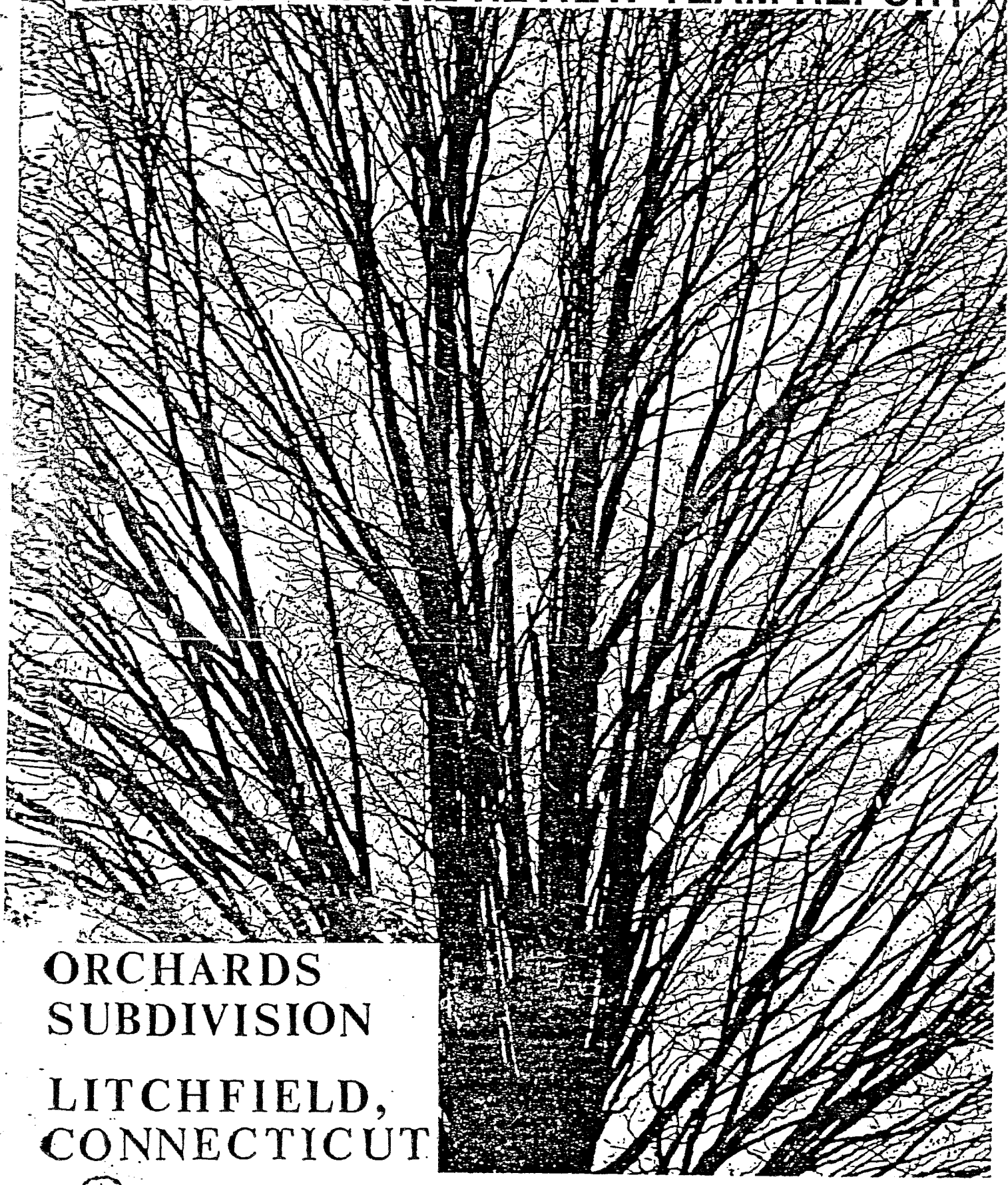
ENVIRONMENTAL REVIEW TEAM REPORT



ORCHARDS SUBDIVISION

LITCHFIELD, CONNECTICUT

KING'S MARK RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.

THE ORCHARDS SUBDIVISION

LITCHFIELD, CONNECTICUT

Environmental Review Team Report

Prepared by the King's Mark Environmental Review Team
of the King's Mark Resource Conservation
and Development Area, Inc.

Wallingford, Connecticut

for the

Litchfield Planning and Zonning Commission

This report is not meant to compete with private consultants by supplying site designs or detailed solutions to development problems. This report identifies the existing resource base and evaluates its signficance to the proposed development and also suggests considerations that should be of concern to the developer and the Town of Litchfield. The results of the Team action are oriented toward the development of a better environmental quality and long-term economics of the land use. The opinions contained herein are those of the individual Team members and do not necessarily represent the views of any regulatory agency with which they may be employed.

SEPTEMBER 1986

ACKNOWLEDGEMENTS

The King's Mark Environmental Review Team Coordinator, Keane Callahan, would like to thank and gratefully acknowledge the following individuals whose professionalism and expertise were invaluable to the completion of this study:

* William Warzecha, Geohydrologist
  Department of Environmental Protection

* Joseph Hickey, State Park Planner
  Department of Environmental Protection

* Edward Lukacovic, Soil Conservationist
  USDA - Soil Conservation Service

* Kip Kolesinskas, Soil Resource Specialist
  USDA - Soil Conservation Service

* Arthur Castellazzo, Senoir Sanitary Engineer
  Department of Health Services

* Larry Johnson, Planner
  Office of Policy and Management

* Harry Siebert, Transportation Planner
  Department of Transportation

I would also like to thank Patricia Newton, Secretary, and Janet Jerolman, Cartographer of the King's Mark Environmental Review Team for assisting in the completion of this report.

Finally, special thanks to the following people for their cooperation and assistance during this environmental review: Mr. John Williams, Chairperson, Planning and Zoning Commission, Town of Litchfield; Mr. David Thompson, Director of Public Works, Town of Litchfield; Mr. Graham Thompson, Shepaug-Bantam River Board; Ms. Nancy Murray, Biologist, Department of Environmental Protection, Glen Eugster, National Park Service, Philidelphia, Pennsylvania, and Mr. Barry Naderman, Engineer, Kellard and Federico Engineers, Mount Kisco, New York.

EXECUTIVE SUMMARY

The Litchfield Planning and Zoning Commission requested that an environmental review be conducted on a site proposed for a subdivision development. The site is located in the southwestern corner of town, bordering the towns of Warren and Washington. Access is provided via Old Mount Tom Road.

The 278-acre site is characterized by apple orchards, mixed hardwood forests, meadows, and former agricultural lands. The proposed site is bordered to the west by the Shepaug River. Steep slopes also occur in the western section of the site. There are scattered wetland communities as well as numerous drainage swales. Stone walls also traverse the site.

The primary goal of this study was to inventory and assess existing natural resources occuring on the site as well as providing planning and traffic/access information.

The Environmental Review Team process consisted of four phases: (1) inventory of the study sites's natural resources; (2) assessment of these resources; (3) identification of natural resource capabilities, and; (4) presentation of planning and development guidelines.

* *

The proposed subdivision would encompass 60 house lots, ranging in size from 2 to 15 acres. A number of access roads and cul-de-sacs are proposed to serve the subdivision as well as a common driveway to provide access to a number of lots in the western portion of the

site. The subdivision would rely upon individual on-site wells and on-site septic systems.

* *

PHYSICAL CHARACTERISTICS

Topography

Steep slopes characterize the terrain in the western parts of the site. Slopes are more moderate in the eastern half of the site. Maximum and minimum elevations on the site are about 1,090 feet and 830 feet above mean sea level.

Bedrock Geology

Bedrock outcrops were visible in the eastern and northern parts of the site. The western part of the site is generally shallow to bedrock, with several areas of individual outcroppings. Depth to bedrock ranges from zero in rock outcrop areas to probably 40 feet or more in the southern parts of the site.

Surficial Geology

Three surficial geologic deposits occur on the proposed site. They are: (1) till; (2) stratified sand, silt, and gravel, and; (3) alluvium or floodplain deposits.

Geologic Development Considerations

Based on visual observations and geologic and soil mapping, the major geological limitations which may pose constraints on the proposed subdivision are: (1) bedrock at or near the ground surface; (2) till deposits which may have a seasonally high groundwater conditions and slow percolation rates; (3) the presence of moderate to very steep slopes, and; (4) the presence of regulated inland wetland and alluvial soils.

These geologic limitations will weigh heaviest in the potential for installation of on-site subsurface sewage disposal systems. These limitations may also pose constraints in terms of foundation placement, roads, and driveways.

Hydrology

Development of the site under present plans would be expected to cause some increase in the amount of runoff from the site. The major concerns of increased runoff include flooding and the potential for streambank erosion. It seems likely that the latter would be of most concern, especially in view of the very steep slopes present in the western parts.

The purpose of the proposed sedimentation basins is to minimize the chance for unwanted sediment from reaching Shepaug River. If sediment does accumulate in these basins, it will have to be removed periodically in order to assure that storage capacity of the basin is not diminished. It is important to determine who will be responsible for maintaining the basins.

All storm drain outlets should include a designed energy dissipator to help protect areas below outlets from gulleying.

Water Supply

Individual on-site wells will serve the proposed 60-lot subdivision. Bedrock appears to be the only suitable aquifer for such wells in this area.

The natural quality of groundwater in this area should be satisfactory. However, due to the mineralogy of the rock types underlying the site, there may be a chance that elevated iron and manganese levels could affect well water quality.

Another water quality-related concern that should be addressed is to determine if pesticides (e.g., herbicides, insecticides, or fungicides) used on apple trees in the orchard have affected groundwater quality.

Soil Resources

The Orchards Subdivision site is dominated by deep, gently sloping to steep glacial till soils with a firm, dense substratum (hardpan) at a two foot depth. They are poorly-drained to well-drained. Small areas of soils that are a complex of deep to shallow (less than 20 inches) over bedrock were also mapped. A thin narrow band of soils without a "hardpan" and a gravellyer substratum is on the lower slopes of the western side of the parcel. A small unit of alluvial (floodplain) soils are found along the Shepaug River.

Erosion and Sedimentation

Since the site is characterized by shallow to bedrock soils, steep slopes, and wetness, it is important that this subdivision proposal submit an erosion and sediment control plan as well as a stormwater drainage plan.

* *

BIOLOGICAL RESOURCES

The Shepaug River

The 26-mile segment of the Shepaug River and its tributary, the Bantam River was found by the National Park Service to be free-flowing and to have outstandingly remarkable cultural and natural resource values qualifying it for inclusion into the National Wild and Scenic Rivers System. Given its accessible, but undeveloped valley, the scenic classification was assigned to the Shepaug River.

To minimize the enivironmental impact of the Shepaug River, development on the property could be clustered on the relatively gently sloping land in the eastern portion of the property.

It is suggested that any development of lots within the eastern fringe of the 15 percent slope land include limitations on the amount of landclearing, and specifically of vista cuts to the west to protect the river's scenic corridor.

Wildlife Resources

Wildlife has four basic needs in which to live and reproduce: (1) food; (2) cover; (3) water, and; (4) space. These four components collectively can be termed habitat, and habitat requirements vary for different species. Most wildlife species require a diversity of habitat such as forests, open fields, meadows, open woodland, wetlands, and woodland edges. Diversity of habitats, therefore, becomes one of the key requirements in meeting the varying needs of individual species, and increasing the number of species in a given area.

The study site exhibits varying degrees of habitat diversity. Existing apple orchards, cropland, mixed deciduous forest, meadow, and the Shepaug River Corridor provides excellent habitat for many wildlife species.

* *

LAND USE AND PLANNING CONSIDERATIONS

Planning and Zoning Issues

The 1986 State Plan of Conservation and Development retains the proposed development area in the "Conservation" category, which means that State funds could only be used for a project which is supported by on-site water supply and sewage disposal, and would not alter the character of the area.

Litchfield's 1967 Plan of Development proposed use for the site area was moderate density residential use (50,000 square foot lots). The area, however, remains zoned for residential R-80 use, which requires a 2-acre (80,000 square feet) minimum lot area. The 1984 Plan Update classified the area along the Shepaug River as streambelt and the orchard as active farmland.

Traffic and Access

The accident experience at the intersection of Old Mount Tom Road and Route 202 has been low. This is to be expected with the low traffic volumes on Old Mount Tom Road.

The options relative to the Old Mount Tom Road and Route 202 intersection are: (1) abandon Old Mount Tom Road; (2) improve the existing intersection with sightline improvements and by-pass lane, and; (3) relocate the intersection to the east with appropriate sightline distances and a by-pass lane.

Sewage Disposal

Based on soil classifications, major portions of the site consist of soils which would be deemed severe and of "special concern" relative to the installation of subsurface sewage disposal systems.

The main concern relative to Woodbridge and Paxton-type soils is the ability of the soils to adequately absorb or disperse the expected volume of sewage effluent without overflow, breakout, or detrimental effect on ground or surface water.

Due to the large lot sizes proposed, it is probable that suitable leaching areas can be identified on the majority of the proposed lots. If testing determines critical portions of a lot "unbuildable," appropriate changes to property lines can be made in order to establish that each lot on the proposed subdivision can ultimately support on approved subsurface sewage disposal system.

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

INTRODUCTION

Introduction

The Litchfield Planning and Zoning Commission requested that an environmental review be conducted on a site proposed for a subdivision development. The site is located in the southwestern corner of town, bordering the towns of Warren and Washington. A small portion of the site is located in the Washington. Access is provided via Old Mount Tom Road, an unimproved road off Route 202 (Figure 1).

Description of the Environment

The 278-acre site is characterized by apple orchards, mixed hardwood forests, meadows, and former agricultural lands. The proposed site is bordered to the west by the Shepaug River. Steep slopes also occur in the western section of the site. There are scattered wetland communities as well as numerous drainage swales. Stone walls also traverse the site.

The proposed subdivision would encompass 60 house lots, ranging in size from 2 to 15 acres. A number of access roads and cul-de-sacs are proposed to serve the subdivision as well as a common driveway to provide access to a number of lots in the western portion of the site (Figure 2). The subdivision would rely upon individual on-site wells and on-site septic systems.

Goals and Objectives of the ERT Study

The primary goal of this study was to inventory and assess existing natural resources occuring on the site as well as providing planning and traffic/access information. Specific objectives included:

(1) Assess the hydrological and geological characteristics of the site, including geological development limitations and opportunities, natural drainage patterns, postdevelopment stormwater runoff potential, and flooding.

(2) Determine the suitability of existing soils to support the proposed development.

(3) Discuss soil erosion and sedimentation concerns.

(4) Assess the capability of the site to support on-site wells and on-site septic systems.

(5) Evaluate traffic and access concerns.

(6) Assess planning and land use issues.

The ERT Process

Through the efforts of the Litchfield Planning and Zoning Commission, the town engineer, Shepaug-Bantam River Board, the developer, and the King's Mark Environmental Review Team, this environmental review and report was prepared for the Town. This report is not designed or intended to compete with private consultant's proposals or plans for this site. Rather, it provides a natural resource data base allowing the Town and the developer make informed decisions concerning the use of the proposed site.

