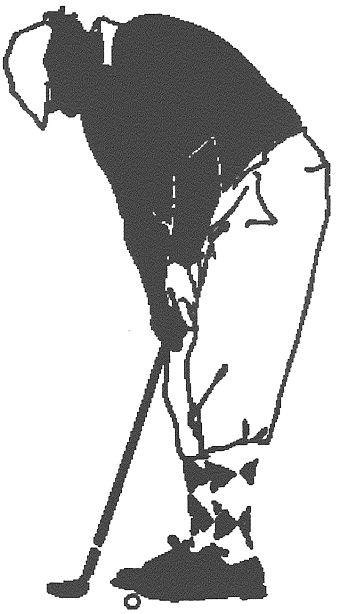


FISH FAMILY FARM GOLF COURSE

Bolton, Connecticut

EASTERN CONNECTICUT ENVIRONMENTAL REVIEW TEAM REPORT

EASTERN CONNECTICUT RESOURCE CONSERVATION & DEVELOPMENT AREA, INC.

FISH FAMILY FARM
GOLF COURSE

Bolton, Connecticut

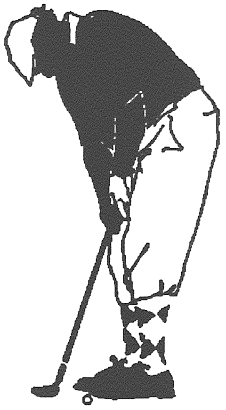
Environmental Review Team Report

Prepared by the Eastern Connecticut Environmental Review Team
of the Eastern Connecticut Resource Conservation & Development Area, Inc.
Haddam, Connecticut

for the

Bolton Planning and Zoning Commission

December 1995



ACKNOWLEDGEMENTS

This report is an outgrowth of a request from the Bolton Planning & Zoning Commission to the Tolland County Soil and Water Conservation District (SWCD). The SWCD referred this request to the Eastern Connecticut Resource Conservation and Development (RC&D) Area Executive Council for their consideration and approval. The request was approved and the measure reviewed by the Eastern Connecticut Environmental Review Team (ERT).

The ERT met and field checked the site on Tuesday, October 3, 1995. Team members participating on this review included:

David Askew	District Manager Tolland County Soil and Water Conservation District 860-875-3881
Nicholas Bellantoni	State Archaeologist Office of the State Archaeologist CT Museum of Natural History - UCONN 860-486-5248
Jeffrey Hall	Geologist/Graduate Student UCONN Department of Geology and Geophysics 860-486-4432
Doug Hoskins	Environmental Analyst II CT DEP - Bureau of Water Management Inland Water Resource Division 860-424-3584
Dawn McKay	Biologist CT DEP - Natural Resources Center 860-424-353585
James Parda	Forester CT DEP - Division of Forestry 860-295-9523
Mildred Powell	Geologist UCONN Department of Geology and Geophysics 860-486-1382

Joyce Purcell	District Conservationist USDA - Natural Resources Conservation Service Tolland County Field Office 860-875-3881
Carol Szymanski	Regional Planner Capitol Region Council of Governments 860-522-2217
Chris Vann	Wildlife Technician DEP - Wildlife Division 860-424-3011
Julie Victoria	Wildlife Biologist CT DEP - Wildlife Division - Franklin Wildlife Managment Area 860-642-7239

Prior to the review day, each Team member received a summary of the proposed project, and location and soils maps. During the field review the Team members were given preliminary plans and additional information. The Team met with, and were accompanied by the Bolton Town Engineer/ Planner, the landowner and his consultants. Following the review, reports from each Team member were submitted to the ERT coordinator for compilation and editing into this final report.

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

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

If you require additional information, please contact:

Elaine A. Sych, ERT Coordinator
Eastern Connecticut RC&D Area
P.O. Box 70
Haddam, Connecticut 06438
(860) 345-3977

TABLE OF CONTENTS

INTRODUCTION

An environmental review was requested by the Bolton Planning and Zoning Commission for the proposed Fish Family Golf Course.

The golf course is proposed for ±210 acres located on Route 85 and Notch Road and Route 85 and Birch Mountain Extension. The existing dairy, barn, store and residence cover approximately 30 acres of the 210 acres and will remain on the site. A 36 lot single family subdivision has been approved for a wooded portion of the farm and the golf course will make use of the open space designated for the subdivision for several of its holes. A small clubhouse is planned as well as parking facilities. Access to the golf course will be from Route 85 to Dimock Lane. Dimock Lane is a dead-end, town-maintained road.

The ERT was asked to review the golf course plans at a preliminary stage so that this environmental assessment and recommendations can help shape the final design. This report primarily provides a description of on-site natural resources and presents planning, management and land use guidelines.

LOCATION MAP

N

Scale 1" = 2000'

Approximate Site

GEOLOGY

The proposed site of the Fish Family Farm Golf Course in Bolton, Connecticut occupies an area of approximately 210 acres. The majority of the site is located on the southeastern side of the prominent Bolton Notch Syncline that trends north-northeast to south-southwest (Aitken, 1953). Locally, the Bolton Notch Syncline runs from Bolton Notch State Park through Whites Hill, and continues on further north and south of the area.

Glacial till ranges from zero to more than ten feet thick (Stone, 1992) and covers most of the area. Till is the loose debris that accumulated at the base of the continental ice sheet. Till is made up of pre-glacial soils and ground-up bedrock, and is typically poorly sorted. The materials that make up till range in size from clay to large boulders, which have been compacted by the overlying weight of a few thousand feet of glacial ice. Because of this, till is fairly impermeable compared to other surficial deposits. The most noticeable till deposit would be the glacial drumlin that makes up a large portion of the south-western part of the proposed site.

