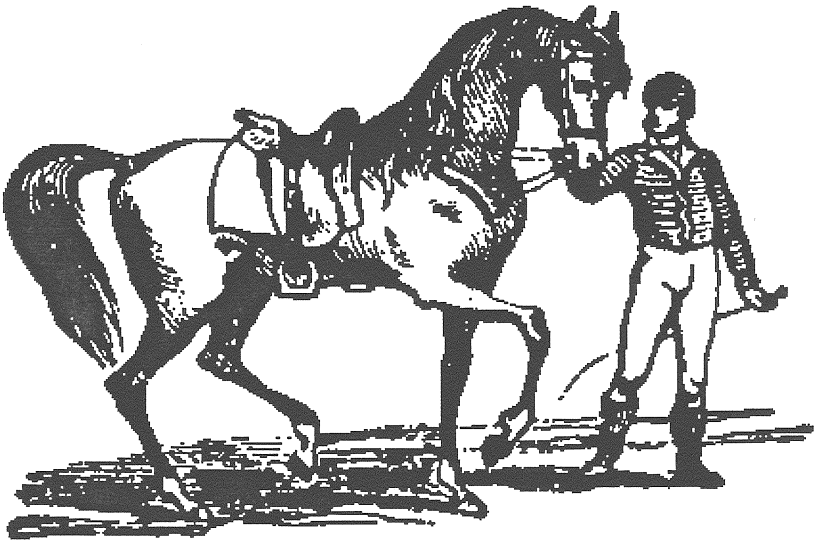
Greenbriar Riding Club Estates

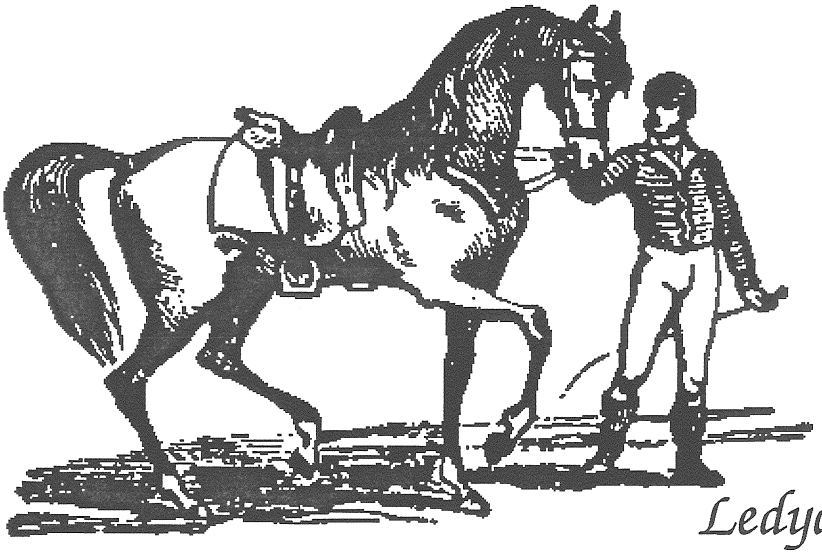
Ledyard, Connecticut



January 1991

EASTERN CONNECTICUT ENVIRONMENTAL REVIEW TEAM REPORT

EASTERN CONNECTICUT RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.



Greenbriar Riding Club Estates

Ledyard, Connecticut

REVIEW DATE: NOVEMBER 8, 1990

REPORT DATE: JANUARY 1991

Eastern Connecticut
Environmental Review Team

Eastern Connecticut Resource Conservation and Development Area, Inc.
P.O. Box 70, 1066 Saybrook Road
Haddam, Connecticut
(203) 345-3977

ENVIRONMENTAL REVIEW TEAM REPORT
ON

Greenbriar Riding Club Estates
Ledyard, Connecticut

This report is an outgrowth of a request from the Ledyard Inland Wetlands and Watercourses 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, November 8, 1990. Team members participating on this review included:

Patrice Beckwith	*Soil Conservationist* *USDA - Soil Conservation Service*
Nick Bellantoni	*State Archaeologist* *Office of State Archaeologist*
Carla Guerra	*Environmental Analyst* *DEP - Inland Water Resources Division*
Pete Merrill	*Forester* *DEP - Patchaug State Forest*
Nancy Murray	*Sr. Environmental Analyst* *DEP - NRC, Natural Diversity Data Base*
David Poirier	*Staff Archaeologist* *CT State Historical Commission*
Tom Seidel	*Regional Planner* *Southeastern CT Regional Planning Agency*
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, and a soils map. During the field review the Team members were given plans and additional information. The Team met with, and were accompanied by the Ledyard Inland Wetland Official, the Town Planner, a representative from the Ledyard Public Works Department, the developer and his engineer. 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 equestrian subdivision.

If you require additional information, please contact:

Elaine A. Sych
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1. Location, Project Description and Zoning

The approximately 119 acre site, which is wooded, is located in eastern Ledyard. It is bounded on the west by Shewville Road and wooded, mostly undeveloped land on the north, east and south. Several single-family homes are scattered along the north, northeast, and western boundary line. The proposed residential subdivision and equestrian facility would be serviced by a loop road that is accessed via Shewville Road. A ±950 foot long cul-de-sac is proposed off of the main loop road in the northern parts.

Present plans indicate the property will be divided into 36 building lots. Each lot will include a single-family home served by individual on-site sewage disposal system and town water supply mains via the Highland Water System. Although the parcel is located in an RU-60 zone, which allows single-family dwellings on 60,000 square foot (1.5 acres) lots, the applicant wishes to utilize a zoning format which allows clustering of homes on smaller lots. Reduction in lot sizes is accomplished by extending a public water supply line which eliminates the need for individual on-site wells and the minimum 75' foot sanitary radius required around the wells. A 10' separating distance is required from a potable water line which flows under pressure and on-site septic systems. Utilizing the cluster zone concept will help provide flexibility in site design which enables greater open space areas and preservation of environmentally sensitive areas on the parcel.

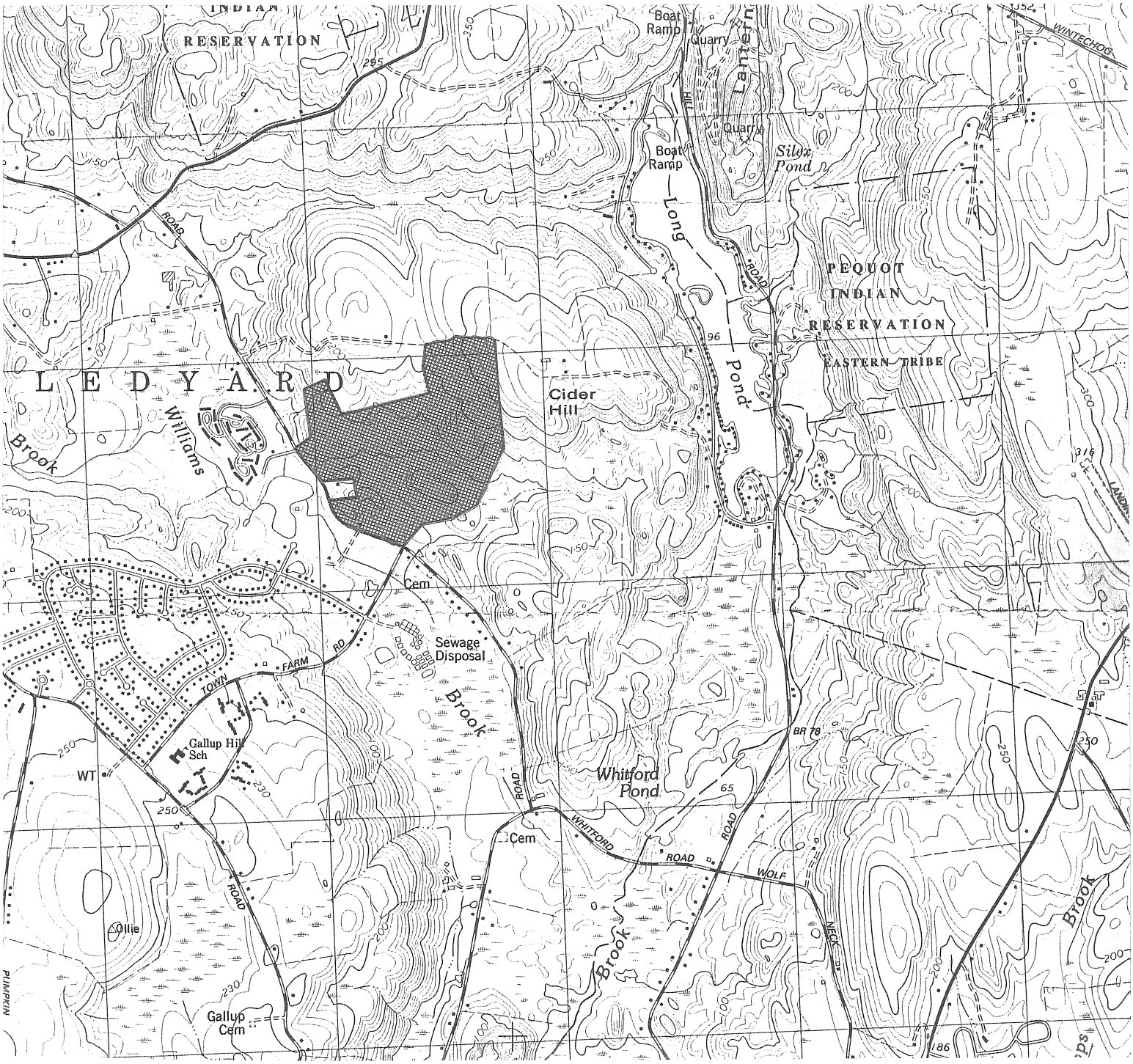
A total of 17.4 acres of open space is proposed for the subdivision. It occurs primarily in the central parts of the site and contains a high percentage of regulated wetland soils. A ±1 acre pond is proposed in the open space area in the east central parts and would be created by excavation in an area where the water table is at or near the ground surface most of the year. Open space areas may be used for riding trails by the equestrian facility which is proposed as part of the residential subdivision.

The equestrian facility will include stalls for about 72 horses, an indoor and outdoor show ring, dressage area, grand prix jumping ring, bull ring and turnout paddocks. It encompasses ±27 acres in the northeast corner of the property.

