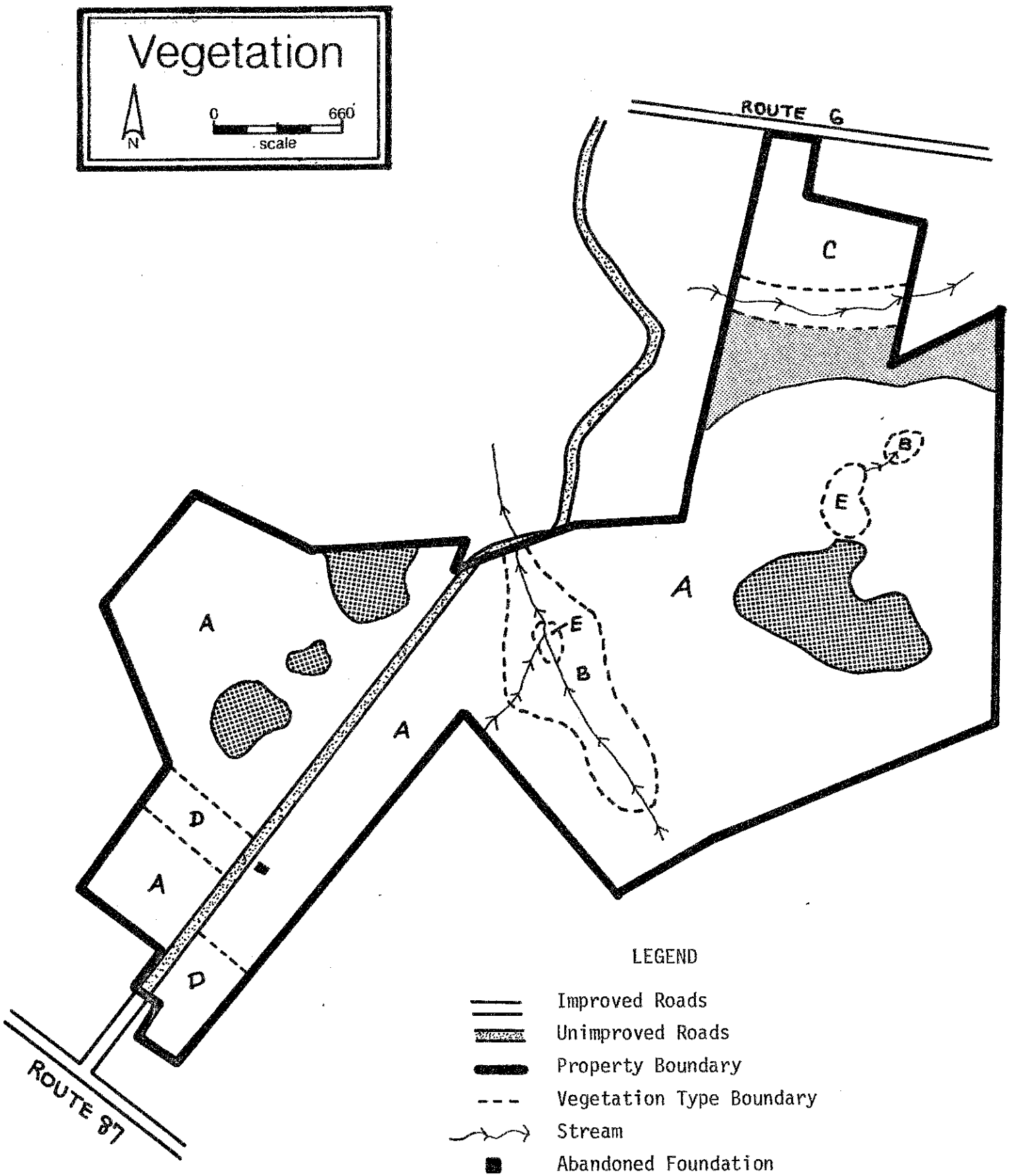
As with other subdivisions in forested areas, the high quality trees (trees without damage or excessive defects), have high aesthetic value and should be preserved to the greatest extent possible. Trees are very sensitive to the condition of the soil within their drip-lines. The drip-line zone corresponds to the entire area under a tree's crown. Development practices such as excavating, filling, and grading for construction of roadways, buildings, and septic systems in the drip-line zone may disturb the balance between soil aeration, soil moisture level, and soil composition. These disturbances may cause a decline in tree health and vigor, potentially resulting in tree mortality within three to five 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 especially during the construction period not to disturb trees that are to be preserved. In general, healthy and high vigor trees should be favored over unhealthy trees because they are usually more resistant to the environmental stresses brought about by construction of a subdivision of this nature. Where feasible, trees should be saved in small groups or "islands". This practice lowers the possibility of soil disturbance and mechanical injury. Individual trees and "islands" of trees should be temporarily but clearly marked so they may be avoided during construction. Recent research has shown that healthy trees on a house lot may enhance the value of that lot by as much as twenty percent.