Bedrock outcrops are prominent in the northern area and along the roadcut on Route 85 cutting through the proposed site. These outcrops are of the Bolton Schist Formation (Aitken;1953) which is a staurolite, garnet-bearing micaceous schist. The outcrops located in the northern portion of the property are largely the result of quarrying that occurred in the past. The trend of foliation and the rock contacts could have a bearing on groundwater movement.

Given the above information there are no geologic obstacles to prevent the project as planned.

References

Stone, Janet R., et. al., 1992. Surficial Materials Map of Connecticut, U.S. Geological Survey and the Geological and Natural History Survey of the State of Connecticut, Department of Environmental Protection.

Aitken, Janet M., 1953. Bedrock Geology of the Rockville Quadrangle, Connecticut Natural History Survey, Quadrangle Report #6, map.

SOIL RESOURCES

Erosion and Sediment Control

A detailed soil erosion and sediment control plan should be developed and implemented for this site. The plan should be developed using the criteria contained in the Connecticut Guidelines for Soil Erosion and Sediment Control (1985). The district conservationist would appreciate the opportunity to review the final plans for adequacy prior to final approval.

Soil Resources

The soils as mapped in the Soil Survey of Tolland County, appear to be adequate for basic planning. Soils on this site have been broken down into three major groups. These groups are the Peat and Muck wetlands, the Leicester, Ridgebury and Whitman wetlands which occupy drainageways, the seasonally wet soils - Sutton and Wodbridge in transitional areas and the Hollis, Paxton and Charlton soils which occupy the well-drained uplands. Descriptions of these soils, along with the physical properties of the soils are attached to the report, accompanied by several charts which indicate soil limitations for various uses. The soil limitation charts indicate the probable limitations for each of the soils for recreational development, wildlife habitat, water management, construction materials, building site development, sanitary facilities, and water features. However, some limitations even though severe, do not preclude the use of land for development.

Wetland Boundary Information

The wetland boundaries that were delineated in the field should be surveyed onto the plan map. The soil scientist that delineated the wetlands should then review and sign a statement on the map(s) certifying that the information is substantially correct. The certification statement should be similar to the following: "The wetland soils on this site were identified in the field using the criteria required by Connecticut P.A. 72-155, as amended by Conn. P.A. 73-571, Conn. P.A. 87-338 and P.A. 87-533. The boundaries of these soils and of identified watercourses are accurately represented on the plot plan." This statement should be signed by the soil scientist that performed the field work.

The proposed construction of fairways numbered #10, #11, #15, and #18 as presented on the preliminary plan map, jeopardizes the natural hydrologic and biologic values of the wetlands. The long term viability of the wetland areas and the assurance that they will not be manipulated to facilitate

fairway construction is a concern that needs to be addressed. Wetland alteration and wetland encroachment should be kept minimal.

Stormwater Management

The removal of existing forest cover and the resulting increase in more open area will increase both the volume and velocity of runoff. The applicant should prepare a hydrologic review and summary. The methods described in Chapter 9 of the Connecticut Guidelines for Soil Erosion and Sediment Control (1985), should be used to estimate changes in peak flows and an assessment of possible off site impacts. Is there concern for flooding and/or off site channel scour? The report summary should use the calculated values to demonstrate whether or not stormwater management is needed.

Water Quality

The quality of aquatic resources can be degraded as a result of golf course construction. Consideration should be given to minimize these effects and to protect the aquatic resources. Priority should be given to the following recommendations:

• Identify all environmentally sensitive areas such as steep slopes, highly erodible soils, coarse-textured or shallow soils, wetlands and watercourses.

• Site the golf course on soils with medium texture, high organic matter content, high cation exchange capacity, low erosion and runoff potential, and at least 4 feet of depth to the water table or bedrock.

• Minimize wetland and watercourse crossings. If a wetland crossing must be used, than 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 placed on pilings from edge of floodplain to edge of floodplain. All watercourses should be bridged, not placed in a culvert.

• A buffer 75 to 150 feet in width consisting of dense vegetation along the periphery of all wetland or watercourses should be established. A well established buffer will provide shade and will help prevent the sun from excessively heating wetlands and watercourses, benefiting trout and other fish that cannot tolerate warm water. Buffers contribute leaves, twigs and other plant parts which serve as the basic source of food that supports the ecosystem of small streams. Tree trunks and root systems retard floodwaters, protecting downstream areas and slowing channel erosion. Buffers may also intercept

and absorb runoff flowing along the surface, reducing the quantity of pollutants reaching a watercourse.

• Integrated pest management (IPM) programs should be employed to minimize concerns related to pesticide and fertilizer use. An effective IPM program consists of prevention, monitoring, control and record keeping. The selection of drought and pesticide resistant turfgrass varieties, reasonable mowing heights, proper irrigation practices and restricting pesticide use to spot treatments with products have a low mobility in the soil column, s short half-life and low toxicity, are a few of the IPM practices that could be used.

• Minimize wetland disturbance. Construct ponds only if needed and consider using wetland and upland areas. Ponds should be designed to minimize use by waterfowl, particularly geese.

• Insure that sufficient water is available to meet irrigation needs without causing a reduction that will significantly impact aquatic communities, nor measurably affect the yield of existing wells in the area. Options to consider if the impact is deemed significant may include; installing runoff collection ponds in upland areas, extending wells into a deeper aquifer, or using several wells located in different groundwater drainage areas to lessen the impact on any single waterway.

• Parking lots, buildings, and other impervious surfaces should be located on soils which are suitable for the infiltration of stormwater. Infiltration will help capture pollutants associated with stormwater and will mitigate the thermal effects as well.

• Avoid steep slopes where grading and filling is necessary to construct the course. Stage construction so the potential for erosion is the lowest and denuded soils can be stabilized within a maximum of 14 days following initial exposure.