LOCATION MAP

Scale 1" = 2000'

Approximate Site



2. Land-Use

A review of air photos by the Team's geologist, which includes the site, indicates that it has been wooded land for the past 56 years, however, the presence of stonewalls gives testimony to past agricultural uses prior to 1934. Every effort should be made to preserve these stonewalls, where possible. They help to retain the rural character of the site and vicinity. Since 1975, there has been an increase in residential land use in the area. High density residential developments (1 to 2 families per acre and apartment buildings) occur west and southwest of the site.

3. Topography

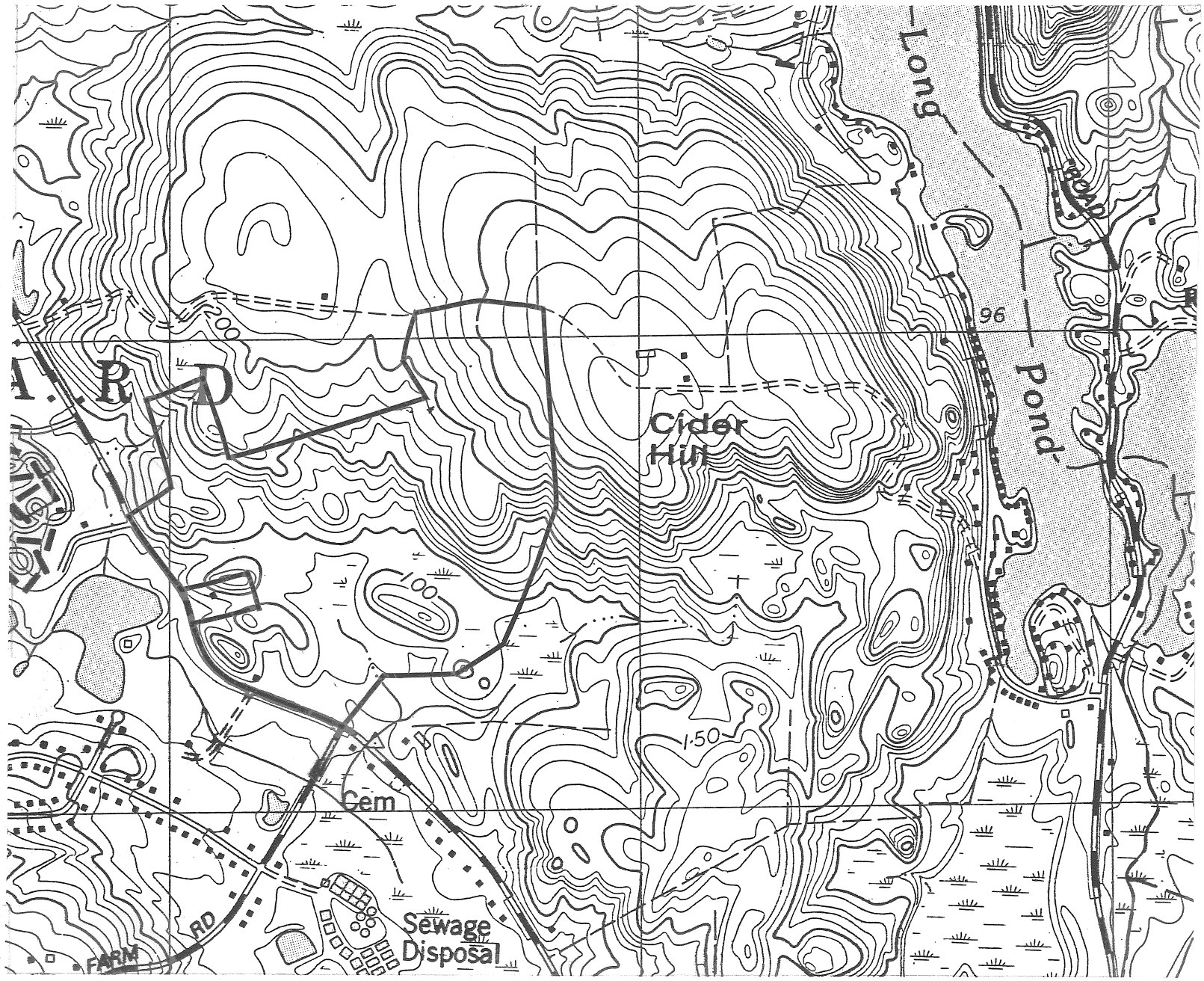
The site is located west of Cider Hill in eastern Ledyard. Site topography is controlled largely by the underlying bedrock. In general, it consists of moderate slopes although nearly level areas and areas of steep slopes occur. The latter areas are associated mainly where bedrock is at or near ground surface, for example in the eastern parts. Flat slopes are associated with the wetland areas in the southern parts. Site elevation ranges from about 80 feet above mean sea level in the southern parts to about 270 feet above mean sea level just west of the top of Cider Hill.

In several areas, the proposed access road alignment will need to traverse steep, bedrock controlled slopes that will probably require significant cutting in order to meet Ledyard's road grade requirements. Because bedrock is at or near ground surface in most areas, even shallow excavations may encounter unweathered rock that requires blasting. This type of work increases site engineering and development costs and if conducted without caution may potentially cause damage to abutting properties. As such, every effort should be made to avoid these areas (bedrock controlled, steep slopes) which should help to reduce the need for blasting and rock removal. Conversely, rock cuts for roads/driveways may help reduce site grading in steeper areas since rock is generally stable along nearly vertical slopes, while unconsolidated slopes cannot usually be more than 2:1 (horizontal:vertical). (Also, see *Sewage Disposal* and *Geology* section).

TOPOGRAPHIC MAP

Scale 1" = 1000'

Approximate Site Boundary



4. Geology

The site is located entirely in the Old Mystic quadrangle. A bedrock geologic map (Map I-1524, by Richard Goldsmith) for the quadrangle has been published by the U.S. Geological Survey. No surficial geologic map for the quadrangle has been published to date. However, unpublished surficial geologic data for the quadrangle which is available at the Natural Resources Center in Hartford was cited for the report along with the Soil Survey for New London County, Connecticut.

Bedrock outcrops are widespread on the site. Continuous outcrops occur on Lots 3, 10 and 11. Goldsmith (Map I-1524) identified three rock formations on the site, which includes the following: **(1)** a fine-grained alaskite gneiss; **(2)** biotite gneiss; and **(3)** a porphyritic quartz monzonite. Underlying primarily the southern half of the site are several east-west trending belts of a rock type described as a biotite gneiss, which is fine to medium-grained and light gray to gray in color. Major minerals in the rock include quartz, biotite and plagioclase. "Gneiss" is a textural term given to a metamorphic rock; one that has undergone changes due to high pressures and temperatures in the earth's crust. These changes generally include recrystallization, altered mineral composition and alignment of elongated and platy minerals. In gneisses, thin layers of elongate minerals alternate with layers of more rounded minerals giving the rock a banded appearance. Inter-fingered with the biotite gneiss in the southern parts of the site, as well as underlying the northeastern parts (equestrian facility site), is a fine-grained alaskite gneiss, which is white to cream colored. An "alaskite gneiss" refers to light-colored, banded (metamorphic rock) rock which has a granite-like composition with potassium feldspar as the major feldspar mineral. It contains only a few percent of dark minerals. Lastly, a narrow band of porphyritic quartz monzonite bisects the alaskite gneiss in the northcentral parts. It intruded the alaskite gneiss as molten magma and, as such, is younger in age than the surrounding rock. It is a massive granite-like rock that is gray to reddish colored and medium-grained. The term monzonite used above refers to a plutonic rock (formed from molten magma) that contains approximately equal amounts of the mineral orthoclase and plagioclase. Other minerals usually include quartz, but commonly only present in small amounts, hornblende, diopside and/or biotite. "Porphyritic"is a term that refers to the texture of igneous (plutonic) rocks in which large crystals are set in a finer groundmass.

Goldsmith identifies a fault zone west of the site. It is located on the west side of Shewville Road and, in proximity to the site, is roughly aligned with the road. The upper few hundred feet of the bedrock in the vicinity of the fault zone may be fractured, weathered or both.

The primary geologic consideration with respect to the underlying bedrock and the proposed subdivision relates to the depth of bedrock and distribution of unconsolidated materials. In areas of shallow bedrock, difficult excavations which require blasting may be required for house foundations, road/driveway grades and utility trenches. Blasting requires great care and the strict supervision of persons experienced with modern blasting techniques to ensure that no damage occurs to surrounding properties from undue seismic shock or airblast. A pre-blast survey which commonly encompasses a 500-1,500 foot radius should be implemented with the project, focusing on the buildings closest to the site. The radius will depend upon the blasting requirements for the site, which has not been determined to date. It should be

pointed out that the alaskite gneiss and biotite gneiss may be a source of stone for rip-rap (crushed stone). Rock from potentially blasted areas may have value in terms of the road base/construction material for the development.

The availability of a public water main will eliminate the need for individual on-site wells. Water supply for the subdivision, excluding the equestrian facility would be provided by extending a water service line from the Highland Water System which is apparently near the site. Due to higher elevations inadequate water pressure appears to be a potential hindrance for the equestrian facility. As such, the facility will likely need to be served by an on-site well or wells. The principal source of water to the well will be the underlying bedrock aquifer (see *Water Supply* section).

Overlying the crystalline bedrock on the site is a glacial sediment called till. The till sediments were deposited by glacial ice as it moved across the bedrock surface from north to southeast. In general, it consists of an olive-gray to tan mixture of sediments ranging in size from clay particles to large boulders, but predominantly contains fine sand, sand and silt. According to the New London County Soil Survey, the texture of the till on the site is generally sandy, stony and loose in the upper few feet and shallow to bedrock areas, and at depths becomes a siltier and more compact variety locally called "hardpan". The latter variety of till occurs in the northeast corner of the site. The remainder of the site is characterized by the sandier variety of till and coincides with the shallow to bedrock areas. Deep test hole information supplied to Team members revealed that the texture of till on the site to be sandy and gravelly and has varying degrees of compactness.

The exact depth of the till is unknown on the site, but is probably 10 feet or less in most places.

The till soils on the site, particularly where they are characterized by a high percentage of silt, fine sand and clay and a shallow (1.5 - 3 feet below ground surface) compact soil zone will be an important design constraint for on-site sewage disposal. These areas are likely to be prone to a seasonally high water table condition that is perched above the "hardpan" layer. This is due to slow permeability of the "hardpan" layer (see *Sewage Disposal* section). Till soils that contain a high percentage of silt, fine sand and/or clay can also make the soil susceptible to erosion and can cause surface water degradation.

