

# TEATICKET GOLF COURSE

LITCHFIELD, CONNECTICUT

*King's Mark  
Environmental Review Team  
Report*

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

# TEATICKET GOLF COURSE LITCHFIELD, CONNECTICUT

## Environmental Review Team Report

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

for the  
Conservation Commission  
Litchfield, Connecticut

August 1997

CT Environmental Review Teams  
1066 Saybrook Road, P.O. Box 70  
Haddam, CT 06442  
(860) 345-3977

# ACKNOWLEDGMENTS

This report is an outgrowth of a request from the Litchfield Conservation Commission to the Litchfield 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, May 15, 1997.

Nicholas Bellantoni	State Archaeologist Office of State Archaeology (860) 486-5248
Chris Fray	Technical Director Litchfield County SWCD (860) 626-8258
Norman Gray	Geologist UCONN - Dept. of Geology and Geophysics (860) 486-4434
John Hirschfeld	Soil Scientist/Ecologist DEP - Bureau of Water Management Discovery and Assessment Program (860) 424-3893
Doug Hoskins	Wetland Specialist/Environmental Analyst III DEP - Bureau of Water Management Inland Water Resources Division (860) 424-3903
Dana Karpowich	Program Specialist UCONN Cooperative Extension System Turfgrass Integrated Pest Management (860) 875-3331

Rick Lynn	Planning Director Litchfield Hills Council of Elected Officials (860) 491-9884
Dawn McKay	Biologist/Environmental Analyst III DEP - Natural Resources Center Natural Diversity Data Base (860) 424-3592
Don Mysling	Fisheries Biologist DEP - Fisheries Division Habitat Conservation and Enhancement Program (860) 567-8998
Judy Singer	Groundwater Hydrogeologist DEP - Pesticide Management Division Groundwater Protection Program (860) 424-3326
Chris Stone	Stormwater Specialist DEP - Bureau of Water Management Permitting, Remediation and Enforcement Division (860) 424-3850
Julie Victoria	Wildlife Biologist DEP - Franklin Wildlife Management Area (860) 642-7239
Judy Wilson	Wildlife Biologist DEP - Sessions Woods Wildlife Management Area (860) 675-8130

I would also like to thank Martin Connor, town land use administrator, Tom McGowan, town planner, Ralph Zimbouski, town engineer, Robert Blazek, inland wetland commission representative, Jacqueline and David Guernsey, the landowners, Peter Herbst, the attorney for the applicant, Bruce Litten and Jean Ricker, the applicants, Dennis McMorrow and Kenneth Hrica, the engineers and David Lord and Penni Sharp, consultants for the applicants 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 location and soils maps. During the field review Team members were given additional reports and plans concerning the project. 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 landowners. 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 and landowners. 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 reviewing this proposed golf course.

If you require additional information please contact:

Elaine Sych, ERT Coordinator  
CT ERT Program  
P.O. Box 70  
Haddam, CT 06438  
(860) 345-3977

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# INTRODUCTION

The Litchfield Conservation Commission has requested assistance from the King's Mark Environmental Review Team in conducting an environmental review of the proposed Teaticket Golf Course.

The 147 acre site known as Teaticket Farm is proposed to be developed as an 18-hole professional-level golf course. The site is located on Webster Road and Route 63. Surrounding land use include residential homes and the White Memorial Foundation Preserve. The site contains a variety of land types from upland fields to wetlands, an open water pond and a watercourse. Approximately 31 acres have been identified as inland wetlands, and according to the developer 2.8 acres of wetlands will be disturbed by construction. A 1.8 acre pond and 3.8 acres of mitigated wetlands are proposed to be created. An additional 14 acre site to the north of Webster Road is proposed for a driving range and it contains no wetland soils.

## Objectives of the ERT Study

The Litchfield Conservation Commission is requesting assistance with review of this proposal to inventory the physical and biological characteristics of the site and to provide information and guidance on the golf course proposal. Specific concerns included wetland and aquatic impacts, ground and surface water quality issues, pesticide and turf management review, stormwater management and erosion and sediment control, wildlife habitat impacts and a review of historical and archaeological significance of the area.

## The ERT Process

Through the efforts of the Conservation Commission this environmental review and report was prepared for the Town of Litchfield.

This report provides an information base and a series of recommendations and guidelines which cover the topics requested by the Town. Team members were able to review maps and supporting documentation provided by the applicant.

The review process consisted of four phases:

1. Inventory of the site's natural resources;
2. Assessment of these resources;
3. Identification of resource areas and review of plans and reports; and
4. Presentation of education, management and land use guidelines.

The data collection phase involved both literature and field research. The field review was conducted on May 15, 1997. The emphasis of the field review was on the

exchange of ideas, concerns and recommendations. Being on site allowed Team members to verify information and to identify other resources.

Once Team members had 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.



Figure 1



# Location and Topographic Map

Scale 1" = 2000'



