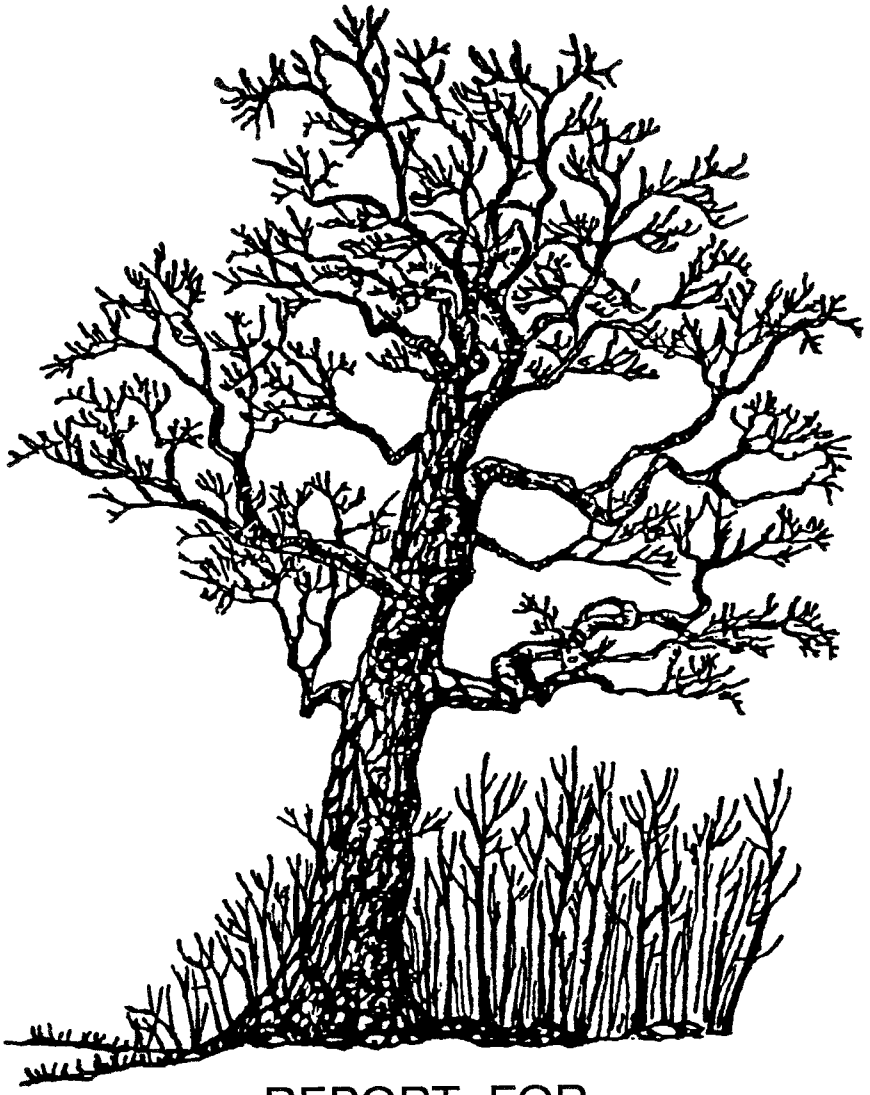
KING'S MARK ENVIRONMENTAL REVIEW TEAM



REPORT FOR

WOODLAND NOTCH CONDOMINIUMS

BURLINGTON,
CONNECTICUT

King's Mark Resource Conservation and Development Area, Inc.

WOODLAND NOTCH CONDOMINIUMS

BURLINGTON, 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

Burlington Board of Selectmen

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 significance to the proposed development and also suggests considerations that should be of concern to the Board of Selectmen and the Town. 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.

APRIL 1990

ACKNOWLEDGMENTS

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

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I would also like to thank Susan Anderson, Secretary of the King's Mark Environmental Review Team for assisting in the completion of this report.

Finally, special thanks to Theodore Scheidel, First Selectman, Brian Hamernick and Graham Norton, developers, Larry Regan, engineer, and Alton Hastings,for their cooperation and assistance during this environmental review.

EXECUTIVE SUMMARY

Introduction

The Burlington Board of Selectmen has requested an environmental review for Woodland Notch, a site proposed for condominium development. The site is located in central Burlington, bordering the Nassahegan State Forest, and is currently wooded with several areas of steep slopes. The wetlands for Punch Brook are located just off-site to the northwest. The Burlington Fish Hatchery is located downstream on Punch Brook. There are no municipal sewer or water lines available to the site.

The developer proposes 54 condominium units, a well house, 2 playgrounds, and a stormwater detention pond for the property. The site will be served by on-site sewer and water. The developer will upgrade George Washington Turnpike from the intersection of Case Road to the site. The Town is concerned with impacts on the wells in the area, impacts on the fish hatchery and downstream landowners, the suitability of the soils to support the proposed development, impacts of stormwater runoff, erosion and sedimentation, impacts on wildlife and traffic and planning implications.

The review process consisted of 4 phases: (1) inventory of the site's natural resources; (2) assessment of these resources; (3) identification of resource problem areas; and (4) presentation of planning and land use guidelines. Based on the review process, specific resources, areas of concern, development limitations and development opportunities were identified.

Location, Land Use and Zoning

The site is located in eastcentral Burlington. Land use in the vicinity includes single family residences and the State Forest. The site is located in a R-15 zone, which has a special permit process for condominiums. Present plans include 54 condominium units clustered in 10 areas. The units will be served by on-site water and septic systems.

Topography

The site is dominated by ice contact stratified drift ridges. Slopes range from flat to very steep. Maximum and minimum elevations are 720 and 620 feet above mean sea level, respectively. Cuts and fills will be required in places and can cause stabilization problems. There is a potential for cut back cave-ins in the sandy soil.

Geology

The bedrock underlying the site has been mapped as the Wildcat Member of the Taine Mountain Formation. Test borings and monitoring wells indicate that bedrock is deep. There is little need for blasting at the site, unless some of the larger boulders require blasting to be moved. The site contains kame terraces, kettles and collapsed topography on stratified drift deposits. The sand and gravel is rapidly permeable and most rainfall is absorbed quickly into the ground.

Water Supply

Public water supply lines are not available to the site. On-site wells will be used. The 2 principal aquifers are the stratified drift and the bedrock. The stratified drift deposits have the potential to yield large amounts of water, but hydrologic data is incomplete. Bedrock wells will be used. The wells must be capable of producing 16,200 gallons of water per day to serve the proposed development. The combined yield of the 3 wells is approximately 28,000 gallons per day and should adequately serve the development. The Connecticut Water Company is willing to own and operate the wells and distribution system and have retained the right to review each phase to ensure an adequate supply of water. The wells for the condominiums may draw from the same fracture system as existing wells on neighboring properties. If the proposed wells have any effect on the neighboring wells it will be to those closest to the site. The developer has offered to test the neighboring wells during pumping periods. The neighbors are encouraged to cooperate with testing. The required yield for the development is less than the amount of recharge area that the site contains. However, groundwater respects no boundaries. Suggestions to maximize the amount of groundwater recharge include minimizing impervious surfaces, using grass swales and using dry wells and detention basins for roof runoff and storm drainage. Septic tank effluent will play a role in the groundwater budget which underscores the need for proper design and maintenance. There are no conclusions concerning the risk of well interference. The developer has taken steps to minimize the risk. The quality of the groundwater should be good, but it may be mineralized with iron and manganese which can require treatment. The groundwater on the site is classified as GA. The wells will probably not affect the fish hatchery because they tap the bedrock, not the local watertable.

Waste Disposal

The development will rely on on-site septic systems. The site is favorable for on-site sewage disposal. The movement of the groundwater is away from the wells which minimizes the potential of well contamination. The DEP Land Disposal Section must issue a permit for the systems. Safeguards are in place for the protection of surface and groundwater. If a problem arises, the applicant must correct it. After 5 years, the development must be reissued a discharge permit.

Hydrology

The site is topographically divided into 2 watersheds. The western part drains to Punch Brook and the eastern part drains to Wildcat Brook. Groundwater does not appear to mimic the surface flows, but rather all groundwater flows to Punch Brook. The surface water has not been classified, but is presumed to be Class A for Bunch Brook and Class AA for Wildcat Brook. The development will increase the amount of runoff. The main concerns are flooding and erosion. A conscious effort has been made to minimize the impacts. The stormwater plan calls for maintaining the existing site runoff patterns. Surface runoff from the eastern parts will flow to the existing topographic depression. Runoff from the western parts and the road drainage will be directed to a retention basin. The "first flush" of road drainage is directed to dry wells to recharge the aquifer and allow the stormwater to filter. The

"first flush" may be laden with pollutants and could pose a threat to groundwater quality. One alternative is to build a 2 stage retention basin that collects the first flush and filters it above ground. As long as it is clean, roof top runoff could be directed to dry wells. Efforts should be made to improve the quality of the stormdrainage. A comprehensive E&S control plan will be needed.

Soil Resources

The site is dominated by well-drained to excessively drained soils on sand and gravel deposits. The major soil limitations are poor filtration, cut bank cave-ins, droughty conditions and slope. The erosion potential of the site is greater than expected, and an E&S control plan is required. The steep slopes with cuts and fills will be difficult to stabilize with vegetation. Stormwater management should be combined with pollutant removal. The site is well-suited to infiltration techniques, but the sediment may clog the structures. The "first flush" of stormwater should be routed to an infiltration basin. The inflow to the infiltration basin should be kept above ground. Infiltration structures should be protected from construction traffic. Debris and sediment must be removed on a regular basis. An effective E&S control plan must be implemented. Steep banks must be stabilized immediately after construction.

Wetland Considerations

While there are no wetlands on-site, valid concerns exist regarding the wetlands for Punch Brook just off-site. Phasing and lateral diversion trenches have been included in the plans. Stabilization of 1 phase prior to the construction should also be included. The exposed soils may require heavy mulching, hydro seeding or geotextile fabrics to aid with vegetative stabilization. The E&S Control plan should include cross sections to aid in design and enforcement. Because the Town may not have sufficient staff, a third party E&S monitor could be required. Also, a letter of credit for remedial work could be required. Because of the Burlington Fish Hatchery, E&S controls are of paramount importance.

Forestry Considerations

The entire site is covered with mixed hardwoods. The development will effect approximately 64% of the present forest. The management emphasis for the remaining areas should be placed on individual trees. To improve the screening capability of the buffer strips, underplanting with softwoods is recommended. In the construction area, retaining existing trees may be difficult. Changes in grade are the greatest cause of tree mortality. An arborist or landscape architect could be used to rate trees on survivability and recommend protection measures. The development should not adversely affect the forest resources of the Nassahegan State Forest.

Wildlife Considerations

The wildlife habitat on the site includes forestland. Wetlands are located just off-site. As proposed, the retention basin will offer little or no habitat. The brook corridor provides travel paths for wildlife. Ideally, a 100-foot buffer should be left

undisturbed around all wetlands. As with any development, the impact on wildlife habitat will be negative. Large portions of the site will be broken-up with homes, roads, parking areas and walkways. Other impacts include the creation of lawns and the presence of humans, traffic, dogs and cats. Certain species which are adaptable may increase, and nuisances may occur. Species adaptable to change may increase in the immediate State Forest area. A buffer of trees should be left along the border. Wetlands are important areas to protect. Punch Brook should be protected from sedimentation and poor quality runoff. If retention basins are proposed near wetlands, an effort could be made to construct them to serve as wildlife habitat. Open space should be connected on- and off-site to provide travel corridors for wildlife.

Fisheries Resources

The site does not contain any waterbodies. However, Punch Brook is located nearby. Punch Brook is a coldwater stream that serves as a water source for the Burlington Fish Hatchery. The ponds are susceptible to erosion and sedimentation which will reduce the trout production. Impacts of the development could include water level reduction although unlikely, degradation of water quality from domestic waste, erosion and sedimentation, poor quality stormwater and fertilizer and chemical runoff. Recommendations include maintaining a 150-foot buffer along the stream, getting an agreement against interbasin water transport, maintaining septic systems, developing a comprehensive E&S control plan, developing an effective stormwater management plan, restricting liming and fertilizers and paving roads in dry periods.