The plans distributed to Team members indicate that regulated wetland soils bisect the site's central parts but also occur in the eastern parts. Much of the wetlands on the site have been designated as open space except for an area of mucky soils (Adrian and Palms Muck) in the central and southeast corner of the site. The Soil Survey of New London County identifies most of the regulated wetland soils on the site as Rn (Ridgebury-Leicester-Whitman extremely stony fine sandy loams) soils.

The Rn soils mentioned in the preceding paragraph have been mapped as an undifferentiated unit comprising Ridgebury-Leicester-Whitman soils. All three soils are very deep, loamy soils that formed in glacial till. The Ridgebury and Whitman soils develop in the compact glacial till, while the Leicester soils develop in the more friable till. They range from poorly drained (Leicester and Ridgebury) to very poorly drained (Whitman). In general, the Ridgebury, Leicester and Whitman soils are nearly level or gently sloping soils found in drainageways and low-lying positions of till covered uplands.

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

In the central and southeast corner of the site, the soil survey identifies pockets of Adrian and Palms Mucks (Aa). They are characterized as nearly level, very poorly drained soils which generally occur in pockets and depressions of stream terraces, outwash plains and glacial till uplands. Typically, the Adrian and Palms soils have black and very dark grayish-brown, layers of muck 42 inches thick. The substratum or parent material is gray, light yellowish-brown, and dark brown gravelly sand to a depth of 60 inches or more. Typically the Palms soils have black and very dark brown layers of muck 22 inches thick. The substratum is dark yellowish-brown and olive very fine sandy loam and loamy very fine sand to a depth of 60 inches or more. The Adrian and Palms Mucks have a high water table near or above the surface for most of the year. As such, it is poorly suited for any type of development. Also, the organic material does not support foundations. If drained, the organic layers shrink and subside. For these reasons, as well as others, the areas covered by Adrian and Palms Mucks should not be developed or disturbed.

Present plans indicate that the proposed interior road system will cross regulated soils (primarily the Rn soils) at several locations. Also, in order to access Lots 4 & 5, a driveway or driveways will need to cross a narrow band of regulated soils.

Since both soil types (Rn and Aa) are regulated under Connecticut Inland Wetland and Watercourses Act, Connecticut General Statutes Section 22a-36 through 22a-45, inclusive, any activity, such as road crossings and placement of fill material that impacts wetlands will require a permit from the local inland wetland agency. Before the agency acts on the proposal they should fully understand the function of the wetland in the area of the crossing with regard to potential impacts of the activity on the wetland. As such, details on all road crossings should be provided to the town for review purposes including, pipe sizes, amount and type of fill material to be used, area of impact, and the presence of important biologic or ecologic features in the area. Also, "feasible and prudent alternatives" that minimize the number of road crossings or re-configuration of roads keeping them entirely out of wetland areas should be investigated by the developer. (Also, refer to *Wetland Review* section and the *Appendix*)

Any wetland road crossings that are permitted by the town agency should be constructed during the summer when water tables are generally at their lowest. This will help to minimize the chance for surface water degradation to on and off site streams.

A ±1.3 acre pond is proposed on open space parcel "B" in the west/central parts of the site. It would probably be created by excavating below the water table to a depth of at least 6-8 feet. Due to the shallow to bedrock conditions in the area, depths greater than 10 feet may be difficult. The excavation of a pond inevitably disturbs and mobilizes the finer soil particles in the till. In order to avoid environmental damage and complaints from neighbors, containment and filtration of the disturbed water is necessary. This can be accomplished by implementing a thorough erosion sediment

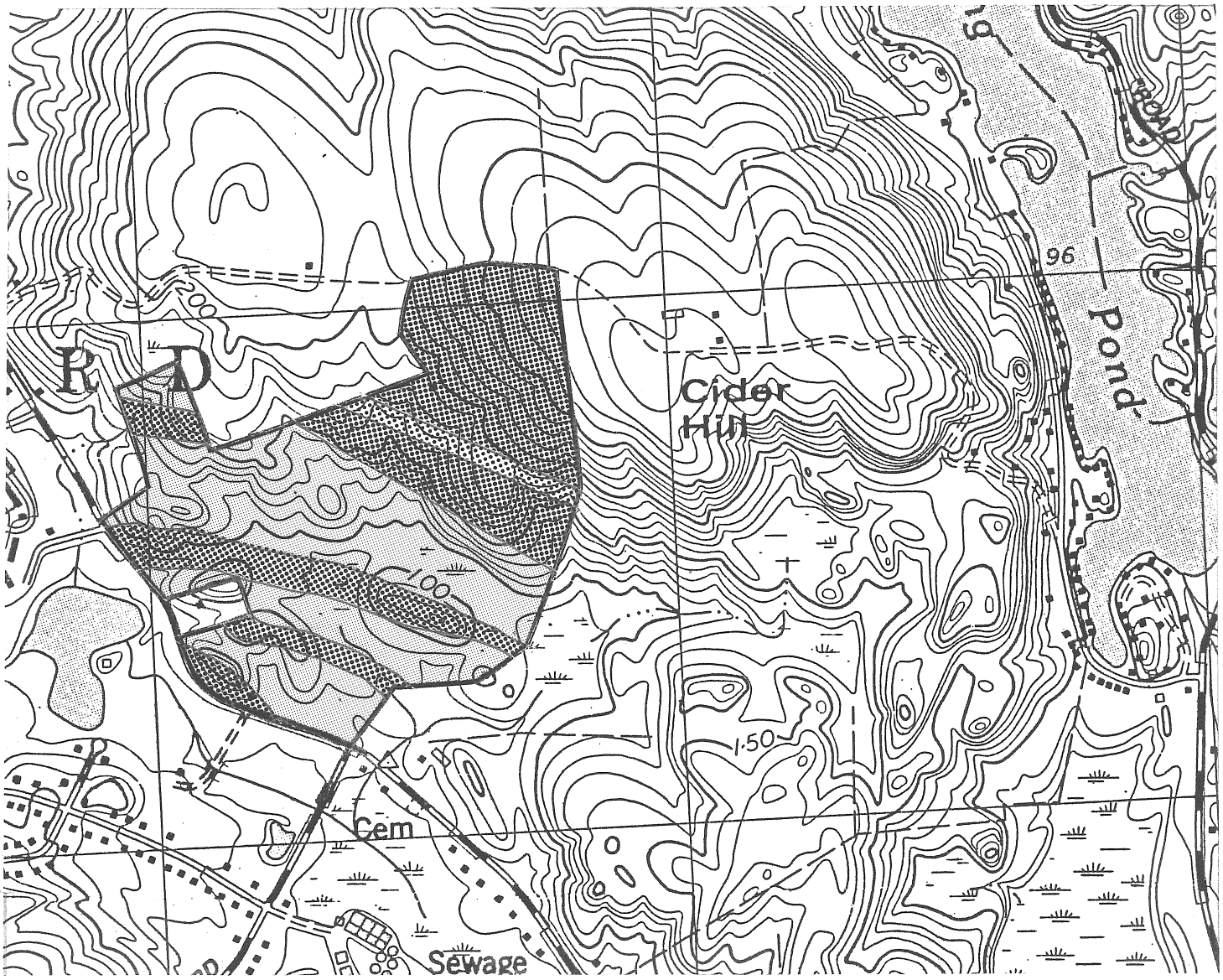
control plan, which is policed by town officials. Every effort should be made to prevent turbid to lightly colored water that contains colloidal matter from reaching the stream that drains the wetland area. The unconsolidated material excavated in this area is likely to include surficial organic soils and muck, underlain by sandy till. The till may be used for fill material and some of the organic material could be stock piled for mixing with the topsoil for landscaped areas. Excavating the till from the saturated zone will result in some oxidation of iron compounds in the sediments, resulting in iron oxide staining.

In the long-term, there would be some re-adjustment in the balance of evapotranspiration from wetland soils and evaporation from open water bodies. Because of the proposed size of the pond and the surface area of wetlands on the site, it is likely that the change in the loss of water to the atmosphere would be negligible. (Also, see *Wetland Review* section and the *Appendix* of report.)

BEDROCK GEOLOGIC MAP

Scale 1" = 1000'

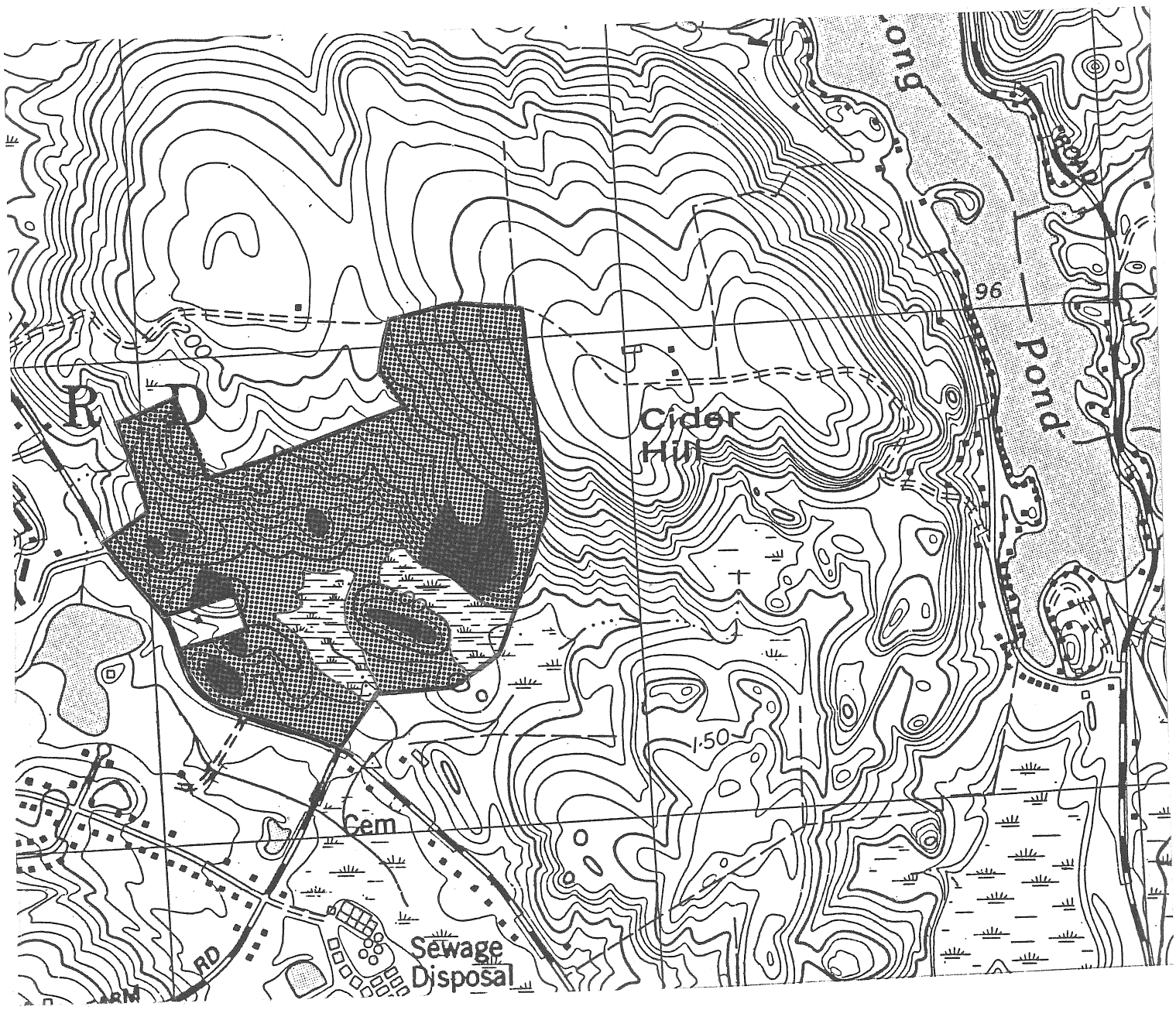
Fine Grained Alaskite Gneiss
Porphyritic Quartz Monzonite
Biotite Gneiss



