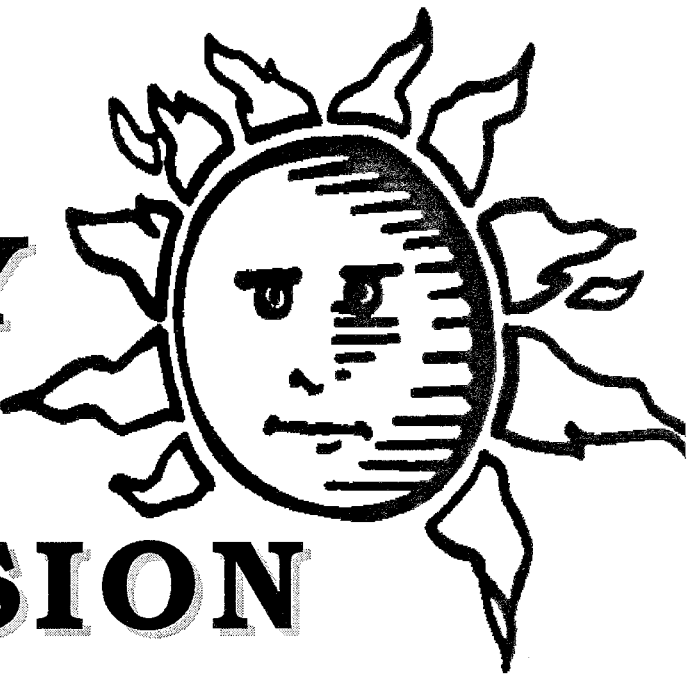
WALKLEY HEIGHTS SUBDIVISION

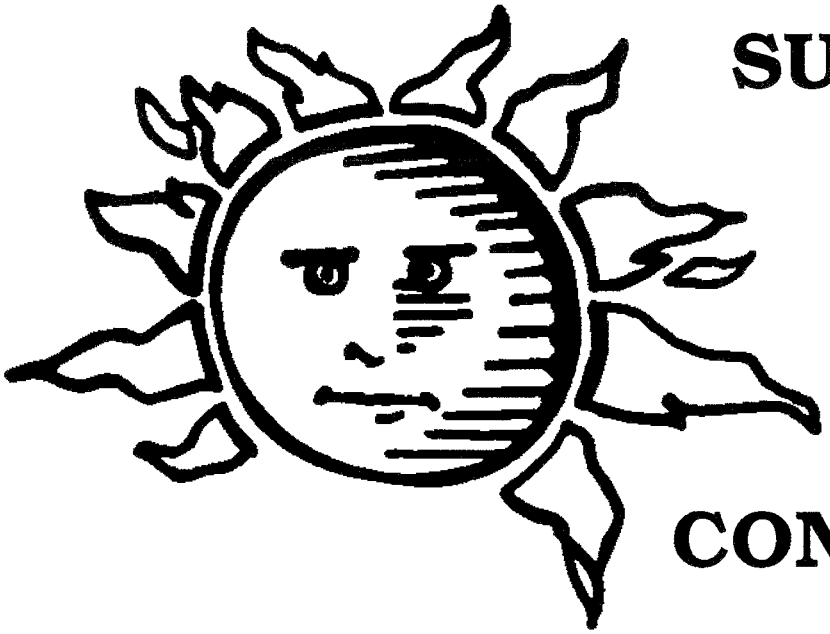


HADDAM, CONNECTICUT
MAY 1990

EASTERN CONNECTICUT ENVIRONMENTAL REVIEW TEAM REPORT

Eastern Connecticut
Resource Conservation and Development Area, Inc.

WALKLEY HEIGHTS SUBDIVISION



HADDAM CONNECTICUT

REVIEW DATE: APRIL 17, 1990
REPORT DATE: MAY 1990

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

WALKLEY HEIGHTS SUBDIVISION
HADDAM, CONNECTICUT

This report is an outgrowth of a request from Haddam Inland Wetlands and Watercourses Agency to the Middlesex 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, April 17, 1990. Team members participating on this review included:

Nick Bellantoni	***State Archaeologist*** ***CT Museum of Natural History***
Tom Gilligan	***Regional Planner*** ***Midstate Regional Planning Agency***
Steve Hill	***Wildlife Biologist*** ***DEP - Eastern District***
Brian Murphy	***Fisheries Biologist*** ***DEP - Eastern District***
Nancy Murray	***Senior Environmental Analyst*** ***DEP - NRC - Natural Diversity Data Base***
Rob Rocks	***Forester*** ***DEP - Cockaponsett Forest Headquarters***
Joyce Scheyer	***District Conservationist*** ***USDA - Soil Conservation Service***
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, and a soils map. During the field review the Team members were given full sets of plans and drainage and environmental studies. The Team met with, and were accompanied by the developer and his engineer and environmental consultant. Following the review, reports from each Team member were submitted to the ERT Coordinator for compilation and editing into this final report.

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

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

If you require additional information, please contact:

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

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1. LOCATION, LAND USE AND ZONING

The proposed subdivision site, about 184 acres in size, is located southeast of Higganum Center in north central Haddam. It abuts private, undeveloped land on the north, High Street on the west, private, undeveloped land and the Cockaponset State Forest on the south and Swain Johnson Trail, and private undeveloped land on the east. To the northeast, the site also has frontage on Walkley Hill Road.

Land-use in the vicinity of the site consists mainly of low to medium density homes. Higganum Center, which contains mixed land-uses, e.g. commercial, office space and industrial, is about 1/2 mile north/northwest of the site. Except for a ±2 acre open field which encompasses Lot 37 and which is presently being considered by the developer for elderly housing, the site is presently undeveloped and is forested. A review of a 1934 air photo of the site and vicinity indicates the site has not changed dramatically except that there was more open land (pasture) in the western parts. Land use changes in the area include an increase in residential, a decrease in agriculture, and an increase in forested land. In places, the new road, which extends from Swain Johnson Trail to High Street is aligned with an existing "woods" road.

The site is located in a R-2A zone which allows residential lots that are a minimum of 80,000 square feet (approximately 2 acres). Present plans indicate there are few lots (38, 39 and 42) that are less than 2 acres in size. The elderly housing units being considered for Lot 37 would not conform to the R-2A zone requirements and, as such, would require a special permit.

LOCATION MAP

Scale 1" = 2000'

Approximate Site

2. PROJECT DESCRIPTION

The applicant proposes 46 houses on lots that range from 1.32 acres to 14.9 acres in size, and about 9,000 feet (1.7 miles) of new road which will be built to town standards. Each lot would be served by individual on-site septic systems and wells. In addition to 46 lots proposed, there are 8 unapproved lots within the subdivision. It is understood that site improvements for on-site sewage disposal systems, such as the placement of fill material, are needed on these lots before they can be approved; hence, the lots are presently unsuitable for on-site sewage disposal. The "burden of proof" will be on the developer to demonstrate that the lots can adequately support an on-site septic system and that all improvements be completed before approval is granted. Lot 37, which is being considered for an elderly housing complex (20 - 1 and 2 bedroom units), would be served by an on-site community water supply and septic system.

According to the applicant, 35 acres or 19% of the site comprises regulated wetlands. Thirty-six acres or about 20% of the site will be dedicated as open space.

3. TOPOGRAPHY

Slopes on the site range from gentle to steep but most of the site consists of moderate slopes. The bedrock structure has strongly influenced the slope of the landforms and the drainage pattern on the parcel. Steepest slopes occur on Lots 21-22 and 3 in the southeast corner, on Lots 23-24 in the central parts and on Lots 44 and 45 in the southern parts. Gentle slopes occur on Lot 28-31 and on Lot 37. The remainder of the site is comprised of moderate slopes.

Maximum and minimum elevations on the site are approximately 400 feet above mean sea level and 150 feet above mean sea level respectively. The highest point is represented by the hill that encompasses Lot 7, 8 and 22. The lowest point on the site occurs near its border with High Street and Walkley Hill Road.

The proposed subdivision has been laid out so that new roads would avoid the steepest areas. One major exception is the segment of Granite Springs Road near proposed Lots 34, 35, 45 and 46 which will require a substantial earth/rock cut. A ±13 foot cut is anticipated for the area. The remainder of the new road appears to have been designed to cross slopes and conform to the topographic contours rather than crossing perpendicular to the hilly areas on the site.