Threatened and Endangered Plant and Animal Species

According to the Natural Diversity Database, there are no Federally listed Threatened or Endangered Species or Connecticut "Species of Special Concern" on the site.

Planning Considerations

The State Policies Plan for the Conservation and Development of Connecticut identifies the site as a Conservation Area. Development in a Conservation Area should be designed to protect natural resources. This high density condominium development appears to be incompatible with the State Plan. The Regional Development Plan classifies the area as low to high density residential, and the proposed development is consistent. However, the development is not consistent with several Goals in the Plan. The development also appears inconsistent with several goals in the Town Plan. The development meets all of the requirements for the Special Permit in the R-15 zone. Alternatives include single- or 2-family townhouses with additional buffer strips and open space or single-family homes with open space.

Traffic Considerations

The plan to widen George Washington Turnpike between Case and Stone Roads is appropriate. Other suggestions include improving the intersection angle of Stone Road, using edge striping as well as center striping and improving the Case Road

intersection to meet design standards. The applicant's traffic consultant has produced a conservative estimate of the traffic generation. The overall traffic operation should not substantially change. The use of dry wells to contain the "first flush" of stormwater should be reconsidered. "Open graded" bituminous concrete mix will retain small amounts of petroleum products. Stormwater pipes should be water tight to prevent erosion of the loose sand.

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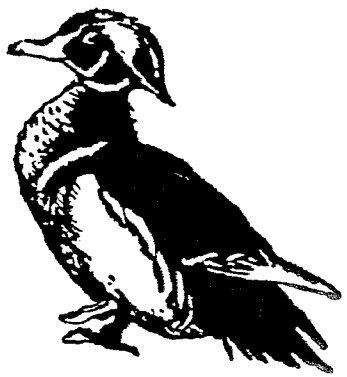


INTRODUCTION

The Burlington Board of Selectmen has requested an environmental review for Woodland Notch, a site proposed for condominium development. The site is located in central Burlington bordering the Nassahegan State Forest. Access to the site is provided via George Washington Turnpike.

The 14.5-acre site is currently wooded with several areas of steep slopes. The wetlands of Punch Brook are located just off site to the northwest. The Burlington Fish Hatchery is located downstream on Punch Brook. There are no municipal sewer or water lines available to the site. George Washington Turnpike becomes a dirt road through the State Forest just west of the site and often is impassable.

The developer proposes 54 condominium units, a well house, 2 playgrounds and a stormwater detention basin for the property. The site will be served by on-site sewer and water. The developer will upgrade George Washington Turnpike from the intersection of Case Road to the site. Currently, the Case Road intersection is considered dangerous. The Town is concerned with impacts to wells in the area, impacts to the fish hatchery and downstream landowners, the suitability of the soils to support the proposed development, the impact of stormwater runoff, erosion and sedimentation, impacts on wildlife and traffic and planning implications.

The primary goal of this ERT is to inventory the natural resources of the site and provide planning information. Specific objectives include:

1) Assess the hydrologic and geologic characteristics of the site, including impacts to wells and potential drawdown, development limitations and development opportunities;

2) Assess the impact of stormwater runoff;

3) Discuss soil erosion and sedimentation concerns;

4) Assess the impact of the proposed development on Punch Brook and the fish hatchery;

5) Assess the impacts of the proposed development on the State Forest and wildlife;

6) Assess planning and land use issues; and

7) Assess traffic and access issues.

THE ERT PROCESS

Through the efforts of the Burlington Board of Selectmen, the developer's representative and the King's Mark ERT, this environmental review and report was prepared for the Town. This report primarily provides a description of on-site natural resources and presents planning and land use guidelines. The review process consisted of 4 phases:

1) Inventory of the site's natural resources (collection of data);

2) Assessment of these resources (analysis of data);

3) Identification of resource problem areas; and

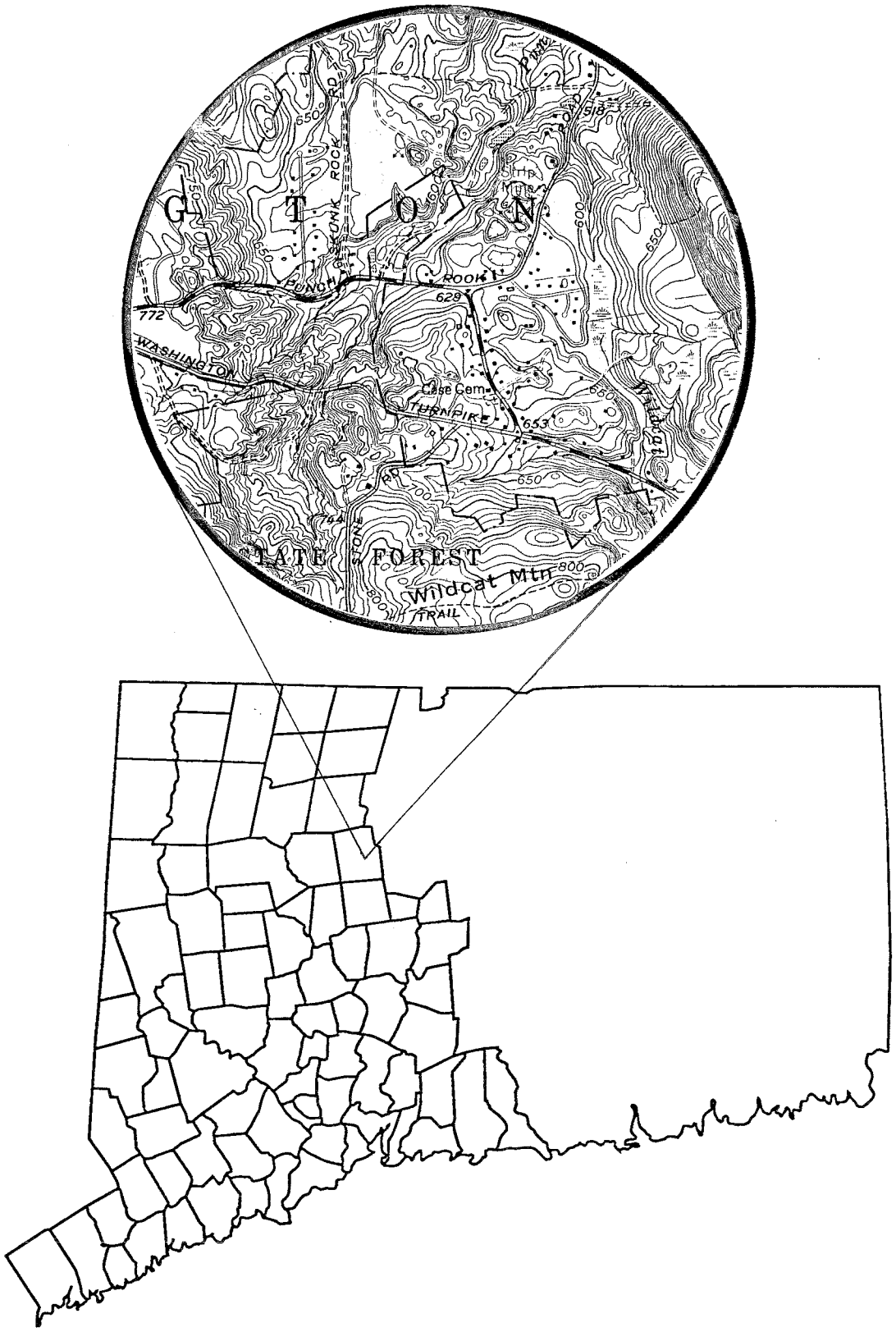
4) Presentation of planning and land use guidelines.

The data collection phase involved both literature and field research. The ERT field review took place on March 22, 1990. Field review and inspection of the proposed development 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. Mapped data or technical reports were also perused, and specific information concerning the site was collected. Being on-site also allowed Team members to check and confirm mapped information and identify other resources.

Once Team members had assimilated an adequate data base, they were able 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

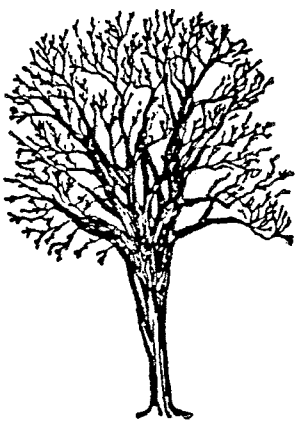
Figure 1

LOCATION OF STUDY SITE



development opportunities and limitations. Individual Team members then prepared and submitted their reports to the ERT Coordinator for compilation into the final ERT report.

PHYSICAL CHARACTERISTICS



LOCATION, LAND USE AND ZONING

The approximately 14.5-acre site is located in eastcentral Burlington. The site is bounded on the south by George Washington Turnpike, on the west and north by the Nassahegan State Forest and on the east/northeast by several residential properties. George Washington Turnpike provides primary access to the site. Land uses to the west and south include medium density single-family residences. The Burlington Fish Hatchery, operated by the Department of Environmental Protection (DEP), is located approximately 1,250 feet north of the site.

The property is zoned R-15 which allows single-family residences on lots of at least 15,000 square feet. Additionally, the construction of condominium units are permissible only by special permit. There are certain density requirements for condominium development.

Present plans include 54 condominium units which will be clustered in 10 areas. Approximately 36% (5.2 acres) of the site will remain undisturbed, 28% (4 acres) will comprise impervious surfaces and 36% (5.3 acres) will be disturbed and landscaped. Each phase of condominium development will be served by a community septic system. Also, 3 water supply wells that tap the underlying bedrock will serve the development. The 3 wells and proposed pump house are located in the southeast corner of the site. Access to the condominium units will be provided by a boulevard that extends 150 feet from George Washington Turnpike.

TOPOGRAPHY

The site and vicinity are dominated by distinctive topography and geologic structures of ice-contact stratified drift (sand and gravel). A ridge with the main axis oriented in a northeast/southwest direction bisects the site. Slopes on the site

range from nearly flat areas on the crest of the ridge and in the eastern parts to very steep areas on the flanks of the ridge. Maximum and minimum elevations are 720 feet and 620 feet above mean sea level, respectively (see Figure 3).

Considering the moderate to steep slopes and the amount of development anticipated for the site, earth cuts and fills will be required, in places. Earth cuts in sandy and gravelly soils can be problematic. Deep cuts in droughty soils expose the layers of sand and gravel. In most cases, the already droughty soil condition becomes much drier. Therefore, stabilization of the slope(s) with vegetation is difficult. Drought resistant vegetation and perhaps geotextile fabric will be required to stabilize slopes. The potential of soil erosion on these dry slopes is greatest when fine sand is exposed.

Ordinarily, grading by heavy equipment is relatively easy for deep sandy, gravelly soils. However, very large boulders, most of which occur in the western parts of the site, will be difficult to remove. These boulders might be left and used for landscaping.

The potential for "cut back cave-ins" in the sandy and gravelly soils may hinder the installation of sewers, water lines, foundations and electrical lines. Therefore, trenches excavated in these soils should have the pipes and conduits placed and be backfilled as soon as possible after excavation. Trenches that are deep enough to pose a hazard to workers (usually 5 feet or more) should have the sides properly shored.

