UNION HILLS

OLD LYME, CONNECTICUT

MARCH 1990

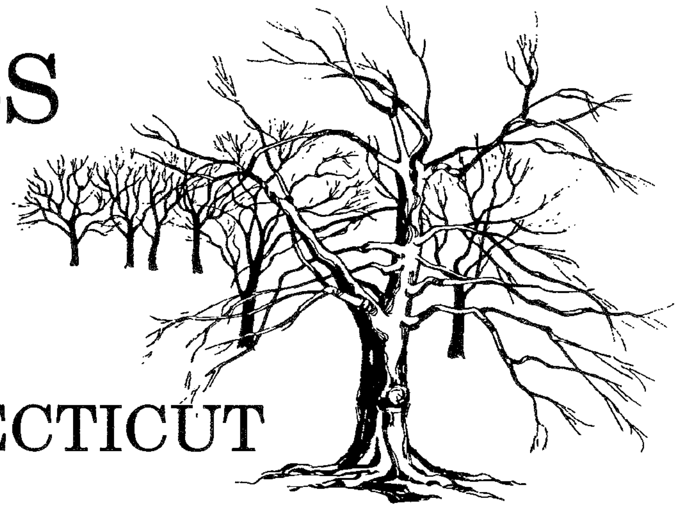
Eastern Connecticut Environmental Review Team Report

EASTERN CONNECTICUT RESOURCE CONSERVATION & DEVELOPMENT AREA, INC.

UNION HILLS

Planned Residential Cluster Development

OLD LYME, CONNECTICUT



Review Date: February 20, 1990

Report Date: March 1990

Eastern Connecticut Environmental Review Team

Eastern Connecticut
Resource Conservation and Development Area, Inc.
1066 Old Saybrook Road, P.O. Box 70
Haddam, Connecticut 06438
203-345-3977

ENVIRONMENTAL REVIEW TEAM REPORT
ON

UNION HILLS

Planned Residential Cluster Development

Old Lyme, Connecticut

This report is an outgrowth of a request from the Old Lyme Planning 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 Tuesday, February 20, 1990. Team members participating on this review included:

Peter Aarrestad	**Fisheries Resource Technician** **DEP - Eastern District Headquarters**
Patrice Beckwith	**Soil Conservationist** **USDA - Soil Conservation Service**
Emery Gluck	**Forester** **Cockaponsett Forest Headquarters**
Carla Harvey	**Environmental Analyst** **DEP-Inland Water Resource Management**
Steve Hill	**Wildlife Biologist** **DEP - Eastern District Headquarters**
Tony Sullivan	**Planner** **State Office of Policy and Management**
Elaine Sych	**ERT Coordinator** **Eastern Connecticut 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 as well as consultant reports. During the field review the Team members were given complete plans. The Team met with, and were accompanied by the Town Planner, the property owner and his engineers. 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 cluster development.

If you require additional information, please contact:

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

TABLE OF CONTENTS

TABLE OF MAPS, CHARTS AND FIGURES

1. LOCATION, ZONING AND LAND USE

The proposed 42 lot subdivision is about 91 acres in size and is located in the southeast corner of Old Lyme. It is bounded on the south by Mile Creek Road and on the west, north and east by wooded, undeveloped land.

Approximately 3.145 acres of the site in the southern parts is currently zoned RU-40, which allows single-family homes on 40,000 square foot (about 1 acre) lots. The remainder (87.25 acres) of the site is zoned RU-80, which allows single-family homes on 80,000 square foot (about 2 acres) lots. Present plans indicate that the applicant wishes to cluster five areas of homes on the site utilizing the town's Planned Residential Cluster Development (PRCD) Regulations. The average lot size would be .84 acres or 36,540 square feet. This design choice will provide flexibility that will encourage preservation of natural resources and greater open space area. A special exception will be required for the PRCD design concept.

The site and vicinity is characterized by wooded land. Surrounding land uses include low density residential land uses on the west, south and east. A low density industrial park lies north of the proposed subdivision. A review of air photos indicates that there has been an increase in residential densities for the site vicinity.

The remains of a former gravel borrow area is visible near the entrance of the property. A larger, active sand and gravel removal operation, which is operated by the applicant, abuts the site on the east. Except for the minor gravel extraction noted earlier, the site has been relatively unused. An old "wood" road loops through the site. In places, the proposed interior road system will be aligned with the "wood" road.

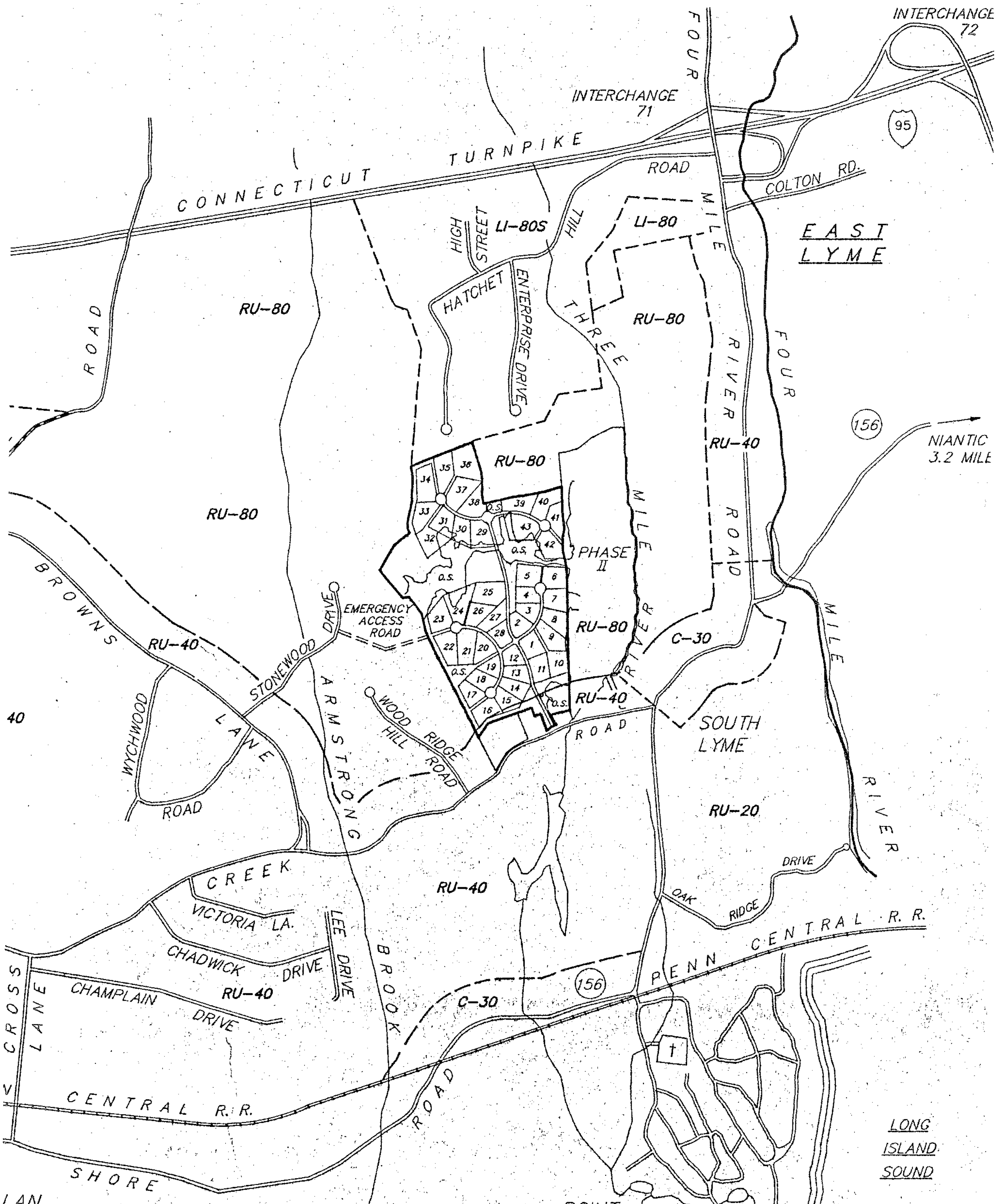
LOCATION MAP

SCALE 1" = 2000'