Scattered throughout much of vegetation type A are patches of mountain laurel. These evergreen shrubs have the potential to produce beautiful flowers when they receive full sunlight. Preservation of the mountain laurel coupled with a partial removal of the overstory near them to bring in the needed sunlight will help to

VEGETATION TYPE DESCRIPTIONS

Stand Type	Acres	*Main Stand Size Class	Stocking Level	Main Stand Quality	Major Components Of: Overstory	Understory	Ground Cover
A. Mixed Hardwoods	160 Total 9 acres Inoperable for small operator steep slope	Small sawtimber	Upper end of fully-stocked	Medium trees have small crowns and are declining in health and vigor. Trees on hill tops are of poor quality. Mortality is high on hilltops.	White oak, black oak, red oak, red maple, with occasional shagbark hickory, sugar maple and tuliptree on concave areas and lower slopes.	Hardwood tree seedlings, white pine seedlings. Sassafras, Chestnut sprouts, scattered patches of mountain laurel, azalea, witch-hazel and maple leaf viburnum.	Grasses, sheep-laurel, clubmoss, huckleberry Christmas fern, royal fern.
B. Hardwood Swamp	12	Pole with occasional sawtimber size trees.	Variable from understocked to overstocked.	Poor to medium-many trees with poor form and broken tops.	Red maple in clumps on hummocks with scattered black birch, yellow birch and white ash increasing in occurence toward the edges of this stand.	Dense growth of spice bush, witch hazel highbush blueberry and swamp azalea.	Spagnum moss, skunk cabbage, cinnamon fern, sensitive fern, Christmas fern and clubmosses.
C. Mixed Hardwoods	10	Pole	Under to fully-stocked.	Poor-many trees with rot and poor form.	Black oak, scarlet oak and black birch with occasional white pine.	Chestnut sprouts, highbush blueberry and huckleberry.	Grasses and clubmoss.
D. Old Field Transition to Mixed Hardwoods	6	Seedling and sapling.	Fully-stocked.	Medium-trees are healthy, however most species are undesirable due to short like span.	Red maple, gray birch, bigtooth aspen, blue beech, speckled alder.	Alternate leafed dogwood, spirea, bayberry, highbush blueberry.	Hairy capped moss grasses, and goldenrod.
E. Open Swamp	2				Dense sweet pepperbush, highbush blueberry, swamp azalea.		Sphagnum moss, tussock sedge.

* Seedling size - Trees less than 1 inch in diameter at 4 1/2 feet above the ground (d.b.h.)
Sapling size - Trees 1 to 5 inches in d.b.h.
Pole size - Trees 5 to 11 inches in d.b.h.
Sawtimber size - Trees 11 inches and greater in d.b.h.


Vegetation
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scale
ROUTE 6
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B
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A
D
ROUTE 87
LEGEND
Improved Roads
Unimproved Roads
Property Boundary
Vegetation Type Boundary
Stream
Abandoned Foundation
Open Space, Excessive Slope Limits Management Practices
Rocky Hill Tops - Moisture Deficiency Limits Vegetation Growth and Conditions

improve the aesthetic quality of the area.

The open swamp (vegetation type E) should be designated as open space, and preserved for wildlife habitat and nature study. The dense wetland shrubs present in this area provide excellent cover for many species of wildlife, including song birds, ducks, turtles, frogs, snakes, and mammals. A 50-to 100-foot vegetated buffer zone around the open swamp will help to protect it from the potential adverse effects of road runoff and de-icing salts. Contamination of this area with de-icing salts from road runoff will alter the vegetation and possibly lower this areas wildlife habitat value.

The soils associated with the hardwood swamp (vegetation type B) and the open swamp (vegetation type E) are characterized by a permanent high water table. These saturated and poorly aerated soils limit vegetative growth to species that are tolerant of excessive moisture conditions. Red maple, the dominant species found in the hardwood swamp, will survive under these conditions; however, root systems are shallow, growth rates are usually slow, and tree quality is commonly poor. The high water table is more critical in the open swamp, where vegetative growth is limited to shrub and herbaceous species.

Management of both of these areas for timber production is usually not economically feasible because of the lack of desirable species, poor growth rates, and the severe limitation that the high water table imposes on equipment use. As fuelwood demands rise, it may become feasitle to manage hardwood swamps, by periodically harvesting a limited quantity of cordwood.

The soils located on the rocky hilltops (see vegetation type map) are excessively drained and in some places shallow to bedrock. Lack of adequate moisture throughout much of the year, especially during the spring rapid growth season, is the primary reason for the stunted growth, malformed appearance, and high percentage of mortality of the trees located in these areas.