SURFICIAL GEOLOGIC MAP

Scale 1" = 1000'

Till
Swamp Sediments
Areas Where Bedrock is at or Near Ground Surface



5. Soil Resources

The soils on the site are mixed and variable, ranging from well drained Canton and Charlton to poorly drained Ridgebury, Leicester and Whitman. Much of the area is stony and steep with slopes averaging eight to fifteen percent and more. The landscape is bedrock dominated and many of the soils are shallow. Due to the steepness of slope, the hazard for erosion is great. The sediment and erosion control plan is essential and proper installation and maintenance of control measures is critical. To insure proper protection, the town should employ the tools in the Materials for Use in Improving Erosion and Sediment Control Plan Implementation as prepared by the Connecticut Council on Soil and Water Conservation.

Many of the soils have a medium to very low potential for septic system and effluent renovation because they are shallow or the slope is significant. These limitations will require an engineered design and careful site preparation to overcome them. Extensive testing and increased area of investigation may be necessary to insure proper placement of systems. Care must be taken to control effluent from breaking out on hill sides and cut banks. A 50 to 75 foot set back may be enforced. Designing systems that will distribute effluent over a larger area may be required, thus, increasing the size of the house lots may be necessary to accommodate these larger systems.

■ Sediment and Erosion Control

The sediment and erosion control plan for typical house lot development has not been prepared for this site. Extensive excavation is proposed for the road bed and cuts in excess of 10 feet are planned. It is likely that extended grading will also be necessary for house lot development and a comprehensive sediment and erosion control plan will be required.

When areas are freshly disturbed and steep side slopes are created, it can be very difficult to stabilize the new slope. Permanent provisions should be made to address this issue. On the site plan, the scale of the details of the wetlands crossings (1:40) is not adequate to determine the proposed grading activity, making the plan for existing and proposed grades unclear. A larger scale detail sheet should be prepared. From the present design, it appears that the details of the grading activity have not been fully prepared. Chapter 7-17 through 7-23 of The Connecticut Guidelines for Soil Erosion and Sediment Control gives details for land grading and reverse bench slopes when the vertical interval of any 2:1 to 5:1 slope exceeds 15 feet (e.g., road crossings 18+00, 21+39, 3+00). When creating this reverse bench slope, the total length of slope is increased and the amount of fill is increased. Therefore, the amount of wetlands being filled for road crossings may be substantially increased. With the present design, approximately one acre of wetlands will be filled with even more being disturbed. This will likely increase with the improved design accommodating the reverse bench slopes. This information should be fully calculated and furnished to the town. In the present design the details for the proposed crossings are not clearly labeled and the detail sheets are not consistent. For instance, the details for the drainage ditch for station 30+00 are not found on sheet 1 of 2 as indicated. Adjustments should be made in the site plan to clearly identify, label and detail the proposed activities.

The applicant proposes construction of a three acre dug out pond in the center of the

property, and filling wetlands at road crossings. Because greater than one acre of wetland will be disturbed, notification to the Army Corps of Engineers at 1-800-343-4789 will be necessary to determine the need for a permit. The plan also describes diverting watercourses during the installation of the wetlands crossing. All of these projects should be done during the driest time of the year to reduce wetland impacts. A CT DEP Water Diversion Permit will be necessary if the size of the drainage area exceeds 100 acres or the average daily flow is greater than 50,000 gallons. Contact the Water Resources Unit at 566-7160 for further information.

All prudent and feasible alternatives to disturbing wetlands should be investigated. There are seven proposed wetland crossings on this site and extensive disturbance is proposed. One option to alleviate wetlands disturbance would be to eliminate the cul-de-sac to lot 13 thus, eliminating three wetland crossings. Access to the back lots could be obtained through an alternate cul-de-sac through lots 4 & 5. The town will need to determine if the benefits of the proposed project warrants the destruction or alteration of wetlands.

The storm water drainage calculations were not submitted to the New London County Soil and Water Conservation District office. The Soil Conservation District is available to review the TR-55 method of determining storm water drainage at the towns request. With all methods, the drainage area and storm frequency used in the design of the system should be explained (refer to chapter 9 of the CT Guidelines for Soil Erosion and Sediment Control). It is generally desirable to outlet storm water outside of the wetland in a designed outlet on stable ground (refer to CT Guidelines for Soil Erosion and Sediment Control, Chapter 8). The details of this information should be furnished to the town.

■ Development of the Stables and Trail System

The stables and riding facilities are located in the northern portion of the property on Woodbridge very stony fine sandy loams. The grade is nearly level to gently sloping. The area will need extensive land smoothing to clear the stones and prepare the grade for the facility. There was a question of wetland soils at this location, however, it appears that the subsurface water travelling horizontally on the hard pan layer is surfacing on the side slope. Installation of a subsurface drainage curtain upslope of the facility should alleviate that problem. A safe, stable outlet should be used.

Equestrian trails should be indirect and lead through a variety of interesting conditions. Rest areas are desirable and may be necessary in steep terrain. Rest areas can be located at scenic views and at difficult portions of the trail. Barriers will be needed at hazardous areas, sudden drop offs and slide areas. Trail surfaces should be fine textured with aggregates not exceeding one inch in diameter. All rocks, roots and stumps should be removed. Soils in general should be well drained or moderately well drained. Trail should not cross wetlands unless safe, durable access is provided. Slopes should not have a sustained grade greater than 8%; maximum grades of 15% are acceptable for very short distances . Optimum trail widths are 8-12 feet with at least 12 feet of height clearance. No uncontrolled hazards or nuisances should exist. The trails should provide for 20 persons per mile per day-use. For a 1/2 hour ride provide a 3 mile trail. Trails can be marked for length at the beginning and along the trail.

■ Soil 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.

CcB - Canton and Charlton very stony fine sandy loams, 3 - 8 percent slopes

These gently 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 medium. These soils warm up and dry out rapidly in the spring. The soil is strongly acid or medium acid. These soils are not suited to cultivated crops. These soils are suited to trees.

These soils are in capability subclass VIs.

CdC - Canton and Charlton extremely stony fine sandy loams, 3 - 15 percent slopes

These gently sloping and sloping, well drained soils are on glacial till upland hills, plains, and ridges. Stones and boulders cover 8 - 25 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 medium or 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 hazard of erosion is moderate or severe. These soils are suited to trees.

These soils are in capability subclass VIIs.

CdD - Canton and Charlton extremely stony fine sandy loams, 15 - 35 percent slopes

These moderately steep to steep, well drained soils are on glacial till upland hills, plains, and ridges. Stones and boulders cover 8 - 25 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. 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 hazard of erosion is severe. These soils are suited to trees. Steepness of slope is a major limitation for community development.

These soils are in capability subclass VIIs.

CrC - Charlton-Hollis fine sandy loams, very rocky, 3 - 15 percent slope

This gently sloping to sloping 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. The runoff of this complex is medium or rapid. It warms up and dries out rapidly in the spring. It is strongly acid or medium acid. These soils are not suited to cultivated crops. The hazard of erosion is moderate to severe. These soils are suited to trees. Windthrow is common on the Hollis soil because of the shallow rooting depth. The major limiting factor for community development is the shallow depth to bedrock.

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.

HrD - Hollis-Charlton-Rock outcrop complex, 15 - 45 percent slopes

This moderately steep to very steep complex consists of somewhat excessively drained and well drained soils and rock outcrop on glacial till uplands. Stones and boulders cover 1 - 8 percent of the surface. Permeability of the Hollis soil is moderate or moderately rapid above the bedrock, the available water capacity is low. Permeability of the Charlton soil is moderate or moderately rapid, the available water capacity is moderate. 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. The soils in this complex are not suited to cultivated crops. The soils in this complex 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 the steep slopes, shallow depth to bedrock and rock outcrop.

The soils in this complex are in capability subclass VIIs.

PeC - Paxton and Montauk extremely stony fine sandy loams, 3 - 15 percent slopes

These gently sloping to sloping, well drained soils are on drumloidal, glacial till, upland landforms. Stones and boulders cover 8 - 25 percent of the surface. Permeability of the Paxton soil is moderate in the surface layer and subsoil and slow or very slow in the substratum, unless limed, it is strongly acid or medium acid. Permeability of the Montauk soil is moderate or moderately rapid in the surface layer and subsoil and slow or moderately slow in the substratum, unless limed, it is very strongly acid or medium acid. The available water capacity for these soils is moderate. Runoff is medium or rapid. These soils warm up and dry out rapidly in the spring. These soils are not suited to cultivated crops. The hazard of erosion is moderate or severe. These soils are suited to trees. The major limiting factor for community development is the very slow, slow, and moderately slow permeability in the substratum.

