HAYWARD WEST SUBDIVISION

COLCHESTER, CONNECTICUT

DECEMBER 1988

EASTERN CONNECTICUT ENVIRONMENTAL REVIEW TEAM REPORT

EASTERN CONNECTICUT RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.

HAYWARD WEST SUBDIVISION

COLCHESTER, CONNECTICUT

REVIEW DATE: OCTOBER 4, 1988

REPORT DATE: DECEMBER 1988

EASTERN CONNECTICUT RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.

EASTERN CONNECTICUT ENVIRONMENTAL REVIEW TEAM
P.O. BOX 70, ROUTE 154
HADDAM, CONNECTICUT 06438
(203) 345-3977

ENVIRONMENTAL REVIEW TEAM REPORT
ON

Hayward West Subdivision
Colchester, Connecticut

This report is an outgrowth of a request from Colchester Conservation Commission to the New London 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, October 4, 1988. Team members participating on this review included:

Nick Bellantoni	State Archaeologist	CT Museum of Natural History
Kevin DesRoberts	Wildlife Assistant	DEP-Eastern District
Dick Guggenheim	Regional Planner	SE CT Regional Planning Agency
Steve Hill	Wildlife Biologist	DEP-Eastern District
Chuck Lee	Environmental Analyst	DEP-Water Compliance Unit
Dawn McKay	Zoologist	DEP-Natural Diversity Data Base
Laura McNamera	Environmental Analyst	DEP-Water Resources Unit
Pete Merrill	Forester	DEP-Patchaug State Forest
Brian Murphy	Fisheries Biologist	DEP-Eastern District
Liz Rogers	District Conservationist	USDA-Soil Conservation Service
Elaine Sych	ERT Coordinator	Eastern CT RC&D Area
Bill Warzecha	Geologist	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 subdivision plans. The Team met with, and were accompanied by the Chairman of the Conservation Commission, the Colchester Wetlands Enforcement Officer, the East Haddam Zoning Enforcement Officer, the developer 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

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

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

If you require additional information, please contact:

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

TABLE OF CONTENTS

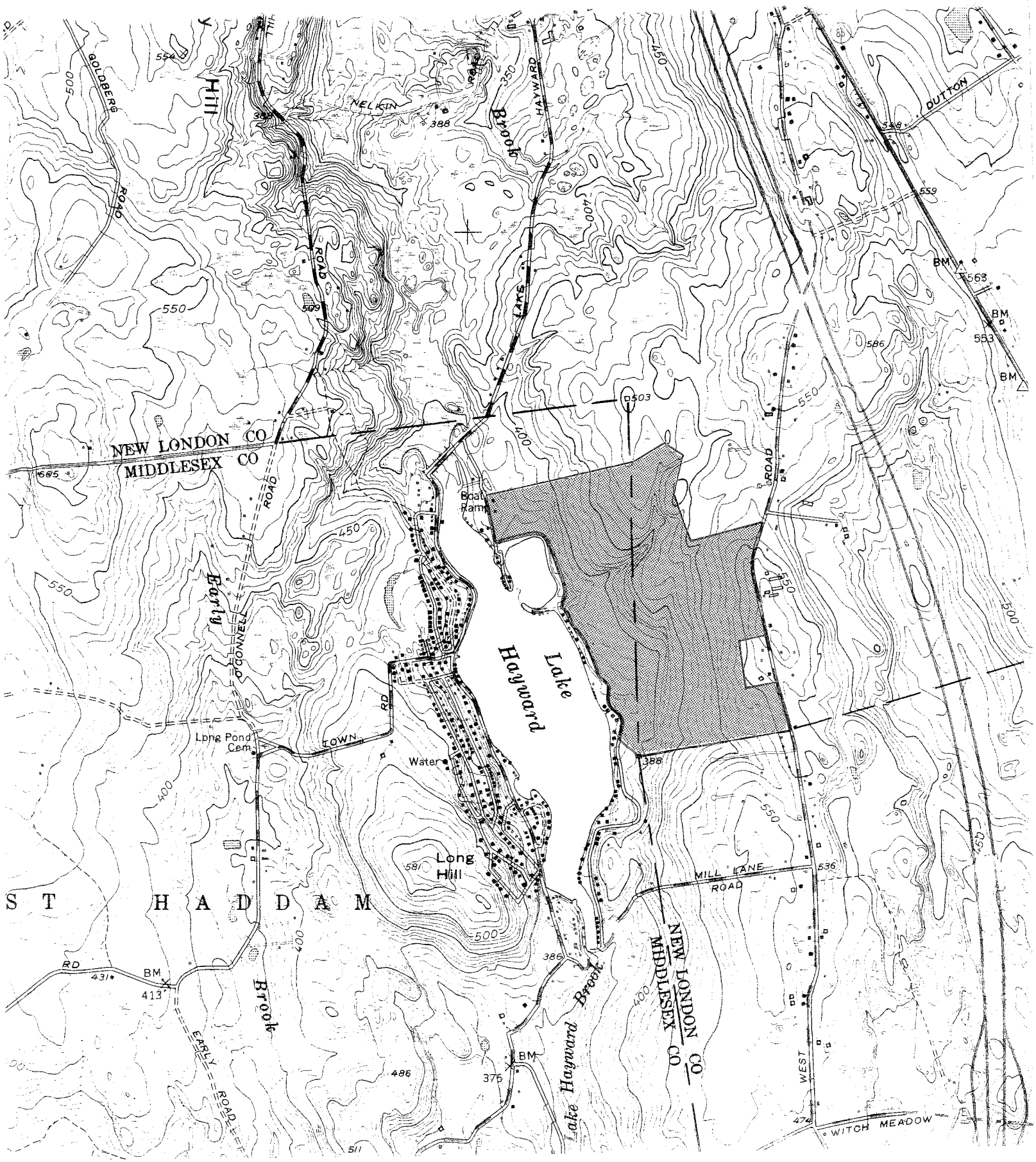
TABLE OF MAPS AND CHARTS

1. SETTING AND LAND USE

The proposed subdivision site, about 292 acres in size, is located at the southern boundary of Colchester with the Town of East Haddam. Approximately 225 acres of the site is in Colchester, while ±67 acres lies within the town of East Haddam. Lake Hayward, the major topographical feature in the area, lies just west of the property. The site is bounded on the east by West Road, which is located in Colchester and will provide the major access to the subdivision, East Shore Drive on the west, which is located in East Haddam and private, undeveloped land on the north and south. The site is entirely wooded, except for those areas recently cut by the property owner for the anticipated interior road system. The subject area is characterized by low density residential development and scattered agricultural land uses.

The Colchester section of the site is located in a R-40 zone, which would allow residential development at a minimum lot size of 40,000 square feet or about 1 acre. The East Haddam section of the site is located in a R-2 zone, which would allow residential development at a minimum lot size of 80,000 square feet or about 2 acres. It is likely that each lot would be served by individual, on-site wells and septic systems. There is a possibility that the subdivision could be serviced by municipal sewers via Lake Hayward Road and Cabin Road but this will require the extension of the sewer for a considerable distance (6 miles or more) and the construction of a pump station. This would undoubtedly result in a large expenditure of capital and require the formation of an association to oversee the maintenance of the utility.

There are at least four (4) perennial streamcourses on the site, all of which are tributary to Lake Hayward. Regulated wetland areas generally parallel these streamcourses. In several areas on the site wetlands spread out to form sizeable wetland pockets. Plans submitted to Team members indicate that there are about 45 acres of wetlands on the 292 acre site. This represents about 15% of the site. Based on the present road layout, regulated wetland areas will need to be crossed in numerous areas for the interior road system. Additionally, there is a likelihood for driveway crossings of regulated wetlands in several areas of the site. Several building lots contain a high percentage of wetland soils which makes the placement of a house, septic system, well, and driveway from wetland set back lines very difficult. Every effort should be made to ensure that each property owner has enough dry, usable land on their respective lot so they do not feel the need to encroach on wetlands. Experience has shown that property owners with a high percentage of wetlands tend to illegally fill these areas, which results in the loss of the wetlands and potential for drainage problems to the property or neighboring properties. In addition, these types of illegal wetland fillings are very difficult for the town to enforce.



LOCATION

SCALE 1" = 2000'

2. TOPOGRAPHY AND GEOLOGY

Topography

In general, the site slopes gently to moderately steeply towards Lake Hayward. Relatively small areas of steep slopes parallel the streamcourses on the site. Site elevations range from about 320 feet above mean sea level at the western limits, to 570 above mean see level at the eastern limits. The overall relief is about 250 feet.

Geology - Bedrock and Surficial

Bedrock does not appear to be well exposed on the site, although it does outcrop in several areas on the east side of West Road.

According to map QR-27 (Bedrock Geology of the Colchester Quadrangle, L. Lundgren and G. Snyder), which encompasses the subject parcel, bedrock underlying the site has been classified as Brimfield Schist. Generally speaking, these rocks are described as a gray, rusty-weathering, medium-to-coarse grained, interlayered schist and gneiss.

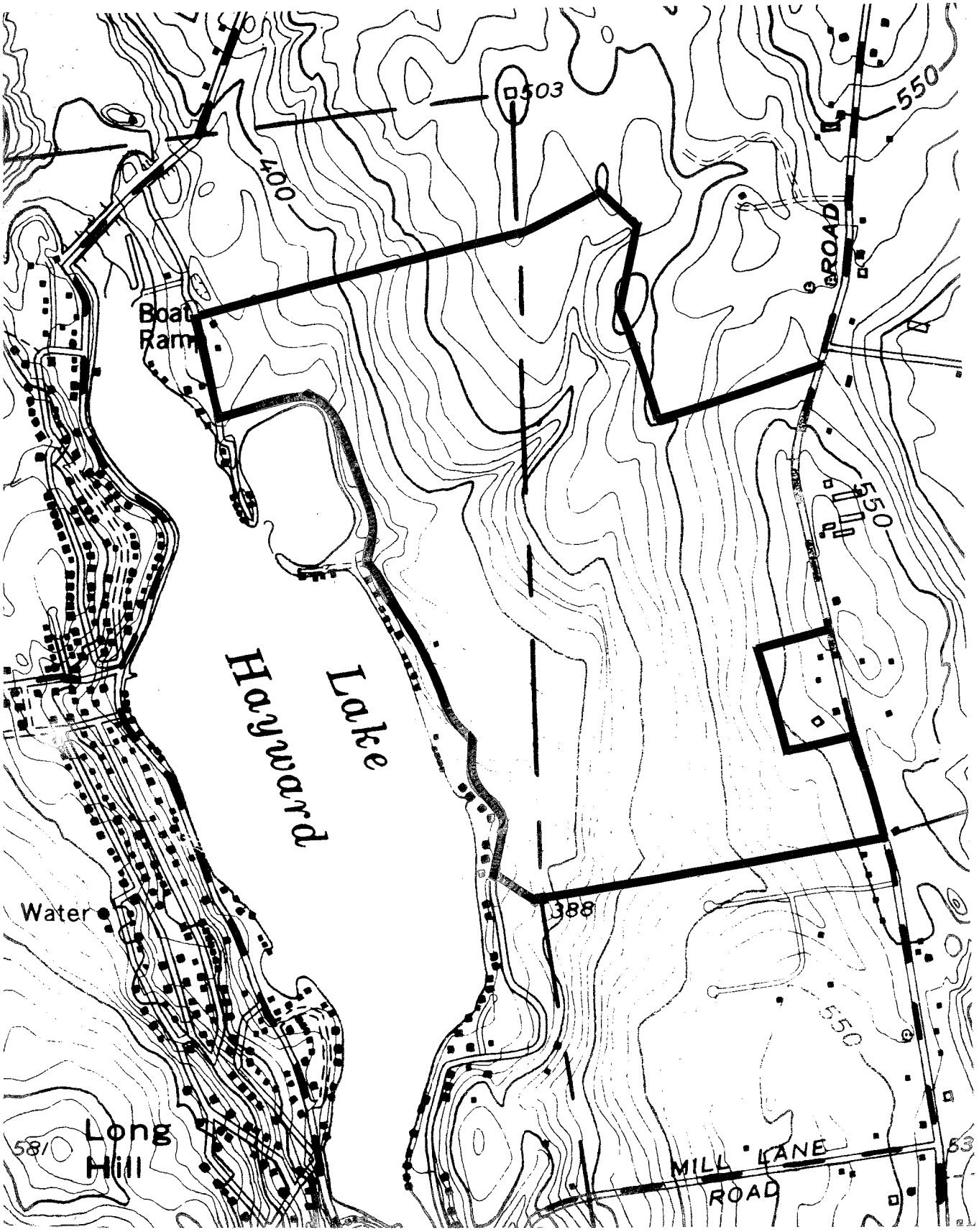
"Schists" and "gneisses" are crystalline rocks that have been geologically altered by great heat and pressure within the earth's crust. The terms "schist" and "gneiss" refer to the textural and structural aspects of the rocks. The rocks underlying the parcel have undergone deformation (metamorphism) one or more times during the period following their deposition as deep ocean sediments. The stresses of deformation caused the alignment of platy, flaky and elongate minerals into thin sheets or bands. Where the alignment has resulted in a slabby rock (i.e., one that parts relatively easily along the surface of mineral alignment or foliation planes), the rock is termed a "schist". Where the alignment has resulted in a banded but more massive rock, the rock is termed "gneiss". Both rock types may grade into another in a single outcrop.

