Queach/Vigliotti Golf Course and Residential Development

Branford, Connecticut

King's Mark Environmental Review Team Report

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

Queach/Vigliotti Golf Course and Residential Development Branford, Connecticut

Environmental Review Team Report

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

for the
Conservation Commission
Branford, Connecticut

July 1996

CT Environmental Review Teams
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Acknowledgments

This report is an outgrowth of a request from the Branford Conservation Commission to the New Haven County Soil and Water Conservation District (SWCD). The SWCD referred this request to the King's Mark Resource Conservation and Development Area (RC&D) Executive Council for their consideration and approval. The request was approved and the measure reviewed by the King's Mark Environmental review Team (ERT).

The King's Mark Environmental Review Team Coordinator, Elaine Sych, would like to thank and gratefully acknowledge the following Team members whose professionalism and expertise were invaluable to the completion of this report.

The field review took place on Thursday, June 27, 1996.

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I would also like to thank Lisa Santacroce, of the Branford Conservation Commission, Nancy Wilson, Branford wetland agent, other members of the Conservation Commission, the applicant William Aniskovich and his consultants for their cooperation and assistance during this environmental review.

Prior to the review day, each Team member received a summary of the proposed project with a location and soils map. During the field review Team members were given site plans and additional information, with more reports and maps being mailed to them at a later date. Following the review, reports from each Team member were submitted to the ERT coordinator for compilation and editing into this final report.

This report represents the Team's findings. It is not meant to compete with private consultants by providing site plans or detailed solutions to development problems. The Team does not recommend what final action should be taken on a proposed project - all final decisions rest with the Town and developer. 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 Town. The results of this Team action are oriented toward the development of better environmental quality and the long term economics of land use.

The King's Mark RC&D Executive Council hopes you will find this report of value and assistance in making your decision concerning this proposed golf course and residential development.

If you require additional information please contact:

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Introduction

The Branford Conservation Commission with suppport of the Branford Inland Wetlands Commission has requested an environmental review of the Queach/Vigliotti Golf Course and Residential Development.

The approximately 260 acre site is located between Laurel Hill Road and Queach Road in the Mill Plain section of Branford. A public 18 hole golf course with a clubhouse and a 105 home single family residential development is being proposed (see Location and Topographic).

Objectives of the ERT Study

The Town has asked for assistance in reviewing the project because of the significant environmental impacts anticipated from the proposed development on a unique and fragile area. Of special concern to the Town is information and recommendations associated with impacts to the wetland systems on and off site, particularly Pisgah Brook and the Branford Supply Ponds.

The ERT Process

Through the efforts of the town this environmental review and report was prepared for the Town.

This report provides an information base and a series of recommendations and planning guidelines which cover a wide range of disciplines and cover numerous topics requested by the Town.

The review process consisted of four phases:

1) Inventory of the site's natural resources;
2) Assessment of these natural resources;
3) Identification of resource problem areas; and
4) Presentation of planning, management and land use guidelines.

The data collection phase involved both literature and field research. The field review was conducted on June 27, 1996. The emphasis of the field review was on the exchange of ideas, concerns and recommendations. Being on site allowed some Team members to verify information and to identify other resources.

Once Team members has assimilated an adequate data base, they were able to analyze and interpret their findings. Individual Team members then prepared and submitted their reports to the ERT coordinator for compilation into this final ERT report.

Location and Topographic Map

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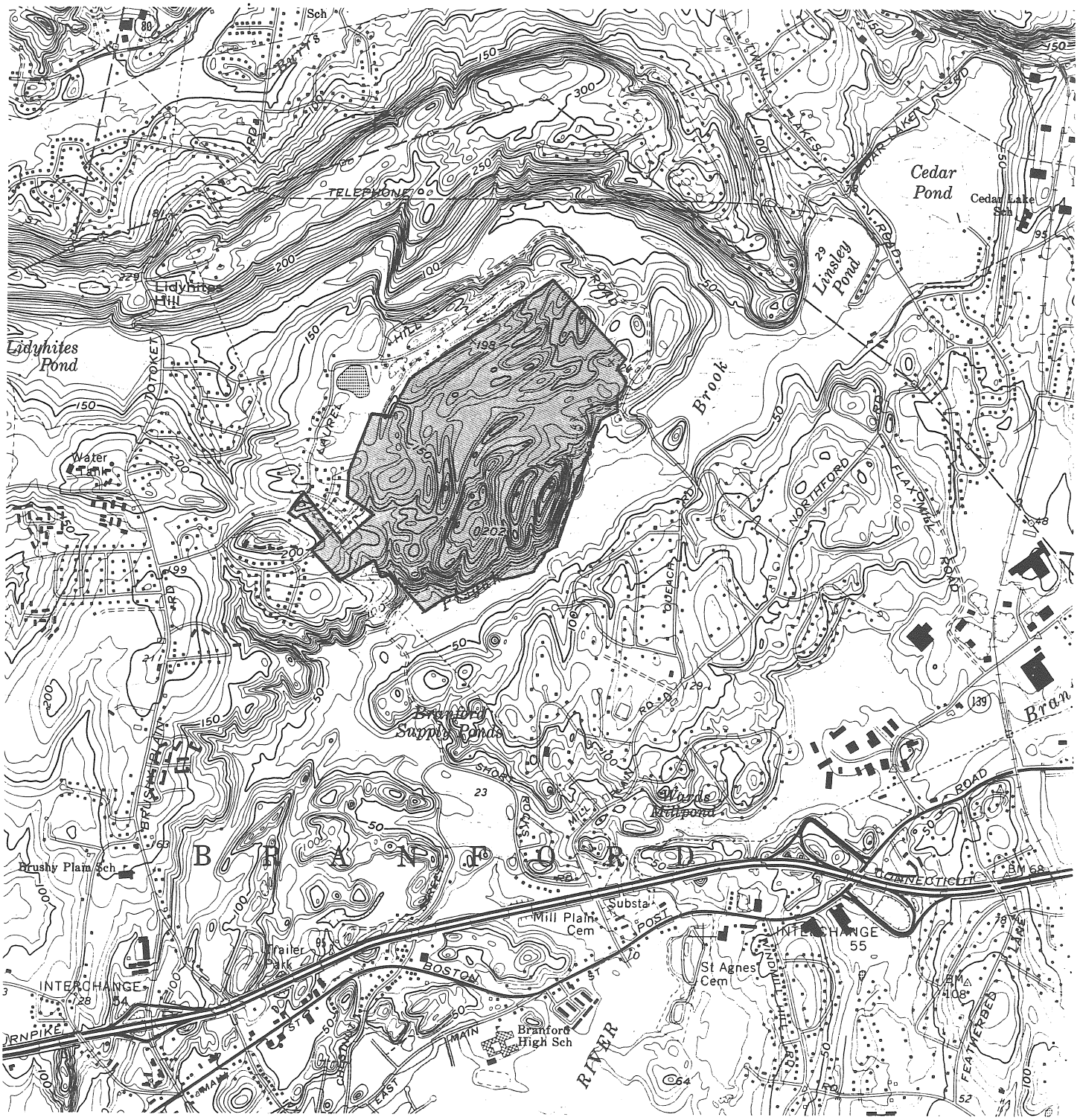
Scale 1" = 2000'



Topography and Geology

Topography

The topography of the area proposed for development is rather unusual for Connecticut. Glacial features dominate much of the State's landscape but here the local relief is controlled by the structure of the underlying sedimentary bedrock. A series of 40 to 50 foot high, regularly spaced parallel ridges trace out layers of coarse conglomerate in the shallow dipping arkosic Mesozoic sandstones. A gentle folding of the sediments is faithfully recorded by the curvilinear course of the ridges. The floors of valleys separating the ridges and the flat terrain in the eastern half of the site lie at a general elevation of between 110 and 130 feet. The modern streams have cut into this surface forming steep-sided small ravines and gullies.

Surficial Geology

The ridges are capped by a thin 0-2 foot thick veneer of loose sandy material which formed directly from underlying bedrock. The bedrock is poorly consolidated and disintegrates readily into pebble and sand sized particles which are quickly washed down the steep ridge slopes. As there is no coarse material to form talus, the upper slopes are very active and judging from the effects of recent logging operations, once disturbed the vegetative cover is slow to reestablish itself. Erosion control will be critical if the area is regraded and landscaped.

Depth to bedrock in the valleys and flat areas between the ridges is of the order of 10s of feet. The fact that many of the valley floors seem to be graded to a 110-130 foot elevation suggests that some stratified sands may have been deposited when the base level of streams draining the area was controlled by stagnant ice in the Pisgah Brook Valley.

Bedrock Geology

The Queach-Vigliotti site lies just north of the Mesozoic (200 million years old) Border Fault located in the Pisgah Brook valley. This fault which was active during the accumulation of the Mesozoic sediments downdropped the Mesozoic rocks several thousands feet relative to the older Paleozoic (400 million years old) metamorphic rocks on its south side.

The bedrock underlying most of the site is light red colored conglomerate containing large pebble to boulder angular to sub-rounded rock fragments up to 2 feet in diameter set in a poorly cemented coarse sandy matrix. The large clasts are principally metamorphic, but in places, particularly close to the Border Fault, sub-rounded basalt boulders up to 2-3 feet in diameter are common. Both massive and vesicular basalt fragments are found. The basalt fragments are conspicuously larger than the metamorphic fragments with which they are intermixed. The clasts presumably originated by rapid erosion of basalt flows uplifted by the border fault.