The review process consisted of four phases: (1) inventory of the study sites's natural resources (collection of data); (2) assessment of these resources (analysis of data); (3)

Figure 1

LOCATION OF STUDY SITE

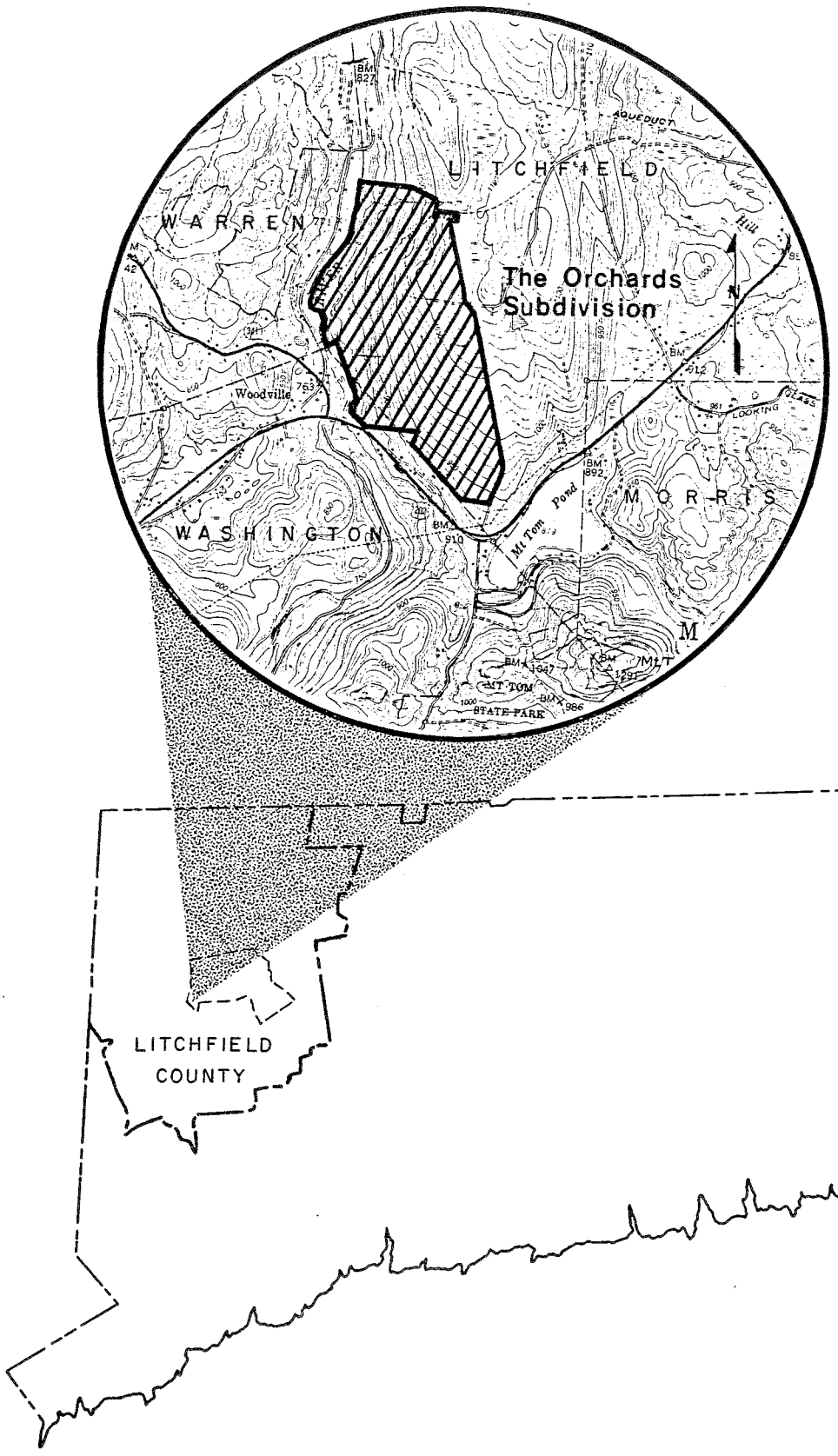
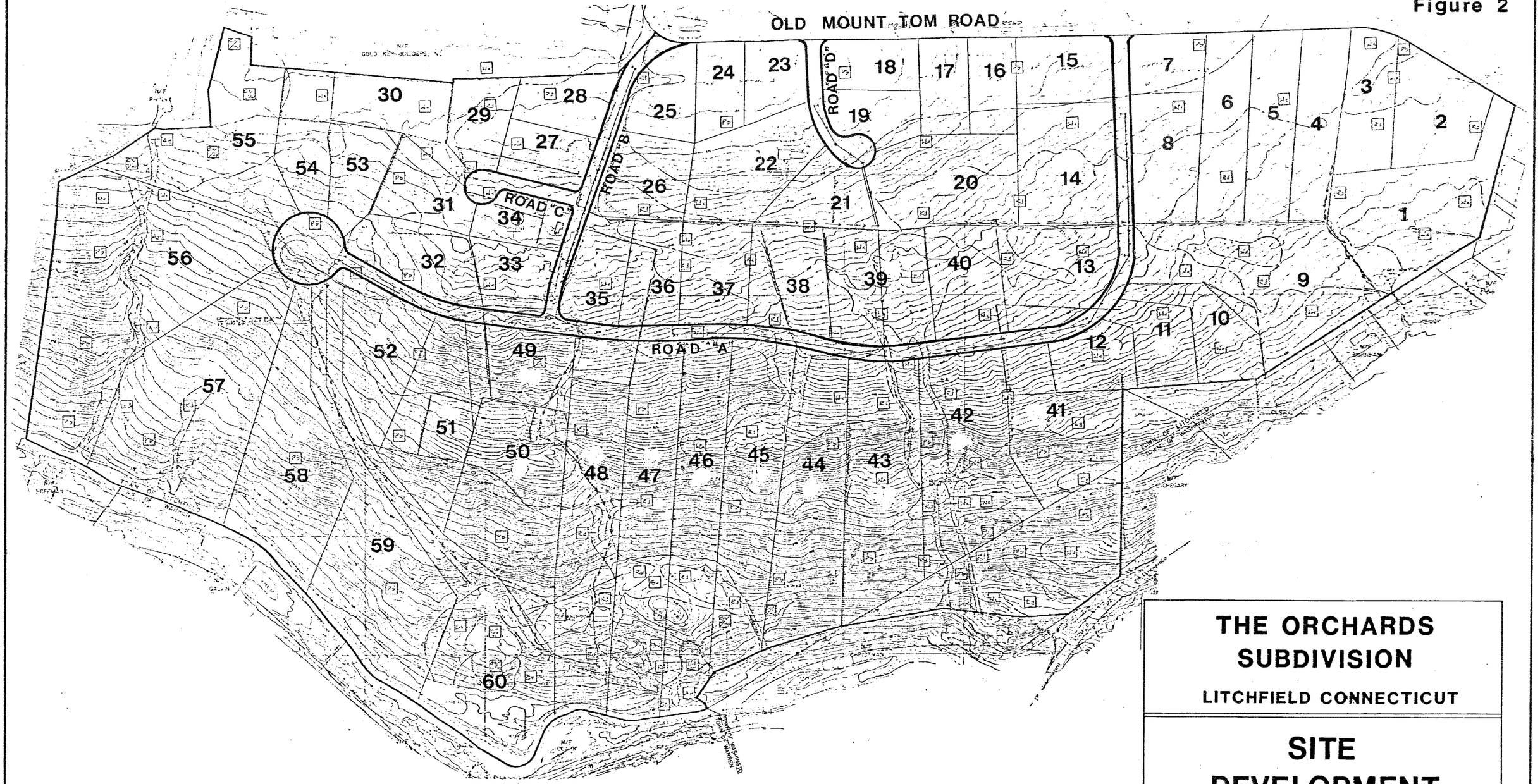


Figure 2



THE ORCHARDS SUBDIVISION

LITCHFIELD CONNECTICUT

SITE DEVELOPMENT PLAN

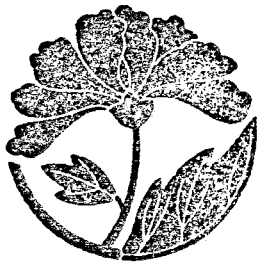
King's Mark Environmental Review Team

0 100'

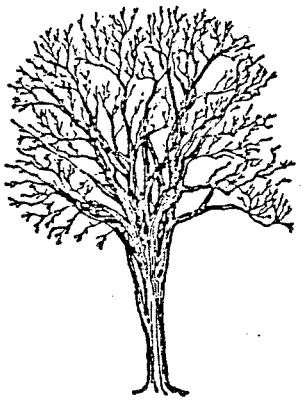
identification of natural resource capabilities, and; (4) presentation of planning and traffic guidelines.

The data collection phase involved both literature and field research. Mapped data, technical reports, or town plans were perused and specific information concerning the site was collected. Field review and inspection of the site proved to be a most valuable component of this phase. The emphasis of the field review was on the exchange of ideas, concerns, or alternatives. Being on site also allowed Team members to check and confirm mapped information and identify other resources.

Once the Team members had assimilated an adequate data base, it was then necessary to analyze and interpret their findings. The results of this analysis enabled the Team members to arrive at an informed assessment of the site's natural resource development opportunities and limitations.



PHYSICAL CHARACTERISTICS



PHYSICAL CHARACTERISTICS

Physical Setting

The proposed 60-lot subdivision is located in the southwestern corner of town, bordering the towns of Warren and Washington. A small portion of the site is located in the Town of Washington. Access is provided via Old Mount Tom Road, an unimproved road off Route 202.

The 278-acre site is characterized by apple orchards, mixed hardwood forests, meadows, and former agricultural lands. The proposed site is bordered to the west by the Shepaug River.

Topography

The site flanks the west side of a geologic feature known as an upland rock drumlin hill. Typical drumlins are streamlined, oval-shaped topographic features that were formed with axes paralleling the direction of past ice movement. The long axis of the hill on which the property is located is oriented in the apparent direction of the former glacier's advance, which was south-southeast.

The drumlin is comprised of ground-up rock fragments and till particles which were plastered by moving glacial ice directly onto the underlying bedrock. (See Geology Section of report).

Steep slopes characterize the terrain in the western parts of the site (Figure 3). Slopes are more moderate in the eastern half of the site. Maximum and minimum elevations on the site are about 1090 feet and 830 feet above mean sea level. Based on the site plan

distributed to Team members, numerous intermittent drainage channels tributary to Shepaug River traverse the site. There are also numerous pockets of seasonally wet areas throughout the site. The largest appears to be in the eastern portions of the site.

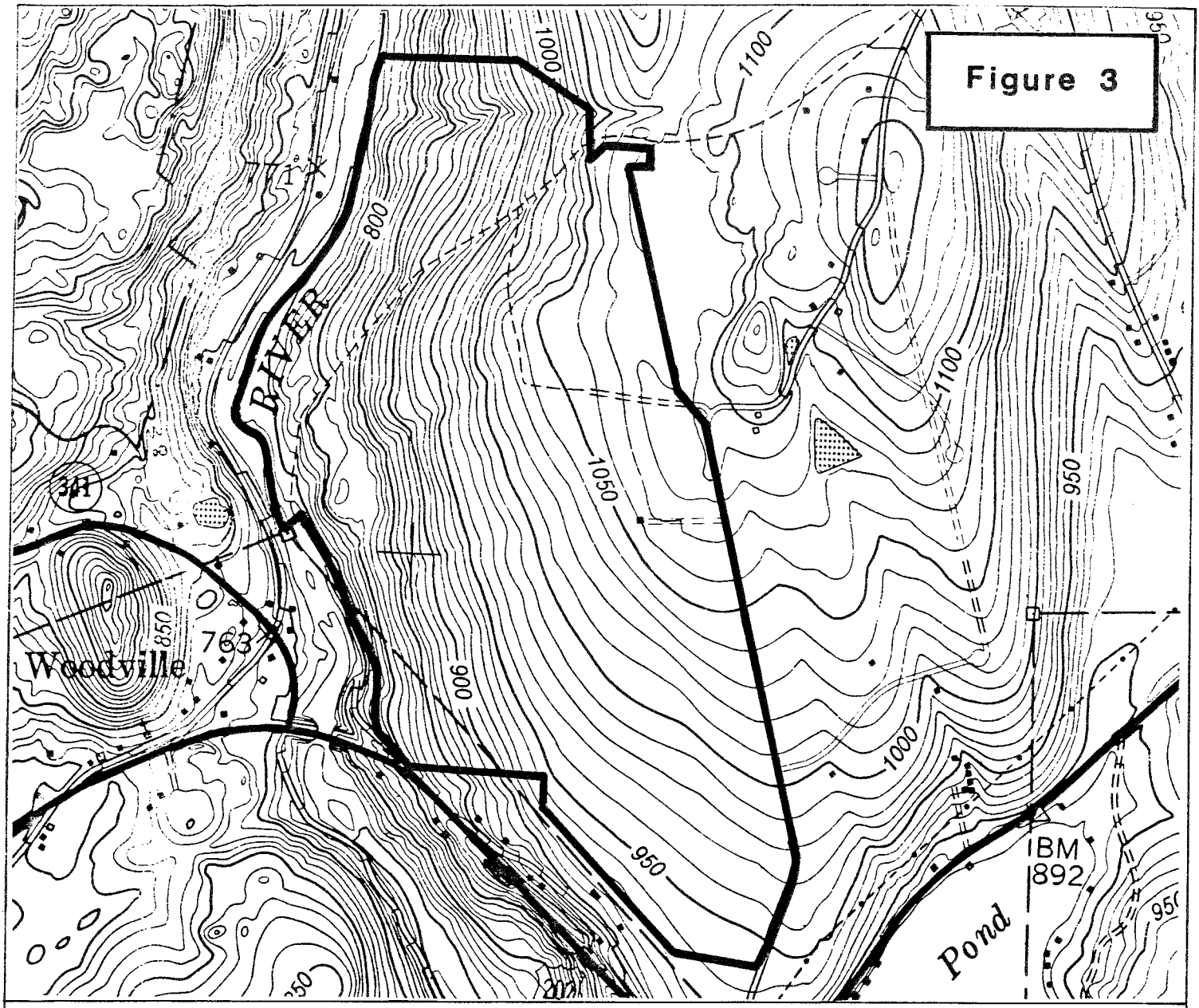
Geology

The Orchards Subdivision site is located within the New Preston topographic quadrangle. A bedrock geologic map (QR-2, by R.M. Gates, 1952) of that quadrangle has been published by the Connecticut Geological and Natural History Survey. The Team's Geologist also referenced John Rodger's Bedrock Geological Map of Connecticut (1985) for the bedrock geology section of the report. A surficial geologic map (U.S. Geological Survey Map GQ-782, by Roger B. Colton, 1969) has been published for the quadrangle.

Bedrock Geology

Bedrock outcrops were visible in the eastern and northern parts of the site. According to published geologic mapping information, the western parts of the site is generally shallow to bedrock (i.e., less than five feet), with several areas of individual outcroppings. Individual outcroppings were observed on the field review day in the eastern and northern parts (Figure 4).