Deep test hole information compiled for a portion of the parcel indicates that depths of about 84" or 7 feet were obtainable in most places. However, the weathered bedrock surface was encountered at shallower depths in several deep test pits. This demonstrates the undulating nature of the bedrock surface throughout the site.

Except for the western limits of the site, which contains sand and gravel deposits, a glacial sediment called till covers the site. Till is a poorly sorted mixture of rock fragments and particles deposited directly by glacier ice. Rock fragments and particles found in the soil were derived from gneisses and schists in the area. Based on soil mapping data, it appears that two varieties of till cover the site. The major type appears to be sandy, stony and loose, which probably does not exceed much more than 10 feet in most places. The other

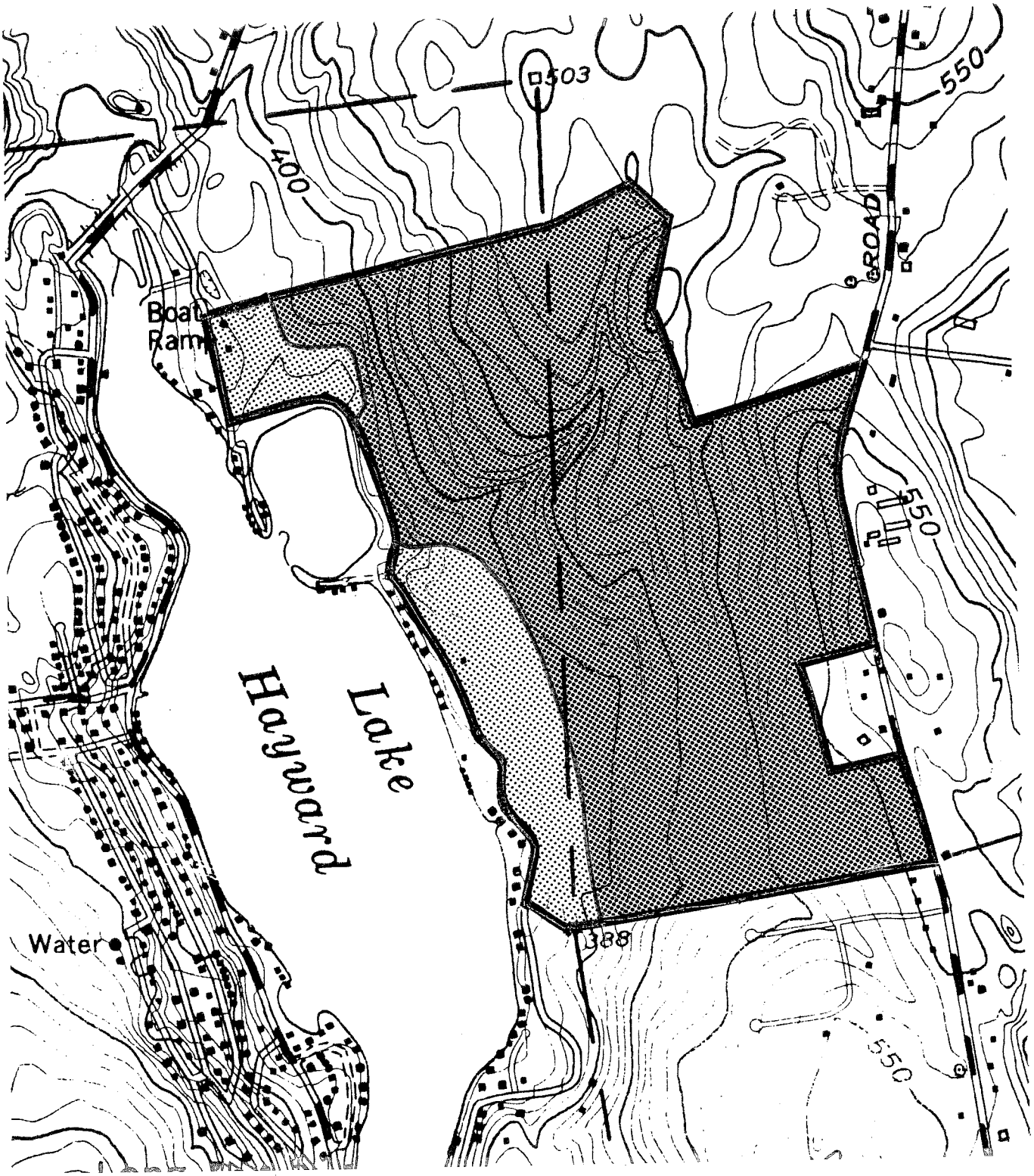
variety is siltier and is characterized by a relatively shallow compact zone. The presence of a compact soil zone commonly results in seasonally high water tables, soil mottling (an indicator of high ground water tables) and slow percolation rates. It should be noted that subsurface exploration conducted for on-site sewage disposal thus far, indicates the widespread presence of the siltier variety of till, which has a shallow, compact soil zone.

The other major surficial deposit of glacial origin found in the western part of the parcel is stratified drift. Stratified drift, whose major components consist of sand and gravel, was deposited by glacial meltwater streams that occupied the area during glacial ice retreat. The stratified drift on the site is gravel sized. The exact thickness of the stratified drift is unknown.



TOPOGRAPHY

SCALE 1" = 1000'



GEOLOGIC MAP

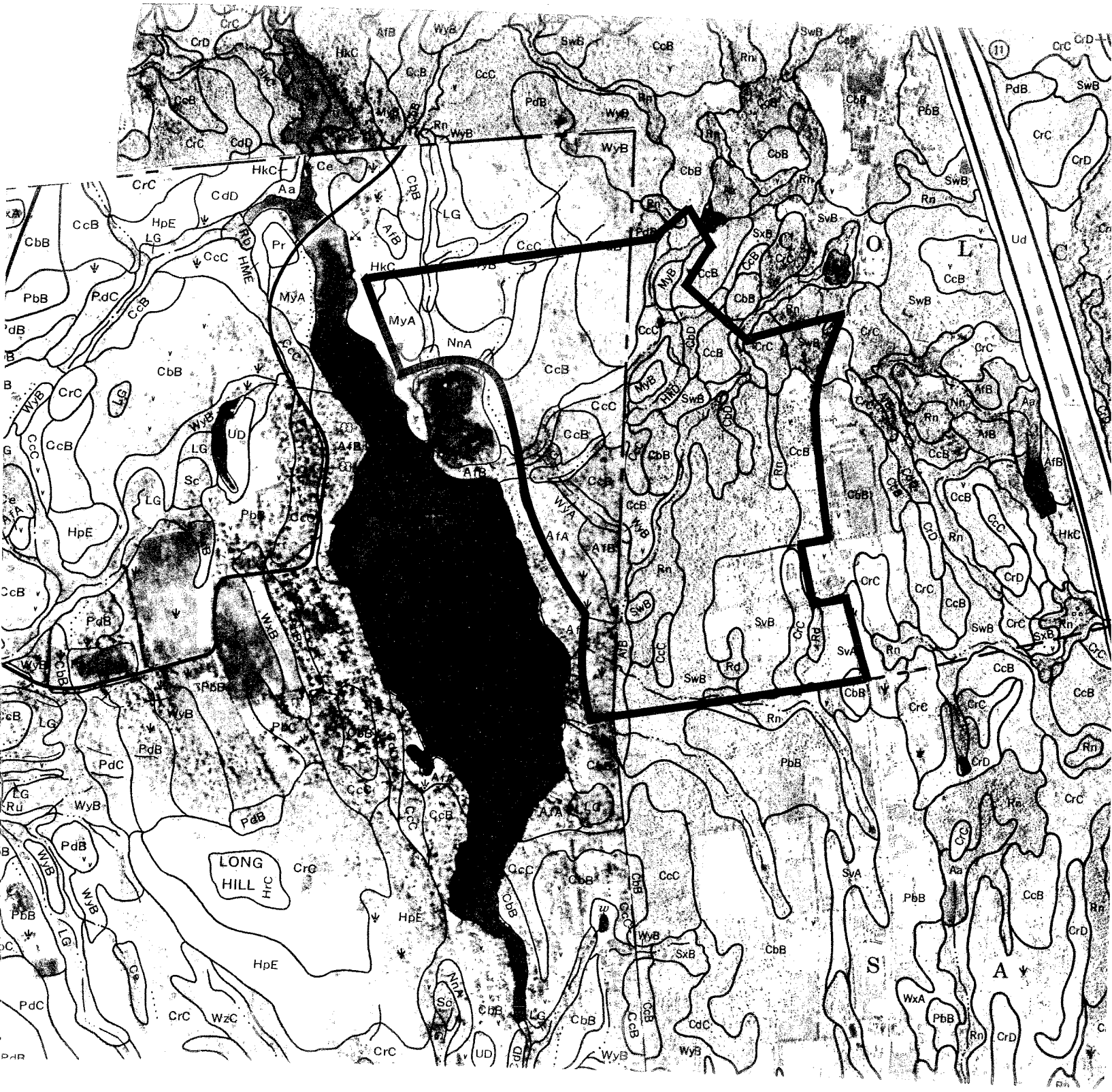
TILL
STRATIFIED DRIFT

*ENTIRE SITE UNDERLAIN BY BRIMFIELD SCHIST

SCALE 1" = 1000'

SOILS

NEW LONDON COUNTY USDA-SCS
562 NEW LONDON TURNPIKE
NORWICH, CT 06360
887-4163



The Soil Conservation Service
is an agency of the
Department of Agriculture

SCALE 1" = 1320'

3. SOILS

Soils Descriptions

AfA - Agawam fine sandy loam, 0 to 3 percent slopes.

AfB - Agawam fine sandy loam, 3 to 8 percent slopes.

CbD - Canton & Charlton fine sandy loams, 15 to 25 percent slopes.

CcB - Canton & Charlton very stony fine sandy loams, 3 to 8 percent slopes.

CcC - Canton & Charlton very stony, fine sandy loams, 8 to 15 percent slopes.

CrC - Charlton-Hollis fine sandy loams, very rocky, 3 to 15 percent slopes.

HkD - Hinckley gravelly sandy loam, 15 to 35 percent slopes.

Lg & Rn - Ridgebury, Leicester & Whitman extremely stony fine sandy loams.

MyA - Merrimac sandy loam, 0 to 3 percent slopes.

MyB - Merrimac sandy loam, 3 to 8 percent slopes.

NaB - Narragansett silt loam, 3 to 8 percent slopes.

NhD - Narragansett extremely stony silt loam, 15 to 25 percent slopes.

NnA - Ninigret fine sandy loam.

PdB - Paxton & Montauk very stony fine sandy loams, 3 to 8 percent slopes.

Rd - Ridgebury fine sandy loam.

SvA - Sutton fine sandy loam, 0 to 3 percent slopes.