These soils are in capability subclass VIIs.

PeD - Paxton and Montauk extremely stony fine sandy loams,15 - 35 percent slopes

These moderately steep to steep, well drained soils are on drumloidal, glacial till, upland landforms. Stones and boulders cover 8 - 25 percent of the surface. Permeability of the Paxton soil is moderate in the surface layer and subsoil and slow or very slow in the substratum, the available water capacity is moderate. Permeability of the Montauk soil is moderate or moderately rapid in the surface layer and subsoil and slow or moderately slow in the substratum, the available water capacity is moderate. Runoff of these soils is very rapid. These soils warm up and dry out rapidly in the spring. Unless limed, they are strongly acid or medium acid. These soils are not suited to cultivated crops. The hazard of erosion is severe. These soils are suited to trees. The major limiting factors for community development are very slow, slow, and moderately slow permeability in the substratum and the steep slopes.

These soils are in capability subclass VIIs.

*** 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.

SxB - Sutton extremely 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 8 - 25 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 VIIs.

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.

*** - Prime Agricultural Farmland**
**** - Farmland of Statewide Importance**
***** - Wetlands**

SOILS MAP

Scale 1" = 1320'

Approximate Site Boundary

6. Hydrology

The entire site drains to Williams Brook, a Whitford Brook tributary. At its point of outflow to Whitford Brook, Williams Brook drains an area of 6.31 square miles or 4,038 acres. Based on this figure the site represents about 3 percent of the watershed. Approximately 101 acres or 85% of the site drains to the wetlands (open space parcels A and B) in the interior parts of the site. The outlet streamcourse for this wetland system flows generally southward passing under Shewville Road and ultimately empties into Williams Brook west of the site. Surface runoff emanating from the western limits of the site about 23 acres, drains via intermittent streamcourses towards Shewville and ultimately to Williams Brook.

The surface waters on the site have not been classified by the Connecticut Department of Environmental Protection (DEP) Water Compliance Unit and are presumed Class A water resources by default. Class A water resources may be suitable for drinking, recreational or other uses and may be subject to restrictions on the discharges of wastes, although certain discharges may be permitted.

Development of the site as proposed will lead to increases in the amount of runoff shed from the site during periods of precipitation. These increases will result from soil compaction, removal of vegetation and placement of impervious surfaces such as rooftops, driveways, roads, and patios. The principal concerns with respect to increased runoff is the potential for flooding problems to downstream areas, streambank erosion and surface water degradation.

The proposed post-development water management plan will utilize a control structure (detention basin) and techniques to avoid net increases in peak flows discharging from most of the site for the 2, 5, 10, 25, 50 and 100 year storm events. The stormwater detention facility consists of an earthen berm, which will be constructed as part of the subdivision road to retain stormwater and a pre-fabricated outlet control structure to regulate stormwater discharges from the site to downstream areas. Because the stormwater control facility affects an area greater than 100 acres, it may be necessary to obtain a diversion permit from DEP's Inland Water Resources Unit. Robert Gilmore should be contacted (566-7160) regarding this potential permit. Close examination of all culverts passing under Shewville Road that convey water from the western limits of the site to Williams Brook and that is now part of the proposed stormwater management structure is warranted.

Due to the site conditions that includes moderate to steep slopes, silty soils and seasonally wet conditions, and the amount of land disturbance anticipated for the development, the potential to degrade surface water on- and off-site during development is high. Therefore, it is imperative that erosion and sediment (E&S) control measures be properly installed and maintained. The town must police E&S control measures on a regular basis. E&S controls should be left in place until each phase of construction is stabilized through one growing season. A detailed E&S control plan that is properly enforced will minimize the chance for surface water degradation on and off-site and adverse impacts to aquatic habitats and fisheries.

During the construction period, control measures, including silt fences, haybales, temporary/permanent sediment basins which permit settling time for suspended solids, anti-tracking devices, energy dissipaters and minimizing land disturbance, should be

used to minimize environmental damage to on- and off-site wetlands and watercourses. The Connecticut Guidelines for Soil Erosion and Sediment Control (1985, as amended) should be closely followed with respect to the E&S control plan.

There exists a potential for degrading surface water on and off-site following development of the property by road and driveway runoff, floating solids, road salt, oils, greases and road sand. Best Management Practices (BMP's) should be developed and implemented to minimize this potential problem. Examples of such practices include: **(1)** using catch basins equipped with hooded outlets and sumps for trapping sediments and floatables; **(2)** implement a regular maintenance program that includes cleaning catch basins and road sweeping following the winter months; and **(3)** restrict de-icing salt application to a lean 7:1 sand-salt mix ration. In order to protect surface and groundwater resources on and near the site, consideration should also be given to prohibiting the use of underground fuel storage tanks in the subdivision.

WATERSHED BOUNDARY MAP

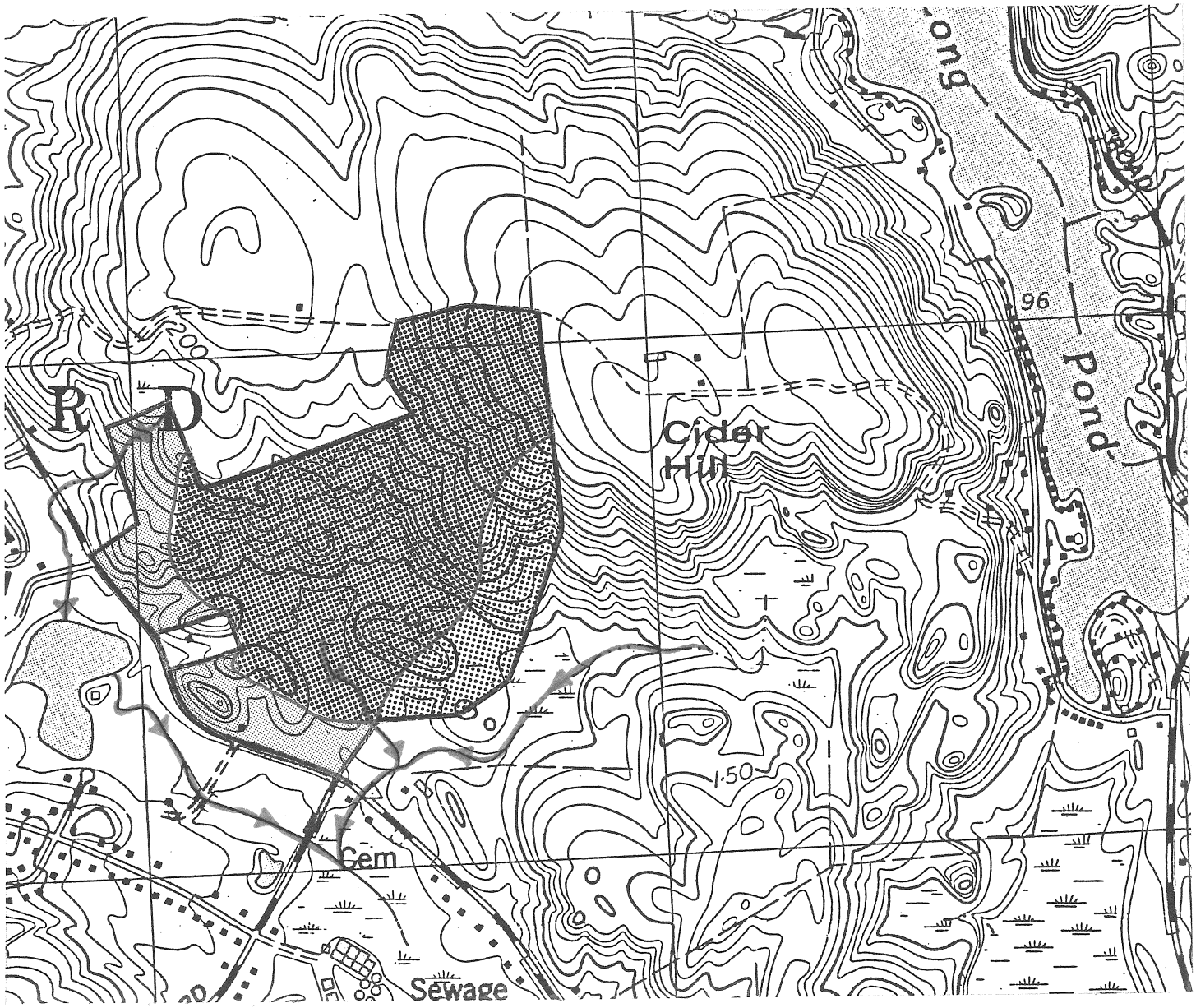
Scale 1" = 1000'

Portion of the site that drains to an unnamed Williams Brook tributary (the outlet for the detention basin will drain to this streamcourse).

Portion of the site that will drain to the proposed stormwater detention facility.

Portion of the site that drains directly to Williams Brook.

Watercourses showing direction of flow.



7. Wetland Review

The site is located on the east side of Shewville Road in Ledyard, Connecticut. The proposed development consists of a 36 lot single family subdivision with full equestrian facilities. The lots range in size from approximately .90 acres to 4.2 acres with most lots in the 1 to 2 acre range. A loop road from Shewville Road provides access to the lots with a cul-de-sac extending from the loop.

A network of wetlands and associated watercourses traverse the property. The wetlands consist primarily of forested swamp systems. For a complete description of wetland composition, refer to the report entitled "Wetland Habitat Assessment and Recommendations for Proposed Equestrian Facility and Residential Development" prepared by Lee Alexander, Certified Wildlife Biologist. The topography of the site ranges from relatively flat terrain to more steep, hilly areas in the northeast (in the area of the proposed cul-de-sac).

The majority of direct wetland intrusions result from the proposed loop road, combined driveway and cul-de-sac crossings. The road configuration intrudes upon wetlands in eight locations, with approximately four of those crossings involving streams. Another major alteration involves the placement of a pond within existing functional wetlands.

■ Wetland Values

Forested wetlands are important to wildlife in the areas surrounding them because they offer a suitable habitat. In times of drought, surface water may generally be obtained by animals in wetlands. In times of windy, winter cold, wetlands provide windless refuges, producing seeds and fruits that may be consumed as food.

Additionally, forested wetlands are often warmer than more open areas because of the close proximity of unfrozen and often flowing surface water and springs, combined with the windbreaking ability of the trees. Thus wetlands offer insurance for survival to animals in times of climatic extremes. This wetland is connected to other off-site wetlands by a stream and thus provides a safe, forested travel lane for wildlife.