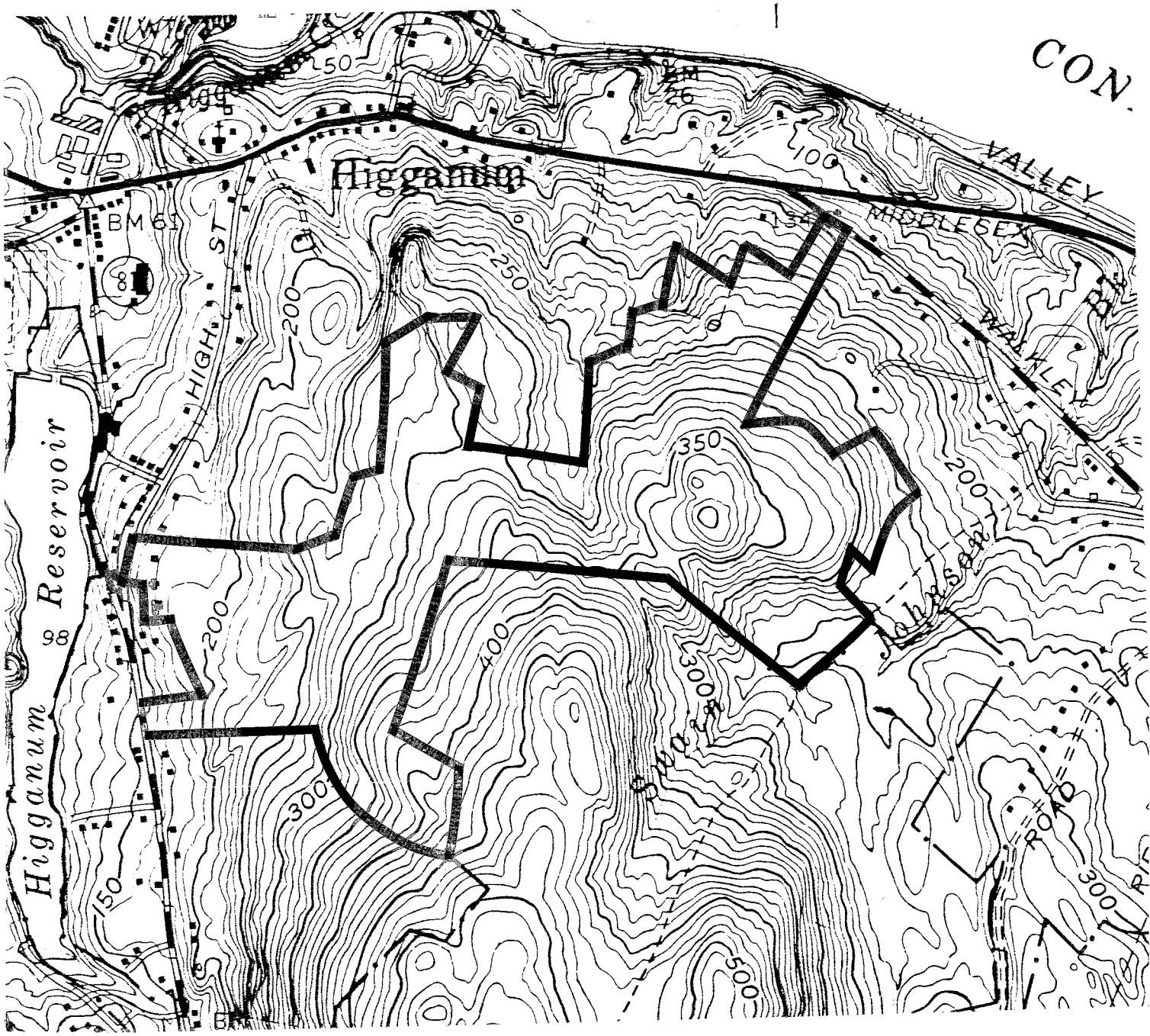
There is a good possibility that the ±13 foot earth/rock cut mentioned in the preceding paragraph will encounter resistant bedrock which requires blasting. All blasting should be performed by persons familiar with the latest technology in blasting and the necessary measures taken to reduce the

chance for seismic shock and airblast. Also special care should be taken to ensure that leaching fields are not located too close to "cut" embankments for roads and driveways. The concern here is that partially treated effluent may bleed out at the cut embankment causing a public health nuisance condition. A minimum 50 foot setback is recommended between the cut embankment and any part of the leaching system.

TOPOGRAPHIC MAP

Scale 1" = 1000'

Approximate Site Boundary



4. GEOLOGY

The site is located entirely in the Haddam topographic quadrangle. A surficial geologic map (QR-36, by R.F. Flint, 1978) and a bedrock geologic map (QR-37 by L. Lundgren, Jr., 1979) for the quadrangle have been published by the Connecticut Geological and Natural History Survey.

Bedrock is at or near ground surface mainly in the eastern parts where a ±125 foot wide band of diabase (traprock) bisects the site in a north-south direction. The remainder of the site is underlain by Monson Gneiss. Monson Gneiss is described as gray gneiss composed of the minerals quartz and plagioclase. It also includes dark, amphibolite layers. Diabase, an igneous rock (rocks formed from molten magma) is dark gray, and a weather resistant basalt (traprock). It intruded the Monson Gneiss as a molten material approximately 144-208 million years ago during the Jurassic geologic period. The diabase was quarried in the site's vicinity probably for aggregate and construction (road base) materials. These quarries are no longer active.

"Gneisses" and "amphibolites", which comprise Monson Gneiss are crystalline rocks that have been geologically altered by great heat and pressure within the earth's crust; hence they are metamorphic rocks. It is believed that the Monson Gneiss which has undergone deformation (metamorphism) three or more times during the period following its emplacement as a pluton (igneous rocks formed beneath the surface of the earth) or as volcanic parts (the amphibolite zones).

The term "gneiss" and "amphibolite" used above refers to the textural and structural aspects of the rocks. "Gneisses" are recognizable by alternating layers of light and dark minerals that give the rock a banded appearance. "Amphibolites" are generally dark colored rocks that contain a high percentage of the minerals plagioclase and amphibolite with little or no quartz. It is a massive to poorly layered rock.

Many homes in Haddam rely on the underlying bedrock as a source of drinking water. Each lot in the proposed subdivision is proposed to be served by individual on-site wells that tap the underlying Monson Gneiss. (Also see WATER SUPPLY section)

The unconsolidated material overlying bedrock on the site consists of a thin blanket (probably not much more than 10 feet) of glacial sediment called till. Till was deposited directly from an ice sheet onto the bedrock surface. Because the ice indiscriminately collected and transported rock particles and fragments of widely ranging size as it advanced through the region, the till is a non-sorted mixture of sand, silt, gravel, clay and boulders. The texture of the till on the site is variable, ranging from sandy and loose to silty and very compact. The sandy and loose variety of till occurs in areas characterized by the shallow to bedrock soils such as the HpE (Hollis-

Charlton) soils and CrE (Charlton-Hollis). Additionally, the soils identified by CaB and CaC (Canton and Charlton) tend to be derived from sandy and loose textured till but may, in places, become compact with depth. The silty and very compact variety of till generally coincides with the areas identified as Woodbridge (WyB) and Paxton (PdB, PdC) on the soils map. These generally occur at the site's western limits and in the east-central parts.

The compact nature of the till in these areas will be an important design constraint with respect to on-site sewage disposal. The compact till zone will restrict the movement of water from the surface into and through the ground. This results in a seasonally high water table which affects the ability of the soil to accept septic tank effluent. The shallow to bedrock soils on the site are also an important design constraint for on-site sewage disposal that warrants careful examination.

The potential for seasonally high ground water tables on the site underscores the need for building footing drains around house foundations. This will help keep basements dry and, depending on the location of the septic system, can be designed to protect the leaching field from the seasonal high water table.

According to the applicant, wetland soils on the site were identified in the field by a certified soil scientist. However, neither the name of the soil scientist nor a certification statement is shown on the plan. Additionally, since Commission members may field walk the site to inspect wetland impact areas i.e., wetland road crossings, stormwater discharges, etc. it would be desirable to include wetland boundary station numbers on the plan map that coordinates with the flagging in the field.

The soil scientist who performed the field work should review and sign a statement on the map(s) certifying that the information is substantially correct. The certification statement should be similar to:

> "The wetland soils on this site were identified in the field using the criteria required by Connecticut P.A. 72-155 as amended by Connecticut P.A. 73-571, Connecticut P.A. 87-338 and Connecticut P.A. 87-533. The boundaries of these soils and of identified watercourses are accurately represented on the plot plan."

The principal wetland soils occur on **(1)** Lot 2; **(2)** between Lots 18 and 25 in the central parts; **(3)** Lot 29 and 30; and **(4)** numerous lots in the western parts of the site. The latter wetlands are generally narrow and parallel streamcourses that for the most part route surface water to Higganum Reservoir or its outlet stream.

Based on the "Soil Survey of Middlesex County, Connecticut" the wetland soils on the site generally consist of Lg (Leicester, Ridgebury and Whitman extremely stony fine sandy loam soils. However, the latter has not been verified by the applicant's soil scientist.

This undifferentiated unit comprises very deep, loamy soils that formed in glacial till. The Ridgebury and Whitman soils develop in the compact glacial till while the Leicester soils develop in the more friable till. They range from poorly drained (Leicester and Ridgebury) to very poorly drained (Whitman). In general, the Leicester and Ridgebury soils are nearly level or gently sloping soils in drainageways and low-lying positions of till covered uplands. The Whitman soils occur on nearly level to gently sloping depressions and drainageways on till covered uplands. From an engineering standpoint, the major concern of these soils focuses on a seasonally high water table (wetness). A high water table condition is at or near ground surface in the Leicester and Ridgebury soils generally between November and May. In the Whitman soils, a high water table condition, at or above ground surface occurs September through June.

Based on present plans, wetland impacts include 3 wetland road crossings at relatively narrow points and the construction of a stormwater detention basin in the wetlands on Lot 14. It is not known if the man-made pond in the western parts will be utilized for detention/retention purposes. Because of its location, it may be utilized for fire protection purposes, but improvements, such as deepening will probably be required. Also, a close look at the condition of the dam is warranted.