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

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

Soils Limitations Chart

Soil Name and Map Symbol	Shallow Excavations	Dwellings without Basements	Dwellings with Basements	Local Roads and Streets	Lawns and Landscaping	On Site Sewage Disposal Potential Rating	Concerns
* AfA Agawam	Severe: cutbanks cave,	Slight	Slight	Slight	Slight	High	Fast perc rate
* AfB Agawam	Severe: Cutbanks Cave	Slight	Slight	Slight	Slight	High	Fast perc rate
CcB Canton	Severe: Cutbanks Cave	Slight	Slight	Slight	Moderate Large Stones	Very High	None
CcC Canton	Severe: Cutbank Cave	Moderate Slope.	Moderate Slope.	Moderate Slope.	Moderate Large Stones	Very High	None
CcD Canton	Severe: slope , Cutbanks cave	Severe slope	Severe slope	Severe slope	Severe slope	Very High	None
CrC Charlton	Moderate Slope,	Moderate Slope,	Moderate Slope,	Moderate Slope,	Moderate Slope, Large Stones,	Very High	None
HkD Hinckley	Severe: slope, Cutbanks cave.	Severe slope,	Severe: slope,	Severe: slope,	Severe: small stones, slope,	Medium	Fast perc rate slope.
* MyA Merrimac	Severe: Cutbanks Cave	Slight	Slight	Slight	Slight	High	Fast Perc Rate
* MyB Merrimac	Severe: Cutbanks Cave.	Slight	Slight	Slight	Slight	High	Fast Perc Rate
* Nh & NhA Ninigret	Severe: wetness Cutbanks Cave	Moderate Wetness	Severe Wetness	Moderate Frost action wetness	Moderate wetness	Low	Fast Perc Rate depth to water table
PdB Paxton	Moderate Dense Layer wetness	Moderate wetness	Moderate wetness	Moderate Frost Action wetness	Moderate large stones	Medium	Slow Perc Rate depth to water table
** Rd Ridgebury	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness frost action	Severe: wetness	Very Low	Depth to water Table.

Soils Limitations Chart

Soil Name and Map Symbol	Shallow Excavations	Dwellings without Basements	Dwellings with Basements	Local Roads and Streets	Lawns and Landscaping	On Site Sewage Disposal Potential Rating	On Site Sewage Disposal Concerns
** Rn & Lg Ridgebury	Severe: Wetness	Severe Wetness	Severe: Wetness	Severe: Wetness Frost Action	Severe: Wetness	Very Low	Depth to water table.
* SvA Sutton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: frost action wetness.	Moderate: wetness	Low	Depth to Water table
SwB Sutton	Severe: wetness	Moderate: wetness	Severe: wetness	Moderate: frost action wetness	Moderate: large stones wetness	Low	Depth to water table
WyA Woodbridge	Severe: Wetness	Moderate wetness	Severe: wetness:	Severe: frost actions	Moderate: wetness	Low	Slow perc test Depth to water table.
WyB Woodbridge	Severe: wetness	Moderate: wetness	Severe: wetness	Severe: Frost Action.	Moderate Large Stones wetness.	Low	Slow Perc Rate depth to water table

* Prime Farmlands

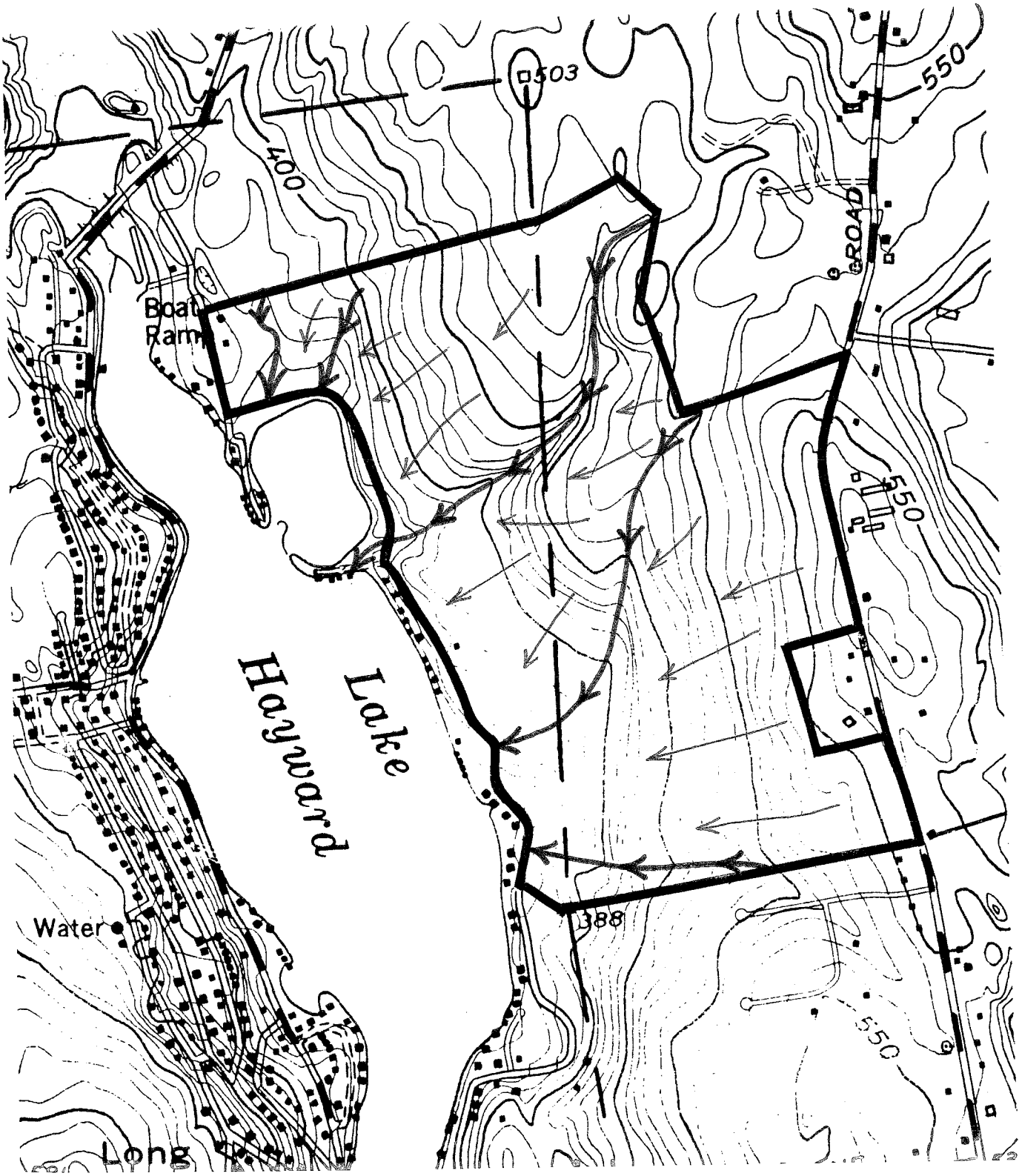
** Wetlands

4. HYDROLOGY

Surface, and probably to a great extent subsurface runoff (groundwater) flows westward to Lake Hayward, which is a few hundred feet from the western property boundary. Based on the hydrogeologic setting of the site, groundwater flow mimics surface flow. The unnamed streamcourses on the site act as discharge points for surface water and groundwater. The water in the streamcourses is then routed to Lake Hayward. The outlet for Lake Hayward is Lake Hayward Brook.

Because of the high density of residential homes presently proposed in the study area, it is expected that increases in post-development runoff would significantly increase during periods of rainfall. These increases would result from soil compaction, removal of vegetation and placement of impervious surfaces (roof tops, roads and driveways, etc.) over otherwise pervious soils. Except for gutter flow analysis calculations, no detailed hydrologic study was available to Team members on the review day.

In order to properly assess post-development runoff in the study area, the developer should be required to prepare a stormwater management plan. The plan would include all pre- and post-development runoff calculations. It is recommended that Connecticut's Guidelines for Erosion and Sediment Control be closely followed with regard to stormwater management on the site. The management plan and calculations should be carefully reviewed by the Town's engineer and other appropriate town officials. The impacts of post-development runoff in the study area should be clearly understood in terms of flooding and streambank erosion. Of particular concern will be the examination of all downstream culverts, especially those along East Shore Drive. Additionally, every effort should be made to protect the streamcourses on and off the site as well as Lake Hayward. It seems likely that in order to protect the Lake, temporary and/or permanent sediment basin(s) will be required during the construction phases, especially in view of the moderate slopes and silty soils. These basins will need to be maintained on a regular basis. Catch basins and roads will also need to be maintained on a regular basis in order to protect watercourses and Lake Hayward from sediment accumulation.



WATER RESOURCES

DIRECTION OF SURFACE RUNOFF
STREAMCOURSE SHOWING DIRECTION OF FLOW

*ENTIRE SITE LIES WITHIN THE LAKE HAYWARD WATERSHED AREA

SCALE 1" = 1000'

5. WETLAND RESOURCES

This section will evaluate the potential effects to the wetlands located on and adjacent to the property. After the site inspection and a subsequent review of the proposed development plans the following paragraphs will describe the wetland resources and outline wetland impacts and proposals to lessen those impacts.

Site Description

The site for the proposed Hayward West Subdivision is a 292 acre parcel of land containing ±45 acres of wetlands, which is ±15% of the total acreage, and has ±15 acres of upland with slopes over 20%. The parcel is bounded on the east by West Road and on the west by East Shore Drive. Access is available from both of these roads. The site is split by the Colchester/East Haddam line and is transected by six wetland/watercourse wetland stream corridors.

Wetlands

The National Wetlands Inventory identifies the wetlands on the site as palustrine forested broad leaf deciduous and seasonally saturated. The wetland soils were flagged by Rich Snarski (a certified soil scientist) and consist primarily of the Ridgebury, Leicester and Whitman soil complex. There is one eutrophied pond on the parcel, and each wetland corridor has a stream/brook traversing through it, outletting into Lake Hayward or into an open water marsh adjacent to Lake Hayward.

During the site inspection an area was noted as a possible wetlands/watercourse that is not identified on the applicant's plans. The area of concern is located between lots 5, 103 and 91. The regulated area under the Inland Wetlands and Watercourses Act encompasses not only wetlands as defined by soil type, but also watercourses, which as defined by the Act means "rivers, streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs and all other bodies of water, natural or artificial, public or private ..." The majority of the area in contention has been clearcut, so a vegetative analysis is difficult. Standing water was noted at this location and there appeared to be an intermittent watercourse emanating from the wet area. The Commission should have the applicant submit a biological report to determine whether or not this area qualifies as a "watercourse" under the statutory definition.

The wetland/watercourse corridors which transect the parcel have dense understory vegetation and extensive canopy cover providing many ecological niches which can be utilized by a diverse array of both plant and animal species for feeding, shelter, cover and reproductive purposes. These areas are seasonally saturated with water tables at or near the ground surface. The wetlands also collect and slowly dissipate large quantities of stormwater runoff

from the adjacent uplands providing some renovation of this water as it travels toward Lake Hayward. These functions will become increasingly important as construction commences and the percentage of impervious surfaces increases leading to greater volumes of surface runoff.

Wetland Impacts

NOTE: This section of the report will refer to lot numbers as presented on the "Schematic Subdivision Plan" revised to reflect the elimination of the road which ran between and parallel to Oak Terrace and Cedar Place.

1. There are thirteen (13) proposed wetland crossings for road access:

a. between lots 11 and 12
b. between lots 104, 105 and 5, 6
c. between lots 90A and 2, 3
d. lot 25 (East Haddam)
e. lot 26
f. lots 31, 32
g. between lots 36 and 96
h. between lots 36A and 78, 82
i. between lots 82 and 96
j. between lots 51A and 71
k. between lots 51A, 51 and 41, 42
l. between lots 5, 6 and 11 (East Haddam)
m. lot 47
n. minimally, road grading will affect the wetlands on lots 69, 72, 81, 95, 86, 87, and 90A

2. Seven (7) lots would require driveway crossings of the wetlands to access buildable land, specifically: lots 6, 10, 26, 70, 71, 72 in Colchester; and lot 22 in East Haddam.

3. There would be significant adverse impacts on the wetlands in at least twenty (20) lots during and after development through site preparation, filling, grading and other incidental intrusions. Specifically on: lots 3, 5, 26, 31, 42, 47, 50, 51, 70, 71, 85, 86, 87, 90, 94, 95 and 96 in Colchester; and lots 6, 11, and 22 in East Haddam.

4. There is potential for decreased water quality, erosion along the watercourses and increased water velocities leaving the site and subsequently entering Lake Hayward due to the development that have not been addressed.

Recommendations/Conclusions

We would recommend the following alternatives be considered.

NOTE: The letters below refer to the letters (lots) referenced above in Number 1 under Wetland Impacts.