Approximate Site

LOT LAYOUT MAP

NO SCALE



2. TOPOGRAPHY

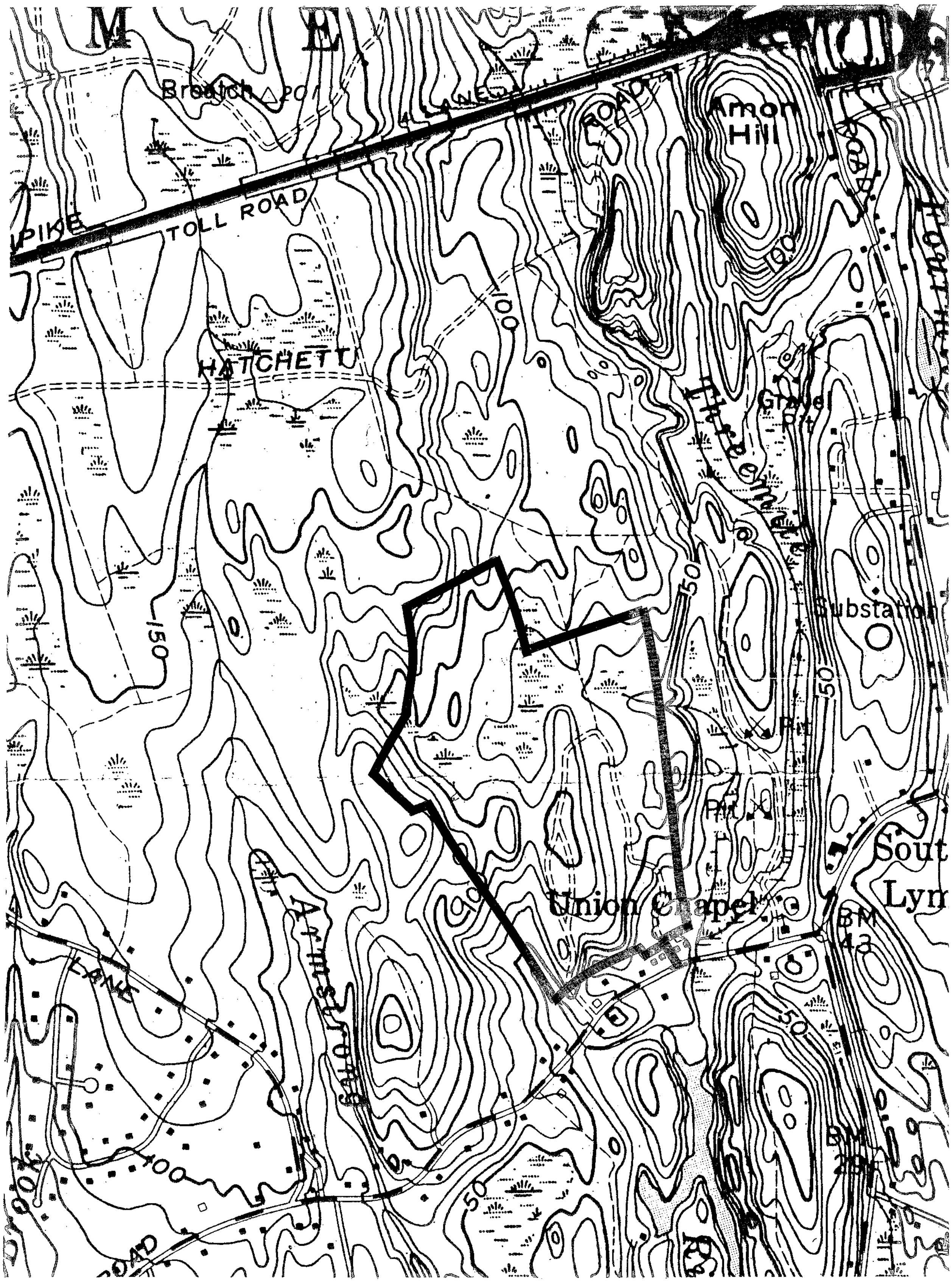
The site topography which is controlled by the underlying bedrock is generally characterized by moderate slopes, but there are also areas of flat and steep slopes. The major land features on the site include a rock-cored streamlined hill (probably a drumlin) in the central parts and a relatively large wetland area in the northcentral parts. Moderately steep slopes occur on the east flank of the drumlinoid hill and at the site's western and southern border. Flat and gentle slopes characterizes the crest of the hill and northcentral parts. Maximum and minimum elevations on the site are 130 feet and 20 feet above mean sea level, respectively.

For the most part, the proposed interior road system has been laid out to cross slopes and conform to contours rather than perpendicular. This will help to minimize road "cuts" and "fills". Nevertheless, road profiles made available to Team members indicate that "cuts" and "fills" will be required in several areas. In the areas covered by CrC (Charlton-Hollis) soils, "cut" areas may encounter competent bedrock that necessitates blasting. If the upper few feet of the schistose bedrock is weathered, it may be possible to peel away the bedrock rather than to blast, but this will depend upon the amount of bedrock to be removed. Deep test holes, especially in significant "cut" areas are warranted to verify subsurface conditions.

TOPOGRAPHIC MAP

SCALE 1" = 1000'

Approximate Site Boundary



3. GEOLOGY

The entire site is located in the Old Lyme topographic quadrangle. A bedrock geologic map (QR-21, by L. Lundgren, Jr., 1967) and a surficial geologic map (QR-31, by R.F. Flint, 1975) for the quadrangle have been published by the Connecticut Geological and Natural History Survey.

The bedrock core of the site consists of crystalline metamorphic rock identified in map QR-21 as a subunit of the Plainfield Formation. It is described as a gray gneiss rich in the minerals biotite, quartz and feldspar, that includes many layers of schist and amphibolite. Also, the rock unit has been extensively cut by granitic rock.

The site flanks the east side of Lyme Dome, an area of uplifted rock. In general, the layering of platy and flaky minerals in the rock dips moderately steeply to the east.

The exact depth to bedrock is unknown on the site. According to a map showing Depth to Bedrock, Old Lyme Quadrangle by D.B. Meade, 1974, bedrock is closest to the ground surface (10 feet or less) in the southern parts of the site but may range between 10 and 50 feet in the central and northern parts. The underlying bedrock will be the principal source of water to wells drilled on the site.

The unconsolidated materials overlying bedrock consist of the glacial sediments till and stratified drift. Except for a very small area of stratified drift in the southeast corner, the site is covered by glacial till. Till consists of an unstratified, unsorted mixture of silty, coarse to fine sand that includes varying amounts of boulders, cobble, gravel and clay. These sediments were transported and deposited by glacial ice as it advanced through the region.

Although the texture of the till varies, it is commonly sandy, stony and relatively loose in the upper feet or in shallow to bedrock areas, but becomes siltier and more compact at depth.

Stratified drift deposits cover till and bedrock in the southeast corner. Sand and gravel are the major components of stratified drift. There is probably too little stratified drift on the site to have any real commercial value although local mining for fill is possible. As noted earlier, evidence of sand and gravel mining is visible in the southeast corner.

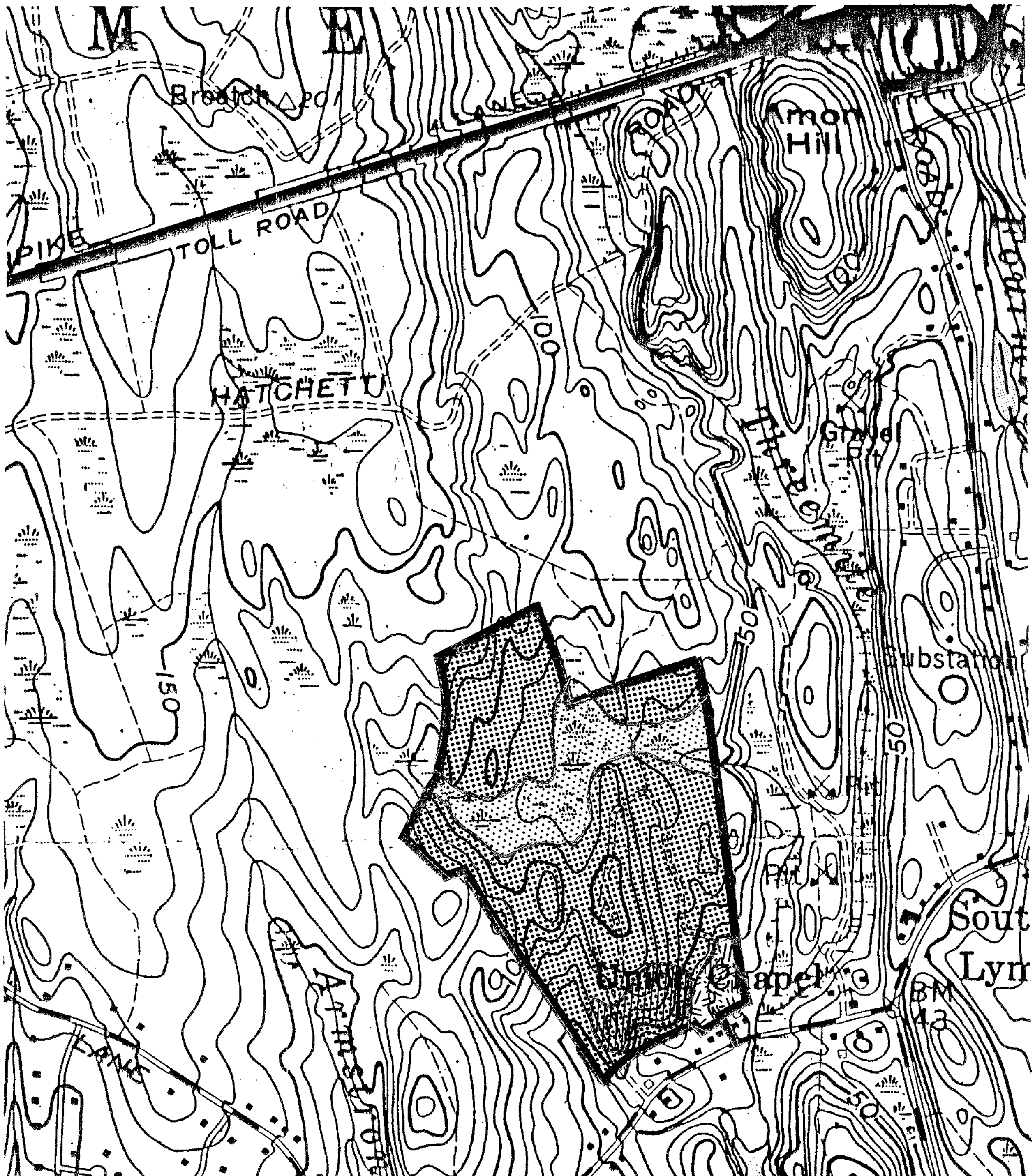
Overlying till in the north central parts of the site are post-glacial swamp sediments. They consist of silt, sand and clay mixed with organic matter in poorly drained areas. The other area of swamp deposits occurs in the southeast corner and overlies the sand and gravel deposits.