The rock core of the drumlin hill is identified as Manhattan Schist (Rodgers, 1985). It consists of a dark gray to silvery rusty-weathering coarse grained schistose gneiss. The rock may also be interbedded with layers of quartzite (i.e., a quartz-rich metamorphic rock). The word "gneiss" is a textural term given to a



THE ORCHARDS SUBDIVISION

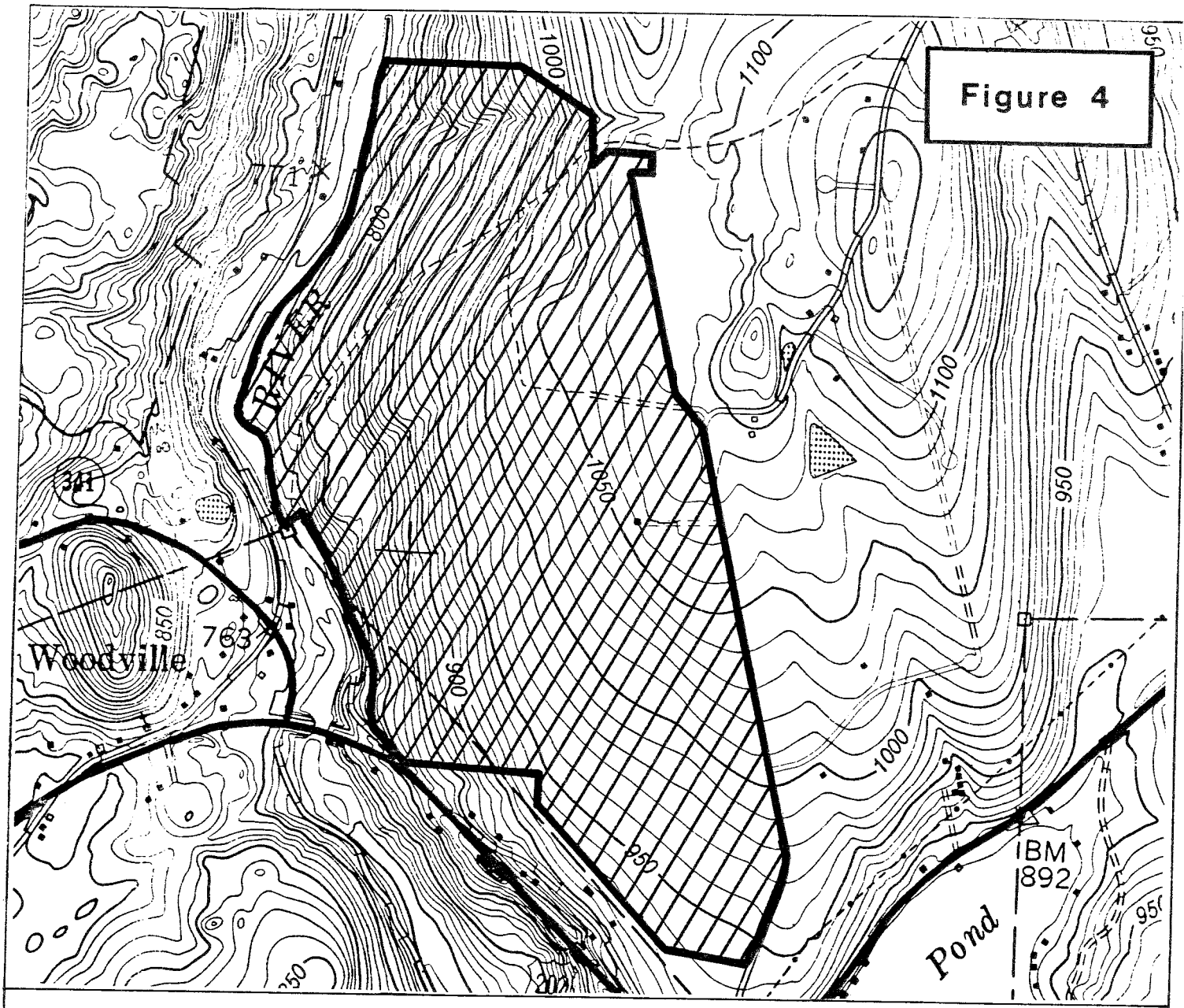
LITCHFIELD CONNECTICUT

TOPOGRAPHY

King's Mark Environmental Review Team

0 1000'

N



MANHATTEN SCHIST (Rodgers, 1985)

THE ORCHARDS SUBDIVISION

LITCHFIELD CONNECTICUT

BEDROCK GEOLOGY

King's Mark Environmental Review Team

0 1000'

crystalline, metamorphic (i.e., geologically altered by great heat and pressure) rocks. "Gneisses" are characterized by thin bands of elongate or platy minerals, generally micas, alternating with layers of granular, lighter minerals such as quartz and feldspar. "Shistose" means that there is a relatively high percentage of platy or elongate mica minerals in the rock.

The crystalline metamorphic rock underlying the site will be the source of water to individual wells drilled on the site.

Depth to bedrock ranges from zero in rock outcrop areas to probably 40 feet or thicker in the southern parts of the site.

Surficial Geology

Overlying the bedrock on the site is a loose to compact glacial sediment known as till (Figure 5). The looser till probabaly overlies bedrock in the shallow to bedrock areas in the eastern parts while the compact variety characterizes the till on the remainder of the site. However, in order to determine exactly the texture of the till on the site, subsurface exploration will be required. According to the project engineer, some deep test pits were excavated near the apple orchard. This soil information was preliminary and as a result was not made available to Team members.

Till consists of rock particles of widely ranging sizes (i.e., from clay to large boulders) and shapes (i.e., from flat to angular to rounded). Most of this sediment was deposited by lodgement beneath the former ice sheet, but some may have been let down from within or from the surface of the ice as it was wasting during the period of glacial retreat. As a result of these different processes,

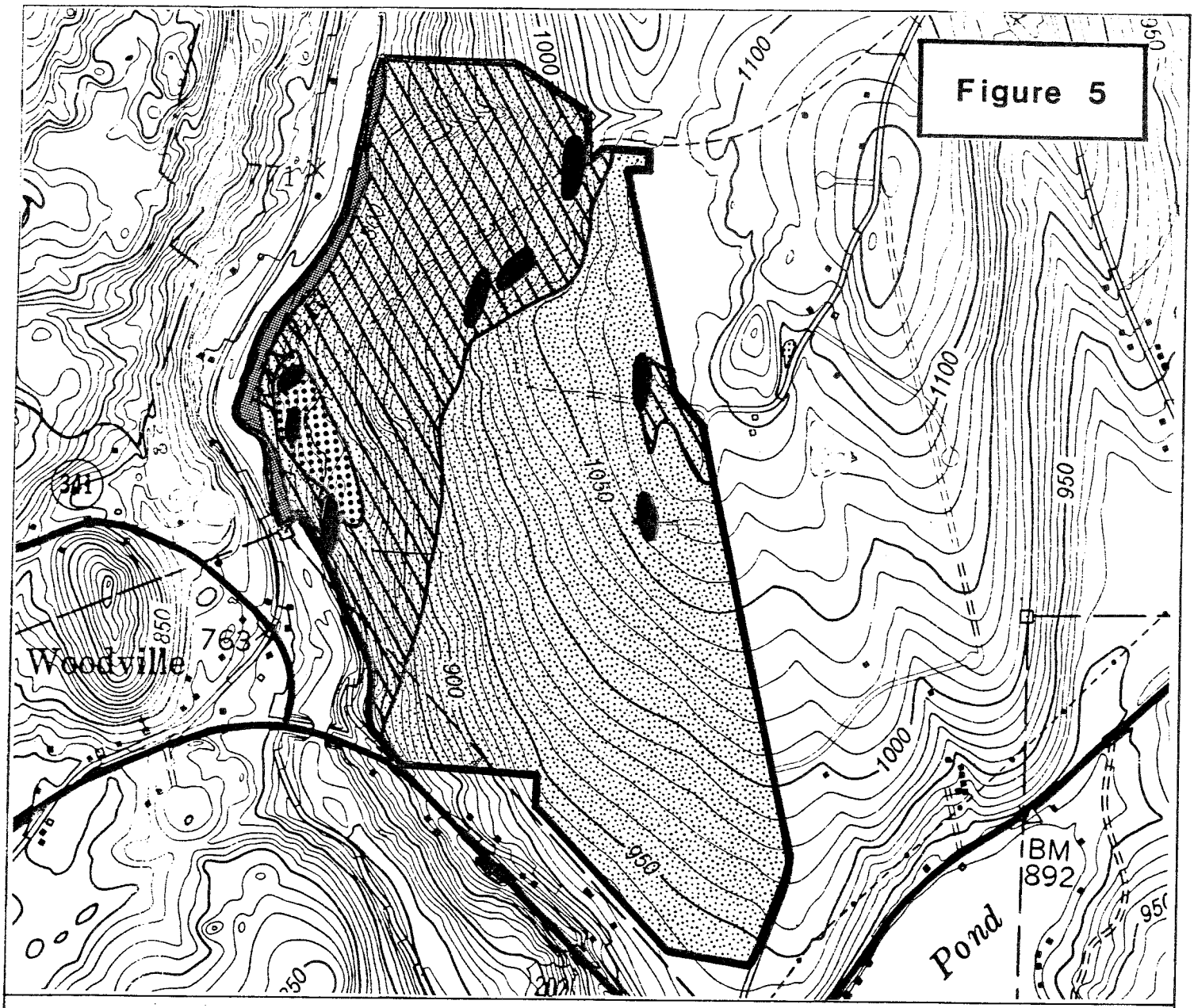
the upper few feet of till are commonly sandy and loose while the lower portion is silty to clayey, blocky, and compact.

A small area in the western limits of the site contains a yellowish brown stratified sand, silt and fine gravel. This material was deposited by meltwater streams emanating from melting glacial ice. Based on visual inspection of this area on the field review day, this material has been mined probably for construction aggregate. In some places, the actual bedrock surface was encountered.

A more recent, postglacially deposited material called alluvium parallels the Shepaug River in the western limits (see Figure 5). "Alluvium" consists of stream deposits of sand and gravel in floodplains. Because these soils are subject to inundation during certain storm events or during spring floods, these soils hold very little potential for development and should be left in their natural state.

Geologic Development Concerns

Based on information supplied to Team members, present plans call for the construction of 60 single-family homes on lots ranging in size from 2 to 15 acres. Since public water and sewer lines do not service this rural part of Litchfield, the proposed homes will need to rely on individual subsurface sewage disposal systems and on-site wells. A number of access roads and cul-de-sacs are proposed to serve the subdivision as well as a common driveway to provide access to a number of lots in the western portion of the site.



ALLUVIUM

TILL

SHALLOW TILL

STRATIFIED DRIFT

INDIVIDUAL OUTCROPS

THE ORCHARDS SUBDIVISION

LITCHFIELD CONNECTICUT

SURFICIAL GEOLOGY

King's Mark Environmental Review Team

0 1000'

N

Based on visual observations and geologic (surficial and bedrock) and soil mapping, the major geological limitations which may pose constraints with respect to the proposed subdivision included:

(1) Bedrock at or near the ground surface mainly in the western half of the site and in isolated areas in the eastern limits.

(2) Till deposits which may have a seasonally high groundwater condition and slow percolation rates.

(3) The presence of moderate to very steep slopes mainly in the western parts.

(4) The presence of regulated inland wetland and alluvial soils, both of which hold very little potential for development.

The latter geologic concern is based on a soils map prepared for the applicant by a certified soil scientist. These areas generally parallel intermittent drainage channels on the site and the Shepaug River. However, there are some widespread areas, especially in the southern half of the site.

These geologic limitations will weigh heaviest in the potential for installation of on-site subsurface sewage disposal systems. These limitations may also pose constraints in terms of foundation placement and roads and driveways.

In terms of subsurface sewage disposal systems, properly engineered and installed septic systems may be able to surmount the aforementioned limitations in some cases. As mentioned earlier, soil testing has been conducted on the site mainly in the area of the apple orchard. These results were not made available to Team members. Careful planning and detailed soil testing is imperative on each lot,

so that potential septic system problems can be avoided. In the western sections where bedrock is at or near ground surface, there is concern for having a sufficiently large, suitable area for on-site septic systems. In order to accurately assess that such an area would be available, a sufficient number of deep test pits are needed on each lot to establish a bedrock profile. Based on the Connecticut Public Health Code, ledge rock would need to be at least 24 inches or two feet below natural-occuring soils. Because depth to bedrock is highly variable throughout the eastern parts of the site, it is likely that leaching systems will need to be kept shallow and spread out over a comparatively wide area.

In areas where bedrock is at or near the ground surface, it may be necessary to blast in order to construct access roads, driveways or to place house foundations. Since the steepest slopes on the site are associated with these areas, it is suggested that a detailed erosion and sediment control plan be formulated and followed very closely with implementation of the project.

Lots exhibiting soils with a seasonal high groundwater table also will need to be carefully planned. Soil testing on each lot in the subdivision will be required in order to properly evaluate subsurface conditions.

Leaching systems should be kept elevated and spread out when seasonally high groundwater tables are encountered. In some cases, it may be necessary to install a curtain drain and/or place proper fill material in the leaching system area in order to effectively overcome high groundwater table conditions. For example, a properly designed and constructed curtain drain installed in a till soil which

has a seasonally high groundwater table will afford protection to a leaching system so that the seasonal water table does not rise up into or flow into the system and interfere with the normal functioning of the system. Curtain drain installation requires an outlet for draining and needs to conform with the Public Health Code. For the flat to gentle areas of the site, curtain drain installation may not be a practical engineering measure for protecting leaching systems from a seasonally high water table. It seems likely that proper fill material would be needed in these areas.

Because lots in the subdivision are two acres or more, it seems likely that this would give allow for greater flexibility in finding a suitable area for a sewage disposal system than, for instance, one-acre lots. However, if some of the geologic limitations mentioned earlier predominate on a particular lot, finding a suitable area for the installation of the sewage disposal system may still be problematic, even with the larger lot sizes.

Once septic systems are engineered and approved by the proper authorities (i.e., state and district health department), it is important that: (1) the system be installed by a state licensed installer; (2) installed according to the finally approved design specifications, and; (3) be properly maintained [e.g., pumped regularly (3-5 years) by the homeowner].

In order to accurately access the property for subsurface sewage disposal, extensive soil testing will be required. The Team's Soil Conservationist noted on the review day that drainage tile has been installed throughout the apple orchard in the past to help control groundwater levels in the area. Every effort should be made to try

to determine the location of the tile, in this area before septic systems are installed. There is a chance that the tile may intercept untreated sewage effluent and ultimately cause a public health nuisance condition.

The moderate to very steep slopes, particularly in the western portions, may present problems in terms of driveways and road grades. If proper engineering measures are not taken, severe gullying and erosion may occur on unpaved drives and roads accumulating unwanted sediment into the Shepaug River via the intermittent drainage channels on the site. Also, water flowing down the driveways during rainy periods or snow melt could carry sand, salt, oils, and other debris, which could ultimately find its way into the river. Since the Shepaug River is classified as "AA," every consideration should be given to protecting the excellent water quality presently maintained in the river.

As indicated by the soils map prepared by the applicants certified soil scientist, several seasonally wet areas parallel the intermittent streamcourses on the site, and in some of the flatter areas, they spread out to form small to large depression which are comprised of regulated inland wetland soils. These soils are protected under Public Act 155. Inland wetland soils, deposited after the glacier disappeared from the region, consist of poorly to very poorly drained mineral soils comprised of fine sand, silt and clay, and may be interbedded with some organic material. Surface water is generally present on these soils during the winter and spring months.

Any activity involving the modification, filling, or removal of inland wetland soils will require a permit and ultimate approval by the Town's Inland Wetland Commission. Development in areas covered by regulated wetland soil types should be avoided if possible.

Depending on the final plan, inland wetland soils on the site may need to be crossed in order to construct the proposed interior road system, and depending on desired house locations, driveways may also need to cross inland wetland soils. Although undesirable, wetland road crossings are feasible provided they are properly engineered. The road should be constructed adequately above the surface elevation of the wetlands. This will allow for better drainage of the road and also decrease the frost heaving potential of the road. Road construction through wetlands should preferably be done during the dry time of the year, and should include provisions for effective erosion and sediment control. Finally, culvert(s) should be properly sized and located so as not to alter the water levels in the wetland or cause flooding problems.