GEOLOGY

The site lies entirely in the Collinsville topographic quadrangle. A bedrock geologic map (QR-16, by Rolfe S. Stanley) for the quadrangle has been published by the U.S. Geological Survey. To date no surficial geologic map has been published for the quadrangle, but there is unpublished surficial geologic data for the quadrangle

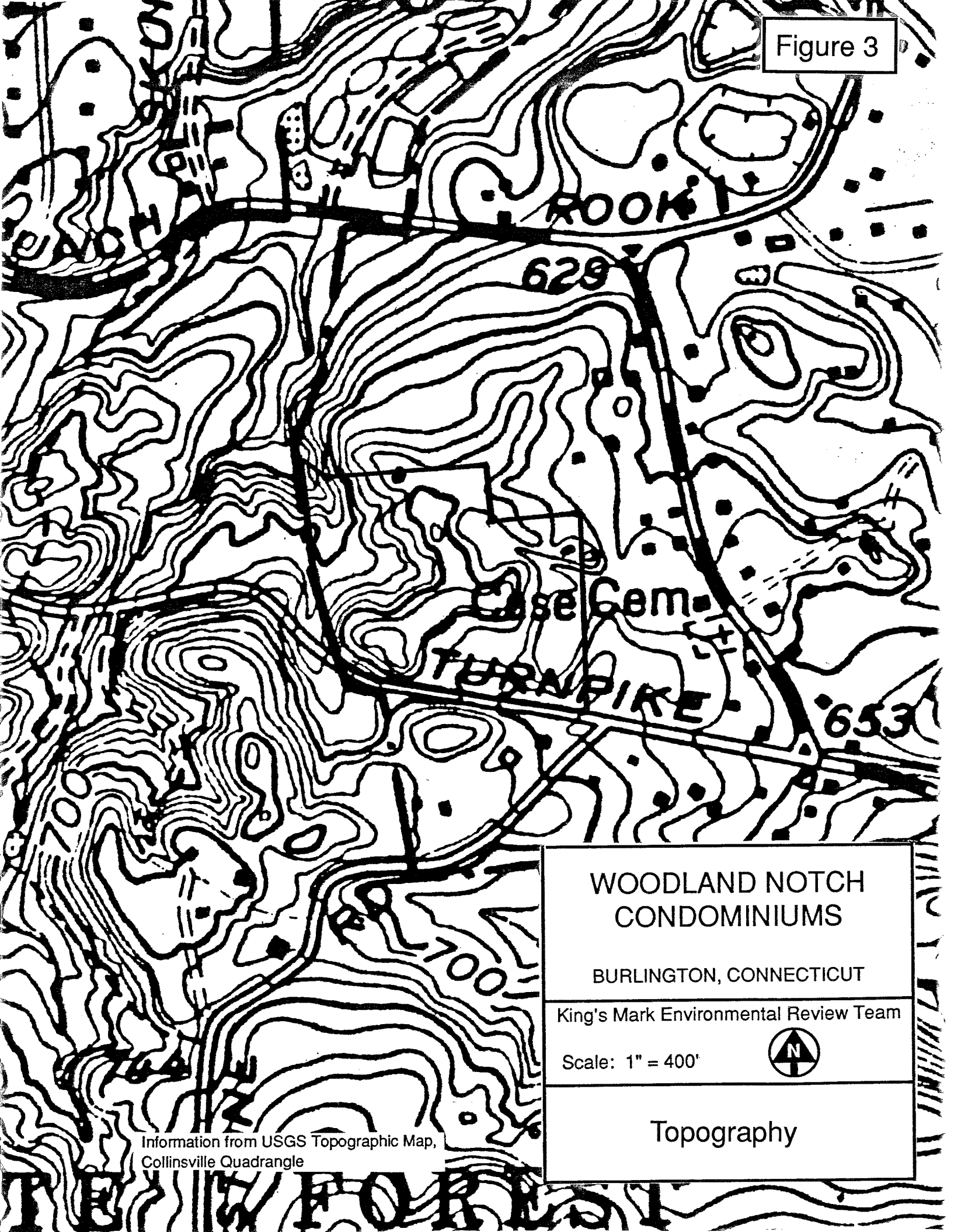


Figure 3
ROOK
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Case Cem
TURNPIKE
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700
WOODLAND NOTCH
CONDOMINIUMS
BURLINGTON, CONNECTICUT
King's Mark Environmental Review Team
Scale: 1" = 400'
N
Topography
Information from USGS Topographic Map,
Collinsville Quadrangle
FOREST

on file at the DEP Natural Resource Center in Hartford. The Soil Survey - Hartford County, the unpublished Surficial Materials Map of Connecticut (Janet Stone et al, 1985) and on-site subsurface information compiled by the applicant's engineer were also referenced for this report.

Bedrock Geology

The site and vicinity is located within the Bristol Dome, an area of uplifted rocks. Bedrock is not exposed on the site. Test borings and monitoring wells drilled throughout the site indicate that in places the depth to bedrock exceeds 100 feet. The shallowest depths to bedrock were encountered in the eastern parts of the site and ranged between 17 and 40 feet. According to information on file at the DEP, the sand and gravel may be as much as 150 feet thick in places.

The bedrock underlying the site is identified as the Wildcat Member of the Taine Mountain Formation (see Figure 4). It is described as a non-rusty weathering, fine- to medium-grained gneiss composed primarily of the minerals biotite, plagioclase and quartz. The rock also contains schistose and amphibolotic layers to a minor extent.

Schists, gneisses and amphibolites are crystalline, metamorphic rocks (geologically altered by great heat and pressure in the earth's crust). The terms schist, gneiss and amphibolite refer to the textural and structural aspects of the rocks. Schists tend to be slabby (part relatively easily along the mineral or foliation planes) due to the alignment of platy or flaky minerals. Gneisses tend to be banded rocks characterized by alternating layers of granular (light-colored) minerals and platy or flaky (dark-colored) minerals. Amphibolites are typically dark-colored, fine- to coarse-grained massive to poorly layered rocks that contain the minerals amphibolite and plagioclase. Little or no quartz is found in the rock.

Since the bedrock surface is deep, the need for blasting for rock removal is slight. However, some of the large boulders on the site may require blasting due to the large area of land disturbance anticipated.

The underlying bedrock aquifer will supply the proposed condominiums with water. Most homes in Burlington rely on the underlying bedrock for domestic water (see Water Supply section).

Surficial Geology

The site is located within a massive series of stratified drift deposits in the Punch Brook Valley (see Figure 5). Stratified drift refers to the typically well-layered sediments that were deposited by glacial meltwater streams. "Ice contact" means that the sediments were deposited on, under or adjacent to wasting blocks of glacier ice. The site contains kame terrace deposits, which are bodies of sand and gravel deposited between glacier ice and an adjacent valley wall (e.g., Wildcat Mountain), and kettled and collapsed topography. Buried ice blocks melted, causing the sediments to collapse into irregular often deep basins called kettles. Kettles occur primarily north of the site, but the depression in the northeast corner of the site may have formed similarly. The ridge that bisects the site is composed of yellowish-brown stratified sand and coarse gravel.

The sand and gravel that covers the site is rapidly permeable. Therefore, most rain that falls on the site is absorbed into the ground.

Depending on certain hydrogeologic factors, stratified drift deposits may have the potential for yielding large volumes of water to individual wells (see Water Supply section).

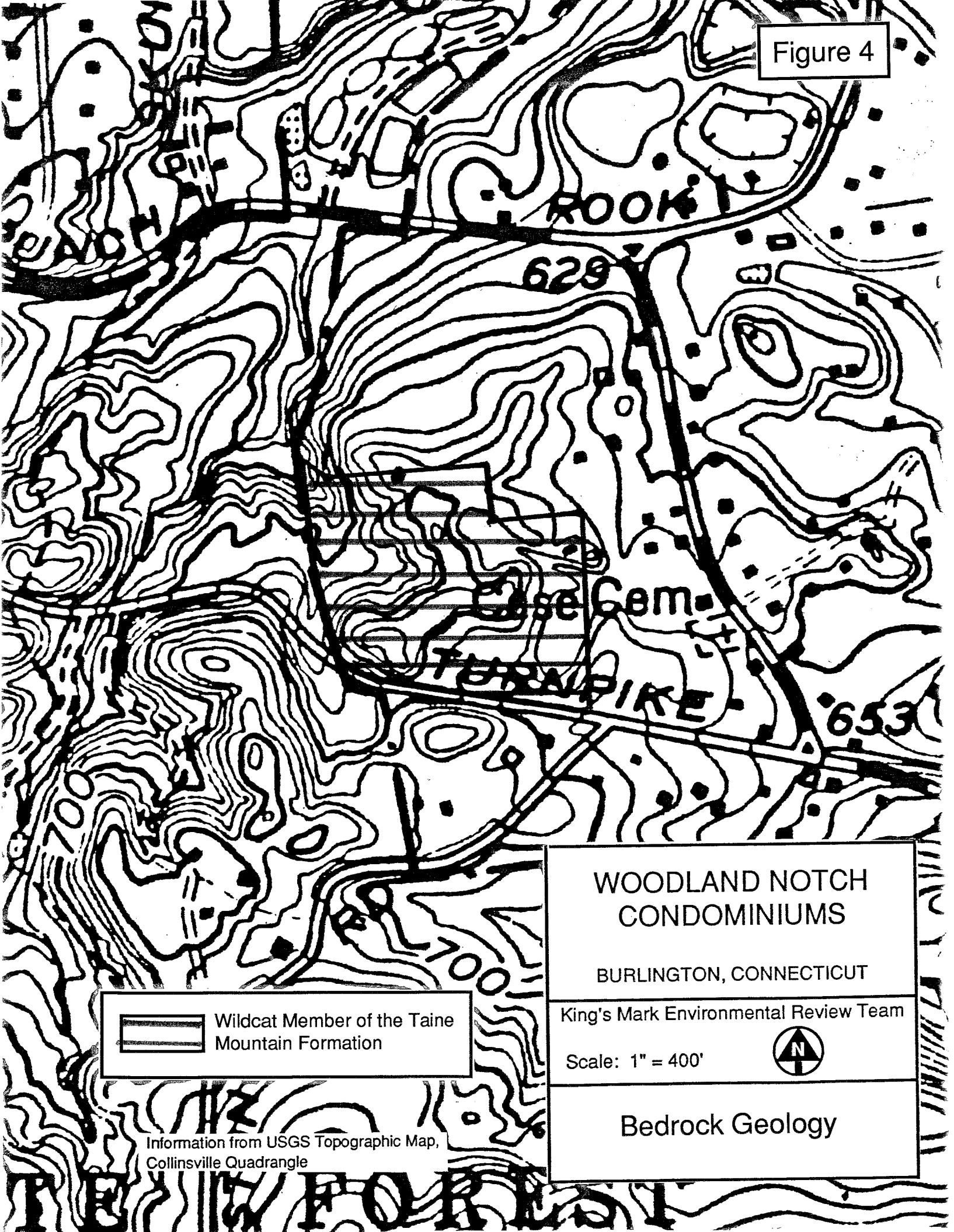
Figure 4
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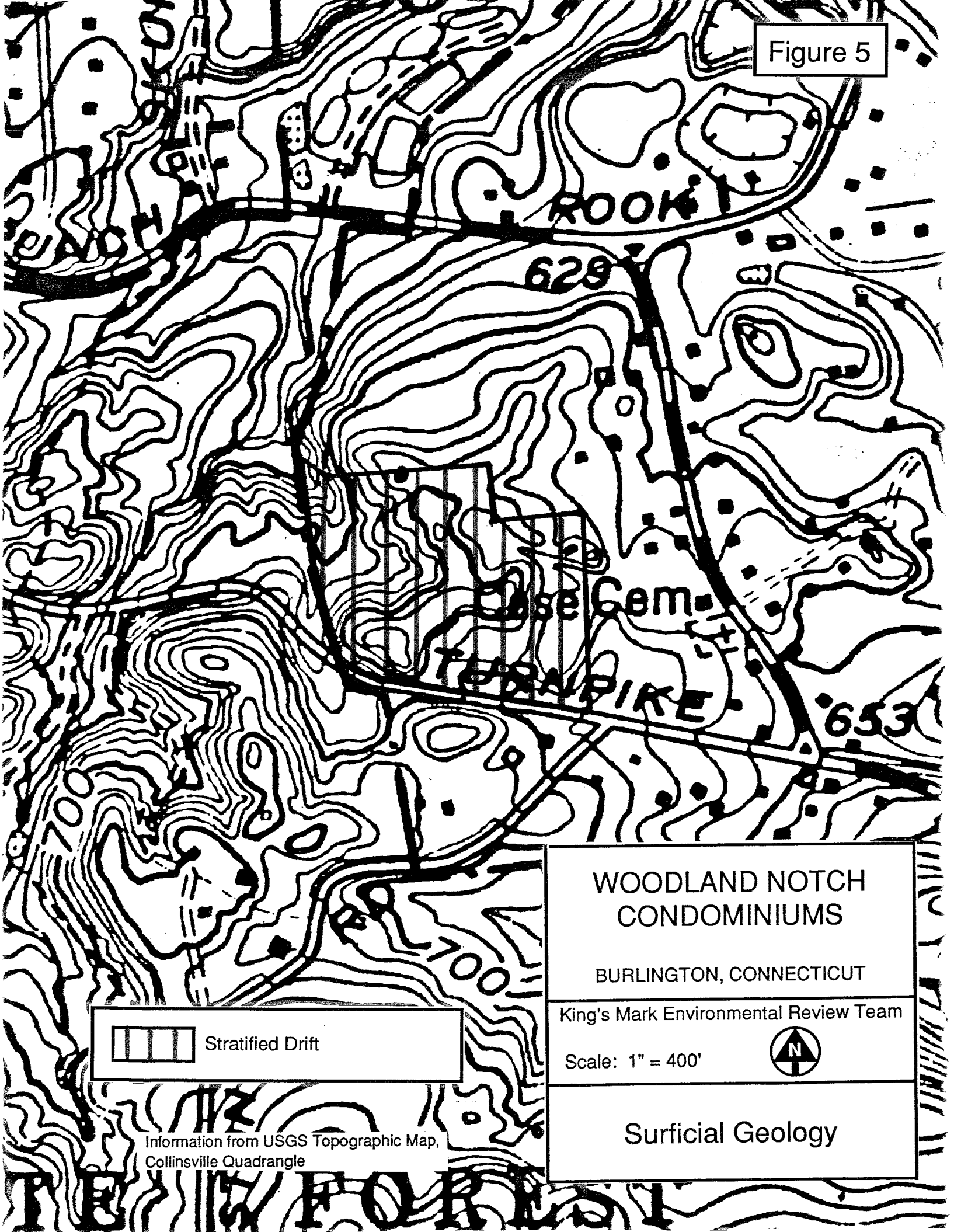
Bedrock Geology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Stratified Drift
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Collinsville Quadrangle
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King's Mark Environmental Review Team
Scale: 1" = 400'
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Surficial Geology
FOREST