GEOLOGIC MAP

SCALE 1" = 1000'

Note: Entire site is underlain by Plainfield Formation subunit
(See text for description)

- Swamp Deposits
- Stratified Drift
- Till
- Shallow to Bedrock Soils



4. SOIL RESOURCES

Soils

The majority of the soils found on the site are Charlton-Hollis fine sandy loams and secondly, Canton and Charlton extremely stony fine sandy loams. Both these soil groups are well drained soils on glacial till uplands. They have a very high potential for septic system leaching systems. The area of concern would be with the Hollis portions of the Charlton-Hollis complex. Here the bedrock approaches the surface of the soil and would be unsuitable for leaching fields. If the depth to bedrock of the naturally occurring soil is less than 24 inches, a permit cannot be granted. The applicant should conduct a feasibility study to use the deepest soils, and use careful design so as not to place septic systems on steep slopes where breakouts could occur.

There are lots proposed on the Woodbridge soils (lots 26 and 38) which exhibit a high water table. To alleviate this problem, curtain drains can be installed, however, there would need to be sufficient slope to properly drain the excess water to a safe outlet. A similar condition is likely to exist on the Paxton soils in the area of Swanswood Lane. Paxton soils are characterized by a perched water table. The limitations are less severe than on Woodbridge soils because the depth of the hardpan layer is generally deeper. In both these cases, a curtain drain around the house foundation and uphill of the septic system can be used to alleviate the problem. Designing leaching fields to distribute effluent over a larger area would provide a solution, however, in a cluster development, where lots are close together, space may be limited.

The hazard for erosion can be severe on these soils and the establishment of vegetation is particularly important after disturbance. On the steeper slopes, erosion control measures will also help to control excess erosion during construction. Large rocks and boulders can present planning problems but can also be used to enhance the landscape.

Two ponds are proposed on the site. It would be advisable to put in a monitoring well to approximate the depth of the pond. By monitoring the water level in the well, the applicant will be able to determine the feasibility of a viable pond in that area.

There are moderate limitations to developing local roads and street due to slope and bedrock. The road layout seems to follow the natural grades of the landscape wherever possible. The areas where bedrock approaches the surface will create problems for both roads and excavations. Test borings would be necessary to determine suitable sites. Homes may be designed without basements in areas where bedrock presents a problem. Excavations should be monitored carefully because the Canton soils tend to slump.

Sediment and Erosion

The plan submitted is general for any site, and no site specific information was given. Erosion control measures were not outlined on the site plan. There are some areas on the site with considerable slope that would need protection. As with all sites, protection for all wetlands is necessary. Specific details on the proposed activities at the wetlands crossings are necessary. Refer to the enclosed checklist for those items which should be included on the plan.

Storm Water Drainage

The drainage calculations that were submitted to this office are incomplete. Because there will be an increase in runoff, there will need to be a detention structure designed. The developer plans to use wet ponds for wildlife as detention.

The drainage calculations cannot be reviewed without the drainage area soils map. The curve number has been calculated, but the runoff (Q) has not. There are no further worksheets included in the report to back up the hydrograph runoff values. The size and detention volume of the ponds has not been calculated and proven.

Refer to the enclosed TR-55 checklist for those items which should be included in the storm drainage report.

When a complete report is prepared this office will be available to review it at the town's request.

CHECKLIST FOR USING TR-55 ANALYSIS

SCS-CT-ENG-HYD1-Trial
April 1988

U.S. DEPT. OF AGRICULTURE
SOIL CONSERVATION SERVICE
STORRS, CONNECTICUT

This form should be used in conjunction with Chapter 9 of the Connecticut Guidelines for Sediment and Erosion Control to develop Hydrologic Reports.

This form should also be used with TR-55 (2nd edition) released in June 1986 which provides other hydrologic procedures not noted in Chapter 9.

CHECKLIST FOR REVIEWING
REPORTS USING TR-55 ANALYSIS

PROJECT: Union Hills Cluster Development LOCATION: Old Lyme

BY: McDonald & Sharpe DATE: 3/7/90

1. __*__ Watershed Map at a scale of 1" = 500' or larger. Show watershed boundary, subarea boundaries, and subarea names or numbers. (Optional - show Tc, CN, and Drainage Area for each subarea on the map). Contour maps must include some additional area outside the property line boundaries.

2. __*__ Large scale map showing different soils within each subarea and subarea boundaries. May also be used to measure drainage areas. Could also show Tc calculation path used for each subarea.

3. __*__ Tabulation sheet or computer printout showing Curve Number and Time of Concentration calculations for each subarea. Drainage areas, Hydrologic Soils Groups, and Land Use areas should be documented from soils maps or other references.

4. __*__ Tabulation sheet showing calculations and equations used for any storage estimates to design a detention basin or other misc. calculations.

5. __*__ TR-55 printout showing graphical or tabular peak discharge calculations. Include printouts for both pre-development and post development conditions. The printout showing the design of a detention basin should be included. These printouts should document the zero discharge increase for all required storms.

6. _____ The written report should state the initial conditions and storm frequencies to be analyzed. Include a summary table showing the pre-development, post development, and designed system peak discharges for all design frequencies. Show a sketch of the structure outlet system with elevations and dimensions.

Items with an * should be included.

EROSION AND SEDIMENT CONTROL PLAN WORKSHEET

EROSION AND SEDIMENT CONTROL PLAN WORKSHEET

This is a guide for the development and review of erosion and sediment control plans. Local commissions should be consulted for regulatory requirements concerning erosion and sediment planning.

Checked ( ) items are those that have been provided on the current erosion and sediment control plan. Items identified with a star (*) should be incorporated into final plans.

Name of development Union Hills Cluster Development

Materials received Subdivision plan and Drainage Calcs

Total Area 90 acres Location Mile Creek Road

Engineer McDonald & Sharpe

Date Received 2/20/90 Site Visit 2/20/90 Reviewed by SCS

Submitted by Old Lyme Planning Commission

NARRATIVE SECTION DESCRIBING:

- ____ The development
- ____ Major land uses of adjoining areas
- ____ The number of total acres and acres to be disturbed in the project
- _*_ The schedule of grading and construction activities including start and completion dates
- ____ Application sequence of all E&S control measures
- ____ The design criteria for all proposed E&S control measures
- _*_ Construction details and installation procedures for all proposed E&S control measures
- _*_ The operations and maintenance program for all proposed E&S control measures
- ____ The name of the person or organization that will be responsible for the installation and maintenance of the E&S control measures
- ____ Organization or person responsible for maintenance of permanent measures when project is completed. Measures include: ____

A SITE PLAN AT A SUFFICIENT SCALE SHOWING:

Natural Features

- ______ Existing topography
- ______ Existing vegetation
- ______ Soils information, including test pit data if available
- ______ Identification of wetlands, watercourses, major drainage ways and water bodies on the site
- ______ Name of soil scientist who performed wetlands delineations and flag numbers
- ______ Rock outcrop areas
- ______ Seeps, springs
- ______ Major aquifers
- ______ Floodplains (100 year) and floodways
- ______ Channel encroachment line (DEP permit required)
- ______ Coastal zone boundary
- ______ Public water supply watershed boundaries
- ______ Possible Army Corps Sec. 404 or Sec. 10 Permit Areas (Contact Corps at 1-800-343-4789)