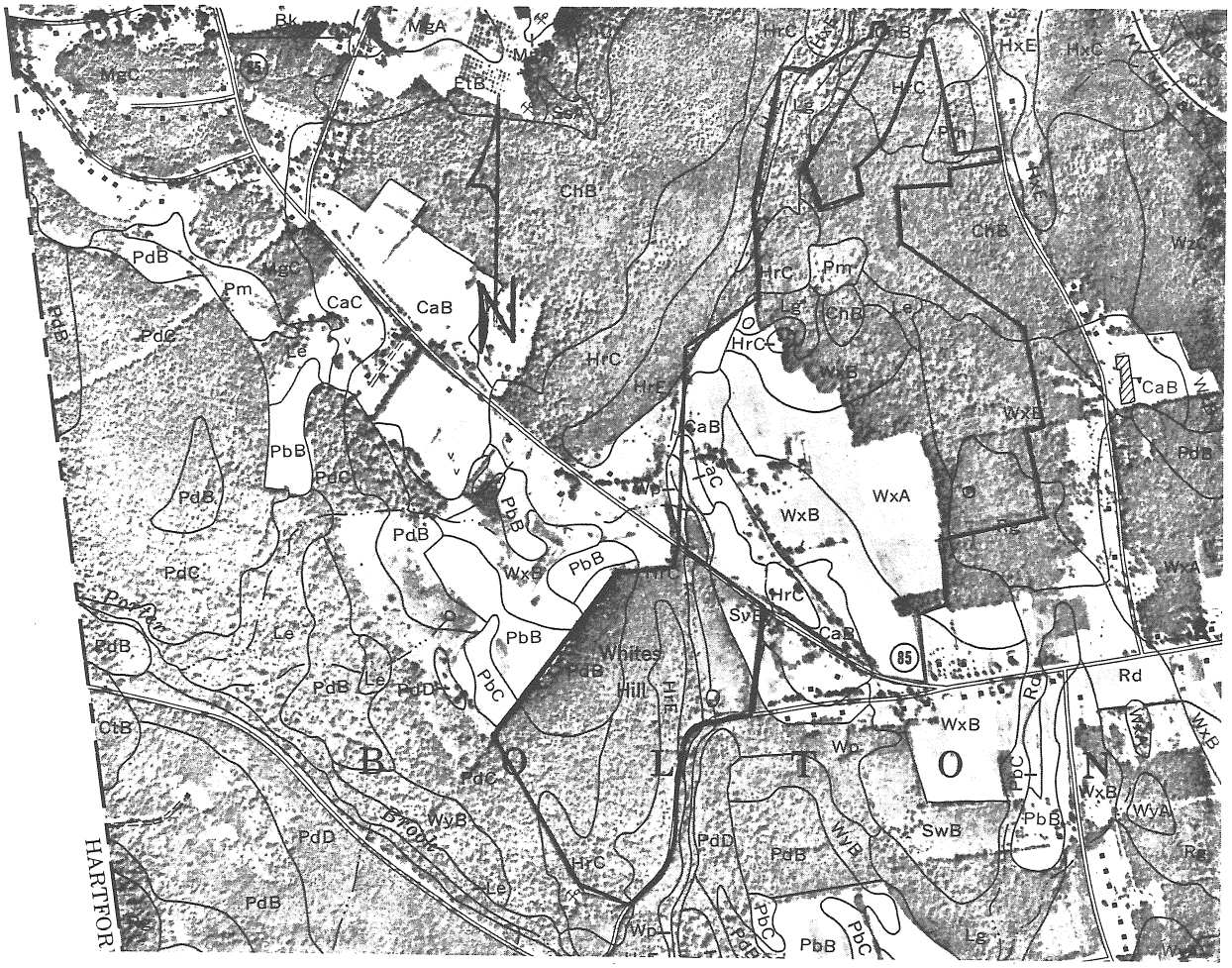
• A monitoring plan should be developed by an expert and should begin one year prior to the construction of the course and continue throughout the life of the course. A groundwater monitoring program should also be established to detect effects upon existing wells, wetlands or drawing contaminants in from surface waters. Baseflow and water temperature should be monitored in the receiving streams from the course.

• Minimize the number of trees removed during site development. Replace trees that removed in one area by planting trees in another portion of the same watershed.

SOILS MAP

N

Scale 1" = 1320



Map symbol	Soil name
CaB	Charlton fine sandy loam, 3 to 8 percent slopes
CaC	Charlton fine sandy loam, 8 to 15 percent slopes
ChB	Charlton stony fine sandy loam, 3 to 8 percent slopes
HrC	Hollis very rocky fine sandy loam, 3 to 15 percent slopes
HrE	Hollis very rocky fine sandy loam, 15 to 35 percent slopes
Le	Leicester stony fine sandy loam
Lg	Leicester-Ridgebury-Whitman very stony complex
PdB	Paxton stony fine sandy loam, 3 to 8 percent slopes
PdC	Paxton stony fine sandy loam, 8 to 15 percent slopes
Pm	peat and muck, shallow
Rg	Ridgebury stony fine sandy loam
SvB	Sutton fine sandy loam, 3 to 8 percent slopes
Wp	Whitman stony fine sandy loam
WxA	Woodbridge fine sandy loam, 0 to 3 percent slopes
WxB	Woodbridge fine sandy loam, 3 to 8 percent slopes

SOIL AND WATER CONSERVATION DISTRICT REVIEW

• Wetland resources on the parcel are extensive and every effort should be made to avoid wetland alterations. In particular, a number of fairways are proposed within wetland areas. Fairway #11 should be relocated to avoid alterations to the stream and riparian vegetation. Additional details are needed to precisely describe what alterations will be required for fairway construction within wetland areas. It is expected that vegetation will have to be removed completely and that grubbing and grading will be fairly extensive. Ideally, fairway construction within the wetland areas will be limited to relatively narrow crossings with minimal soil disturbance. Maintaining existing drainage patterns should also be a factor in planning.