Potential Hazards and Mitigating Practices

Windthrow is a potential hazard in the hardwood swamp (vegetation type B). As a result of the high water table and saturated soils, the trees present are unable to become securely anchored. The crowded condition of some of the trees in this stand increase the potential for windthrow, especially if disturbances occur. At present many of these trees rely on each other for stability. If linear openings are made in or along side this stand, the windthrow hazard may be increased. Any openings which would allow wind to pass through rather than over this stand will increase the windthrow hazard and should be avoided. A light fuelwood thinning in this stand will help to increase tree stability over time by stimulating crown and root growth in residual trees. It should be noted that changes in the water table depth in the hardwood swamp area, caused by blocking or restricting natural drainage flows may cause trees and shrubs in this area to die. Alterations which may raise the water table in this area, drowning vegetation, should be avoided.

Suggested Management Techniques

The trees in vegetation type A are becoming overcrowded and as a result are beginning to decline in health and vigor.

If subdivision of this area is not planned for several years, a commercial thinning for sawtimber or fuelwood would be beneficial at this time. This thinning would reduce competition between trees for space, sunlight, water, and nutrients, improving health and vigor of residual trees over time. Removal of approximately one-third of the volume in this stand, focusing on poor quality trees, unhealthy trees, and undesirable trees along with trees that are directly competing with healthy high quality trees, would generate approximately 1,500 board feet per acre or between 5 and 7 cords per acre. Utilization of the tops for fuelwood will greatly improve aesthetic quality after the harvest has been completed. If the proposed thinning is agreed upon a consultant forester should be contacted to mark the trees to be removed and also to oversee the harvest operation. Revenues from this thinning will more than cover the costs of hiring a consultant.

Regardless of whether or not this thinning takes place, the trees cleared during road, house, and septic system construction should be utilized for fuelwood and, when feasible, utilized for sawtimber.

If the actual subdivision of this tract will occur within a year, thinnings might be accomplished on an individual lot basis by owners for fuelwood after the subdivision.

The open space area just to the south of Route 6 (see vegetation type map) would, like the rest of vegetation type A, benefit by receiving a thinning; however, the excessive slope makes removal of trees very difficult. As a result of this difficulty, the potential for management of this area is limited.

Most of the hardwood swamp is designated as an open space/storm water management area. As mentioned earlier, stocking levels are quite variable in this stand; however, the majority of this stand is somewhat crowded. Due to the sensitivity of this area, thinnings should remove no more than one quarter of the total volume present. Areas that are understocked should not be thinned at all. This thinning, like the one recommended for vegetation type A, will help to improve the condition of the stand over time by reducing competition between residual trees. It should favor tree species other than red maple, and focus on removing the poorest quarter of the trees in the stand. To help avoid irreversible soil damage this thinning should be implemented during the winter when the ground is frozen or the summer when the ground is relatively dry.

WILDLIFE

Most of the site is heavily wooded with a stand of mixed hardwoods. The understory is poor to fair due to the well-developed canopy. (See Forestry Section for vegetative zones and list of species). The quality of this woodland habitat for wildlife is fair, but with proper management (underplanting, cleaning, and establishing grasses and legumes), the area has good potential for wildlife habitat development.

Small populations of game and non-game species of birds and mammals utilize the area. Deer probably utilize the area infrequently because of the lack of food, cover, and distance from open fields. Evidence that birds of prey (hawks or owls) use the area was also noted. The lack of spent shotgun shell also indicates the area is not utilized heavily for hunting.

The property is crisscrossed by several dirt roads and trails. Evidence of dirt bikes was noted. The noise and disturbance these vehicles produce cause a reduction in the quality of the habitat for wildlife.

A large wetland-stream complex bisects the property into east and west portions. Two streams leave this wetland. The larger stream flows north toward Hop River. The smaller stream flows south into Clarks Brook. The wetland is heavily wooded with a fair understory. The area provides habitat for certain species of animals (birds, reptiles, amphibians, and small mammals) and a source of water for others.

Soils in the wetland have an extremely stony surface layer, and the stream channels are narrow and lined with stones and boulders. The wetland is on a 3-5% grade and therefore does not naturally act as a stormwater detention area. However, the thick woods in the watershed and large size of the wetland allows a large portion of the rainfall to infiltrate. A 18" x 18" stone culvert appears adequate to handle peak flows under present conditions. Thus the area may be a reliable source of water during dry periods.

A small wetland ($\pm$ 1 ac.) to the east (lot 61) drains into the larger wetland-stream complex via a small channel. A somewhat larger 1.5-2 acre wetland exists to the west at the top of the ridge (lots 35-38). (The site plan designates the area as "dense woods and brush"). This area is unusual because of its location (isolated and on top of a ridge) and because the outlet channel is small and appears to flow only intermittently. Approximately 10 acres surrounding the wetland act as its watershed. Efforts should be made to protect this unusual area from the adverse effects of development. Road location, stormwater discharge, siltation, and noise from urbanization will affect the quality of this wetland for wildlife. The time of year and time constraints did not allow an adequate habitat evaluation to be made.

