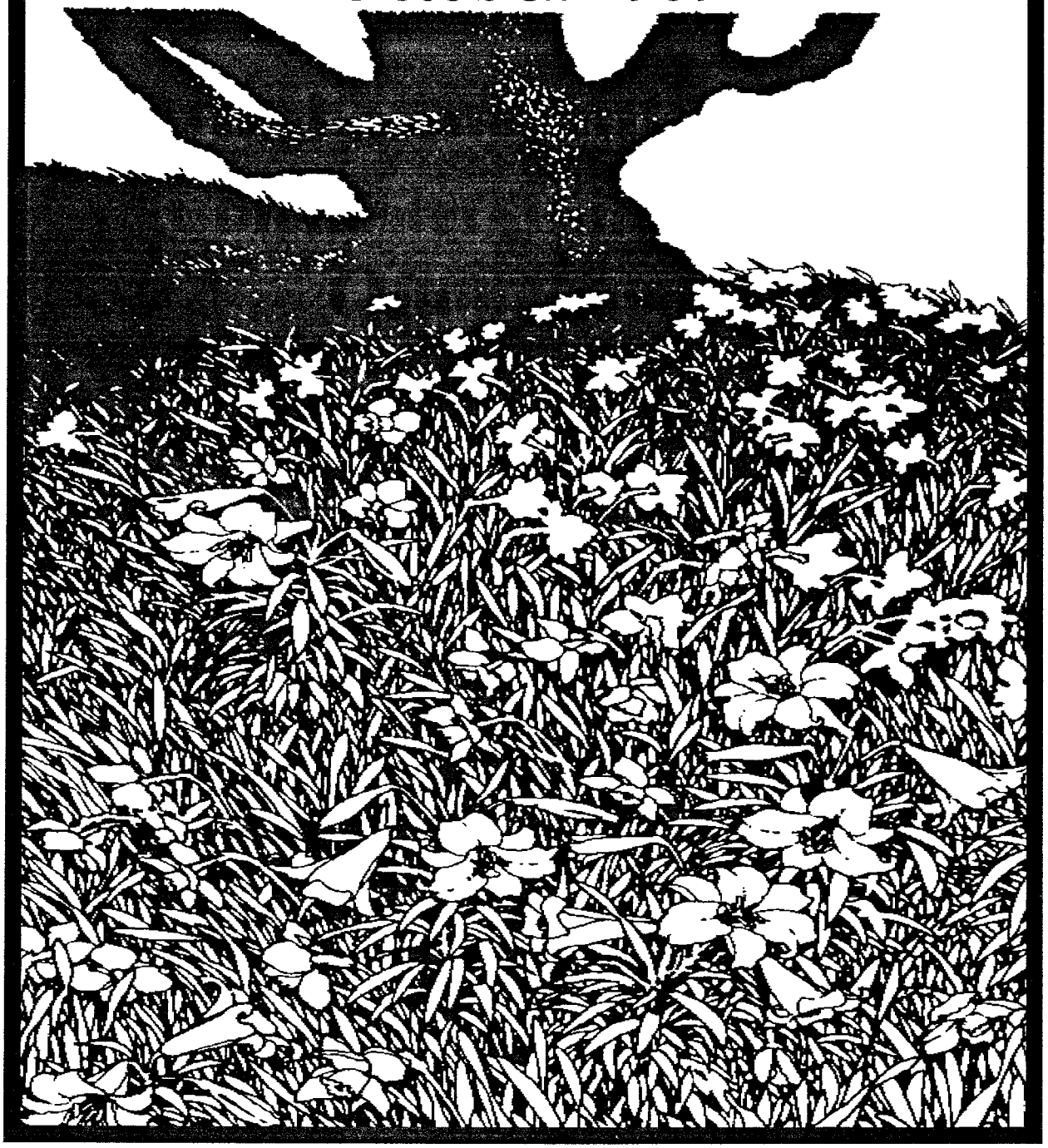
South Farms Subdivision

Colchester, Connecticut

October 1989



EASTERN CONNECTICUT
ENVIRONMENTAL REVIEW TEAM REPORT

Eastern Connecticut Resource Conservation and Development Area, Inc.

South Farms Subdivision
Colchester, Connecticut

Review Date: July 27, 1989

Report Date: October 1989

EASTERN CONNECTICUT
RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.
Eastern Connecticut Environmental Review Team
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ENVIRONMENTAL REVIEW TEAM REPORT
ON

SOUTH FARMS SUBDIVISION
COLCHESTER, CONNECTICUT

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

The ERT met and field checked the site on Thursday, July 27, 1989. Team members participating on this review included:

Patrice D'Ovidio	**Soil Conservationist**	**USDA-Soil Conservation Service**
Laura McNamera	**Environmental Analyst**	**DEP - Water Resources Unit**
Charles Phillips	**Fisheries Biologist**	**DEP - Eastern District**
Elaine Sych	**ERT Coordinator**	**Eastern CT RC & D Area, Inc.**
Bill Warzecha	**Geologist/Sanitarian**	**DEP - Natural Resources Center**

Prior to the review day, each Team member received a summary of the proposed project, a list of the town's concerns, a location map, a topographic map, a soils map, a key plan map and various supporting documents. During the field review the Team members were given plans, a soils report and environmental assessment reports. The Team met with, and were accompanied by members of the Colchester Conservation Commission and the applicant's engineers and environmental consultant. Following the review, reports from each Team member were submitted to the ERT Coordinator for compilation and editing into this final report.

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

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

If you require additional information, please contact:

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1. Location, Land-Use and Zoning

The site is about 172 acres in size and is located between Routes 85 and 354 in the southeast corner of town. It abuts McDonald Road on the west, Mill Lane (a.k.a. Piekarz Road) on the north and private, undeveloped land on the east and south. A review of recent air photos indicates that low-density residential and agricultural land uses characterize the area. The site itself has an agricultural past which is shown by a review of air photos for the area that date back to 1934. Open farm fields and an orchard, probably apple, are visible on the site in the 1934 air photo. Changes in land use on the site and in it's vicinity include a decrease in actively farmed acreage and an increase in forested acreage. Also, there has been an increase in residential density.

The entire site is located in a R-60 zone, which allows single family residences on lots of 60,000 square feet or 1 1/2 acres. Each lot is to be served by individual on-site septic systems and wells. The interior road system for the subdivision is comprised of Blueberry Drive and Winterberry Drive which will connect McDonald Road to Mill Lane. In addition, Spice Bush Lane, a cul-de-sac, will serve several lots in the eastern parts.

LOCATION MAP

Scale 1" = 2000'

Approximate Site

2. Topography

Overall, the land surface slopes eastward at about 5% from McDonald Road. Steeper terrain (10% or greater) occurs at the southern limits.