Project Features

- ______ The location of the proposed development
- ______ A plan legend
- ______ Adjacent properties
- ______ Property lines
- ______ Lot lines and setback lines
- ______ Lot and/or building numbers
- ______ Planned and existing roads
- ______ Proposed structures
- ______ Location of existing and planned utilities
- ______ Location of wells and septic systems
- ______ Proposed topography
- ______ North arrow

Clearing, Grading, Vegetative Stabilization

- ______ The sequence of grading, construction, and sediment and erosion control activities
- __*__ The location of and construction details for all proposed E&S control measures
- ______ Recommended measures include ______________________________

  ____

  ____
- __*__ Limits of disturbed areas
- __*__ Extent of areas to be graded
- __*__ Disposal procedure for cleared material
- __*__ Location of stockpiled topsoil and subsoil
- ______ Temporary erosion control method for protection of disturbed areas when time of year or weather prohibit establishment of permanent vegetative cover
- ______ Seedbed preparation (including topsoiling specifications)
- ______ Fertilizer and lime application rates
- ______ Mulch application rate
- ______ Mulch anchoring measures

<u>Drainage System</u>

- ______ Existing and planned drainage pattern
- ______ Drainage areas used in design of storm water management system
- ______ Size and location of culverts and storm sewers
- ______ Drainage calculations for review by town engineer
- ______ Storm water management measures and construction details
- ______ Groundwater control measures (footing drains, curtain drains)
- ______ Planned water diversions and dams (DEP permit may be required)

<u>House Site Developments</u>

- ______ Sediment and erosion control measures for individual lot development

<u>Additional Comments</u>

SOILS LIMITATION CHART

SIGNAL HILL SUBDIVISION ERT

SOIL	WATER TABLE	SEPTIC TANK ABSORPTION FIELD	SHALLOW EXCAVATION	LOCAL ROADS AND STREETS
CdC	>6.0	Moderate slope	Mod - Severe cutbanks cave, slope	Moderate slope, large stones
CdD	>6.0	Severe slope	Severe, cutbanks cave	Severe slope, large stones
Ce	1.0 Sept - June	Severe ponding	Severe ponding, excess humus	Severe ponding
CrD	>6.0	Severe slope, bedrock	Severe slope, bedrock	Severe slope, bedrock
HkC	>6.0	Severe poor filter	Severe cutbanks cave	Moderate slope, stones
HrD	>6.0	Severe slope, bedrock	Severe slope, bedrock	Severe slope, bedrock
PdC	1.5 - 3.0 Feb - March	Severe percs slowly	Moderate slope, wetness, hardpan	Moderate slope, wetness, frost action
PdB	1.5 - 3.0 Feb - March	Severe percs slowly	Moderate wetness, hardpan	Moderate wetness, frost action
Rn	1.0 Nov - May	Severe percs slowly	Severe wetness	Severe wetness, frost action
SxB	1.5 - 3.0 Nov - April	Severe wetness	Severe wetness	Severe frost action
WxA	1.5 - 3.0 Nov - May	Severe percs slow,wetness	Severe wetness	Severe frost action
WxB	1.5 - 3.0 Nov - May	Severe percs slow, wetness	Severe wetness	Severe frost action
WyB	1.5 - 3.0 Nov - May	Severe percs slow, wetness	Severe wetness	Severe frost action
WyC	1.5 - 3.0 Nov - May	Severe percs slow, wetness	Severe wetness	Severe frost action

SOILS MAP

SCALE 1" = 1320

Union Hills Subdivision Soils Descriptions

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.

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.

* HcB - Haven silt loam, 3 - 8 percent slopes

This gently sloping, well drained soil is on stream terraces and outwash plains. Permeability of the Haven soil is moderate in the surface layer and subsoil and very rapid in the substratum. The available water capacity is high. Runoff is medium. Haven soil warms up and dries out rapidly 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 moderate. This soil is suited to trees.

This soil is in capability subclass IIe.

PdB - Paxton and Montauk very stony fine sandy loams, 3 - 8 percent slopes

These gently sloping, well drained soils are on drumloidal, glacial till, upland landforms. Stones and boulders cover 1 - 8 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. 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 of these soils is moderate. Runoff is medium. 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 moderate. These soils are suited to trees. The major limiting factor for community development is very slow, slow, and moderately slow permeability in the substratum.

These soils are in capability subclass VIs.

***** 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.

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.

WzA - Woodbridge and Rainbow extremely stony soils, 0 - 3 percent slopes

These nearly level, moderately well drained soils are on drumloidal, glacial till, upland landforms. Stones and boulders cover 8 - 25 percent of the surface. These soils have 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 runoff of these soils is slow. These soils warm up and dry out slowly in the spring.

The Woodbridge soil available water capacity is moderate. The Rainbow soil available water capacity is high. The Woodbridge soils are strongly acid or medium acid in the surface layer and subsoil and strongly acid through slightly acid in the substratum. The Rainbow soils are strongly acid or medium acid. These soils are not suited to cultivated crops. The hazard of erosion is moderate. These soils are suited to trees. The major limiting factors for community development are the seasonal high water and the slow or very slow permeability in the substratum.

These soils are in capability subclass VIIs.

*** - Prime Agricultural Farmland**

**** - Farmland of Statewide Importance**

***** - Wetlands**

5. HYDROLOGY

The site can be divided into two subdrainage areas. Except for ±11 acres in the southwest corner, surface drainage on the site flows to the unnamed Three Mile River tributary whose headwaters are located in the wetland in the northcentral parts. It flows into the Three Mile River about 200 feet north of the intersection of Mile Creek Road and the river and drains an area of about 178 acres. The ±11 acres mentioned above drains to an unnamed tributary to the Three Mile River. The streamcourse originates in a swale west of Swanswood Lane then flows under Mile Creek Road into a Three Mile River impoundment south of the site. Three Mile River drains an area of 2.43 square miles or 1,555 acres. The site, about 91 acres, represents 6% of the Three Mile River drainage area.

According to a map published by the Department of Environmental Protection call Water Quality Classifications of Connecticut, Murphy, 1987 the surface waters on the site have not been classified and, by default, are presumed to be Class "A" streamcourses.

Class "A" surface waters may be suitable for private drinking water supply, recreational or other uses and may be subject to absolute restriction on the discharge of pollutants, although there may be certain discharges that would be allowed.

The map also classifies groundwater and, as such, groundwater within the site is designated as GA. A GA water resource is suitable for private drinking water supplies without treatment.

Development of the site for the proposed residential purpose will increase the amount of runoff shed from the site. These increases will result from the creation of impervious surfaces such as roads and rooftops, the removal of vegetation and the compaction of soil. The major concerns with increased runoff are the potential for flooding to downstream areas and streambank erosion/surface water degradation.

The overall goal for the proposed stormwater plan for the Union Hill Subdivision should be to maintain existing site runoff patterns and ensure that site generated storm flows are not diverted into adjoining watersheds. Also, the stormwater management plan should store storm runoff by collecting and holding the water for slow release to downstream off-site watercourses at a rate that does not exceed pre-development runoff rates during design storm events. This can be achieved by the creation of detention basins. The main downstream area of concern is the culvert under Mile Creek Road at its intersection with the Three Mile River. Team members were informed on the review day that the road overtops during certain storm events.

Although the applicant's engineers hydrologic computations show small increases (<5%) for the 2-year, 10-year and 100-year storm frequency, two detention basins/fire ponds that will, among other things reduce the post-development peak flows to their corresponding pre-developed flows, are proposed for the development. These detention ponds will hopefully prevent further aggravation of flooding that presently occurs at Mile Creek Road.

For the most part, the detention basins will be located on upland soils. The detention/fire pond closest to the entrance of the subdivision will be partially excavated in regulated wetlands and as such will require a permit from the town's inland wetland agency. The detention basins should be designed to "renovate" runoff before it enters the wetlands/streamcourses on the site. This can be accomplished by designing it to serve a dual function of detention and sediment retention.

The town's engineer should carefully check the applicant's drainage computations and basin's design to ensure that they comply with town regulations and adhere to the Connecticut Guidelines for Soil Erosion and Sediment Control, 1985, as amended.

In order to prevent surface water degradation and sediment transport to on and off-site streamcourses/wetlands a comprehensive soil erosion and sediment control plan should be implemented. The control measures should be monitored from time to time by town officials especially following periods of heavy precipitation. An inspection program should be implemented.

During the construction period, control measures that included silt fences and hay bales, temporary/permanent sediment basins, which permit settling time for suspended solids, anti-tracking devices, as well as minimizing land disturbance should be used to reduce the chance for environmental damage to on and off-site wetlands and watercourses. Connecticut Guidelines for Soil Erosion and Sediment Control (1985, as amended) should be closely followed with respect to the erosion and sediment control plan.

WATERSHED BOUNDARY MAP

SCALE 1" = 1000'

- Design point for the watershed at it's point of outflow to Three Mile River.
- Streamcourses showing direction of flow.
- Portion of site that drains to an unnamed Three Mile River tributary which originates in the wetland in the northcentral parts of the site.
- Portion of site that drains to unnamed Three Mile River tributary located in the southeast corner of the site.