The Mesozoic rocks dip gently to the south. Some layers, especially the coarser conglomerates, are better cemented and more resistant to weathering and stand up as distinct steep-sided ridges. The pattern of these parallel ridges reveals the sediments have been deformed into a series of small northward plunging gentle folds. The deformation presumably connected differential movement on the border fault.

Although the State Geologic Map and the open-filed Branford quadrangle report show Hampden basalt underlying the southwestern section of the area, the exposed rocks are actually sediments. The error is understandable as loose basalt boulders are scattered over the surface. The fragments however are weathering out of a sedimentary conglomerate rather than a massive basalt flow or volcanic agglomerate. Only one exposure of massive basalt, in the bed of the southerly flowing stream at the

western edge of the property was seen during the ERT site visit. The basalt is well consolidated and much more resistant to weathering than any of the conglomerates or arkoses and would pose a different set of problems for construction and landscaping (more blasting and less erosion control). However the current plans do not propose any major excavations or regrading in areas likely to be underlain by basalt.

Soil Resources Review

Soils

The landscape of the site is dominated by steep, rough uplands that have long ridges and knobs of exposed bedrock. These soils are somewhat excessively drained to well drained. This site is represented by the Holyoke-Rock outcrop - Cheshire general soils map unit. These upland soils were formed in glacial till where relief is affected by the underlying bedrock.

Holyoke soils in this unit are excessively drained, loamy soils that have bedrock at a depth of 10 to 20 inches. They are on the top of the broader ridges and on the more gently sloping side slopes of ridges and hills.

Rock outcrops within this map unit area areas of bare exposed bedrock on the very steep sides of ridges and are on the top of ridges and hills.

Cheshire soils are deep, well drained, loamy soils on the lower cliff areas between the bedrock-controlled ridges.

Minor soils make up the remaining soils located within this site and associated with the general soil map unit. They are mainly the Yalesville, Wilbrham, and Watchaug soils. Yalesville soils are well drained, loamy soils that have bedrock at a depth of 20 to 40 inches. Wilbraham soils are deep, poorly drained, loamy soils in drainageways and depressions. Watchaug soils are deep, moderately we drained, and loamy. They are in slight depressions and on the lower concave slopes adjacent to the base of ridges and hills.

According to the *Soil Survey of New Haven County* (1979), this general map unit has poor potential for community development. It is limited mainly by the bedrock outcrops and shallowness to bedrock.

According to the figures reported by the applicant, of the approximately 260 site, there are approximately 31 acres of State of Connecticut regulated wetlands and 1200 feet of regulated watercourses. Those soils listed on the site as hydric soils (see Hydric Soil List in the Appendix) are Adrian and Palms muck (AA), Saco silt loam (Sc), Wilbraham very stony silt loam (Ws) and Wilbraham and Menlo extremely stony silt loams (Wt).

The Soils Map is taken from the *Soil Survey of New Haven County* (1979), atlas sheet #61. The soil map legend (in the Appendix) provides a listing of those soil map units found on the atlas sheet and the current soil name used for soil interpretations for those map units. The general suitability and limitations of these soil map units for the proposed uses will be discussed within the text and the referenced tables included within this report. Soil limitations for this site range from slight to severe, depending upon potential development opportunities of the site.

The limitations for identified uses are considered "slight" if soil properties or site features are favorable, or site features are favorable for the intended use and limitations are minor or easily overcome. "Moderate" limitations occur if soil properties are not favorable for the intended use and specific planning, design or maintenance is needed to overcome or minimize limitations. "Severe" limitations occur when soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs and possible increased maintenance are required. A review of the soils map and the attached reports will indicate any areas of potential soil limitations.

The dominant soil features of this site are depth to bedrock and steepness of slopes. According to the Holyoke-Cheshire Complex Map, the cross hatch area represents this

soil map unit (HuD). This complex has bedrock at 10 to 20 inches below the surface with rock outcrops on steeper exposed slopes. Slopes on this map unit range from 15 to 35 percent. Approximately 65% of the site is represented by this map unit. The other map units HtC (Holyoke silt loam, rocky, 3 to 15 percent) and YaC (Yalesville fine sandy loam, 8 to 15 percent) have similar dominant soil features to HuD.

The *Soil Survey of New Haven County* (1979), is not a substitute for on-site soils investigations. It will be necessary to conduct an on-site investigation to accurately determine the suitability of any soil type for nay intended use. Due to the extensive site modifications being proposed to accommodate roadways, house foundations, golf fairways and greens and utilities, it is recommended that the applicant hire a professional geotechnical engineer to determine site suitability for intended use and engineering requirements for appropriate engineering designs.

The "Water Management " report (in the Appendix) lists limitations for soils on the site. These limitations are useful in consideration of planning and designing water management measures (waterways, ponds or basins, etc.). Additionally, the "Building Site Development "report (in the Appendix) provides soil limitations for the site when considering specific site development.

The soil erodibility factors for soil map units located on the parcel range from 0.17 to 0.43, where the higher the number, the more susceptible the soil is to erosion by water. The soil map units that range in slope from 3 to 15 percent, have an erodibility factor of 0.42, are highly erodible soils. It is on these type slopes that a majority of the site is being developed.

Due to the proximity of the steep, erodible soils to regulated wetlands, intensive efforts will need to be employed to keep sediments out of wetlands. Attempts to protect all existing buffer areas will help to ensure that existing wetlands can be protected. This could include, but not limited to: maintaining as much separating distances between

construction activities and wetlands, especially on steep areas; establishing all erosion and sediment control devices outside of the buffer areas and not use buffer areas as sediment filters; maintaining and protecting existing native vegetation within buffer areas to help protect wetlands and provide for wildlife habitat and a natural screen to wetland areas.

Because of the high hazard of erosion, this site needs a more extensive soil erosion and sediment control plan that what is presented in the plans offered for review. Detailing phasing and sequencing of the construction activity is needed for this site. Control measures need detailed drawings and calculations and additional information should be provided to ensure that off-site impacts are not realized due to stormwater flow from proposed outlets.

Current channel erosion was observed at the site downstream of the proposed 9th green. This existing channel erosion can be accelerated if outflows from the proposed ponds upstream are not properly designed. Plans should be made to analyze this watercourse and all others for stability as a result of receiving runoff from the proposed development.

Recommendations for Consideration

- Have the applicant present a final inland wetland and watercourses map signed as to its accuracy by a qualified soil scientist.
- Conduct detailed non wetland soil and geotechnical investigations of the site by a geotechnical engineer to determine the extent of site limitations for development for intended uses.
- A majority of the site is comprised of soils with a thin soil profile. Evidence of the high hazard of erosion was observed on the site as a result of recent logging operations and off-road recreational vehicles (mountain bikes, all-terrain vehicles, etc.). These shallow, steep soils are easily eroded. Strong consideration should be

given to staying off of slopes that are greater than 3:1, especially when they abut regulated and/or other sensitive areas. Plans do not show all expected cut and fill elevations for houselots, greens, fairways, and driveways. A complete evaluation of impact to on and off-site resources cannot be completed until this detailed information is presented. Consideration should be given to developing a planning map which identifies all sensitive areas (wetlands and watercourses) adjacent to steep slopes (slopes that are 3:1 or greater). These identified areas should be avoided and left intact. If development of these sensitive areas is unavoidable, plans to minimize impact to these areas should be comprehensive.

- Clearing of vegetation and earth-moving activities on shallow, steep soils will result in an increased hazard of soil loss unless these areas are identified and appropriate measures re installed to protect them and adjacent areas.
- Consider extending the 50 foot buffer around inland wetlands and watercourses on those areas with slopes 3:1 or greater and designate these areas as fragile sites. Maintain a minimum width of 25 foot top-of-slope setback from 3:1 or steeper slopes.
- Retaining vegetative buffers adjacent to wetlands and watercourses will help reduce runoff, renovate stormwater and assist in maintaining surface water (stream) temperatures. These areas will also help maintain base flow of groundwater to these wetland systems.
- Buffers maintained along wetlands and watercourses between residential house lots and fairways and greens will provide some water renovations of pesticides and fertilizers. Additionally, where feasible and practical, stormwater runoff from roads and driveways can be diverted to vegetated filter areas for renovation before outletted into waterways or wetlands.
- In developing impervious areas, consideration should be given to filtering runoff by use of systems designed outside of the natural renovation systems. Assuming that existing systems have a limited capacity to accept, treat and transport an increased loading of stormwater, the applicant should plan for water renovation systems that

will achieve a level of treatment that will not impact or degrade runoff beyond current levels.