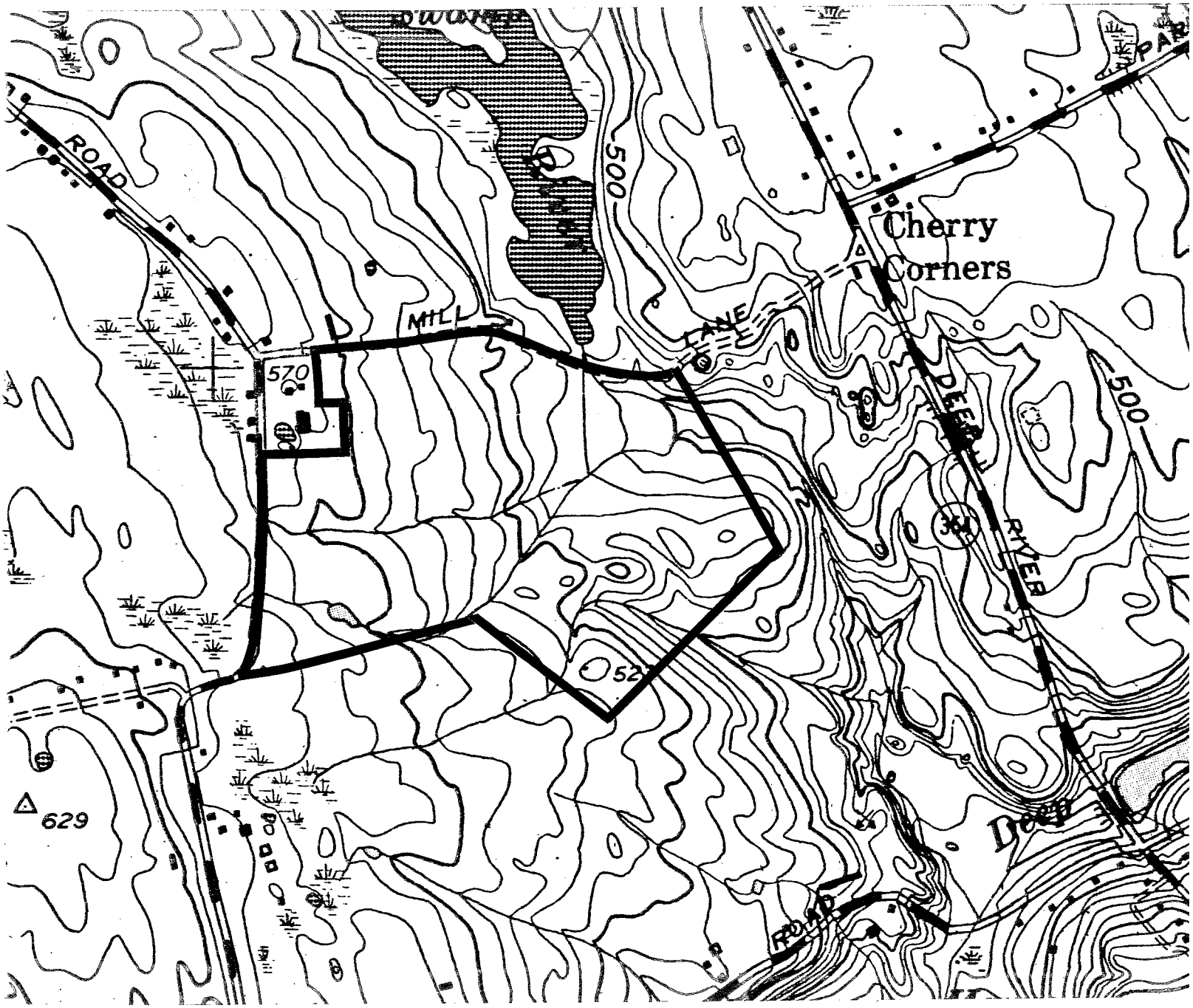
Several streamcourses and their respective wetlands, that in general flow easterly through the site, are tributary to Deep River. Deep River which flows through the northeast corner of the site feeds Deep River Reservoir, a public water supply reservoir owned and operated by the Norwich Water Department.

The areas between the streamcourses and their accompanying wetlands consists of upland terrain that is relatively level.

TOPOGRAPHIC MAP

Scale 1" = 1000'

Approximate Site Boundary



3. Geology

The subdivision site is underlain by: **(1)** glacially deposited till; and **(2)** bedrock. In addition there may be some small patches of stratified drift (sand and gravel) in the northern parts. They are also glacially derived sediments. The till consists of sediment that was deposited directly from glacier ice. It consists of varying portions of sand, silt, gravel, clay and boulders. The till covering the site is very stony. Particles of different sizes are generally mixed together in a complex fashion.

According to the Soil Survey of New London County the texture of the till in the western parts is silty and medium to tightly compacted. The compact zone is encountered below the weathered and rooted surficial soil zone (1.5 - 3 feet below ground surface). Above the compact soil zone, the texture of soil is generally more permeable. The compact variety of till, often called "hardpan" is characterized by seasonally high water tables, strong soil mottling (stained soil that identifies a historic or existing ground water table) and slow percolation rates. These soils are identified as WxB, WyB (Woodbridge soils) on the accompanying soils map.

In the eastern half of the site, the texture of the till is sandy, very stony and loose, and lacks a "hardpan" layer. These soils are mapped as CrD (Charlton- Hollis soils) and CcC (Canton and Charlton soils). The bedrock surface is usually at or close to the ground surface in the areas covered by CrD soils.

Patches of stratified, gravelly sands, deposited by glacial meltwater overlie till and bedrock in the northern parts. These deposits are thin (less than 10 feet) and cover small areas.

Based on a site plan made available to Team members, approximately 28.5% of the site is covered by inland-wetland soils. The latter figure also includes the seasonal wetland acreage. Regulated soils mostly parallel the streamcourses on the site and consist of Rn soils (Ridgebury, Leciester and Whitman extremely stony, fine sandy loam) and Rd soils (Ridgebury fine

sandy loam). One notable exception is the broad wetland in the northeast corner, which comprises decayed organic materials (peat and muck) mixed with minor amounts of sand, silt, and clay. The latter soils are depicted as Aa (Adrian and Palms muck) on the soils map. It should be noted that the Team's geologist did not differentiate between wetlands and seasonal wetlands as shown on the plan, but considered them all to be regulated areas by State statute (please refer to **Wetland Review** section).

Bedrock is exposed on the site on Lot 28, in the open space area east of Lots 26-28 and between Lots 39 and 40 and the wetland area proposed for open space. It was also encountered in numerous deep test holes excavated on the site for subsurface sewage disposal exploration. The shallowest depths, ranging between 2.5 feet and 5 feet were encountered in the central, northcentral and southern parts of the site. The bedrock consists of the crystalline Brimfield Schist, a gray, rusty weathering medium- to coarse-grained, interlayered schist and gneiss. It will serve as the major aquifer to domestic wells drilled in the subdivision.