WATER SUPPLY

Public water supply lines are not available to the site. Accordingly, the developer will utilize on-site wells. The 2 principal aquifers on the site are the underlying crystalline, metamorphic rock and the stratified drift deposits (sand and gravel) that overlie the bedrock.

According to the Ground Water Availability Map in Connecticut (D. Meade, 1978), the sand and gravel deposits on the site are coarse-grained, but hydrogeologic data are incomplete, and verification requires further investigation. The potential of any stratified drift deposit to yield large volumes of water to wells depends upon many hydrogeologic factors of the deposits, including texture, thickness, saturated thickness, hydraulic conductivity, the proximity to streams and the size of those streams. Since this information is not available, the usefulness of the stratified drift deposits on the site for water supply purposes is unknown.

Present plans indicate that the developer will utilize 3 drilled bedrock wells, to service the proposed condominium development. The yield of a well tapping the bedrock depends in part upon the number and size of water-bearing fractures that the well intersects. Because the fractures are unevenly spaced throughout the bedrock, there is no practical way, other than drilling the well(s), to predict the yield of any specific well site. The wells located in the eastern parts of the site are capable of producing 11.4 gallons per minute, 7.8 gallons per minute and 8 gallons per minute. The pumping capacity of the 11.4 gallon per minute well will be designed for a maximum 9.9 gallons per minute to accommodate a 75-foot sanitary radius around the well. Based on Connecticut Public Health Code requirements, a sanitary radius of 150 feet is required around wells that yield between 10 and 50 gallons per minute.

Water supply wells must be capable of producing 16,200 gallons of water per day to adequately service the proposed condominium development, with the production

occurring over an 18-hour period each day. (The figure of 16,200 gallons of water per day is based on 150 gallons per day per bedroom for 54 2-bedroom units.) The combined yield of the 3 wells drilled on the site is almost 26 gallons per minute or approximately 28,000 gallons of water for an 18-hour pumping period and should adequately meet the needs of the proposed development. The Connecticut Water Company is willing to own, operate and maintain the water supply wells and distribution system for Woodland Notch, once the final plans and specifications are approved by the Department of Health Services. A stipulation by the Connecticut Water Company for takeover of the public water supply system is that they reserve the right to review and approve the adequacy of supply prior to each phase of construction. This will ensure that a sufficient supply of water exists on-site to satisfy each phase of the proposed development.

The proposed public water supply system will require approval by the State Department of Health Services (Public Water Supply Section). Information on projected needs of the proposed development, including water quantity, water quality testing and plans for pumpage, storage, treatment, if necessary, and the distribution system will also be necessary for a public water supply system. The public water supply system should be operated and maintained by a private water supply company such as the Connecticut Water Company which is knowledgeable concerning the operation of a public water supply systems.

Depending upon the interconnection of the fractures in the bedrock underlying the area, it is possible for the condominium wells to draw from the same fractures as neighboring wells of local residents. However, the same situation could easily be occurring among the existing residences themselves. Whether such mutual interference will have a negative impact on the residents for practical purposes is unclear. If the proposed wells have any effect on neighboring wells, the affected wells will be relatively close to the site. The probability of an effect decreases with

distance from the wells on the site. Based on the location of the condominium wells, the risk of interference is greatest (although not necessarily high) to the areas east/southeast where residential wells occur. The developer has offered to test neighboring wells for mutual interference with the condominium wells during pumping periods. Because of the complexity of groundwater movement in a bedrock fracture system, neighbors are encouraged to cooperate with the developer regarding the test. The testing may be the only way to determine whether or not the condominium wells will deplete the yield of neighboring wells during pumping periods.

The required yield (16,200 gallons per day) for the proposed condominiums is slightly less than the amount of recharge area which the site contains. Water resources studies have indicated that the yearly recharge to the groundwater system in stratified drift covered areas in Connecticut is approximately 24 inches, on the average (50% of total precipitation). Variations in local rainfall, topography and geology may either increase or decrease this amount. Assuming that at least 24 inches of rainfall reachs the groundwater supply each year, the total recharge is approximately 18,600 gallons per day or 1,283 gallons/acre/day (calculated for 10.5 acres of pervious land). Based on these calculations, groundwater recharge is 1.1 times gross water demand. Also, using the 75 gallons of water per capita per day figure, the recharge, if entirely recaptured, will supply enough water to meet the needs of approximately 17 persons per acre. The population density of the proposed condominium development is conservatively estimated to be 3 2-bedroom units or 12 persons per acre.

Although the calculations provide an interesting starting point for an evaluation, several additional factors should be weighed. First, the actual population of the proposed condominiums may be less than the 4 persons/unit estimate used. Second, the DEP's monitoring of water usage at other condominium projects shows

that the actual per capita usage is less than the 75 gallons per day standard. However, the wells may not be capable of recapturing the entire recharge volume.

Groundwater does not respect property boundaries. Although recharge through the site itself is only 1.1 times the full need of the development, the actual source of supply to the wells may extend far beyond the boundaries of the site. Therefore, when the groundwater demand in the area surrounding a high-requirement site is equally high, there is a greater possibility of mutual interference among wells. However, it does not appear that neighboring properties will require high-yielding wells. Every effort should be made to encourage direct recharge of the underlying stratified drift aquifer by infiltrating precipitation. Consideration should be given to:

1) Minimizing the amount of impervious surfaces created and encouraging pervious open areas, where possible;

2) Utilizing grass swales instead of asphalt or concrete drainage swales; and

3) Utilizing features such as dry wells and detention basins for on-site infiltration of roof drainage and stormwater runoff, respectively.

Careful examination is warranted for direct stormwater discharges to dry wells on the site. Stormwater may be laden with automobile residue that poses a threat to groundwater quality (see Hydrology section). Roof drainage, as long as it is clean, could be discharged to dry wells on-site, which will offset the loss of recharge.

Septic tank effluent plays an important role in the groundwater budget for the site. A high portion (85-95%) of the renovated domestic wastewater will percolate downward to recharge the underlying bedrock via on-site sewage disposal systems. This underscores the need for proper design, location, installation and maintenance of the proposed community septic systems.

Unfortunately, there are no specific conclusions concerning well drawdown. There is simply too little known about the bedrock fracture system and the movement of groundwater through it. Although the risk of interference cannot be predicted

accurately, the developer and the Connecticut Water Company, pending the takeover of the public water supply system, are taking favorable steps to mitigate the risk, including:

1) The testing made available to neighboring properties;

2) Maintaining flows less than 10 gallons per minute;

3) The water company's right to review and approve the adequacy of supply prior to each phase of construction; and

4) Based on certain conditions, the developer's willingness to drill new well(s) on neighboring properties, if well yields are diminished by the project's wells.

The natural quality of groundwater should be satisfactory. However, there is a chance that groundwater may be mineralized by iron and manganese, and suitable treatment filters may be necessary.

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

Because the Burlington Fish Hatchery is approximately 1,500 feet north of the site and because the pumping capacity of the wells will be designed at less than 10 gallons per minute, it is unlikely that the water level of the hatchery ponds and/or Punch Brook will be lowered or diminished. Also, since the wells are all deeper than 385 feet and tap the bedrock fracture system rather than the local watertable, the potential to adversely impact local surface waterbodies is reduced. There is greater concern regarding water quality degradation to surface waters feeding the hatcheries during actual construction periods and by post-development storm drainage (see Hydrology section).

WASTE DISPOSAL

Since there are no municipal sewer lines available to the site, the proposed condominium development will rely on on-site sewage disposal systems. A number of common or public subsurface sewage systems is planned. More specifically, each septic system will consist of a septic tank followed by rows of 4-foot by 4-foot deep leaching galleries. The undisturbed soils between the various rows of leaching galleries will be utilized for reserve leaching areas, when needed. Because the site is characterized by deep, well-drained soils and the watertable is deep, the site is favorable for sewage disposal. Also, no surface waterbodies were identified on the site. The nearest wetland is off-site to the northwest. Extensive soil testing indicates that groundwater is 40 feet or more below ground surface across the site (shallowest in the southeast corner), the soil is pervious ranging between 5.5 feet/day and 45 feet/day and groundwater moves in a northwesterly direction across the site at approximately a 3% gradient. This movement is in a direction opposite that of the on-site wells serving the condominiums and residential wells to the east/southeast. This will minimize the potential for well contamination by septic tank effluent.

The sewage disposal systems serving the proposed condominium development are classified as a community "public" subsurface sewage disposal system, and the DEP Land Disposal Section of the Water Compliance Unit must issue a permit for the systems. Through detailed testing, the applicant must demonstrate to the DEP that the site's soils can adequately treat and disperse sewage effluent at the proposed volumes without adversely impacting surface and groundwater in the area. Therefore, the hydraulic capacity was determined for the various disposal sites. This information, taking into account certain parameters, will be used in making an evaluation of the site's capabilities for handling the design flows of the project. Based on the DEP staff statements regarding Woodland Notch, the applicant's engineer has

demonstrated through the permit application and engineering report that the on-site sewage disposal system proposed for the development can be installed while protecting waters of the State from pollution.

If the systems are constructed, as-built plans must be submitted to the DEP to verify that they were constructed according to approved plans and specifications. At that time a 5-year discharge permit will be issued. This permit requires the owners of the facility to:

1) Monitor water use;
2) Pump out septic tanks on an annual basis;
3) Monitor operations of the leachfield systems; and
4) Monitor groundwater quality downgradient of the leachfield areas.