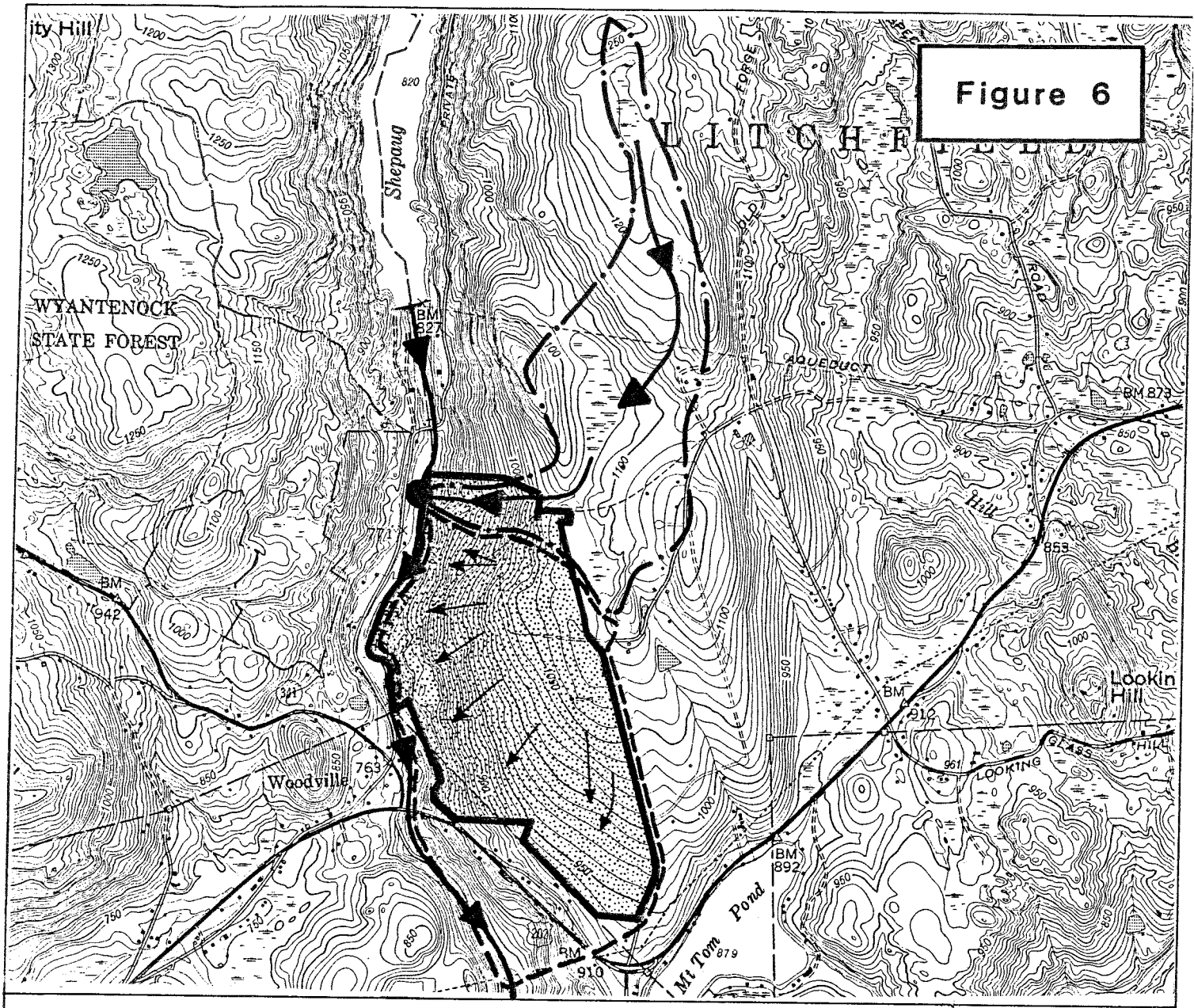
Hydrology

The proposed subdivision lies entirely within Shepaug River watershed. The surface and groundwaters on the site flow generally downslope toward intermittent drainage channels which act as discharge zones. The intermittent drainage channels on the site then route the water toward Shepaug River. The intermittent drainage channels on the site trend primarily in westerly and southwesterly direction (Figure 6).

Development of the site under present plans would be expected to cause some increase in the amount of runoff shed from the site. These increases would arise mainly from the creation of impervious surfaces such as roof tops, driveways, patios, or interior road systems over otherwise pervious soils. According to the project engineer, drainage calculations have not been prepared to date. As a matter of policy, it is advised that the applicant's engineer formulate a stormwater management plan which includes pre- and postdevelopment runoff calculations.

The major concerns of increased runoff include flooding and the potential for streambank erosion. It seems likely that the latter would be of most concern, especially in view of the very steep slopes present in the western parts. The applicant's engineer has located potential sites for three sedimentation basins, mainly in the western parts. The purpose of these basins would be to minimize the chance for unwanted sediment from reaching the Shepaug River. If sediment does accumulate in these basins, it will have to be removed periodically in order to assure that storage capacity of the pond is not seriously diminished. As a result, it should be determined who will be responsible for maintaining the basins. If there is a need to detain runoff from the site, the proposed sediment retention ponds may also be designed to function as a stormwater detention pond. Finally, all storm drain outlets should include a designed energy dissipator to help protect areas below outlets from gulleying.

Design specifications for all stormwater control facilities and erosion control devices should be included on the subdivision plan for review by appropriate town officials.



WATERSHED BOUNDARY AND DESIGN POINT FOR THE UNNAMED WATERCOURSE WHICH DRAINS THE NORTHERN LIMITS OF THE SITE

WATERSHED BOUNDARY FOR THE CENTRAL AND SOUTHERN PARTS OF THE PROPERTY WHICH FLOWS INTO SHEPAUG RIVER

DIRECTION OF SURFACE FLOW

WATERCOURSES SHOWING DIRECTION OF FLOW

Note: Boundaries do not account for possible re-routing by man-made structures, i.e. pipes, culverts, etc.

THE ORCHARDS SUBDIVISION

LITCHFIELD CONNECTICUT

WATERSHED BOUNDARY

King's Mark Environmental Review Team

0 2000'

N

Water Supply

According to the project engineer, individual on-site water supply wells will serve the proposed 60-lot subdivision. Bedrock appears to be the only suitable aquifer for such wells in this area. Water is supplied to bedrock-floored wells chiefly through fractures in the rock. Fractures in the bedrock are mainly a result of geological forces such as folding and faulting.

The exact yield of a bedrock-based well is a function of many geologic factors, including the number and size of fractures present in the bedrock. Since the fractures in bedrock are irregular, there is no practical way of predicting the yield of a bedrock well drilled in specific location. Even with geophysical exploration, it is extremely difficult to predict such yields. Nevertheless, wells drilled in bedrock are generally capable of supplying small but reliable yields.

An assessment of presently installed bedrock-based wells has been conducted for the upper Housatonic River Basin including the subject site. (Source: Connecticut Water Resource Bulletin No. 21). All of the 824 wells surveyed in that study tap crystalline bedrock, which is similar to the bedrock underlying the site. This assessment allows one to predict the chances for any new well to achieve certain minimum yields. Based on data described in Bulletin Number 21, 90 percent of the wells tapping the type of rock underlying the site yielded about two gallons per minute (gpm) or more; 70 percent yielded about four gpm or more; 50 percent yielded about seven gpm or more. Only 10 percent yielded 12 gpm or more.

A yield of at least three gpm is desirable and adequate for most household needs. Usually, a bedrock well needs to penetrate between 150 feet and 300 feet of solid rock in order to obtain three gpm. It has been determined that the density and size of water bearing fractures decreases markedly at depths greater that 150 feet.

As a result, if a yield of at least one gpm is not achieved within the first 150-200 feet of bedrock (not including the till deposits, which may be thick in parts of the site), it would probably be more practical to drill in a new location rather than to continue drilling in the original well.

A concern often raised when a number of wells are installed in an area is whether or not there will be mutual interference during pumping periods. A pumping well drilled into the underlying bedrock would be expected to lower the water table at least some. As mentioned earlier, even with geophysical equipment it is very difficult to determine how much it will be lowered. Because of the large lot sizes presently proposed (i.e., two acres or greater), and because a portion of the renovated septic effluent will ultimately percolate downward to recharge the underlying metamorphic bedrock, the chance for mutual interference between neighboring wells should not pose any major problems. However, if the lot sizes were smaller and the density of development greater, there could be a problem with mutual interference between pumping wells.

In general, wells should be located towards the high side of lots, properly separated from on-site sewage disposal systems or other potential sources of pollution such as buried fuel oil tanks or discharges from on site water treatment facilities. They must also

have adequate separation from watercourses or drains, and be protected from surface drainage and erosion in view of the steep slopes on the site.

The natural quality of groundwater in this area should be satisfactory and is classified by DEP as "GAA," which means that it is an existing or proposed public drinking water use without treatment (Source: Water Quality Classifications for the Hudson, Housatonic River Basins. DEP, Water Compliance Unit, April 1985). However, due to the mineralogy of the rock types underlying the site, there may be a chance that elevated iron and manganese levels could affect well water quality. As a result, it may be necessary to install an appropriate water treatment filtration system.

Another water quality-related concern that should be addressed is to determine if pesticides (e.g., herbicides, insecticides, or fungicides) used on apple trees in the orchard have affected groundwater quality. This may include finding out the pesticide, if any, that was used in the apple orchard as well as sampling existing wells in close proximity to the apple orchard. Although the Town or health district requires drinking water supplies for new homes be tested before issuing a Certificate of Occupancy, the water is usually tested for a variety of chemical, physical, and biological substances, but pesticides are not tested for, unless it is specially requested by the homeowner or health department.

Soil Resources and Characteristics

The landscapes of the Orchards Subdivision are dominated by deep, gently sloping to steep glacial till soils with a firm, dense substratum (hardpan) at a two foot depth. They range from poorly-drained to well-drained soils. Small areas of soils that are a complex of deep to shallow (less than 20 inches) over bedrock were also mapped. A thin narrow band of soils without a "hardpan" and a gravellyer substratum is on the lower slopes of the western side of the parcel. A small unit of alluvial (floodplain) soils is along the Shepaug River.

The soil map included with this report (Figure 7), has been created from the information provided by Soil Science Services. The intensive soil survey of the parcel by Soil Science Services was mapped at a scale of 1" = 100' and should be used for decisions on a lot by lot basis. The map prepared at a scale of 1" = 1000' is for discussion purposes for this report. Because of the large number of map units involved, a chart of important soil features and interpretations has been prepared (Appendix A). The map unit symbols and names are unique to this report and cannot be used in other areas. Below is listed some additional soils information and concerns:

(1) Figure 7 is at a scale of 1" = 1000' should not be used in discussions about wetland values and acreage. A soil map prepared for the developer by a private soil scientist at a scale of 1" = 100' shows many wetland areas that could not be shown at the scale in Figure 7.

(2) Included with mapping in the PbE, PbD map units (Paxton) are small areas of soils that are shallow (less than 20 inches) or moderately deep (20-40 inches) to underlying bedrock, and areas of soils that have a sandy and gravelly friable substratum.

(3) Included with mapping in the ChD and ChC map units (Charlton-Hollis) are small areas of Paxton soils, and areas of gently sloping soils.

(4) The location of homes and septic systems should carefully consider the proximity and effect on the numerous small watercourses that drain the parcel. Many of these drainageways are shown on the plans, some are not.

(5) The cuts associated with road and street construction on map units PbD and PbE (Paxton) may be difficult to stabilize. Resulting sideslopes should be as gentle and short as possible.

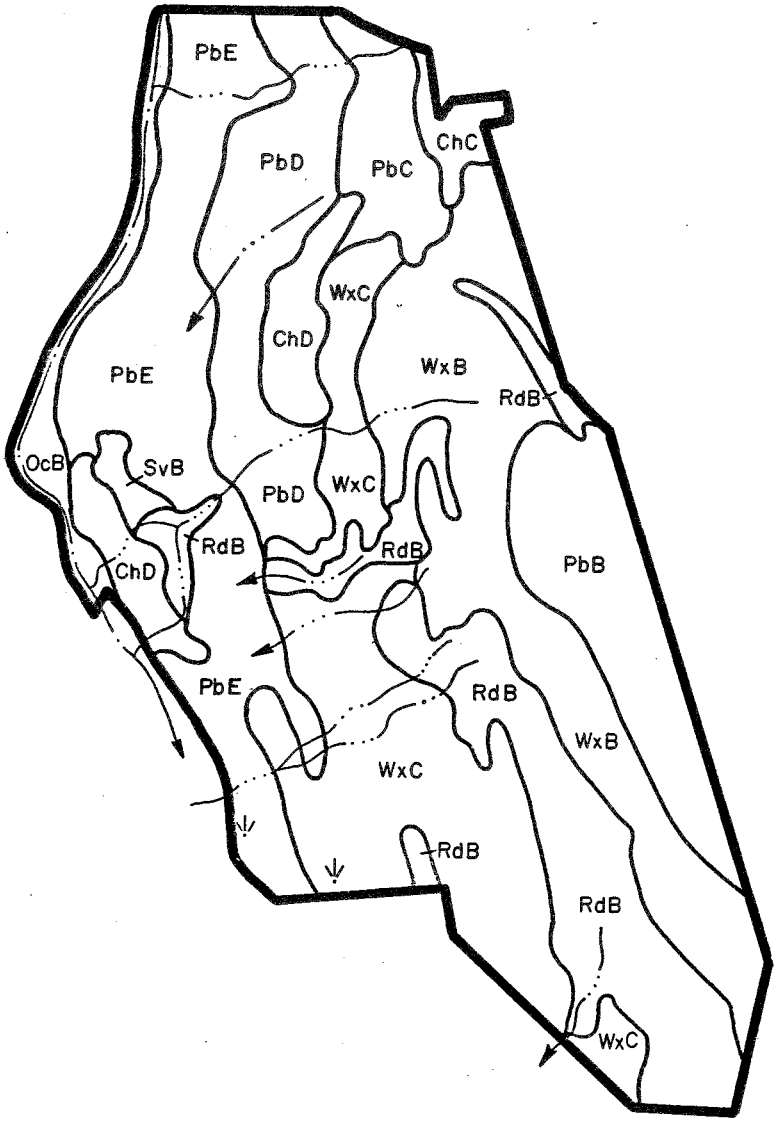
(6) Because of long slopes and numerous surface drainage features associated with the landscape, there is a significant potential for erosion. Soil disturbance should be kept to a minimum and an erosion and sediment control plan carefully followed and inspected (see discussion below).

(7) Large amounts of surface water and subsurface soil water move downslope on this parcel. On many lots carefully designed septic systems may need diversions and/or curtain drains to remove surface and subsurface water.

Erosion and Sedimentation Considerations

The 60-lot subdivision is in an area predominately comprised of soils with severe limitations due to bedrock, steep slopes, and wetness for building development. Because of these limitations, it is important that this subdivision proposal, as part of their application process, submit an erosion and sediment control plan as well as a stormwater drainage plan. The erosion control plan is required by State law for any proposal disturbing an area of 20,000

Figure 7



SMALL AREAS OF POORLY OR VERY POORLY DRAINED SOILS

PERENNIAL STREAM

INTERMITTENT STREAM

THE ORCHARDS SUBDIVISION

LITCHFIELD CONNECTICUT

DISTRIBUTION OF SOILS

King's Mark Environmental Review Team

0 1000' (approx) N

square feet or more. This plan should conform to the "Guidelines for Erosion and Sediment Control" (1985).

Though the present plan calls for a sediment basin, other measures should be added as well. Erosion controls such as seeding and mulching pertaining to soil conditions and construction sequences should be included with the plan. Also specific engineering designs and details of any structures need to be submitted for evaluation as well.

Some of the concerns and guidelines for the development are as follows:

(1) Lots 59 and 60 that will have a common driveway will need a proper water conveyance system to carry runoff along the driveway safely.

(2) Also Lots 58, 59 and 60 have severe limitations for driveway access due to the long and steep slopes.

(3) It would be best to construct driveways on the contour as much as possible and install water bars to cut the slope length for steep accesses.

(4) A proposed 200-foot setback along the Shepaug River should help maintain the water quality of the river.

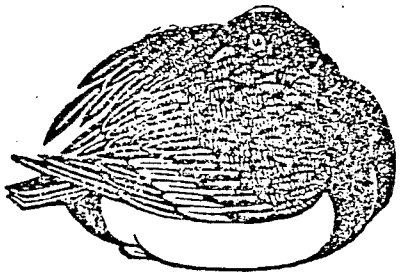
(5) The increase stormwater runoff that would result from this proposed development would be small due to the large lot sizes. However, some of the runoff can easily be detained with a properly designed and adequately maintained sediment basin.

(6) Care must be taken when installing septic systems and foundations in the hayfields and orchard. The Soil Conservation Service Office in Litchfield has helped with subsurface drainage in these fields for better crop production. Interrupting these lines can cause problems for septic leaching fields.

(7) There is also possibilities of installing fire ponds on Lots 14 and 28. However, further investigation would be needed.

(8) It is most likely that the subdivision will result in the end of the apple orchard production. However, with the large lots proposed some apple trees will be left. Proper management with integrated pest management could be used to maintain some production. Appendix B contains information pertaining to integrated pest management and apple orchards.

BIOLOGICAL RESOURCES



The 1979 NPS report, The Shepaug of Connecticut: A Wild and Scenic River Study, identified five major resource values of the Shepaug River needing protection and conservation. They are:

(1) The free-flowing nature of the river.

(2) The existing high water quality of the river.

(3) The visual character of the study site's portion of the river corridor is recognized for its deep valleys, numerous rock outcroppings, and heavily forested hillsides which foster a sense of solitude.

(4) Potential for significant archaeological or historical resources (Figure 9).