1. Reconfigure the roads to minimize the number of road crossings.

a. Is access from the main road at this point necessary? The road is a through road from West Road to East Shore Drive. If this access is not necessary, from a wetlands standpoint, it would be better to eliminate this access point and put a cul de sac at the east end of Deerfield Crossing to serve lot 10.

b. Although the wetlands could be bisected at a narrower point, the wetlands under the proposed intersection of Woodbridge road and Deerfield Crossing are marginal, whereas the wetlands to the south, the narrow point of the wetlands and the wetland area this broadens into, would be better served by maintaining the road crossing at the edge of the wetlands where currently proposed. The other alternative to this would be to reconfigure the road keeping it entirely out of this wetland area.

c. If access across this wetland area is needed to connect Deerfield Crossing to East Shore Drive grading should be kept to a minimum, and culverts should be placed under the road to preserve the hydraulics in both portions of the wetlands.

d. Move the road to the south to eliminate impact on the wetland in this location.

e., f. and m. Realign the roads to avoid impacts on the wetlands.

g. and h. The course that Forest Street follows should be revised to significantly reduce the wetland impacts. One way this could be accomplished would be to move the road 75 feet to the west. This would allow the road to cross the stream perpendicularly, rather than eliminating a large portion of the stream and associated wetland by following the stream bed.

i. The elimination of either Viti Court or Ashford Place would potentially result in a more sound servicing of the area by road and a better configuration of lots with less impact on the wetlands.

j. Alignment of the road along the existing farm road would significantly reduce the impact of this crossing. Since this crossing is an old dam, the Dam Safety Section of The Department of Environmental Protection should be contacted to determine if any permits will be required by them for work in this area (contact Wesley Marsh at 566-7245).

k. A reconfiguration of Forest Street would eliminate the need to cross the wetlands with Ashford Place.

l. As currently proposed, Forest Street crosses the wetlands at this location in one of the widest points possible. The crossing should be moved to the south where there is already an impacted area of an old road crossing or a report from a biologist should be submitted by the applicant explaining why there would be less impact to the wetlands by crossing at the widest point.

n. Where feasible the course of the road should be altered to avoid any grading in wetland areas.

2. A permit for a driveway crossing should be granted only if it is the most feasible and prudent method of access and the proposed activity causing the driveway crossing is suitable to the lot's other constraining factors. For example, if two adjacent lots require driveway crossings, these crossings should be consolidated to minimize impacts. Of the seven lots that have crossings, lots 6, 10, and 70 appear consistent with this reasoning. Lot 26 (Colchester) may have marginal area for the construction of a residence and on-site septic. The upland portion of lot 72 has 20% slopes, and as such may not be suitable as a building lot, construction on such a site often leads to severe sediment and erosion problems despite best efforts. Although it may appear at first glance that access to lot 71 would not be a problem, the slopes along the ravine/stream would mandate a substantial cut and fill affecting the stability of the bank causing short term disturbance and potentially long term adverse impacts on the wetlands. The wetland crossing for a driveway is not necessary for lot 22 (East Haddam). This lot would be better serviced from the end of Viti Court.

3. Many of these lots are unsuitable for development as proposed. Colchester: To maintain a 50 foot buffer from the wetlands, and a 50' front yard and 25' rear and side yards, lots 3, 5, 31, 51, 70, 85, 85, 87, 90, 94, 95 and 96 would not have sufficient space to construct a house. Lots 26, 42, 47 and 50 are severely marginal for space, and with the presence of a watercourse on the lot may be unsuitable for a septic system as a septic system must be 75' from an open watercourse. Lot 26 should incorporate the rear half of lots 22 and 25 to provide sufficient buildable area for this lot. With the realignment of the road lot 96 may be eliminated. Lots 70 and 71 should be combined to provide sufficient buildable area. The front halves of lots 86 and 85 could be combined to form a lot, and the rear halves of these lots could be combined to form another lot with the elimination of Ashford Place and the realignment of Viti Court.

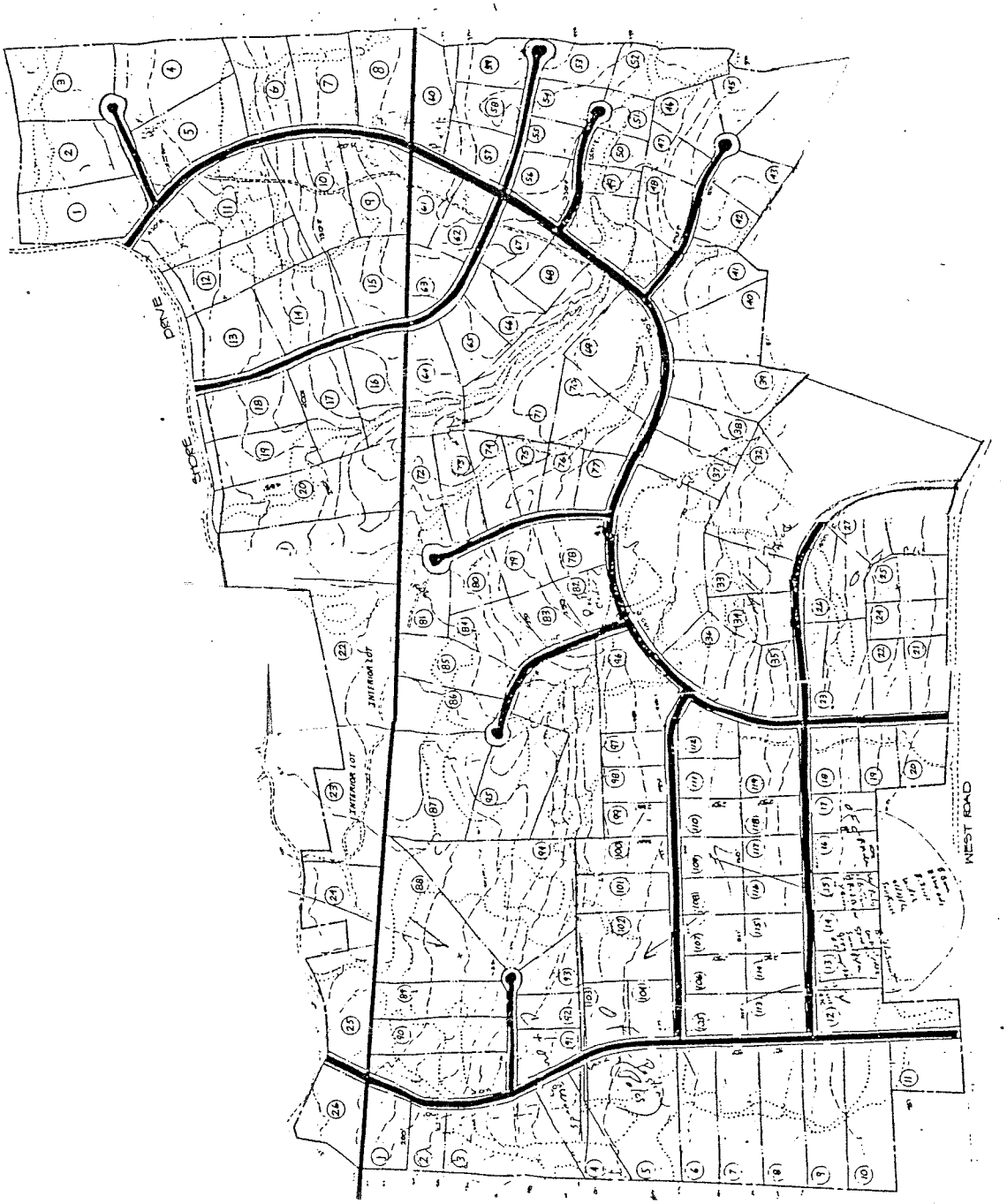
East Haddam: To maintain a 50' buffer from the wetlands, and 40' front, side and rear yards lots 6 and 11 may not have sufficient space to construct a house and septic system. (Lot 22 discussed under #2.)

4. Detention, Retention and Erosion & Sediment Controls should be thoroughly researched by the applicant and clearly marked on the plans prior to a permit being issued. These controls should be constructed/erected outside of the wetlands to allow the wetlands to continue to perform their present functions in addition to the benefits to be derived from the sediment controls. During the

site inspection, the applicant expressed a desire to clean out the eutrophied pond and use it as detention. If the pond is deepened the dredge materials should not be deposited in the surrounded wetlands, and the vegetation surrounding the existing pond should not be disturbed. Plans to deepen the pond should coincide with its existing shape to preserve the ecology of the surrounding areas.

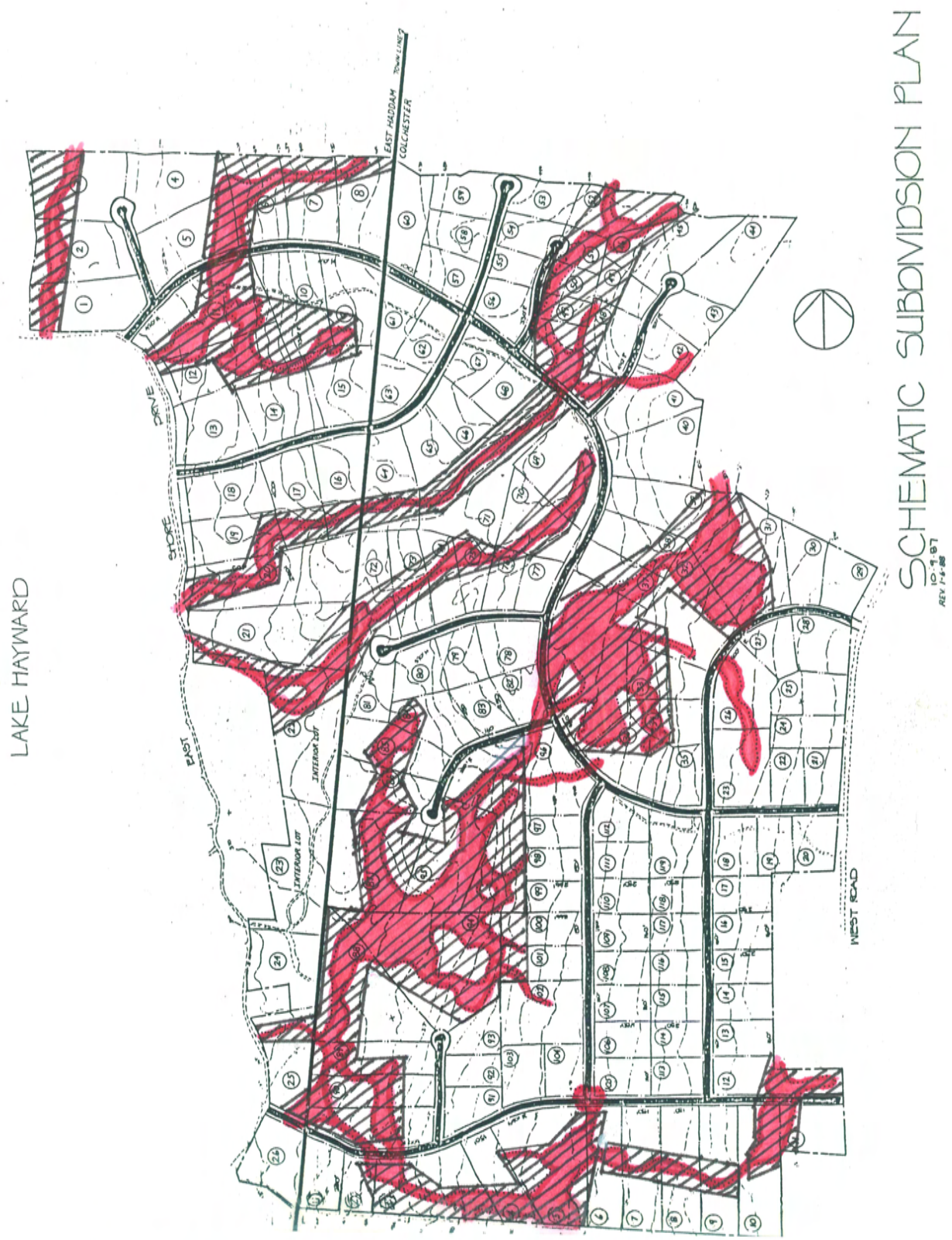
Summary

In summary, this site has significant resource restrictions. The wetlands on the property function in preserving the water quality of Lake Hayward as well as a wildlife refuge. The road should be realigned to coincide with the resource restrictions. To best protect the wetlands and future public health, safety and welfare "green belts" should be established around the wetland/watercourse corridors and this land be dedicated as open space and/or have conservation easements imposed on the sensitive areas. (see attached diagram)



SCHEMATIC SUBDIVISION PLAN

NO SCALE



POSSIBLE GREENBELT ZONES

WETLAND AREAS
POSSIBLE GREENBELT ZONE

6. EROSION AND SEDIMENT CONTROL

At the review, the developer informed the Team that the site plans were preliminary. However, during the site walk it was found that the subdivision roads were under construction. This construction has resulted in erosion and siltation problems especially in wetland areas. Wetland areas along the roadway have been filled during the road construction. The grading of roadway banks has resulted in additional filling of wetlands and contributed to the siltation problems.