Development of the area as proposed will eliminate habitat for the deer or other native woodland species that presently utilize the area. The presence of large forest areas around the development will lessen the impact on local wildlife. Clearing and creation of new edge areas may provide some benefits to wildlife if done properly. Landscaping homesites with fruiting trees, shrubs and bushes and establishment of grasses and legumes will improve the area. On areas that are not developed, (due to shallow soils, bedrock outcrops or wet conditions) implementation of a wildlife management plan (underplanting, thinning, clearing, shrubs, tree and grass planting) will improve the area for certain wildlife species that can survive in undisturbed areas.

Wetlands on the property should be left undisturbed and efforts should be made to preserve good water quality. Implementation of an open space-streambelt zone around each wetland will be beneficial, but the impact of road crossings, residential construction, and discharge of stormwater as well as disturbance by people, will result in some degradation.

It is important that a sediment and erosion control plan and a stormwater management plan be developed and implemented for the site, to minimize the adverse effects of development on the wetlands.

FISH RESOURCES

Three waterbodies constitute the primary fisheries resources in the town of Columbia. They are Mono Pond, Hop River, and Columbia Lake. Mono Pond's drainage area is the site for a major subdivision. Drainage from the proposed Laurel Lane property will be directed toward the Hop River to the north and Columbia Lake to the south.

The Hop River represents an extremely valuable fisheries resource. Its natural fish population includes largemouth bass, brown bullheads, shiners, dace, and small numbers of wild brook and brown trout. Trout populations in the river are augmented by the State's stocking program which liberates in excess of 3,500 fish in the Hop River each year.

According to the subdivision plan for Laurel Lane, the small hilltop wetland area will be used as a storm water retention area. Since the wetland is presently insufficient to control runoff (witness the condition of Laurel Lane on the north side of the hill), the wetland's retention capacity must be increased substantially to prevent erosion and sedimentation. The unnamed brook flowing down the north side of the hill from the wetland runs into the Hop River. Under conditions imposed by clearing and paving as part of the proposed development, it can be anticipated that runoff will accelerate and increase, effecting erosion and sedimentation. A natural settling place for sediment will be the Hop River. If adequate drainage planning is not done, a silt layer could build up on the river's bed reducing aquatic insect and other invertebrates' productivity in the area. With less food organisms present, fish will be fewer, and the soft sediment will provide a substrate on which aquatic vegetation can better survive, choking the river.

The primary water resource available to Columbia's townspeople is Columbia Lake. The lake already suffers from high fertility levels and their associated problems, i.e. aquatic vegetation proliferation and loss of aesthetic quality. The lake can ill afford another source of nutrients. For this reason drainage at the south end of Laurel Lane must be planned to avoid the Columbia Lake drainage area.

Depending upon the percentage of drainage to the south from the hilltop wetland, an additional problem could develop. A small tributory stream to Clarks Brook flows southeast from the wetland. Before crossing Routes 66 and 6, Clarks Brook enters a small, privately owned pond. Heavy runoff from the development entering Clarks Brook could turn the pond into an aquatic vegetation nightmare, engendering legal problems for the town and the developer.

From a fisheries viewpoint the message is clear: Drainage planning represents the most vital phase of the proposed development.

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 feet/inch scale to

660 feet/inch, the soil boundary line 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 of each of the soils for on-site sewage disposal, dwellings with basements, roads and streets, and lawns and landscaping. The principle limiting factor is also listed on the chart. Note that severe limitations do not preclude the use of this land for development if economics permit large expenditures for land development. The soils map, with the publication Soil Survey Tolland County, Connecticut, can aid in the identification and interpretation of soils and their uses on this site. It is strongly recommended, however, that a detailed soil survey be performed prior to final design. The survey will allow accurate location of the various soils present as well as wetlands, streams, areas with ledge, or with outcrops or shallow to bedrock soils.

Soils mapped as occuring on this site include:

The Charlton series, a deep, well-drained soil occuring on uplands. These soils formed in glacial till mainly from schist and gneiss. The series is mapped as stony. Limitations to development are largely due to slope and stoniness.

The Gloucester and Charlton series are steep well-drained soils occurring on uplands; they usually occupy steep hillsides. They are formed over glacial till and do not have a high water table during the year. The series is mapped as stony, and the primary limitations are stoniness, slope, and droughtiness.

The Hollis series is a well-drained upland soil that is rocky and shallow to bedrock. These soils are underlain by hard bedrock and the areas contain barren rock outcrops. In most places, hard rock is less than 20 inches below the soil surface, but occasional pockets of deeper soils can be utilized for individual home sites.