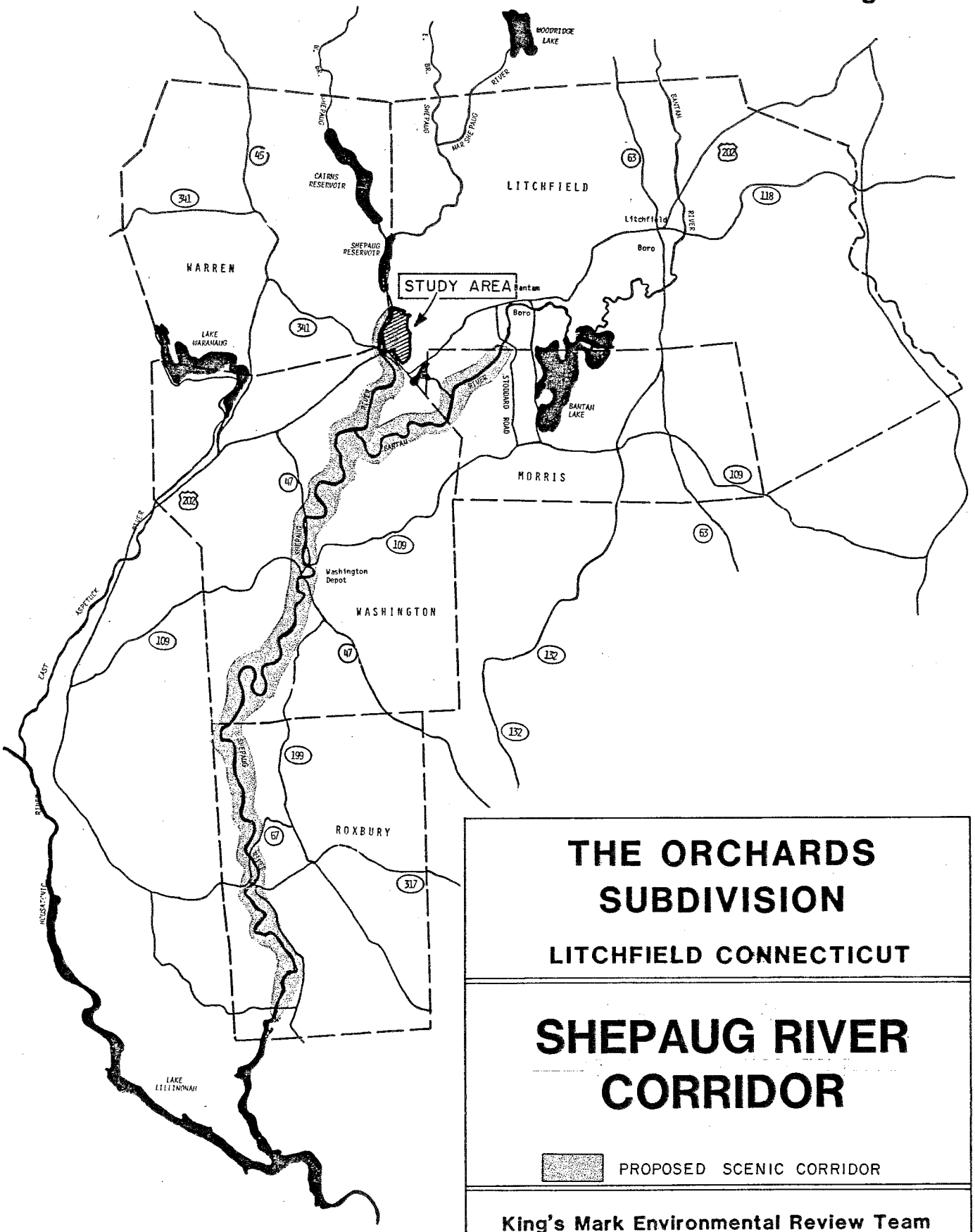
(5) River-related landforms and topography which is unique to the New England Upland Physiographic section.

Also, land-based resource values which are river-related and/or within a quarter of a mile of the river's edge are of special concern It is encouraged that these areas be protected or conserved.

Mitigative Measures to Protect the Shepaug River Corridor

To minimize the enivironmental impact of the Shepaug River, development on the property could be clustered on the relatively gently sloping land in the eastern portion of the property. It is encouraged that development near the 15 percent slope land be minimized and left as wooded open space to protect the Shepaug River scenic corridor and to prevent erosion and siltation into the river. The proposed 200-foot setback/scenic easement from the river or even the dedication of open space near the river would accomplish this goal.

Figure 8



THE ORCHARDS SUBDIVISION

LITCHFIELD CONNECTICUT

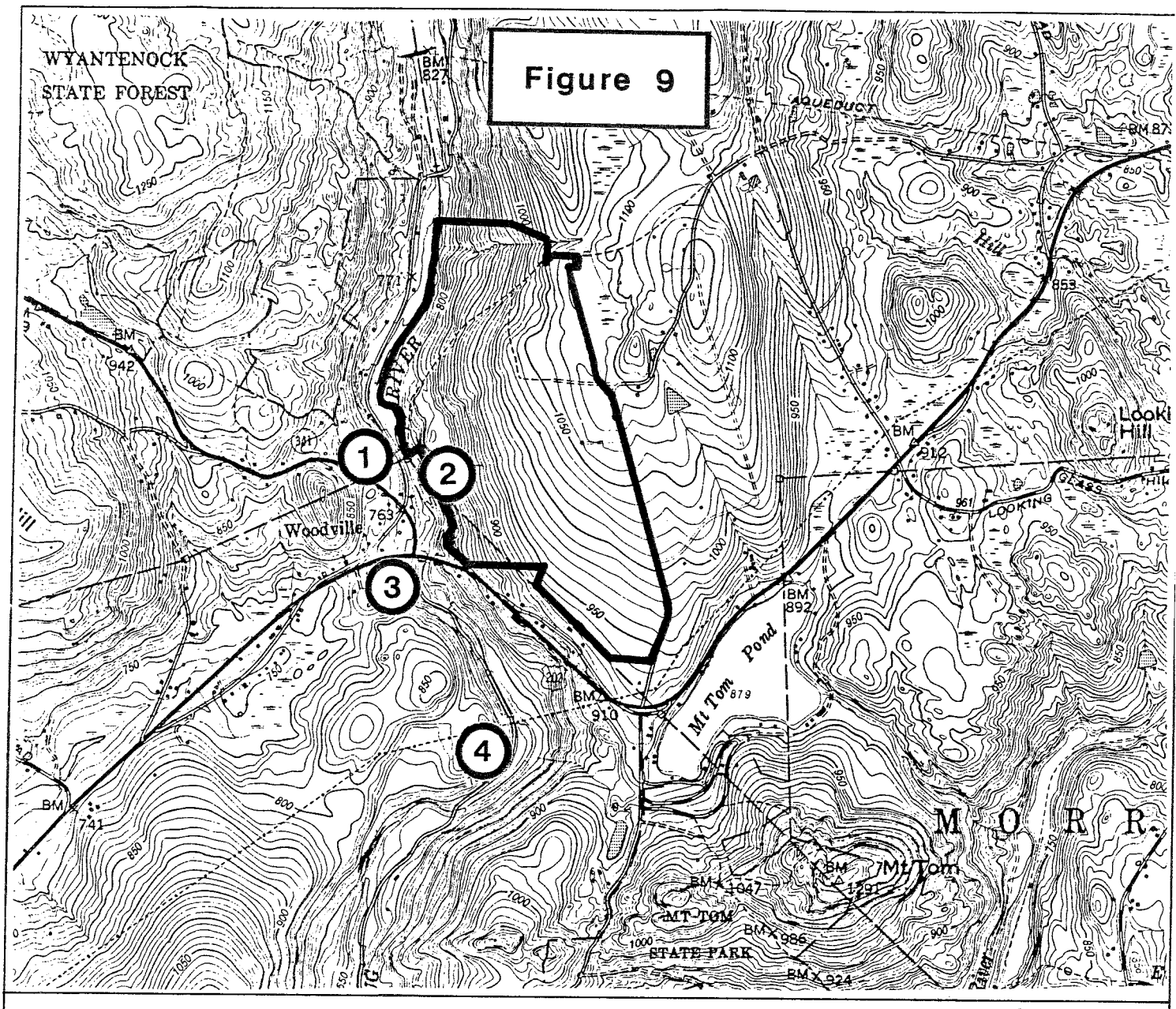
SHEPAUG RIVER CORRIDOR

PROPOSED SCENIC CORRIDOR

King's Mark Environmental Review Team

0 2.5miles

N



1. HITCHCOK-PRATT IRONWORKS - 1782
2. PETERS FORGE - 1799
3. FORBES NAIL WORKS - 1794
4. GUTHRIE FORGE - 1794

THE ORCHARDS SUBDIVISION

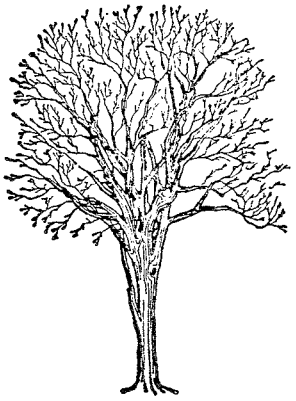
LITCHFIELD CONNECTICUT

SELECTED HISTORIC SITES

King's Mark Environmental Review Team

0 2000'

It is suggested that any development of lots within the eastern fringe of the 15 percent slope land include limitations on the amount of landclearing, and specifically of vista cuts to the west to protect the river's scenic corridor. Such clustering on the higher land may also remove the necessity for building access drives or sedimentation basins in the western portion of the property, and thereby also help protect the scenic corridor.



Wildlife Resources

Introduction

The Town of Litchfield did not specifically request that wildlife resources be assessed by the Environmental Review Team. However, due to the size of the site, the diversity of wildlife habitat, and the extent of the proposed development, the Team felt that some general comments concerning wildlife resources may be helpful with the analysis of this parcel.

Wildlife has four basic needs in which to live and reproduce: (1) food; (2) cover; (3) water, and; (4) space. These four components collectively can be termed habitat, and habitat requirements vary for different species. Although many species show a strong affinity for specific types of habitat, most require a diversity of habitat such as forests, open fields, meadows, open woodland, wetlands, and woodland edges. Diversity of habitats, therefore, becomes one of the key requirements in meeting the varying needs of individual species, and increasing the number of species in a given area.

Wildlife Habitats

The study site exhibits varying degrees of habitat diversity. Existing apple orchards, cropland, and meadow provides excellent habitat for many wildlife species. White-tailed deer, bobolink, American goldfinch and numerous other bird species were observed in these habitat areas during the field review. The aforementioned habitat would be expected to provide important habitat for other

wildlife species as well such as mice, moles, woodchuck, cottontail rabbit, passerines, and other non-game wildlife species.

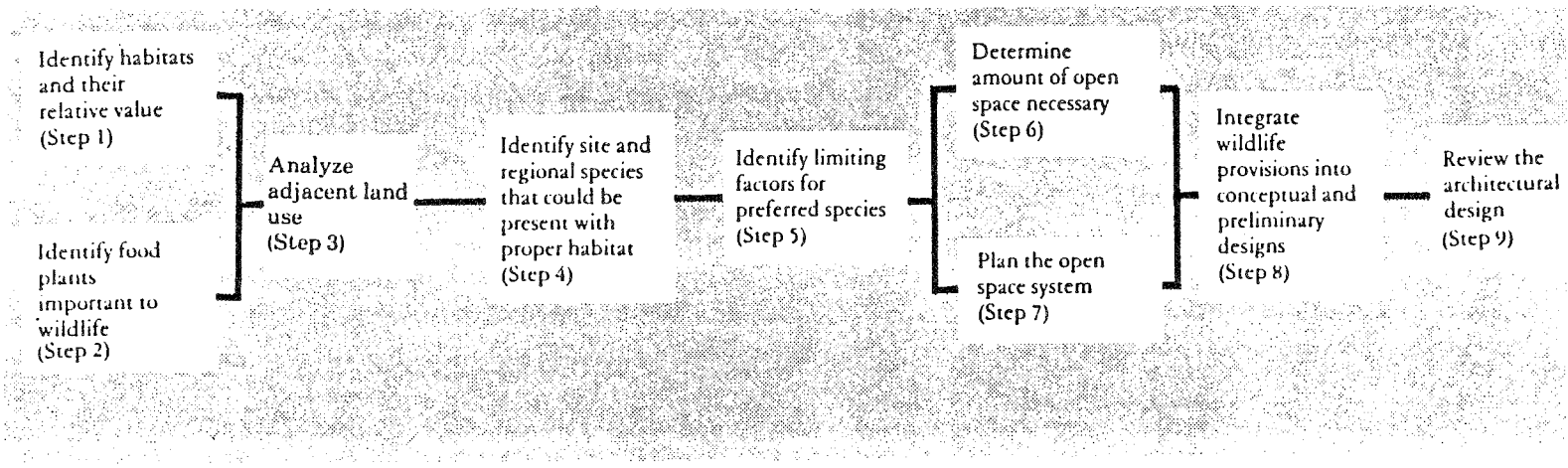
The western portion of the proposed site is characterized by mixed deciduous forest and woodland, with many stone walls traversing the site. Slopes also become steeper in this area as they approach the Shepaug River. Pockets of diseased red pine were also observed in this area. These areas provide important habitat for large and small mammals, birds, reptiles, and amphibians.

The Shepaug River Corridor bordering the western edge of the site provides excellent habitat for many wildlife species. The section of the river abutting the site is dominated by mixed deciduous forest, interspersed with stands of hemlock. The National Park Service report (1979), The Shepaug of Connecticut: A Wild and Scenic River Study, identifies 40 wildlife species utilizing the entire Shepaug River Corridor. Sixteen fish species have also been identified as utilizing the Shepaug River. The report also identified well over 150 breeding and migratory bird species inhabiting the corridor (Appendix C).

Planning for Wildlife Resources in the Proposed Development

Since the site is characterized by having a wide array of wildlife habitats and located in the ecological significant Shepaug River Corridor, designing and planning for wildlife resources is an important consideration. Thus, planning for wildlife can be integrated readily into conventional planning approaches. The following flow chart outlines procedures for incorporating wildlife considerations into site design and development of this site (Figure 10).

Figure 10. Procedures for Integrating Wildlife Considerations into Site Development Plans.



The first step to integrating wildlife into the site design process is to determine the types of habitats that exist on the site. Though this ERT report described general wildlife habitats occurring on the site, a more detailed inventory and assessment would be useful. Once the habitats have been determined, their relative value and potential for habitat development needs to be assessed.

Step two concerns the identification of plant species important to wildlife as food sources. Plants of all types are important to wildlife. However, in relationship to site development and wildlife

planning, the seed-producing species are particularly important in that they provide food, cover, and resting sites. Appendix D provides a listing of plant species valuable to wildlife species as food sources.

Step three in the wildlife planning process analyzes adjacent land uses. Many additional wildlife benefits can be derived from adjoining open space areas. Maintaining wildlife movement corridors through the site and between adjacent lands will also enhance the potential wildlife amenities within the proposed development.

The next step involves the identification of species on the site and in the region (i.e., specifically the Shepaug River Corridor) that could be present if proper habitat were provided.

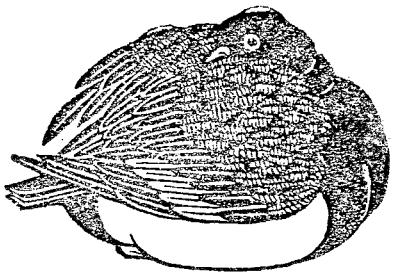
Once other regional wildlife resources have been identified, factors limiting preferred wildlife species need to be addressed.

Step six is the determination of how much open space within the proposed development is needed to maintain existing wildlife species. The size of open areas will vary with the type and extent of development. It can only be assumed that the larger and more diverse the open spaces are within the proposed development area, the more wildlife there is likely to be. As indicated previously, this acreage can be maximized by connecting wildlife corridors with suitable areas adjacent to the proposed development area.