Erosion and sediment control measures are absent from the site. At this time is is vital that a site specific erosion and sediment control plan not only be prepared but installed to avoid further adverse impacts to the environment. The general note which was included with the site plan cannot be considered a complete erosion and sediment control plan. It should be noted that even the provisions outlined in the general notes were not installed at the site. It will be necessary for a complete site specific plan to be prepared. This plan should be developed using the Connecticut Guidelines for Soil Erosion and Sediment Control, Chapter 1.

The proposal is for an intensely developed subdivision. It is extremely important that a stormwater management system be designed in accordance to the standards outlined in chapter 9 of the Connecticut Guidelines for Soil Erosion and Sediment Control. The size of the watershed may necessitate using Tr-20 as opposed to Tr-55 as the design standard for the system. All drainage calculations and design criteria should be provided with the erosion and sediment control plan.

The soil conservation service working through the New London County Soil and Water Conservation District is available to review the erosion and sediment control plan when it is completed, at the town's request.

7. GEOLOGIC DEVELOPMENT CONCERNS

In terms of the proposed residential subdivision, the major geological limitations found on the site include; (1) areas where bedrock is at or near ground surface; (2) areas of moderate slopes; (3) the presence of till soils, which are characterized by a relatively shallow, compact zone that results in elevated ground water tables and slow percolation rates; and (4) areas of seasonal and permanent wetness.

These geologic limitations will weigh heaviest on the ability to provide adequate subsurface sewage disposal serving homes constructed in the subdivision, if the sewer line is not extended to the site. A review of available soil testing and mapping data suggests that major portions of the site contain subsurface conditions (shallow bedrock and seasonally high water table) that would be deemed severe and of "special concern" by the Public Health Code relative to the installation of subsurface sewage disposal systems. In some cases, proper planning and engineering can surmount some of the limitations mentioned above. As noted earlier, lots in East Haddam must be a minimum of 2 acres. This should add some flexibility for finding a suitable area for a sewage disposal system. However, it may be more problematic on the one acre lots that occupy the Colchester side. Depending upon the outcome of soil testing, it seems likely that there may be a need to combine and/or eliminate certain lots in places, especially on the Colchester side. This may also be the case on the East Haddam side but can only be determined once soil testing has been completed on the site.

According to soils information supplied to Team members, soil testing to date has been conducted mainly during the month of August. Because most of the site contains soils that are characterized by seasonally high water tables, it would probably be best to conduct soil testing on the site during the wet time of year (February 1 to May 31) or at least monitor the groundwater levels through the wet time of year . Only then can an accurate assessment of ground water levels be determined.

As mentioned earlier, the two major limitations appear to be areas of shallow bedrock which in many places is rotted in the upper few feet and "hard pan" soils.

Because of the relatively shallow depth to the compact layer and the existence of a seasonally "perched" groundwater condition, the main concern relative to this type of soil condition is the ability of the naturally occurring soils to adequately absorb or disperse the expected volume of sewage effluent without overflow, breakout or detrimental effects on ground or surface waters. In general, proper fill material and/or intercepting curtain drains are used relative to construction of systems under these conditions. "Hardpan" soils usually allow for the installation of curtain drains as long as there is sufficient slope to outlet the pipe to daylight. A properly designed and constructed curtain drain installed in accordance with all applicable codes can effectively lower the

groundwater so it does not interfere with the proper functioning of the septic system. Ideally, curtain drains should be outletted to the storm drainage system when possible. If this is not possible, it should outlet at a point where it does not create water problems, i.e., near septic systems, near neighboring properties, etc.

A curtain drain may be used in conjunction with building footing drains. Because of the potential for high groundwater levels throughout the site, footing drains should probably be required for all homes constructed in the subdivision. This will hopefully keep basements from getting wet during the wet time of the year.

Soil testing in shallow bedrocks areas should proceed with great caution. A sufficient number of deep test holes should be excavated in these areas so that a good profile of the bedrock surface can be accurately determined. Special care should be taken with regard to those areas which encounter a weathered bedrock surface. It is suggested that the weathered bedrock be treated as though it was consolidated rock and maintain the required separating distance of 4 feet between the bottom of the leaching system and the bedrock surface.

Before subdivision approval, the applicant's engineering firm must show that each of the proposed lots in the subdivision meets the minimum soil standards set forth in Section 19-13B103e(a) (3) of the Public Health Code and be able to hydraulically disperse the expected discharge from the home's sewage disposal system into the site's natural soil layers per Section 19-12-B103e(a)(4) of the Code.

The process should be a coordinated effort between the design engineer and the town sanitarian. Because most of the lots will be deemed of "special concern" by the State Public Health Code, plans for the design of the subsurface sewage disposal facilities (along with the placement of each on-site well water supply) must be prepared by a professional engineer and submitted to the Health Department for review and approval by their certified staff.

The final configuration of lots should not be approved until the Health Department is assured of the feasibility of each lot meeting all of the State Health Code Requirements and above listed concerns.

There is a possibility for municipal sewers to serve the proposed subdivision. Since on-site septic systems would not be used under this scenario, renovated effluent from septic systems will not be available for ground water recharge. No matter how distasteful it may sound, renovated wastewater plays a very important role in the groundwater budget.

The hydrogeologic question that needs to be answered is whether or not the loss of available recharge of domestic wastes to the municipal sewer line will adversely affect the groundwater table in the area and the ability of bedrock wells to supply groundwater to homes in the subdivision. Additionally, the

potential impact to streamcourses and wetlands should also be studied. Since there is much undeveloped land in the vicinity of the site and since sewers will be available to this area if the utility is extended, the question of groundwater recharge becomes a significant one. One then begins to see the importance of sewer avoidance, particularly when municipal water mains are not in the vicinity.

Where the bedrock cannot be excavated by heavy machinery, there may be a need for blasting in shallow bedrock areas for roads, driveways, utility lines and house foundations. Any blasting which takes place in the subdivision should be done under the supervision of personnel familiar with the latest technology in blasting. This will hopefully reduce the chance for damage from undue seismic shock or airblast. A pre-blast survey of the area would also be wise to minimize the chance for damage claims.

Based on a subdivision plan submitted to Team members, the present interior road system will need to cross or impact wetland areas in numerous areas. It seems likely that the road layout could be re-designed to minimize and eliminate anticipated wetland crossings in several areas. (Refer to WETLAND RESOURCES section for more specific information)

In general, wetland crossings are feasible provided they are properly designed (e.g. culverts are properly sized and installed and permeable road base fill material is used). The roads should be constructed at least 1.5 feet and preferably 2 feet above the surface elevation of the wetlands. This will allow for better drainage of the roads and decrease the frost heaving potential of the road. It is recommended that any road construction through wetland areas be done during the dry time of the year with adequate provisions for effective erosion and sediment control.

Detailed plans for the road crossings through wetlands were not available on the review day. It is strongly suggested that the applicant be required to submit detailed plans for all wetland crossings. The plans would indicate specific site development details, erosion and sediment control measures, fill lines, amount of fill to be placed, the impacts of filling, watercourse channel location and flow direction, disturbed areas, etc.

Because the soils in the preceding paragraphs are classified as inland-wetland soils in Connecticut, they are regulated under Public Act 155. Any activity which involves modification, filling removal of soils, etc., will require a permit and ultimate approval by the Town's Inland Wetland Commission. In reviewing a proposal, the Commission needs to determine the impact that the proposed activity will have on the wetlands. If the Commission determines that the wetland is serving an important hydrological or ecological function and that the impact of the proposed activity will be significant, they may deny the activity altogether or, at least, require measures that would minimize the impact.

8. WATER SUPPLY

Each lot in the proposed subdivision would be served by an individual on-site well. It appears that wells will need to tap the underlying bedrock aquifer. Wells drilled in bedrock generally supply small but reliable yields of groundwater. However, since the yield of a given well depends upon the number and size of water bearing fractures that it intersects and since the distribution of fractures in bedrock is irregular, there is no practical way, outside of drilling the well, to predict the yield of a well drilled in a specific location. Because fractures in the rock generally occur within the first 100 to 150 feet below the surface, it has been shown that the probability of increasing the yield of a well decreases with depth below this level.

Ideally, each well should be located on a relatively high portion of a lot, properly separated from the sewage disposal system and any other potential pollutant (e.g., fuel oil storage tanks, etc.) and in a direction opposite the expected direction of groundwater movement. They should all be cased with steel pipe into the underlying bedrock. In order to provide adequate protection of the quality of the bedrock aquifer, all wells will need to be properly installed in accordance with applicable State Public Health Code and Connecticut Well Drilling Board regulations. In addition, the town sanitarian will need to inspect and approve all well locations.

In the lower Connecticut River basin, 314 wells tapping crystalline metamorphic bedrock (i.e., gneisses, schists, etc.) were surveyed for Connecticut Water Resources Bulletin No. 31. Of these, 90 percent yielded just under 2 gallons per minute or more, 50 percent yielded about 6 gallons per minute or more and 10 percent yielded about 17 gallons per minute or more. A well yield of 3 gallons per minute is generally satisfactory for most domestic uses.

The natural quality of groundwater should be satisfactory. However, the Brimfield Schist that underlies the site is known to contain elevated iron, manganese and iron sulfides which would tend to lower the overall quality. If elevated iron and/or manganese levels are present in the water, it may be necessary to provide suitable treatment filters.

According to the Water Quality Classification Map of Connecticut (Murphy, 1987), groundwater in the area of the site is classified as GA, which means that it is suitable for drinking water supplies without need for treatment.

9. LAKE HAYWARD

Lake Hayward is a 198.9 acre lake with a maximum depth of 37 feet and a mean depth of 10 feet. The state owned boat launch is in the northern section of the lake where emergent aquatic weeds are abundant. This lake and its tributaries are Class A waterbodies. Class A means that the designated uses are fish and wildlife habitat and recreational use. The lake and its tributaries are not suitable for discharges of treated wastewater.

In 1974 the Connecticut Agricultural Experiment Station (CAES) classified the lake as mesotrophic. A mesotrophic lake has ranges of 15-25 parts per billion (ppb) total phosphorous, 300-500 ppb total nitrogen, and visibility 10-13 feet. Three permanent streams and a number of seasonal streams drain the ±300 acre subdivision site. These tributaries provide a major source of recharge water to Lake Hayward.