Approximate Site

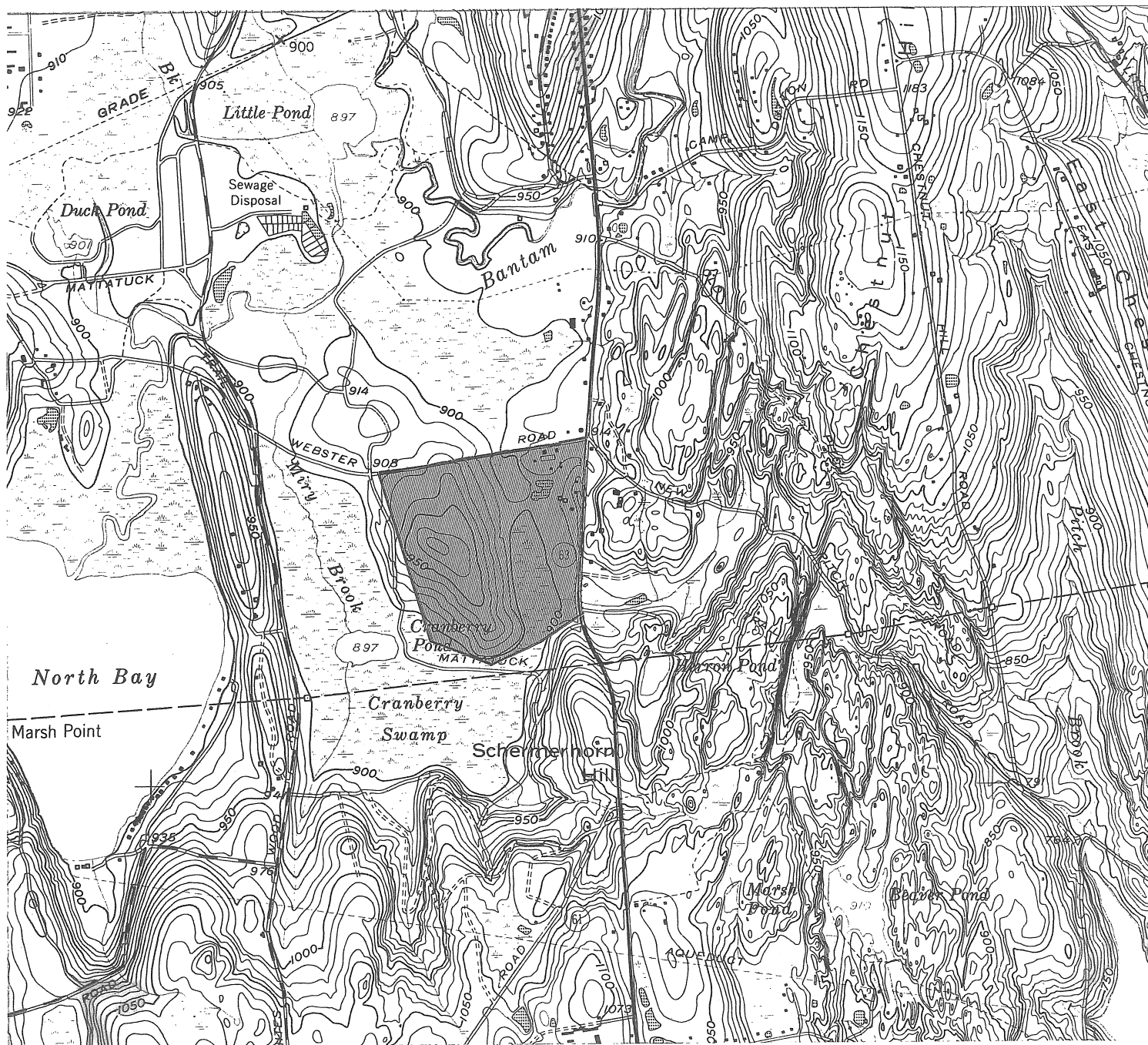
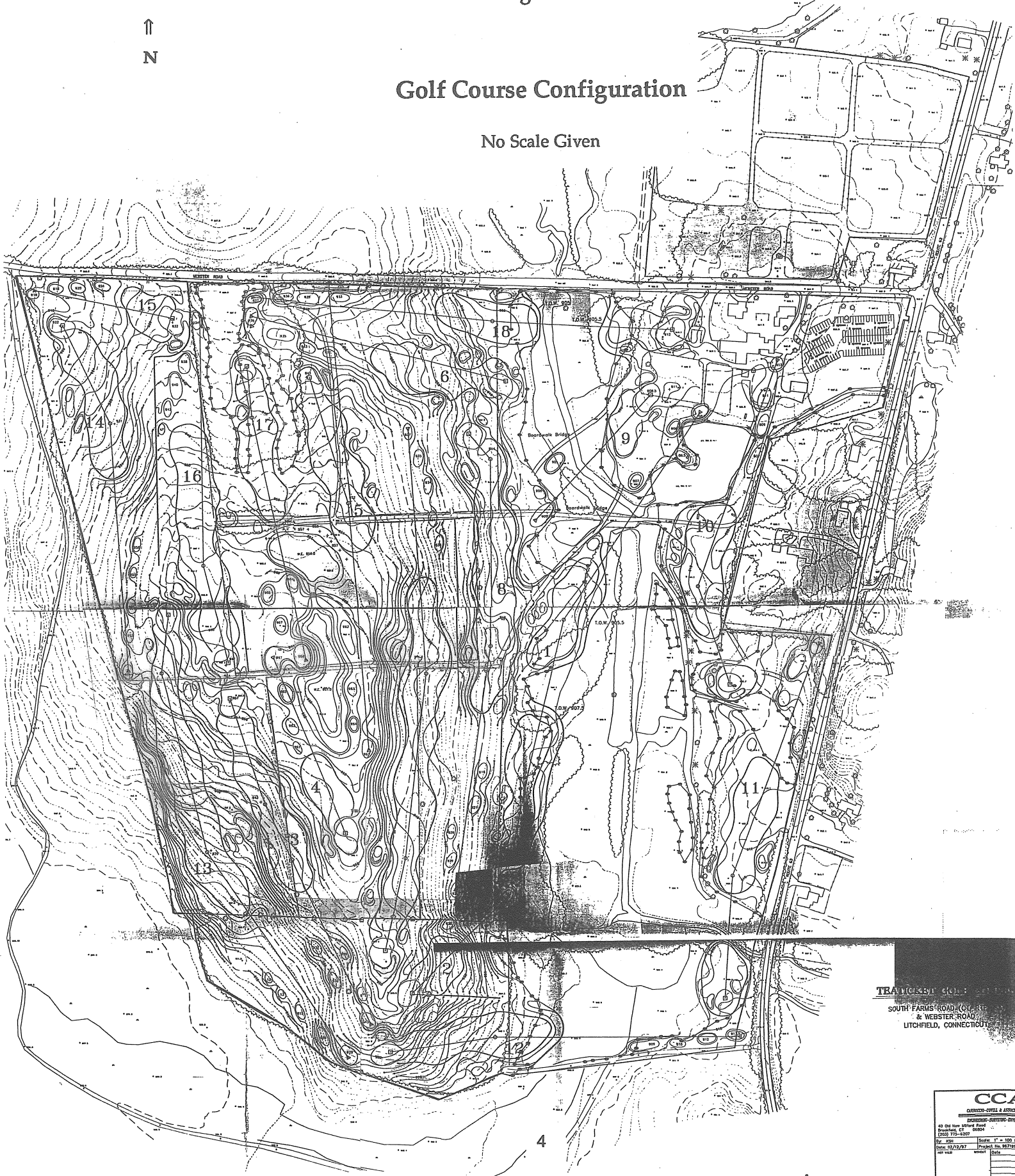


Figure 2

↑  
N

# Golf Course Configuration

No Scale Given



TRAVERSTON GOLF & COUNTRY CLUB  
SOUTH FARMS ROAD, CO. RD. 1  
& WEBSTER ROAD,  
LITCHFIELD, CONNECTICUT

**CCA**  
CANNON-PIVEL & ASSOCIATES  
40 Old New London Road  
Bloomfield, CT 06044  
(203) 775-6397  
Date: 02/27/87 Scale: 1" = 100 ft.  
Project No. 887815