• The wetland adjacent to proposed hole #17 has a diverse vegetative cover and serves as a headwater to a perennial stream. Currently a pond is proposed there. Although the location of the pond makes sense from a hydrological and engineering standpoint, it is not a desirable location, due to the value of the wetland. Some consideration should be given to utilizing some of the adjacent upland. A complete hydrological analysis should be done to ensure that minimum base flow is maintained in the perennial stream and is not jeopardized by irrigation from the storage pond. Some type of minimum flow structure should be designed into the pond outlet.

• A detailed erosion control plan must be developed. A construction sequence and revegetation schedule are important components of the plan.

• The District concurs with NRCS that some water quality monitoring should be done. The monitoring should begin as soon as possible to establish some baseline information. The District would appreciate the opportunity to review any proposed monitoring plan that might be developed. Only a few stations are necessary to monitor the two major (aquatic) systems.

• Vegetated buffers should be established between play areas (tees, greens, fairways) and surface waters.

WETLAND RESOURCES

Included in this section are observations of the wetland resources, the impacts that the proposed activities will have on those resources and recommendations for future development of this parcel.

Existing Conditions

Wetlands on this parcel are almost entirely of the palustrian-deciduous forested type. The wetlands boundary as represented on the undated site plan entitled "Development Plan for the Fish Family Farm and Golf Course", appears to be accurate at the scale mapped.

There are three separate wetland areas, the largest (#1) is the "spider"-shaped wetland with a central core and three contributing "legs" as well as one outlet "leg" which drains north to the Hop River. The second area of wetlands (#2) is a triangular area just south of Bolton Center Road draining to the Blackledge River. Its primary hydrologic input appears to be groundwater with overland flow of storm water runoff. There is also an intermittent watercourse entering from the northeast through a large box culvert under Bolton Center Road. This wetland is covered with a young, even-aged stand of red maples. The third wetland area (#3) is the relatively small section of a larger wetland which is located between the two proposed residential areas at the north end of the site which also drains to the Hop River. All three of these wetland areas are situated at the "top" of their respective watersheds.

There are also four existing ponds on the parcel, the largest of which is southwest of the farmstead along Bolton Center Road. Two other very small ponds are located between this pond and the driveway to the west. The fourth pond is also very small and lies in the forested area east of the farmstead.

Wetland Functional Values

Being at the "top" of their respective watersheds, all three of these wetland areas have high value in the functional category of Flood Control. Natural wetlands act to retain stormwater flow which would otherwise rush down the watershed at higher velocities and volumes. The numerous small wetland areas high up in the watershed very effectively act together to buffer larger streams and rivers from the damaging erosive forces of high storm flows.

Wetland area #1 also should be highly valued as a wildlife habitat. Its linear shape, culminating in a central wetland provides a unique pattern which is attractive to wildlife. Wetlands themselves contain particularly diverse assemblages of wildlife. When they are situated in this "palmate" fashion with

undeveloped upland buffers surrounding them, their value to wildlife increases.

Wetlands also effectively function to improve the quality of degraded water as it passes through the wetland system. As apposed to wetland area #1 which is situated in a relatively undeveloped watershed, wetland area #2 is located downstream of probable sources of non-point source pollution emanating from paved road surfaces and agricultural waste. Additionally, with the construction of the residential area on the north end of the parcel, wetland area #3 may also become useful in this regard.

Proposed Activities

As reflected in the conceptual development plan, the primary proposed activity is the construction of an 18-hole golf course. The golf course will include the creation of four ponds. Additional activities include construction of a moderately sized clubhouse, as well as parking facilities.

Impact of Proposed Activities on Watercourses and Wetlands

The construction of the golf course and ponds, as proposed in the development plan will have a significant impact upon the wetland resources of this parcel. Measured direct impacts to wetlands include 11.0 acres of tree clearing, 3.5 acres of fairway construction and 8.6 acres of pond construction for a total of 23.1 acres of impact or 59% of the entire 39.2 acres of wetland on the parcel.

These direct wetland impacts will diminish the ability of these wetlands to provide the functions outlined above. The construction of the ponds, fairways and crossings within these linear wetland systems will disrupt the valuable wetland corridors that exist within wetland #1.
The ponds themselves will act to transform the more diverse vegetative communities of the forested wetland into less diverse, open water habitats. Additionally, these ponds, if not designed specifically for detention, will reduce the potential for wetlands #2 and #3 to retain stormwater and reduce flooding downstream by replacing a "rough" landscape, succulent vegetation and porous soils with smooth, non-porous water. Finally, ponds located in wetlands with continuous surface flow tend to increase the temperatures and decrease the oxygen content of surface waters in downstream wetlands.

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

1) excessive sedimentation resulting from temporarily disturbed soils during construction in adjacent upland areas;

2) decreased water quality resulting from herbicide and nutrient application,

3) negative effects on wetland as a result of development of valuable upland buffer areas adjacent to the wetlands,

4) de-watering of wetland areas as a result of irrigation needs.

Recommendations

Clear cutting, deposition and excavation in or on wetland soils are regulated activities under Connecticut's Inland Wetland and Watercourses Act. In addition, activities occurring outside of the wetland that are likely to have negative impacts upon those wetlands, such as those listed above, can be regulated by inland wetland agencies also.

In considering an application involving regulated impacts to wetland areas, the Bolton 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 include:

1) Reduction of the number of holes.
2) Realignment of existing holes.
3) Greater utilization of upland areas, for example, reduction or elimination of the "practice area".
4) Reducing the size of the ponds or locating them in upland areas bordering wetlands.

Some of the proposed golf course and much of the wetland impact are situated on lands marked as "open space" on a planimetric map supplied to ERT members. If these areas, situated next to the approved subdivision, were designated as open space there may be conditions applied to these areas which preclude its use as a golf course.