Steps seven, eight, and nine involve specific planning and designing for wildlife in the proposed development. Once existing on-site conditions have been determined and a plan for open space has been devised (Step 7), one can proceed to integrate wildlife into conceptual or preliminary site designs (Step 8) and review

architectural design (Step 9). In most cases, it will be impos ible to incorporate all of the on-site habitats into the design because they may coincide with the areas preferable for site development.

This flow chart and discussion is offered strictly as a guide for the Town and the developer in order to enhance or maintain existing wildlife resources occupying the site. Some steps may be implemented while others may have little or no application to the proposed development.



LAND USE
AND
PLANNING CONSIDERATIONS

Planning and Zoning Considerations

The subdivision regulations require lots to have a 200-foot frontage on an approved road. Local and collector roads must have a 66-foot right of way and a 26-foot pavement. Cul-de-sacs must be 150 feet in diameter with a 75-foot center island. Street grades must not exceed seven percent nor be less than one percent. The zoning regulations allow interior lots, such as Lots 59 and 60, provided that the parcels meet the required area and front width requirements, and that they have an adequate right of way for fire trucks and other emergency vehicles.

It was obvious during the field review that it would be very difficult to combine the proposed residential development of the site with an active working orchard. Doing so would require common ownership of the trees for convenience in leasing to a farmer as well as some separation of homes from the trees to avoid problems from the sprays required to grow apples. This might be possible if clustered homes or townhouse units were allowed. The orchard would take up much of the level land, however, and it would be necessary to find one or more suitable sites for community septic systems as well as for useable open space for the residents.

The major limitations, however, are the difficult soils and steep slopes on the site. The Litchfield Estates Subdivision (Avalon Farms Subdivision) on the eastern side of Old Mount Tom Road was recently approved with five-acre lots. The Litchfield Estates Subdivision has similar soils and much more level topography than the Orchards Subdivision site, and is zoned R-60 (60,000 square foot lots). It seems likely that many lots in the proposed subdivision will require

engineered septic systems and that some of the 2 to 3 acre lots will have to be enlarged.

Also, half of the site has slopes of 10 to 20 percent or more. Many lots will have steep driveways of 10 percent or greater, which will present problems of access in icy conditions. This affects most of the lots abutting road "A" and its cul-de-sac (see Figure 2). Lots 59 and 60 have even greater problems in that they are reachable only by a 1200 to 1500 right-of-way along the old stage road which has an average slope of nine percent. Unless this road is fully improved, there will be very poor access to these homes for emergency vehicles, as well as for the owners in bad weather. It is suggested that these lots be re-examined or re-evaluated due to of lack of good access.

Removing these lots would reinforce the 200-foot conservation easement the developers have agreed to provide along the Shepaug River to retain the scenic aspects of the view. The developers were also asked to provide deed restrictions preventing clearance of the steep slopes by future owners. The scenic and historic aspects of the site could also be improved by retaining as many of the old stone walls as possible. The proposed roads and cul-de-sacs eliminate extensive lengths of the old stone walls which could be saved through minor modifications of the plan.

Traffic and Access

A review of the Orchard Subdivision involves two traffic issues: (1) Route 202-Old Mount Tom Road intersection, and; (2) general circulation via Goslee Hill Road.

The accident experience at the intersection of Old Mount Tom Road and Route 202 has been low. This is to be expected with the low traffic volumes on Old Mount Tom Road. The options relative to the Old Mount Tom Road and Route 202 intersection are:

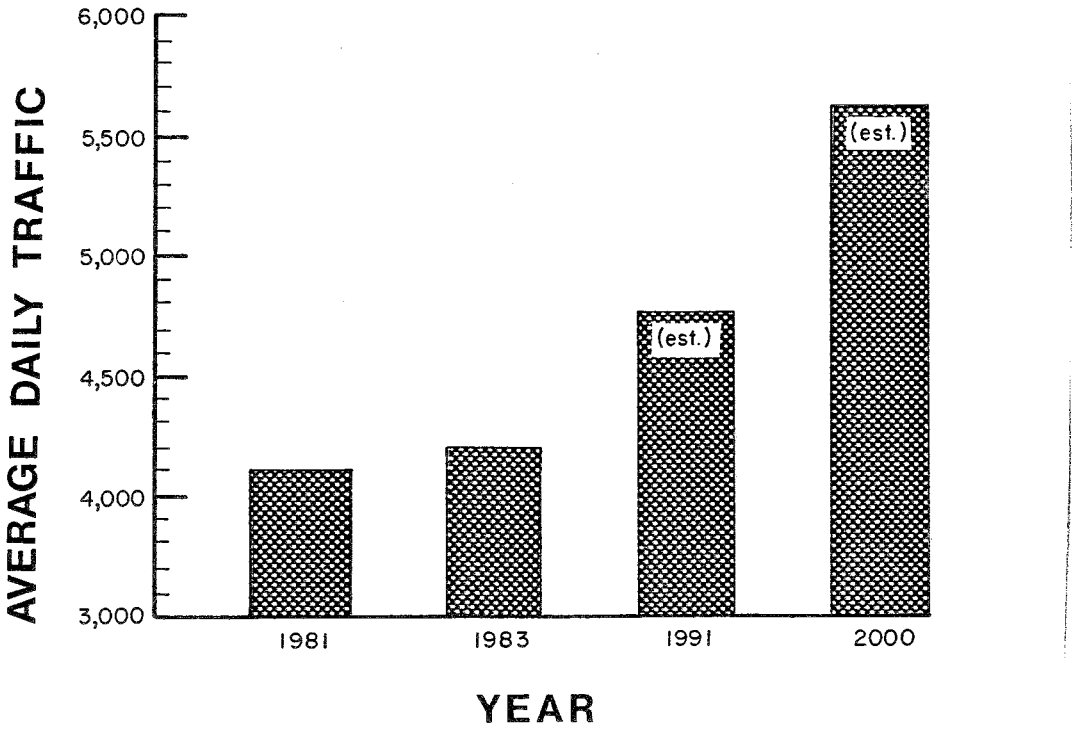
(1) Abandon Old Mount Tom Road.

(2) Improve the existing intersection with sightline improvements and by-pass lane.

(3) Relocate the intersection to the east with appropriate sightline distances (800 feet to 950 feet) and a by-pass lane.

Traffic counts and projections on Route 202 at Goslee Road is about the same as it is at Old Mount Tom Road (Figure 11):

Figure 11. Projected Traffic Volumes.



The development of 60 house lots could generate 480 trips. If 30 percent were in a westerly direction, the number of left-turns onto Old Mount Tom Road could approach 90 turning movements, which combined with the potential of developing the lots in the Litchfield Estates Subdivision, could increase safety problems at the intersection. Presently, the unpaved section of Old Mount Tom Road is a deterrent to traffic using this intersection. Abandonment is a reasonable solution to the potential problems of traffic increases on Old Mount Tom Road. Drainage on Route 202 must also be considered if Old Mount Tom Road is improved.

The location of roads within the subdivision should be reviewed to determine if adjustments can be made to bias traffic towards Goslee Road. The southerly intersection of Road "A" in the proposed subdivision plan (see Figure 2) could terminate into a cul-de-sac to contain the traffic within the subdivision. Access to lots off Old Mount Tom Road would be by way of Road "B" (see Figure 2). This intersection may require some adjustments to facilitate turning movements.

Coordination and approval of any activities relative to improvements of the Old Mount Tom Road intersection with Route 202 must be made with the Department of Transportation (DOT) District 4 Office, (New Milford), and the State Traffic Commission.

Traffic and Access Improvements

The following suggestions may be useful in improving the overall traffic and access concerns of the proposed subdivision development:

(1) The preferred option would be to abandon Old Mount Tom Road and generated traffic utilizing Goslee Road.

(2) If Old Mount Tom Road is relocated, the following considerations would be necessary:

(a) Sightline distance between 800 and 950 feet measured 10 feet from the curbline is necessary.

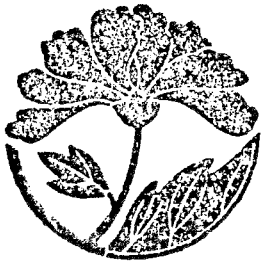
(b) The cut slope should be 1V to 2H along Route 202.

(c) Drainage must be reviewed to insure existing Route 202 drainage has the capacity to accept any additional run-off from the relocated Old Mount Tom Road.

(d) The profile of Old Mount Tom Road must be adjusted to provide adequate landing area for stopped vehicles at the intersection with Route 202.

(e) The cut slope on Old Mount Tom Road should be adjusted to provide and enhance the sightline, especially to the west.

(3) A State Traffic Commission action will be required as well as coordination with the DOT's New Milford Office.



On-site Subsurface Sewage Disposal

Since preliminary soil testing has not been performed over the majority of this site, the only sources of information relative to the existing soil and hydrologic conditions were from the Soil Survey of Litchfield County prepared by the Soil Conservation Service and a soils map prepared for the developer by the firm of Soil Science Surveys, dated July 1, 1986.

A review of the soil classifications outlined in these documents indicate that major portions of the site consist of soils which would be deemed severe and of "special concern" relative to the installation of subsurface sewage disposal systems.

The upper portion of the property consists mainly of Woodbridge and Paxton-type soils. These soils are limited predominantly by the seasonal high water table and by the slowly permeable substratum. The middle to lower portions of the site, down to the Shepaug River, are composed extensively of steeply sloping Woodbridge and Paxton soils with Ridgebury drainageways dissecting the property in four or five places.

The main concern relative to these types of soils is the ability of the naturally occurring soils to adequately absorb or disperse the expected volume of sewage effluent without overflow, breakout or detrimental effect on ground or surface water. In order to determine the feasibility for subsurface sewage disposal on each of the proposed lots of this proposed subdivision extensive site testing must be performed.

The tests must determine maximum ground water levels, the ledge profile both in the system area and immediately downgrade from it,

the depth from existing grade of the compact "hardpan" layer and the percolation rates of both the subsoil and compact substratum layers.

With the above information known, lot feasibility can be determined using the following criteria for systems installed on hillsides with shallow hardpan conditions present:

(1) Determine that ledge will not interfere with the performance of the leaching system (i.e., minimum of 48 inches of soil must exist).

(2) Depth of pervious subsoil layer must be greater than 24 inches thick.

(3) If impervious soil (percolation slower than one inch in 60 minutes) is encountered between 24 inches and 36 inches in depth, then the subsoil must have percolation rate of one inch in 20 minutes or faster.

(4) Perched groundwater must be effectively controlled by the use of upgrade interceptor curtain drains. This drainage should be discharged to storm drains in the road or adjacent watercourses and wetlands.

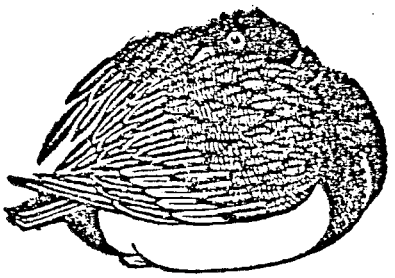
(5) When the impervious "hardpan" layer is found between 24 inches and 36 inches below existing grade, then the minimum lateral dispersal length (i.e., length the leaching system is spread along the existing ground contour) shall be 150 feet. Note: This requirement may necessitate the widening some lots.

In summary, complete soil testing should be performed prior to subdivision approval in order to assure that satisfactory leaching areas exist on each of the proposed lots. The tests should be conducted by an engineering firm under the supervision of a professional engineer licensed by the State of Connecticut and witnessed by the staff of the Torrington Area Health District. 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 District for review and approval by their certified staff.

Due to the large lot sizes proposed, it is probable that suitable leaching areas can be identified on the majority of the proposed lots. If testing determines critical portions of a lot "unbuildable," appropriate changes to property lines can be made in order to establish that each lot on the proposed subdivision can ultimately support on approved subsurface sewage disposal system for a single-family home.

APPENDICES



APPENDIX A

SOILS LIMITATION CHART

SOILS LIMITATION CHART

THE ORCHARDS SUBDIVISION - LITCHFIELD, CT.

MAP UNIT *	GENERAL SOIL PROPERTIES	DRAINAGE CLASS & DEPTH TO SEASONAL HIGH WATER TABLE	MAJOR LIMITATIONS FOR THE DEVELOPMENT OF:		
			HOMES WITH BASEMENTS	ONSITE SEPTIC SYSTEMS	ROADS & STREETS
ChC-Charlton-Hollis Complex, very rocky, 3-15% slopes	Glacial till soils from deep to shallow over bedrock formed in loamy materials	Well drained to excessively drained	Variable depth to bedrock	Depth to bedrock variable depth to bedrock	Depth to bedrock
ChD-Charlton-Hollis complex, very rocky, 15-35% slopes	Glacial till soils from deep to shallow over bedrock formed in loamy materials	Well drained to excessively drained	Variable depth to bedrock slope	Depth to bedrock slope	Depth to bedrock slope
OcB-Occum fine sandy loam, 0-8% slopes	Alluvial soils formed in loamy over sandy and/or gravelly materials	Well drained >3 ft.	Flooding	Flooding	Flooding
PbB-Paxton fine sandy loam 3-8% slopes	Glacial till soils formed in dense loamy materials	Well drained 1.5-2.5 ft.	Seasonal wetness	Substratum percs slowly	----
PbC-Paxton fine sandy loam, 8-15% slopes	Glacial till soils formed in dense loamy materials	Well drained 1.5-2.5 ft.	Seasonal wetness slope	Substratum percs slowly slope	Slope
PbD-Paxton fine sandy loam, 15-25% slopes	Glacial till soils formed in dense loamy materials	Well drained 1.5-2.5 ft.	Slope	Substratum percs slowly slope	Slope
PbE-Paxton fine sandy loam, 25+% slopes	Glacial till soils in dense loamy material	Well drained 1.5-2.5 ft.	Slope	Slope Subatratum percs slowly	Slope
RdB-Ridgebury fine sandy loam, 3-8% slopes	Glacial till soils formed in dense loamy materials	Poorly drained 0-1.5 ft.	Wetness	Wetness Substratum percs slowly	Wetness subject to frost action
SvB-Sutton fine sandy loam, 3-8% slopes	Glacial till soils formed in loamy materials	Moderately well drained 1.5-2.5 ft.	Seasonal wetness	Wetness	Subject to frost action

SOILS LIMITATION CHART

THE ORCHARDS SUBDIVISION - LITCHFIELD, CT.

MAP UNIT *	GENERAL SOIL PROPERTIES	DRAINAGE CLASS & DEPTH TO SEASONAL HIGH WATER TABLE	MAJOR LIMITATIONS FOR THE DEVELOPMENT OF:		
			HOMES WITH BASEMENTS	ONSITE SEPTIC SYSTEMS	ROADS & STREETS
WxB-Woodbridge fine sandy loam, 3-8% slopes	Glacial till soils formed in dense loamy materials	Moderately well drained 1.5-2.5 ft.	Seasonal wetness	Wetness Substratum percs slowly	Subject to frost action
WxC-Woodbridge fine sandy loam, 8-15% slopes	Glacial till soils formed in dense loamy materials	Moderately well drained 1.5-2.5 ft.	Seasonal wetness	Wetness Substratum percs slowly	Subject to frost action

(*) - Map units were not separated by surface stoniness.
Any map unit may include stony and non-stony soils.

APPENDIX B

INTEGRATED PEST MANAGEMENT AND APPLE ORCHARDS

INTEGRATED PEST MANAGEMENT

FOR CONNECTICUT APPLE ORCHARDS

COOPERATIVE EXTENSION SERVICE
COLLEGE OF AGRICULTURE AND NATURAL RESOURCES
THE UNIVERSITY OF CONNECTICUT, STORRS, CT 06268

Integrated Pest Management for Connecticut Apple Orchards

Roger G. Adams (Extension Entomologist)
David A. Kollas (Extension Pomologist)
Department of Plant Science, University of Connecticut, Storrs

During the 1950's and 1960's many new pesticidal chemicals became available to orchardists. Their use became widespread as the standard tool for combatting most orchard pests. Pesticides were easy to use, inexpensive, and initially provided rapid and highly effective control of a wide range of pests. However, over the years several weaknesses in the prevailing approach to pest control became apparent. This has necessitated a re-thinking of pest control strategies. Some of the problems included: the development of pesticide-resistant pests, elimination of natural enemies, stimulation of secondary pests and concern over damage to the environment. In addition, changes in application techniques, technology advances, rising chemical and energy costs, government regulations, and a slowed rate of new product development have also altered the situation.