# GEOLOGY

Teaticket Farm is underlain by thick glacial sediments deposited during the last glacial episode some 14,000 - 30,000 years ago. There are no outcrops of bedrock on the site. The eastern portion of the property consists of wetlands covering glacial outwash consisting chiefly of sand. Drill cores have been made into the outwash sand unit and found that the sand is in excess of 30 feet thick (Stone et al, 1992). The farmhouse sits upon a kame terrace which extends from Webster Road, just west of the house, to Route 63. Sand and gravel has been excavated from the kame terrace north of Webster Road. The majority of the property to the west is a streamlined, drumlin-like hill consisting of what is probably a thick accumulation of glacial till, an unsorted mixture of sand with silt, clay, rock flour, and angular to rounded stones including boulders that are up to three feet or more in diameter. Most of the surface boulders have been bulldozed from the cultivated fields and are now piled up along their edges.

The sands and gravels on the east side of the property have high porosity and permeability, making them good aquifers. Shallow wells drilled on the kame terrace should be capable of supplying a significant portion of the water required to irrigate the proposed golf course. On the other hand, the till which forms the hill is quite impermeable and the yield of any water wells, which would have to be drilled to bedrock, would be difficult to predict. It is possible, however, that an elongated lens of permeable sands and gravels is entrained in the till of the drumlin. There is a peculiar North-South trending "wet" zone on the western slope of the hill. The sands and gravels could have been deposited as outwash during an earlier interglacial period and then molded into the drumloidal hill at the height of the last glacial period. It is also possible that the linear feature is the surface expression of a highly fractured artesian permeable zone in the bedrock underlying a thin cover of till. In either case wells drilled along the trace of the feature could be highly productive.

The glacial deposits on the site cover two different bedrock formations. Under the western portion of the property is the Brookfield Gneiss which is a dark and light, medium to coarse-grained dioritic gneiss. The Ratlum Mountain Schist is found beneath the eastern part of the property. This formation is a gray, medium-grained schist. The contact between the two formations is interpreted to lie beneath the till covered hill (Rodgers, 1985).

## Terminology

Drumlin - A streamlined hill or ridge of glacial drift with a long axis paralleling the direction of flow of a former glacier.

Till - unconsolidated sediment deposited directly by a glacier without reworking by meltwater, and consisting of a mixture of clay, silt, sand, gravel and boulders ranging widely in size and shape.

Kame Terrace - a terrace consisting of stratified sands and gravels along a valley side which was directly in contact with glacier ice when deposited.

Schist - a well foliated metamorphic rock in which the component platy materials are clearly visible.

Gneiss - a high grade metamorphic rock, always coarse grained and foliated, with marked compositional layering, but with imperfect cleavage.

# WETLAND RESOURCES

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

## Existing Conditions

A detailed and representative description of on-site wetlands is contained within the document entitled "Draft #1" which was distributed by consultants for the developer prior to our 3/15/97 site walk. The Team wetland specialist is assuming that the author is Penelope C. Sharp, one of the developer's environmental consultants. Approximately 31 acres of the 147-acre horse farm (21%), have been determined to contain predominately wetland soils as a result of detailed site inspections by the developer's soil scientist. During the ERT site walk, the wetland specialist noted an area outside of the wetland boundary, between wetland flag numbers #119 and #127 (west of the eighth tee), which should be re-checked by the project soil scientist for possible boundary relocation. There is also one complete wetland area that appears to have been overlooked in the vicinity of the third fairway leading down to the thirteenth fairway. This area consisted of an advanced wet-meadow on the "high-end" of saturation evidenced by the existence of tussock sedges. This wetland appears to be fed via a seep/spring where the ground water breaks out of the slope and flows down in a broad, vegetated swale to the property line where the slope begins to level out (refer to Figures 3 & 4 for a map location of these areas).

All major phases of the palustrine wetland classifications are present on this property; including forested, shrub-scrub, emergent marsh, wet meadow and aquatic bed. Much of these wetlands have been altered in the past as a result of agricultural practices and logging activities; however Ms. Sharp has assigned them high ratings in several categories including wildlife habitat, flood control, visual/aesthetic qualities, nutrient retention/sediment trapping and general noteworthiness. Low wetland ratings were understandably assigned only to finfish habitat and water-based recreation. The remaining categories, including ecological integrity and educational potential, received moderate ratings. The Team wetland specialist has reviewed these ratings and fundamentally agrees with them.

One of the most outstanding values appears to be the diverse wildlife habitat present on this site. The presence of such numerous different types of wetland habitat as mentioned above provides abundant and varied opportunities for several different wildlife communities to exist. The Wildlife and Natural Diversity Data Base sections of this ERT report will provide more detail on this topic, however, it bears repeating that the DEP's Natural Resource Center's (NRC) Natural Diversity Database has recorded two animal species of special concern and three endangered plant species occurring off-site in Cranberry Swamp, located off the western

boundary of the subject property (refer to Figure 5 for approximate locations). In addition, the NRC indicated that the subject property may provide critical habitat to such neo-tropical migrant bird species (those birds that winter in the tropics and summer in temperate zones) as the yellow-rumped warbler (during the site walk, numerous yellow warblers were observed using forested wetlands on site as resting and feeding areas during their north migration).

Ms. Sharp stated in her report that the species recorded as part of the DEP/NRC Natural Diversity Database have not been noted during her summer fall and winter visits to the site. After discussing these matters with NRC staff, the ERT Wetland Specialist team member recommends that Ms. Sharp coordinates directly with NRC biologist Nancy Murray to ensure that all prudent steps have been taken to reasonably ensure that none of these listed species occur on site. Additionally, Ms. Sharp listed one other species in her "Observed and Potentially Occurring" wildlife list which is endangered in this state - the American Bittern, and one species that may soon be placed on the list - the wood turtle. *It should be determined if these species were actually observed on site.*

A majority of the onsite wetlands are part of a wide corridor transecting the site in a north-south direction and are associated with an unnamed watercourse entering in the southeast portion of the site and flowing north to the northern border of the farm. The southern extreme of this wetland corridor appears to be part of another watershed, that of Miry Brook, which flows through Cranberry Swamp to the south and west of the subject parcel. Both of these watersheds are part of the Bantam River sub-regional basin.