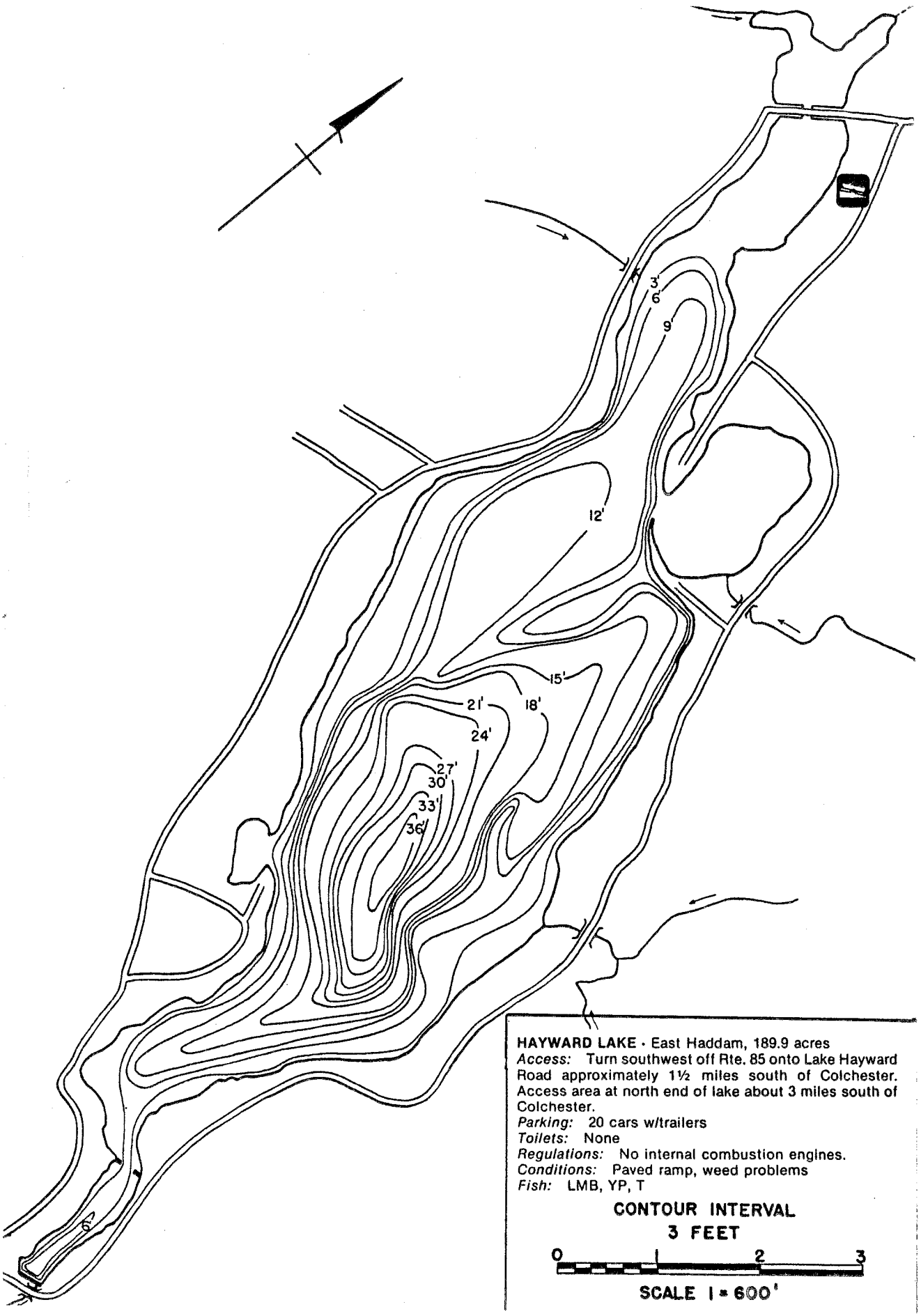
The proposed Hayward West Subdivision composes ±300 acres of the 1,592 Lake Hayward drainage basin, or 18.8% of the total watershed. A development that changes land use from wooded to residential is considered unfavorable when water quality is an issue. Septic systems, fertilizers, and other nutrient sources from residential areas increase phosphorous loading in receiving waterbodies which augments plant productivity (eutrophication). Runoff from stormwater sewers carries sand, silt, salt, and oil into a body of water resulting in the polluting of many urban ponds.

A mathematical model developed by CAES was used to predict phosphorous concentrations in Lake Hayward in 1979. This model is based on the percentage of land in the watershed which is wooded, urban, and agricultural. In 1979 the fraction of land in urban use was .107, which predicted a phosphorous concentration of 18 ppb. Actual measured levels ranged from 21-24 ppb. Using the same model when 300 acres change from wooded to residential, predicted phosphorous increases to 35 ppb, well within the eutrophic range. Actual measured levels may again be higher. This would place the lake in an advanced state of productivity characterized by algae blooms, and increased weed growth. Eutrophic lakes eventually lose dissolved oxygen in lower levels leading to a reduction in fish habitat and internal nutrient cycling.

The calculations are as follows:

$$P = \frac{Q + 1.2}{Q + 12}(170U + 54A + IOW)/D$$

P = Phosphorous (ppb)
Q = Water Load (m/yr)
U = Fraction of land in urban use
A = Fraction of land in agricultural use
W = Fraction of watershed wooded and wet
D = Water load divided by the watershed to surface area ratio which is 8/5.3 = .6625



HAYWARD LAKE - East Haddam, 189.9 acres
Access: Turn southwest off Rte. 85 onto Lake Hayward Road approximately 1½ miles south of Colchester. Access area at north end of lake about 3 miles south of Colchester.
Parking: 20 cars w/trailers
Toilets: None
Regulations: No internal combustion engines.
Conditions: Paved ramp, weed problems
Fish: LMB, YP, T

CONTOUR INTERVAL
3 FEET

0 1 2 3

SCALE 1 = 600'

1974

$$\frac{5.3 + 1.2}{5.3 + 12} \quad \{(170 \times .107) + (54 \times .087) + (10 \times 804)\}/.6625 = 17.5\text{ppb}$$

With Hayward West Subdivision

$$\frac{5.3 + 1.2}{5.3 + 12} \quad \{(170 \times .295) + (54 \times .087) + (10 \times .616)\}/.6625 = 34.5\text{ ppb}$$

These calculations represent the potential to increase the phosphorous concentration within the lake from the Hayward West Subdivision utilizing on-site sewage disposal. The phosphorous loading will be lower if the sewage from the development is treated at the Colchester sewage treatment plant. However, on-site sewage disposal would remove a source of groundwater from the watershed which could affect the lake to some extent. Either on-site or off-site sewage disposal will probably impact the lake in some manner. A detailed study of the hydrologic system would be required if the option for both methods is available. At the field review (10/04/88) a decision had not been reached as to what type of sewage treatment will be used.

Stormwater runoff from paved surfaces is another major source of pollution to urban lakes. Careful design, and proper maintenance of stormwater drainage structures and adjacent roads is the key to minimizing impacts from stormwater runoff. The responsibility of designing a stormwater drainage system belongs to the developer. He should employ a qualified engineer with experience in stormwater design to plan a system that will protect the lake. The plans may include detention ponds, filtering wetlands, groundwater infiltration, double chamber catch basin, and buffer zones. Each town should review this section of the development plans carefully before final approval is granted.

If the Hayward West Subdivision forms a home owners association a management plan addressing land use practices may be a method to protect water quality. This plan could be drafted by the developer and approved by the towns. Perhaps a covenant agreement restricting various land uses could make such a plan enforceable.

Maintenance of drainage systems and the roads can be part of the homeowners associations management plan. If these responsibilities are entirely the association's, the town should assure that it is followed. If the town is responsible for maintenance perhaps the extra measures needed to protect the lake could be charged to the association. An effective plan will include regularly scheduled street sweeping, cleaning of catch basins and detention ponds, leaf pick-up, using chipseal instead of oil, and lower concentrations of de-icing chemicals.

Lawn maintenance is another subject the association's management plan should encompass. Over fertilization of lawns also increases nutrient loading to lakes. To prevent this the association can educate the residents in proper methods of applying lawn fertilizers. The association may also assist

residents by having aggregate soil samples of each lawn analyzed to determine soil nutrient requirements for the intended use (i.e. lawn, garden). Once a recommended ratio of phosphorous to nitrogen to potassium is determined the potential for excess fertilizer draining into the lake will decrease. The Middlesex County Soil and Water Conservation District could help in analyzing and making these recommendations.

Public Act 83-388 designates authority to municipalities to enforce soil erosion control regulation through inland wetland commissions. Strict continuous enforcement of these regulations by the towns during construction of this subdivision is essential to protecting Lake Hayward.

Soil erosion from poorly managed construction activities have filled in sections of many lakes. Although construction is short in duration, disturbed and exposed soils are highly susceptible to erosion. These filled areas become suitable habitat for aquatic weeds by increasing littoral zone size and providing a nutrient rich substrate.

Turbidity levels will increase if particulate size is sufficiently small. Small particles or colloids do not settle as quickly as larger particles such as sand. These fine particulates will remain suspended in the water column resulting in higher than background turbidity readings. This may be detrimental to aquatic organism such as fish and zooplankton. Methods to control soil erosion during construction are addressed in other sections of this report.

Once the Lake Hayward subdivision materializes, the Towns of East Haddam and Colchester can expect some inevitable degradation in the water quality of Lake Hayward. The extent of the change can be controlled if the towns are conscientious and concerned about protecting this resource. However, the homeowner's association will not have lake frontage and may not share this concern. Therefore, the towns should assume little support from the association in their lake preservation efforts. This may require both municipalities to be meticulous and stringent in enforcing regulations that will protect Lake Hayward.

REFERENCES

DEP Water Compliance 1987
Water Quality Standards

DEP Water Compliance 1988
A Watershed Management Guide for CT Lakes

W. A. Norvell, C. R. Frink 1975
Water Chemistry and Fertility of
Twenty-Three Connecticut Lakes
Connecticut Agricultural Experiment Station
Bulletin 759

W. A. Norvell, C. R. Frink and D. E. Hill 1979
Phosphorous in Connecticut Lakes Predicted by Land Use
Proc. Natl. Acad Sci Vol 76 Noll pp 5426-5429

10. NATURAL DIVERSITY DATA BASE

The Natural Diversity Data Base maps and files have been reviewed regarding the proposed subdivision. According to our information, there are no known extant populations of Federally Endangered and Threatened species or Connecticut "Species of Special Concern" occurring at the subdivision site.

But, our information indicates a critical habitat exists at the northeastern end of Lake Hayward - just north of the State owned boat launch. This critical habitat is a level bog; it is characterized by a wet vegetative mat dominated by peat moss and Vaccinium macrocarpon,(cranberry).

In addition to this critical habitat, our records indicate a "monitored" invertebrate species occurs within the level bog. Lycaena epiranthe, the Bog Copper Butterfly often feeds on Vaccinium macrocarpon and 70 adults were found in this area recently. These butterflies are found in acidic marshes or bogs with cranberry patches.

Any activity in the area delineated as the proposed subdivision that effects the water quality or quantity would negatively impact the critical habitat and "monitored" butterfly.

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 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

The tree cover on this project falls into four general categories.

Area 1: This was an old field area and was probably cultivated at one time. In later years it was probably pasture as there are a few scattered larger trees. The cover is generally Red Maple with Red Cedar, Black or Scarlet Oak, Black Birch , White Ash, Black Gum, Sassafras, and even a few old Apple trees. Mostly the trees are fairly small, 2-8 inches, and less than 25 years old. There is some area that is still in natural grasses and shrubs such as Blackberry, Grapes, Bittersweet, Sweet Fern, Bayberry, and small trees of Red Maple , Grey Birch and Black Cherry.

Area 2: Is similar, but the trees are larger and older,8-10 inches and 40-50 years old. The tree species are about the same but also include Tulip, Black Birch and Black Cherry. Most of the Red Cedar has died out and is gone. There are no grasses or goldenrod in the understory. The vines are mostly Bull brier with only a few grape and woodbine vines. The stonewalls give evidence to the fact that this was a cultivated field or at least well maintained pasture land at one time. Slopes are gentle.

Area 3: This area appears as a young woodland with the only species change being the introduction of a few Hickories and less Sassafras and Black Cherry. Because of the tight canopy in much of the area species in the understory are smaller in size and of fewer species. Some seedlings of the overstory species include Viburnum and some Spice Bush.

Area 4: This includes the rest of the area. Although there are considerable differences in stand density and site quality the area all has one thing in common. Approximately 10 years ago this area was cut to remove sawlogs. It was a very heavy cut in most areas and most of the trees that would make sawlogs were removed. Many of the remaining trees were buttscared. Many of the trees had their crowns damaged by the logging or more recently by ice or wind storms. There are some smaller areas such as the Maple swamps where there was little cutting, as most of the trees were not of size or quality for sawlogs.

Tree species in this area would include Mochernut and Pignut Hickories, Red Maple, Black and Yellow Birches, Black White and Scarlet Oaks, Tulip Poplar, Black gum, White Ash, Black Cherry, Sassafras, and American Beech. The Northern and Northwestern portions of the area are more the typical Oak/Hickory forest.

Because of the heavy harvest there is everything in the understory from grasses and flowers to tree seedlings and saplings. Species noted include seedlings of all the overstory species plus Flowering Dogwood, Blue Beech, Spice Bush, Sweet Pepper Bush, Arrowhead, Maple Leaf Viburnum, Chestnut,

Blackberry, Japanese Barberry, Black Alder, and even one Striped Maple was noted.

Obviously a development of this intensity is going to remove a good percentage of the ground cover/tree cover and therefore is detrimental to this area as a forest stand useful for producing wood products for the future, but assuming that the project will progress, the high degree of wood utilization exhibited is highly desirable compared to burying all the wood residue. This causes future problems when the wood decays. A more serious problem is the effect of the forest on the development. The old field types contain young trees that are quite wind-firm, but in the areas that were logged so many of the residued trees exhibit butt damage and associated rot that they will be unsafe to leave on the house lot. This will make some of the house lots quite sparse of tree growth; the hazardous trees should be removed before the houses are occupied. However, there has been so much regrowth of various species in the seedling-sapling stage that there should be no open land erosion problem, unless this growth is removed.