The wetlands, by the nature of the soils and vegetation contained therein, also provide pollution abatement functions. Sediments and other pollutants entering the wetlands through runoff are filtered by the vegetation and allowed to settle out prior to entrance into brooks and streams. With the addition of chemical fertilizers pesticides and herbicides for manicured and landscaped lawns this pollution attenuation function becomes very important.

■ Wetland Impacts

The current road configuration proposes eight wetland crossings. Several of these crossings will require significant filling for road bank stabilization. Most significant is the cul-de-sac crossing near the northeast portion of the site. The amount of fill to be placed in this extremely steep area poses numerous concerns about sediment and

erosion control problems. It is suggested that an alternative road layout be evaluated. Perhaps eliminating the cul-de-sac road and converting the common driveway crossing to a cul-de-sac road crossing to access the rear lots (4, 5, 10, 11, 12, 13, and 57). This would eliminate three northern crossings and the filling associated with each.

The proposed pond situated to the northeast of lots 6 and 7 is primarily an aesthetic pond. The plans do not indicate that the pond will serve as a detention facility for stormwater management purposes. Lee Alexander's report (noted above) discusses the ecological benefits of creating an open water body, i.e. increasing overall species diversity. However, on the eastern shoreline of the pond the report describes that "There is no need to attempt to make this site a 'natural area'. Instead, an attractive, parklike appearance is the goal." If the argument for a pond is to attract wildlife, then the entire pond should be designed for such purposes. It would appear that the need for this pond is simply to provide an aesthetic amenity to the community. Excavating an existing viable, functioning wetland simply for aesthetic purposes should be discouraged. The construction of this pond will also require filling for bank stabilization and the placement of the temporary access road.

It is often represented that the addition of open water bodies to the landscape will lead to an increase in species diversity and will add to the overall habitat value of an area. DEP - Inland Water Resource Management Bureau feels that pond creation in wetlands simply replaces one type of viable habitat with another. This may lead to an increase in the number of species that utilize the open water environment, but may also result in a decline of the species that currently utilize the forested wetlands for shelter, cover, feeding and reproductive purposes.

This type of habitat replacement should not be an acceptable alternative to wetland loss when those losses are otherwise avoidable. The construction of the pond would result in a permanent loss of natural wetland habitat and consequently the functions that this wetland provides in its natural state.

In cases where wetland commissions are reviewing proposals for pond creation within an existing wetland area, the commission should consider the following during its evaluation of the proposal.

- 1.The proposed need and uses of the pond;
- 2.The existing quality and function of the wetland area to be converted;
- 3.The feasibility of creating a pond at the location proposed, (depth to bedrock, water supply, access, etc.);
- 4.The alternatives to the pond size and location.

Applying these criteria to the proposed pond will provide a good framework for evaluating the need, impacts and feasibility of this proposal.

■ Conclusions and Recommendations

The application represents a good effort in attempting to avoid wetland impacts. However, it is felt that further reductions in wetland impacts can be achieved by evaluating alternative road configurations as well as alternative pond design and location. These alternatives include the following:

■ 1. Moving the cul-de-sac road from the northern end of the loop to the southern end of the loop, although this would probably result in the loss of several lots, three wetland crossings would be eliminated.

■ 2. Eliminating or reducing the scope of the proposed pond. A smaller pond (less than one acre in size) designed to attract wildlife may in fact enhance the ecological value of the area. However, development of a large manicured, park-like pond should be discouraged.

8. Sewage Disposal

Since municipal sewers are not presently available to the project site an individual on-site sewage disposal system will be required for each lot.

Subsurface exploration for on-site sewage disposal feasibility, which included 172 deep test holes and 37 percolation tests, was performed by Kenny & Stevens, Inc., engineers for the applicant. The minimum number of test holes excavated on any lot was 3, but nearly 60% of the proposed lots had 5 or more test holes. They ranged between 2 feet and 10 feet, but the majority were in the 6-8 foot range. In general, the test holes encountered topsoil, 4-8 inches thick, subsoil intermingled with humus and boulders, 1-3 feet thick, then a sandy/gravelly till or bedrock.

Ledge rock, which was encountered at depths 7 feet or less, was reported in 21% of the test holes excavated. Nearly 8 percent of the test holes reported ledge rock at depths of 5 feet or less, which according to the State Public Health Code constitutes an area of special concern. Shallow to bedrock conditions occur mainly on Lots 2, 10, 11, 15 and 29 and, as such, will be an important design constraint with regard to on-site sewage disposal.

For the purposes of sewage disposal, ledge rock would need to be at least 4 feet below the bottom area of any leaching system. The State Health Code prohibits the issuance of sewage disposal permits where there is less than 4 feet of existing soil over ledge rock. This does not mean that no sewage disposal system could ever be built at this location but that the necessary fill must be placed, compacted and tested before the final sewage disposal plan is approved and a building permit issues. This puts the "burden of proof" on the applicant to demonstrate that the site improvements can be made. The State Health Code requires that there be at least 2 feet of natural soil over ledge. Deep test holes dug on only two lots (10 and 11) encountered ledge rock at depths of 4 feet or less. Several other test holes were dug on these lots and attained depths greater than 5 feet. As such, it seems likely that on-site sewage disposal is feasible on these lots, but that additional deep test holes may be necessary.

Because of the shallow to bedrock conditions that in places include continuous ledge rock outcrops, there is always a concern for having a sufficiently large suitable area for sewage disposal installation. In order to accurately determine that such an area, in fact, would be available, a sufficient number of deep test holes are needed on individual lots for ledge profile. For a residential septic system, the depth to ledge rock should be determined at 3 or 4 locations within the area of the proposed leaching system; and at one or more locations within the area of the proposed reserve leaching system; and at one or more locations down gradient from the system. On some lots, more than 4 deep test holes will be necessary in order to establish depth to bedrock conditions. There should be no ledge outcroppings within 50 feet downslope of the leaching system. Also, consideration should be given to digging a test hole in the area of the proposed septic tank, in order to avoid possible installation problems.

Numerous deep test holes excavated on the site intercepted a shallow water table condition (36 inches or less to the groundwater table). Additionally, soil mottling less than 36 inches from ground surface was commonly reported in the deep test holes. This indicates a potential seasonally high water table condition. The seasonally high

water may be due to: **1)** the presence of slowly permeable soil zone that occurs 2.0-3.0 feet below ground surface; and **2)** the undulating nature of the underlying bedrock surface that may create depressional features or basins which collect pockets of groundwater following periods of precipitation during the wet time of year; or **3)** location of the test holes at a low point on the landscape, where the water level is close to the ground surface. Like the shallow to bedrock soil condition, a seasonally high water table condition will also be an important design constraint in terms of on-site sewage disposal. The Public Health Code requires that a least eighteen inches of soil separate the bottom of the leaching system from the maximum groundwater level. Lots indicating seasonally high water table conditions should be monitored through a wet season (spring months).

Percolation tests ranged between 3 minutes per inch and 20 minutes per inch but more than half were in the 5-7 minutes per inch. All of the percolation tests done on the site appear satisfactory.

Because of the likelihood of bedrock being encountered at varying depths and a potential seasonal water table condition, leaching systems will need to be kept shallow or spread out over a wider area. Ideally lots should be at least 200 feet wide. Depending on contours and septic system placement, it may be difficult, at times, to provide necessary lateral leaching area following natural contours while maintaining all required Public Health Code separating distances.

Because of the shallow to bedrock soils and ledge outcrops that characterize the site, any earth cuts for the access road or driveways are likely to encounter bedrock, quite possibly necessitating blasting. Where an exposed ledge face occurs down gradient from the rock cut the prescribed 15 foot embankment setback is insufficient. The concern here is that partially treated sewage effluent may break out at the rock cut creating a public health hazard condition. Therefore, it is recommended that a minimum setback of 50 feet (75 feet preferred) be maintained from any rock cut area and any portion of a septic system (including reserve leaching areas), particularly if catch basins for road drainage are in the vicinity.

Due to changes in elevation across the site, there is a chance some lots may require that septic tank effluent be pumped to a higher elevation on a particular lot. Every effort should be made to utilize gravity flow septic systems instead of pumped systems, even if it means rearranging lot lines. However, if this is not possible, it is recommended that lots whose septic systems require a pump be so noted on the subdivision plan.

Overall, the site is moderately well suited for on-site sewage disposal. Due to shallow to bedrock conditions and seasonally high groundwater table conditions, it is probable that several of the proposed lots will require detailed plans prepared by a registered professional engineer. Depending on the final house location on each lot, it is possible that additional soil testing will be required in order to confirm subsurface conditions and site suitability for on-site septic systems. The presence of shallow to bedrock soils and "hardpan" soils (seasonally high watertables) warrants that extreme caution be exercised with regard to septic system placement. The availability of public water mains will provide some flexibility for septic system siting and helps reduce the risk of groundwater contamination problems. It is suggested that the septic system(s) and well(s) serving neighboring properties (Gayette, Haynes) be located on the plan to ensure that all necessary Public Health Code separating distances are complied with.

An agricultural waste plan will need to be developed for horse manure handling at the proposed equestrian facility. It is suggested that the applicant contact the U.S. Department of Agriculture Soil Conservation Service (SCS) in Norwich (887-4163) for assistance regarding an agricultural waste plan for the facility. A Department of Environmental Protection Land Disposal Section staff will also review the plans in conjunction with the SCS staff.

The ±26 acre equestrian facility site is somewhat limited for development due to the presence of "hardpan" soils, which commonly results in seasonally high water tables and seasonal seep areas and wetlands. The construction of an on-site septic system to serve the facility appears feasible but only with the provision that sewage flows from the facility be kept low to moderate. The latter however will depend upon the results of subsurface exploration for on-site sewage disposal for the parcel. Sewage disposal systems typically constructed in "hardpan" soils, require installation of groundwater control drains and placement of well-drained fill material to elevate the leaching system above the seasonally high water table. Also, they should be spread out laterally across the contours of the land to ensure proper dispersal of septic tank effluent.