6. WETLAND REVIEW

As the Plan titled "Union Hills Planned Residential Cluster Development, Site Development Plan" dated October 13, 1989 revealed no significant wetlands/watercourse alteration, a plan review was performed by the DEP-Inland Water Resource Management Unit with respect to the current proposal.

The irregularly shaped parcel is located between Armstrong Brook and Three Mile River in Old Lyme, CT and is accessed by Mile Creek Road to the south. Encompassing approximately 91 acres, this parcel contains approximately 12 acres of wetlands. Within the wetland system are numerous small meandering streams and larger watercourses. For a complete description of the wetland communities see the report titled "Wetland Habitat Assessment of planned Residential Cluster Development" Prepared by Lee Alexander, M.S., Ph.D.

The forty-three lot subdivision is concentrated outside of the wetland/watercourse boundaries with two exceptions.

1. The proposed Union Hills Road crossed the wetlands and a major stream at the narrowest point in the north-central portion of the property. This streambelt served as a travel corridor for the area's population of wildlife. This crossing will bisect the wetlands, which may inhibit wildlife travel from one side of the road to the other. However, since there appears to be no alternative access from the north, west or east of the site, and the plans indicate that an existing path already exists in this area, a crossing at this location seems to be a feasible and prudent alternative.

2. Approximately 300 feet north of Mile Creek Road, the proposed Union Hills Road crossed a wetland finger. A combination detention basin/fire pond is proposed just east of this crossing.

   The proposed activities at this location appear to be acceptable due to the fact that **a)** they occur along the fringe of the wetland, and **b)** the area appears to have been previously disturbed by the presence of an existing path.

The Plan reviewed above did not include a Sediment and Erosion Control Plan, a Drainage Plan or detailed design criteria for the two proposed ponds, therefore comments could not be made relating to the above concerns. However, careful attention should be given to the above mentioned plans to guard against secondary impacts to wetlands and watercourses arising from sedimentation problems.

The open space areas seem to be limited to the actual wetland boundary. It is suggested that a portion of uplands be dedicated to open space as well for those wildlife species that utilize both upland and wetland habitat in their life cycles. Additionally, a conservation easement should be placed on those lots containing wetlands to further protect them from secondary impacts.

7. WATER SUPPLY

The proposed water supply for the residential subdivision will consist of drilled wells tapping the underlying crystalline metamorphic rock. Each building lot will be served by individual wells that are cased with steel pipe firmly into solid rock and completed as open boreholes in the metamorphic bedrock.

The typical well depth is likely to range between 150 feet and 300 feet. The local gneiss-schist-amphibolite complex is not known to be a prolific aquifer but a review of domestic water supplies in the vicinity of the site indicate that generally higher than normal yields (2-3 gallons per minute) have been obtained from the local bedrock. The Team's geologist believes there could be a correlation between the highly productive wells and the site's proximity to the main axis of the Lyme Dome, but this would require further study. Uplifting of the rock in the vicinity of the Lyme Dome may have caused an abundance of fractures and cracks to occur in the upper few hundred feet of the bedrock surface in the area. Well completion reports for bedrock wells serving numerous homes located on Stonewood Drive and Woodridge Hill Road, 1000-2000 feet west of the proposed subdivision were reviewed by the Team's geologist. An accompanying table shows the yield and well depth of the wells surveyed. The wells were drilled between 1980 and 1986. The wells ranged in depth from 103 feet to 303 feet. Well yields were reported to range from 5 gallons per minute to 150 gallons per minute.

Yields from bedrock wells depend upon the number and size of water-bearing fractures that are intersected by the wells. Density and size of fractures in different bedrock zones vary widely, but they generally occur within the first few hundred feet of the surface. Because the distribution of fractures in bedrock is irregular, there is no practical way, outside of expensive geophysical testing, of predicting the yield of a well without drilling it first.

Every effort should be made to locate wells on a relatively high portion of the lot, properly separated from the sewage disposal systems or any other potential pollutants (e.g., road drainage, curtain drain pipe, etc.) and in a direction opposite the expected groundwater movement. All wells should be cased with steel pipe into the underlying bedrock and properly installed in accordance with all applicable State Public Health

Code and Connecticut Well Drilling Board regulations to provide adequate protection of the quality of bedrock water. In addition, the town sanitarian must inspect and approve well locations.

The "planned residential cluster development" design concept does not allow as much flexibility for separation distances between neighboring wells as the RU-80 zone. As such, the separation distances between wells on several lots range from about 40 feet to 60 feet. The concern here is the potential for mutual interference between pumping wells. It is suggested that neighboring wells be separated as far apart as possible which will help to reduce the chance for mutual interference between bedrock wells. This appears to be achievable on several lots but will require shifting some of the proposed well locations.

Figure 1

Summary of Private Water Supply Wells
Tapping Metamorphic Rock
on Stonewood Drive and Woodridge Hill Road

Well No.	Total Depth (ft)	Well Yield (gpm)
1	103	50
2	230	150
3	300	5
4	275	10
5	140	20
6	160	30
7	180	30
8	160	25
9	264	5
10	280	40
11	283	5
12	143	20
13	163	10
14	203	7
15	204	25
16	273	50
17	184	30
18	163	18

8. SEWAGE DISPOSAL

Since municipal sewers are not available to this part of Old Lyme, the proposed planned residential cluster development will be served by individual on-site sewage disposal systems. In order to determine subsurface conditions for on-site septic systems, 104 deep test holes were excavated on the parcel. This work, performed by Angus McDonald/Gary Sharpe and Associates, Inc. for the applicant Leon Lech, was conducted during February and December of 1989. Deep test holes, generally 6 feet or more in depth typically encountered a top soil layer (6 inches - 13 inches deep), a subsoil zone (2.5 feet deep), which was described as fine sandy loam to sandy loam textured materials then till or "hardpan". For the most part, the texture of the till consists of gray, firm, silty sand with stones, however, several deep test holes in the northeast corner encountered sandy gravelly materials.

Based on visual observations made during the field walk, soils mapping data, and review of subsurface data compiled from the 104 deep test pits excavated on the parcel, the site is moderately favorable for on-site sewage disposal. Some areas are limited by nearly flat slopes, seasonal high water tables and/or shallow underlying bedrock, all of which will be a major hindrance for on-site sewage disposal, especially on small lots (<one acre in size). Ledge, 5 feet or less was reported on four lots (12, 19, 33 and 38) and will be an important design constraint that requires careful examination. A sufficient number of test holes are warranted in the proposed leaching area on these lots to ensure that the bottom of leaching systems is at least 4 feet above bedrock.

Mottling was commonly noted in the compact till layer (hardpan) but also in the subsoil zone above the "hardpan" in several test holes especially in the northwest cluster (Buttermilk Lane). This indicates a potential seasonally high water table condition. The seasonal high water table appears to be a perched water table that results from the relatively low permeability of a "hardpan" zone 2-3 feet below ground surface. The seasonally high water table condition will also be an important design constraint in terms of on-site sewage disposal.

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

Present plans indicate that average lot sizes will be less than one acre (±.84 acres). Clustering of the houses in 5 areas on the site would seem to have certain merits such as retention of more open space and protection of environmentally sensitive areas. However, a major concern or question is one of locating a sufficient suitable area for sewage disposal purposes on each lot.

The area of major concern is the northwest cluster where subsurface conditions are characterized by seasonally high water table conditions caused by a restrictive "hardpan" layer 2-3 feet below ground level, slow percolation rates and nearly level slopes. Because of these limiting factors, the lots presently proposed for this cluster may be too small in size to adequately treat and disperse the anticipated sewage effluent flows. As such, this area warrants careful examination. Also since many of these lots may need to utilize building footing drains/curtain drains to protect basements and septic systems, respectively, from the seasonal high water table, it seems likely that larger lots will be required in order to maintain Public Health Code separation distances.

Based on soil and site characteristics, it seems that the projected density for the northwest cluster is too high and that a more conservative figure is in order to achieve successful disposal for the long term.

The subdivision plans made available to Team members indicates that all septic systems require special design (engineered). The detailed plans should be prepared by a professional engineer prior to issuance of building permits for each lot. Because of shallow to bedrock soils and/or seasonally high water tables, it seems likely that many systems will need to be filled and raised and should be spread out parallel to the contours. Additionally, curtain drains may be utilized on lots to protect leaching fields from the seasonal high water table but this will depend upon topographic conditions. Curtain drains, when properly installed can intercept groundwater flow above the leaching field so that the water table does not rise up into the leaching field and impair its hydraulic capacity.

On a few lots it appears that pumping chambers will need to be used to raise the waste water to elevations higher than the discharge level at the house. It is suggested that systems which require a pump be noted on the subdivision plans.