Integrated Pest Management (IPM) is a comprehensive pest control strategy whose objective is to obtain the necessary control of plant pests while minimizing the costs and any undesirable effects of the control. Modern pest management attempts to integrate precision timing, efficient and accurate application, biological control agents, and appropriate cultural practices. Let's take a closer look at some of the significant problems and changes that have brought about the need for putting IPM methods into practice.

Pest resistance to pesticides. Continued and frequent use of certain pesticides has resulted in the selection of pest strains that are resistant to formerly effective materials. This has reduced the effectiveness or eliminated the use of certain pesticides against a number of pests. In some instances resistance has developed after only a few years of use. Because

few new pesticides are being registered for use, any materials lost to resistance are not readily replaced. In general, the higher the dosage rate and the greater the frequency of application of a given pesticide the more rapidly the resistance process progresses.

Reductions in natural enemies. Non-selective broad-spectrum pesticides reduce predatory, parasitic, and competing species. This allows more rapid and frequent build-up of both primary and secondary (new) pest species, thus requiring additional pesticide treatments. These additional treatments can further hasten the resistance process, and pose an additional threat to predators and parasites of pests.

Environmental concern. Many people are concerned about the effects of pesticides on the environment. Nevertheless, pesticides will continue to be a necessary pest control tool. Apple growers, as major pesticide users, must be aware of this concern and do whatever they can to minimize potential problems.

Cost of pesticides and energy. The cost of developing new pesticides with fewer undesirable features has risen at a rapid rate. Yet the expected market life of new pesticides is often shorter now than it used to be, because of the development of pest resistance, product competition, and advances in pest control technology. Shorter market life and increased development cost lead to higher price to the grower. Pesticides are no longer cheap.

The current high cost of energy influences the cost of machinery operation and pesticides. Every spray application is now made at substantial expense to the grower.

Concentrate spray application. Orchard sprays that used to be applied dilute to completely wet the trees are now commonly applied more concentrate (low volume). Proper use of concentrate spraying permits pest control with less pesticide as well as less water and labor. However, pesticide drift may be a problem and proper calibration and coverage become critical.

Greater orchard diversity. Trees in the orchards of the 1950's and 1960's were generally quite uniform in size and spacing. Introduction of dwarfing rootstocks, interstems, and spur-type varieties has changed that situation. As older blocks are gradually removed and replanted, the diversity in row spacing and tree size on each farm is increased. Proper calibration of sprays becomes more complicated, and points to another area for IPM effort, namely block-specific calibration to reduce excess spray and achieve optimum spray coverage.

The ability to control tree size, and the possibility of training trees to uniform thin canopies gives today's orchardists new opportunities to use cultural techniques to substantially improve the efficiency of pesticide usage.

This bulletin was prepared to acquaint orchardists with the concepts and methods of the University of Connecticut's Apple IPM program and to aid growers in adopting and utilizing IPM methods in their own orchards.

The value of IPM is measured in pest control efficiency, safety and cost. IPM growers have the satisfaction of knowing that their pest control efforts are based upon the best available information.

IPM, however, is not as easy as calendar schedule spraying. Effective use of IPM requires more knowledge and precision than standard spray programs. New information is continually being added to the base of knowledge upon which IPM decisions are founded.

IPM also requires that time be spent making systematic observations in the orchard. Decisions can be made only after answering such questions as: What pests are present, and in what numbers and what stages of development? What beneficial species are present? What is the action threshold for the pest? What pest management options are available, and how do the advantages and disadvantages of each apply to this situation?

The action threshold is the number of pests or the pest's activity level that economically justifies treatment. At pest numbers or pest activity below the action threshold, the cost of applying a pesticide treatment would not be offset by increased crop value. A few individuals of certain pest species can be tolerated in orchards without causing economic loss.

The options for pest control in the IPM philosophy include use of registered pesticides, as well as use of non-pesticidal cultural practices such as pruning, training cultivation, mowing, trapping, sanitation, mechanical barriers, etc. Additional considerations include pesticide rates, timing, selectivity, method of application, weather conditions during application, and the use of biological control agents.

Use of genetically resistant varieties is an option at the time orchards are planted. Genetic resistance to the major apple diseases is currently available in some new varieties. Practical insect resistance is yet to be demonstrated, but varietal differences in susceptibility to certain pests do exist.

The IPM philosophy requires that treatments be tailored to the specific situation, utilizing available knowledge and available tools. Therefore, the appropriate treatment at any given time may not be the same for every orchard, nor is it likely that the treatment for a given pest will remain the same throughout the season. We can expect continuing development and refinement of IPM practices as knowledge increases concerning pests and their interaction with the environment, and as new pesticides and alternative management techniques are developed.

The University of Connecticut Apple IPM Program currently utilizes insect trapping systems, orchard scouting, selective materials and dosage rates which allow survival of beneficial species, and accurate block-specific spray calibration with emphasis on uniform coverage and drift control.

Trapping systems: These may be either visual or sex pheromone traps. Visual traps are thought to be effective because of their ability to mimic certain plant parts, such as flowers, fruits, or leaves. For example, the white sticky rectangle trap mimics apple blossoms. The adult European apple sawfly, which normally lays its eggs at the base of apple flower petals in the calyx cup, is attracted to and captured on the trap. Just any white colored trap will not attract this pest. Research has shown that the sawfly sees reflected ultra-violet light, as well as visible light. It is attracted only to white lures that have the same ultra-violet reflectance as apple blossoms.

Sex pheromones are chemical odors emitted by certain female insects. Pheromones can be detected by males of the same species at great distance, and serve to lead them to the odor source for mating. Chemists have identified and synthesized pheromones from a number of plant pests, including several apple pests. The synthetic pheromones can be encapsulated and placed in a sticky trap in the orchard. Males of the particular pest that detect the pheromone are attracted and become captured on the sticky surface of the trap.

Insects captured on either visual or sex pheromone traps can be identified, counted and removed at regular intervals to monitor the presence and abundance of the pest. Treatment decisions can be made for several pests based upon trap captures.

Scouting: Scouting involves spending time in the orchard at regular intervals systematically checking leaves, fruits, terminals, etc. for pests, checking traps and recording the information so that it can be used in making pest management decisions. The scout may be the grower, one of his regular employees, or a contract scout who covers several farms. Standardized orchard scouting and pest monitoring is the backbone of an apple IPM program. Most growers spend a lot of time in their orchards anyway. Systematic scouting is more time efficient and accurate than casual observation. In addition, spraying is also very time consuming. The scouting and monitoring will help to indicate whether the spray is needed, and if so, the best time for application. In this way the grower gets the greatest benefit for his spray dollar.

Selective materials: Selective pesticides are effective against a few pest species and often allow beneficial species to survive treatments. Broad-spectrum pesticides, however, are often lethal against many pest and non-pest species. Most of the pesticides listed in this manual are relatively selective. However, Lannate, Vydate and the synthetic pyrethroids (Pydrin, Ambush and Pounce) are harsh on beneficial species and should be used only Pre-Bloom or as a last choice at other times.

Selective rates: For certain pests, lower than normal dosage rates can be effective. Such rates reduce the pest to acceptable levels while allowing beneficial species to survive and continue to provide natural control. Such selective rates have been used successfully for aphids and apple maggot flies.

Accurate calibration and uniform coverage: Accurate calibration refers to adjusting the pesticide application rate per acre to match the amount of tree surface per acre. This requires that one know: 1) the number of acres that can be uniformly treated with one sprayer tankful; and 2) the amount of pesticide to be placed in the sprayer tank.

Because of the considerable diversity in tree size and spacing, several calibrations may be required. That is, the calibration should be block specific to assure that the minimum necessary material is being used. This subject is discussed in detail in a separate University of Connecticut publication "Block-specific calibration for airblast spraying in apple orchards". It is available from the authors of this bulletin.

Drift control means keeping the pesticide on target. Drift of pesticides off target represents reduced pest control, or extra cost, and often presents a potential hazard to plant, animal or human health. Efforts to minimize drift should be a part of every pest management program.

The following section presents the current monitoring and scouting methods, action thresholds, and management suggestions for several insect and mite pests of apples in Connecticut for 1984. This will be updated annually and will serve as a comprehensive guide for implementation of IPM methods in Connecticut orchards.

Sources for purchasing monitoring traps are given at the end of this publication.

1. TARNISHED PLANT BUG (TPB)

A. Monitoring:
- non ultraviolet (UV) reflecting sticky white rectangles hung low in apple trees at 2 to 3 feet from the ground.
- monitor each week from Silver Tip through Petal Fall.
- use 1 trap every 3-5 acres.
- locate traps near block periphery, 1 or 2 rows in from the outermost row near wooded areas or brush piles.

B. Action threshold:
- cumulative capture of 6 TPB adults/trap by Tight Cluster. For example - Let's assume that 3 traps are used. The first week, 0,1, and 2 TPB are captured on the traps, for a total of 3 TPB or an average of 1 TPB per trap. The second week the traps captured 3, 5 and 1 TPB, for a total of 9 or an average of 3 TPB per trap. The cumulative capture is the sum of the average capture for each week, in this case 1 + 3 = 4 TPB per trap. In this case, the total is below the action threshold so no TPB spray is needed unless the cumulative capture of 6 TPB per trap is exceeded by Tight Cluster.

C. Treatment (if threshold exceeded):
- Guthion 50 WP (1/2 lb./100 gal.) or Imidan 50 WP (1-1 1/2 lbs./100 gals.) at Pink.
- or Synthetic Pyrethroids : Pydrin, Ambush, or Pounce at Pink if not applied earlier for adult leafminer control. See the leafminer treatment section for rates.
- Treatments earlier than Tight Cluster provide little TPB control.

2. EUROPEAN APPLE SAWFLY (EAS)

A. Monitoring:
- non UV reflecting sticky white rectangles hung in apple trees 5 to 6 ft. from the ground.
- position traps on south side of tree near blossom clusters at about head height.
- monitor each week from Early Pink to 1 week after Petal Fall.
- use 1 trap every 3-5 acres. Place traps on periphery of orchard (one row in from outermost row) near any abandoned apple trees.

B. Action threshold:
- cumulative capture of 3 EAS/trap reached at 90% Petal Fall in blocks where no Pink stage insecticide was applied, or a cumulative capture of 6 EAS/trap by 90% Petal Fall in blocks sprayed at Pink.
- see the TPB section B for an example of obtaining the cumulative capture.

European Apple Sawfly (con't)

C. Treatment
- Guthion 50 WP (1/2 lb./100 gal.) or Imidan 50 WP (1- 1 1/2 lbs/100 gal.) at 90% Petal Fall after beehives have been removed from the area and if thresholds are reached or exceeded.
- Synthetic Pyrethroids such as Pydrin, Ambush, or Pounce may provide some EAS control through bloom when applied at Pink. See Apple Blotch Leafminer for rates.

3. PLUM CURCULIO (PC)

A. Monitoring:
- inspect 30-60 fruits on at least one tree/acre to detect signs of fresh PC egg-laying. Border trees near woods are often first to show injury. Injury will appear as 1/8" crescent-shaped cuts on the fruits.
- begin fruit inspections at Bloom and continue through mid-June.
- apricots, peaches, plums, and nectarines may be attacked before apples, therefore, check these tress to also help determine earliest activity.

B. Action threshold:
- 1 fresh sting/300-600 fruits/10 acres.

C. Treatment:
- Guthion 50 WP (5/8 lb./100 gal.), or Imidan 50 WP (1-1 1/2 lbs/100 gal.) starting at Petal Fall when threshold is reached or exceeded. Additional treatments may be needed based on continued PC activity.
- See Penncap-M note under San Jose Scale Section B. Penncap-M (1 1/2 pts/100 gal.)
- DO NOT use Penncap-M at Petal Fall.

4. APPLE BLOTCH LEAFMINER (ABLM) and SPOTTED TENTIFORM LEAFMINER (STLM)

A. Monitoring:

1. For adults (moths): hang sticky red rectangular traps at chest height inside the apple tree canopy.
   - use 1 trap every 3 acres.
   - check traps each week from Silver Tip through Late Pink.

2. For 1st brood (sap-feeding) larvae: begin monitoring just before Petal Fall and continue at weekly intervals for 2 weeks after Petal Fall.
   - examine 20 cluster leaves/tree on at least 5 trees/block. Sample leaves from the inside, outside, and top portions of trees.
   - look carefully for young mines. Hold leaves up to sunlight to aid in detection.

Apple Blotch Leafminer (con't)

3. For 2nd brood larvae: begin monitoring in late June and continue at weekly intervals through July. Sample, as decribed above, checking young fruit cluster leaves. Count only second brood sap-feeding mines at this time.

B. Action threshold:
1. treatment for adults should be applied at Tight Cluster or Pink when leafminer moths begin to be captured on red rectangles.
2. treatment should be made if first brood sap-feeding mines exceed an average of 0.13 mines/leaf (or 13 mines/100 leaves) on stressed trees, or 0.50 mines/leaf on unstressed trees.
3. for second brood, treat only if the average number of sap-feeding mines exceeds 1.0/leaf for stressed trees, 2.0/leaf for unstressed trees.
4. treatment for third brood is not suggested.

C. Treatment (if thresholds reached or exceeded):
1. For adults - Synthetic pyrethroids such as Pydrin 2.4 EC (2 2/3 ozs./100 gal.), Ambush 2 EC (3.2 ozs./100 gal.), or Pounce 3.2 EC (2 ozs./100 gal.) applied at Tight Cluster or Pink. May also provide some egg control.
2. Lannate L (1 qt./100 gal.) at Petal Fall and/or in July for sap-feeding larvae.
3. or use Vydate (1-2 pts./100 gal.) for adults and larvae at Pink (before any petals open) and/or sap-feeding larvae in July. DO NOT use Vydate at Petal Fall or for 30 days thereafter because fruit thinning may occur.

5. SAN JOSE SCALE (SJS)

A. Monitoring:
- hang pheromone traps at Pink to capture adult males during Bloom or Petal Fall and again in mid-July (not recommended for growers).
- detect the first emergence and peak emergence of the crawler stage in mid-June and again in mid-August. Locate scale infested branches in mid-May and wrap black electrician's tape around the branch at each end of the infested area, and coat the middle section of the tape with a very thin film of petroleum jelly. Check often during June and August for minute yellow crawlers on the black tape. They are very small!!

San Jose Scale (con't)

B. Economic threshold and treatment:
- treat the following year blocks where 0.10% or more of the fruits are SJS infested.
- Superior oil (60-70 sec. viscosity, 2 gals/100 gal.) at Half-Inch Green. If mites are also of concern, this 2% oil treatment can be applied as two 1% oil sprays at Half-Inch Green and Tight Cluster.

- For crawlers: Apply treatments on an individual block basis using Lorsban 50 WP(1/2 - 1 lb./100 gal.), Penncap-M (1 - 1 1/2 pts/100 gal.), Guthion 50 WP (1/2 lb./100 gal.), or Diazinon 50 WP (1/2 lb./100 gal. after second cover with other insecticides at half rates). Treat when crawlers become active and again when their numbers peak. Proper timing and good coverage are essential.
- DO NOT use Penncap-M before First Cover or whenever there is any bloom in the ground cover. Penncap-M is very toxic to honey bees and is carried in treated pollen back to hives where serious bee kills can occur.
- if control of first brood crawlers is inadequate, and second brood crawlers are observed, 2 sprays in August may be needed. Base the timing on monitoring individual blocks.
- Diazinon applied from Pink through First Cover may cause fruit russeting.

6. MITES

A. Monitoring:
- examine 5 hardened-off leaves from 4 trees/acre each week from Bloom through August. Monitoring weekly during hot, dry weather in mid-summer is essential.
- using a handlens count all active stages of pest and predator mites. Predator mites are more active than pest mites and are tear-drop shaped.
- use "hot-spot" trees for examination, if available. Red Delicious and Baldwin varieties are especially mite susceptible. Also, note mite status when monitoring for other pests.