- In order to maximize the use of on site soil resources and reduce operation and maintenance costs, fairways and greens should be located on soils with a medium-textured, high organic content, high cation exchange capacity, low erosion and runoff potential and at least a depth of 4 feet to the water table or bedrock. An under-drain system should be installed beneath any portion of the fairways, greens, or tees which are sited on coarse-textured soils or where the depth to bedrock or the maximum elevation of watertable is less than 4 feet. The purpose of the under-drain is to collect fertilizer and pesticide contaminated leachate. The leachate should be treated by applying it to medium-textured soils lying 4 feet or more above bedrock and the water table. Or the leachate may be treated with a system such as a sand-peat filter. Either approach will generally lower the concentration of fertilizers and pesticides to an acceptable level.
- Avoid all waterway crossings when possible, trying to combine both golf cart and road crossings where possible. If a waterway crossing must be used then it should be designed to minimize the removal of trees and other shading vegetation. Cart paths should be constructed of permeable material, no wider than 8 feet, and when crossing watercourses or wetlands, constructed on pilings from edge of wetland/watercourse to edge of wetland/watercourse. All streams should be bridged, not placed in a culvert.
- Consider construction of ponds on upland soils where possible, providing additional water renovation to existing resources. A pond should not be located on an intermittent or perennial stream. Upland ponds must not expose stream channels to an increase in either the rate or duration of floodwater velocity. Upland ponds must not reduce flood scour to a degree that silt and other fine material will accumulate within downstream channels. Ponds should be designed to minimize use by waterfowl, particularly geese.
- Consider construction of parking lots, golf cart storage and other areas around buildings by using impervious materials to enhance infiltration of stormwater. If

impervious surfaces cannot be sited on soils suitable for infiltration, then a wet-pond/sand-filter combination should be used to control stormwater pollutant loadings.

- Reduce or eliminate grading and filling on fairways and greens, especially where existing slopes are 15% or steeper. If grading or filling must occur on slopes steeper than 15%, then clearance should be timed to occur during that portion of the year when the potential for erosion is lowest (generally late summer and early fall). Work on the steep slopes should be staged so denuded soils can be stabilized within a maximum of 14 days following initial exposure.
- Another tree should be planted for each tree removed during site development. Replacement trees should be planted within the same watershed where the loss occurs. The survival rate for each tree species should be taken into consideration. If the survival rate averages 25%, then four trees should be planted for each specimen felled.
- Monitoring should begin one year prior to the construction of a golf course and continue throughout the life of the course. Ground and surface water should be analyzed quarterly for ammonia, nitrate, and pesticides. Biomonitoring may be substituted for full pesticide analysis beginning in the third year. Initially biological sampling should be performed quarterly, then, beginning in the third year, once annually, in August. Fish tissues should be examined once a year for pesticides used on the course which the have the potential to bioaccumulate. A groundwater monitoring program should also be established to detect effects upon existing wells, wetlands, or drawing contaminants in from surface waters. Base flow and water temperature should be monitored in any streams or rivers in the vicinity of the course.
- Post-development considerations should also be considered for this site. A comprehensive operation and maintenance (O&M) plan should be developed and implemented for the golf course. To reduce the impact of the golf course on the aquatic environment, it is suggested the O&M plan include the following:

- A combination of physical, chemical, and biological monitoring techniques should be employed to assess the current extent of impact and to pin-point probable causes.
- The maintenance personnel responsible for identifying and controlling pests should become expert in the use of Integrated Pest Management (IPM), but IPM alone will eliminate the potential for contamination of ground and surface waters with pesticides.
- If any portion of a fairway, green, or tee is located on coarse-textured soils or the depth to bedrock or the watertable is less than 4 feet, then:
    - the areas should either be converted to a low maintenance use (rough), or
    - replanted with a grass variety requiring minimal fertilizers, pesticides, and irrigation, or
    - filled with material which will increase the clay and organic matter content, reduce soil permeability, and increase the depth to groundwater, or
    - fitted with an under-drain system to collect leachate so it can be treated through application to suitable soils or with a sand-peat filter.
- Fertilizers with a low leaching potential should be applied at the lowest acceptable rate and during periods when grass is actively growing.
- Irrigation should be performed on an "as needed" basis, rather then on a set schedule. If irrigation water is drawn from wells of a stream/river, then an analysis of the impact upon low-flows and aquatic organisms should be conducted. An analysis should also be conducted of the effects upon well yields in the area. If either analysis indicates a problem, then the following options should be considered:
    - reconstructing a pond(s) to capture stormwater runoff, (if this option is used, then the ponds must be designed and sited to avoid either a significant increase or decrease in flood flows) and/or:

        - relocating wells to several groundwater drainage basins to reduce the impact upon individual streams or rivers and to lower the impact on other well water users, and/or
        - relocating a surface water intake to utilize a stream, river, or lake which can meet irrigation needs without an accompanying impact upon aquatic communities, and/or
        - reduce or terminate water withdraws during critical periods, and/or
        - replant the course with grass varieties having a higher drought tolerance.
    - The first inch of stormwater runoff from all impervious surfaces should be delivered to an infiltration device or a wet-pond/sand-filter combination.
    - A 100-foot wooded buffer should be maintained along all wetlands, streams, rivers, tidal waters, ponds, or lakes on the course.
    - The use of chemical control measures for managing ponds and lakes should be reduced or eliminated. Rather than using toxic substances to control algae, techniques with fewer long term impacts should be used, such as reducing nutrient inputs, dredging, and so forth.
    - Wherever possible, the number of trees ad shrubs on the course should be increased.
    - Pesticides, fertilizers, fuels, and other toxic substances should be stored in a location where a spill will not result in rapid, uncontrollable entry into ground or surface waters.
- A more comprehensive soil erosion and sediment control plan is needed for this site that complies with the provisions of the State of Connecticut's General Permit for Construction Activities as required under EPA's National Pollution Discharge Elimination Systems (NPDES) General Permits for Stormwater Discharges from Construction Sites. Features of this plan would include, but not be limited to:
    - a construction phasing pan with detailed sequencing of construction activities and needed control measures.
    - Detailed design measures with calculations.

- Operation and maintenance, and inspection schedules.
- Plans with identified and properly located control measures.

Soils Map

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Scale 1" = 1320'

Soils Map

Scale 1" = 1320'

Cross Hatched Area showing HuD Soil Map Unit

Inland Wetlands Review

This section will focus on a few fundamental issues related to the general merits of this project as it pertains to Connecticut's Inland Wetlands and Watercourses Act as well as the policies of the Inland Wetlands Resources Division of the DEP. This will be followed by several other key observations and comments. In order to keep attention focused on these key issues, a detailed review of specific components of this plan will not be performed.

According to the information contained within the applicant's supporting documents, there are approximately 31 acres of inland wetlands located on this 260 acre parcel. Forty-one separate wetland parcels were mapped and grouped into three major systems. Most of these wetland areas are interconnected, however, some were characterized as "small, isolated pockets" or "ephemeral" wetland areas. Almost all of these wetlands can be described as forested or scrub/shrub type wetlands. Many of these wetlands are situated among largely undeveloped, steeply sloping forested upland areas. These wetland systems all drain to the Pisgah Brook which flows into the Branford Supply Ponds and shortly thereafter in to the Branford River.

The proposal calls for direct wetland impacts of 9.4 acres. This represents 30% of the total wetland acreage of this parcel. These impacts are in the form of filling or excavating to provide for 20 wetland crossings, three irrigation ponds, a driving range, fairways, and grading for residential building lots. In addition to this proposed work in wetlands, there will be similar activities taking place in 19.3 acres of Branford's administrative review area (consisting of a 50 foot "setback" from the wetland boundary).

Also of concern are the indirect impacts that may occur to the wetland areas due to:

- Excessive sedimentation resulting from temporarily disturbed soils during construction in adjacent upland areas;
- Excessive erosion of off-site watercourses as a result of increased stormwater runoff created by developed conditions;
- Decreased water quality resulting from herbicide and nutrient application; and
- De-watering of wetland areas as a result of irrigation.

In considering an application involving regulated impacts to wetland areas, the Branford Inland Wetlands Commission (BIWC) should ensure that the applicant has taken all reasonable steps to first avoid and then minimize any proposed impacts to wetland areas. Alternative development proposals considered by the applicant should be presented as part of their application process, preferably in the form of a diagram or site plan. In the case of an application which receives a public hearing, the BIWC must find that a feasible and prudent alternative to the proposed wetland alteration does not exist prior to issuing a wetland permit.

Steps that could be taken to reduce direct impacts to the wetlands, while still preserving the fundamental goals of the applicant, include:

- Reduction of the number of holes.
- Realignment of existing holes.
- Reduction of the number of residential building lots.
- Realignment of the proposed road.
- Reducing the size of the ponds or locating them in upland areas bordering wetlands.

This minimization of impact, which is a critical concept of our wetland regulations, should be considered in light of among other things, the ecological integrity of the effected wetlands, their vulnerability given the surrounding steep slopes and the overall socio-economic benefits afforded by the proposed project.

Once the process of avoidance and minimization is completed, the applicant should focus on measures which will act to mitigate the unavoidable impacts. This step typically includes the restoration or creation of wetland areas which replace or exceed the functional values of wetlands destruction caused by the development.

According to the record presented at this time, there is no evidence that the applicant has considered any alternatives to the currently proposed project. The mitigation measures, as listed on page 24 of the Environmental Report's second volume, include many ordinary items which should be expected of any proposal. Wetland restoration or creation of the large area, of what the Team wetland specialist assumes the applicant considers to be unavoidable wetland impacts (9.4 acres), was limited to the 1.3 acres of upland which will be converted into open water irrigation ponds. However, using this as a mitigation measure is dubious due to possible negative biological effects of the water level fluctuations which were predicted on page 20, Vol. II of the applicant's ... *Water Supply Evaluation*.