These requirements are a safeguard for the protection of surface and groundwater in the vicinity of the site. If a problem arises in the groundwater monitoring wells, the applicant is required by the DEP to investigate and propose a corrective course of action. When the permit expires at the end of 5 years, the facility must reapply for a discharge permit. Before the permit is re-issued, the subsurface sewage disposal system must be inspected by an engineer to verify it is functioning according to design. Assuming that the relevant regulatory agencies and officials will not allow the installation of septic systems that are likely to fail, and assuming further that any problems will be followed by predescribed remedial regulatory action, any incident of pollution should be short-lived.

HYDROLOGY

Topographically, the site can be divided into 2 watershed areas (see Figure 6). The main axis for the northeast/southwest trending ridge on the site roughly

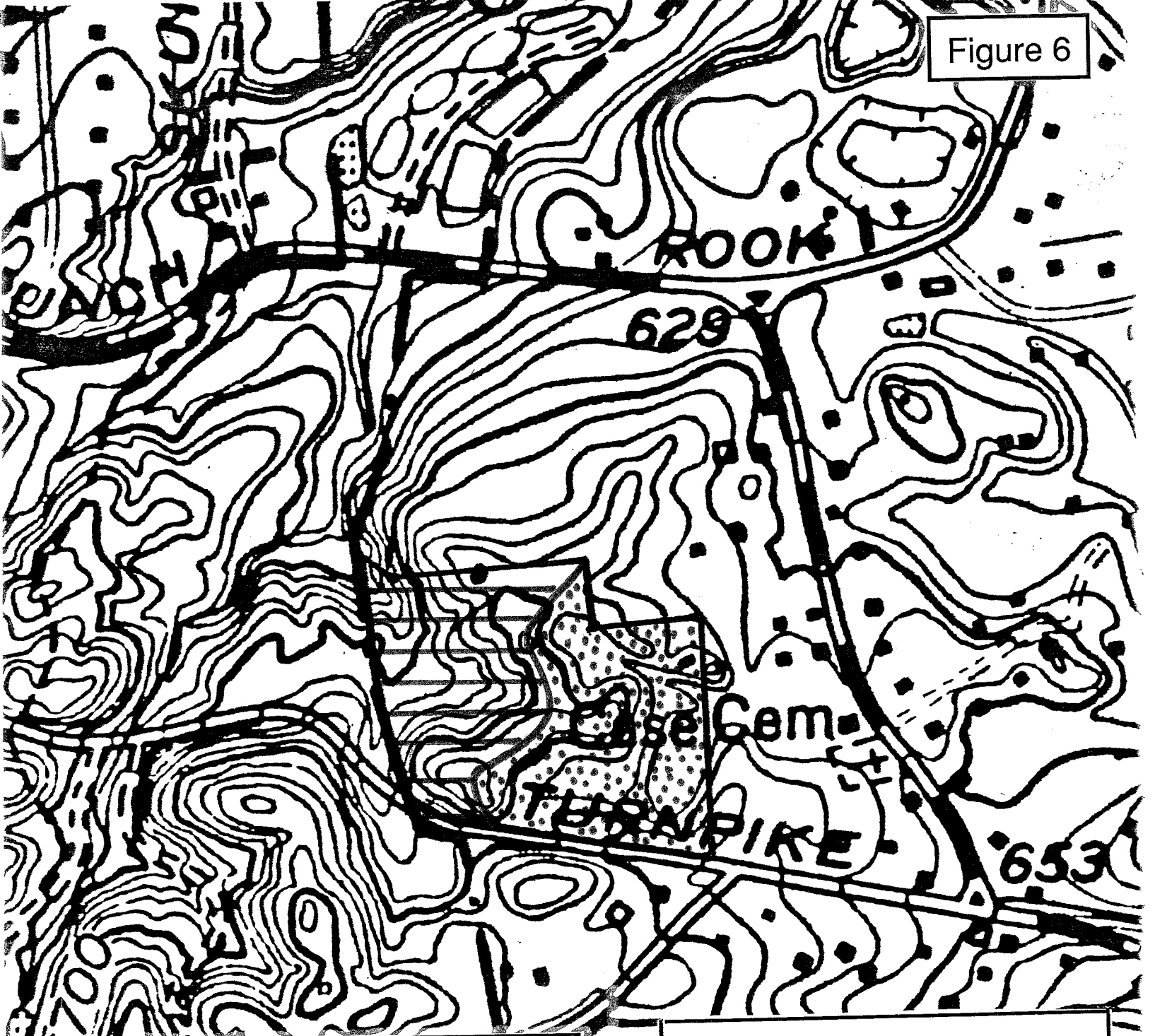
represents the watershed boundary. East of the ridge surface, the flow drains to Case Road, ultimately discharging to Wildcat Brook. To the west, surface drainage flows to Punch Brook which feeds the Burlington Fish Hatchery ponds north of the site. Monitoring well data supplied by the project engineer indicates that for the most part, precipitation falling on the site is quickly absorbed by the stratified sands and gravels, percolates downward to the local watertable and once it reaches the watertable below the site, flows by the force of gravity in a northwestward direction to Punch Brook. The groundwater gradient is estimated at approximately 3%. Therefore, groundwater beneath the site does not appear to mimic surface water flow or topography.

According to the DEP, Water Quality Classification Map of Connecticut (Murphy, 1987), surface water quality for Punch Brook and Wildcat Brook have not been classified and are considered Class A and AA water resources, respectively by default. Class A water resources are suitable for drinking, recreational or other uses and may be subject to absolute restrictions on the discharge of pollutants, although certain discharges may be allowed. Class AA water resources are an existing or proposed public drinking water supply and are regulated similarly to A resources.

Development as planned will cause increases in runoff. These increases will result from the creation of impervious surfaces such as rooftops, roads, parking areas and sidewalks over the permeable sands and gravel. Additionally, removal of vegetation on the site will increase runoff. It is estimated that 4 acres of impervious surfaces will be created following development, and approximately 5.3 acres will be disturbed and landscaped.

The main concerns with post-development runoff increases are the potential for flooding and streambank erosion/surface water degradation. A conscientious effort has been made to minimize these impacts. The storm drainage proposal for the

Figure 6



Surface flow that drains to Punch Brook

Surface flow that drains to Wildcat Brook

Note: Groundwater drains to Punch Brook based on monitoring well data.

Information from USGS Topographic Map, Collinsville Quadrangle

WOODLAND NOTCH CONDOMINIUMS

BURLINGTON, CONNECTICUT

King's Mark Environmental Review Team

Scale: 1" = 400'

N

Watershed Boundary

proposed development calls for maintaining existing site runoff patterns. Post-development runoff (not including road drainage which is routed to the retention basin) that occurs in the eastern half of the site will be routed to an existing depressed area in the northeast corner of the property. This topographic depression, which permits ponding to an elevation of 666 feet, will function as a natural retention area. There is no evidence that surface water occurring in this area persists for any significant length of time, but rather is quickly absorbed by the permeable sand and gravel. Computations prepared by the project engineer indicate that the depression can store post-development runoff increases for the eastern part of the site from at least a 100-year storm. In these computations, the engineer did not consider the potential for infiltration into the sandy gravelly soils which are expected to be high. Consideration should be given to directing the runoff for this area to grassed drainage swales that route the water to the basin which will allow for groundwater recharge to the site.

Post-development runoff emanating in the western parts and all road drainage will be directed to a retention/detention basin located in the northwest corner of the site. The purpose of this detention basin, which will be constructed by a combination of excavation and berms, is to store stormwater runoff for the 50-year storm by collecting and holding the water for slow release to a downstream off-site watercourse (Punch Brook) at a rate that does not exceed pre-development runoff rates. These computations also did not consider infiltration that occurs during the period of runoff due to the presence of permeable sands and gravels. The "first flush" will be directed to pre-cast leaching pits or dry wells. The purpose of this arrangement is:

1) Recharge of building, road and parking lot runoff is desirable to reduce or minimize losses to the site aquifer.

2) The dry well will allow retention, settling and filtration of stormwater.

While it is desirable to encourage recharge of building and road runoff to the site, the "first flush" may be laden with automobile residue, including oil, grease, gasoline and other compounds which pose a threat to groundwater quality. Therefore, consideration should be given to a mitigative measure that treats the "first flush" above ground. A possible solution is a 2 stage detention/retention basin. The "first flush" could be retained in the primary basin and the secondary basin could be designed to detain subsequent flows. The primary basin is designed to retain, settle and filter the "first flush" of the storm and trap floatable materials. Once a critical design elevation is reached in this basin, the water is routed to the secondary basin, where it is detained based on hydrologic computations. The primary basin could be vegetated with selective plants that have the capacity to remove certain nutrients, grease, oil and other organic compounds from stormwater.

As long as it is clean (i.e., no discharge from air conditioning units, etc.), roof top runoff for each building unit could be directed to on-site dry wells.

Every effort should be made to maintain or improve the quality of stormwater generated at the site. Catch basins should be equipped with hooded outlets and sumps to trap sediments and floatables. From time to time, catch basins will require maintenance, and provisions should be made for this work.

The potential for streambank erosion/surface water degradation should be addressed in a comprehensive soil erosion and sediment (E&S) control plan. The E&S control measures should be monitored by Town officials, especially following periods of heavy rainfall. An inspection program should be implemented.

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

watercourses, particularly Punch Brook. Connecticut Guidelines for Soil Erosion and Sediment Control (1985, as amended) should be followed closely with respect to the E&S control plan.

SOIL RESOURCES

The landscapes of the site are dominated by very deep, gently sloping to very steep soils formed in kame-like sand and gravel deposits with a sandy to loamy cap. The soils range from excessively drained to well-drained, depending on the thickness of the fine-textured upper horizons. Soils on the northern part of the site contain surface stones and boulders.

The soil map (Figure 6) has been created from on-site investigation during the field review and air photo interpretation. Therefore, the map and map unit descriptions have been modified from the Hartford County Soil Survey, 1962 to more accurately reflect site conditions and current concepts. Soil interpretations have been included in the map unit descriptions.

1) 10BC- Agawam and Merrimac soils, 3-15% slopes are gently sloping to sloping, somewhat excessively drained to well-drained soils on the sideslopes, hilltops and depressional areas of the site. These soils were mapped together because they have no major differences in use and management for this development. Typically, the Agawam soils have a loamy topsoil and subsoil over the stratified sand and gravel, and the Merrimac soils have a thinner, sandier topsoil and subsoil.

   Included with these soils in mapping are areas of sandy Windsor soils and gravelly Hinckley soils. Also included are areas with 2-10% of the surface covered by stones and boulders.

   The major limitations to development are:

   a) The sandy and/or gravelly substratum is a poor filter for septic systems. Careful design and siting are needed to prevent pollution of groundwater.

   b) Shallow excavations are subject to cutbank cave-ins.

c) Cut slopes exposing the substratum are droughty with low fertility and are difficult to stabilize.

2) 10DE- Agawam and Merrimac soils, 15-45% slopes are moderately steep to very steep, somewhat excessively drained to well-drained soils on the sideslopes of the site. These soils were mapped together because they have no major differences in use and management for this development. The general soil characteristics and soils included in mapping are similar to map unit 10BC.

   In addition to the limitations listed for unit 10BC, these soils have the limitation of slope. Development on these slopes requires cutting and filling, and the slopes are difficult to stabilize when disturbed.

Additional areas of concern:

1) On-site investigation revealed that the erosivity of the soils (K factor) and erosion potential of the site is greater than expected. Therefore, properly phased, installed, **inspected** and **maintained** E&S control is required (see Erosion and Sediment Control section).