VEGETATION

12. WILDLIFE RESOURCES

Habitat Description

The area for the proposed subdivision currently offers a high diversity of wildlife habitat although it has been partially cleared. The area is composed of three major habitat types; mixed hardwoods, wetland/riparian areas and old field/reverting areas. The abundance of understory cover and mature hardwoods combined with the existence of wetlands enables this area to support a high diversity of wildlife species.

The majority of the area consists of mixed hardwoods. Dominant species occurring in the overstory include red maple, white oak, red oak, shagbark hickory, ash, beech, and black cherry. The understory is dense in many areas and provides important cover for a variety of wildlife. Spice bush, greenbriar viburnum, winterberry, high bush blueberry, black berry, beech and black cherry seedlings are the dominant species. Club mosses, sassafrass seedlings, and a variety of ferns dominate the area at ground level.

Wetland/riparian areas consists of at least three small brooks and associated wetlands. A small wetland is located in the northern portion of the property. It is surrounded by vegetation consisting primarily of sweet pepperbush, winterberry, greenbriar, high bush blueberry, viburnum, and smooth alder. A variety of wetland grasses exists within the wetland. This area and the associated brook that runs through it provides habitat for a number of amphibian and reptilian species. Vegetation along brooks and associated wetlands consists of spice bush, high bush blueberry, winterberry, and viburnum at higher elevations. Dominant species at lower elevations consist of red maple, spirea, black berry, and a variety of grasses.

As a result of agricultural practices and cordwood cutting there are several areas of early successional vegetation. These areas are dominated by red maple, bittersweet, winterberry, viburnum, black berry, multiflora rose, ragweed, spirea, and a variety of ferns, grasses, and sedges.

Wildlife Species

Bird species observed inhabiting the area include bluejays, yellow rumped warblers, cardinals, blackcapped chickadees, ruffed grouse, wood thrushes, flickers, robins, cedar waxwings, white breasted nuthatches, slate-colored juncos, sparrows, and a variety of other songbirds.

Mammalian species consist of white-tailed deer, eastern gray squirrels, northern striped chipmunks, eastern cottontails, raccoons, red fox, and a variety of other small mammals.

Due to the abundance of wetland/riparian habitat this area also supports a diversity of amphibian and reptilian species.

Effects of Proposed Development on Wildlife

The preliminary plans indicate that about 95% of the area will be composed of building lots. This type of development will eliminate large areas of wildife habibat, which will in turn severely reduce species diversity and richness. Species that are intolarable to human disturbance will be forced to emigrate into adjacent habitat. Species dispersion into adjacent habitats may result in competition with species already occupying the area. Many species will also be forced to inhabit less desirable habitat; decreasing survivorability. Species more tolerable to man such as starlings, robins, house sparrows, and raccoons may increase in number and become a nuisance.

Since many of the proposed building lots contain wetlands there will be a negetative impact on these areas if there is any clearing or removal of vegetation. Vegetation removal in wetlands would have severe impacts on wildlife, especially reptiles and amphibians. Soil and water types, cover, food, breeding grounds, and hibernation areas may be altered so that species dependant on specialized habitats are eliminated and more adaptable species reduced. Barriers to seasonal movement and population dispersal, such as roads, are also serious threats. The road network crosses wetland areas in many locations. This road layout has been cleared including wetland and brook crossings, causing severe impacts on wildlife habitat. Vegetation removal should not take place within 100 feet of wetlands or brooks. The road will have to be relocated and vegetation replanted in order to restore these areas. Due to the steepness of slope in many areas there is also a high risk of erosion and siltation of wetland and riparian areas.

Another area of concern is the marsh in the northern end of Lake Hayward. This wetland is adjacent to the property and currently supports a high diversity of plant and animal species. Wildlife species observed foraging in the marsh included black ducks, mallards, woodducks, kingfishers, and king rails. A small brook which flows through the property proposed for subdivision feeds into the wetland. Siltation to the brook as a result of development activities will result in silt being deposited in the wetland. This may have adverse affects on the ecological structure of the wetland.

Mitigation of Impacts on Wildlife

Several measures can be taken to minimize the affect of development on wildlife. Since the development plans are in the preliminary stage, as much of wetland area as possible should be designated as open space. Due to the abundance of wetlands erosion control measures will have to be implemented during and prior development to limit siltation. Owners of lots adjacent to or containing wetlands should be discouraged from any removal of vegetation within **100 feet** of wetlands. These buffer strips will limit disturbance to wetlands and provide important corridors for a number of wildlfe species. It

would also be beneficial to wildlife if lot sizes were increased and the number of lots decreased. This would reduce vegetation removal, habitat destruction, and be more aesthetically pleasing for the residents of the development.

13. FISH RESOURCES

Site Description

This report will address potential impacts of residential development to Lake Hayward and the major three streams that flow through the property.

On the day of the field review it was discovered that a portion of the proposed road network had already been cleared. Significant damage to streams and wetlands was observed due to unauthorized stream and wetland crossings and removal of riparian and wetland vegetation.

Three major perennial streams flow through this property into Lake Hayward. The maintenance of existing water quality standards in these streams is critical to the long-term health of the lake.

Lake Hayward, also known as Shaw Lake, has a surface area of approximately 198.9 acres. Maximum water depth is 37 feet with an average depth of 10 feet. Its 1,592 acre watershed is 6.7% urban 5.5% agricultural and 87.8% wooded or wet (Frink and Norvell 1984). Of the 1,592 acre watershed, the proposed subdivision of 292 acres represents an 18% modification of the Lake Hayward watershed.

Surface waters of the Lake are defined by the Department of Environmental Protection (DEP) as "Class A". Designated uses for this classification are as follows: potential drinking water supply; fish and wildlife habitat; recreational use; agricultural and industrial supply.

Lake Hayward is defined in limnological terms as being in a "mesotrophic" state of eutrophication or lake aging. During the process of eutrophication, a lake typically passes through three major states of succession; oligotrophy, mesotrophy, and eutrophy. The transition from one state to the next may take thousands of years; however, eutrophication can be rapidly accelerated by man-made inputs of nutrients such as excessive soil erosion, stormwater runoff, and septic tank leachate. A "mesotrophic" state of eutrophication essentially means that moderate levels of nutrient enrichment have occurred. Mesotrophic lakes are susceptible to the development of periodic "algae blooms" that will discolor the water and support moderate amounts of aquatic weeds.

Fish Population

Lake Hayward primarily supports a warmwater fishery. The lake is best known for its largemouth bass fishery. Other fish species expected to inhabit the lake are: smallmouth bass, yellow perch, calico bass, bluegill sunfish,

pumpkinseed sunfish, brown bullhead, white sucker, and golden shiner. Additionally, the lake is annually stocked by the Bureau of Fisheries with more than 900 adult (9-12") brown and rainbow trout.

All three streams support viable fish populations. Dominant fish species that inhabit the headwater reaches of these streams would be blacknose dace and fallfish. Diversity would increase towards the lower stretches of the streams near the lake. In addition to blacknose dace and fallfish, these areas would support white sucker and possibly even native brook trout populations. White sucker populations typically utilize lake tributaries for spawning in the spring. Fish species common to the lake such as smallmouth bass and sunfish may also seasonally inhabit the lower sections of these streams.

Impacts

The following impacts of the Hayward West Subdivision on the three tributary streams and Lake Hayward can be expected if proper mitigation measures are not implemented:

1. Construction site soil erosion and sedimentation of the lake and watercourses through increased runoff from unvegetated areas - devegetation of steep sloped land on this development site presents a situation conducive to the development of serious soil erosion problems. If a siltation problem developed, the watercourses on this property will provide a direct avenue for siltation into the lake.

Erosion and sedimentation due to residential housing construction has long been regarded as a major stimulus in the lake eutrophication or aging process. Silt is considered a serious pollutant. The lake eutrophication process can be accelerated by excessive erosion and sedimentation and seriously impact resident fishes, water quality, and overall lake recreational value. In particular, excessive siltation will:

* Reduce the amount of usable fish habitat used for spawning purposes - preferred substrate that becomes compacted with silt is no longer available for spawning. Fish will be forced to disperse to other areas not affected by siltation.

* Reduce fish egg survival - water free of sediment particles is required for egg respiration (biological process of extracting oxygen from water) and successful hatching. Silt deposits will smother eggs.

* Reduce aquatic insect production - sediment-free water is also required for successful aquatic insect egg respiration and hatching. Aquatic insects are the primary food source of young and adult fishes. Reduced insect levels will adversely affect fish growth during their early growth

period. Ultimately, this will lead to reduced growth rates and negatively impact fish survival.

* Reduce water depth within the lake and stream "pools" - this occurrence will result in a further reduction of usable fish habitat.

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

* Adversely affect "gill" function and impair feeding activities - studies have documented that high sediment concentrations and turbidity will disturb fish respiration and gill function.

* Encourage the growth and survival of rooted aquatic plants in streams and along the lake shoreline and precipitate dense "algae blooms" - eroded soils contain plant nutrients such as nitrates and phosphates. Although algae and aquatic plants require these nutrients for growth, most lakes and streams contain very limited amounts. Consequently, these nutrients act as fertilizers once they are introduced into aquatic habitats resulting in accelerated plant growth. Extensive algae blooms may turn the water a pea-soup or soupy brown color. Fish kills due to oxygen depletion in the summer called "summerkill" may occur in lakes when algae populations die. Dead algae are rapidly decomposed by bacteria in the summer, sometimes causing low oxygen levels. Unfortunately, summer lake dissolved oxygen levels are naturally at their lowest and the introduction of nutrients can only serve to make a bad situation critical.

2. Aquatic habitat degradation due to the influx of stormwater drainage - since the entire site drains into the lake, roadway runoff that contains pollutants such as salt, sand, gasoline, oil, and other pollutants that may be spilled on driveways and roads can be directly introduced into the streams and flow into Lake Hayward. Stormwaters can cause severe water quality and aquatic habitat degradation. Fine sediments in stormwaters that remain in suspension for prolonged periods of time cannot be effectively removed from stormwaters since catch basins and detention basins will only remove heavy and coarse particulate matter; thus, they are ineffective against the removal of fine sediments. Stormwater runoff containing salts and fine sediments can result in increased fertility of lake waters, in turn encouraging the growth of rooted aquatic plants and stimulating algae blooms.

3. Proposed road construction over streams and wetland areas will result in the following impacts:

* Instream culvert placement in concert with placement of fill or rip-rap alongside streams will inevitably result in stream sedimentation

problems if proper mitigation precautions are not followed - the negative impacts due to excessive siltation events were previously discussed.

* Instream culvert placement represents an irreplaceable loss of stream habitat - additionally, improperly placed culverts can prevent or impede resident fish movement from one section of the stream to another.

* Loss of overhead vegetation along stream riparian zones - the loss of overhead shading in the immediate area of the three road crossings will result in a net loss of this important stream parameter. This impact has already occurred in two locations due to unauthorized clearing of streamside vegetation. Vegetation loss will increase evaporation of exposed stream waters. Trees are very important in that they help cool stream water temperatures in the summer and provide important cover for resident fishes. Resident fish may be forced to disperse and locate to more suitable sections in lower sections of these streams.

* Degradation or loss of wetland habitat - wetlands are beneficial in several ways. Wetlands serve to: (1) control flood waters by acting as a water storage basin, (2) trap sediments from natural and man-made sources of erosion, and (3) help filter out pollutants from runoff.

4. Septic effluent may percolate into the lake and local streams if on-site septic systems are utilized - a failure of individual septic systems to operate properly is potentially dangerous to aquatic habitats. Nutrients and assorted chemicals that may be placed in septic systems could enter surface waters in the event of a failure or possibly infiltrate groundwater, especially when water tables are seasonally close to the surface. The introduction of septic effluent could result in a major threat to fish, public health, and overall water quality conditions in the Lake Hayward watershed. Effluent will stimulate the growth of rooted nuisance aquatic weeds along a lake shoreline and stimulate nuisance unicellular algae blooms. Septic tank leachate can rapidly accelerate the lake eutrophication process; thus,a mesotrophic lake may reach a "eutrophic" condition more rapidly.