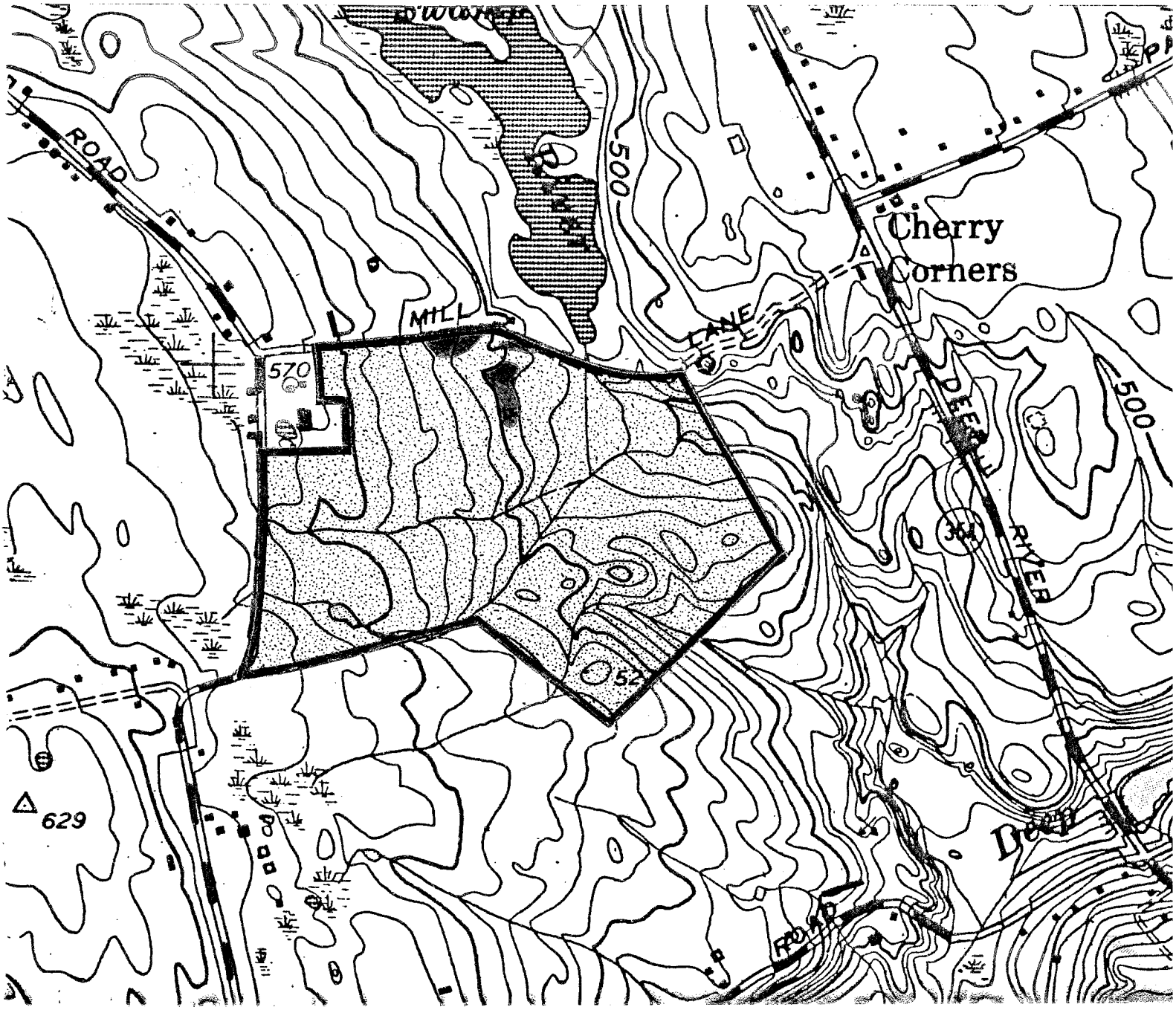
GEOLOGIC MAP

Scale 1" = 1000'

Stratified Drift

Till

*Entire site underlain by Brimfield Schist



4. Soil Resources

According to the soil survey, there are a variety of soil types found on this piece of property. However, Woodbridge dominates the western half, while Canton-Charlton is predominate in the eastern portion. Woodbridge soils tend to have a seasonal high water table. Runoff and permeability is moderate. The major limiting factor to development is the slow permeability in the substratum. Curtain drains and engineered septic systems are usually required.

The Canton-Charleton complex soils are usually well drained and do not need engineered septic systems. However, run off is rapid due to slope and erosion and sediment control measures are absolutely necessary. Stoniness and steepness of slope pose the greatest problems to development.

There is considerable amount of wetland soils on the property as well as areas classified as wetlands by other than soil type. Many towns reserve the right to regulate areas of hydrologic importance regardless of soil type. This office supports protection of areas that serve a hydrologic function, even if only at intermittent or seasonal times.

It is recommended that for a project of this size that it should be phased. A logical division for each phase would be the five small communities of 12 houses each as described in the wetlands considerations portion of the narrative. Each phase should be completely stabilized before proceeding to the next phase of the project.

In reference to the General Notes on sheet NI-37 of the plan, the following comments are offered:

1) The limits of land disturbance should be outlined on the house lot plans or on a "typical" house lot detail. Approximately 25 - 35 feet around the building is acceptable.

2) The maintenance program for all sediment and erosion control devices is described in the Connecticut Guidelines. Chapter 7. The complete maintenance plan should be outlined in the notes.

3) Disturbed areas and stockpiled areas shall be seeded and ringed with sediment barriers within 15 days of formation as described in the Connecticut Guidelines, Chapters 6 and 7. Other control measures should be described in the notes.

4) Silt fences are to be used in areas that will have prolonged exposure. Hay bales are to be used as a temporary barrier for no longer than 60 days. The timetable for land grading and exposure for the project site should be outlined for the town and from this a determination can be made as to the type of barrier that would best suit that site.

5) A schedule of planned activities shall be submitted to the town prior to approval of the sediment and erosion plan.

6) The name of the soil scientist who delineated the wetlands boundary was omitted from the plan.

7) The total number of wetlands areas to be disturbed and/or filled should be included in the plan narrative. This would include those disturbed areas described as intermittent wetland areas. Complete details of construction activities in wetlands area should be submitted to the town. Provisions should be made to mitigate disturbances to wetland areas.

8) Chapters 6 and 7 of the Connecticut Guidelines gives complete details of care and protection of valuable vegetation. The necessary procedures should be outlined on the site plan for easy on-site reference.

9) Provisions are described to protect roadbeds from fluctuating water levels, however, soil test pits should be installed wherever possible to predetermine problem areas in the line of the roadbed.

10) Drainage calculations were not submitted to the New London County SWCD and SCS office for review. The New London County Soil and Water Conservation District with assistance from the Soil Conservation Service is available to review TR-55 stormwater drainage calculations at the town's request.

11) Sediment and erosion control barriers are not shown on the site plan. The location details as well as a typical house lot sketch would be helpful in review of the sediment and erosion plan.