2) As proposed, a number of steep side slopes will be created by cutting and filling. Exposing or filling with the sandy and/or gravelly substratum creates a droughty sideslope that is difficult to stabilize vegetatively. Topsoil and subsoil (B horizon) material should be carefully stockpiled and used as final grading materials. Approximately 20 inches of soil material (including topsoil) that is loamy find sand or finer in texture is necessary to establish and maintain vegetation without supplemental irrigation.

Stormwater Quality

Research has shown that the urbanization of a watershed can have negative effects on streams and wetland systems. Efforts have been focused largely on stormwater management to reduce the risk of flooding downstream. Stormwater may contain pollutants that can affect water quality and wetland resources. Stormwater management should be combined with pollutant removal. Best Management Practices (BMPs) incorporate these ideas. An effective BMP is the use of infiltration basins and trenches that can not only manage stormwater quantity and quality, but also provide groundwater recharge, important to the hydrology of downgradient wetlands and watercourses.

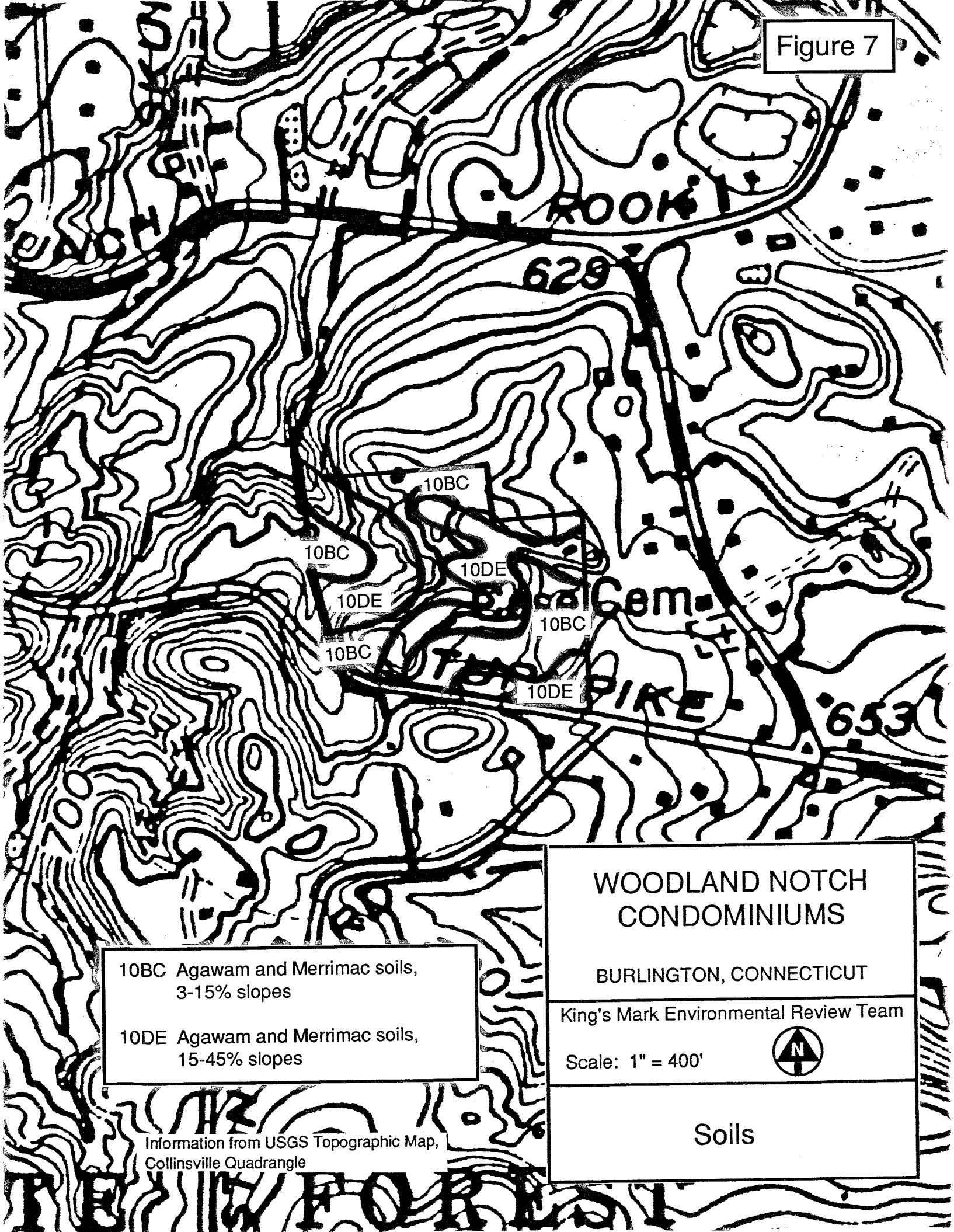


Figure 7
ROOK
629
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653
10BC Agawam and Merrimac soils, 3-15% slopes
10DE Agawam and Merrimac soils, 15-45% slopes
WOODLAND NOTCH CONDOMINIUMS
BURLINGTON, CONNECTICUT
King's Mark Environmental Review Team
Scale: 1" = 400'
N
Soils
Information from USGS Topographic Map, Collinsville Quadrangle

The developer and consultants are applauded for their attempt to use infiltration techniques on the site. Although the site is well-suited to such techniques (i.e., deep to groundwater and highly permeable soils), the structures and system as currently designed may not perform as expected for the following reasons:

1) Particulate matter in the stormwater will clog the pores of dry wells. The attached catch basins with sumps will only catch coarse sediments. Consider the dry wells only for rooftop runoff. Keep them 10 feet from the buildings and use rooftop gutter screens to trap debris. The remaining stormwater should be put into infiltration trenches or infiltration basins.

2) The infiltration basin in the northwest corner of the site may not function as expected. Keep the inflow above ground, otherwise the infiltration trenches will become clogged. Consider trapping the entering sediments with a sediment basin with a riprap/filter fabric weir before the water spreads out in the basin. The infiltration trenches should be secondary and slightly higher to allow the maximum water surface area.

Additional comments include:

1) Areas where infiltration structures (i.e., basins and dry wells) are planned should be protected from construction traffic during all phased of construction to prevent compaction.

2) Grasses used in the basin should be water tolerant and low maintenance.

3) Debris and sediment must be removed on a regular basis. Maintenance is **extremely** important to infiltration systems.

Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs (Thomas Schuler, Metropolitan Washington Council of Governments, July 1987) should be referenced for more specific detailed information on design, construction specifications and maintenance. Contact Kip Kolesinskas at 688-7725 for more information.

Erosion and Sediment Control

The E&S control plan must be re-worked to comply with Town regulations. Soil and slope conditions on the site dictate that an effective E&S control plan be developed and implemented to protect the watercourse off-site.

Items that must be addressed include:

1) Location and details of the construction entrance pad should be shown on the plans.

2) Location of stockpile areas should be shown on the plans.

3) No vegetative clearing or earth moving activities should take place until E&S control measures are in place.

4) Clearing limits should be located on the plans and clearly marked in the field.

5) Clearing should be limited to the phase being constructed.

6) Details of catch basin protection using filter fabric should be shown on the plans.

7) Location of sediment barriers for each phase should be shown on the plans.

8) Barriers in outlet swales should be curved upslope, and energy dissipators and/or level spreaders should be required at all outlets.

9) Temporary and permanent seeding specifications, including seeding mixtures, rates and dates, should be on the plans.

Steep banks like the one south of the playing field and detention basin, will require immediate stabilization during construction. It is inappropriate to wait until all construction is completed to stabilize these slopes. The use of erosion control blanket materials is recommended to protect slopes 3:1 or greater. Each construction phase should be stabilized before the next construction phase is started.

BIOLOGICAL RESOURCES

WETLAND CONSIDERATIONS

While no inland wetlands are found on the site, valid concerns exist regarding the possible negative effects of development upon water quality within Punch Brook. E&S control recommendations include:

1) Phasing of construction to reduce exposure of soils to erosion; and

2) Inclusion of lateral diversion trenches or reverse cut swales along steep cuts or fills to reduce the linear distance of uninterrupted slope and water velocity along such slopes.

Based on review of the E&S control plans for Woodland Notch (1/10/90), it appears that these recommendations have been partially incorporated into project design. Additionally, prior to the initiation of subsequent phases, previous phases should be suitably stabilized. The Town should consider including this as a requirement for approval.

The droughty nature of the exposed soils along cut and fill slopes will make it difficult to establish permanent vegetation for long-term slope stabilization. The Town may require heavy mulching, hydro seeding or the use of geotextile fabrics to encourage vegetation growth along these slopes.

To establish proper design and to allow proper enforcement, the E&S control plans should be modified to clearly illustrate cross-section drawings of the proposed lateral diversion/reverse cut swales. These drawings should be included in the plans before approval.

Plans entitled "Erosion and Sediment Control Notes and Details" state: "Inspection of erosion and sedimentation control measures shall be preformed by the Town Engineer or an assigned representative on a regular basis during construction to ensure compliance with proposed plans." Because the Town may not have sufficient staff resources to monitor the development, it is recommended that the

Town require the applicant to retain qualified personnel to monitor E&S control measures. This individual will report to the Town Engineer on a periodic basis. Also, the Town obtain a letter of credit which allows immediate access to funds to carry out independent remedial efforts if the applicant be ineffective in controlling erosion and sedimentation. The amount of credit should be sufficient to cover costs associated with installation of controls, including geotextile fabrics, hay bales or siltation fencing.

Because the Burlington Fish Hatchery is downstream of the site, adequate implementation and monitoring of E&S control measures at this development is of paramount importance and essential to minimize negative impacts to the fish hatchery.

FORESTRY CONSIDERATIONS

Vegetation

The Woodland Notch site is a 14.5-acre forested parcel containing mixed hardwood type vegetation. The present commercial value of the forest is low to moderate due to the size and condition of the predominant sawtimber-sized trees. The value of the forest is greater for its aesthetic properties, watershed, diversified wildlife habitat and passive recreation potentials. The forest management potential of the site with the proposed development will be limited to shade tree care and ornamental plantings.

Vegetation Type Description

The entire site is covered by mixed hardwoods. The predominant hardwood species present are black oak, red oak, white oak, black birch, white birch and red maple. Aspen, white ash, gray birch, yellow birch and sugar maple occur in lesser quantities. The softwood species present as scattered individuals or in small clumps

are red cedar, hemlock, pitch pine and white pine. Tree size ranges from sapling to sawtimber, with sawtimber the dominant class. The understory included mountain laurel, huckleberry, blueberry, juniper, club moss (princess pine) and chestnut. The present condition of the forest is average. Trees in the western portion of the property show poorer growth and form due to the soil type. The forest cover type is directly influenced by either soil conditions, past management of the property or a combination of both. Soil types often dictate the moisture availability which can limit or restrict the forest's growth. Historical use of the land also influences the present vegetation type and condition.

Limiting Conditions, Potential Hazards and Management Considerations

The proposed development will directly affect an estimated 64% (9.3 acres) of the present forest stand through construction. The remaining 5.2 acres of native vegetation will be located in 60-foot strips along the property lines. Forest management emphasis should be placed on maintaining and improving individual tree growth. This is accomplished by first choosing individual trees with good form that are presently defect-free and have the potential to increase in growth. These crop trees should be of a variety of species to lessen the impact of a specific insect of disease outbreak and to create species diversity. After the crop trees have been designated, trees which are limiting the crown growth of the crop trees should be removed. To improve the screening capability of the native vegetation buffer, underplanting with softwoods is recommended. In the construction area, retaining existing trees may be an expensive and difficult task. The greatest cause of tree mortality from construction is changes in grade, not mechanical wounding. The topography of the property is very rolling, and drastic changes in grade are anticipated. If individual trees in the construction area are to be saved, then the services of an arborist or landscape architect should be enlisted to rate the trees on

their potential to survive and recommend measures to protect them during construction.

Impact of Development on the Abutting State Forest

The Nassahegan State Forest abuts the site on the western and northwestern boundaries. The forest resource of the State Forest should not be adversely affected by the proposed development.