Most of this site is on relatively shallow slopes. The only potentially serious erosion and sedimentation

control condition exists on fairway #5 where the fairway is being constructed for a distance of 900 feet, perpendicular to a 10% slope. Phasing of the project construction should also be encouraged to reduce the area disturbed at any one time. A detailed erosion & sedimentation control plan should be developed prior to permit application. Wetland boundaries should be clearly identified in the field prior to construction.

According to CT-DEP's "Comprehensive State Ground Water Protection Program: A Profile of the State of Connecticut" (1995), DEP testing has concluded that "...pesticides can and do migrate to groundwater as a result of ordinary application." Contaminated groundwater could then travel to nearby drinking water wells or seep out onto wetlands to affect its biota. It is recommended that any pesticide applications (fungicide, herbicide, insecticide) be made according to Integrated Pest Management (IPM) guidelines. The IPM philosophy includes overall reductions of pesticide application and more reliance on the targeting of specific pests encountered with alternate control methods. Contact Judy Singer of the CT-DEP Pesticide/Groundwater program for more information on this program (424-3369). Also, the U.S. Department of Agriculture's "NPURG" computer modeling program may be useful to determine the potential for groundwater contamination given certain parameters such as pesticide brand, soil profile and hydrology. As further insurance to guard against contamination, an ongoing groundwater monitoring program could be developed for this site to alert golf course managers, town officials and nearby residents of the location, direction and severity of any groundwater contamination.

It is understood that a hydrologic study has been initiated for this parcel in order to gauge how irrigation needs may affect ground and surface waters. This study will be valuable to address the concern of de-watering wetlands as a result of irrigation needs.

The maintenance of sufficient upland buffers around the wetlands on this parcel is also recommended to further ensure that non-point source or "diffuse" pollutants such as pesticides, fertilizers, and excessively eroded sediments do not enter wetlands. Upland buffers also increase the wildlife habitat function of wetlands by providing breeding, roosting and feeding for wildlife which utilize the adjacent wetlands.

Further reductions of any non-point source pollutants should occur with the incorporation of Best Management Practices such as grassed swales, filter strips and bio-filters in the design of the golf course.

Other Regulatory Programs

If this project will impact more than 1 acre of wetlands, it probably will require an Individual Permit from the U.S. Army Corp of Engineers (A.C.O.E.) and a Water Quality Certification (WQC) from CT-DEP. If this project will impact .5 to 1 acre of wetlands, a WQC must be obtained from CT DEP. However, these

are basic guidelines. A.C.O.E. or WQC permits may be required for other specific activities proposed for wetland areas. For questions regarding these regulatory programs contact Ruth Ladd of the A.C.O.E. at 617-647-8338 / 800-343-4789 or Sally Snyder of the CTDEP at 424-3019.

Be advised that this proposed golf course, inasmuch as it causes the alteration, modification, or diminution of the instantaneous flow of the waters of the state (including groundwater withdrawals), may require a permit from this division as called for in the Connecticut Water Diversion Policy Act (sections 22a-365 through 22a-378 of the Connecticut General Statutes). It is recommended that the applicant call Bob Gilmore of this division at 424-3019 to determine the need for such a permit.

If this project is not phased, and construction activities covering five acres or more are approved, the applicant is required to apply to the CT-DEP for a general permit for the discharge of stormwater under the National Pollutant Discharge Elimination System (NPDES) program. For further information on this permit program contact Christopher Stone of the DEP Permitting Enforcement and Remediation Division at 424-3850.

Pesticide applicators and their supervisors are required to obtain certification from the CT-DEP Pesticides Section. Contact Judy Singer of this section at 424-3369 for further information.

VEGETATION

Environmental Considerations

The techniques outlined in this review can reduce erosion problems, help control storm water, save valuable vegetation and utilize certain timber resources. Woodlands provide a protective influence on soil stability and water quality. The forest also provides for a variety of wildlife from amphibians and reptiles to small mammals, a variety of birds, predators and larger mammals. They depend on woodland for food, water, shelter, and breeding habitat. Trees also have a positive influence on air quality as they convert carbon dioxide to oxygen and act as terrestrial sinks (collectors) to reduce airborne particulate and gaseous pollutants. Forests also provide a cool ecosystem from shade that is absent in open areas.

Vegetation

Oak-Hickory Type: Composed of red oak, black oak, white oak, pignut hickory, shag bark hickory, red maple, and black birch. This forest type is located on drier upland soils such as Hollis and Charlton fine sandy loam. Trees are predominantly poletimber and small sawtimber in size. Understory composed of hazelnut, viburnum, low bush blueberry, hay scented fern.

Mixed Hardwood Type: Composed of red maple, red oak, shagbark hickory, black oak, black birch, yellow birch, white ash and sugar maple. Located on more moderately well-drained and seasonally wet Woodbridge and Ridgebury fine sandy loams. Trees are predominantly poletimber with some sawtimber after a recent harvest. Understory is mountain laurel, viburnum, hazelnut, fern, spice bush, pepperbush, witch hazel, highbush blueberry, black berry and hophorn beam.

Hardwood Swamp: These forested wetlands are composed of poletimber red maple with some white ash and yellow birch. Understory is dense spicebush, sweet pepper bush, azalea, and high bush blueberry.

Field Pasture: Areas are grass with encroaching edges along forest lines of multi-flora rose, wild aster, winterberry, willow, golden rod, autumn olive, sapling birch and aspen, bittersweet and grape.