Leicester-Ridgebury-Whitman Complex is an upland soil formed over friable to firm glacial till. It is a poorly to very poorly drained soil that has a water table within 6 inches of the soil surface during the wettest months. The soil has a high water table during most of the year. These soils have severe to very severe limitations for most urban uses due to wetness and poor drainage. This series is listed as a Connecticut inland wetland.

The Paxton series is a deep upland soil formed over compact glacial till; i.e., hardpan. This hardpan is 16 inches to 36 inches below the soil surface. Permeability through the pan is drastically reduced and excess water above the pan usually occurs for short periods during spring thaws and heavy rainstorms. The principle limiting factor is the hardpan.

The Sutton series is a deep, moderately well-drained permeable till soil. This series is the stony phase and has a moderately high seasonal water table. The water table limits successful operation of septage effluent absorption fields unless special measures are used, such as drainage and land fill. The primary limitations are slow percolation through the hardpan and large stones.

The Woodbridge series is a moderately well-drained compact till upland soil. It has a moderately high water table during wet seasons. This is the stony phase, and installation of disposal systems is more difficult in the very stony soils. Hardpan and stones are principal limiting factors.

The soils map fairly accurately depicts the wetland soils and their boundaries. The one major difference is the ± 1.5 acre parcel shown as "Dense Woods and Brush" (lots 35-38) on the preliminary plans. This small and unique upland wetland that should be considered for preservation in its original state and protected from development.

Bedrock outcrops and ledge were prevalent throughout the southwest section of this parcel. Hollis soil is mapped in a large section. More extensive site inspections should be done in order to locate a suitable area for the houses and septic fields. It is feasible that the Hollis soils may be more extensive than what is shown on the soils map. Hollis soils are frequently associated with Charlton soils and it is common to find pockets of Hollis throughout. Thus, individual site testing is necessary.

Sediment and Erosion Control

Although soils on the areas proposed for development have a low to moderate erosion potential, a detailed sediment and erosion control plan should be developed and implemented because of the large area involved and its proximity to wetlands and watercourses. This plan should adhere to the basic principles outlined in the Connecticut Erosion and Sediment Control Handbook, available from the Soil Conservation Service field office in Tolland County. Wetlands on the site and the stormwater system will be particularly susceptible to damage from siltation, and planning efforts should be directed towards protection of these areas.

The conservation plan developed should show soils information, location of wetlands, proposed alterations, location of stormwater systems, and proposed sequence of construction, and should detail the vegetative and structural measures to be utilized. The plan should also specify maintenance responsibilities during and after the construction phase.

The northernmost parcel (6 lots off Route 6) is situated in an area of moderate to steep slopes. The access from Strickland Road will be quite steep and the road cut needed to gain access will have a minimum of 2:1 side slopes. Erosion, stormwater problems, and winter icing are possible areas that need consideration in planning to avoid problems.

Stormwater Management

The preliminary site plan suggests that the majority of stormwater may be directed into the north-flowing stream, which is a tributary of the Hop River. The wetland at the headwaters of this stream has been designated on the plan as an open space-stormwater management area. The remainder of the proposed development will drain either southwest toward Route 87 or south to Clarks Brook.

The integrity of existing streams and downstream stormwater systems should be protected by a stormwater management system. This system should be designed to retain peak runoff in excess of that which was discharged from the watershed in its undeveloped state.

Calculations to support the design should be presented. The system should be tied into the erosion and sediment control plan and a maintenence schedule and responsibilities defined.

WATER SUPPLY

Individual on-site water supply wells are proposed to serve homes within the subdivision. Because of the geology of the site, these wells would probably tap bedrock as a water source. Water is transmitted through bedrock and into wells along fractures. The distribution of fractures in bedrock is highly irregular; severly fractured zones may be located a few feet from relatively unfractured rock. As a consequence, it is virtually impossible to predict the yield of a new well at any given site. Nevertheless, Connecticut Water Resources Bulletin No. 11 reports that 90 percent of the bedrock-based wells within the Shetucket River basin yield 3 gallons per minute or more, enough to supply an average family's needs. Most bedrock wells penetrate less than 200 feet of rock. Evidence from well reports suggests that the amount of fracturing in bedrock decreases significantly with depth. A well penetrating 200 feet of rock without achieving a sufficient yield probably won't be improved by further drilling.

The Tatnic Hill Formation, which is the bedrock type most prevalent on the site, contains rusty-weathering zones in some surface exposures that indicate the presence of iron or manganese-bearing minerals. Water passing through such zones in the subsurface may pick up objectionable concentrations of these elements. It is possible that some wells in the subdivision could draw mineralized water; this problem may often be solved satisfactorily by filtration or water-softening devices. In other respects, the natural groundwater quality should be good.