9. Water Supply

As noted earlier, public water facilities are accessible to this site. However, due to increased elevation, the equestrian facility site may experience low water pressure, if the water main is extended to this area. As a result, the applicant proposes to develop an on-site well that would serve the facility. Bedrock appears to be the most suitable aquifer on the site for ground water development. A well drilled no more than 250 feet into the bedrock should be capable of yielding 2 to 5 gallons per minute, but there is at least a slight probability that drilling in any particular location will result in a dry hole. For an 18-hour pumping period, a well yielding 2 to 5 gallons per minute is equivalent to 2,160 to 5,400 gallons per day. Information supplied by the applicant's hydrogeological consultant stated that water demand for the equestrian use was estimated at 2,600 gallons per day. The latter is based on 72 horses as well as miscellaneous water use for wetting rings, roadways, etc. Based on an 18-hour pumping period, a well yielding almost 3 gallons per minute would be required to satisfy the anticipated water demand for the equestrian facility. Water Resources Bulletin 315 Lower Thames and Southeastern Coastal River Basin indicates that 90% of the bedrock wells surveyed for Bulletin #15 yielded 3 gallons per minute or more of water to a well.

The natural water quality should be generally adequate. Connecticut Department of Environmental Protection classifies groundwater beneath the site as GA, which means it is suitable for drinking without treatment.

10. The Natural Diversity Data Base

According to the information, there are no known extant populations of Federally Endangered and Threatened species or Connecticut "Species of Special concern" occurring at the site.

Natural Diversity Data Base information includes all information regarding critical biologic resources available to us at the time of the request. This information is a compilation of data collected over the years by the Natural Resources Center's Geological and Natural History Survey and cooperating units of DEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultation with the Data Base should not be substituted for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as enhance existing data. Such new information is incorporated into the Data Base as it becomes available.

11. Vegetation

There are only three main forest types in the proposed development area.

■ **1. Red maple wetlands,** where the overstory species is mainly red maple with a mixture of yellow birch, black gum (tupelo), swamp , white and pin oaks as individuals or in patches. The understory is usually high bush blueberry or spice bush with some maple leaf viburnum, nannyberry and blue beech.

Most of the trees are under 14 inches in diameter and rather dense, however, there are some older red maples and black gums which have potential as den trees. These should be noted and saved if practical.

■ **2. Oak ridges,** these are areas of soils shallow to bedrock which dry out excessively and therefore inhibit good tree growth. There is also a scattering of American beech. The understory is confined to some white oak and hop hornbeam seedlings.

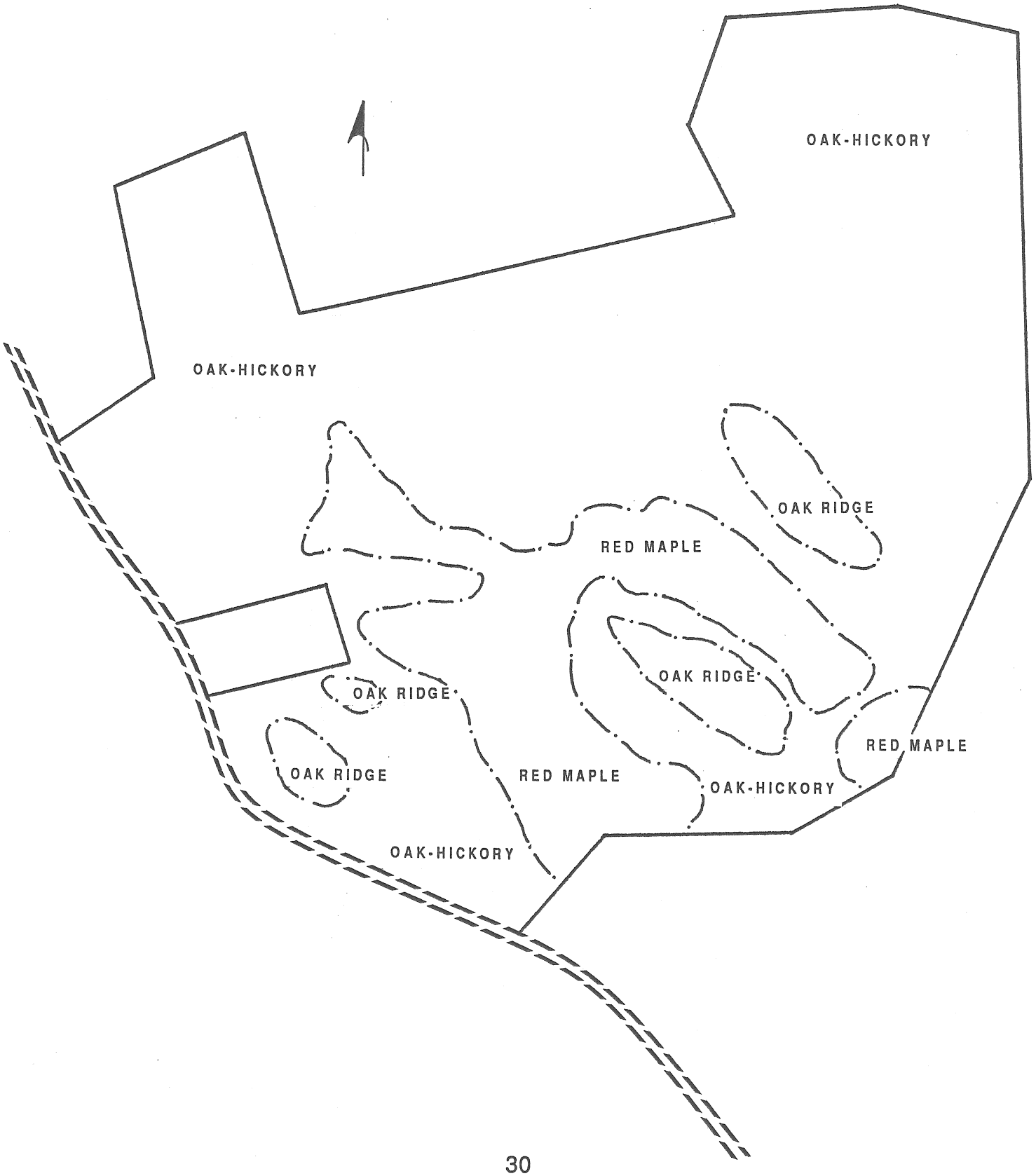
■ **3. Mixed hardwoods (oak-hickory type)** comprise most of the woodland. The area was heavily cut about 1958, so most of the trees are similar in age except for a scattering of large trees that were of too low a quality to be harvested. Many of these now have some sort of cavity which is being used by wildlife. Most of the trees are young (8-14 inches in diameter) and growing vigorously. The predominant species are red oak, although white oak and pignut hickory are common. Tulip, American beech and black birch grow in patches and are also scattered throughout the stands. Other species noted were large tooth Aspens and shagbark hickory.

The understory was variable. Some areas had a dense canopy of 20 foot flowering dogwood with very little herbaceous growth; other areas had seedlings and saplings of blue beech and hornbeam. The viburnums were common in areas of better moisture.

Because of the young nature of this stand there should be minimal problem with tree growth and survival in this development. The trees should be quite wind firm and barring root disturbance during construction, they should not be adversely effected as they are thinned and exposed by the road and house lot clearings. The most sensitive areas are the lowlands or red maple areas. These areas are sensitive to water table changes, a higher watertable will cause tree mortality - a lower one will change the understory species.

VEGETATION MAP

Scale Unknown



12. Planning Concerns

The proposed subdivision and riding club is located in eastern Ledyard on the easterly side of Shewville Road. The location is immediately north of the intersection of Shewville Road and Town Farm Road. Surrounding land uses are scattered low density residential units and undeveloped forested areas on the easterly side of Shewville Road. On the westerly side of Shewville Road high density multi-family units are present and farther to the west is located the medium density, single family development known as the "Highlands". The Gallup Hill elementary school is located about one mile west of the site at the intersection of Town Farm Road and Gallup Hill Road. The sewage treatment plant for the Highlands development is located about 1,000 feet southwest of the intersection of Town Farm Road and Shewville Road.

The area is recommended for mixed suburban and low density uses in the Regional Development Plan. The mixed suburban category recommends one dwelling unit per 1.5 acres up to two units per acre while the low density category recommends less than one dwelling unit per 1.5 acres. Agriculture, open space, recreation and water supply uses are also recommended for the low density areas. The Town Plan of Development recommends most of the area for rural residential with some pockets of natural resource areas. The area is zoned Low Density Residential R-60 which requires 1.5 acre lot sizes. These lot sizes may be reduced to 40,000 square feet if the cluster provisions of the Ledyard Zoning Regulations are utilized.

The applicant has chosen to use this provision. With the exception of lots 29 and 31, all of the lots are greater than one acre in size. Twelve of the lots are greater than two acres in size, with the balance of 22 lots being one to two acres in size. In terms of subdivision design, the proposed layout appears to meet the requirements of the Ledyard subdivision regulations concerning interior lots, shared driveways, and length of dead-end streets. Ledyard does not generally approve dead-end street longer than 1,000 feet in length which this proposal meets. The proposal also appears to meet the road ordinance requirements for street grades, although final designs will have to be reviewed by the Town engineer. Because the site is very hilly with numerous areas of steep slopes, bedrock outcrops, and wetland soils, road and driveway construction will require much cutting, filling and in some cases blasting. To minimize both on and off-site effects on wetlands and watercourses it will be critical to follow the erosion and sedimentation control plan. The best designed plan is only as good as its implementation.

17.4 acres are proposed for open space which accounts for about 15 percent of the total tract area. In addition the equestrian parcel totals another 27 acres. This means that about 38 percent of the tract will be reserved for open space and equestrian uses.

Data from Trip Generation, 4th Edition, by the Institute of Transportation Engineers indicate that on a weekday each single family home can be expected to generate 10 trips.This generation rate results in 360 trips for the proposed subdivision. No separate trip generations are presented here for the riding club because it is intended to serve only homeowners of the subdivision. No existing traffic counts are available for Shewville Road. The site lines where the proposed roads enter Shewville Road appear adequate, although this should be checked by the Town. No improvements are recommended in the Regional Transportation Plan for roads in this area of Ledyard.

13. Archaeological Review

A review of the State of Connecticut Archaeological Site Files and Maps located a prehistoric Native American camp site in the southern portion of the project area (See map). Their files have relatively little information concerning this site and its temporal period is unknown. Additional Indian sites exist in close proximity to the project area including rock shelter, camps and open village settlements. The Mashantucket Pequot Reservation has had considerable archaeological survey work conducted locating numerous prehistoric and historic occupations and cemetery areas. The project area contains a high potential for Native American cultural resources.