SOILS

Scale 1" = 1320'

SOILS DESCRIPTIONS

Aa - Adrian and Palms mucks

These nearly level, very poorly drained soils are in pockets and depressions of stream terraces, outwash plains, and glacial till uplands. Slopes range from 0 to 2 percent. Adrian soils have a high water table which is at or near the surface for most of the year. Permeability is moderately rapid in the organic layers and rapid in the substratum. Palms soils have a high water table which is at or near the surface for most of the year. Permeability is moderately rapid in the organic layers and moderately slow in the substratum. The available water capacity is high for these soils. Runoff is very slow or ponded. These soils are strongly acid through slightly acid. These soils are not suited to cultivate crops. These soils are suited to trees. Windthrow is common because of shallow rooting depth above the water table. These soils are poorly suited to community development.

These soils are in capability subclass VIw.

CcC - Canton and Charlton very stony fine sandy loams, 8 - 15 percent slopes

These sloping, well drained soils are on glacial till upland hills, plains, and ridges. Stones and boulders cover 1 - 8 percent of the surface. Permeability of the Canton soil is moderately rapid in the surface layer and subsoil and rapid in the substratum. Permeability of the Charlton soil is moderate or moderately rapid. The available water capacity of these soils is moderate. Runoff is rapid. These soils warm up and dry out rapidly in the spring. It is strongly acid or medium acid. These soils are not suited to cultivated crops. These soils are suited to trees. Steepness of slope is a major limiting factor for community development.

These soils are in capability subclass VIs.

CrD - Charlton-Hollis fine sandy loams, very rocky, 15 - 45 percent slopes

This moderately steep to steep complex consists of somewhat excessively drained and well drained soils on glacial till uplands. Rock outcrops cover up to 10 percent of the surface. Stones and boulders cover 1 - 8 percent of the surface. Permeability of the Charlton soil is moderate or moderately rapid, the available water capacity is moderate. Permeability of the Hollis soil is moderate or moderately rapid above the bedrock, the available water capacity is low. Runoff of these soils is rapid or very rapid. These soils warm up and dry out rapidly in the spring. They are strongly acid or medium acid. These soils are not suited to cultivated crops. The Hollis soil has a shallow rooting depth and is droughty. These soils are suited to trees. Windthrow is common on the Hollis soil because of the shallow rooting depth. The major limiting factors for community development are steepness of slope, shallow depth to bedrock, and rock outcrops.

These soils are in capability subclass VIIs.

SOILS DESCRIPTIONS

Ln - Limerick Variant silt loam

This nearly level, poorly drained soil is on flood plains along major rivers and streams. The Limerick Variant soil has a seasonal high water table at a depth of about 6 inches. It is subject to frequent flooding. Permeability is moderate in the surface layer and subsoil and rapid or very rapid in the substratum. The available water capacity is high. It warms up and dries out slowly in the spring. It is strongly acid in the upper part of the soil and strongly acid through slightly acid in the lower part; it is medium acid or slightly acid within a depth of 40 inches. This soil is suited to cultivated crops. Wetness and flooding are the major limitations, but this soil is seldom flooded during the growing season. The hazard of erosion is slight. This soil is suited to trees. Windthrow is common because of the shallow rooting depth above the high water table. This soil is poorly suited to community development.

This soil is in capability subclass IIIw.

MyC - Merrimac sandy loam, 8 - 15 percent slopes

This sloping, somewhat excessively drained soil is on stream terraces, outwash plains, kames, and eskers. Permeability of the Merrimac soil is moderately rapid in the surface layer and subsoil and rapid in the substratum. The available water capacity is moderate. Runoff is rapid. Merrimac soil warms up and dries out rapidly in the spring. Unless limed, it is strongly acid or medium acid. This soil is suited to cultivated crops. The hazard of erosion is severe. The soil is droughty during the summer. This soil is suited to trees.

This soil is in capability subclass IIIe.

Rd - Ridgebury fine sandy loam

This nearly level, poorly drained soil is on drumloidal, glacial till, upland landforms. The Ridgebury soil has a seasonal high water table at a depth of about 6 inches. Permeability is moderate or moderately rapid in the surface layer and subsoil and slow or very slow in the substratum. The available water capacity is moderate. Runoff is very slow or slow. Ridgebury soil warms up and dries out slowly in the spring. Unless limed, it is strongly acid through slightly acid. This soil is suited to cultivated crops. The hazard of erosion is slight. This soil is suited to trees. Windthrow is common because of the shallow rooting depth above the high water table. The major limiting factors for community development are the slow or very slow permeability in the substratum and the seasonal high water table.

This soil is in capability subclass IIIw.

SOILS DESCRIPTIONS

Rn - Ridgebury, Leicester, and Whitman extremely stony fine sandy loams

These nearly level, poorly drained and very poorly drained soils are in drainageways and depressions of glacial till upland hills, ridges, plains, and drumloidal landforms. Stones and boulders cover 8 - 25 percent of the surface. The Ridgebury and Leicester soils have a seasonal high water table at a depth of about 6 inches. The Whitman soil has a high water table at or near the surface for most of the year. Permeability of Ridgebury and Whitman soils is moderate or moderately rapid in the surface layer and subsoil and slow or very slow in the substratum. The Ridgebury and Whitman soils are strongly acid through slightly acid. Permeability of Leicester soil is moderate or moderately rapid, it is very strongly acid through medium acid. Runoff for the Ridgebury and Leicester soil is very slow or slow. Whitman soil runoff is very slow, or the soil is ponded. The available water capacity for these soils is moderate. These soils are not suited to cultivated crops. The erosion hazard is slight. These soils are suited to trees. Windthrow is common because of the shallow rooting depth above the high water table. The major limiting factors for community development are the high water table and the slow or very slow permeability in the substratum.

These soils are in capability subclass VIIs.

Sg - Sudbury sandy loam

This nearly level to gently sloping, moderately well drained soil is on outwash plains and stream terraces. The Sudbury soil has a seasonal high water table at a depth of about 18 inches. Permeability is moderately rapid in the surface layer and subsoil and rapid in the substratum. The available water capacity is moderate. Runoff is slow or medium. Sudbury soil warms up and dries out slowly in the spring. Unless limed, it is strongly acid or medium acid. This soil is well suited to cultivated crops. The hazard of erosion is slight. This soil is suited to trees. The major limiting factor for community development is the seasonal high water table.

This soil is in capability subclass IIw.

SwB - Sutton very stony fine sandy loam, 0 - 8 percent slopes

This nearly level to gently sloping, moderately well drained soil is on upland glacial till plains, hills, and ridges. Stones and boulders cover 1 - 8 percent of the surface. The Sutton soil has a seasonal high water table at a depth of about 18 inches. Permeability is moderate or moderately rapid. The available water capacity is moderate. Runoff is slow or medium. Sutton soil warms up and dries out slowly in the spring. It is strongly acid or medium acid in the surface layer and subsoil and strongly acid through slightly acid in the substratum. This soil is not suited to cultivated crops. The hazard of erosion is slight or moderate. This soil is suited to trees. The major limiting factor for community development is the seasonal high water table.