The shallow-to-bedrock areas on the site are numerous and of concern. Discharges from septic systems must receive adequate filtration in the soil to remove biological and chemical impurities. On shallow-to-bedrock areas, careful engineering is required to assure that leachate passes through soil of suitable depth and texture. Incompletely renovated septic discharges may enter the bedrock fracture system, where they receive little additional filtration. These conditions may produce well contamination. A well-designed and carefully constructed septic system will minimize or eliminate such risks.

WASTE DISPOSAL

On-site subsurface sewage disposal is proposed for all lots. Examination of the Soil Conservation Service soils classifications for the area reveal that the majority of the soils have moderate to severe limitations for on-site subsurface sewage disposal.

Review of the plan shows that the central area between the two hills is very wet, and that this has been left as an open space-storm water management area. Development has also not been proposed for the extremely steep slopes at the northern part of the parcel.

Inspection of the property revealed large numbers of bedrock outcrops near the Route 87 end of Laurel Lane. It is felt that a large number of lots may not

be buildable in the lot #104 area. There are bedrock outcrops, wet areas, and steep slopes in other parts of the property also, and extensive soils testing will have to be done to determine the actual number of lots that can be considered buildable.

Once soils testing has been done, it is felt that engineer-designed septic systems will be required on most lots.

A large amount of the property has severe limitations for on-site subsurface sewage disposal. Although the 125-lot proposal leaves undeveloped areas which are wet and steep, it is felt that a large number of lots will be lost due to shallow depth of soil to bedrock. As stated, however, this is a preliminary proposal, and the actual number of lots possible will only be determined after extensive on-site soil testing.

ROADS

The condition of existing roads and highways serving the development is of critical importance. Approximately 120 lots in the initial plan are proposed to exit onto Route 87 via the very modest Laurel Lane. If fully developed according to the preliminary plan, more than 1,000 vehicle trips per day might be expected to take place on the lower portion of Laurel Lane on any given day (an average single-family suburban house generates 8 to 10 vehicle trips per day, i.e., 4 to 5 round trips; in the future that average might be expected to decrease somewhat as the cost of operation of a vehicle increases). In 1975, Route 87 in the vicinity of Laurel Lane carried an average of 2,000 vehicles per day. A subdivison of the scale of the one proposed would significantly increase the level of vehicle activity on the State highway. The subdivision will in no way tax the theoretical capacity of the State highway, although there are safety and convenience implications which must be addressed in any review.

Laurel Lane is inadequate to handle such an increase in volume of traffic; upgrading to contemporary road standards should be a prerequisite before any significant subdivision activity is permitted on the subject parcel. Such upgrading should be sensitive, however, to its impact on the existing homes along the road; appropriate adjustments to the road specifications should be made to reasonably minimize that impact.

Another critical consideration is Laurel Lane's intersection with Route 87. The Lane meets the highway at a curve and signt distances in both directions are restricted. In addition Lake Road, which is a natural extension of Laurel Lane, intersects Route 87 at an offset of 50 to 75 feet east from Laurel Lane. Any significant traffic between the two streets will likely generate considerable traffic hazards. Solutions to this geometric problem are available if, upon analysis, it proved to be significant. One would involve the relocation of Lake Road to the west to cross in front of an existing home to a point opposite the Lane. The home would clearly be negatively impacted. A second option would entail the construction of a new road east of Laurel Lane through a portion of the parcel under study. The road could be tied into Route 87 at the point of intersection with Lake Road with the acquisition of some additional private land which intervenes between Route 87 and the subdivision land. Provision for this second option could be made through the reservation of the appropriate land with actual construction reserved for some point in the future.

In any event a detailed analysis of the traffic problems likely to be generated by a subdivision of this size should be provided for consideration by the Planning and Zoning Commission during the review of any final subdivision proposal.

GENERAL DESIGN CONCERNS

Every attempt should be made to reduce the internal roads necessary to service the development. Because there will be of necessity only one entrance serving a large number of lots for a considerable period of time, ease of movement within the subdivision is to be desired; however, every effort should be made to reduce the internal roadway network by using cul-de-sacs, rear lots, reduced lot sizes or lot dimensions as permitted under the cluster-zoning provisions of the regulations; the gained additional land could be added to an open space system or to other lots to permit greater flexibility in the general siting of lots.