Of all the onsite wetlands, it is this extreme southern wetland which appears to be in the most unaffected, "pristine" condition. It is a forested wetland with a noteworthy and aesthetically pleasing assortment of white pine, tamarack, hemlock and red maple trees, with a well developed shrub and herbaceous layers underneath. It is directly associated with the preserved forested wetlands of the White Memorial Foundation property.

## **Impact of Proposed Activities on Watercourses and Wetlands**

The proposed construction of an 18-hole golf course, clubhouse, driving range and associated parking will occupy virtually all of the available upland area as well as 3.2 acres of wetland areas of this property. This figure of direct, permanent impacts was derived by the wetland specialist Team member in contrast to the 2.8 acre figure derived by the developer. This discrepancy of 13% can be attributed in part to two factors: 1) the Team member slightly enlarged some impact areas assuming that impact would include all areas within the proposed sediment control barrier, and 2) a fill area was not accounted for in the vicinity of wetland flags 252-257 at the twelfth tee area.

In addition to the direct wetland impacts as a result of the placement of fill material, there are also two significant areas of wetland alteration not accounted for by the developer: 1) the twelfth fairway "carry-over" which, assuming a 100 foot width, will convert approximately 36,056 square feet (0.83 acres) of the previously mentioned, highly valuable, forested wetland area into a scrub-shrub wetland; and 2) the existing swale in the extreme northeast portion of the parcel which will be converted to open water habitat as part of the stormwater treatment wetland. Carry overs on the first, ninth and eighteenth fairways appear to be proposed for wet-meadow, scrub-shrub areas which will not result in alteration but may need to be periodically maintained for such a purpose.

Also not accounted for by the developer are the approximately 9,900 square feet (0.23 acres) of temporary impacts created by the construction of the five proposed boardwalk bridges. This forms a total of 4.2 acres of direct impact of one form or another.

Indirect impacts resulting from the proposed activities may include such things as impacts from eroded sediment, excessive nutrient/pesticide inputs, effects on wetland hydrology due to groundwater diversion resulting from irrigation activities, and alterations to wetland buffer areas.

The most crucial of these items may be the alteration of wetland buffer areas. The Town of Litchfield deem certain activities, 100 feet up-gradient of wetland boundaries and 150 feet up-gradient of watercourse, to be regulated in the same way they regulate certain activities within wetland areas themselves. Upland land clearing, excavating and filling, if not properly planned and executed can have significant impacts on adjacent wetlands and watercourses. In general, most of the activities which are likely to impact wetland are significantly reduced outside of the 100 foot setback line. The use of a 100 foot setback area for the purpose of administrative review seems reasonable to the DEP - Inland Water Resource Management division. However, this is not to say that a "prohibitive" exclusionary zone of 100 feet outside of all wetlands is recommended either.

Much of the activity taking place within this setback area will result in permanent alteration from a mowed field habitat to one of turf grass or fairway which should not have a significant impact on adjacent wetlands. However, a significant amount of conversion from upland forest to cleared fairway, greens and tees is proposed, and it is the opinion of this Team member that this will have a significant impact on adjacent wetlands specifically on its wildlife habitat value. The impacts will be most significant within the mature forests of the twelfth tee and fairway as well as the first tee, fairway and greens. It was apparent from our site visit that these wooded buffer areas are limited on this site and were especially active with bird life, offering an attractive and functional transition zone between the upland fields and the bottom land wetland areas. *The placement of the 100 foot wetland setback line*

*and 150 foot watercourse setback line onto the site plan is recommended to assist in the review of regulated activities in these areas.*

The indirect impacts of eroded sediments and excessive nutrients/pesticides are addressed elsewhere in this ERT report. The effect on wetland hydrology due to groundwater diversion resulting from irrigation activities is difficult to gauge due to insufficient information. The Turfgrass Management Plan mentions that an average of 150,000 to 200,000 gallons per day during the growing season is expected. While this may be lower than other types of golf courses, it may still have an effect on down gradient wetlands especially if the water is withdrawn from the watershed of the unnamed watercourse and utilized within the Miry Brook watershed never to flow back to the source watershed. *A detailed irrigation plan should be considered required information as part of a wetland permit application package.*

## Proposed Mitigation

The developer's current wetland impact mitigation plan appears to be contained within a letter from David Lord to Jean Ricker dated 5/12/97. It is clearly indicated that this is a preliminary plan. In general, the method prescribed to in this document seems to reflect the current DEP mitigation policy, that is to first avoid and then minimize any proposed impacts to wetland areas. Once the least environmentally damaging alternative has been achieved and areas of wetland impact are still necessary *and approvable* by the Litchfield Conservation Commission (LCC), only then should compensation be considered to mitigate for unavoidable wetland impacts. This compensation should be undertaken with the goal of replacing these wetland functional values lost as a result of those unavoidable impacts and should be prioritized in the following manner: restoration of degraded wetland areas (highest priority), enhancement of existing wetland areas and creation of new wetland areas (lowest priority). In the case of an application which receives a public hearing the LCC must find, in writing, that a feasible and prudent alternative to the proposed wetland alteration does not exist prior to issuing a wetlands permit. According to the developer's mitigation plan, the current site plan design is the end product of several higher-impact alternatives which were considered in the past. Copies of these alternatives were not delivered to this office for review purposes as requested by the wetland specialist team member at the 5/15/97 ERT meeting. *These alternatives, as well as other conceptual plan alternatives with less impact than is currently proposed, would be useful during any review process.*

The mitigation plan includes no plans for wetland restoration. The mitigation plan speaks of buffer plantings to be used as a wetland enhancement technique, however there appears to be no evidence of their proposed use on the site plan itself. Other possible wetland enhancement procedures were eluded to at the ERT meeting as part of the developers discussions with the Connecticut Audubon Society, but again no concrete design features are present. The crux of the developer's wetland



mitigation plan as it stands now is the creation of a total of 5.6 acres of wetland, 3.8 acres of which are to be shallow marsh habitat and 1.8 of open water pond habitat. There was some concern raised at the ERT meeting over the possibility of success in creating a pond on top of a drumloidal features such as is proposed here. Recommendations for further investigation have been made as part of the Soil & Water Conservation District Review section. A majority of the wetland impacts are to take place in areas of forested wetlands, which as discussed earlier provide valuable transition habitat between the emergent marshes of the central wetland corridor and the upland mowed fields, yet there is no creation of forested wetlands proposed as part of the mitigation plan. *The valuable functions provided by the impacted forested wetlands will be lost and replaced by habitats of the shallow marsh creation areas.* Shallow-marsh habitats contain their own unique set of functional values, however there appears to be an abundance of these habitats within the Bantam River watershed southwest of the Town of Litchfield.