Although undesirable, wetland crossings are feasible, provided they are properly engineered. Wetland crossings should be constructed adequately above the surface elevation of the wetlands. This will allow for better drainage of the road and decrease the frost heaving potential. Road construction through wetlands should be done during the dry time of year and should include provisions for effective erosion and sediment control. Any unstable, organic or mucky material should be removed and replaced with a permeable road base material. Culverts should be properly sized and located to avoid altering the water levels in the wetland or causing flooding problems.

The principal wetland road crossing occurs east of the small man-made pond in the western parts. If this crossing is permitted, it is suggested that a box culvert be utilized rather than pipe. This will help to reduce potential adverse impacts to the streambed and maintain the streamcourse corridor for amphibious animals.

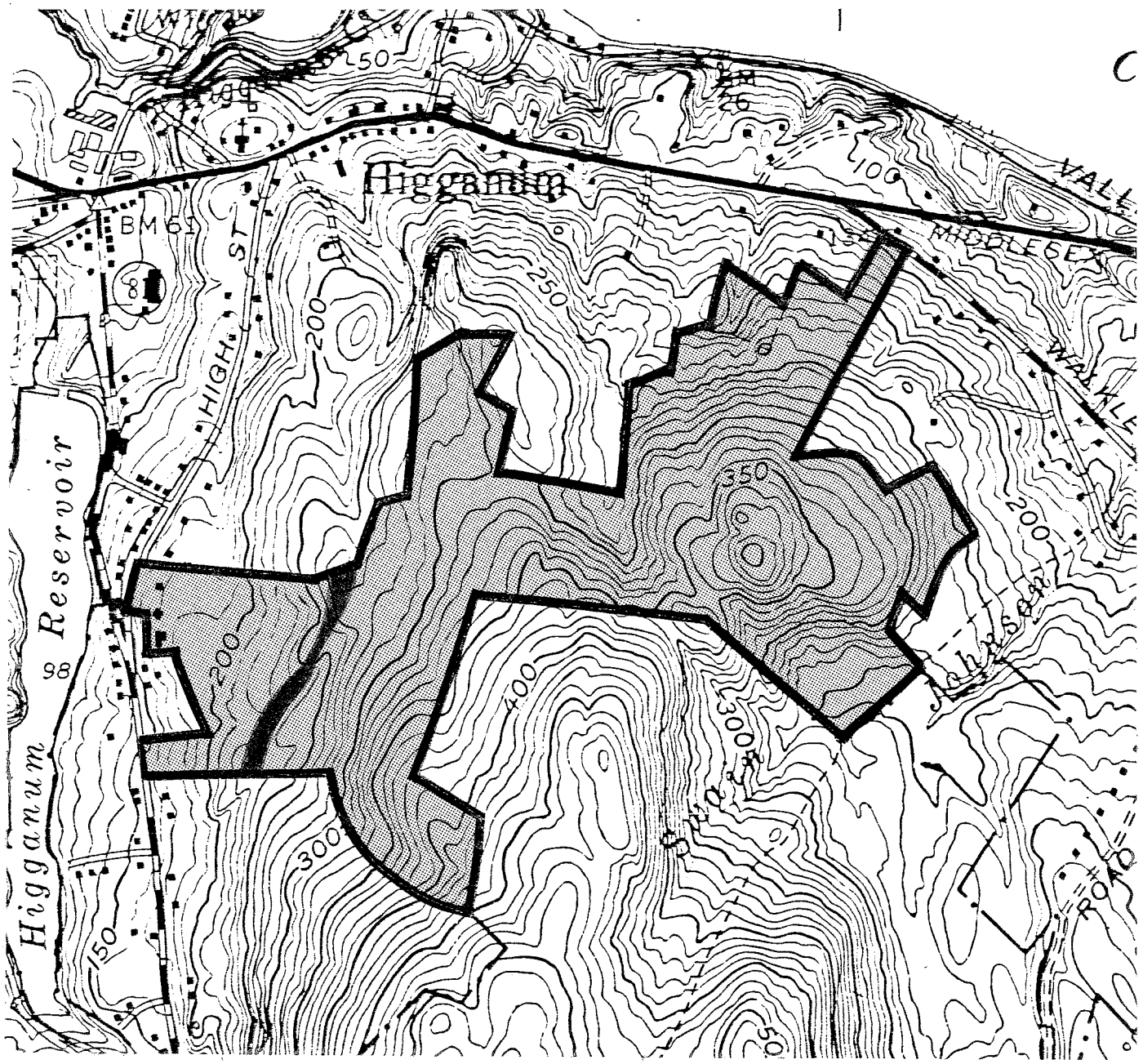
In order to minimize potential adverse environmental impacts to wetlands/streamcourses the stormwater management plan should locate detention structures outside of watercourses and their respective wetlands on the site. Locating these structures outside of regulated areas will help minimize potential negative impacts to wetlands and watercourses.

BEDROCK GEOLOGY MAP

Scale 1" = 1000'

Diabase - known as the Higganum Dike

Monson Gneiss

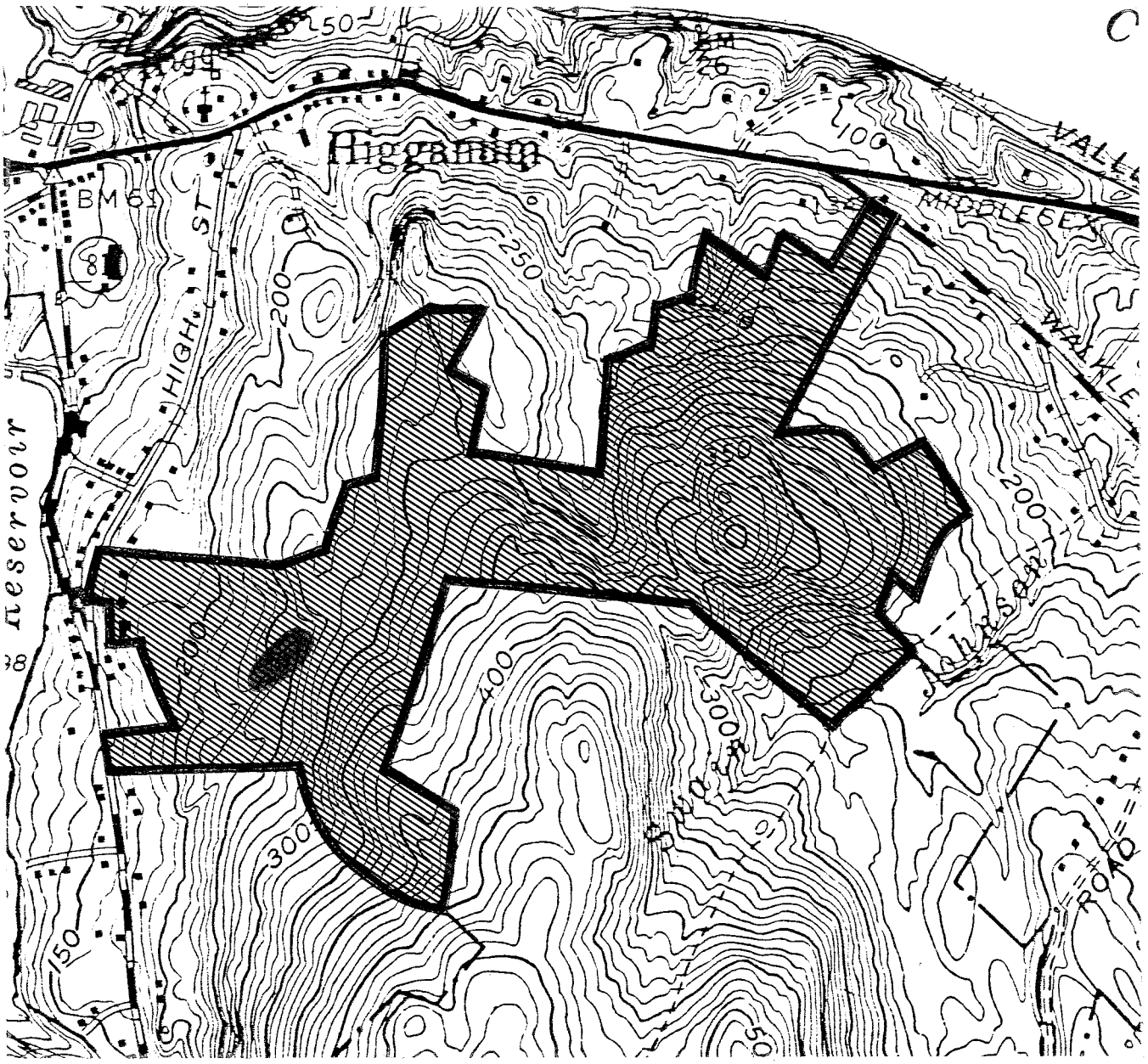


SURFICIAL GEOLOGIC MAP

Scale 1" = 1000'

Till

Shallow to Bedrock Areas



5. HYDROLOGY

The entire site lies within the Connecticut River watershed.