The severe limitations that this site poses for erosion and sedimentation concerns will be addressed in other sections of this report. As for the ecological integrity and general noteworthiness of these wetlands, the Team wetland specialist will generally comment that having such a large system of interconnecting as well as ephemeral wetlands on one parcel, is rare in his experience as a wetland specialist in Connecticut. In addition, it is clear that the record generated by other experts on this proposal certainly attests to the noteworthiness of this wetland system.

Other primary concerns include:

- None of the plans reviewed contained an embossed seal of, or certification statement by a civil engineer.

- All of the plans reviewed were specifically labeled "not to scale" or "n.t.s.". This makes review of these documents difficult when the scale has to be assumed.
- There was no soil scientist's report included in the supporting documents.
- A certification statement attesting, at some level, to the accuracy of the wetland boundaries presented was not found.
- Very few wetland boundary flags remained in the field at the time of inspection. This makes verification of wetland boundaries difficult if not impossible. Re-flagging of at least the areas to be impacted is recommended for any future site walks. Additionally, rough staking of proposed impact areas would also aid in the review process.
- A review of the applicant's Stormwater and Irrigation Water Supply Evaluation by DEP Supervising Engineer Art Christian revealed that there are over 50 building lots which are not within the drainage areas of the proposed detention/irrigation ponds. This finding was based on the existing drainage areas map since there was no proposed drainage areas map found. There are reductions in post-construction peak stormwater discharges for the areas under the influence of the three proposed ponds, however, there is no way of knowing if this will be enough to balance the effects of the increase in stormwater runoff expected from the development proposed outside of the ponds' drainage areas. **No conclusions of the downstream impacts that this development may cause were found in the record**. This item is of particular importance given the channel erosion already experienced in this area.
- The wetlands evaluation completed by the applicant's consultant was limited to only five categories to be rated (size, it's unspoiled nature, wildlife, hydrologic inter-connectiveness, and stormwater renovation). CT DEP's *Method for Evaluation of Inland Wetlands in Connecticut* includes additional categories which were not rated, the most important of which is flood control. Other categories which could have been rated include visual aesthetics, ecological integrity and general noteworthiness.

Regulation by the Inland Water Resources Division (IWRD)

Be advised that this proposal would most likely require a permit from this division as called for in the Connecticut Water Diversion Policy Act (sections 22a-365 through 22a-378 of the C.G.S.) if there are to be any surface or groundwater withdraws exceeding 50,000 gallons on any given day. It is recommended that the applicant call Bob Gilmore of the IWRD at 860-424-3019 to determine the need for such a permit.

In addition, this project appears to fall under Category III of the new U.S. Army Corps of Engineers (ACOE) Programmatic General Permit (PGP) requiring that an individual "404" application be submitted to the ACOE as well as a "401" application Water Quality Certification application to the Connecticut DEP's Inland Water Resource Division. For questions regarding these regulatory programs contact Ruth Ladd of the ACOE at 617-647-8338/800-343-4789 or Sally Snyder of the CT DEP at 860-424-3019.

Fish Resources

Fish Population

The proposed golf course and residential development borders Pisgah Brook, a resource expected to support diverse warmwater fish populations. No fisheries survey information are available within this watercourse; however, based on a field review of physical instream and riparian resources on the site, the presence of numerous impoundments on this system, and fisheries data in adjacent watersheds, the following freshwater finfish should be found in Pisgah Brook: blacknose dace, brown bullhead, white sucker, redfin pickerel, chain pickerel, sunfish species and golden shiner. American eel, a species which exhibits catadromous migratory behavior should also be very common.

This property contain several small feeder streams which are tributary to Pisgah Brook. None of these streams support fisheries resources. One of the primary functions of these headwater stream reaches and their associated wetlands is to provide clean and unpolluted waters to downstream areas of the watershed.

Surface waters of Pisgah Brook are classified as "Class A". Designated uses for this classification are: potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply, and other legitimate uses.

Impacts

The following impacts can be expected if proper mitigation measure are not implemented:

1. Reduced streamflow in Pisgah Brook. The loss and alteration of over 24 acres of wetlands and buffers that supply ground and surface waters to Pisgah Brook may effectively reduce stream flows. This situation would be most critical during normal summer low flow periods since Connecticut streams are dependent upon groundwater inputs to maintain base flows. The functional value of wetlands to supply waters to stream resources may be impacted with the loss/alteration of wetlands. This alteration coupled with the actual withdrawal of groundwaters from man-made ponds used for irrigation purposes may further compromise stream flows. Man-made ponds can interrupt groundwaters that function to augment stream flows. Evaporative losses from ponds and from turf maintenance can also be expected. The decrease of low flows may inflict myriad impacts to local fisheries. The main concern is that reduced stream flow could translate into a loss of instream habitat for fish. Other impacts from reduced stream flows are water quality related. Reduced flows can significantly elevate stream water temperatures and decrease dissolved oxygen levels. Low gradient watercourses, such as Pisgah Brook adjacent to this parcel, that contain pool habitat are particularly susceptible to dissolved oxygen deficiencies. Riffle areas contain turbulent fast flowing waters where dissolved oxygen levels can be inherently higher than in pools.

2. Site soil erosion and sedimentation of watercourses due to extensive vegetation clearing and cut/fill activities. Without proper safeguards, the placement of fill in concert with land disturbances associated with golf course construction may introduce suspended sediments to watercourses. This parcel with its steep, hilly topography and thin soils presents a challenge to properly control soil runoff. If not properly controlled, suspended sediments may cause stream degradation in downstream areas. All drainage from this property is eventually conveyed to Pisgah Brook. Sedimentation is of special concern in a meandering, low gradient system such as Pisgah Brook where deposited sediments take much longer to be washed and transported downstream by Spring freshets. Ultimately, sediments would collect within the Branford Supply Ponds which would serve as sediment basins. Excessive sediment deposition could damage the aquatic ecosystem in the following ways:

- Sediment reduces the survival of resident fish eggs and hinders the emergence of newly hatched fry. Adequate water flow, free of excess sediment particles is required for fish egg respiration and successful hatching.
- Sediment reduces the survival of aquatic macro-invertebrates. Since aquatic insects are important food items in fish diets, reduced insect population levels in turn will adversely affect fish growth and survival. Fish require an excessive output of energy to locate preferred prey when aquatic insect levels decrease.
- Sediment reduces the amount of usable habitat required for spawning purposes. Excessive fines can clog and even cement gravels and other desirable substrate together. Resident fish may be forced to disperse to other areas not impacted by siltation.
- Sediment reduces stream pool depth. Pools are invaluable stream components since they provide necessary cover, shelter, and resting areas for resident fish. A reduction of usable fish habitat can effectively limit fish population levels.
- Turbid waters impair gill functions of fish and normal feeding activities of fish. High concentrations of sediment can cause mortality in adult fish by clogging the opercular cavity and gill filaments.
- Sediment encourages the growth of filamentous algae and nuisance proportions of aquatic macrophytes. Eroded soils contain plant nutrients such as phosphorous and nitrogen. Once introduced into aquatic habitats, these nutrients function as fertilizers resulting in accelerated plant growth.
- Sediment contributes to the depletion of dissolved oxygen. Organic matter associated with soil particles is readily decomposed by microorganisms thereby effectively reducing oxygen levels.

Recommendations

The following recommendations are provided to assure protection of aquatic resources.

1. Hydrologic analyses should investigate anticipated impacts to streamflow regimes. Information should be generated to evaluate and assess the extent to which the existing stream flows of Pisgah Brook may be diminished due to the alteration of wetlands and buffers and the withdrawal of water used for irrigation and turf maintenance. The period of concern is during the base flow period, typically June through September. Diminished flows to Pisgah Brook could translate into instream habitat losses. Further information may also be required if water losses are expected to be significant. This could include stream habitat based studies which predict instream habitat losses in different microhabitat types.

2. Develop an aggressive and effective erosion and sediment control plan. Proper installation and maintenance of erosion/sediment controls is critical to environmental well being. This includes such mitigative measures as filter fabric barrier fences, staked hay bales, and sediment basins. Land disturbance and clearing should be kept to a minimum and all disturbed areas should be restabilized as soon as possible. Exposed, unvegetated areas should be protected from storm events. The applicant and the local wetland enforcement officer should be responsible for checking this development on a periodic basis to ensure that all soil erosion and sediment controls are being maintained. In addition, the applicant should post a performance bond with the town to protect against future soil erosion violations. Past stream siltation disturbances in Connecticut have occurred when individual contractors either improperly deployed mitigation devices or failed to maintain these devices on a regular basis.

3. All instream work and land grading/filling near watercourses should take place during low flow periods. This will help to minimize the impact to the aquatic resources. Reduced streamflows and rainfall during the summer and early fall provide the least hazardous conditions in which to work near sensitive aquatic environments.

4. The excavation of wetlands to create ponds for irrigation and subsequent withdrawal of waters is considered a water diversion, and as such, may require a

State of Connecticut Water Diversion Permit. The applicant should contact the DEP Water Diversion Program at 860-424-3019 for further details.

Pesticides and Water Quality Issues Related to Geology and Hydrogeology

The following sections will address some of the background and previous studies of the area, site suitability factors, pesticides and water quality issues and Integrated Pest Management (IPM) suggestions.