The mitigation plan states that the wetland creation efforts will be supervised by the project engineer or the a wetland specialist. *It is recommended that this be changed to "project engineer and wetland specialist."* For effective inspection, monitoring and updating of a wetland mitigation plan, on-going and responsive involvement by a trained, experienced wetland scientist is crucial. The plan does not specifically say who this person will be. *It is recommended that, prior to the local permit review process, the developer identifies who this person will be and provides a document detailing the education, training and experience of such a person for review by the LCC. Further it is recommended that post-project monitoring be extended to at least three years and not the two years called for in the current plan.*

## Additional Regulatory Programs

Maps on file in this office indicate the existence of a FEMA 100- year floodplain boundary (Refer to Figure 6 for a copied portion of the FEMA map of this area). It appears that areas of fill are proposed within this bounded area. The developer should contact the municipal planning and zoning agency to apply for a Floodplain Permit should this project progress.

If this project will impact between 5,000 square feet and one (1) acre, project review is required by both the U.S. Army Corp of Engineers (A.C.O.E.) and the Inland Water Resource Management division of the CT-DEP. If this project will impact more than 1 acre of inland wetlands, an individual 404 application to the A.C.O.E. will be required. However, these are basic guidelines. A.C.O.E. or CT-DEP action may be required for other specific activities proposed for wetland areas. For questions regarding these regulatory programs contact the A.C.O.E. at 617-647-8338 / 800-343-4789 or Sally Snyder of the CT-DEP at 860-424-3019.

If 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 860-424-3850.

Finally, if this proposal results in the alteration, modification, or diminution of the instantaneous flow of the waters of the state, it may require a permit from the DEP-Inland Water Resource Management division as called for in the Connecticut Water Diversion Policy Act (sections 22a-365 through 22a-378 of the Connecticut General Statutes). Consumptive groundwater withdrawals of over 50,000 gallons per day would, at this time, most likely require a Diversion Permit. It is recommended that the applicant call Bob Gilmore of this division at 424-3019 to determine the need for such a permit.