When highly absorptive forest soils are disturbed by clearing and stump removal, grades on hills cut and filled to create roads, trails, greens, and fairways the overland flow of water increases because the sponge-like effect of the litter and humus layer is lost. The resulting soil compaction prevents rain from

soaking into the soil surface as it falls. This causes water to collect and run over the grass and roads. The runoff has the potential to build erosive power in short distances, tear soil loose and result in sedimentation and siltation. The greatest impact on water quality from loss of absorptive forest soils is during, or just after, construction. The increased erosion can cause sediment accumulation in streams, ponds or wetlands, destruction of aquatic wildlife habitat by siltation and reduction of water quality from turbidity. Forested areas contribute little sediment to stream flow. Converting a forest environment to a grass one could affect water relations drastically. Peak flows may increase as well as sedimentation. This is because open areas reduce interception of rain, infiltration, soil moisture storage, and evapotranspiration, and increase overland flow and run off. Forest land is also beneficial in protecting water quality by minimizing eutrophying nutrients, such as phosphorus, and soil-borne contaminants. Phosphorus is generally the limiting nutrient for aquatic ecosystems and usually tightly held by forest ecosystems. Phosphorus export from forested land is estimated to be one-seventeenth that of open land. In the Fish Family Farm Golf Course stream quality may be adversely affected by erosion, sedimentation, and/or nutrient inputs from fairway construction during and after development. The following measures can be taken to maintain streamside and wateredge forest buffers to reduce erosion and sedimentation.

Forests along streams, wetlands and ponds can remove excess nutrients and sediment from the surface runoff and shallow groundwater. They can also ameliorate the effects of some pesticides. Forests adjacent to streams and ponds act as filters to remove sediment and other suspended solids from the surface run off. They can also transform toxic pesticides to non-toxic forms. Bio-degrading forces in some forest soils along water edge use microbial decomposition, oxidation, reduction hydrolysis and solar radiation to convert run off borne residues to non-toxic compounds. These forests also provide energy sources for the entire aquatic food chain from head water to estuary. Forest buffers along streams, ponds and wetlands can range from 15 feet wide to 100 feet wide depending on drainage area. Further information can be obtained from USDA Forest Service Bulletin NA-PR-07-91., Riparian Forest Buffers.

Trees are very sensitive to the condition of the soil within the entire area of their root systems. Construction practices involving excavation, filling and grading, and soil compaction from heavy equipment disturbs the balance between soil aeration, soil moisture level and soil composition. Disturbances to soil near trees can cause a decline in tree health and vigor resulting in mortality in three to five years. Cutting or bruising roots with machinery creates breeding areas for root fungi which can kill a tree in short time. Trees with cut root systems do not have proper soil holding capacity, wind firmness or water-nutrient absorption ability. This results in reduced health and vigor and opens the tree for insect and/or disease infestation. Mechanical injury which physically damages bark and scars

the surface of the tree can lead to hollow trees which are structurally unsafe. The older and/or larger a tree is the more readily it is affected by the negative impact of construction related activities. Dead trees become a hazard and expensive to remove. No excavation, equipment or filling should occur within 20-50 feet (depending on the tree diameter - the larger the tree, the further away disturbance should occur) of single trees or groups of trees. A general rule to follow is no equipment or excavation within two times the radial spread distance of the crown. The negative effects of construction on trees is not usually visible at the time the work is done. However, soil compaction, root injury, and scraped bark contribute to insects and disease infesting the tree after machinery has left the site. This creates hazards and problems as trees die several years after construction. These problems can be minimized or eliminated with proper care taken with vegetation during development.

Trees grown in a crowded forest environment rely on each other for stability and side support. Openings from fairways which allow wind to pass through them will result in broken off or uprooted trees. Trees growing in hardpan soils with seasonally high water tables are the greatest liability. Also contributing to wind throw is construction equipment which cuts root systems and thereby reduces the tree's own capacity to support itself. Machinery should not get closer than 25 feet from the base of the trees to be saved along fairway edges.

Trees along fairways will provide excellent autumn foliage color. Some conifer planting (white pine and Norway spruce) would provide year round green color. Some specific tree characteristics and cautions are listed below.

Red Maple: Good red fall color. Root cutting causes mortality. Rots easily after bruising/wounding from mechanical injury. Branches break in ice and snow along exposed forest edges especially on smaller trees. Windthrow in wetter soils. Susceptible to mortality from more than 3 inches of silt or sand over roots.

Black Birch: Good yellow fall color. Ice and snow cause bending in trees less than 8 inches diameter. Trees do not return to vertical, remain bowed to ground. Crown breakage when nectria cankered trees exposed to wind.

White Ash: Sensitive to ozone. High risk of wind breakage when released from forested condition. Needs side tree association unless open grown.

Hickory: Subject to trunk rot. Hollow trunks in wet soils. Wind firm on fairway edges. Resists breakage.

Oaks: Well rooted. Windfirm except in high water table. Late fall color. Resists breakage. Root rot spreads by cutting root systems. Subject to gypsy moth defoliation.

Conclusion

Trees have value in reducing climatic extremes, controlling runoff, filtering runoff, filtering out polluting particles from air and water, reducing noise, providing aesthetic enjoyment, creating wildlife habitat, recharging aquifers, supplying wood fiber and functioning as a carbon sink. Healthy vegetation provides the long term amenities. Therefore a good relationship between urban growth and forest land must exist. Trees around fairways can be healthy, long lived and valuable if treated properly in the conversion from forested habitat to other uses.

THE NATURAL DIVERSITY DATA BASE

The Natural Diversity Data Base maps and files regarding the project area have been reviewed. According to our information, there are no known extant populations of Federal or State Endangered, Threatened or Special Concern Species that occur at the site in question. However, our information indicates that a sensitive species *Clemmys insculpta* (Wood Turtle) does occur in the vicinity of this project. In recent years the number of wood turtles has declined in our state and we are currently monitoring their populations.

Wood turtles require riparian habitats bordered by flood plains, woodlands or meadows. Their summer habitat includes pastures, old fields, woodlands, power line cuts and railroad beds bordering or adjacent to streams and rivers.

Please note, this reviewer has not seen a detailed description of what will be done with this property, nor has an on-site inspection been conducted. This species has recently been negatively impacted by the loss of suitable habitat. Perhaps suitable habitat that occurs on the project site can be set aside or enhanced for this species. If you need more information about wood turtles, please contact Julie Victoria, DEP-Franklin Wildlife Management Area, 860-642-7239.