Surface runoff on the site can be divided into 5 subwatershed areas. Approximately 25 acres in the southeast corner drains to Swain Johnson Brook, a Connecticut River tributary. Swain Johnson Brook flows through the southern part of Lot 2. Surface runoff in the northeast corner and east central parts of the site, which comprise 77 acres is routed to narrow drainageways that directly transports the water under Route 9 and ultimately to the Connecticut River. About 14 acres in the central parts drains northerly to an unnamed Higganum Creek tributary. Higganum Creek flows into the Connecticut River. The west central parts of the site, which consists of about 20 acres, drains via a drainageway to the outlet stream for Higganum Reservoir. Finally, the western limits of the site about 50 acres drains directly to Higganum Reservoir via seasonal drainageways or by the outlet stream for the man-made pond on Lot 41.

Surface waterbodies on the site have not been classified by the DEP. Nevertheless, all are considered to be Class "A" water resources, by default, which means they maybe suitable for drinking, recreational or other uses. Additionally, these surface waters may be subject to absolute restrictions on the discharge of pollutants, although certain discharges may be allowed.

Subdivision of the property as planned will increase runoff from the site. In order to thoroughly assess the impacts of post-development runoff, the applicant should prepare a stormwater management plan. This information was not available. The plan should include all pre- and post-development runoff calculations as required by Town regulations. The Connecticut Guidelines for Soil Erosion and Sediment Control should be used as a guide.

Once this work has been completed, Town officials should evaluate the effects of post-development runoff on flooding and streambank erosion/surface water degradation. Every effort should be made to protect Higganum Reservoir and the other surface water bodies on and off the site. A narrative report, which states the initial conditions and storm frequencies to be analyzed, should accompany the stormwater management plan. A summary table showing the pre-development post-development and design system peak discharges for all design frequencies should also be included. An examination of existing and proposed downstream culverts is warranted for each subwatershed area. Also, if detention basins are required to avoid net increases in peak flows discharging from the site, this information should also be included in the stormwater management plan. As discussed earlier, in-stream basins are not recommended since they may cause temperature increases in streams, which negatively impacts aquatic life.

To be effective over the design life, the detention basin(s) must be properly maintained. A plan of operation and maintenance should be prepared for use by the owner or others responsible for the system to ensure that each

component functions properly. This plan should provide requirements for inspection, operation and maintenance of individual components, including outlets. It should be prepared before the system is installed and should specify maintenance responsibility. Adequate rights-of-way must be provided for maintenance access. The minimum recommended width for an access right-of-way is 10 feet, and the maximum recommended slope is 15%. A minimum 25 foot maintenance right-of-way is recommended around the perimeter of stormwater detention basins. The maintenance access should not be in wetland soils to prevent wetland disturbance and the difficulty of working in wet soil conditions.

Due to the site topography, necessary grading for the new roads, driveways and foundations and the presence of some till soils that may have a high silt and fine sand content, measures should be taken to minimize the potential adverse environmental impacts to wetlands and/or surface water as a result of erosion and sedimentation. This can be accomplished by producing a comprehensive E&S control plan to be enforced by the Town.

During the construction period, control measures, including silt fences, haybales, temporary/permanent sediment basins which permit settling time for suspended solids, anti-tracking devices and minimizing land disturbance, should be used to minimize the potential for environmental damage to wetlands and surface waters on- and off-site.

The physical condition of the dam impounding the man-made pond in the western parts is unknown. The DEP Bureau of Water Management Flood Control (Dams) sections should be contacted to determine if the dam is registered and if any information exists regarding its physical condition, especially if it is to be used for stormwater management purposes. The potential impacts to downstream areas, including the proposed subdivision, that would be inundated by a dam break, should be determined.

WATERSHED BOUNDARY MAP

Scale 1" = 1000'

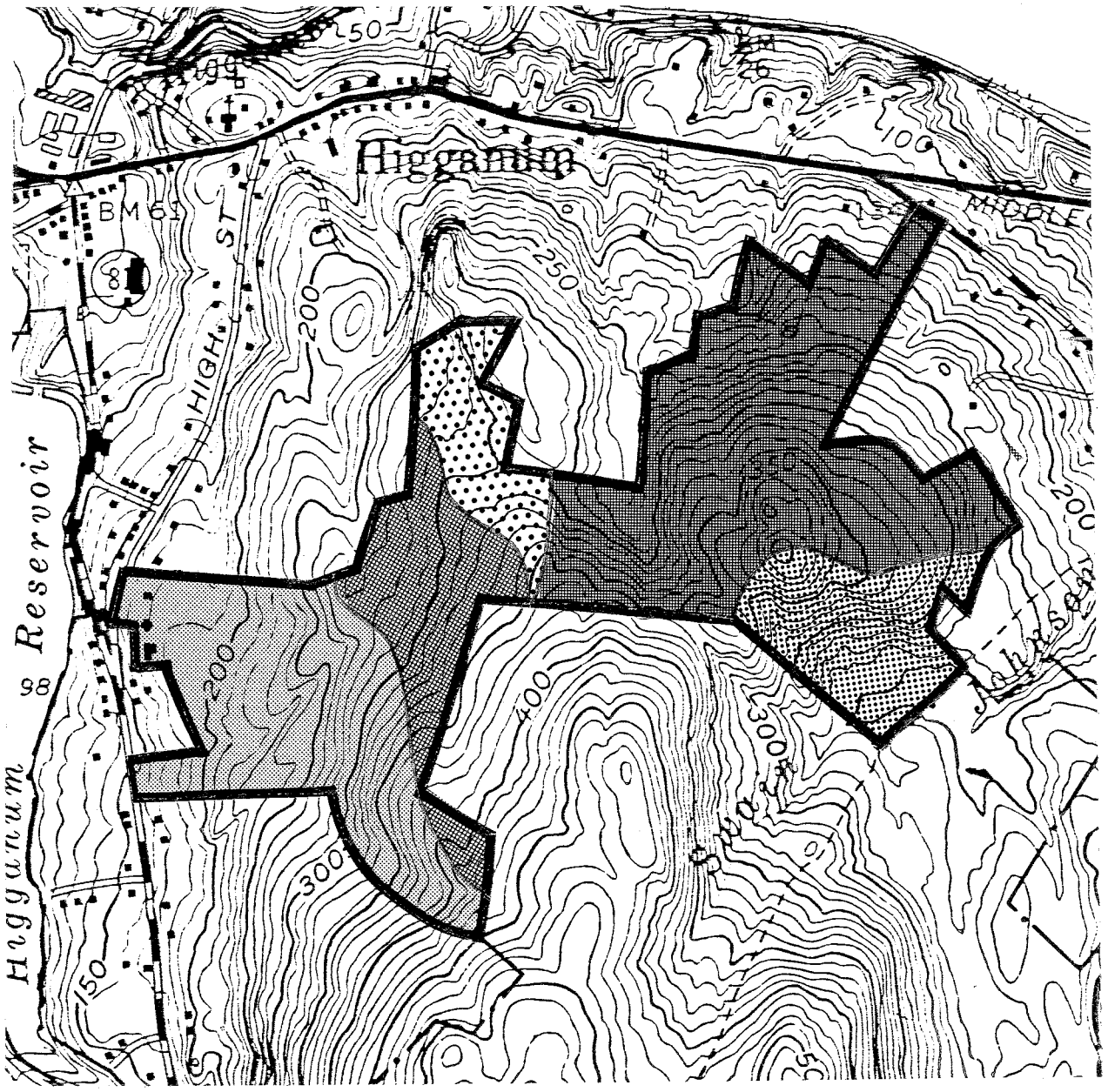
Portion of site that drains to Swain Johnson Brook.

Portion of site that drains to the Connecticut River via drainageways/topographic swales.

Portion of site that drains to Higganum Creek.

Portion of site that drains to the outlet stream for Higganum Reservoir.

Portion of site that drains directly to Higganum Reservoir.



6. SOIL RESOURCES

Soil Resource on the Site

Map Unit	Description
LG	Leicester, Ridgebury, and Whitman extremely stony fine sandy loam, nearly level. Regulated inland wetland soil in the state of Connecticut and by SCS guidelines.
CcC	Canton and Charlton fine sandy loams, 3-8% percent slopes.
CrC	Charlton-Hollis very fine sandy loams, 3-8 percent slopes.
PdB	Paxton and Montauk very stony fine sandy loam, 3-8% percent slopes.
WyB	Woodbridge very stony fine sandy loam, 3-8 percent slopes.

The Potential for Building Site Development on this parcel is moderate to severe (according to ratings in the Soil Survey). The major limitations are slope and large stones. In addition, the "Paxton and Montauk" and the "Woodbridge" series are limited by wetness and potential frost action. The "Leicester, et al" complex exhibits all of the limitations listed above except for slope. On-site septic systems throughout the proposed subdivision need careful design and installation to prevent effluent from seeping to the surface.

The soils as described on page 340-4 of the report by FGA Services Inc. appear to be taken from the General Soil Map at a scale of 1:190,080 in the Soil Survey. Using the numbered soil map sheets to identify the site specifically at a scale of 1:15,840 or 4 inches to the mile would be more appropriate.

The slow permeability in the substratum of "Paxton and Montauk" and in "Woodbridge" soils may result in slumping of steep slopes of excavations when they are saturated with water. Lawns are often wet and soft in autumn and spring, with wet spots typical near the base of excavated slopes.