Background and Previous Studies

Since the 1960's the site and surrounding areas have been the subjects of many natural resource and environmental investigations. Detailed study and documentation have identified this and surrounding areas as a unique and valuable natural resource system. In 1972, it was designated as Natural Area Inventory Site by the Connecticut Forest and Park Association. The area is also part of the Branford River Marsh Fish and Wildlife Area as identified on various state-wide maps. The site is also designated a special project area for the 1996 Connecticut Resource Protection Project currently underway. Less than one-half mile upstream in the Pisgah Brook system, there are three occurrences of state-listed endangered or special concern plant and animal species as well as a recognized community habitat. One species is reportedly the only known occurrence in the state of Connecticut.

The site appears to have superior qualifications as a candidate for open space acquisition for the town of Branford. For many years, open space acquisition for municipalities has been funded through the Land Acquisition and Management Division of the Department of Environmental Protection utilizing federal Land and Water Conservation Funds. Branford may wish to explore its eligibility for such funding for this parcel.

Site Suitability Factors

Geologically, the site is especially unique and significant since its border, the Pisgah Brook is the location of the Eastern Border Fault Zone, a major extensional normal fault that extends well beyond Connecticut's northern border and which separates the Connecticut Valley rift basin from the Eastern Highlands metamorphic terrane. Related subparallel faults occur in a similar northeast-southwest orientation through and near the site. These faults represent not only contacts for different rock types but are evidence for past geologic/tectonic movement. Here at the site, Triassic/Jurassic aged siltstones and sandstone of the East Berlin formation are extruded by the Hampden basalts. On the southwest side of the Eastern Border Fault are the early Paleozoic granites and gneisses. (1) These structural relationships between rock types are significant hydrogeologically since rock formation contacts and faults may function as groundwater flow conduits.

The underlying geology and past tectonic adjustments are the foundation for the rugged topography we observe at the site. Normally, sites with so many steep slopes would be ruled out for development purposes and preserved in the natural condition for open space. In fact, a great portion of the mapped soils at the site contain a severe restriction for building construction due to steep slopes and shallow depth to bedrock. Slopes in the 15 to 35% range are considered unsuitable for development. Soils are thin over steep areas and the sedimentary rock is very erodible (2).

Pesticides and Water Quality

This portion of the report will address the Queach-Vigliotti proposal's golf course management plan with some general comments about pesticides and water quality and then specific responses to items in the plan.

Existing and proposed golf courses are currently receiving considerable attention regarding their potential impact on surface and groundwater quality. All three of the major categories of pesticides (herbicides, insecticides and fungicides) are commonly and routinely used on golf courses. There are numerous studies and documentation concerning pesticides occurrence in surface and groundwater as a result of normal usage practices, that is, pesticides applied according to label directions and not that which might be explained by way of spills, mishandling or leaks. As one would expect, concentrations are low, generally in the part per billion range. Two reasons explain in part why we are finding pesticides in water. Only since 1971 and more intensively since 1979 has a nationwide effort been undertaken to survey for the occurrence of pesticides in groundwater and surface water. Laboratory technology has become sophisticated enough to detect not only in the part per billion (ppb) range but in some cases as low as part per trillion (ppt) range. These sampling and analysis efforts, however, are limited with respect to the actual number of samples taken, and also with regard to the number of analytes tested for. Studies document pesticide occurrence in Connecticut, Massachusetts and nationwide. Specifically, 2, 4-D, dicamba and DCPA have been detected in groundwaters in some areas of Connecticut (3&4).

The two major ways in which pesticides can reach the water resource be it surface water or groundwater are: 1) by the vertical infiltration or percolation of pesticides with rainwater or irrigation water through soil layers into the groundwater, 2) surface runoff or overland flow into streams depending on the antecedent moisture conditions in the soil profile, bedrock at the surface or impermeable (paved) surfaces. The physical and chemical characteristics of a pesticide determine its leachability or surface runoff potential. For instance, the solubility of a pesticide may make it less likely to migrate with percolating water down to the water table but its KOC value may enhance its potential to adsorb onto eroded soil particles that are subject to surface runoff forces. In summary, it is difficult to satisfy all the criteria that would inhibit movement of pesticides to groundwater and surface water.

While the site project will be served by public water and not be dependent on private wells, the Pisgah Brook drainage system which is classified as GA, must be maintained and the project must demonstrate no potential to degrade the groundwater or surface water resources.

Integrated Pest Management (IPM) Suggestions

Integrated Pest Management (IPM) techniques are discussed in the golf course management plan. Following are some suggestions for inclusion within the plan.

- The underlying principle behind IPM is to strive for the reduction of or elimination of pesticide usage. One critical component of IPM is to correctly identify the pest, be it a weed, insect or fungus. Does the presence of the correctly identified pest constitute an infestation? In other words, there are threshold levels within which a pest population can be tolerated.
- Pesticide storage provisions should include spill contingency plans. Concrete bermed secondary containment should be built around a separate structure for pesticide storage.
- Pesticide selection for a golf course should consider the pesticide's solubility levels in addition to KD or KOC and the half -life in soil and water. Pesticide solubility at less than 20 ppm is a suggested criteria. Another protective criteria might be the use of the GUS or Groundwater Ubiquity Score of small or extremely small for leachability potential. The relevant pesticide characteristics should be evaluated in conjunction with the particular soil type on which it is applied.
- Again to reiterate the previously discussed concept, while the pesticide's characteristics may be favorable to impede infiltration to groundwater, those characteristics may result in a higher runoff potential to surface water.
- Another concept to be aware of are the degradation products of the original pesticide product, also called the metabolites. These compounds must be identified

and considered as well with regard to their potential to contaminate the water resource.

- Many golf courses, both existing and proposed, are planning for a strategically placed monitoring well network to monitor for pesticide occurrence and movement. In considering this option, it is important to ascertain the feasibility and practicality of conducting the laboratory analysis for the particular compound and its metabolites. Before pesticides are chosen for use, a determination should be made about whether equipment, methodologies and expertise are available to test for these compounds.
- Finally, pesticide applications and applicators must conform to the statutes and requirements of the Connecticut Pesticide Control Act, C.C.S. Chapter 441, Part I and II, particularly in regard to the appropriate certification of the applicator, and the registration of the product contemplated for use.

References

(1) Sander, J., et al., Bedrock Geology of the Barnyard Quadrangle, unpublished.

(2) USDA Soil Survey, 1975, New Haven County, Connecticut.

(3) Millenary, JR., et al., 1991, Pesticides in Groundwater, Soil, and Unsaturated-Zone Sediments at Selected Sites in Connecticut, Connecticut Water Resource Bulletin No. 42.

(4) US EPA, 1992, Pesticides in Groundwater Database. A Compilation of Monitoring Studies: 1977-1971 National Summary.

Lake and Pond Water Quality

The proposed golf course and residential development encompasses approximately 10% of the watershed of the Branford Supply Ponds. Although the development is upstream from the Ponds, indirect impacts could degrade the water quality of the Ponds. Concerns such as controlling erosion during construction or impacts to wetlands are being discussed in other sections of this report and therefore, will not be addressed in this section. However, post construction stormwater runoff, increased habitat for water birds, and maintenance of the golf course ponds are water quality issues that should be discussed in more detail.

Currently the Branford Supply Pond area is used for open space recreation such as fishing and hiking. The ponds do not support contact recreation like swimming and sailing. The Branford Supply Ponds are biologically productive ponds with considerable aquatic plant growth. The Branford Supply Ponds are infested with the introduced exotic plant Eurasian water milfoil. Although no water chemistry was available, the ponds would most likely be classified as eutrophic. Eutrophic lakes or ponds have extensive rooted aquatic growth and frequent algae blooms due to nutrient enrichment of the waterbody. Eutrophication is a natural process accelerated by nutrient loading and sedimentation from land uses such as urban development, agriculture and residential lawns.

The natural conditions of the Branford Supply Ponds influences the eutrophic condition of the ponds. The surface area of the Branford Supply Ponds is approximately 27 acres, and the watershed is 2464 acres resulting in a watershed to surface area ratio of 91 to 1. With such a ratio, the relatively small ponds will have a high loading of phosphorous and nitrogen from its large watershed. Because of the small volume of the ponds, these nutrients will be in high concentrations creating fertile conditions for plant and algae growth.

Although the Branford Supply Ponds are naturally eutrophic, stormwater runoff from the proposed development could exacerbate these eutrophic characteristics. The conditions of the stormwater general permit required for this development include that at least 80% of the solids be removed before leaving the site. Additional treatment to remove dissolved nutrients from stormwater would reduce nutrient loading from the site. Discharging stormwater through created wetlands can enhance nutrient removal. If feasible, creating wetlands for stormwater treatment as mitigation for the wetlands that will be lost through the development could be a way of protecting the Branford Supply Ponds.

When a forested area is converted to lawns or golf courses, developers unwittingly create ideal habitat for nuisance Canada geese. As these areas increase in Connecticut, so do the concerns of impacts to water quality from Canada geese. Canada geese use these areas to feed on the lush lawns during the day and then roost on nearby waterbodies at night. Their feces are high in nutrients and oxidizable organics both of which can accelerate eutrophication. Additionally bacteria from their fecal matter can cause problems with bathing areas and water supply reservoirs.

The proposal for this development should include a plan to discourage Canada geese from feeding at the golf course. The U.S. Department of Agriculture, Animal Damage Control Office can assist with this plan. Discouraging Canada geese from frequenting this area is a strategy that will protect the Branford Supply Ponds and other nearby lakes and ponds as well.