This soil is in capability subclass VIs.

SOILS DESCRIPTIONS

Wd - Walpole fine sandy loam

This nearly level, poorly drained soil is on stream terraces and outwash plains. The Walpole soil has a seasonal high water table at a depth of about 6 inches. Permeability is moderately rapid in the surface layer and subsoil and rapid or very rapid in the substratum. The available water capacity is moderate. Runoff is slow. Walpole soil warms up and dries out slowly in the spring. It is very strongly acid or medium acid. This soil is suited to cultivated crops. The hazard of erosion is slight. This soil is suited to trees. Windthrow is common because of the shallow rooting depth above the high water table. The major limiting factor for community development is the seasonal high water table.

This soil is in capability subclass IIIw.

WxA - Woodbridge fine sandy loam, 0 - 3 percent slopes

This nearly level, moderately well drained soil is on drumloidal, glacial till, upland landforms. The Woodbridge soil has a seasonal high water table at a depth of about 18 inches. Permeability is moderate in the surface layer and subsoil and slow or very slow in the substratum. The available water capacity is moderate. Runoff is slow. This Woodbridge soil warms up and dries out slowly in the spring. Unless limed, it is strongly acid or medium acid in the surface layer and subsoil and strongly acid through slightly acid in the substratum. This soil is well suited to cultivated crops. The hazard of erosion is slight. This soil is suited to trees. The major limiting factors for community development are the seasonal high water table and the slow or very slow permeability in the substratum.

This soil is in capability subclass IIw.

WxB - Woodbridge fine sandy loam, 3 - 8 percent slopes

This gently sloping, moderately well drained soil is on drumloidal, glacial till, upland landforms. The Woodbridge soil has a seasonal high water table at a depth of about 18 inches. It has moderate permeability in the surface layer and subsoil and slow or very slow permeability in the substratum. The available water capacity is moderate. Runoff is medium. This soil warms up and dries out slowly in the spring. Unless limed, it is strongly acid or medium acid in the surface layer and subsoil and strongly acid through slightly acid in the substratum. This soil is well suited to cultivated crops. Artificial drainage helps to dry the soil earlier in the spring. The hazard of erosion is moderate. This soil is suited to trees. The major limiting factors for community development are the seasonal high water table and slow or very slow permeability in the substratum.

This soil is in capability subclass IIw.

SOILS DESCRIPTIONS

WyB - Woodbridge very stony fine sandy loam, 0 - 8 percent slopes

This nearly level to gently sloping, moderately well drained soil is on drumloidal, glacial till, upland landforms. Stones and boulders cover 1 - 8 percent of the surface. The Woodbridge soil has a seasonal high water table at a depth of about 18 inches. Permeability is moderate in the surface layer and subsoil and slow or very slow in the substratum. The available water capacity is moderate. Runoff is medium. This Woodbridge soil warms up and dries out slowly in the spring. It is strongly acid or medium acid in the surface layer and subsoil and strongly acid through slightly acid in the substratum. This soil is not suited to cultivated crops. The hazard of erosion is moderate. This soil is suited to trees. The major limiting factors for community development are the seasonal high water table and the slow or very slow permeability in the substratum.

This soil is in capability subclass VIs.

5. Hydrology

The major drainage features on the site include several, unnamed stream corridors, all of which flow generally eastward to Deep River and a man-made pond situated between Lot 1 and 3 and 8-10. The streamcourses flow into Deep River east of the site. Deep River flows through the northeast corner of the site. From the Deep River's closest point to Marvin Road (north of Harvey Pond) it drains an area of about 1937 acres or about 3.02 square miles. The entire parcel is encompassed by the watershed and therefore represents about 9% of the watershed area. This watershed area is characterized by low density residential and agricultural uses and contains two large swamps (Dutton and McDonald Swamp). In addition, there are numerous small wetland areas.

Development of the site for residential uses will lead to increases in the amount of runoff shed from the site. The amount of increase will depend upon the extent of the finally approved plan, the impervious surfaces created and amount of vegetation removed or preserved.

In order to maintain post-development flows at pre-development flows, the applicant's engineer is proposing a retention basin near the confluence of two streamcourses in the central part of the site. Details for the retention basin were not available to Team members on the review day (drainage calculations were available). Based on natural drainage conditions the retention basin will capture slightly less than half of the lots in the subdivision. The applicant's engineer should explain how post-development flows will be reduced to below pre-development flows under this scenario. Also, based on test hole data near the proposed retention basin, it appears that groundwater and mottling (an indication of seasonally high water conditions) are close to the ground surface. The concern here is that the retention basin may fill up with groundwater, thereby reducing its capacity to handle post-development flows. This potential problem should be investigated.

Although drainage and retention pond computations were made available to Team members, it is recommended that the applicant's engineer

also provide a narrative report and summary table for Commission members. The report should demonstrate that no adverse impacts such as flood or erosion (streambank) are anticipated from post-development flows. Careful examination for all downstream culverts is warranted.

Because of its location, it seems likely that the retention basin will need to be maintained (i.e., sediment removed) at least once a year. Access road(s) for maintenance vehicles to the retention basin should be shown on the plan.

A detailed soil erosion and sediment control has been developed for the project. The installation of grassed swales, energy dissipators and retention pond which can serve a sediment retention function, will help to minimize potential erosion and siltation problems on and off-site. This is a very important component of the site plan because of the site's location in a public water supply reservoir watershed.

Areas of special concern include roadway and driveway crossings of watercourses and their respective wetlands, storm drain outlet areas, and areas where road and/or driveway grading may impact wetlands on the site. If wetland disturbances, such as road crossings, etc. are permitted, they should be done during the dry time of year and provision for sediment and erosion control be made. Careful monitoring and maintenance of all control measures will be needed in order to maintain existing water quality conditions.