Forest management on the site is recommended as a tool for preventing excess soil erosion. Removal of excessive amounts of trees can reduce water uptake from the soil so that drainage problems on individual lots may become evident. Soil and water resources on and near the site should be protected with practices such as those outlined in the CT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL.

Wetland Considerations

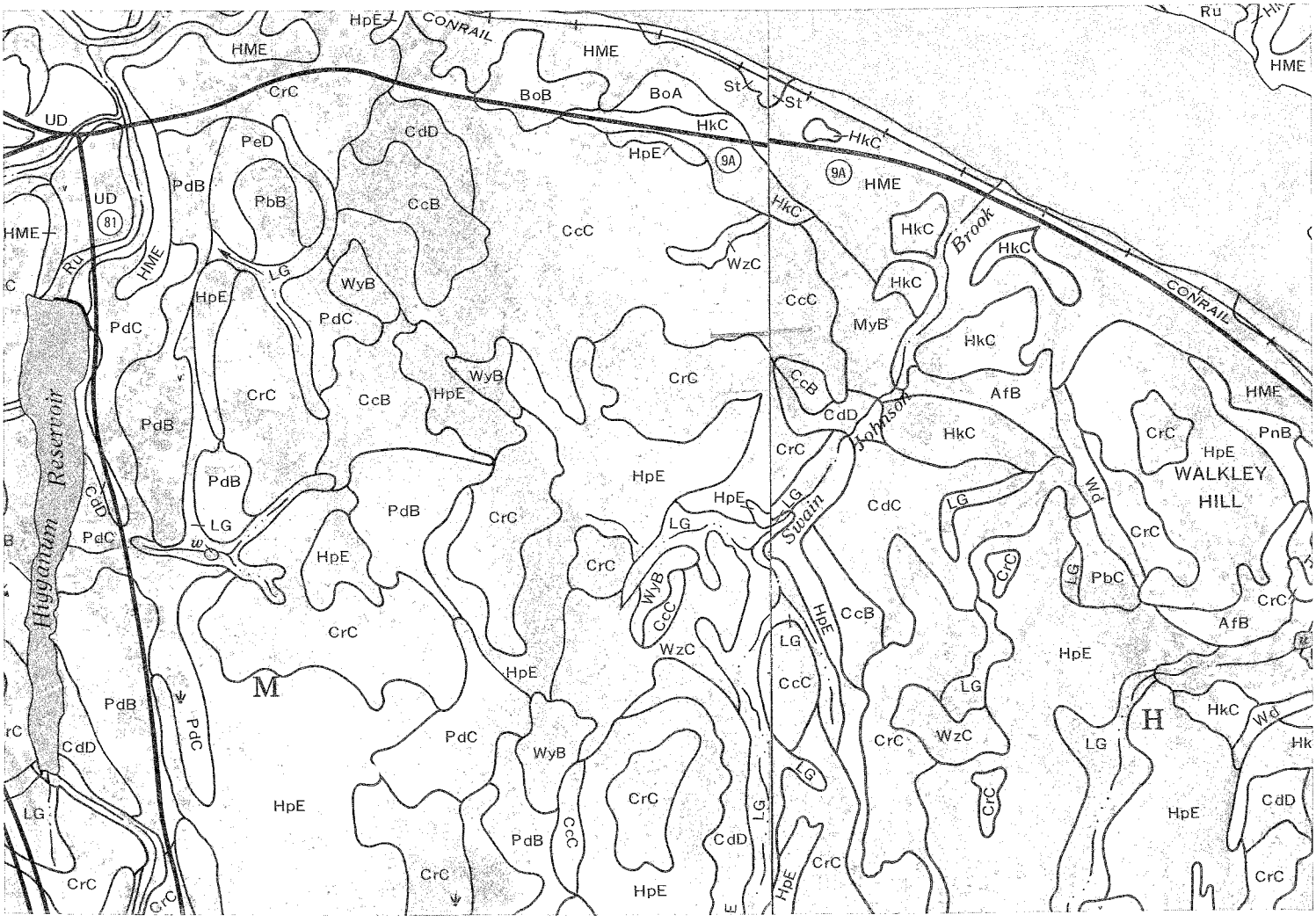
Each of the wetland systems identified on the site plan includes areas of land designated "not an approved lot". These areas of uncertain future land use currently provide buffer areas near headwaters or between lots planned for development and adjacent to the designated outlets for storm drainage.

Further consideration should be given to protecting these areas if they are to be included in the overall subdivision plan because development for house lots could have a significant environmental impact in these areas.

Detention basins are preferable to direct outlets of storm drainage into wetlands, no matter how small the expected increase in runoff. Sediment basins should be used where runoff during construction is expected to exceed normal operation and maintenance for silt fence or hay bales. Flooding of natural wetland areas with the existing maximum discharge of storm water, but for a longer period of time, can result in damage to wildlife nesting areas and vegetation.

SOILS MAP

Scale 1" = 1320'



7. WATER SUPPLY

The water supply for the proposed subdivision will consist of drilled wells that tap the underlying crystalline metamorphic rock. Based on the present well locations proposed for the subdivision it does not appear that the diabase rock will be penetrated by bedrock wells. Even if well or wells tapped the diabase, there probably would not be any significant differences in water quality or quantity from the Monson Gneiss. Each building lot will be served by an individual well that is cased with steel pipe firmly into solid rock and completed as open boreholes in the metamorphic bedrock.

Typical well depth is expected to range between 150 feet and 300 feet. The local gneiss and amphibolite is not a prolific aquifer, but a review of domestic water supplies in the vicinity of the site indicate that some higher than normal yields have been obtained from the local bedrock. According to the well drilling reports, all of the well completion reports reviewed indicate that the wells tap a granite rock, which is presumed to be Monson Gneiss and which underlies the site and vicinity. Well completion reports for bedrock wells serving 8 homes located on Clark Road, High Street and Swain Johnson Road near the site were reviewed. According to map QR-37, dwellings located on these roads are underlain by Monson Gneiss. **Table 1** shows the yield and well depth of the wells surveyed. The wells were drilled between 1970 and the present. Wells ranged in depth from 93 feet to 178 feet. Well yields were reported to range from 2 gallons per minute to 20 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 extensive geological testing, of predicting the yield of a well without drilling. 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. The orientation of the septic system relative to the well and groundwater flow is a very important consideration. Special attention should focus on Lot 42 whose well is proposed downgradient from the septic system.

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. Well locations and their respective 75 foot sanitary radius (this radius assumes the pump capacity of the well is under 10 gallons per minute) are shown on all lots.

Because lot sizes are relatively large (2 acres or more) and because a very high percentage of the renovated domestic wastewater is expected to percolate downward to recharge the underlying bedrock via on-site sewage disposal systems, emphasizing the need for careful design, installation and maintenance of sewage disposal systems, the annual groundwater usage for the site should not exceed annual groundwater recharge. If the underlying bedrock is fractured and capable of transmitting water to drilled wells, the bedrock aquifer should adequately meet the water demands of the proposed subdivision. Additionally, 2 acre lots should allow for separating distances of at least 160 feet between neighboring wells. This will help to minimize the chance for mutual interference between pumping wells.

Table 1

Summary of Domestic Water Supply Wells
Drilled on Clark Road, High Street,
Swain Johnson Trail,
Haddam, Connecticut
(Note: All wells reportedly tap the underlying bedrock)

Well	Total Depth of Well (ft)	Well Yield (gpm)
Swain Johnson Trail		
1	225	8
Clark Road		
2	178	3
3	93	20
4	130	4
5	96	8
6	116	10
High Street		
7	163	15
8	140	20

The natural quality of groundwater in the bedrock should be good, except those wells that are completed in an amphibolite zone. The amphibolite zones may contain elevated concentrations of iron and manganese which lower the overall water quality and in some cases may require treatment.

The federally recommended limits of iron and manganese in drinking water are 0.3 ppm and 0.05 ppm, respectively. Higher levels may stain laundry, utensils and plumbing fixtures and impart a metallic taste to the water. The

limits of iron and manganese are based largely on aesthetic and taste considerations.

Groundwater beneath the western half of the site is classified by the Department of Environmental Protection as "GA" which means it is suitable for private drinking water supplies without treatment. It should be noted that a few wells northwest of the site (mainly between the northern end of High Street and Route 81) have been contaminated by dry cleaning and/or cleaning solvents.

If an elderly housing development was created on Lot 37 as indicated by the applicant, a community well water supply would be needed. Although there were no details for this development on the review day, if one assumes that each individual in the complex would require 75 gallons of water per day, a well yielding 3 gallons per minute could serve the needs of 43 persons. (The latter is based on an 18-hour pumping rate.) A well yielding 10 gallons per minute would be capable of serving 144 persons. Storage facilities (tanks, etc.) would be needed to assure that sufficient quantities and pressure of water would be available during peak demand periods.