9. VEGETATION

The vegetation of the property is common to the oak-hickory forest found in southern Connecticut. The vegetation can be divided into two forest types(red maple and white oak - black oak - red oak). These forest types can be broken down into 6 individual stands. The acreage of the forest stands were obtained from aerial photographs and should only be used as estimates.

Vegetation Description

Stand 1 (white oak - black oak - red oak) is a 58 acre fully stocked stand composed of sawtimber (trees 11.1'" in diameter at breast height and larger) and poles (trees 6.1" to 11" dbh). Black oak is the the dominant overstory tree species. White oak, hickory, red oak, tulip poplar, beech, white ash, red maple, black birch, scarlet oak, and sassafras are present . White pine and hemlock are present in token numbers. The shrub layer and the ground cover include American hornbeam, witch hazel, green briar, ground cedar, mountain laurel, flowering dogwood, and hazelnut.

Most of the overstory trees appear to be relatively healthy but show some early signs of stress. The drier ridges provide a poor site for growing hardwoods while the lower slopes and areas adjacent to the drainage provide an average growing site for hardwoods. The stand is approximately 100 years old.

Stand 2 (white oak-black oak-red oak) is an 8 acre pole stand. Black oak, white oak, scarlet oak, hickory, black birch, and red cedar are present. The shrub layer includes American hornbeam and green briar.

Most of the overstory trees are approximately 60 years old. The drought-prone soils underlying the stand limit the growth potential of the stand and subject the trees to some degree of moisture stress.

Stand 3 (white oak-black oak-red oak) is a 9 acre pole stand. Black oak, red maple , black cherry, red cedar, sassafras, black birch and white oak are present. The lesser vegetation includes green briar, American hornbeam, maple leaf viburnum, and flowering dogwood. Most of the trees appear to have seeded in naturally when pasturing was terminated about 60 years ago. The few large sawtimber trees that have large low branches were present when the area was still used as for grazing livestock . The shallow soils provide a poor site for growing hardwoods.

Stand 4 (red maple) is a 14 acre pole stand. Red maple is the dominant tree species. Black gum, yellow birch, white ash and American elm represent a minor component of the stand. The lesser vegetation include green briar, clethra, spicebush, swamp azalea, skunk cabbage, ferns, and poison ivy. The excessively high water table limits tree growth in this area.

Stand 5 (white oak - black oak - red oak) is a 2 acre sapling (trees 1.1" to 6.0" dbh) stand. Black oak, red maple, gray birch, red cedar, and aspen. The lesser vegetation includes sweet fern, mountain laurel, bittersweet, green briar, and grape.

Stand 6 (white oak - black oak - red oak) is a 7 acre pole and sawtimber stand. White oak, black birch , hickory, scarlet oak, red maple, and black oak are present. A partial harvest that took place about 10 years ago has left the stand understocked and has stimulated the understory vegetation (primarily green briar, mountain laurel and scattered hardwood saplings).

Limiting Conditions/Potential Hazards

Presently, the main limiting condition of the forest is the lack of healthy and vigorous trees that are free of significant decay. Unhealthy and low-vigor trees are more susceptible to insect and disease problems which in turn could lead to a high mortality rate. Trees growing in crowded conditions or on drought prone soils can be expected to experience greater stress and have limited growth. Mast production (i.e. acorn, hickory nuts, etc.) can be expected to be lower in a less healthy forest. Therefore, less food will be available for wildlife. Long term aesthetics will also be limited by the health of the forest.

Potential hazards include dead trees, dead tree parts and those trees whose roots or trunks have a high probability of failing due to excessive decay or lean. These trees become hazard trees if there is a high risk of injuring people or damaging property. All trees with the above-mentioned characteristics would be hazards if located within striking distance of a building or along areas of high use such as hiking trails or roads.

Construction activities that occur too close to trees that are to be retained will adversely effect the health of the trees and create future hazard trees. Trees are very sensitive to the condition of the soil within the entire area of their root systems. Road building, filling, and general use of heavy machinery will lead to some degree of soil compaction that will adversely affect the soil moisture and aeration balance. This could lead to the decline in tree health and vigor and may lead to the death of the tree within three to five years. Physical damage to the root system (by excavation) and bark damage allow the introduction of decay organisms and may also result in the decline of tree health. The older and/or larger a tree is the more readily it is affected by the negative impact of construction related activities. The delayed effect of construction activities on trees can create future hazards trees that are expensive to remove once utility lines, roads, and homes are in place.

The creation of openings in the forest (from clearing houselots) will increase the susceptibility of the trees to windthrow at the leeward edge of the openings. Trees adjacent to or in openings that occur on soils with a high moisture content or on windward slopes will be at the greatest risk for windthrow. These trees are also susceptible to ice storms that may cause consider able crown breakage.

Aesthetic Considerations

The forested lots and proposed conservation land should provide many of the rural amenities for which many home buyers are looking. The aesthetics of a forest depends upon numerous characteristics of the individual trees, the forest as a whole and the landscape. Some of these characteristics include: size of the trees, density of the forest, variety of forest scenes, unique or interesting features, amount of dead and down material, depth of view into the forest, and visual attractiveness of the bark texture and leaf and flower color. Generally, forests with large trees and a deep unobstructed view into the woods are most desirable. A forestry operation could promote this type of setting by harvesting smaller understory trees that limit or obstruct visual penetration. A forestry operation could also improve long term aesthetics by giving healthy overstory trees adequate growing space. This will result in an increased growth rate and therefore a larger tree in a shorter time period. For views between houselots, it is usually desirable to block visual penetration with a vegetative screen for privacy. Mountain laurel could provide a good visual screen in some of the houselots where it is already present. Where an effective screen is absent, a forestry operation could promote the growth of understory vegetation to impede visual penetration by harvesting a portion of the overstory trees.

The amount of down material created by a forestry operation could temporarily impact the forest aesthetics. This could be minimized by controlling the intensity of the harvest, timing the harvest to correspond with good fuelwood markets (to improve cull and top wood utilization), require lopping of tops to a certain height. These steps plus the decomposition process will aid in making the down material less noticeable within a few years.

The development of a variety of forest stands in the open space land would most likely be more visually interesting than the present relatively homogeneous forest. A variety of species and age classes would also safeguard the long term aesthetics by minimizing the impact of damaging agents (i.e.. catastrophic hurricanes, insect and disease infestations) on a particular species or older trees. The concept of "not putting all your eggs in one basket" is an effective management method of reducing the high risk of growing forests over an extended period of time.

Management Considerations

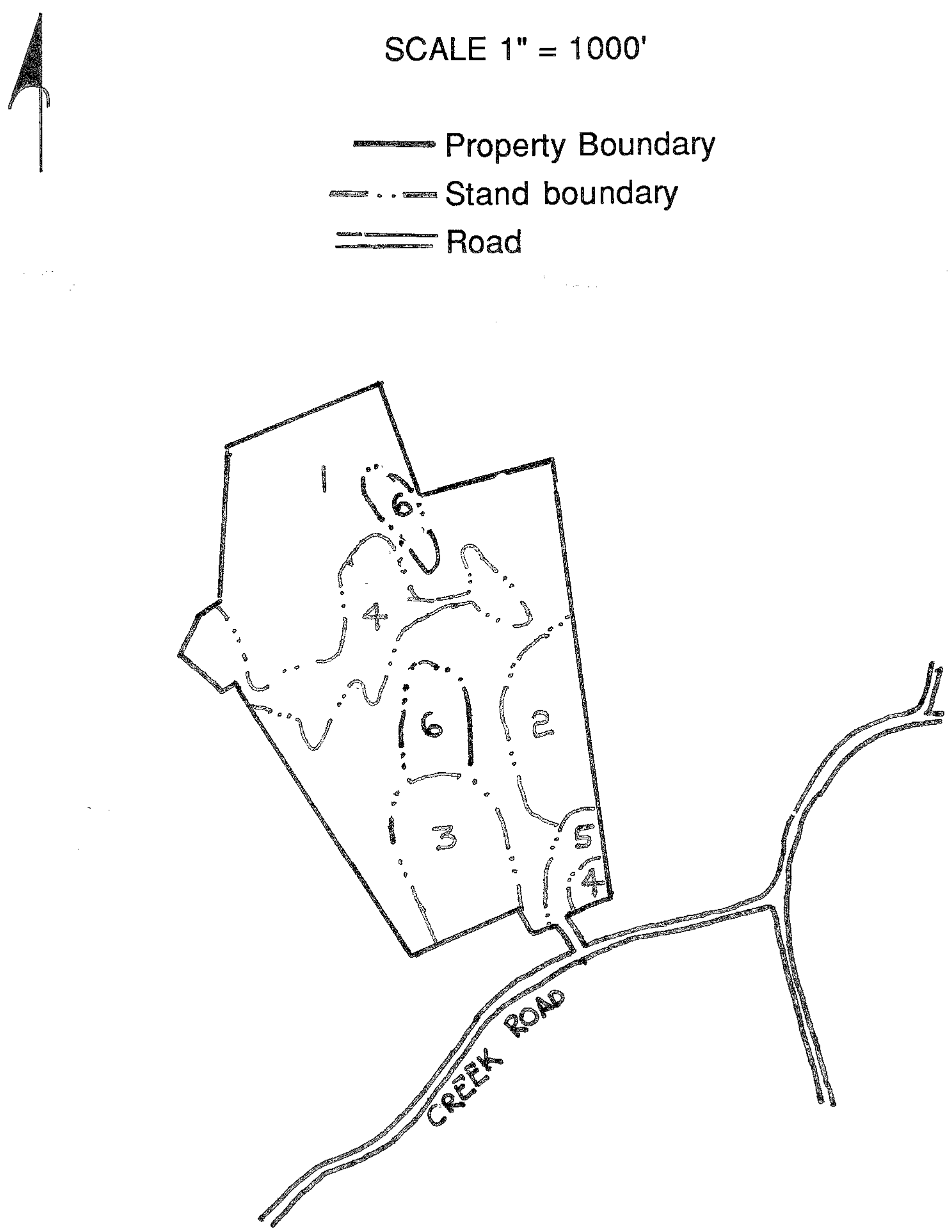
The maintenance and development of healthy vigorous trees and forests should be a major concern in the development and management of the property. In addition to the environmental and aesthetic amenities they provide, the presence of healthy trees increase the value of houselots. A reconnaissance of the trees on the individual houselots should be performed in conjunction with laying out the construction site in order to identify the best candidates to be retained. The trees to be retained should be healthy, free of decay, a long lived species, and a safe distance from construction activity. These trees and their root zones (the area directly under the tree crown) should be protected by flagging off and not allowing construction equipment in that area.