WILDLIFE CONSIDERATIONS

Description of Area/Habitats

The 14.5-acre site located off of George Washington Turnpike in Burlington is completely wooded. The site contains some small steep hills. Although the site has no wetlands, the wetland system associated with Punch Brook is immediately adjacent to the site. The site abuts the Nassahegan State Forest, which is approximately 1,226 acres in size.

Wildlife habitat is the complex of vegetative and physical characteristics that provides for all the requirements of wildlife, including food, shelter, resting, nesting and escape cover, water and space.

Generally, the greater the habitat diversity and degree of interspersion of the various habitats, the greater the variety of wildlife there is using an area. Although the site has limited habitat diversity, it is adjacent to an area of extensive forested habitat. The site provides fair to good mixed woodland habitat for a variety of species. The value of the site as habitat is enhanced because it is adjacent to a large forest and the Punch Brook wetlands.

A wide variety of wildlife is expected to utilize the site to serve all of their needs, while many other species find it a place to meet some requirements. These species

include deer, ruffed grouse, weasel, raccoon, otter, fox, coyote, catbirds, sparrows, juncos, chickadees and a variety of reptiles and amphibians.

Forestland: The site is covered by second growth mixed woodland containing oaks, white pine, birches, sugar maple, hemlock and pitch pine. Understory species include birch, white pine, mountain laurel and various viburnums. In places, the ground cover includes running pine (club moss) and blueberry.

Forests provide for many wildlife requirements, including food, cover, shelter, roosting and nesting areas. Oak trees provide a source of acorns or mast for a variety of species. Beech and hickory also provide nuts. Birch trees provide catkins and seeds which are used by ruffed grouse, chickadees, pine siskins and tree sparrows. Deer browse on twigs. The snag trees (dead trees) are a source of insects which serve as food for many species, including woodpeckers and chickadees. Den trees (trees with cavities) can serve as nesting or denning places for animals such as squirrels or raccoons.

Wetlands: There are no wetlands as defined by soil type on the site. The wetlands associated with Punch Brook are immediately adjacent to the site and could be affected by the proposed development. Punch Brook is a fairly fast moving stream with a rocky bottom in the steep areas. The substrate becomes gravelly as the topography flattens out. Here, the watertable comes to the surface in places and forms pools and rivlets which flow into the brook. A lush growth of wetland plants such as skunk cabbage grow in these areas. The overstory is dominated by red maple, hemlock and yellow birch. This palustrine forested wetland offers habitat to a variety of mammals, birds, amphibians and reptiles.

In addition to providing riparian and associated stream-type habitat, Punch Brook provides a travel corridor for wildlife. Predators such as fox and otter use brooks to find an assortment of prey (i.e., fish, frogs, salamanders, etc.). Streams are often easier to travel along, especially in the winter.

Retention Basins

A retention basin is planned to be located in the uplands in the northwest corner of the site near the Punch Brook wetlands. As proposed, the basin will be roughly 6 feet deep, grassed-in and will only hold water on a temporary basis. The retention basin will offer little or no wildlife habitat. A variety of vegetation and a constant supply of water will make it useful to at least some species of wildlife.

Stream Corridor/Wetland Buffers

Streams are used as travel corridors by wildlife. Ideally, a buffer of undisturbed vegetation should be left all along the stream corridor and associated wetlands. A minimum of 100 feet of undisturbed vegetation left along the brook/riparian zone between the perimeter of the wetlands and any development, including lawns, is recommended. This will preserve the usefulness of the brook or riparian habitat for wildlife.

Wildlife Habitat Impacts

As with any development, the impact on wildlife habitat will be negative and long-lasting. Because 54 units are planned along with a well house and 2 playgrounds on the 14.5-acre site, the impact to wildlife at this site will be substantial. The area will be broken-up with the construction of roads, houses, driveways, lawns, etc. Habitat will be lost where cover is cleared for lawns and landscaping. Another impact is the increased human presence, vehicular traffic and free roaming dogs and cats. This could drive the less tolerant species from the site, even in areas where there has been no physical change. The value of an area for wildlife habitat decreases as the amount of development in the area increases. Certain species which are adaptable to man's activities may increase, and associated nuisances may occur. Typical species which can become a nuisance include pigeons, starlings and raccoons. Species sensitive to man's presence or the changes made will either move away or perish.

Cluster development is often preferable (if density is not greatly increased) to reduce the impact of development on wildlife habitat because it tends to leave more contiguous and larger areas of land as open space. Individual homes on lots fragment or cut-up land with houses and driveways. Small lot sizes augment the negative impacts of development on wildlife habitat. Larger lot sizes of 5 acres or more, especially if used in conjunction with open space, can be less detrimental. Even though residences have been clustered, the site is so small in relation to the amount of development proposed, that it represents a significant impact.

Possible Effects to State Forest Wildlife Habitat

The Nassahegan State Forest is a multi-use area, managed for forest, wildlife, fisheries and recreational resources. The recreational uses include hunting, fishing, trapping, hiking and wildlife observation.

Species adaptable to change may increase in the immediate State Forest area. To offset some of the impact of the increased disturbance and the habitat change, a buffer of trees should be left along the boundary between the State Forest and the site. The increasing number of free roaming cats and dogs that typically come with development will find their way to the State Forest and will cause additional negative impacts to the wildlife. Free roaming cats and dogs often needlessly chase and sometimes wound and kill wildlife. All residents should keep their cats and dogs under control.

Because hunters using the State Forest during the appropriate seasons are prohibited to hunt, shoot or carry a loaded firearm within 500 feet of any building occupied by people or domestic animals or used for storage of flammable material by regulation, some recreational potential will be lost, but the loss will be minimal.

Off-site Wetlands

Because wetlands increase the habitat diversity of an area and offer a variety of food and cover to wildlife, they are important areas to consider for protection. Acre

for acre, wetlands and their associated riparian zones exceed all other land types in wildlife productivity. In addition to their value as wildlife habitat, wetlands serve other valuable functions, including water recharge, sediment filtration and flood storage. For these reasons, development of, filling in and/or crossing of wetlands should be avoided or limited where ever possible.

The existing Punch Brook wetlands should be protected from sedimentation and poor quality runoff. Sediment deposition in a wetland can degrade habitat and markedly change the value of the wetland for wildlife. The retention basin should be carefully designed, and provisions for regular careful maintenance should be made so that the basin continues to function as designed. Wetlands should not receive runoff water of questionable quality that could contain lawn fertilizers and oils and salts from roads. Additionally, wetlands should not receive any sediment that could degrade existing wildlife habitat.

If retention basins are proposed adjacent to wetlands or in uplands, an effort should be made, if possible, to construct them to serve as some wildlife habitat. A basin planted with facultative wetland vegetation with standing water is more valuable than a grassed-in basin that holds water only temporarily. Maintaining water in a detention basin should not come at the expense of drying out any naturally occurring wetlands.

Open Space Areas

When and where possible, open space areas within developments should be set aside not only to conserve wildlife habitat, but also to benefit residents both in and outside of the development. Setting aside a combination of habitat types in conjunction with wetlands is preferable. Whatever type or combination of habitat types set aside, setting aside an "island of open space" surrounded by development is least desirable for wildlife. Open space areas should be connected throughout the development area and, ideally, should be connected with other open space areas in

the vicinity. The open space should have natural travel pathways for wildlife (i.e., streams, valleys and ridgetops) to enter and exit to other open space areas. The open space area is more valuable to wildlife if not traversed by roads which may impede movement.

Ways to Minimize Some Development Effects

In planning and constructing a development, there are measures that should be considered to minimize adverse impacts on wildlife (see Appendix A). Despite these measures, wildlife habitat will increasingly be adversely impacted as the amount of development increases on a site.

FISHERIES RESOURCES

Site Description

The Woodland Notch site does not contain any perennial waterbodies or watercourses. However, the steepest sloping terrain of the 14.5-acre site is contained on the 7 acres within the Punch Brook Watershed.

Punch Brook is a coldwater stream which averages 8 feet in width and 1 foot in depth. Stream flow is predominated by shallow riffle interspersed with moving pool. Stream substrate is of cobble, gravel, coarse sand and sand/silt fines. Riparian vegetation is of mature hardwoods and woody shrubs. In-stream fisheries habitat is composed of undercut banks and accumulations of fallen debris.

The DEP has classified Punch Brook as Class A surface waters. Designated uses of Class A water resources include drinking water supply, fish and wildlife habitat, recreational use (recreational use may be restricted), agricultural and industrial supply and other purposes. Lying almost entirely within the Nassahegan State Forest, the Punch Brook Watershed has been protected from development and subsequent water quality degradation. At present, alterations to the stream have

been from forest road/trail crossing(s), which have not altered water or habitat quality.

Aquatic Resources

The DEP Inland Fisheries Division does not have a recorded fisheries investigation of Punch Brook. The stream is physically characteristic of a coldwater stream. Anticipated fish species include brook trout, blacknose dace, longnose dace, tessellated darter and white sucker. Yearling brook trout and blacknose dace have been observed in Punch Brook by DEP personnel on several occasions. Because brook trout are not stocked in Punch Brook, those observed are presumed to be from naturally reproducing stocks.

The flows of Punch Brook not only provide high quality coldwater stream habitats, but in part serve (through interconnection) as the major source of water supply for a portion of the Burlington Fish Hatchery known as the Punch Brook Ponds. This series of 6 ponds, each approximately 1/4 acre in surface area, produce 50,000 brown and rainbow trout annually. The total trout production within the Punch Brook Ponds represents 25% of the total yearly production of the Burlington Fish Hatchery. All trout raised at the hatchery are released within Connecticut waters open to the general public for recreational sportfishing. Production of trout from these ponds has not declined since their creation in the mid- to late 1930s. However, the ponds are susceptible to siltation, because their primary water source is a stream. Siltation of the ponds will result in reduced production of trout. Silt will not only reduce the ponds' volume, but also will add nutrients promoting aquatic plant growth and increasing the biological oxygen demand (decreasing the amount of oxygen available to the trout). Silt/sediment/aquatic plant removal is costly and will remove the ponds from a normal production cycle.

Impacts

The proposed Woodland Notch development may have these impacts on Punch Brook and the fish hatchery ponds:

1) Groundwater withdrawal, required to supply the development with a potable source of supply, is proposed to be from a series of 4 wells tapping the bedrock aquifer. The Connecticut Water Company is planning to assume control of the wells following completion of the development's first construction phase. The Connecticut Water Company requires a total groundwater yield of 15 gallons per minute from the wellfield for an adequate supply. The wellfield can deliver that amount with 3 wells (#2, 3 and 4). Well #1 will be removed from production due to concerns with an easement. The removal of groundwater can, in many instances, alter surface flow of nearby waterbodies. Flows of Punch Brook and the amount of water available to the ponds may be lessened. However, because the wells will be withdrawing from a bedrock supply, this may be unlikely.

2) Domestic waste from the complex will be managed by 4 on-site septic systems. If poorly designed or installed, septic leachate may enter Punch Brook, primarily from systems closest to the stream. Nutrients entering Punch Brook can degrade the water quality of the stream as well as the productivity of the hatchery ponds. Nutrient enrichment of the ponds could cause an oxygen deficiency during the summer months and during the winter under the cover of ice and snow. However, soil samples taken from the septic/leach field sites have indicated that septic system nutrients will remain on-site and not be transported to Punch Brook.

3) During construction, the potential for soil erosion and sedimentation of the watercourse caused by the overland flow of water over scarified soils, recently excavated/filled areas or stockpiled materials, following storm events can cause habitat degradation. There exists a great potential for increased surface runoff, especially considering the steeply sloping topography along the western boundary of the site and the close proximity to Punch Brook. Siltation of the brook will fill gravel interstices and impact native brook trout reproduction. Silt carried into the hatchery ponds will reduce trout production and require costly and difficult remedial measures.