5. Transport of lawn fertilizers and chemicals to the lake and streams - runoff and leaching of nutrients from fertilizers placed on lawns can stimulate nuisance aquatic weed growth and help precipitate algae blooms. The introduction of nutrients will accelerate the lake eutrophication process. Introduction of lawn chemicals may result in fish kills and water quality degradation.

Recommendations

Impacts on Lake Hayward and its tributary streams may be somewhat reduced by implementing the following recommendations:

1. The town of Colchester should consider reducing the total number of houses to be constructed on this site - this subdivision will modify approximately 18% of the Lake Hayward watershed and has a great potential to degradate the water quality of Lake Hayward. Hence, negative impacts may be reduced by increasing building lot size from one to two acres.

2. Install and maintain proper erosion and sedimentation controls during site construction activities - this includes such mitigative measures as silt fences and staked hay bales. Only small areas of soil should be exposed at one time and these areas should be seeded and restabilized as soon as possible. Complete mitigation of silt runoff may be difficult to achieve at this subdivision location if development is allowed on steep slopes. If this development is approved, the Towns of Colchester and East Haddam should have an appointed official that would be responsible for inspecting this development on a daily basis to ensure that contractors have complied with all stipulated mitigation devices. Past lake and 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. The towns must be willing to immediately issue a cease and desist order if proper compliance with recommended measures is not being met.

3. The developer should submit a detailed stormwater management plan for town review - the effective management of stormwaters and roadway runoff can be accomplished through proper design, location, and maintenance of catch basins and detention basins. Maintenance is very critical. Catch/detention basins should be regularly maintained to minimize adverse impacts to streams. Catch/detention basins will only trap heavy, coarse sediments reducing the likelihood of excessive stream sedimentation; however, waters that contain pollutants such as salts and even small amounts of fine enriched sediments will eventually cause water quality and aquatic habitat degradation. This impact can not be prevented since catch basins will not remove these materials.

4. Maintain at the **minimum** a **100 foot** open space **buffer zone** along the wetland boundaries that border both streams - no construction and alteration of riparian habitat shall take place in this zone, otherwise the ability of the buffer zone to function properly will be reduced. Colchester and East Haddam officials should regulate the vast array of land owner activities that may or may not take place within the buffer zone. 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 absorb surface runoff and other pollutants before they can enter wetlands and stream ecosystems.

5. Natural streamside vegetation should be restored and replanted at the stream crossing locations that have already been damaged. Fast growing trees that provide good overhead canopy such as white pine, American larch, and black willow should be planted.

6. "Septic system effluent", a potential source of lake eutrophication, can be completely mitigated at this site if this development is connected to existing town sewer lines - if not, then individual septic systems must be properly designed and located. The addition of septic effluent to Lake Hayward can lead to accelerated eutrophication. All septic systems should be maintained on a regularlar basis. Prevent the disposal of harmful chemicals!s into septic systems which may negatively effect operation and possibly result in system failure.

7. It is strongly suggested that culverts at stream crossings should be installed at least 6 inches below existing streambed levels - this installation design will allow for the natural accumulation of stream substrate within the concrete culvert and also allow for unobstructed passage for resident fishes to move to upstream and downstream areas of each brook.

8. All instream work and land grading/filling near streams should take place during the summer - this will help minimize the impact to the aquatic resources. Reduced streamflows and rainfall during the summer provide the least hazardous conditions in which to work near sensitive aquatic environments.

9. Limit liming, fertilization, and the introduction of chemicals to subdivision lawns - this will help abate the amount of additional nutrients to the lake and stream environments. Nonphosphorous lawn fertilizers are currently available from various lawn care distribution centers.

Summary

Complete mitigation of all environmental impacts at this sensitive development location will be difficult to achieve if proper mitigation actions are not undertaken. Damage has already occurred on this parcel due to unauthorized stream crossings and vegetation removal. Any further development must be carefully scrutinized by town officials. Town officials and residents have a very critical decision to make. They must weigh the value of an irreplaceable aquatic resource such as Lake Hayward versus the need for lakeside residential development.

Bibliography

Frink, C.R. and W.A. Norvell. 1984. Chemical and Physical Properties of Connecticut Lakes. Conn. Agr. Exp. Sta. Bull. 817.

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. 70 pp.

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.

14. PLANNING AND TRAFFIC

From a planning perspective, there is major concern with this subdivision proposal regarding the traffic impacts on East Shore Drive in East Haddam. Three major intersections are proposed for East Shore Drive to carry traffic into and out of this subdivision. Clearly, as proposed, the subdivision traffic plan is predicated on an assumed, but as yet virtually non-existent, carrying capacity of East Shore Drive functioning as a residential collector street.

As of this writing (10/04/88), East Shore Drive has a paved area in some sections of 14 feet. In other sections, between lots 21 and 24, East Shore Drive has a gravel base. East Shore Drive is, therefore, not presently constructed to a standard sufficient to carry any but the most minimal amount of traffic. By comparison, the Guidelines for Subdivision Streets,published by the State of Connecticut Department of Transportation, recommends a pavement width of 30 feet for a residential collector street.

Traffic volumes on East Shore Drive will be exacerbated by residential zoning densities in Colchester which are double those permitted in East Haddam. In estimating this bi-modal traffic impact, a traffic distribution model was made. This model was based on the establishment of an imaginary north-south line dividing the subdivision. The line was located approximately 1800 feet to the west of West Road and running parallel to it. The traffic distribution model assumes that under normal conditions, residences located to the west of this line (toward Lake Hayward) will access/egress the subdivision via East Shore Drive, while those lots located to the east will access/egress via West Road. This imaginary line runs from Lot 59 on the north of the proposed subdivision midway through Lot 3 on the south. Accordingly, the model predicts that there are 50 residences which will tend to use East Shore Drive for access/egress on a regular basis. For purposes of definition, if a residence is considered to be the origin of a trip, then a trip itself is defined as a single event which uni-directionally links the origin (home) with a destination (e.g., store, school or work). A round-trip, from origin to destination and then back to origin, is therefore considered to be two trips. Since the standard used by the Institute of Traffic Engineers to estimate the average number of daily trips generated by a residence is IO/day, then according to this model, East Shore Drive can expect to see a total increase in traffic of 500 trips per day. This may represent as much as a 20 fold increase, or more, in the volume of traffic presently on East Shore Drive.

Given the structural inadequacy of East Shore Drive in its existing condition to accommodate two-way vehicular traffic and the uncertainty of its future with respect to the legal questions involved in the developer's claim of adverse possession of the unpaved section of road between lots 21 and 24, it is the Team Planner's view that at this time, the subdivision of property in the East Haddam section should be viewed independently from subdivision of land in Colchester. From this point of departure there is no inherent traffic generation

reason why some of the lots on the East Haddam side cannot be developed at the present allowable density. The conditional proviso is that access to East Shore Drive be either direct or limited to a short cul-de-sac leading directly to East Shore Drive.

Shifting emphasis to Colchester, the issue becomes focused on the development of a street network within the subdivision that; 1) minimizes the impact to environmentally sensitive areas, and 2) meets all of the road standards set forth in Section 6.3 of the Subdivision Regulations.

Given the extensive environmental limitations of this site and the severence of the through-access from West Road to East Shore Drive, it is the view of the Team Planner that the proposed road network will not meet the criteria set forth in the aforementioned section of Colchester's subdivision regulations. For this reason, the subdivision does not appear approvable as proposed. This leads to the conclusion that a sizable portion of the interior property may not be developable at the allowable densities in the foreseeable future. For this reason, it is recommended that the developer limit the size of the project to the areas comprised of lots 12-30 and 96-119.

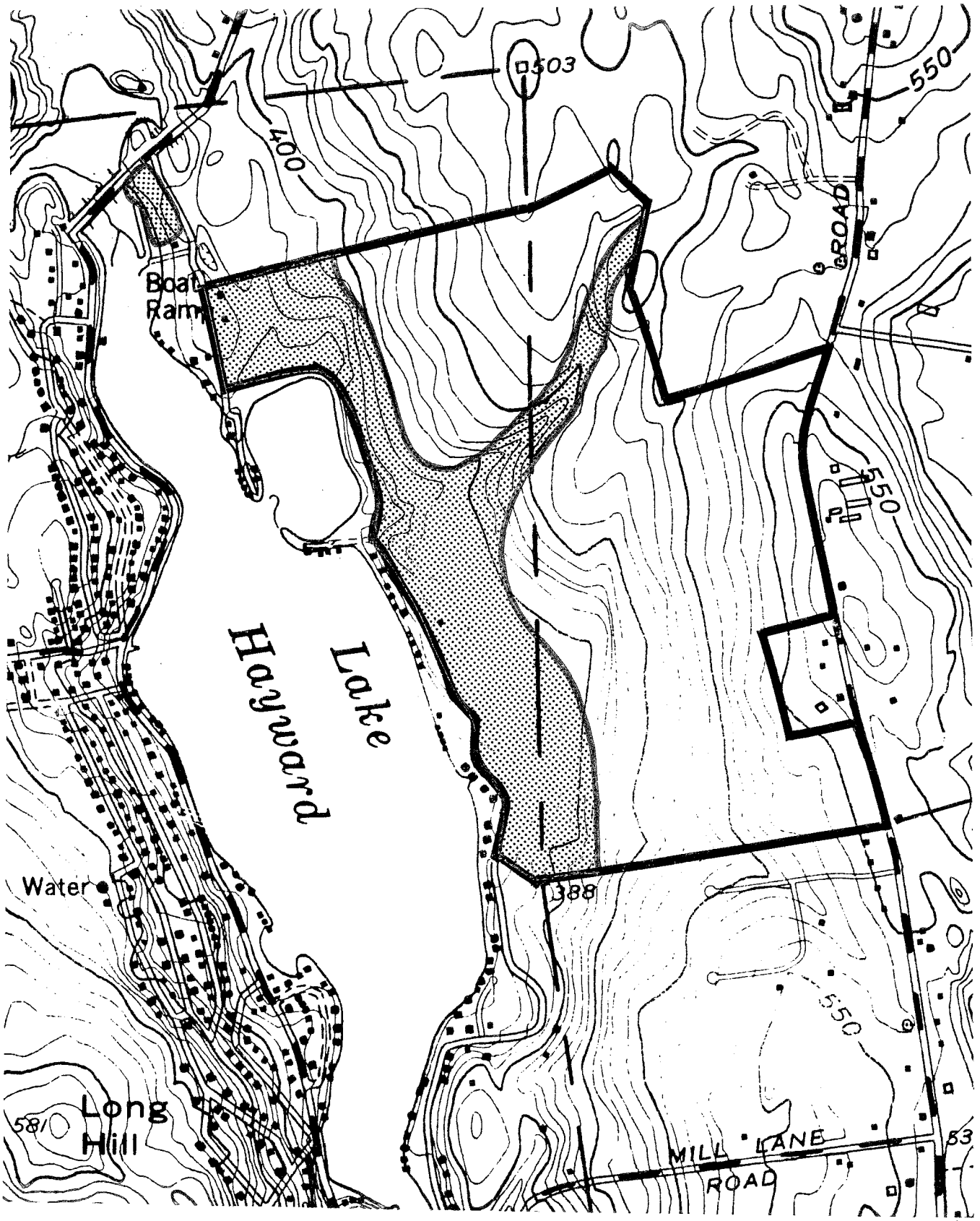
15. ARCHAEOLOGICAL REVIEW

A review of the State of Connecticut Archaeological Site Files and Maps indicates the presence of one prehistoric site immediately north of the project area near the existing boat ramp for Lake Hayward. No sites are listed for the project area itself. However, an old historic mill site has been recently located on the property.

Due to the damming of the brook system that created Lake Hayward, it is suggested that the location of prehistoric occupations in the project area would be situated in the flat topographic land immediately east of the lake. Historic cultural resources, like the mill ruins, might be expected in steeper inclines along the brook system.

It is recommended that a professional archaeological reconnaissance survey be conducted prior to development activity in order to locate and identify all prehistoric and historic resources which might exist in the project area. All archaeological studies should be undertaken in accordance with the Connecticut Historical Commission's Environmental Review Primer for Connecticut's Archaeological Resources.

In summary, the project area is sensitive to prehistoric archaeological sites along the eastern border of the lake where little sloping of the land occurs. The area is also sensitive to early industrial mill sites where water systems run through inclined slopes. It is recommended that all feasible efforts be undertaken to identify and ensure the preservation and conservation of the cultural resources in the project area.



AREAS OF POSSIBLE ARCHAEOLOGICAL SIGNIFICANCE

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 specialsits, 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.