The proposed development includes several ponds that will be created from existing natural wetlands. The plans do not mention maintenance procedures that they will employ after the ponds are created. Ponds created from wetlands eventually show signs of eutrophication. Proper design of ponds can reduce the impacts of eutrophication management techniques such as dredging or herbicide treatments. The

Integrated Pest Management (IPM) plan should address design features and future management of the golf course ponds with respect to eutrophication.

The Forest Ecosystem

The site of the Queach and Vigliotti development proposal, consisting of an 18-hole golf course and approximately one hundred homes, is unique in Branford because it is one of a few remaining forest ecosystems in the area. The ecosystem is mature and highly productive. The system serves as a great biological filter purifying the atmosphere and waters passing through it.

The parcel of the proposed development is in the upper reaches of the watershed supporting the Branford Supply Ponds. Waters and sediments emanating from the up-gradient site have an influence on the supply ponds, via the surface water and ground water pathways passing through Pisgah Brook and into the ponds. Very simply, and without uncertaintly, any substantial development of the upper reaches of the watershed will negatively impact Pisgah Brook and the Branford Supply Ponds.

The soils on the site include the Holyoke-Cheshire complex (HuD), Holyoke (HtC), Yalesville (YaB, YaC), Wilbraham (WcB,Ws), Watchaug (WT), and Adrian/Palms Muck (AA) series. These soils are classified as lithic, typic, and aquic dystrochrohepts; aquic fragiochrepts; and medisaprists. Soil textures range from coarse-loamy (HuD, HtC, WT, WcB, Ws, YaB, YaC) to sandy-skeletal (AA). Some soils are extremely stony. Distinguishing features are shallowness to bedrock (lithic); a subsurface horizon restrictive to water infiltration, percolation and drainage (aquic fragiochrepts); and a permanent or seasonally high water table characteristic of wetlands (aquic, saprists).

The *Soil Survey of New Haven County, CT* indicates that these soils have serious restrictions for development. The features limiting land use potentials are shallowness to bedrock, steep slopes, a fragipan restricting subsurface water percolation, and aquic soils. The coarse-textured soils present erosion and seepage problems. Wetness results in potential frost action and soil churning. Specifically, the soil survey indicates severe restrictions for building site development and golf course fairways. The attached

soils map from the survey illustrates the spatial location of these soils on the site, and natural surface water drainage towards the brook and ponds.

Evidently, the proposed development will clear at least 140 acres of forest that profoundly affect the fragile soils developed on steep slopes of the site. The forest ecosystem offers physical stability rooting in the soil, by mitigating the weathering and erosive forces of precipitation and surface waterflow, and by providing a tight and conservative mineral cycle. Clearing the forest will result in a sudden change in the hydrologic cycle. Rapid decomposition of the forest floor organic matter and mobilization of the forest floor reservoir of nutrients will occur. Subsequently, erosion of the coarse-textured soils will carry nutrient enriched sediments along the surface water pathway. Sedimentation will damage the brook and ponds. Without the forested system regulating the water regime on the site, ground water levels could be impacted, particularly if ground water is used to irrigate the golf course greens. Loss of the forested buffer about the surface water bodies will cause a warming of the waters, also having an impact on aquatic life.

There is ample research that indicates deforestation results in a disruption to the tight mineral cycle of a stable forest ecosystem, and subsequently results in soil erosion and sedimentation of streams and ponds with nutrient enriched sediments. Local history has shown this to be true after the development of a neighboring parcel off Laurel Hill Road. In fact much of the research into the environmental impacts of deforestation, and specifically as they relate to the Laurel Hill Road development, was conducted by the distinguished Dr. F. H. Bormann of Yale University and resident of Branford. This Team member strongly advises the Branford Town Officials to seek Dr. Bormann's consultation and heed his expert guidance.

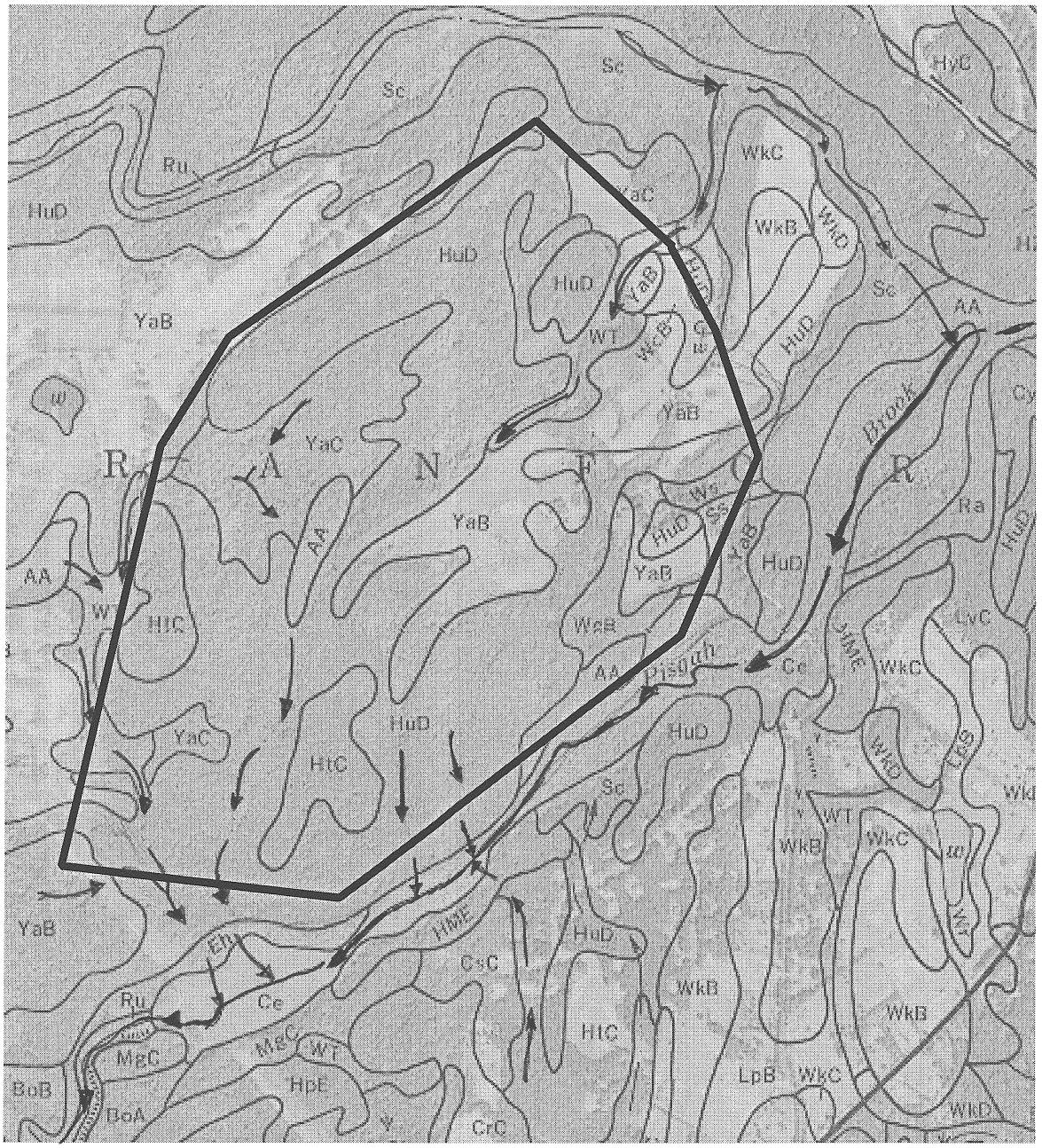
The activities of a golf course and residential development pose serious post development problems that further compound the issues of destruction of the existing ecosystem. Golf courses use copious amounts of agri-chemicals that can be expected

to leach from the site into neighboring waterways. Further, a development as proposed, attracts waterfowl species, which add nutrients, through defecation, into the waterways. Homes employing onsite septic systems also contribute to the loading of nutrients into the waterways. The misplacement of these facilities on lands incapable of supporting them is a formula for trouble.

The Branford Conservation Commission expressed concerns at the ERT meeting that the proposed development would have serious ecological impacts to onsite wetlands, Pisgah Brook, the supply ponds, natural waterflow and water quality, and wildlife and fisheries habitat; resulting from soil erosion, impacts to wetland buffers, increased storm water runoff, and leaching of agri-chemicals. Questions posed to the applicant's respresentatives, querying for their response to these concerns, were discounted; but specific rebuttal was not offered. A question regarding the amount of forest to be cleared was posed. The representatives were unable to provide that information. The forest ecologist Team member expressed concern to the applicant's representatives that they were on fragile soils with steep slopes, and that past history of Laurel Hill Road development illustrates the sensitivities of this site to development. The applicant's representatives indicated that they would utilize engineering techniques that were different from the past, but they did not elaborate. Nonetheless, this site is fragile and potentials for drastic environmental degradation is real. There remain outstanding environmental concerns that warrant resolution.

The forest ecologist Team member concurs with the concerns expressed by the Branford Conservation Commission and shared by Dr. Bormann in his statement to the Branford Wetlands Commission and the citizens of Branford. Clear cutting of the forest cover on shallow and fragile soils, on steep slopes, will result in loss of biotic regulation of biogeochemical flux (ie, circulation and retention of nutrients), soil erosion, and sedimentation into surface water bodies. These environmental impacts would be made worse by post development disturbances to the system. Stormwater runoff characteristics will change because of loss of forest interception of precipitation, from

slow release to rapid flow directed through storm water sewer systems. Natural recharge of water bodies will be altered. The existing biofiltration system will be lost.