On-site review of the project area notes the existence of a mid-18th century European farmstead. The stone ruins and potential artifactual remnants appear to have excellent integrity and raises its potential eligibility for the National Register of Historic Places.

The Office of State Archaeology understands that the Public Archaeology Laboratory, Inc. has undertaken archaeological investigations of the proposed subdivision. In order to provide professional review and comment concerning the property's archaeological sensitivity, it is imperative that the Office of State Archaeology and the Connecticut Historical Commission are provided a meaningful review opportunity for PAL, Inc.'s survey report.

The Connecticut Historical Commission notes that No. 594 Shewville Road is an outstanding five bay center chimney Colonial structure which appears eligible for the National Register. A substantial buffer of mature tree species should be retained along Shewville Road in order to provide the maximum possible buffer between this historic property and any new house lots.

The Office of State Archaeology recommends an archaeological survey of the project area, including further investigation of the prehistoric campsite on listed on state files. In addition, they further recommend the complete avoidance and preservation of the 18th-century farmstead ruins. They commend Daystar Development for initiating the archaeological survey early in the planning process and look forward to reviewing PAL, Inc.'s report and recommendations.

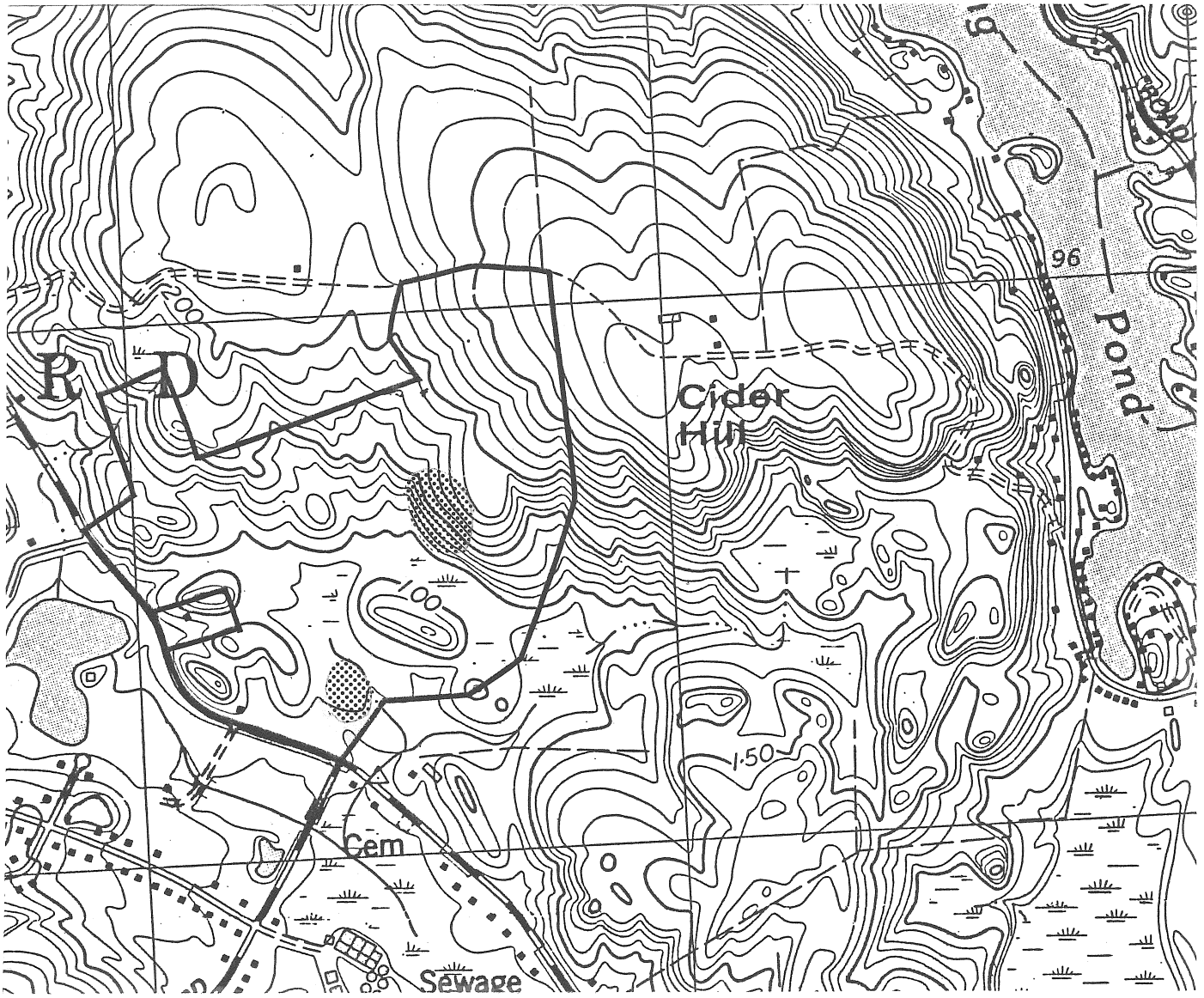
In summary, two archaeological sites exist in the project area, including a prehistoric Native American camp and a colonial farmstead. It is recommended that there be further exploration of the campsite to provide information on its integrity for future research. The farmstead should be preserved and possibly nominated to the National Register of Historic Places, if found eligible. The Office of State Archaeology and the State Historic Preservation Officer should be provided with the opportunity to review the archaeological survey report that is currently being prepared.

The Office of State Archaeology is prepared to offer further technical assistance to the Town of Ledyard and Daystar Development and looks forward to working with them in the future.

ARCHAEOLOGICAL MAP

Scale 1" = 1000'

Known Archaeological Site Areas



14. Appendix

A. Comments from the DEP-Technical Assistance Biologist Dated 08/21/90

B. Comments from the DEP-Technical Assistance Biologist Dated 11/20/90

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

RECEIVED NOV - 5 1990

August 21, 1990

Ms. Joyce Rowley
Town of Ledyard
Inland Wetlands and Watercourses Commission
P.O. Box 38
Ledyard, CT 06339

Dear Ms. Rowley:

I have reviewed the site plan pertaining to the "Greenbriar Riding Club Subdivision". It appears that most concerns initially raised by the CTDEP Inland Fisheries Division in a previous correspondance dated 11/20/89 have been sufficiently addressed by the Daystar Development Company; however, the following items remain outstanding issues:

1. Pond Construction - The proposed pond will be constructed within wetland habitat that is hydrologically associated with the unnamed tributary of Seth Williams Brook. This activity is unwarranted and represents an avoidable impact since existing wetland habitat will be altered and converted to a pond/marsh ecosystem. Such activity may alter the functional capabilities of the wetland and moreover, increase surface water temperatures in the watercourse which would undoubtedly impact the coldwater native brook trout fishery.

2. Animal Waste Management - An effective waste management program should be devised to contain manure runoff from proposed horse stables. Water quality will be impacted if manure is allowed to discharge into wetlands and/or watercourses.

If you have any questions regarding my comments, please feel free to call me at 295-9523. Thank you for the opportunity to review this project.

Sincerely,

Brian D. Murphy

Brian D. Murphy
Technical Assistance Biologist
DEP Eastern District
209 Hebron Road
Marlborough, CT 06447

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

November 20, 1989

Ms. Joyce Rowley
Town of Ledyard
Inland Wetlands and Watercourses Commission
P.O. Box 38
Ledyard, CT 06339

Dear Ms. Rowley:

Per your request, I have had an opportunity to review the parcel of land off of Shewville Road which is intended for subdivision. As you had mentioned in your letter, native brook trout do inhabit the unnamed watercourse which flows through the property. This brook, a tributary of Seth Williams Brook, is expected to support other freshwater species as well. These would include white sucker, fallfish, and blacknose dace. A tributary stream such as this is very important to fishes that inhabit the mainstem of Seth Williams Brook. Mainstem fishes will frequently immigrate into this watercourse on both a seasonal and daily basis. Enclosed are some specific recommendations that will be useful to protect the local fisheries in this stream.

1. **The unnamed tributary of Seth Williams Brook should be crossed with a span bridge rather than with concrete box culverts.** Span bridges will allow native brook trout and other resident fish species to move freely and unimpeded within the stream and also preserve natural instream substrate. The preservation of natural stream habitat is particularly important since it utilized for spawning purposes for a large segment of the local brook trout population.

2. **The unnamed tributary should only be crossed in one area.** You had mentioned in a recent telephone conversation that local zoning requires two separate road crossings for a housing development of this size. An exemption should be considered in this case to limit disturbance to the stream and adjacent wetlands.

3. **Due to native brook trout spawning in the immediate area, it is highly recommended that instream work be prohibited from September 15 to October 31.** Instream work and land grading/filling near watercourses and wetlands is more

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environmentally compatible during low flow periods. This will help minimize the impact to aquatic resources. Reduced streamflows and rainfall during the summer provide the least hazardous conditions in which to work near sensitive aquatic environments and wetlands.

4. Riparian (streamside) vegetation should be restored and replanted at the proposed stream crossing. Fast growing trees that provide good overhead canopy such as red maple should be planted. In addition, these plantings will greatly improve the visual aesthetics of the altered streambelt.

5. It is highly recommended that at the minimum, a 100 foot open space buffer zone be maintained along the boundary of all wetlands and wetland boundary of the unnamed tributary. No construction nor alteration of existing habitat should be allowed in this zone. This buffer can be an effective mitigation measure at this development location.

6. Develop an aggressive and effective erosion and sediment control plan. Install and maintain proper erosion and sedimentation controls during both road crossing and site construction activities. This includes such mitigative measures as filter fabric barrier fences, staked hay bales, and sediment catch basins. Land disturbance and clearing should be kept to a minimum and all disturbed areas should be restabilized as soon as possible. Exposed, unvegetated areas should be protected from storm events.

6. Any on site septic systems should be properly designed and installed. The ability of local soils to effectively renovate septic effluent should be investigated. Systems should not be placed adjacent (within 100 feet) to sensitive wetland and aquatic ecosystems.

If you have any questions regarding my comments, please feel free to call me at 295-9523. Thank you for the opportunity to review this project.

Sincerely,

Brian D. Murphy

Brian D. Murphy
Technical Assistance Biologist
DEP Eastern District
209 Hebron Road
Marlborough, CT 06447

CC: C. Phillips
R. Jacobson

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.