131

904.1

Figure 3

Wetland Area To Be Rechecked

Au

T.O.W. 910.5 +

904

Re-check AREA

128

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126

125

124

910

123

122

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916.1

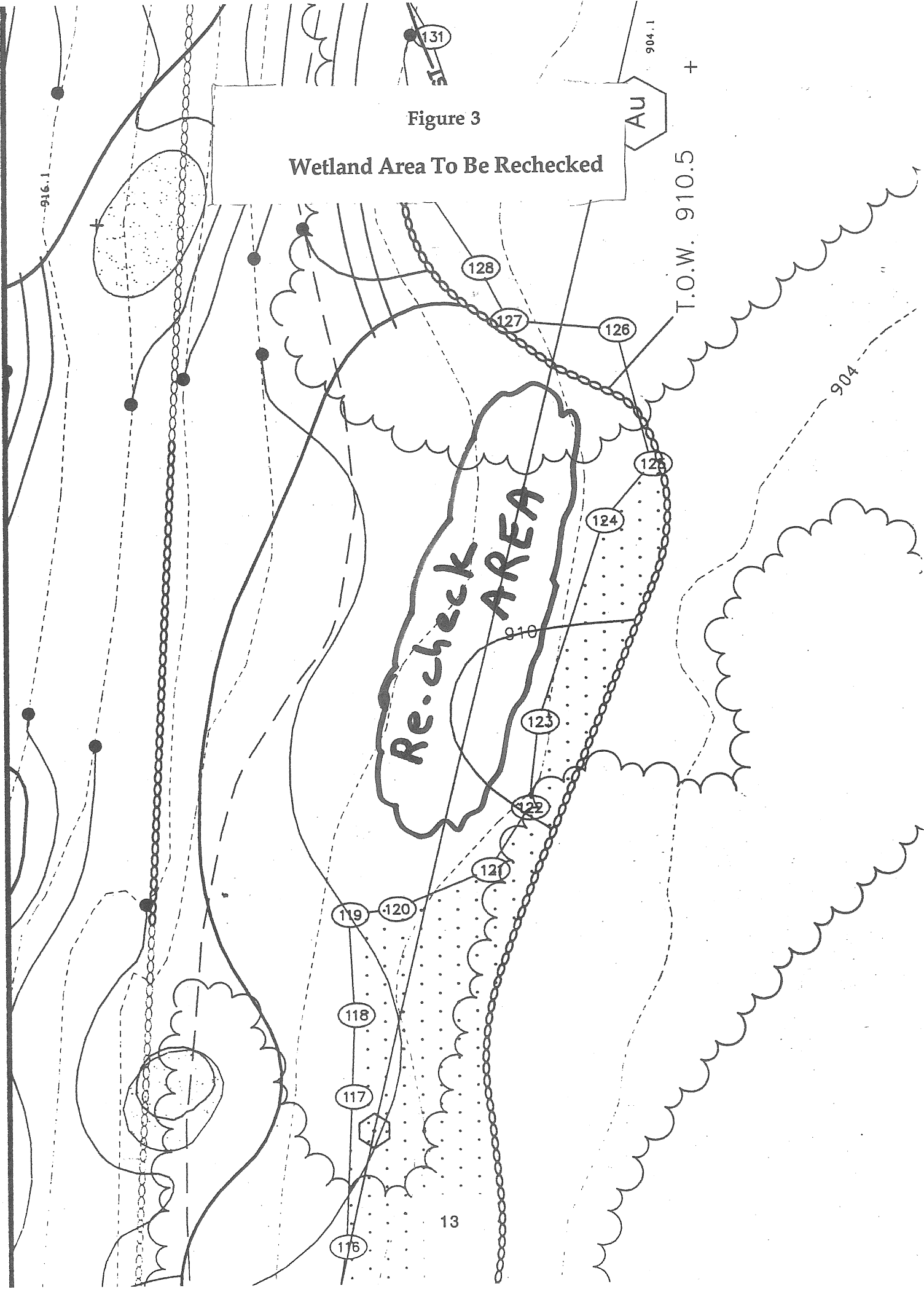
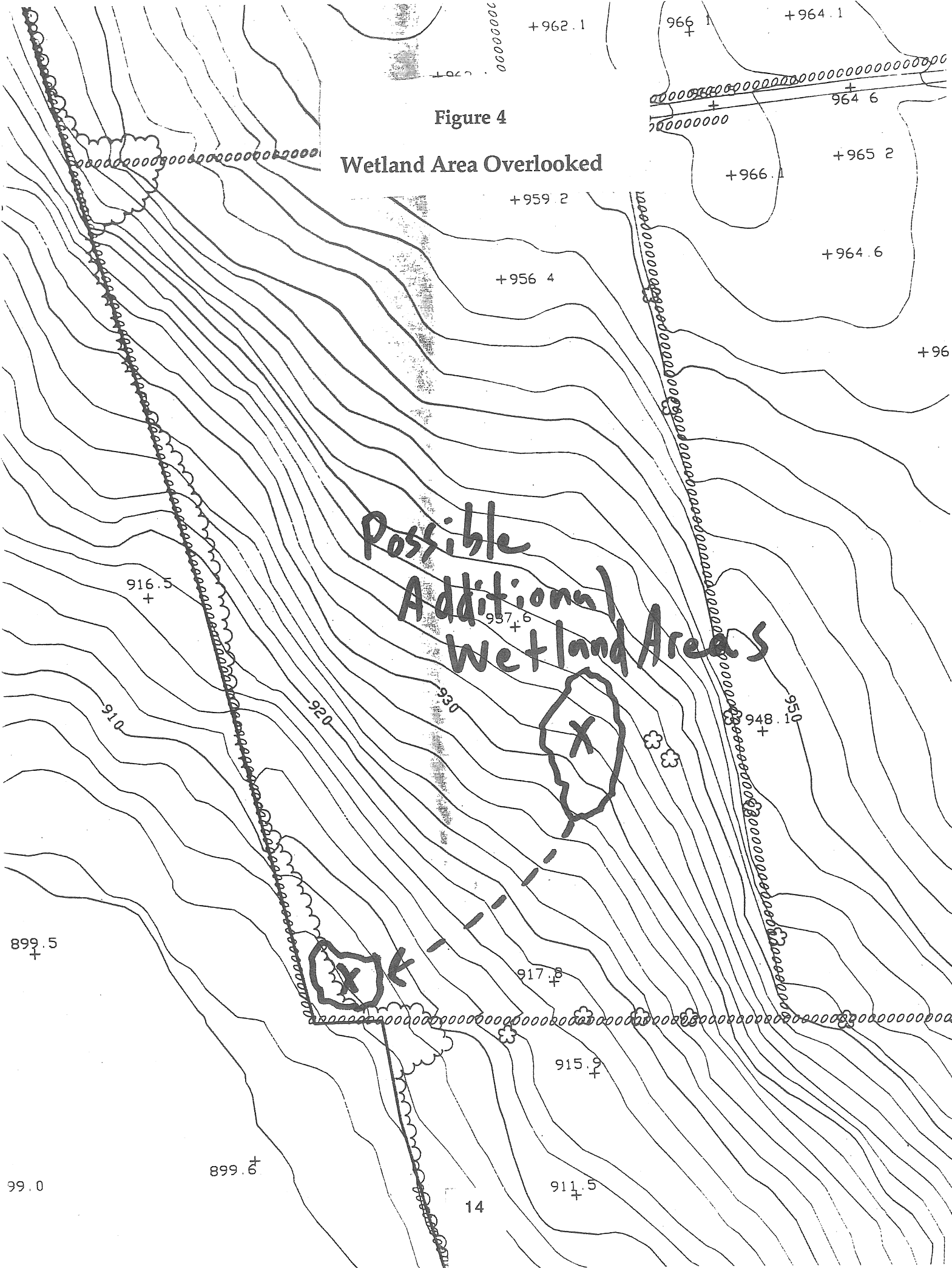
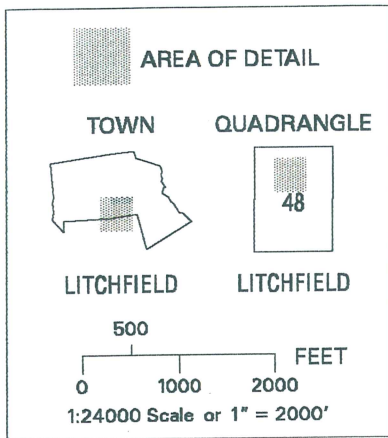


Figure 4

Wetland Area Overlooked

Possible  
Additional  
Wetland Areas





**DEP-GIS**

**LEGEND**

*Natural Diversity Database Areas*  
**PROPOSED TEATICKET GOLFCOURSE**

Natural Diversity Database Area (NDDB)

NDDB Areas represent a generalization of known locations of State and Federal listed species and natural communities. Additional populations of species and locations of habitats of concern are incorporated into NDDB as they are identified.