Soil Survey of Queach and Vigliotii Golf Course and Residential Development, Branford, CT

HuD: Holyoke-Chesire; YaB, YaC: Yalesville; WcB, Ws: Wilbraham; WT: Watchaug; AA: Adrian/Palms.

Site boundaries are roughly precise. ←: surface water drainage.

Stormwater Management

Since the site construction involves the disturbance of over five acres, Connecticut's General Permit for the Discharge of Stormwater and Dewatering Wastewaters (the "Permit") will cover the project. The permit requires that the site register with the Department of Environmental Protection (DEP). The registrant must then prepare and keep on site during the construction project a Stormwater Pollution Control Plan (the "Plan"). Please note that while this review is based primarily on the state Permit, many of the erosion and sedimentation issues are included in the Connecticut Guidelines for Soil Erosion and Sediment Control (the "Guidelines"), and are issues that must be dealt with on a local level before being included in the Plan.

The Plan must include a site map as described in Part VI.B.3.a. of the General Permit and a copy of the erosion and sedimentation (E&S) control plan for the site. The E&S plan that has been approved by the Town in conjunction with the CTDEP Inland Water Resources Division (IWRD) and the local Soil and Water Conservation District may be included in the Plan. The "Sedimentation and Erosion Control and Stormwater Management Plan" (the "report") prepared by Delta Environmental (dated May 1996) may be used for the basis of this Plan, but it does not currently meet the requirements of the Permit. *This plan and site map must include specifics on controls that will be used during each phase of construction*. The few rows of silt fence in one of the maps provided are assumed to be a general typical detail, and in no way a finished control plan. Delta's report is very general: specific site maps and controls will have to be described in the Plan, as well as construction details for each control used. Some discrepancies between the Permit and Delta's report include, but may not be limited to:

- Page 11 of the report states that temporary seeding will occur in areas that will not be disturbed for "several weeks or more." Part VI.B.3.b.(i) requires stabilization

practices where construction activities have "temporarily been suspended for more than thirty days, or when final grades are reached in *any* portion of the site."

- The Permit (Part VI.B.3.b.(i)(b)) requires that for areas where greater than five acres (not ten as stated by Delta) are disturbed at one time, the Plan must show that a sediment basin will be available that will store a minimum of 134 cubic yards of water per acre disturbed. On page 24, the report discusses "equivalent sediment controls" in place of sediment basins. Please note that since the lack of a sedimentation basin constitutes a permit violation, such alternative controls would have to approved by the CTDEP.
- The Permit requires velocity dissipators (Part VI.B.3.b.(iii)9b)) at all discharge locations and along the length of any outfall channel. In the section on "outlet protection" details and descriptions of how velocity dissapators will work (both during and post construction) need to be included.
- Part VI.B.3.b.(ii) of the permit requires a description of how dewatering wastewaters are treated to ensure that they do not discolor or contain suspended solids that would pollute the waters of the State.
- The Permit (Part VI.B.3.c.) requires, and the report included, inspections at least once every seven calendar days and after every storm event of 0.5 inches or greater. However, the Plan must also allow for the inspector to require additional measures if the inspection finds them necessary, and should note qualifications of personnel doing the inspection. In addition, the Plan must include monthly inspections of stabilized areas for at least three months *following* stabilization. The inspection worksheet should be much more specific to the site and its special conditions; the sample shown in Appendix A is wholly inadequate for documenting the necessary controls and potential problem areas on this site.
- The permit requires, and none of the reports address, post-construction stormwater management. Part VI.B.3.b.(iii) of the permit requires that stormwater management measures be designed that will meet a goal of 80% removal of total suspended solids from the post-construction development. The installation of catch basins and

level spreaders (the only post-construction management measures discussed in the report) do not meet this goal.

This site has many long, steep slopes, most of which have wetlands and/or watercourses at the slope toe, which will require extreme erosion and sedimentation controls to prevent pollution. These measures include phasing of construction, extensive use of erosion control matting and diversion berms, and continual monitoring of controls and conditions. The construction should be phased to avoid exposing large expanses of land to erosion problems and to enable controls to function more effectively. Erosion and sedimentation controls must be maintained throughout the project. The permit requires that "the plan shall ensure and demonstrate compliance with" the guidelines.

Additional improvements that should be made to the report include, but may not be limited to:

- Section 4.2 notes that topsoiling is not necessary for temporary seeding. Mulch, however, is necessary for any seeding.
- Section 4.2.2 discussed geotextiles and their uses. Geotextiles and/or construction matting should also be used on any slope steeper than 3:1. Proper installation for these controls is essential to prevent undercutting, and should be included in the Plan. The extreme conditions discussed on page 12, paragraph 2 also are cases for erosion control matting.
- Page 16 notes that the construction entrance will be 4 inches thick, and page 17 states that they will be 6 inches thick.
- The description of how a stream will be diverted in order to install a temporary stream crossing needs clarification (silt fence will not divert all of the water and is not designed for in-stream use).
- The discussion of silt fence should include the drainage area that may discharge to any one row of fence (silt fence is designed to contain silt from a limited area, which

should be designed for and defined in the Plan). Silt should be removed from behind the fence when it reaches one-third (not one-half) of the fence height. Silt fence details must include a discussion of properly burying the fence toe to prevent sediment from flowing under the fence.

- Stone berms and filters should be used in place of and/or in conjunction with silt fence where appropriate.
- The temporary sediment basin design should be more specific on the amount of sediment storage in the basin (per the guidelines). Stakes showing cleanout elevation and maintenance access must be included. The best basins incorporate the use of risers with trash guards.
- The Plan should better define the conditions under which surface roughening will be used as a control and note areas and brevity in which this type of control is effective.
- Section 4.3.2 (permanent structural controls) includes a discussion of temporary drainage swales: where is the discussion of permanent controls?
- Check dam design should include how far apart (based upon slope) the dams are located.
- Gradient terrace (slope bench) design should include a discussion of specific length and slope of areas where they will be needed.

A plan, schedule, and detail of responsible parties should be prepared for post-construction management control maintenance. Post-construction treatment is not discussed excessively here due to lack of information given, but should be an important part of the design.

Subsurface Sewage Treatment and Disposal

The proposed development will consist of a golf course with a pro shop and possibly other facilities (i.e. banquet) and approximately 100 single family homes. The development will be served by public water and a combination of sewage treatment and disposal techniques. It is understood that any facilities related to the golf course will be served by sanitary sewers connected to the city sewer line. This type of discharge will be covered by a general permit. Plans and specifications for the sewer extension should be submitted to the Municipal Facilities Section of the Department of Environmental Protection for review and approval. It is believed that the current proposal calls for only the residential development to be served by a number of community septic systems.

It is understood by this Department that some limited site testing has been done to date. However, this Department has not witnessed any such testing nor have the local health officials. Therefore, the opinions of this Department must be based on what limited information that has been received as well as available soil maps and the suggested bedrock geology.

Based on the site location map it appears that the majority of this site consists of Holyoke-Cheshire complex (HuD) with some areas of Holyoke silt loam (HtC) and Yalesville fine sandy loam (YaB and YaC). The Holyoke-Cheshire complex makes up the major portion of the site. This complex consists of moderately steep and steep, well drained and somewhat excessively drained soils on uplands where the relief is affected by the underlying bedrock. Both Holyoke and Cheshire soils have moderate permeabilities. However, this complex has poor potential for community development. It is limited mainly by steep slopes, shallowness to bedrock, and rock outcrops. Onsite waste treatment and disposal systems, such as septic tank leachfield systems, require very careful and often innovative design and installation to insure proper treatment. Yalesville fine sandy loam is gently sloping to sloping, well drained soil on hills and

ridges. The relief is affected by the underlying bedrock. These soils have moderate or moderately rapid permeabilities above bedrock. This soil has fair potential for community development. It is limited however by shallowness to bedrock and the steepness of slopes. Onsite sewage treatment and disposal systems require very careful and often costly design and installation to ensure proper function.

Another issue considered by this Department is depth to groundwater. Based on the preliminary information given to this Department the actual depth to groundwater has not been adequately determined. If it is found that the groundwater table is within the bedrock, it will be very difficult to determine groundwater gradients and direction of flow. This is essential in calculating pollutant renovation.

Due to the design flows to be generated by this development, which will exceed 5,000 gallons per day, and the fact that they will be community systems, a Discharge Permit from the Department of Environmental Protection's required pursuant o Section 22a-430 of the Connecticut General Statutes and regulations adopted thereunder, as amended. In accordance with the aforementioned statutes and regulations, the engineer must demonstrate that the system will function hydraulically and that the subject will meet the pertinent Water Quality Standards prior to reaching any surface water bodies, wells or crossing the applicant's property line. These goals must be reached with reasonable analysis and safety factors. This would include a system and site hydraulic analysis of nitrates, phosphorus, virus and bacterial pathogens.

Actual construction of any sewage treatment and disposal system approved by the Department of Environmental Protection must be overseen by a professional engineer. Additionally, a detailed construction sequence must be provided and approved in advance to avoid potential construction problems.

Once construction of the system is completed, in accordance with plans and specifications approved by the Department of Environmental Protection, a permit to

operate the system would be issued. Annual monitoring and maintenance will be required, with results and verification submitted annually to the Department Environmental Protection and the East Shore Health District.