In the open space areas and the remaining forested sections of the house lots, forest management could promote the development of a healthier forest by reducing crowding in densely stocked stands. A sawtimber thinning that removed approximately one quarter of the least healthy trees in Stand 1 would give the residual trees adequate growing space. This would only be economically feasible if done in conjunction with harvesting the sawtimber trees in the area to be cleared for houselots, roads, and driveways.

A patch cut (.5 to 2 acres) in the open space area of Stand 1 would reforest naturally and improve wildlife habitat through a diversification of forest vegetation. Any patch cuts should be located where mountain laurel is absent.

Stand 2 would be an appropriate site for underplanting white pine. The droughty soils are more suitable for growing conifers. The white pine will need to be protected from deer browse and released from competing vegetation.

VEGETATION MAP



10. WILDLIFE RESOURCES

Habitat Type Descriptions

The habitat types on this property have been described in a consultants report dated 17 December 1989. The Team Wildlife Biologist's field review of the property agrees with the consultants descriptive assessment of habitat types.

Impacts of Development

Wetland/Riparian Zones: Wetlands provide important habitat for a variety of wildlife species and function as areas for absorption of natural runoff. Wetlands also support a high diversity of wildlife due to the complexity of the vegetative structure, high productivity and abundant food supply which allows for a high carrying capacity (Brown et. al. 1978). Many species require access to streams or water body margins for survival even though they may spend much of their time in other habitats (Milligan and Raedeke 1986). Part of the food supply for many vertebrates is the high abundance and diversity of insect populations that are typical of wetland ecosystems (Brown et al. 1978).

Two fire ponds are proposed to be constructed along the main access road. The most northern pond is to be constructed out of the wetlands and is being designed to enhance wildlife use. The other pond is to be constructed in a small area of wetlands. Creating open water ponds in a wetland alters wildlife use of the current habitat. It is recommended that the pond at this site be constructed adjacent to the existing wetland. This will provide both use as a fire pond and add to the diversity of wetland habitat.

Vegetation removal in wetlands may have severe impacts on wildlife, especially reptiles and amphibians. One or several of the cover, food, breeding and hibernation areas may be altered. Species dependent on specialized habitat are eliminated and more adaptable species are reduced in numbers (Campbell 1973). Barriers, such as roads, to seasonal movement and population dispersal are also serious threats (Campbell 1973). To minimize impact maintain a 100 foot wide buffer zone of vegetation around wetland/riparian areas. This buffer zone will help filter and trap silt and sediments, provide excellent wildlife cover and be an aesthetic and educational asset to the community.

Upland Wooded Areas: Fragmentation and loss of habitat may lead to a decline in species diversity and richness. Wildlife populations will be reduced in proportion to the amount of habitat lost. Sensitive, interior species that require large tracts of undisturbed forest, such as veeries, ovenbirds and scarlet tanangers may decrease and no longer occupy the area.

Mitigation of Disturbances

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

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

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

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

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

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

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

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

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

Cluster Development

Cluster developments have superior ecological values to wildlife and are recommended over conventional developments. Properly planned development can provide better habitat for wildlife species primarily because of increased open space, vegetative corridors, sensitive landscaping, and aquatic habitat (ponds). Some wildlife using the site prior to development should remain and additional species should be supported with the establishment of new pond habitat. Cluster developments should be considered when developing similar urban estates because of their aesthetic and ecological benefits and marketing value.

Wildlife Corridors/Open Space

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

References

Adams, L.W. and D.L.Leedy. (Eds.) 1986. Integrating man and nature in the metropolitan environment. Proceedings of a Nat. Symp. on urban wildlife. Nat. Inst. for Urban Wildlife, Columbia, MD.

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

Bessinger, S.R. and D.R. Osburn. 1982. Effects of urbanization on avian community organization. Condor 84:75-82.

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

Brown, S., M.M. Brinson and A.E. Lugo. 1978. Structure and functions of riparian wetlands. Pages 17-31. in (Strategies For Protection and Management of Floodplain and Other Riparian Communities). Proc. symp. Dec. 11-13, 1978, Gallaway, GA. Gen. Tech. Rep. W0-12, Forest 8erv., U.S. Dep. Agric., Wash. D.C. 410pp.

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

Clark, K.L., D.L. Euler, and E. Armstrong. 1984. Predicting avain community responce to lakeshore development. J. Wildl. Manage. 48 (4)1239-1247.

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

DeGraaf,R.M. and J.M.Wentworth.1986. Avian guild structure and habitat associations in suburban bird communities. Urban Ecology., 9:399-412

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

Dickman, C.R.1987. Habitat fragmentation and vertebrate species richness in an urban environment. Jour. of Applied Ecology, 24 337-351.

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

Goldstein, E.L., M. Gross, and R.M. DeGraaf. 1983. Wildlife and greenspace planning in medium-scale residential developments. Urban Ecology,7:201-214.

--.1986.Breeding birds and vegetation:a quantitative assessment. Urban Ecology., 9: 377-385.

--.1981.Explorations in bird-land geometry. Urban Ecology,5:113-124.

Griffin, C.R.1989. Protection of wildlife habitat by state wetland regulations: the Massachuesetts initiative. Trans.54 N.A. Wildl. and Nat. Res. Conf.22-31.

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

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

Vilkitis,J.R.1978. Wildlife habitat as a integral component of a planned unit development. Urban Ecology,3:171-187.

11. FISH RESOURCES

Site Description

Union Hills Planned Residential Cluster Development (Phase I) is a subdivision proposed for 91 acres in the Town of Old Lyme. The subdivision appears to be located entirely within the Three Mile River watershed. An unnamed tributary to the Three Mile River is the only stream within Phase I. The eastern border of Phase II abuts the Three Mile River. An active gravel operation exists within that portion of land proposed for Phase II. Several ponds associated with the gravel operation exist on the site and they appear to be connected with the unnamed tributary.

Site plans for Phase I were reviewed as was "Wetland Habitat Assessment of Planned Residential Cluster Development" (Alexander, 1989). A site inspection encompassing both phases focused on wetland and stream areas. No plans for phase II were reviewed.

Aquatic Resources

The Three Mile River is the major aquatic resource within the study area. The stream is generally of low gradient with small substrates within the study area. Fishes expected to inhabit the Three Mile River include tessellated darter, golden shiner, white sucker, brown bullhead, redfin pickerel, American eel, largemouth bass, and various species of sunfish. The alewife, a type of anadromous herring, may also occur in this reach of the Three Mile River.

The Three Mile River is currently being degraded by sedimentation due to land clearing and excavation for the construction of Enterprise Drive at the intersection of Hatchet Hill Road.

The unnamed tributary stream within Phase I is apparently intermittent, and is therefore not expected to support fish year round. It is possible that certain species (American eel, tessellated darter and white sucker) may colonize the lower portion of this stream on a seasonal basis.

Potential Subdivision Impacts

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

1. Construction site soil erosion and sedimentation of watercourses : During construction topsoil will be exposed and susceptible to runoff events, especially if suitable erosion and sediment controls are not properly installed and maintained.