**Figure 5**

PLOTTED: 05/29/97 06.50.58 GIS

Natural Resources Center, Connecticut DEP

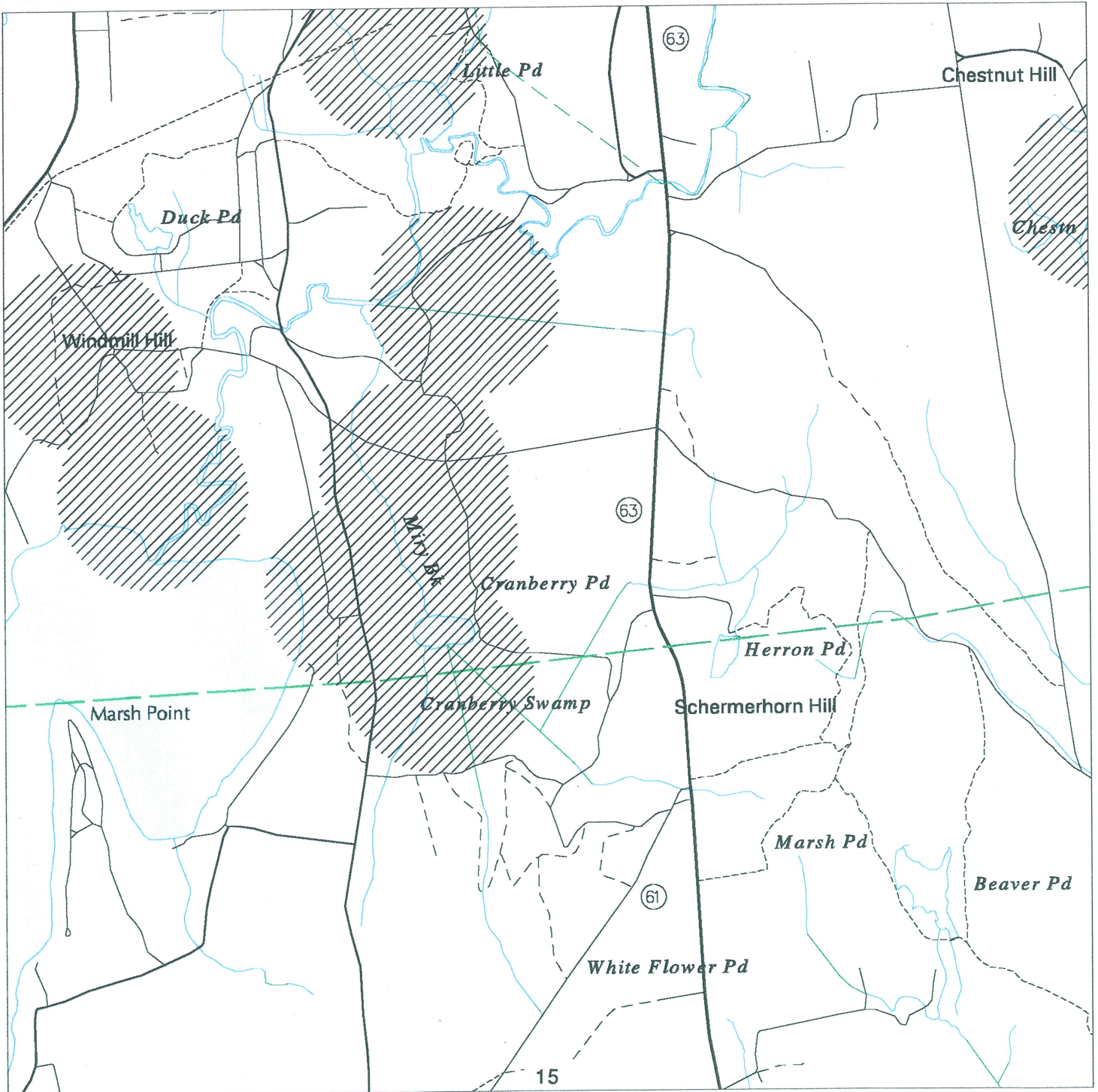
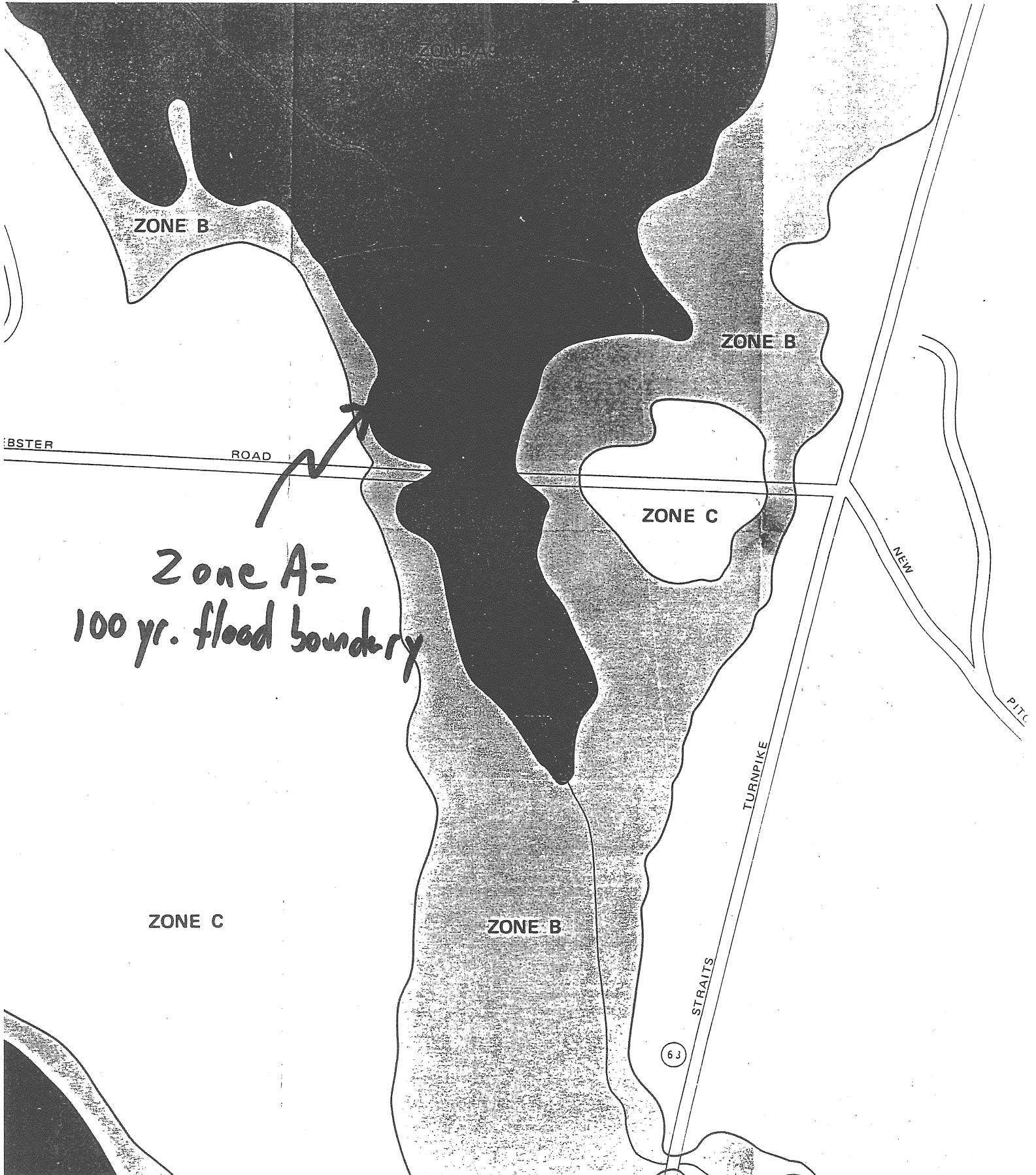


Figure 6

FEMA Map



# STORMWATER MANAGEMENT

The 147 acre site contains a diversity of land types from open upland fields to wetlands and marsh. The wetlands are integral with the proposed golf course and particular care must be exercised during construction and in operation to protect them.