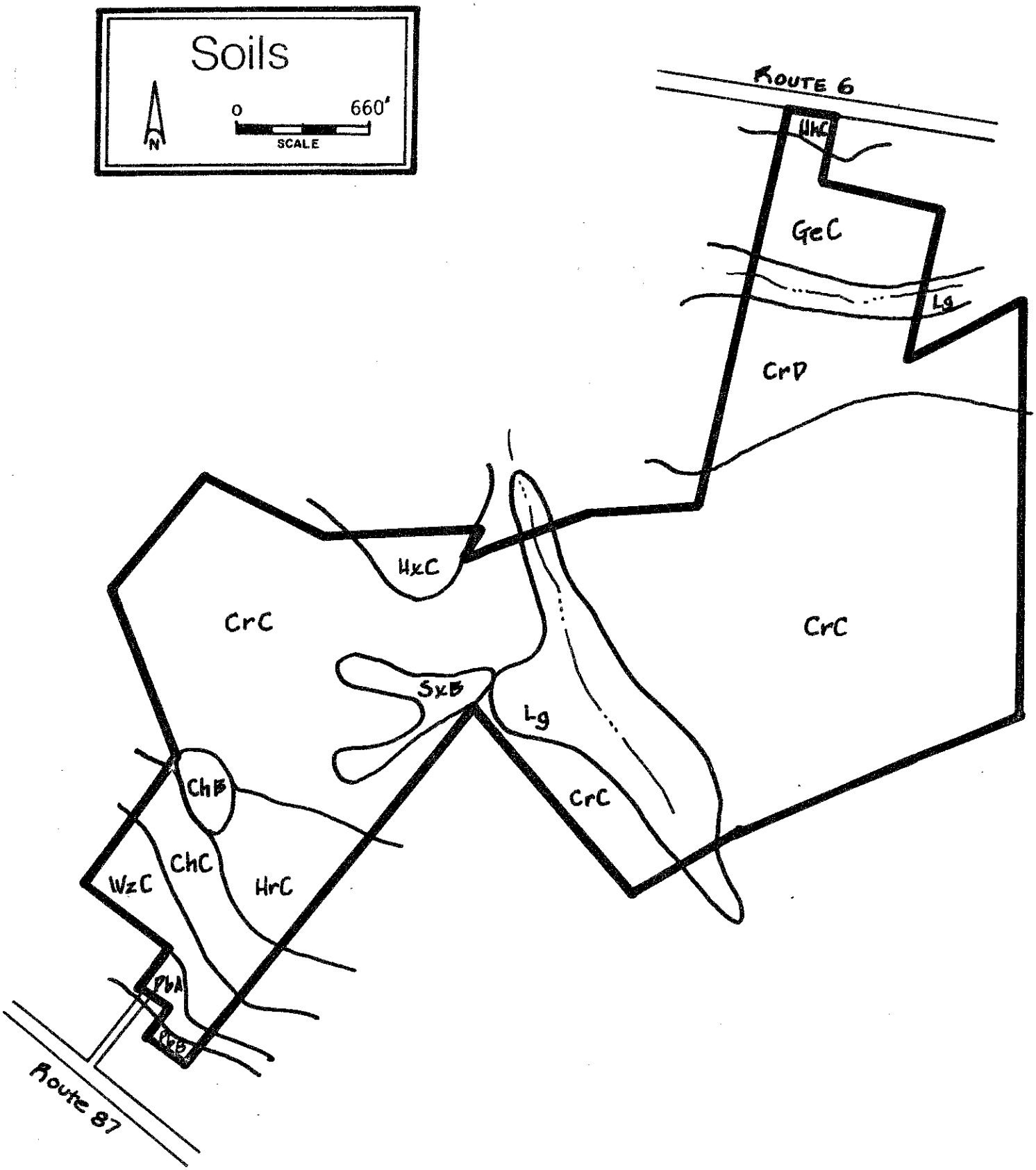
COMPATIBILITY WITH SURROUNDING LAND USES

While large in scale compared with the typical subdivision in Columbia, the proposed subdivision is not significantly different from the urban development common in the vicinity of the lake and along Route 87 to the west. A new land-use type is not being introduced by a subdivision of this type, and if developed over a period of years, as is likely, only a few units will have to be absorbed by the town in any one year. After consideration of traffic, open space, and soils, however, it is likely that a smaller number of lots would make for a better designed, more attractive subdivision.

AESTHETIC CONSIDERATIONS

The site is a pleasant one without being particularly spectacular or unique. The site does, however, have natural features worthy of consideration in the design of a final subdivision. The present preliminary proposal has taken some care with a number of these natural elements. Some additional work in this area would be desirable. The very size of the site, spanning the distance between Route 6 and Route 87, offers unique opportunities to tie the varied and interesting landscape features into a continuous open-space network of benefit to the residents of any future subdivision and to Columbia residents as a whole. The steep land and brook at the northern end of the parcel could be connected by a modest pathway system to the more sizable stream valley at the center of the site. On-site inspection indicated the presence of a large wetland area intermediate between those two features and it too could be tied into such a pathway network. Finally, the pathways could be extended to Route 6 on the north and to Laurel Lane at a point close to Route 87. Such an open space system, owned by a homeowners association or by the town, would be a clear benefit to the subdivision community and the many residents of the town and could be the nucleus of an extended system of trails around the lake. The unique size and disposition of this parcel ought to be matched by a unique and creative exploitation of its modest natural assets.