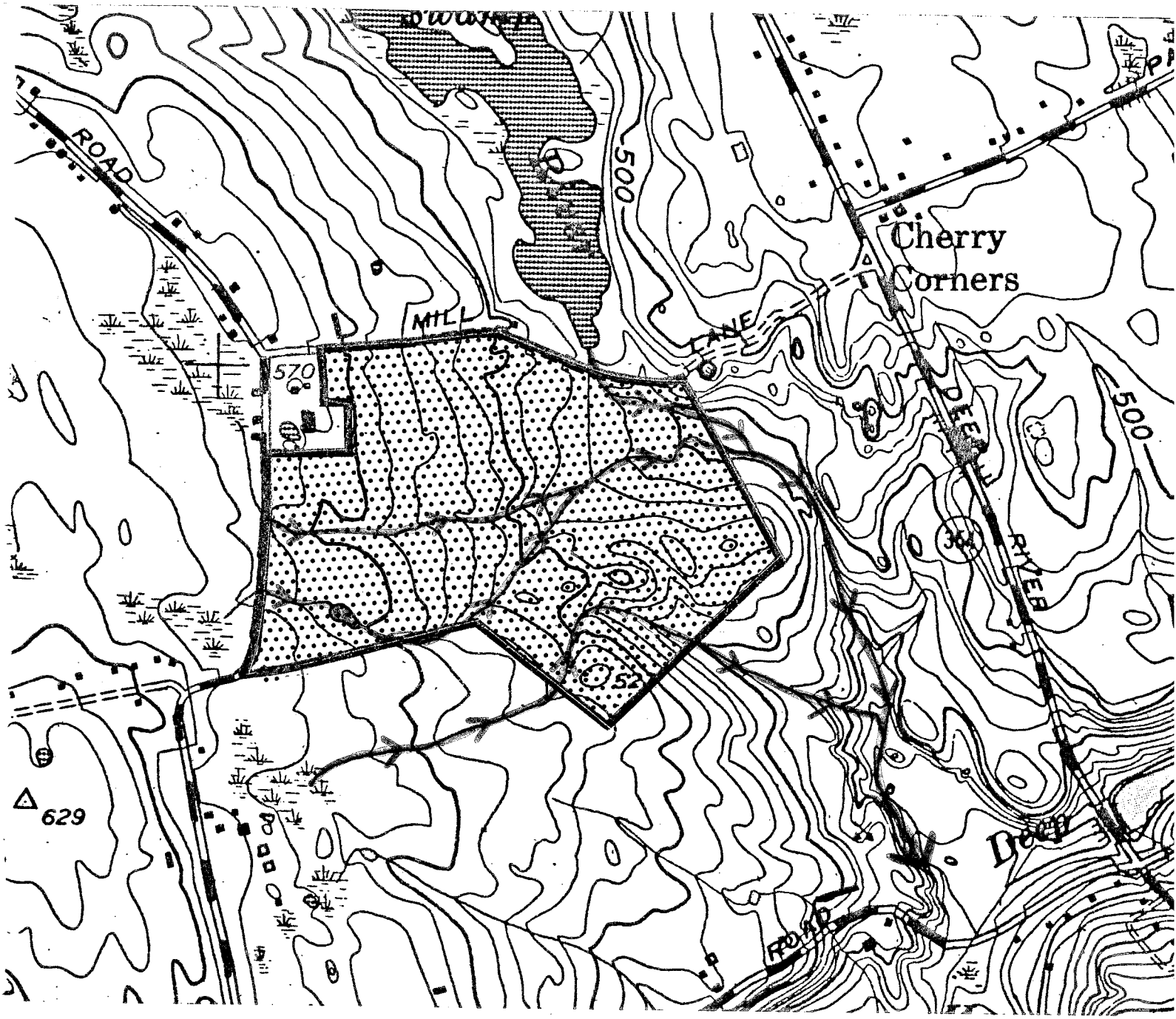
As requested by the Norwich Department of Public Utilities, underground fuel storage tanks should not be buried on the site, since they pose a great risk to ground water and surface water contamination.

WATERSHED BOUNDARY MAP

Scale 1" = 1000'

Entire site lies within the Deep River watershed area and is tributary to Deep River Reservoir, and as a result the site lieswithin a GAA area

Watercourses showing direction of flow



6. Wetland Review

During the ERT field review meeting it came to the Team's attention that there had been some disagreement between the applicant/the applicant's consultants and the Colchester Conservation and Inland Wetlands Commission pertaining as to what constituted a regulated area. The governing statutes are Connecticut General Statutes 22a-36 through 22a 45, inclusive. These sections of the statutes are known as **The Inland Wetlands and Watercourses Act**. Therefore, the regulated area encompasses Section 22a-38(15) "Wetlands, meaning land, including submerged land ... which consists of any of the soil types designated as poorly drained, very poorly drained, alluvial and flood plain ... , and Section 22a-38(18) "Watercourses" meaning rivers, streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs and all other bodies of water, natural or artificial, public or private, ... The watercourses definition is interpreted to include intermittent watercourses, a waterway which has flow for a minimum of two days after an average rainstorm event. Wetlands and watercourses (intermittent or otherwise) are provided the same protections, and are subject to the same courses of regulation under **The Inland Wetlands and Watercourses Act**.

With the inclusion of the areas delineated as seasonal wetlands, the wetlands and watercourses appear to be adequately delineated on plan sheet 1-1 titled "Wetland Protective Space Plan, South Farms" dated 8/1/89, revised 7/25/89.

The first impact to regulated areas encountered is due to the proximity of Blueberry Drive to the wetland system located to the north of the proposed road. The edge of the 50 foot road right-of-way extends into the wetland. There is a stone wall which approximately parallels the wetland system providing a natural buffer edge for the wetland system. If the edge of the 50 foot road right-of-way is kept a minimum of 25 feet from the existing stone wall, this natural feature will be preserved, and the wetland will be protected against the short term impacts of the construction of the road, and long term impacts such as future road repairs/grading and incidental impacts related to human debris.

The house on Lot 13 would be sandwiched between two fingers of a swamp, and the pipes for the septic system would cross the swamp to the septic field. Construction on this lot could lead to the eventual complete destruction of this wetland area due to impacts during the construction, clearing for access, grading etc. and secondary impacts related to occupancy of the house. The adjacent wetland areas would benefit from the inclusion of this lot into open space.

All wetland and watercourse crossings should have a culvert or an equalizer pipe, unless the applicant can show that such a structure is not necessary, or that other alternatives would provide greater benefits.

The cul-de-sac and the portion of the road leading to the cul-de-sac on Spicebush Drive could be shifted to the east, thus minimizing, or eliminating impacts to the wetland system to the west of the road.

Based on the wetland protective spaces plan made available to Team members numerous road crossings (including driveways) of the wetland are proposed. It is estimated that .81 acres of wetlands will be disturbed by this activity. Road grading may also impact in a few areas. A review of the plans indicates that the proposed wetland driveway crossing on Lot 18 could be minimized by providing access from the driveway serving Lot 7. Also every effort should be to shift roadways away from wetlands so that grading does not push fill material into the wetlands.

Wetland road crossings can be feasible, provided they are properly engineered. If the road/driveway crossings are approved, provisions should be made for removing unstable material beneath the roadbed, backfilling with a permeable road base fill material, and installing culverts as necessary. When crossing any wetland, the road should be at least 1.5 and preferably 2 feet above the surface elevation of the wetlands. This will allow for better drainage of the roads. It will also decrease the frost heaving and should be done at a dry time of the year. Provisions should include an effective erosion and sediment control plan.

7. Water Supply

The water supply for each lot in the proposed subdivision would be derived from drilled (6-inch diameter) wells with steel pipe cased firmly into solid rock and completed as open boreholes in the underlying metamorphic bedrock. In general, the casing should extend at least 5 feet into the bedrock, but may be more especially if weathered and rotten bedrock (a caving zone) is encountered.