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

Please contact the Natural Diversity Data Base if you have further questions about the data base (424-3592). Also be advised that this is a preliminary review and not a final determination. A more detailed review may be conducted as part of any subsequent environmental permit applications submitted to DEP for the proposed site.

WILDLIFE RESOURCES

Field inspections to identify existing wildlife habitats and communities and evaluate impacts to these resources from the planned development of an 18 hole golf course was done on October 3 and 11, 1995. Suggestions to reduce impacts to these resources and enhance wildlife value on land managed for golf are also included. Wildlife actually observed or identified by field sign (i.e. tracks, scat, calls, burrows, etc.) are identified by an asterisk (*).

Existing Wildlife Habitats and Communities

The Fish Family Farm is located within an ecoregion of Connecticut known as the Eastern Highlands. This region is characterized by rolling hills of moderate to steep topography.

A mixed forest ecosystem is this zones most common forest type within which a diversity of wetland/riparian habitats can be commonly found (Dowhan, Joseph J. and R. Craig, 1976, Rare and Endangered Species Of Connecticut & Their Habitats).

Historic and current land use and vegetation has been affected by agricultural use. Currently, a small dairy farm with its associated pastures, farm ponds and garden plots occupies roughly 30% of the 210 acres proposed to be developed. Approximately 15-30 acres of farmland will remain according to plans once the project is complete.

Several wetland habitats exist on this site. The largest and consequently most important of these is the hardwood swamp that occurs along the intermittent brook channels bisecting this site and on areas which are seasonally wet and having poorly drained soils. Three or four vernal pools also are present where an old quarry once existed with another located near the edge of a pasture.

Within these hardwood swamps dense shrub growth comprised of species such as arrow wood viburnum, spice bush, winterberry and highbush blueberry exist. In association with these wetland shrubs, trees and herbaceous plants present in these areas include red maple, yellow and black birch, mockernut and pignut hickory, witch hazel, ferns, grasses and skunk cabbage.

Of the many species of wildlife utilizing wooded swamp habitats it is the reptiles and amphibians who are so highly dependent on them for survival. Amphibians such as the fourtoed, Marbled and Spotted salamanders; Green*, grey-tree and wood frogs; Northern Spring peepers and American toads* may all breed, feed, hibernate and find shelter in and around the vernal pools and wetlands found on this

site. Reptiles like the Northern ringnecked and Eastern Ribbon snake, the latter a state species of special concern may also utilize this type of habitat.(Gruner, Hank, 1995, per comm.)

Many species of birds utilize wooded swamp habitats at varying times of the year for breeding, feeding and shelter. Some of these birds include Wood thrush, Northern Waterthrush, red-eyed vireo, Black-throated blue warbler, Veery, Eastern Pheobe, Red-shouldered hawk, Eastern Screech Owl and Winter wren*. Some of these same birds are further recognized as interior forest species (i.e. veery) and reportedly in decline in Connecticut due to forest fragmentation. Additional bird species which utilize hardwood swamp habitats as well as the nearby upland mixed forest include: American Robin*, Myrtle warbler*, Black and White warbler, tufted titmouse*, Black-capped chickadee*, Dark-eyed junco*, Rufous-sided towhee, White-throated sparrow*, Woodpeckers (Downy, Hairy and Pileated), White-breasted nuthatch*, Broad-winged hawk, Ruffed grouse* and Wild Turkey.

Further use of brushy early successional field edges and open fields by Song sparrow*, American goldfinch*, Eastern bluebird, Carolina Wren, Northern Cardinal, Gray catbird, and Red-tailed hawk* is likely.

Mammals frequenting wooded swamp and upland forest include White-footed mouse, short-tailed shrew, Eastern Chipmunk*, starnosed mole, gray squirrel*, opossum, raccoon, red fox* (scat), coyote and white-tailed deer* (heavy browse sign in hardwood regeneration). Cottontail rabbit, woodchuck* (burrow), longtailed weasel, and meadow voles are more closely associated with the brushy field edges.

Wildlife Impact and Recommendations

The extensive amount of forest clearing and fragmentation which would result from the construction of the proposed golf course will significantly effect many species of wildlife on the site. The replacement of mixed forest and wooded swamp with tees, fairways, greens and ponds will likely drive interior and more sensitive forest species (i.e. veery, wood thrush, ruffed grouse, wild turkey) from the remaining habitat due to lack of adequate territory and increased disturbance. Further negative impacts to daily and seasonal movements of wildlife, especially amphibians and reptiles, from the conversion of forest cover to open fairways will occur. Several proposed ponds planned to be constructed within the wooded swamp wetlands will severely impact this important habitat and the wildlife which make use of them, replacing it with open water habitat of much less value to wildlife presently associated with the site. In addition, large golf course ponds have high potential for attracting Canada geese in large concentrations due to the close proximity of grass fairways used for food and a protective pond

for resting and escape. These geese can cause tremendous damage to the course from heavy accumulations of feces as well as being an obstruction to play.

Establishing 100' wetland buffers and reducing or eliminating the number of fairway crossings (i.e. holes #11, #12, #14, #17 & #18) through these wetlands will greatly benefit wildlife on the site. Where fairway crossings do exist, maintaining wetland vegetation will provide a corridor for wildlife movement. Consideration in linking wetland corridors into some of the uplands by maintaining heavily vegetated areas around cart paths, tees, greens or other areas not used for golf is recommended.

Eliminating the two large ponds proposed and preserving the wooded swamp habitats will preserve these valuable habitats and eliminate the potential for attracting nuisance geese to the course. If they are built, designs to deter geese such as preserving or establishing a dense shrub shoreline edge and locating these ponds away form the more open/grassy sections of the course are recommended (Merola, P. 1995 per comm).