4) Introduction of sand and oils to Punch Brook may occur during the normal course of operating the development. Surface drainage from roads, parking lots and other impervious areas within the proposed development may allow these pollutants to enter Punch Brook. This will result in long-term water quality degradation. In the short-term, phenols from recently paved roads may enter the brook and cause fish kills in Punch Brook and/or the hatchery ponds.

5) Lawn fertilizers and chemicals may be transported to Punch Brook. Runoff and leaching of nutrients from fertilizers will stimulate excessive aquatic

plant growth, while the introduction of lawn chemicals may result in fish kills and water quality degradation.

6) Any water quality problems and habitat degradation to Punch Brook due to lessened water flows, enrichment from septic system leachate, increased sedimentation, road and stormwater drainage and lawn chemicals and fertilizers will eventually be observed in the downstream areas of Punch Brook proper and in the production capabilities of the Burlington Fish Hatchery's Punch Brook Ponds.

Recommendations

The impact to the aquatic resources of Punch Brook and the Burlington Fish Hatchery from the proposed development can be minimized by implementing these precautionary measures:

1) Maintain a 150-foot minimum open space buffer zone along the development's closest encroachment to Punch Brook. No construction or alteration of riparian habitat should take place within this zone.

2) An agreement obtained from the Connecticut Water Company, which prevents groundwater from off-site or interbasin transfer, is strongly recommended.

3) A strict schedule of septic system maintenance must be developed and implemented to prevent leachate from breaking the soil surface and/or entering Punch Brook via groundwater infiltration.

4) A comprehensive E&S control plan should be submitted for review, approved and installed prior to the start of construction and maintained through all construction phases. Mitigative measures should include, but not be limited to, above ground detention/retention basin(s), catch basins, silt fences and haybales. Surface runoff should not be allowed to directly enter Punch Brook. Once construction is initiated, officials from the Town should regularly police the development to ensure that all E&S controls are properly emplaced and regularly maintained with provisions to address corrective measures in case of emergency situations. In addition, a regularly scheduled maintenance of all detention/retention basins and catch basins should be required.

5) An effective stormwater management plan should be designed, reviewed prior to approval, implemented and regularly maintained. The stormwater management system should be designed to adequately hold stormwater runoff on-site, and stormwater should not be directly discharged into Punch Brook.

6) Restrict liming, fertilizing and the introduction of chemicals to manicured lawns of the proposed development. This restriction will abate the amount of additional nutrients entering Punch Brook.

7) The paving of roads and parking areas should be done only when precipitation events are not anticipated for several days.

THREATENED AND ENDANGERED PLANT AND ANIMAL SPECIES

According to the Natural Diversity Data Base, there are no known extant populations of Connecticut "Species of Special Concern" or Federal Endangered and Threatened Species occurring at the site.

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

LAND USE AND PLANNING CONSIDERATIONS

PLANNING CONSIDERATIONS

State Forest land surrounds the site on the north and west sides, and single-family residences border the site on the south and east. Land use of the area surrounding the site for a considerable distance is exclusively open space and single-family residential. The exception is a small cemetery on Case Road to the east of the site. The cemetery has aesthetic and historic value.

The State Policies Plan designates the site as a Conservation Area primarily because it is adjacent to the State Forest and directly upstream from the Burlington Fish Hatchery. State strategy for Conservation Areas is to manage them for the long-term public benefit for water quality, open space, recreation and general environmental quality and assure that changes in land use are compatible with these conservation values. State guidelines support only those uses which are compatible with the resource of concern, water quality in this instance. This high-density condominium development proposal appears to be incompatible with the State guidelines. Alternatives that are consistent with the State Policies Plan could be considered.

The proposed development is consistent with the Regional Development Plan Map which lists the area as residential, low to high densities. However, as designed, the development is not consistent with several objectives of the Plan.

> **Goal #1, Objective 1**: to promote an energy efficient land use pattern by such means as encouraging higher residential zoning densities where appropriate and close proximity between major residential areas and employment and social service facilities.

The site, in a rural heavily forested area and located on a road which becomes impassible immediately beyond the proposed development site, seems inappropriate for the proposed high density residential usage.

Goal #1, Objective 2: to support efforts to upgrade ground water and surface water quality by minimizing pollution from point and non-point sources.

The proposed development will be served by on-site sewer and water facilities. Whether or not sanitary, water quality, stormwater runoff and erosion/ sedimentation concerns are technically satisfied, the proposed development does not appear to be consistent with efforts to minimize potential pollution sources.

Goal #1, Objective 3: to promote the public use of and insure reasonable access to public parks, forest land and other related facilities for passive and recreational activities.

Goal #1, Objective 6: to identify, preserve and, where feasible, enhance the aesthetic features within the Region that make it a desirable place to live.

George Washington Turnpike is used to access the State Forest, for walking, riding and other recreational activities. Development of housing units of the proposed density might diminish or destroy the aesthetic beauty of the site and detract from the aesthetic value of the neighboring State Forest.

The relevant sections of the Burlington Town Plan of Development, Part V, Planning Goals and Development Policies are II. Residential Development and I. Natural Setting. The proposed development, as written, is not supported by Burlington's Goals and Policies for Residential Development. While Goal E, encouraging a variety of housing types, seems to support the project, Goals A and C do not. The development will increase stormwater runoff and will put additional stress on the Case Road intersection. Additionally, the development, as proposed, might weaken, rather than maintain, the attractiveness and stability of the single-family residential neighborhood bordering the site on the east. Policies 1.a. and 2.b. also conflict with the proposed development.

Burlington's Goals and Policies for Natural Setting place great emphasis on maintaining the rural character of the Town and ensuring a balance between man

and nature in the development of the Town. Surface and groundwater supplies are to be protected to the maximum extent possible. Site design should encourage the retention of open space. The proposed development pays little attention to these goals. The proposed development seems to fit as many units as allowed onto the site. The area closest to Punch Brook is of greatest environmental concern because of the close proximity to the Burlington Fish Hatchery ponds. The plans denote construction or earthwork within 100 feet of the border along most of the western boundary.

To be consistent with policies of the Town Plan, the proposed development should be in an area where there is some compatibility with surrounding land use and where it can be serviced by municipal sanitary sewers and water mains. The site contains many low ridges and knolls, most of which will be leveled off. The overall plan should take advantage of the opportunities for incorporation of these landscape elements into the design plan. A buffer of 100 feet along the State Forest boundary is recommended.

The proposed development meets all requirements of the multi-family use allowed by Special Permit in Burlington's R-15 zone. General considerations for approval of Special Permit Uses raise some questions concerning elements of the project. The Case Road intersection, already dangerous because of poor visibility, will undergo an increase in traffic entering from George Washington Turnpike.

The proposed development seems inappropriate for the site and the surrounding area. The site lends itself well to cluster development of single- or 2-family townhouses with a buffer along the State Forest boundary and open space set aside at the back of the parcel. Following that concept, the site could provide 20-25 dwelling units while paying attention to environmental and sanitary concerns. The smaller townhouses could be incorporated into the existing hilly terrain much more easily and comfortably than the larger condominium units. Another alternative is to

subdivide the parcel and build single-family homes, again setting aside the rear portion of the parcel for open space.

TRAFFIC CONSIDERATIONS

The site fronts on rural roads in an area that is subject to limited land use modification. State owned property limits the potential for land use change. The developer's proposal to widen a portion of the George Washington Turnpike between Stone Road and Case Road is appropriate. The existing roadway is in poor repair and normally 18 feet wide. Widening to 22 feet will improve traffic operations.

Off-site Comments

1) The George Washington Turnpike and Stone Road intersection should be improved and the intersection angle of the Stone Road leg lessened to "square up" the intersection. The increase in the width of the George Washington Turnpike with some additional work on Stone Road should facilitate this adjustment.

2) The Town should consider the use of edge striping along with center line striping. A traffic control sign should be placed on Stone Road.

3) The east approach of the George Washington Turnpike and Case Road, at the intersection, will require the existing stop sign to be relocated to meet accepted design standards. The Town should review the sightlines and make any necessary improvements. Road improvements may be needed to meet safety standards. These improvements should be made even if this development is not approved.

Generation Rates

The consultant's traffic study estimated 450 weekday trips with a 25% expansion factor due to the isolated location of the site. This is a conservative analysis for this location. The isolation factor and the 25% expansion may not represent the real conditions since a resident may be able to organize trip making to reduce extraneous trips. An annual increase in traffic between 3 and 5% occurs on State roads and is

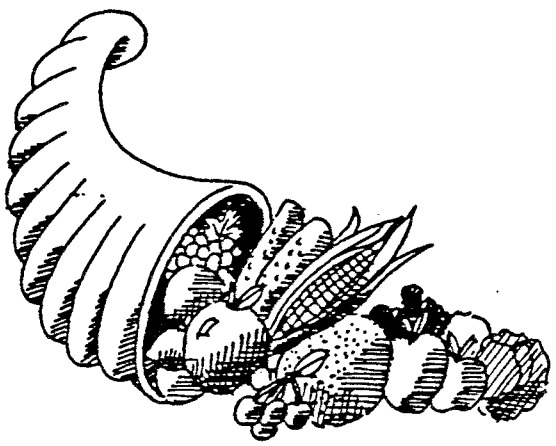
generally reflected on local roads. The overall traffic operation will not be substantially changed in this portion of Burlington.

Internal Roadways

The condominium roadway network is limited, and the design attempts to manage stormwater drainage by use of catch basins and combined lateral extensions with dry wells, which would distribute the "first flush" during a storm event. The use of the lateral extensions and dry wells should be reviewed since the retention basin is capable of processing stormwater.

Pavement should be an "open graded" bituminous concrete mix. This type of pavement will retain the small amounts of petroleum products falling on the roadway surface. Long-term pavement performance will be enhanced since the bottom of the sub-grade is loose sand. All stormwater pipe joints should be water tight to prevent undermining if a leak should occur at a joint. The loose sand is susceptible to erosion and loss of material if a leak should occur.

APPENDICIES



Appendix A: Suggestions for Maintaining Wildlife Requirements

SUGGESTIONS FOR MAINTAINING WILDLIFE REQUIREMENTS

1) Maintain a 100 foot (minimum) wide buffer zone of natural vegetation around all wetland/riparian areas to filter and trap silt and sediments and to provide some habitat for wildlife.

2) Utilize natural landscaping techniques (avoiding lawn and chemical runoff) to lessen acreage of habitat lost and possible wetland contamination.

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

4) Early successional stage vegetation (i.e. field) is an important habitat type and should be maintained if possible.

5) During land clearing, care should be taken to maintain certain forest wildlife requirements:

   a) Encourage mast producing trees (i.e oak, hickory, beech). A minimum of five oaks/acre, 14 inches dbh or greater should remain.

   b) Leave 5 to 7 snag/den trees per acre as they are used by birds and mammals for nesting, roosting and feeding.

   c) Exceptionally tall trees, used by raptors as perching and nesting sites, should be encouraged.

   d) Brush debris from tree clearing should be piled to provide cover for small mammals, birds and amphibians and reptiles.

   e) Shrubs, vines and trees which produce fruit should be encouraged (or can be planted as part of the landscaping in conjunction with the development) especially those that produce fruit which persists through the winter (winterberry). See Appendix B for a list of suggested shrub and tree species that can be encouraged and/or planted to benefit wildlife.

Appendix B: Suitable Planting Materials for Wildlife Food and Cover

SUITABLE PLANTING MATERIALS FOR WILDLIFE FOOD AND COVER

Herbaceous/Vines	Shrubs	Small Trees
Panicgrass	Sumac	Hawthorn
Timothy	Dogwood	Cherry
Trumpet creeper	Elderberry	Serviceberry
Grape	Winterberry	Cedar
Birdsfoot trefoil	Autumn olive	Crabapple
Virginia creeper	Blackberry	
Switchgrass	Raspberry	
Lespedeza	Honeysuckle	
Bittersweet	Cranberrybush	
Boston ivy		

NOTES

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 - an 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 through 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 land owner/ 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 approximately two (2) reviews per month.

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