As noted in the **Geology** section, the bedrock underlying the site consists of interlayered gneisses and schists. The composition and texture of the rocks will vary considerably across the site and with depth. Gneisses are commonly characterized by the parallel orientation of the mineral grain with massive to platy appearance. Gneissic rock responds to movements and deformation stresses within the earth's crust by fracturing and forming distinct open joints and fractures. On the other hand, schists are characterized by parallel orientation and abundance of mica minerals and by the ease with which the rock parts into thin layers. Unlike the gneisses, the schist rock responds to geologic stresses by slipping and folding along the layered planes. The openings that develop in schist are generally small and discontinuous. As a result, studies have shown that the chances for obtaining water from bedrock wells that tap gneissic rock are slightly more productive in terms of yield than schist rock.

A typical well depth for a bedrock well ranges from 150 to 300 feet. Although bedrock is not known to be a prolific aquifer, Water Resources Bulletin No. 15 (Lower Thames and Southeastern Coastal River Basin) indicates that of 274 wells surveyed which tap metamorphic bedrock, 90% yielded 3 gallons per minute or more. Generally speaking, a yield of 2 -3 gallons per minute would be equivalent to 4320 gallons of water for a 24-hour period.

Because lot sizes are relatively large (1.5 acres or more) and because a high portion (about 95%) of the renovated domestic wastewater will percolate downward to recharge the underlying bedrock via on-site sewage disposal

systems, the annual groundwater usage for the site will not exceed annual groundwater recharge. As long as the underlying bedrock is fractured and capable of transmitting water to drilled wells, the bedrock aquifer can be expected to adequately meet the water demands of the proposed subdivision. Every effort should be made to separate neighboring wells by distances of 200 feet. If this can be accomplished, each well would have a 1 acre of recharge per well or about 595 gallons per day. It is estimated that a family of five would use about 375 gallons per day or 75 gallons per person per day. The latter assumes the recharge rate of about 8 inches per year for an upland till covered site.

In order to provide for the adequate protection of the bedrock aquifer, all wells will need to be properly installed in accordance with applicable State Public Health Code and Connecticut Well Drilling Board regulations. Additionally, the Town sanitarian will need to inspect and approve all well locations. The well location for each lot should be shown on the subdivision plan.

The natural quality of groundwater should be satisfactory, however, the Brimfield Schist that underlies the site is known to contain elevated iron, iron sulfides and manganese, which would tend to lower the overall quality. Additionally, the water may have a rotten egg odor that is produced by hydrogen sulfide. As a result, it seems reasonable to expect that suitable treatment filters will be necessary. As mentioned earlier, it appears that a fruit orchard may have existed in the north central parts. It might be wise to test a few wells in this area for pesticides.

According to the Water Quality Classification Map of Connecticut (Murphy, 1987) groundwater in the area of the site is classified as GAA, which means that it is presumed suitable for direct human consumption. Groundwater and surface waters are tributary to Deep River Reservoir, the Norwich principal public water supply reservoir.

8. Sewage Disposal

Extensive subsurface exploration of the subdivision site has been performed by R.P. Dimmock Associates under the direction of Colchester's sanitarian. This work involved 2-3 deep test holes per lot, which in general encountered topsoil, a weathered and rooted subsoil soil, and then till or stratified drift. As noted earlier the texture of till is variable throughout the site and deep test holes revealed both types; "hardpan" and non-compact variety. Many test holes were excavated to the bedrock surface which was decomposed in the upper parts in some places. Of the proposed 57 lots, depth to ledge is an important design constraint on 9 lots those being Lots 14-16, 24-28 and 44. Because of shallow ledge on Lot 44, it appears that more testing should be done on this lot before a permit is issued. The "burden of proof" should be on the applicant to demonstrate that the leaching field area can be improved for on-site sewage disposal. This means placing the proper fill material, compacting it, and testing it for on-site sewage disposal.

Groundwater and/or mottling was commonly noted, mostly within the "hardpan" layer but at higher elevations in some holes, indicating a widespread seasonal high water table on the site. It is considered likely the seasonal high water table is a perched water table due to the relatively low permeability of the "hardpan" layer.

The subsurface sewage disposal report prepared by R. P. Dimmock Associates indicates that conditions are suitable for on site sewage disposal, but that engineered septic systems would be required for each lot. No approval should be granted for the subdivision until the applicant can demonstrate that each of the proposed lots meets the minimum soil standards set forth in Section 19-13-B103e(a)(3) of the State's Public Health Code. The process should be a coordinated effort between the design engineer and the Town's certified sanitarian.

Based on the review of deep test hole information, most septic systems will need to be filled and raised at the most suitable location on the lot to protect it from the seasonally high water table condition. Consideration

should also be given to the installation of curtain drains. Curtain drains are located up gradient from the leaching system so that it intercepts the seasonal ground water table. As a result, ground water does not rise up into the leaching system and impair its hydraulic capacity. Curtain drains may be used in conjunction with building footing drains which protect the house basement from becoming wet.

Sewage disposal systems serving 11 lots are located 51 feet to 290 feet from the proposed dwelling. This appears to have been done to take advantage of better subsurface conditions. Because of this unique situation, long effluent distribution lines must be constructed in such a manner to exclude sewage from leaking out, especially in the areas of shallow to bedrock soils. (All homes will be served by bedrock wells.) Several cleanouts should be provided between the septic tank and leaching areas, and sufficient cover material over distribution lines and/or an adequate pitch so that sewage effluent does not freeze. Also, provisions should be made to prevent short-circuiting of effluent in the distribution boxes. If this occurs, equal distribution of all trenches may not occur and as a result the final trench may be over taxed causing pre-mature failure.

At the request of the Norwich Department of Public Utilities, the applicant has attempted to maintain a 100 foot separating distance between septic systems and wetland boundaries on the site. This was accomplished on all lots except 1, 7, 11, 13, 14 and 19-21 (8 lots total). A separating distance of 75 feet, the same distance required of domestic water supply wells yielding 10 gallons per minute or less, from any portion of a septic system, can be accomplished on 5 of the 8 lots. Since the 100 foot separating distance cannot be maintained on these lots, the Town may consider having the applicant conduct permeability testing of the soil on affected lots to determine whether or not the effluent will meet drinking water standards by the time it reaches the wetland boundary. Of special concern, will be the renovation of bacteria, viruses, phosphates and nitrates.

Since the entire site lies within a GAA area, a public water supply reservoir watershed, the Team's geologist has included with this section a copy of Section 19-13 B32. Sanitation of Watersheds, (a-i), which addresses the

protection of water quality from subsurface sewage disposal systems and storm drainage systems in public water supply watersheds.

Sec. 19-18-B32. Sanitation of watersheds. Unless specifically limited, the following regulations apply to land and watercourses tributary to a public water supply including both surface and groundwater sources.

(a) As used in this section, "sewage" shall have the meaning found in section 19-13-B20(a) of the public health code: "Toxic metals" shall be arsenic, barium, cadmium, chromium, lead, mercury, and silver, and the salts thereof; "high water mark" shall be the upper limit of any land area which water may cover, either standing, or flowing, at any time during the year; watershed shall mean land which drains by natural or man-made causes to a public drinking water supply intake.