Appendix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ChC
WzC
HrC
PbA
KvB
Route 87

LAUREL LANE PROPERTY - COLUMBIA

SOILS AND THEIR LIMITATIONS FOR CERTAIN LAND USES

Map Symbol and Soils Series	Principal Limiting Factor	Septic Tank Leaching Fields	Dwellings with Basements	Roads and Streets	Lawns and Landscaping
ChB Charlton stony fine sandy loam 3-8% slopes	Stony	Slight	Slight	Slight	Moderate Stones
CrC Charlton very stony fine sandy loam, 3-15% slopes	Stony Slope	Moderate Slope	Moderate Slope	Moderate Slope	Moderate Slope, Stones
CrD Charlton very stony fine sandy loam, 15-25% slopes	Stony Slope	Severe Slope	Severe Slope	Severe Slope	Severe Slope
GeC Gloucester and Charlton very stony soils, 3-15% slopes	Droughty, Stony	Severe Large Stones	Moderate Large Stones	Moderate Slope	Moderate Large Stones
HrC Hollis very rocky fine sandy loam, 3-15% slopes	Closeness to Bedrock	Severe Depth to Bedrock	Severe Depth to Bedrock	Severe Depth to Bedrock	Severe Depth to Bedrock
HxC Hollis extremely rocky fine sandy loam, 3-15% slopes	Closeness to Bedrock, Stony	Severe Depth to Bedrock	Severe Depth to Bedrock	Severe Depth to Bedrock	Severe Depth to Bedrock
Lg* Leicester-Ridgebury-Whitman Complex	Wetness Poorly Drained	Severe Large Stones, Wetness	Severe Large Stones Wetness	Severe Large Stones, Frost Action	Severe Large Stones, Wetness
PbA** Paxton fine sandy loam, 0-3% slopes	Hardpan	Severe Slow Percolation	Moderate Wetness	Moderate Frost Action Wetness	Slight

LAUREL LANE PROPERTY - COLUMBIA

SOILS AND THEIR LIMITATIONS FOR CERTAIN LAND USES

Map Symbol and Soils Series	Principal Limiting Factor	Septic Tank Leaching Fields	Dwellings with Basements	Roads and Streets	Lawns and Landscaping
PbB** Paxton fine sandy loam, 3-8% slopes	Hardpan	Severe Slow Percolation	Moderate Wetness	Moderate Frost Action, Wetness	Slight
SxB Sutton very stony fine sandy loam, 3-15% slopes	Hardpan Large Stones	Severe Slow Percolation	Severe Wetness	Moderate Large Stones	Moderate Large Stones
WzC Woodbridge very stony fine sandy loam, 3-15% slopes	Hardpan	Severe Slow Percolation	Severe Wetness	Severe Frost Action	Severe Large Stones

* Inland Wetlands as defined by P.A. 155 as amended

** Prime Farmlands as defined by USDA National Cooperative Soil Survey

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.

About the Team

The Eastern Connecticut Environmental Review Team (ERT) is a group of professionals in environmental fields drawn together from a variety of federal, state, and regional agencies. Specialists on the Team include geologists, biologists, foresters, climatologists, soil scientists, landscape architects, archeologists, recreation specialists, engineers and planners. The ERT operates with state funding under the supervision of the Eastern Connecticut Resource Conservation and Development (RC&D) Area.

The Team is available as a public service at no cost to Connecticut towns.

PURPOSE OF THE TEAM

The Environmental Review Team is available to help towns and developers in the review of sites proposed for major land use activities. To date, the ERT has been involved in reviewing a wide range of projects including subdivisions, sanitary landfills, commercial and industrial developments, sand and gravel operations, elderly housing, recreation/open space projects, watershed studies and resource inventories.

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

REQUESTING A REVIEW

Environmental reviews may be requested by the chief elected officials of a municipality or the chairman of town commissions such as planning and zoning, conservation, inland wetlands, parks and recreation or economic development. Requests should be directed to the Chairman of your local Soil and Water Conservation District. This request letter should include a summary of the proposed project, a location map of the project site, written permission from the landowner allowing the Team to enter the property for purposes of review, and a statement identifying the specific areas of concern the Team should address. When this request is approved by the local Soil and Water Conservation District and the Eastern Connecticut RC&D Executive Council, the Team will undertake the review on a priority basis.

For additional information regarding the Environmental Review Team, please contact Jeanne Shelburn (889-2324), Environmental Review Team Coordinator, Eastern Connecticut RC&D Area, 139 Boswell Avenue, Norwich, Connecticut 06360.