B. Action threshold:
- apply treatment on an individual block basis when an average of 5 active stage mites/leaf is reached for that block. This is a conservative threshold for orchard mites.

Mites (con't)

C. Treatment:
- Superior Oil (60-70 sec. viscosity, 1 gal./100 gal.) at Tight Cluster is the backbone of good early season mite management. Good coverage is essential. Dilute and near-dilute sprays give better coverage than low volume sprays.
- Plictran 50 WP (4-6 ozs./100 gal.), or Kelthane 4F (1 pt./100 gal.). Dikar 72 WP (2 lbs./100 gal.) used as a regular fungicide treatment when active mites are fewer than 5/leaf helps to hold the mite population below the action threshold. Dikar is effective against scab, rust, and powdery mildew. Use two back to back applications of Plictran or Kelthane at 5-7 day intervals. Omite is a choice after Second Cover.

7. GREEN APPLE APHID (GAA)

A. Monitoring.
- inspect 15 current season shoots (not watersprouts) on 2 trees/acre for aphids and predators. Eggs and larvae (maggots) of the cecidomyiid, Aphidoletes aphidimyza, are small and bright orange in color. Syrphid fly eggs are white and the maggots are mottled yellowish-brown. The maggots of these predators feed on aphids.
- examine 15 apples on 2 trees/acre for the presence of aphids and/or honeydew droplets on the fruit.
- monitor from mid-May through August.

B. Action Threshold:
- treat if 10% or more of the fruit has honeydew and/or aphids.
- rain will remove fresh honeydew from fruits.

C. Treatment.
- Superior Oil (1 gal/100 gal) alone, or Ethion-Oil (1 gal/100 gal) at Tight Cluster. This is also the best timing for mite management with oil. Ethion can be injurious to Wealthy, Astrachan, and Melba varieties.
- Thiodan 50 WP (1/2 lb/100 gal), or Phosphamidon 8 EC (3 oz/100 gal) if threshold is reached.

8. ROSY APPLE APHID (RAA)

A. Monitoring.
- inspect 15 flower cluster leaves on 4 trees/acre each week from Half Inch Green to Pink. Look for rosy-purple colored aphids on the undersides of leaves, especially curled leaves.

Rosy apple aphid (con't)

B. Treatment.
- Lorsban 4 EC (1 pt/100 gal) at Half Inch Green can be added to the 1% oil spray for San Jose Scale.
- Phosphamidon 8 EC (4 oz/100 gal), or Pydrin 2.4 EC (2 2/3 ozs/100 gal) at Tight Cluster to Pink. Control at Petal Fall or later is not as effective.

9. WOOLY APPLE APHID (WAA)

A. Monitoring.
- examine 15 recent pruning cuts above the 3 foot level on 1 tree/acre for WAA.

B. Action Threshold.
- treat if 50% of the cuts are infested.

C. Treatment.
- Thiodan 50 WP (1 lb/100 gal), Penncap-M (1 1/2 pts/100 gal), Cygon 4 EC (3/4-1 pt/100 gal), or Phosphamidon 8 EC (1/4 pt/100 gal) if threshold is reached. - See Penncap-M note under San Jose Scale Section B.

10. APPLE MAGGOT (AM)

A. Monitoring.
- hang Tanglefoot-coated red spheres 5-6 feet from the ground and about 2 feet in from the outermost foliage of apple trees.
- traps should be clear of leaves and other obstructions, but should be within 1 1/2 feet of developing fruits. Make sure that the trap will be visible to incoming flies.
- count and remove AM flies from the traps each week from late June through September.
- use 1 sphere/3-5 acres. Select trees near the perimeter of the orchard near abandoned trees, if present.

B. Action Threshold.
- treat within 7 days of the capture of the first female AM fly.
- when a spray is applied for AM, remove but discount any AM trap captures for the following 14 days after treatment. A second treatment should be made only if new AM adults are captured after the 14 day residue period. AM flies are killed by the spray residue.

C. Treatment.
- Guthion 50 WP (1/4 lb/100 gal), Imidan 50 WP (1 lb/100 gal), Penncap-M (1 1/2 pts/100 gal), or Lorsban 50 WP (1/2-1 lb/100 gal). See Penncap-M note under San Jose Scale Section B.

11. Miscellaneous

The following insect species are also monitored by the Connecticut Apple IPM program: codling moth, redbanded leafroller, obliquebanded leafroller, fruittree leafroller, lesser apple worm, tufted apple budmoth, oriental fruit moth, and white apple leafhopper.

Traps can be purchased from the following sources:

Applied Pest Management Research, Inc.
P.O. Box 938
Amherst, MA 01004
(source of red spheres, white and red sticky rectangles)

Zoecon Corp.
975 California Ave.
Palo Alto, CA 94304
Telephone: (415) 857-1130
(source of pheromone traps)

Albany International Corp.
Controlled Release Division
110 A Street
Needham Heights, MA 02194
Telephone: (617) 449-3970
(source of pheromone traps)

Biolure
Bend Research Inc.
64550 Research Road
Bend, OR 97701
Telephone: (503) 382-4100
(source of pheromone traps)

APPENDIX C

WILDLIFE SPECIES FOUND IN THE SHEPAUG RIVER CORRIDOR

MAMMALS

Virginia Opossum (Didelphis marsupialis)
Common Mole (Scalopus aquaticus)
Hairy-Tailed Mole (Parascalops breweri)
Star-Nosed Mole (Condylura cristata)
Masked Shrew (Sorex cinereus)
Northern Water Shrew (Sorex palustris)
Shorttail Shrew (Blarina brevicauda)
Little Brown Bat (Myotis lucifugus)
Silver-Haired Bat (Lasionycteris noctivagans)
Eastern Pipistrelle (Pipistrellus subflavus)
Big Brown Bat (Eptesicus fuscus)
Red Bat (Lasiurus borealis)
Hoary Bat (Lasiurus cinereus)
Raccoon (Procyon lotor)
Shorttail Weasel (Mustela erminea)
Longtail Weasel (Mustela frenata)
Mink (Mustela vison)
Otter (Lutra canadensis)
Striped Skunk (Mephitis mephitis)
Red Fox (Vulpes fulva)
Gray Fox (Urocyon cinereoargenteus)
Bobcat (Lynx rufus)
Woodchuck (Marmota monax)
Eastern Chipmunk (Tamias striatus)
Red Squirrel (Tamiasciurus hudsonicus)
Eastern Gray Squirrel (Sciurus carolinensis)
Southern Flying Squirrel (Glaucomys volans)
Beaver (Castor canadensis)
White-Footed Mouse (Peromyscus leucopus)
Meadow Vole (Microtus pennsylvanicus)
Muskrat (Ondatra zibethicus)
House Mouse (Mus musculus)
Norway Rat (Rattus norvegicus)
Meadow Jumping Mouse (Zapus hudsonius)
Woodland Jumping Mouse (Nepaeozapus insignis)
Porcupine (Erethizon dorsatum)
Snowshoe Hare (Lepus americanus)
Cottontail (Sylvilagus floridanus)
New England Cottontail (Sylvilagus transitionalis)
White-Tailed Deer (Odocoileus virginianus)

BIRDS

Pied-Billed Grebe
Great Blue Heron "R"
Green Heron "X"
American Bittern "R"
Canada Goose "X"
Mallard "X"
Black Duck "X"
Blue-Winged Teal
Wood Duck "X"
Ring-Necked Duck
Common Goldeneye
Hooded Merganser
Common Merganser
Turkey Vulture "X"
Goshawk "X" & "R"
Sharp-Shinned Hawk "R"
Cooper's Hawk "R"
Red-Tailed Hawk "X"
Red-Shouldered Hawk "R"
Broad-Winged Hawk "X"
Marsh Hawk "R"
Osprey "R"
Peregrine Falcon "R"
Sparrow Hawk "X"
Ruffed Grouse "X"
Bobwhite "X"
Ring-Necked Pheasant "X"
Turkey
Virginia Rail "X"
Sora
Killdeer "X"
American Woodcock "X"
Common Snipe "X"
Spotted Sandpiper "X"
Pectoral Sandpiper
Rock Dove "X"
Mourning Dove "X"
Yellow-Billed Cuckoo "X"
Black-Billed Cuckoo "X"
Screech Owl "X"
Great Horned Owl "X"
Barred Owl "X"
Saw-Whet Owl
Whip-Poor-Will "X"
Common Nighthawk "X"
Chimney Swift "X"
Ruby-Throated Hummingbird "X"
Belted Kingfisher "X"
Yellow-Shafted Flicker "X"
Pileated Woodpecker "X"
Red-Bellied Woodpecker "R"
Yellow-Bellied Sapsucker "R"
Hairy Woodpecker "X"
Downy Woodpecker "X"
Eastern Kingbird "X"
Great Crested Flycatcher "X"
Eastern Phoebe "X"
Alder Flycatcher "X" & "R"
Traill's Flycatcher "X"
Least Flycatcher "X"
Wood Eastern Pewee "X"
Olive-Sided Flycatcher
Horned Lark "R"
Tree Swallow "X"
Bank Swallow "X"
Rough-Winged Swallow "X"
Barn Swallow "X"
Cliff Swallow "X" & "R"
Purple Martin "X" & "R"
Blue Jay "X"
Common Crow "X"
Black-Capped Chickadee "X"
Tufted Titmouse "X"
White-Breasted Nuthatch "X"
Red-Breasted Nuthatch "X"
Brown Creeper "X"
House Wren "X"
Winter Wren "X"
Long-Billed Marsh Wren
Short-Billed Marsh Wren "X" & "R"
Mockingbird "X"
Catbird "X"
Brown Thrasher "X"
Robin "X"
Wood Thrush "X"
Hermit Thrush
Swainson's Thrush "R"
Gray-Cheeked Thrush
Veery "X"
Eastern Bluebird "X" & "R"
Blue-Gray Gnatcatcher "X"
Golden-Crowned Kinglet "R"
Ruby-Crowned Kinglet
Cedar Waxwing "X"
Starling "X"
White-Eyed Vireo "X"
Yellow-Throated Vireo "X"
Solitary Vireo
Red-Eyed Vireo "X"
Warbling Vireo "X"

BIRDS (continued)

Black-and-White Warbler "X"
Worm-Eating Warbler
Golden-Winged Warbler "X"
Blue-Winged Warbler "X"
Tennessee Warbler
Nashville Warbler
Parula Warbler "X" & "R"
Yellow Warbler "X"
Magnolia Warbler "X" & "R"
Cape May Warbler
Black-Throated Blue Warbler "X"
Myrtle Warbler "X" & "R"
Black-Throated Green Warbler "X"
Blackburnian Warbler "X"
Chestnut-Sided Warbler "X"
Bay-Breasted Warbler
Blackpoll Warbler
Pine Warbler "R"
Prairie Warbler "X"
Palm Warbler
Ovenbird "X"
Northern Waterthrush "X"
Louisiana Waterthrush "X"
Yellowthroat "X"
Yellow-Breasted Chat
Hooded Warbler
Wilson's Warbler
Canada Warbler "X"
American Redstart "X"
House Sparrow "X"
Bobolink "X"
Eastern Meadowlark "X"
Redwinged Blackbird "X"
Northern Oriole "X"

Common Grackle "X"
Brown-Headed Cowbird "X"
Scarlet Tanager "X"
Cardinal "X"
Rose-Breasted Grosbeak "X"
Indigo Bunting "X"
Dickcissel
Evening Grosbeak "R"
Purple Finch "X"
House Finch
Pine Grosbeak
Common Redpoll
Pine Siskin
American Goldfinch "X"
Red Crossbill
White-Winged Crossbill
Rufous-Sided Towhee "X"
Savannah Sparrow "R"
Vesper Sparrow "R"
Slate-Colored Junco "X"
Tree Sparrow
Chipping Sparrow "X"
Field Sparrow "X"
White-Crowned Sparrow
White-Throated Sparrow "X"
Fox Sparrow
Lincoln's Sparrow
Swamp Sparrow "X"
Song Sparrow "X"

"X" = breeding

"R" = Listed in "Rare & Endangered Species of Connecticut and Their Habitats".

LIST OF FISH SPECIES FROM SHEPAUG RIVER

	ABUNDANCE
Brown Trout (*Salmo trutta*)	Stocked
Brook Trout (*Salvelinus fontinalis*)	"
Rainbow Trout (*Salmo gairdneri*)	"
Redbreast Sunfish (*Lepomis auritus*)	Common
Pumpkinseed (*Lepomis gibbosus*)	"
Bluegill (*Lepomis macrochirus*)	"
Golden Shiner (*Notemigonus crysoleucas*)	"
Longnose Dace (*Rhinichthys cataractae*)	"
Tessellated Darter (*Etheostoma olmstedi*)	"
Smallmouth Bass (*Micropterus dolomieui*)	"
Blacknose Dace (*Rhinichthys atratulus*)	"
Fallfish (*Semotilus corporalis*)	Abundant
Creek Chub (*Semotilus atromaculatus*)	"
White Sucker (*Catostomus commersoni*)	"
Common Shiner (*Notropis cornutus*)	"
* Northern Pike (*Esox lucius*)	Introduced

* Most likely found in Bantam Lake and Lake Lillinonah.

APPENDIX D

LIST OF PLANTS IMPORTANT TO WILDLIFE

Woody Plants	Upland Weeds and Herbs	Marsh and Aquatic Plants	Cultivated Plants
Oak Blackberry Wild cherry Pine Dogwood Grape Maple Beech Blueberry Birch Sumac Aspen Spruce Hickory Fir Alder Poison ivy Black gum Mulberry Elm Cedar Serviceberry Hazelnut Willow Hemlock Greenbrier Ash Elderberry Virginia creeper Tulip tree Mountain ash Holly Hawthorn Black walnut	Ragweed Bristle grass Sedge Crabgrass Panic grass Pigweed Clover Sheep sorrel Goosefoot Dropseed grass Bluegrass Pokeweed Dandelion Plantain	Smartweed Pondweed Wild rice Bulrush Wild celery Naiad Cord grass Widgeon grass Cut-grass Spike rush Eelgrass Bur reed Wild millet Duckweed Algae Arrowhead Muskgrass Arrow arum	Corn Wheat Oats Apple Cultivated cherry Timothy Barley

ABOUT THE TEAM

The King's Mark Environmental Review Team (ERT) is a group of environmental professionals drawn together from a variety of federal, state, and regional agencies. Specialists on the Team include geologists, biologists, soil scientists, foresters, climatologists, landscape architects, recreational specialists, engineers, and planners. The ERT operates with state funding under the aegis of the King's Mark Resource Conservation and Development (RC & D) Area - a 83 town area serving western Connecticut.

As a public service activity, the Team is available to serve towns and/or developers within the King's Mark RC & D Area - free of charge.

PURPOSE OF THE ENVIRONMENTAL REVIEW TEAM

The Environmental Review Team is available to assist towns and/or developers in the review of sites proposed for major land use activities. For example, the ERT has been involved in the review of a wide range of significant land use activities including subdivisions, sanitary landfills, commercial and industrial developments, and recreational/open space projects.

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 site, and highlighting opportunities and limitations for the proposed land use.

REQUESTING AN ENVIRONMENTAL REVIEW

Environmental Reviews may be requested by the chief elected official of a municipality, or the chairman of an administrative agency such as planning and zoning, conservation, or inland wetlands. Environmental Review Request Forms are available at your local Soil and Water Conservation District, and the King's Mark ERT Coordinator. This request form must include a summary of the proposed project, a location map of the project site, written permission from the landowner/developer allowing the Team to enter the property for purposes of review, and a statement identifying the specific areas of concern the Team should investigate. When this request is approved by the local Soil and Water Conservation District and King's Mark RC & D Executive Committee, the Team will undertake the review. At present, the ERT can undertake two (2) reviews per month.

For additional information regarding the Environmental Review Team, please contact your local Soil and Water Conservation District or Keane Callahan, ERT Coordinator, King's Mark Environmental Review Team, King's Mark Resource Conservation and Development Area, 322 North Main Street, Wallingford, Connecticut 06492. King's Mark ERT phone number is 265-6695.