(b) No sewage disposal system, cesspool, privy or other place for the deposit or storage of sewage shall be located within one hundred feet of the high water mark of any reservoir or within fifty feet of the high water mark of any stream, brook, or watercourse flowing into any reservoir used for drinking purposes.

(c) No sewage disposal system, cesspool, privy or other place for the deposit or storage of sewage shall be located on any watershed, unless such facility is so constructed that no portion of the contents can escape or be washed into the stream or reservoir.

(d) No sewage shall be discharged on the surface of the ground on any watershed.

(e) No stable, pig pen, chicken house or other structure where the excrement of animals or fowls is allowed to accumulate shall be located within one hundred feet of the high water mark of a reservoir or within fifty feet of the high water mark of any watercourse as above mentioned, and no such structure shall be located on any watershed unless provision is made in a manner acceptable to the commissioner of health services for preventing manure or other polluting materials from flowing or being washed into such waters.

(f) No toxic metals, gasoline, oil or any pesticide shall be disposed of as waste into any watercourse tributary to a public drinking water supply or to any ground water identified as supplying a public water supply well.

(g) Where fertilizer is identified as a significant contributing factor to nitrate nitrogen occurring in excess of 8 mg/l in a public water supply, fertilizer application shall be made only under current guidelines established by the commissioner of health in cooperation with the state commissioner of agriculture, the college of agriculture of the University of Connecticut and the Connecticut agricultural experiment station in order to prevent exceeding the maximum allowable limit in public drinking water of 10.0 mg/l for nitrate plus nitrate nitrogen.

(h) Where sodium occurs in excess of 15 mg/l in a public drinking water supply, no sodium chloride shall be used for maintenance of roads, driveways, or parking areas draining to that water supply except under application rates approved by the commissioner of health, designed to prevent sodium content of the public drinking water from exceeding 20 mg/l.

(i) The design of storm water drainage facilities shall be such as to minimize soil erosion and maximize absorption of pollutants by the soil. Storm water drain pipes, except for

crossing culverts, shall terminate at least one hundred feet from the edge of an established watercourse unless such termination is impractical, the discharge arrangement is so constructed as to dissipate the flow energy in a way that will minimize the possibility of soil erosion, and the commissioner of health finds that a discharge at a lesser distance is advantageous to stream quality. Special precautions shall be taken to protect stream quality during construction.

9. Fish Resources

The proposed South Farms Subdivision will be located on a gentle east facing slope in the Deep River Reservoir watershed. Deep River Reservoir is currently used by the City of Norwich as a water supply reservoir.

Of the flowages on the property, two are intermittent and two are marginally perennial. Surface waters of all watercourses on the property are classified by the Connecticut Department of Environmental Protection as "Class A". Designated uses for this water quality classification are as follows: potential drinking water supply, fish and wildlife habitat, recreational use, and agricultural and/or industrial supply.

Fish populations would be expected only during periods of moderate flow in the two perennial streams and as potential migrants in the stream draining the pond in the site's southwest corner. The confluence of the flowages draining the proposed development site occurs approximately one half mile from Deep River Reservoir. It would be this lower reach and the western end of the reservoir where fish populations would be expected that would be impacted most severely by careless development of the area.

The following impacts on local watercourses may be evidenced if the development is not carefully constructed:

1. Construction site soil erosion and sedimentation of the watershed through increased runoff from unvegetated areas - erosion and sedimentation due to construction has long been regarded as a major cause of stream degradation. In particular, silt deposition will:

* Reduce fish egg survival - adequate water flow, free of sediment particles is required for egg respiration and successful hatching.

* Reduce aquatic insect production - sediment free water is also required for successful aquatic insect egg respiration and hatching. Aquatic insects are

important food items in fish diets. Reduced insect levels will adversely effect fish growth and survival since excessive energy demands are required to locate preferred aquatic insects when populations levels are low.

* Reduce stream pool depth - pools provide cover, shelter, and resting areas for fish.

* Encourage the growth of rooted aquatic plants and promote filamentous algae growth in streams and reservoir - eroded soils contain plant as nitrates and phosphates. Although algae and aquatic plants require these nutrients for growth, most aquatic ecosystems contain limited amounts. Consequently, these nutrients act as fertilizers once they are introduced into aquatic habitats resulting in accelerated growth.

* Contribute to the depletion of oxygen - organic matter associated with soil particles is decomposed by micro organisms contributing to the depletion of oxygen in waters overlying sediments.

The Deep River Reservoir western end will act as a silt trap since the flow velocities through it will not move fine materials. Consequently, any damage effected by silt deposition could be long lasting.

2. Percolation of septic system leachate into watercourses and the reservoir - proposed septic systems would be potentially dangerous to the watershed. Seasonally high water tables could allow transport of leachate into perennial stream reaches below the development, potentially presenting a threat to fish and public health.

3. Transport of lawn fertilizer to the reservoir - runoff and leaching of nutrients from fertilizers could stimulate nuisance aquatic weed growth.

The impact of residential development on local aquatic resources can be minimized by implementing the following precautionary measures:

1. Maintain at the minimum a 75 foot open space buffer zone along

the edge of all wetland boundaries of intermittent flowages and a 100 foot open space buffer along the edge of all wetland boundaries of perennial streams - this buffer can be an effective mitigation measure at this development location. No construction and alteration of existing habitat should be allowed in this zone. Construction for the purpose of perpendicular crossing shall only take place in this zone. Research has shown that 100 foot buffer zones help to prevent damage to wetlands and stream ecosystems that support diverse fish and aquatic insect life (USFWS 1984;USFWS 1986;0DFW 1985).

2. Install and maintain proper erosion and sedimentation controls during construction such as silt fences, hay bales, and catch basins - regularly maintain all erosion controls.

3. Limit liming and fertilization of subdivision lawns - stress the use of low phosphate laundry detergents. These steps will partially mitigate the addition of nutrients to watercourses.

As proposed, this development has the potential to negatively impact a perennial tributary to the Deep River Reservoir. Careful and conscientious planning must be exercised by the developer and the town of Colchester to mitigate a myriad of potential impacts. If implemented, proper mitigation measures will preserve existing water quality and fish habitat. If development is environmentally inadequate, litigation from a neighboring community is possible.

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ABOUT THE TEAM

The Eastern Connecticut Environmental Review Team (ERT) is a group of professionals in environmental fields drawn together from a varety of federal, state and regional agencies. Specialists on the Team include geologists, biologists, foresters, soil specialists, engineers and planners. The ERT operates with state funding under the supervision of the Eastern Connecticut Resource Conservation and Development (RC&D) Area --- an 86 town region.

The services of the Team are 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, landfills, commercial and industrial developments, sand and gravel excavations, 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 official 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 and the ERT Coordinator. A request form should be completely filled out and should include the required materials. 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 and request forms regarding the Environmental Review Team please contact the ERT Coordinator: 203-345-3977, Eastern Connecticut RC&D Area, P.O. Box 70, Haddam, Connecticut 06438.