Under this type of arrangement (community water supply system), the applicant must obtain a "Certificate of Public Convenience and Necessity" from the Department of Public Utility Control (DPUC) and Department of Health Services (DOHS). The applicant should contact Richard Albani, DPUC, at 827-1553 regarding this matter. The well or wells for the subdivision will be classified as a public water supply and will require approval for well locations by the DOHS, Public Water Supply Section in conjunction with the local health department. If elderly housing is considered, the DOHS should be contacted as soon as possible regarding the proposal. Water quality, yield and plans for pumpage, storage and distribution must be reviewed and approved by DOHS, Public Water Supply Section. Consideration will need to be given in advance to provide for proper operation and maintenance of the community water supply system (i.e., takeover by a private or municipal water supply company). Maintaining the pumping capacity of the well under 10 gallons per minute will require a 75 foot sanitary radius around the well. Pumping rates greater than 10 gallons per minute will require a sanitary radius of 150 feet or more. This may interfere with septic system locations on neighboring lots.

8. SEWAGE DISPOSAL

Houses in the proposed residential subdivision are to depend upon the satisfactory installation of on-site septic systems. In order to determine the feasibility for on-site sewage disposal for each lot, extensive subsurface exploration was conducted throughout the parcel by the applicant's technical staff. This work included numerous deep test holes and percolation tests. Additionally, an attempt was made on each lot to identify at least a 100 foot square leaching area.

Based on the results of the deep test hole and percolation tests as well as review of soil mapping data and visual observations, on-site sewage disposal feasibility varies throughout the site. Present plans indicate that 8 lots identified as "other lands of Walkley Heights Association", in their present condition are unsuitable for on-site sewage disposal. Further testing and possibly site improvements such as curtain drains or proper fill material are needed before these lots can be considered for on-site sewage disposal. The "burden of proof" will be on the developer to demonstrate that a satisfactory on-site sewage disposal system can be installed on each lot and meet all applicable local and state regulations.

Of the 46 lots proposed, 19 can accommodate a conventional septic system (non-engineered). The remaining 27 lots were deemed "areas of special concern" i.e., restricted mainly due to seasonal high ground water levels and shallow depths to bedrock. As such, these lots will require detailed plans prepared by a registered professional engineer.

In general, a minimum of four feet of original soil should be maintained between the bottom of a leaching system and bedrock. Likewise, at least eighteen inches is to be maintained above the maximum ground water level. In keeping with the location of the sewage system, consideration of excessive slopes and the proximity of watercourses would also be paramount.

As mentioned earlier, further testing is likely on the 8 "unapproved" lots and may be required on the other lots if leaching system areas relocated. Additionally, it may be required on lots, where shallow to bedrock soils occur.

If thorough testing of any proposed lot fails to identify a satisfactory leaching area and unsuitable conditions as identified in Section 19-13-B103e(a)(3) exist, the lot or lots should be combined with adjacent properties or otherwise removed.

Considering the quantity of sewage (300 to 500 gallons) applied by a single-family residence to lots of about 2 acres or more, one would not anticipate water quality problems providing the septic systems are properly designed, installed and maintained. The proposed density of this development allows

for adequate dilution of nitrates and proper construction of individual subsurface sewage disposal systems should provide sufficient treatment for bacteria and viruses.

It appears that Lots 5, 24, 25, 27 and 46 have septic systems located at elevations which will necessitate a pump. It is recommended that systems which require a pump be noted on the subdivision map.

The sewage disposal system or systems serving the potential elderly housing development on Lot 37 may qualify as a community "public" subsurface sewage disposal system, and the DEP Land Disposal Section of the Water Compliance Unit would need to issue a permit for the system(s). Through detailed testing, the applicant must demonstrate to the DEP that the site's soils can adequately treat and disperse sewage effluent at the proposed volumes without adversely impacting surface and groundwater in the area. Therefore, the hydraulic capacity of the soil on the lot will need to be determined for the various disposal sites. This information, taking into account certain parameters, will be used in making an evaluation of the site's capabilities for handling the design flows of the project. If this arrangement is being seriously considered, the Land Disposal Section should be contacted (566-2154) regarding the on-site testing program.

9. THE NATURAL DIVERSITY DATA BASE

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

The records do, however, indicate that **Lachnanthes caroliana, Redroot**, was collected from the general area in 1947. This plant grows in open bogs. boggy meadows, swamps, sandy shores of ponds and cranberry bogs.

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

10. VEGETATION

The 184 acre tract which is proposed for subdivision Walkley Heights may be divided into seven distinct vegetation areas. These include three mixed hardwood stands, several hardwood swamp areas, an old field area, an open field area and a softwood plantation (see vegetation map). The acreages of these areas were obtained from aerial photographs and should only be used as estimates.

STAND 1: This mixed hardwood stand totals approximately 112 acres and is fully stocked with sawtimber (trees 11.1" in diameter at breast height (d.b.h.) and larger) and poles (trees 6.1" to 11" d.b.h.). Red oak is the dominant overstory tree species except on the shallow to bedrock knolls where black oak and scarlet oak are dominant. Black oak, sugar maple, red maple, white oak, hickory, black birch and American beech are present throughout, while tulip tree, yellow birch and white ash are only present in the valleys or near wetlands. Hemlock in all size classes occur in specific areas throughout this stand (please see the vegetation map). In some sections of this stand mountain laurel is extremely dense and precludes all other understory vegetation. Where mountain laurel is not dense hardwood tree seedlings, maple leaved viburnum, witch-hazel, hazelnut along with huckleberry and lowbush blueberry on the drier sites are present. Ground cover vegetation includes Canada May flower, club mosses, green briar, poison ivy, Christmas fern and hay scented fern.

Most of the overstory trees especially the red oak appear healthy. Some of the other species show early signs of the stress. The lower slopes and areas adjacent to drainages provide an excellent growing site for hardwoods while the drier knolls provide a poor to average growing site for hardwoods.

STAND 2: Hardwood swamps and stream belt areas make up approximately 35 acres of this tract. These wetland areas are quite variable. Red maple is usually the dominant tree species present, however in some areas hemlock dominate. Yellow birch, white ash and black gum make up a minor component of these areas. Understory vegetation includes highbush blueberry, spice bush, mountain laurel, sweet pepperbush and witch hazel. Herbaceous vegetation is made up of skunk cabbage, false hellebore, marsh marigold, wild geranium, solomans seal, trilium, Jack-in-the-pulpit, violets, wild sasparilla, Canada May flower, club moss, sphagnum moss, cinnamon fern, evergreen wood fern, Christmas fern, sensitive fern, hay scented fern and tussock sedge.

STAND 3: This area totals approximately 25 acres and was harvested of most of it's merchantable trees many years ago. Included were 6 acres of wetlands. At present, the area is dominated by a dense stand of sapling size (trees 1.1" to 6.0" d.b.h.) red maple, black oak, white oak, yellow birch, black birch, hemlock, hickory, American beech and white ash, many of which are in clumps from sprout origin. Occasional sawtimber size black oak, hickory, red maple and American beech were left uncut from the last harvest. Many of these trees are damaged and unhealthy. Patches of mountain laurel, witch hazel, green briar and brambles occur throughout.

STAND 4: ±8 acres of old field are present within this tract. Much of this area was planted with white pine several years ago. These pine are growing well, however seedling to sapling size hardwoods including red maple, black cherry, gray birch, aspen, black oak and flowering dogwood are encroaching. The shrubs species which are present include hazelnut, alder, barberry, sweet fern and bayberry. Grasses, goldenrod, poison ivy, Virginia creeper, dewberry, cinquefoil, meadow sweet, Asiatic day flower, buttercup, selfheal and daisy are also present.

STAND 5: This open field totals approximately 5 acres and is vegetated by grasses along with many of the weed and wildflower species which are present in the old field area.

STAND 6: This ±4 acre mixed hardwood stand is fully stocked with sapling to pole size trees. Included are black oak, scarlet oak, white oak, hickory, black cherry and occasional sugar maple. Maple leaved viburnum, huckleberry, poison ivy and green briar form the understory vegetation. Pennsylvania sedge and club moss are present as ground cover.

STAND 7: A softwood plantation which totals less than one acre is present within this tract. It is made up of pole size Norway spruce, white spruce and red pine. These trees appear to be healthy and growing well. The red pine which is susceptible to red pine scale will probably not survive. Its absence will allow room for the spruce to grow.

Limiting Conditions and Potential Hazards

At this time hemlock are scattered throughout approximately 30% of the property. All of the trees which were sampled regardless of size or location were moderately to heavily infested with the Hemlock Woolly Adelgid. This scale-like insect which is relatively new to the area, may cause mortality in hemlock within several years, however the evidence which points toward mortality is not conclusive. The adelgid does however create needle loss in varying degrees which at the very least stresses the trees. Stressed trees are much more susceptible to secondary insect and disease organisms which also may cause mortality. Control of the Hemlock Woolly Adelgid has been successful using a wide variety of insecticides. Relatively non-toxic insecticides such as insecticidal soap which suffocates the insect have proven very effective on individual trees where complete soaking is feasible. Stands of larger trees will be almost impossible to treat in this manner effectively.

Potential hazards throughout the property 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 problems that are expensive to rectify once utility lines, roads, and homes are in place.

The creation of openings in the forest (from building roadways and 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 considerable 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 privacy between houselots, it is usually desirable to block visual penetration with a vegetative screen for privacy. Mountain laurel will provide a good visual screen in most 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) and by requiring 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.