Erosion and sedimentation due to construction is regarded as a major cause of stream degradation. Excessive sedimentation can damage aquatic ecosystems in the following ways:

(A) Sediment reduces the survival of resident fish eggs and hinders the emergence of newly hatched fry. Adequate water flow, free of sediment is required for fish egg respiration and successful hatching.

(B) Sediment reduces the amount of usable habitat required for spawning purposes by some species. Excessive fines can clog spawning gravels causing fish to disperse to more desirable areas.

(C) Sediment reduces the survival of aquatic insects. Since aquatic insects are important prey items for most fish, reduced insect populations levels will adversely affect fish growth and survival as fish expend excess energy locating prey.

(D) Sediment reduces stream pool depth. Pools are invaluable stream components since they provide necessary cover, shelter, and resting areas for fish. A reduction of usable fish habitat can result in reduced population levels.

(E) Turbid waters impair normal gill function and feeding activities of fish. High concentrations of sediment can cause mortality by clogging gills and interfering with the fish's respiration.

(F) Sediment encourages the growth of filamentous algae and nuisance proportions of aquatic weeds (CT DEP 1989). Eroded soils contain nutrients that can result in accelerated plant growth.

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

2. Road construction : Instream culvert placement in concert with placement of fill alongside wetlands and intermittent streams will inevitably result in stream degradation from sedimentation (see above) in downstream areas if proper erosion and sedimentation practices are not followed.

3. Percolation of septic effluent into watercourses : A failure of individual septic systems to operate properly (refer to <u>**SEWAGE DISPOSAL**</u> section) may be potentially dangerous to stream environments. Nutrients and assorted chemicals that may be placed in septic systems may enter stream waters in the event of a septic system failure or infiltrate the groundwater during the spring when water tables are near the surface. Effluent may also stimulate the growth of nuisance aquatic vegetation and algae in downstream areas.

4. Aquatic habitat degradation in streams due to the influx of stormwater drainage : Stormwaters from road systems can contain a variety of pollutants that are detrimental to aquatic organisms. Pollutants often found in stormwaters include: hydrocarbons (gasoline and oil), herbicides, heavy metals, road salt, fine silts, and coarse sediment. Nutrients in stormwater runoff can fertilize stream waters causing water quality degradation. Additionally, fine silts in stormwaters that remain in suspension for prolonged periods of time often cannot be effectively removed from roadway catch basins and/or stormwater detention basins. Accidentally spilled petroleum based chemicals or other toxicants can precipitate partial or complete fishkills if introduced in high concentrations. Stormwater drainage can also result in increased stream flows, potentially resulting in flooding or streambank erosion.

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

6. Degradation of wetland habitat : Wetlands serve to protect stream water quality by: (1) controlling flood waters by acting as a water storage basin, (2) trapping sediments from natural and man-made sources of erosion, and (3) filtering out pollutants and nutrients from runoff before they enter watercourses. Development which brings about polluted stormwaters, excessive stream sedimentation, lawn fertilizers, and lawn herbicides can negatively impact wetlands by hindering their ability to properly carry out these functions.

Recommendations

The following recommendations should be considered by the Town of Old Lyme to mitigate impacts to local aquatic resources.

1. It is recommended that at the minimum, a 100 foot naturally vegetated buffer be maintained along all wetland boundaries, especially those that directly abut the Three Mile River or the intermittent watercourse tributary to it : Research has shown that 100 foot buffer zones help prevent damage to wetlands and stream ecosystems that support diverse fish and aquatic insect life (USFWS 1984;USFWS 1986;0DFW 1985). These buffers will aid in absorbing surface runoff and other pollutants before they can damage wetlands and stream ecosystems. As shown on the site plans, a 100 foot buffer is scheduled for most wetland boundaries in this subdivision.

This recommendation is of critical importance to the development of Phase II as well. Currently, earth is disturbed and barren of vegetation to the edge of wetland boundaries. The wetlands directly abut both the Three Mile River and the unnamed watercourse and serve as vital buffers to the well being of these streams.

2. Install and maintain proper erosion and sedimentation controls during site construction activities : Past stream siltation disturbances in Connecticut associated with residential housing developments have occurred when individual contractors either improperly deployed mitigation devices or failed to maintain these devices on a regular basis. Proper installation and maintenance of these devices is critical to minimizing stream degradation.

3. All instream work and land grading/filling near streams or wetlands should take place during periods of low precipitation : This will help minimize the impacts to aquatic resources. Reduced streamflows and rainfall during the summer and early fall provide the least hazardous conditions in which to work near sensitive aquatic environments.

Construction of the detention basin and fire pond, and the stream crossing of Union Hills Road must be carried out during this period to minimize damage to wetlands and watercourses. Appropriate Erosion and Sedimentation controls (as discussed above in #2) relative to these activities are also key to minimizing damage to aquatic resources.

In regards to Phase II, the existing stream crossing used to access the gravel operation is totally inappropriate as a permanent structure and must be reconstructed. This crossing consists of a single reinforced concrete pipe (RCP) that is capped with gravel. It is unlikely that this single RCP can effectively handle above normal stream flows. It is therefore subject to overtopping and as a result poses great potential damage to downstream areas due to erosion and sedimentation. The RCP is also likely to be a barrier to upstream migrating fishes, at least during periods of abnormal stream flow. When reconstructed, this crossing should consist of either a span bridge, precast arch culvert, or single or twin box culverts. If box culverts are employed, a low flow channel must be created to allow for adequate fish migration. Culverts installed below grade allow natural substrates to be placed within the culvert prior to rewatering. This will minimize the loss of instream habitat as well as prevent the downstream end from becoming a barrier should natural forces change (lower) the stream bed elevations immediately downstream.

Fish passage is not a concern at the Union Hills Road crossing in Phase I due to the small size and seasonal nature of the watercourse.

4. Watercourse setbacks for septic systems (refer to SEWAGE DISPOSAL section) : Septic systems must be properly located and designed to effectively renovate septic effluent. Septic effluent can be one of the greatest threats to the ecology of streams. When septic leach fields are proposed to be located within 100 feet of wetlands or watercourses, a town's sanitarian or IWWCA should consider requiring analyses of phosphate and nitrate transport to ensure that leachate does not interfere with important aquatic resources. Systems located on steep slopes adjacent to streams are also dangerous due to the increased potential of leachate "breakout". All septic systems should be maintained on a regular basis and residents should be encouraged to use non-phosphate laundry detergents to further minimize the potential for stream degradation. It does not appear that any of the systems in this subdivision are within 100 feet of wetland boundaries.

5. The developer should submit a detailed stormwater management plan for town review : The effective management of stormwaters and roadway runoff can only be accomplished through proper design, location, and maintenance of stormwater control devices. When possible, stormwaters should only be outletted into nonwetland habitat; thus avoiding direct contact with wetlands. Timely maintenance of catch basins is of critical importance. Roadway catch basins should be regularly maintained to minimize adverse impacts to riverine/ wetland habitats. Notwithstanding public safety concerns, the application of salt and sand in the winter should be done as sparingly as possible to minimize wetland and stream degradation.

6. Additional comments relative to Phase II : Due to the existence of several waterbodies in Phase II, including the gravel excavation ponds, the land use commissions in Old Lyme should pay particular attention to the stabilization of the existing area as it relates to the development of Phase II. The aquatic resources of the Three Mile River could be potentially damaged if the site is improperly stabilized or altered. Of special concern is the intended use or alteration of the existing excavation ponds. The Inland Fisheries Division would appreciate the opportunity to review design plans for Phase II of this project.

References

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

ODFW (Oregon Department of Fish and Wildlife) 1985. The Effects of Stream Alterations on Salmon and Trout Habitat in Oregon. Oregon Department of Fish and Wildlife, Portland, Oregon. 70pp.

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

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

12. PLANNING COMMENTS

The developer and the Town are to be commended for the way in which this development has been planned and administered. Experience has shown that most ERT reviews deal with more difficult development problems or contentions over details. Most differences appear to have been negotiated before the review.

While reviewing the regulations, before applying them to the application in question, comments are as noted noted. Section I.2.1 might be more clearly understood if it referred directly to preserving streams, waterbodies, wetland soils and farmland soils. Section I.5.3 might include parking spaces for recreational vehicles and trailers. This becomes a problem in private developments where persons park very large vehicles in their driveways detracting from the protected residential atmosphere. Section I.7.1 restricts any development to a maximum acreage which might work against the town should a development with desirable open space be offered and it had to be denied because it exceeded the acreage allowed. Section I.9.2. 1) should include farmland soils. Section I.14.2 and I.14.3 as written can, if applied vigorously, deny certain elements of safety to the persons who choose to live in such developments. When no town roads are provided and when no through-streets are allowed, one small accident in the wrong place could block the passage of emergency vehicles, possibly causing an unforeseen disaster. Section I.18.2 should mention ownership of and maintenance of roads.

R-O-W's for an emergency drive should be permanent and dedicated as such on final plans. Drainage pipes do not show headwalls, endwalls or rip-rap. If they are needed they should be shown.

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.