Land Use Considerations

Site Location

The 260 acre site is located between Laurel Hill Road and Queach Road in the Mill Plain section of Branford. Of the 260 acres of land, roughly 206 acres are scheduled for development. The site development would consist of a 18 hole golf course with clubhouse facilities. Additionally, 105 single family residences ranging in lot size from .5 to 1 acre would be built on the site. The current design allows for public access to the clubhouse and gold course from Laurel Hill Road. The residential sites would be served by a series of cul-de-sacs extending from Queach Road. The current site do not provide a connecting roadway from Laurel Hill Road to Queach Road.

Site Characteristics

The site is characterized by forested steep slopes and ravines with significant wetland areas which all drain to the Pisgah Brook system and eventually the Branford Supply Ponds. The Supply Pond area is a 200+ acre open space recreational site which is utilized by the public for passive and active recreational pursuits. The Supply Ponds site was purchased by Branford in the 1980's from the New Haven Water Company. The area provides acres of trails for hiking and ponds for fishing, birdwatching and skating.

Traffic Circulation/Site Access/Offsite Impacts

One of the key elements of any development proposed for the Mill Plain area of the community should be to seek to provide connecting transportation linkage to other municipal collector and arterial roadways. Apparently, the current proposal design would not permit through traffic circulation. The residential traffic would access property

via Queach Road through a series of private cul-de-sac roadways. Public access to the clubhouse parking area and golf course would be provided from Laurel View Road. Consultant traffic studies will provide trip generation data and information on direct and indirect impacts on adjacent roadways and intersections. Other consultant reports should provide calculations, methods, and Best Management Practices (BMP's) to address impacts from impervious surfaces, cut and fill activities, site disturbance for construction of structures, roads, and paths, fairways, and water detention facilities. The development will be served by public water and a combination of sewage disposal techniques.

Zoning

The proposed development plan appears to meet all of the municipal zoning requirements. The property is all located in the R-5 Residence zone. The R-5 zone allows single family residential development on 1 acre (40,000 s.f.) lots by right. The residential/golf course development application proposal would qualify as either a Planned Residential Development plan (ORD) or Open Space Residential Development plan (OSRD). Both PRD and OSRD would be permitted in the R-5 zoning district based on special requirements and conditions. Municipal Town Subdivision Regulations would allow for the following waivers for any proposed Planned Residential Development or Open Space Residential Development:

- Subject parcel is proposed as, or is located in, a Planned Development District or Open Space Residential Development and contains a minimum area of fifty (50) acres, and private roadways are proposed which are not intended to become Town roads.
- Conditions exist on the subject parcel which are not generally applicable to other land in the area; including but t not limited to, difficult topographical conditions, natural environmental features, or natural beauty.
- Cluster development is utilized to preserve open space and provide for passive and/or active recreation.

- Not less than fifty (50%) percent of the available acreage is reserved for undisturbed and/or maintained open space and/or active or passive recreation.

The predominant existing land use adjacent to the proposed development is classified as public open space, and low to medium density single family residential property (R-5). The Planning and Zoning Commission may want to develop specific standards which regulate setbacks and maximum coverage for clubhouse facilities, accessory buildings, signage, parking and artificial lighting.

Conformance with Other Land Use Plans

The 1972 Branford Plan of Development - Land Use and Circulation Plan seeks to establish through collector roadways connecting Laurel Hill Road with Queach Road for better internal circulation patterns. The 1972 Community Facility and Open Space Plan identified two sites which may be appropriate for the development of a municipal golf courses. Neither site was located in the Mill Plain section of the community.

The proposed **1996 Branford Plan of Conservation and Development** addresses Parks, Open Space and Other Natural Resources in the comprehensive planning document. One general policy encourages the Town to "Acquire or otherwise preserve open space and recreation areas on the basis of established criteria including contribution to the integrity and diversity of rare, fragile or threatened ecosystems (including Long Island Sound, farmlands, and the Branford River), continuity of greenway system, protection of wildlife travel corridors, flood and erosion control, water supply protection, and protection of outstanding scenic and historic sites and farmland."

The **1993-1998 State Comprehensive Outdoor Recreation Plan (SCORP)** - The Plan includes a detailed inventory of population, public and private land holdings, municipal recreation facilities and a telephone survey of recreational interest of 1,200 Connecticut residents conducted by the Institute of Social Inquiry, University of Connecticut to

accurately inventory various open space categories in the communities throughout the state. The Plan seeks to provide a document which promotes the wise use of outdoor resources for current and future generations. The current Plan states that the South Central region, which includes Branford, has the third highest population density (2.2 persons per acre) of the states 15 planning regions.

Recreational Opportunities - Open Space Priorities

The Town of Branford is very fortunate to have outstanding recreational facilities available to the residents. Through foresight, generous donations and keen awareness, the residents of Branford can take advantage of numerous active and passive recreation sites throughout all districts of the community. No apparent local statistical data is available to determine the degree of interest and participation in golf activities by the general public and residents of Branford. However, recent golf course development proposals and a long waiting list at area courses would indicate that golf is experiencing a consistent rise in popularity among all age groups both male and female. The closest public 18 hole golf courses are at Lyman Meadows in Middlefield and the New Haven Municipal course. Some relevant open space/recreation issues for land use commissions to consider include the following:

- Assurance that the golf course design is seeking to avoid unnecessary impact on the sensitive natural areas including, steep ravines, streams, wetland systems and ponds.
- "Greenbelt" connectivity and the need to keep undeveloped land from being unnecessarily fragmented through the development process. The community may wish to seek support for acquiring conservation easements and/or fee simple acquisition. Technical and financial support may be available through State sources, the Trust for Public Land or the Nature Conservancy.
- Town commissions may want to investigate the development of a municipal or public golf course in a less sensitive area with less severe topography.

- Local citizen surveys and questionnaires should be conducted to better gauge the recreational and open space priorities of the community.

Management Issues

Although any detailed plans for the management of a public golf course would take shape after the physical feasibility of the proposal has been determined, some key golf course management issues and concerns include the following:

- The need for appropriate Pesticide and Erosion Control Plan to minimize impacts on the fragile Pisgah Brook and Branford Supply Pond ecosystems.
- Who would operate the facility, and what plans are being made for any auxiliary uses
- Establishment of easements for possible mullet-use trail connectivity with adjacent open space areas.
- Education of golf course superintendents, managers, course officials and the golfing public about environmental issues and what must be done to protect the environment.
- Assistance from the golf course management and officials with the establishment of a Branford Watershed Association to monitor and review conservation and development proposals in the Branford River Watershed.

Housing Element Impact

Planning issues pertaining to the proposed housing development aspect of the development proposal to consider include the following:

- Would the development of a residential golf course project in the community offer a needed housing alternative? How would the development impact the municipal tax base and quality of life issues?

- The Town should consider the need to provide a through street to improve the traffic circulation in the community and lessen the traffic impact on other arterial roadways and intersections.
- The Town should carefully assess the impact on the existing infrastructure and community services including fire and emergency services, sewer extensions, water supply and stormwater control.
- What type of phased construction activity is planned? When would the golf course be operational? Is there any future development planned for the site in terms of expanded banquet facilities, and/or other recreational facilities?
- Assurance that minimal disturbance takes place on the site during lot clearing and building construction, roadway layout, and golf course construction design.
- Seek cooperation from the proposed Homeowners Association for any easements for trails or other municipal "greenbelt" activities. Make certain there would not be any detrimental deed restrictions on the property.
- Seek assurance of proper cluster design techniques are utilized.
- Seek assurance sewage disposal system plans for the residential properties and clubhouse facilities are adequate. If community septic systems are proposed make sure they will meet CT DEP standards.
- What would the density of the site be without the golf course element? How would the site limitations impact conventional development design for the site?

Archaeological Review

A review of the State of Connecticut Archaeological Site files and Maps shows no known archaeological resource in the project area. However, there are two recorded prehistoric Native American encampments located in close proximity to the project area. In addition, the area contains topographic and environmental features that suggest a high probability for undiscovered archaeological resources existing there.

The archaeological sites listed in our files are located along Pisgah Brook to the south and near Lidyhites Pond to the north. These sites represent Indian hunting camps dating to over 3,000 years ago. They are important in that they represent one little known aspect of prehistoric subsistence-settlement strategies. Archaeological sites can be predicted along the high ridges adjacent to Pisgah Brook as well as associated with outcroppings of bedrock that provide a natural ledge for camping.

The Office of State Archaeology knows of no known historic resource in the project area, however, off-site historic stone structures may be adversely effected by soil erosion and other possible factors of development activities. All precautions should be taken to avoid impact to any historic stone structure in the area.

The Office of State Archaeology highly recommends an archaeological reconnaissance survey for portions of the project area that are most sensitive to prehistoric cultural resources. This survey can be employed to locate archaeological sites and proposed mitigation of those sites threatened with destruction due to land use activities. It is further recommended that all archaeological survey work be completed prior to any earth moving activities. The Office of State Archaeology is prepared to offer any technical assistance in conducting the recommended archaeological survey. They look forward to working with the applicants and the Town of Branford in the conservation of any archaeological resources which may exist in the project area. The State Archaeologist may be contacted for a more specific site review.

Appendix

For Appendix Information Please
Contact the ERT Office at 860-345-3977