Although no extant populations of endangered, threatened or special concern species of wildlife are currently known to exist on the property according to the Natural Diversity Data Base records, more comprehensive or site-specific field investigations could identify populations or habitats of concern.

Populations of the declining wood turtle have been documented within the nearby Hop & Blackledge River drainage systems (Mckay, Dawn 1995 per comm).

Concerns over chemical and nutrient loading into these watersheds may affect water quality and in turn negatively impact these and other wildlife. Properly designed and maintained sediment and erosion control techniques should be used during the construction phase if this project to protect nearby wetlands.

Literature Cited

Dowhan, Joseph J. and Craig, Robert J., 1976, Rare and Endangered Species of Connecticut and Their Habitats, State Geological & Natural History Survey of Connecticut - Report of Investigations No. 6, pp. 137

Gruner, Hank 1995, Science Museum of Connecticut, per communication.

McKay, Dawn, 1995. Connecticut Department of Environmental Protection, Natural Resource Center. Incidence records from Natural Diversity Data Base.

Merola, Paul 1995, Connecticut Department of Environmental Protection, Wildlife Division, per communication.

PLANNING CONCERNS AND COMMENTS

The construction of a golf course open space subdivision is very popular and could prove an asset to the community and region.

• Will the open space occupied by the golf course be protected from further development through deed restriction?

• A phasing plan should be devised for the construction of the golf course and followed to minimize exposed soil.

• Proper erosion and sediment control during the construction phase is important. Town staff should review and approve the developer's submitted detailed plan which was conceived specifically for this site. A responsible individual's name should appear on the plan as a contact person if problems arise. All erosion and sediment control measures should be in place before construction commences.

• To prevent elevated water temperatures, shading vegetation should be maintained or planted along streams.

• Ideally, a 100 foot wide buffer is provided along all streams, ponds and other waterways. The opportunity for pollution is lessened when buffers are present. Buffers also provide wildlife corridors.
•Waterway crossings should be minimized. Cart paths for necessary waterway crossings should be constructed of permeable material with a maximum width of eight feet and placed on pilings from the edge of floodplain to edge of floodplain. Streams should be bridged, not placed in a culvert.

• Ponds, if needed, should be constructed in upland areas.

• An underdrain system should be installed beneath any portion of the fairways, greens or tees which are sited on coarse-textured soils or where depth to bedrock or the maximum elevation of the water table is less than 4 feet. The underdrain will collect fertilizer and pesticide contaminated leachate.

• Irrigation should be performed on an "as needed" basis, rather than a set schedule which may deplete water resources.

• Grass varieties having a high drought tolerance should be planted.

• 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.

• Because trees provide aesthetic value, greater safety and strategic shots, they should be preserved as much as possible.

• Dimock Lane is a town road. Given the new demands for this road to accommodate, the developer should be required to make the necessary improvements.

• The proposed clubhouse should be accessible to emergency vehicles (fire trucks and police) with properly sized turn-around areas.

ARCHAEOLOGICAL REVIEW

A review of the State of Connecticut Archaeological Site Files and Maps shows no known archaeological resource in the project area. However, a series of prehistoric Native American encampments are located to the north in the Bolton Notch area. Almost 20 sites were surveyed along the proposed I-84 extension corridor. In addition, our files show Indian sites along the Blackledge River drainage.

Archaeological sites are primarily located on well-drained soils adjacent to wetland systems. The most archaeologically sensitive areas for the proposed golf course property are those within 200 yards of the brook system draining into the Blackledge River.

The Office of State Archaeology recommends an archaeological reconnaissance survey for all areas within 200 yards of any wetland system. This survey would locate and identify all archaeological resources which might exist in the proposed project area. Our office is prepared to provide any technical assistance to the property owner and the Town of Bolton in accomplishing this archaeological fieldwork. All archaeological testing should be conducted in accordance with the Connecticut Historical Commission's *Environmental Review Primer for Connecticut's Archaeological Resources.* The Office of State Archaeology looks forward to working with all concerned parties to protect and preserve any archaeological sites which may be affected by the proposed golf course and subdivision development.

Appendix

For Appendix Information please contact
the ERT Office at 860-345-3977

ABOUT THE TEAM

The Eastern Connecticut Environmental Review Team (ERT) is a group of professionals in environmental fields drawn together from a varety of federal, state and regional agencies. Specialists on the Team include geologists, biologists, foresters, soil specialists, engineers and planners. The ERT operates with state funding under the supervision of the Eastern Connecticut Resource Conservation and Development (RC&D) Area — an 86 town region.

The services of the Team are available as a public service at no cost to Connecticut towns.

PURPOSE OF THE TEAM

The Environmental Review Team is available to help towns and developers in the review of sites proposed for major land use activities. To date, the ERT has been involved in reviewing a wide range of projects including subdivisions, landfills, commercial and industrial developments, sand and gravel excavations, elderly housing, recreation/open space projects, watershed studies and resource inventories.

Reviews are conducted in the interest of providing information and analysis that will assist towns and developers in environmentally sound decision-making. This is done through identifying the natural resource base of the project site and highlighting opportunities and limitations for the proposed land use.

REQUESTING A REVIEW

Environmental reviews may be requested by the chief elected official of a municipality or the chairman of town commissions such as planning and zoning, conservation, inland wetlands, parks and recreation or economic development. Requests should be directed to the chairman of your local Soil and Water Conservation District and the ERT Coordinator. A request form should be completely filled out and should include the required materials. When this request is approved by the local Soil and Water Conservation District and the Eastern Connecticut RC&D Executive Council, the Team will undertake the review on a priority basis.

For additional information and request forms regarding the Environmental Review Team please contact the ERT Coordinator: 860-345-3977, Eastern Connecticut RC&D Area, P.O. Box 70, Haddam, Connecticut 06438.