Management Considerations

The maintenance and development of healthy vigorous trees and forests should be a major concern in the development and management of this 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 and a long lived species such as red oak and sugar maple. These trees may be left in groups or "islands" to reduce the impact of soil disturbance and mechanical injury. Both individual trees and "islands" can be designated for retention with flagging prior to construction by a professional forester so they will be avoided. No excavation, driving equipment or filling should occur within 20-50 feet (depending on tree diameter - the larger the tree the further away disturbance should occur) of single trees or groups of trees. A general rule to follow is no equipment or excavation within two times the radial spread distance of the crown. Finally, trees left on site around houses should be away from the house at least for a distance equal to the height of the tree. The negative effects of construction on trees is not usually visible at the time the work is done. However, soil compaction, root injury, and scraped bark contribute to insects and disease infesting the tree after machinery has left the site. This creates hazards and problems for home owners as trees die several years after construction. These problems can be minimized or eliminated with proper care taken with vegetation during development.

When making road and grade cuts, trees should be removed back from the cut for at least a distance of two feet for each one foot of depth of cut, e.g. 20 feet back for a 10 foot cut. If it is possible, roads and driveways should be relocated slightly to protect healthy, highly aesthetic trees.

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 pre-development sawtimber thinning that removes approximately one quarter to one third of the least healthy trees in **STAND 1** (approximately 100 acres) would give the residual trees adequate growing space, while removing potential hazard trees. Roads, driveways and house lots could be cleared in conjunction with this thinning to save costs and get the best utilization of the trees which are to be removed. The large, healthy red oak trees which are present throughout the property should be retained as "standards". These trees are long lived and are extremely valuable to the integrity of the tract.

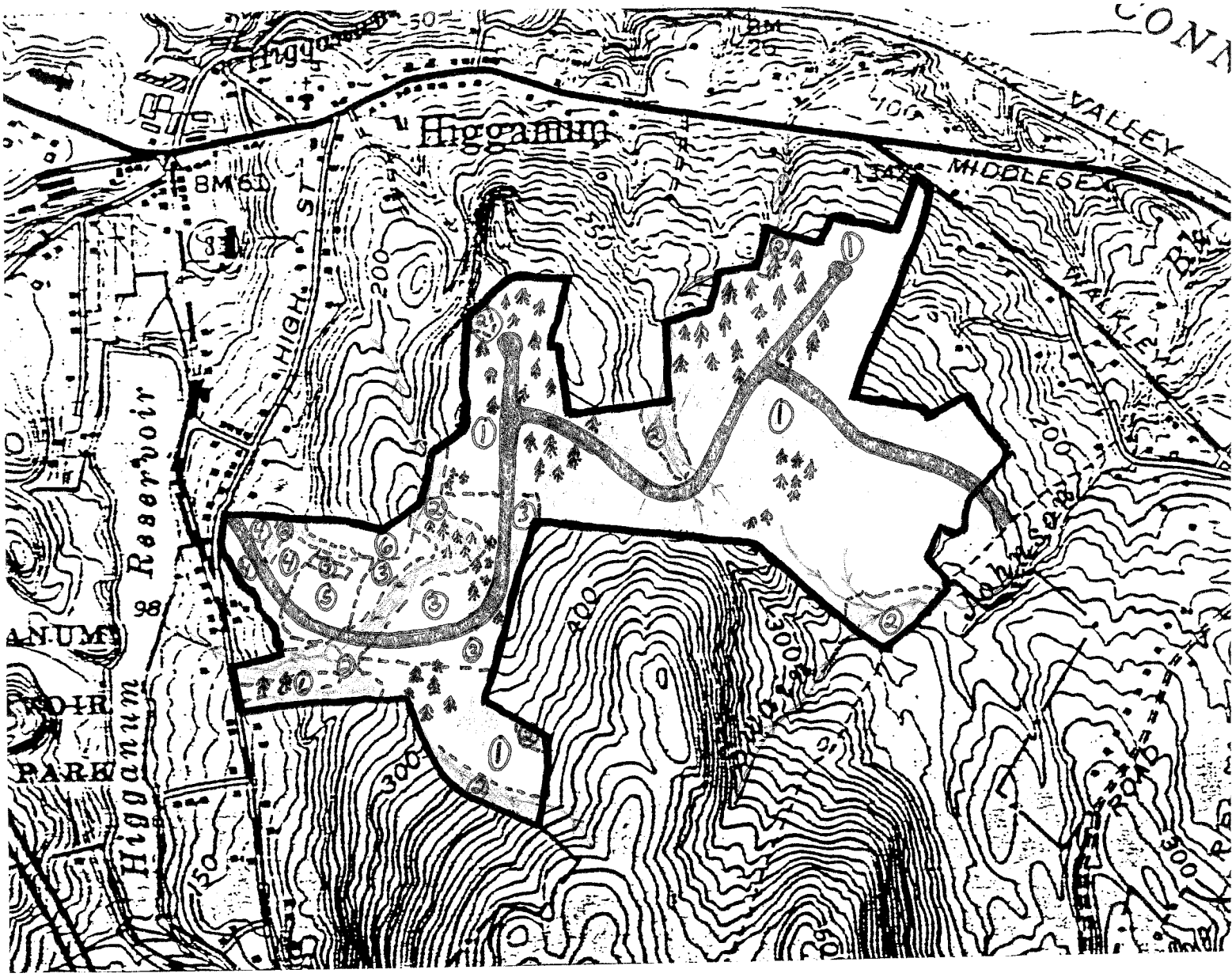
An experienced professional forester will be essential during the implementation of proper forest management and development of this tract. They will be able to determine tree health and vigor, insect and disease problems, species longevity, potential mortality, management of open space for recreational opportunities and wildlife habitat. A forester should be involved in the overall development plan to advise on individual tree retention, tree island retention, erosion and sedimentation control and site limitations which can create future hazards.

Conclusion

Trees and forests have value in reducing climatic extremes, controlling runoff, filtering out polluting particles from air and water, reducing noise, providing aesthetic enjoyment, creating wildlife habitat, recharging aquifers, supplying wood fiber and functioning as a carbon sink. Healthy vegetation provides these long term amenities. Therefore a good relationship between urban growth and forest land must exist. Trees around houses can be healthy, long lived and valuable if treated properly in the conversion from unbroken forest to subdivision. What is lost due to development is the wildlife carrying capacity of the forest and it's ability to produce wood fiber for generations in the next century and beyond.

VEGETATION MAP

Scale 1" = 1000'



11. WILDLIFE RESOURCES

Habitat Type Descriptions

The habitat types on this property have been described in a consultants report dated April 1990. 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).

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. 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. Removal of dead and down woody material should be discouraged where possible. The existence of many wildlife species (salamanders, snakes, mice) depend on the presence of dead trees (Hassinger 1986).

4. 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 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 rhododendrons, 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).

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.

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12. FISH RESOURCES

Site Description

A. Proposed Development Location - The proposed development location totals 184 acres in size with 35 acres containing wetland habitat. A total of 46 building lots are proposed; lots will be served by on-site water and sewage disposal. Surface drainage and small unnamed watercourses from the sloping lands that characterize this property drain into either the Connecticut River or into Higganum Reservoir. Consequently, development at this location will have to be carefully planned to avert man induced water pollution inputs to the lake and surrounding riverine ecosystems.

B. Higganum Reservoir - Higganum Reservoir, approximately 32 acres in size, is an impoundment of Ponset Brook. The reservoir is owned by the State of Connecticut. Maximum water depth is 34 feet; average depth is 12.6 feet (State Board of Fish and Game, 1959) No detailed limnological data exists for this water body. Surface waters of the lake are classified by the Department of Environmental Protection (DEP) as "Class A". Designated uses for this classification are: potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply, and other legitimate uses.

C. Watercourses - several unnamed watercourses and their associated wetlands are found on the development parcel along with Swain Johnson Brook. All watercourses are classified as "Class A' waters. These watercourses function to provide clean, unpolluted waters to lower reaches of their watersheds. If not properly controlled, housing development runoff may enter these streams and degrade water quality, thereby directly impacting aquatic organisms which are dependent upon good water quality conditions for survival.

Fish Population

Fish that inhabit Higganum Reservoir may seasonally utilize the lower stretch of the unnamed tributary below Route 81. Swain Johnson Brook would be expected to support native brook trout, blacknose dace, common shiner, tessellated darter, white sucker, and fallfish populations.

Higganum Reservoir is annually stocked by the DEP Inland Fisheries Division with more than 2,000 adult brown and rainbow trout for the support of a "put-and-take" trout fishery. The fish population of the reservoir has not been sampled by the Inland Fisheries Division; however, it is expected to support a diverse warmwater fish population comprised of: largemouth bass, chain pickerel, bluegill sunfish, pumpkinseed sunfish, yellow perch, white sucker, brown bullhead, and golden shiner.

Impacts

The following impacts of the proposed Walkley Heights subdivision on local aquatic ecosystems can be expected if proper mitigation measures are not implemented:

1. Construction site soil erosion and sedimentation through increased runoff from unvegetated areas : Sloped, hilly land that characterizes this parcel is conducive to the development of serious soil erosion problems especially since numerous watercourses can quickly convey introduced runoff to either the Connecticut River or Higganum Reservoir. Erosion and sedimentation due to residential housing construction can accelerate the lake eutrophication or aging process. 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 lake and stream habitats*** - 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 (CT DEP 1989).

* ***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 along the lake shorelines and precipitate dense "algae blooms" (CTDEP 1989)*** - eroded soils contain plant nutrients such as nitrates and phosphates. Although these plants require 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. Percolation of septic effluent into aquatic habitats : a failure of individual septic systems to operate properly is potentially dangerous to aquatic habitats. A total of 27 engineered septic systems will be required on this parcel. Nutrients and assorted chemicals that may be placed in septic systems could enter surface waters in the event of a failure or possible 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. 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.

3. Water quality and habitat degradation due to the influx of stormwater drainage from nearby residential housing : stormwaters can contain a variety of pollutants that are detrimental to aquatic organisms and their habitat. Pollutants commonly found in stormwaters are: hydrocarbons (gasoline and oil), herbicides, heavy metals, road salt, fine silts, and coarse sediment. If introduced into a lake environment, stormwater runoff will accelerate the lake eutrophication process and lead to degraded water quality. Spilled petroleum based chemicals or other toxicants can precipitate partial or complete fishkills.

4. Transport of lawn fertilizers and chemicals to aquatic ecosystems : 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.

5. Degradation/alteration 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. Three road crossings are proposed which will disturb wetlands along with stormwater detention basins or berms proposed in wetland complexes. Development which brings about polluted stormwaters, excessive stream sedimentation, lawn fertilizers, and lawn herbicides can negatively impact wetlands by hindering their ability to properly function.

Recommendations

Impacts due to housing development may be reduced somewhat by implementing the following recommendations:

1. 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 reseeded as soon as possible. If this development is approved, the Town of 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.

2. Maintain at the minimum a 100 foot open space buffer zone along the edge of all wetlands : no construction or alteration of natural vegetative habitat should be allowed in this zone. Research has shown that 100 foot buffer zones help prevent damage to aquatic 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 aquatic habitats.

3. The developer should submit a detailed stormwater management plan for town review : to determine if on-site detention is required. The effective management of stormwaters and roadway runoff can only be accomplished through proper design, location, and maintenance of catch basins. Stormwaters should only be outletted into non-wetland habitat; thus, avoiding initial and direct contact with wetlands. Stormwater detention basins or berms should not be built in wetlands. Maintenance of catch basins is very critical. Roadway catch basins should be regularly maintained to minimize adverse impacts to lake and wetland habitats. The use of road salt to de-ice roads should be prohibited.

4. Properly design and locate individual septic systems (refer to sewage disposal section for specific recommendations) : 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 and the addition of septic effluent to Higganum Reservoir can lead to accelerated lake eutrophication. When septic leach fields are proposed to be located within 100 feet of wetlands or watercourses, the town sanitarian or IWWCA should require analyses of phosphate and nitrate transport to ensure that leachate does not interfere with aquatic resources. This activity exceeds the standards of the State health code, but is warranted to protect surface waters from avoidable sources of eutrophication. 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 the disposal of harmful chemicals into septic systems which may negatively effect operation and possibly result in system failure should be prevented.

5. All instream work and land grading/filling near streams should take place during low flow periods : this will help minimize the impact to the 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.

6. 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. Nonphosphorus lawn fertilizers are currently available from various lawn care distribution centers.

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13. PLANNING CONSIDERATIONS

General Description

The proposed subdivision is of conventional design, consisting of 46 lots adjacent to approximately 9,500 lineal feet of new roadway on ±184 acres of land. Roughly 35 acres (19% of total area) are to be dedicated as permanent open space. Dedication of the open space areas is proposed to be in the form of preservation/conservation easements. The easements will occur on a number of the proposed subdivision lots (some lots are not presently proposed for development) and on parcels that will not be subject to development. Virtually all wetlands contained on the tract are included in the open space areas. The subdivision road network will connect with existing town roads at High Street and Swain Johnson Trail.

In its present state, the site can be described as a hardwood forest, with rolling hills and valleys. The property elevations range from 160 feet to 400 feet (NGVD), with average slopes ranging from 5 to 25 percent. Depth to bedrock has been recorded to vary from over 10 feet throughout much of the property to near the surface at the property's highest elevations. It is recognized that there are four significant "wetland systems" throughout the site. Such systems accommodate most of the existing and proposed drainage patterns.

Traffic Considerations

As represented in the applicant's traffic study, the proposed road system connects to existing town roads that have "several design deficiencies". The concern with the proposed High Street connection is that it intersects on the inside of a fairly sharp curve, where pavement width is insufficient and site line is poor. Review of the applicant's plans and traffic study indicates proposed improvements to High Street to accommodate a safer intersection. However, the Town should make sure that such improvements consider existing traffic volumes, speeds and frequencies and that they reflect reasonable design standards. (e.g. Often times only the posted speed limit is utilized in the design process. It is recommended that the Town attempt to utilize measured speeds in recognizing certain necessary road improvements.)

The proposed Swain Johnson Trail connection introduces different concerns than the High Street connector. It is obvious that Swain Johnson Trail presently functions and will function only to accommodate the immediate area's residential traffic and to provide access to the State forest. Presently the road, as it fronts the subdivision, is in an unapproved state (e.g. dirt, width ...). Of principal importance is assurance that each proposed subdivision lot has a reasonably safe and convenient means of access. Ease in maintenance is also an important factor to consider. Once this subdivision is developed, Swain Johnson Trail will obviously experience a significant increase in traffic and maintenance requirements. As with the High Street

connector, the Town must evaluate the degree of improvements necessary to accommodate reasonable design standards.

From a broader perspective, there are other concerns relating to existing road designs that feed into Swain Johnson Trail and High Street. It is important that they be evaluated and recognized for future improvements.

The Midstate Regional Planning Agency is presently evaluating the traffic study supplied by the applicant and is conducting its own traffic study to assist the Town in recognizing optional solutions to particular traffic concerns.

Environmental Considerations

The proposed subdivision layout and restrictive covenants attempt to recognize the environmentally sensitive areas within the parcel, while considering and maintaining general conformance to the local Inland Wetland, Zoning and Subdivision Regulations. Efforts have been made for the roadway system to parallel existing topography and to avoid and preserve the site's wetland areas. Most of the proposed lots contain enough area to more than satisfy the Town's minimum lot requirements. However, some of the lots appear to have excessive driveway grades. The proposed open space areas establish convenient connections to the abutting state forest land as well as introduce buffers between development and such lands. It is worth noting however that other abutting land is owned by the Haddam Land Trust. Consideration should be given to establishing a corridor to the Trust land to obtain continuity in preserved land holdings. Please note that the concept has been introduced in the Nature Conservany's corridor study.

Conclusion

The site is surrounded by development, undeveloped land, and road networks that reflect many of the virtues of Haddam's quality of life. A quality of life that includes roads that are not up to engineer design standards and land areas that seem to buffer and enhance most existing development. The Higganum Center area is an exception. Most of the activities and the general character of that area, however, exemplify the quaint New England Village atmosphere.

As mentioned earlier, the proposed development is of conventional design and generally satisfies local regulatory controls. It is the Midstate Regional Planning Agency's opinion that the site and the Town may be better served if controls were in place to address the three quality of life items recognized above (open space, "country" roads and village atmosphere). For future consideration, the Town should explore open space development (cluster) regulations in order to promote development that better caters to the Town's existing character. Such regulations can promote more open space and recreation lands, less pavement, affordable living and more neighborly environments.

Perhaps most importantly, open space developments are designed to take advantage of the more developable land within a given parcel. That is, the area of a parcel chosen for development generally will have natural characteristics (e.g. soil type, topography, vegetation ...) that best support residential and even commercial activities.

14. ARCHAEOLOGICAL REVIEW

A review of the State of Connecticut Archaeological Site Files and Maps indicate three known prehistoric Native American sites in close proximity to the project area. However, no sites are listed for the project area itself. The nearest prehistoric site is a rockshelter encampment on State property to the south of the proposed subdivision. No areas of bedrock outcroppings suitable for habitation were located in the project area.

Concern for historic resources centers around two particular features: the stone walling along Walkley Hill Road and Middlesex Turnpike and the mill ruins associated with the brook system draining into the Higganum Reservoir. Present development plans call for no impact on these features, however, if the development proposal changes and an impact on these stone structures is to occur, an archaeological survey should proceed prior to any construction activities. The stone walls are an excellent example of nineteenth century technology and should be maintained were feasible. The mill operation is visible, with an earthen and stone dam and pond structure still maintained and with the tail-race and sluiceways intact. The need for water power to propel the wheel places the mill within the brook drainage and thus in the wetlands conservation zone. Once again, as the project plans stand, these cultural resources should not be effected. However, their presence should be noted in lot deeds so that they are protected from destruction by future property owners.

The remnants of a hunting cabin with foundations and chimney stack were located upstream from the mill site. Review of these ruins indicate little historical significance. However, the structure could be repaired and incorporated into future design elements for the property.

In summary, the project area contains no bedrock outcropping suggestive of prehistoric shelter sites. Two historic stone features were located. They consist of 19th-century stone walls and an industrial mill ruin. Both features appear to be preserved with the present development plans. However, any proposed changes should consider the effect on these stone structures. The Office of State Archaeology is prepared to offer technical assistance to the Town of Haddam and the developer in preserving these cultural resources.

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.