The development is divided into four drainage areas. Most of the drainage from the site flows to the central wetlands/watercourse which flows to the north under Webster Road and eventually to the Bantam River. Drainage from the western portion of the site (proposed holes 3, 4 & 13-16) flows to Cranberry Swamp and then north to the Bantam River.

Potential runoff pollutants include sediment during construction, nutrients from fertilizers used for course maintenance and pesticides/herbicides also used in course maintenance. To some extent these impacts will be mitigated by the vegetation over which the runoff flows before it reaches the wetlands and watercourses. The proposal allows a substantial vegetative buffer in most areas between the maintained areas of the course and the wetlands. The wetlands themselves also have a certain capacity to absorb pollutants before runoff reaches the stream. Any negligible remaining pollutants should be mitigated within the wetland before they reach the stream leading to the Bantam River. In addition to these existing natural means of runoff mitigation, there are also several areas of wetland expansion and creation to balance areas of wetland disturbance. These additional wetland resources include the creation of a 3-basin wetland system east of the tee area for the tenth hole. All of these wetland mitigation areas will further contribute to the reduction of stormwater pollutants reaching the Bantam River. Since virtually all of the stormwater runoff from the proposed development will be overland, there will be minimal piped or channelized flows creating point source discharges. Issues of energy dissipation and sediment removal in the drainage design are, therefore, negligible. The 3-basin system near the 10th tee will serve to negate potential off-site sediment which may enter from the culvert under Route 63. Maintenance of this system must be well-documented in the operational plan for the golf course.

A registration for the General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities must be submitted at least 15 days prior to the start of construction. A Stormwater Pollution Control Plan must also be prepared and kept on site at that time. In particular, erosion and sediment control measures utilized must be appropriate for the varying grades and conditions on the site. Particular care must be taken to protect the wetlands as much of the construction is in close proximity. Temporary construction sedimentation basins or trenches must be employed with all disturbed areas to prevent sediment migration. The plans currently do not show any sedimentation basins. Sedimentation basins shall have a capacity of at least 134 cubic yards per acre drained to them. Disturbed areas to be left bare for over 30 days will receive temporary seeding or heavy mulch.

All disturbed areas must be seeded as soon as possible. No areas may be left bare by the end of the planting season. On a site with such varied grades and interconnected wetlands, care must be taken to properly stabilize seeded areas with mulch and/or geotextiles. Properly constructed and maintained, the potential stormwater impacts on the adjacent wetlands or downstream watercourses should be manageable.



# SOIL AND WATER CONSERVATION DISTRICT REVIEW

Materials submitted for review include: Erosion Control Plan for Teaticket Golf Course prepared by CCA Engineers (dated 5/13/97), Drainage Report Teaticket Golf Course prepared by CCA Engineers (dated 5/14/97), Site Grading Plan (sheet 1 of 1), Site Grading - Erosion and Sediment Control Plan (sheets 1-3, dated 5/15/97), letter to Jean Ricker from David Lord, Certified Soil Scientist (dated 7/29/96), letter to Jean Ricker from David Lord (dated 5/12/97), Environmental Principles for Golf Courses (dated 5/9/97), Draft #1 (author unknown), and Teaticket Golf Course Turfgrass Management Plan by Hurdzan Golf Course Design, Inc.

Per the site inspection and plan review, the following comments are made:

1. It is understood that multiple incursions will be made (which are not indicated as "Wetland Disturbance Areas" on the site plans) into wetland areas for purposes of brush and tree clearing. Among the items which should be included are:
  - a) Areas to be cleared, staging, and sequence of clearing.
  - b) Disposal of cleared material.
  - c) Temporary erosion protection of the cleared area (i.e. mulching, seeding, etc.).
  - d) Additionally, efforts should be made to minimize the use of heavy equipment in these areas.
  
2. The sediment and erosion control plan is not complete. The plan should be a specific, integral part of the overall site plan.
  - a) The information needed for construction should be on the construction drawings and not displayed as background information.
  - b) The soil erosion and sediment control measure construction drawings should be a part of the overall construction drawings.
  - c) The construction details for measures should be shown on a separate sheet from the plan view sheets.
  - d) The stages of development, sequence of major operations on the land, and maintenance program during construction are in the narrative portion of the plan but should also be on the construction drawings.

- e) Significant filling activity will occur along the central wetland corridor. To prevent erosion, a vegetative streambank stabilization plan should be included in the site plans.
3. Under point 3 of the "Construction Sequence" of the Erosion Control Plan, it states to "Install underdrains as necessary throughout tees, greens, and fairway areas. Daylight to "rough" areas where possible." It would be beneficial that the placement of these underdrains and their outlets be indicated on the site plans. Consideration should be given to the possibility that pesticides, herbicides, insecticides, and fertilizers (or residues thereof), which are typically applied on golf courses, may be routed into an adjacent wetland area. Further, the installation of a drainage system may necessitate additional wetland disturbances or crossings which are not indicated on the site plans. Additional sediment and erosion control measures may be necessary if trenching is to occur.
  4. Under "C. Construction Sequence" point 3 of the Erosion Control Plan, "topsoil to be stockpiled": The proposed stockpile soil sites should be indicated on the site plans. Proper silt fencing should be placed around these stockpiles to prevent the movement of silts downslope. Fencing should also be indicated on the plans.
  5. Proposed mitigation areas:
    - a) Feasible and prudent alternatives should be considered in the design of the golf course and impact to wetland areas. Use of mitigation should be considered as a last resort. Zero wetland disturbance should be considered as the most desirable alternative.
    - b) The field visit revealed plans to excavate "from 6 to 12 inches" of soil along the central wetland corridor to create mitigated wetland areas. This would result in a flooding of the area and a removal of the rich, organic topsoil. Once flooded, it would take several years for the soils to assume the properties of true wetland soils. The proper way to create a mitigated wetland area would be to remove the individual soil horizons, including the rich "A" horizon, replacing them to the desired depth to reach the final elevation. Additional information should be provided detailing depth of excavation (per site), planting inventory, and other design characteristics for each proposed mitigated area.
    - c) Consideration should be given to the functional values that have been determined for the lost wetland areas. It would be beneficial to create wetland areas of similar or enhanced quality and functionality.

6. Additional silt fencing should be placed in the following areas:
  - a) Exterior to wetland flags 193 and 194 - creation of a mitigated wetland (north of 193-194) in this area will necessitate the temporary installation of silt fencing to contain the disturbance from the central wetland corridor (south of wetland flags 193-194). The disturbance will result from the planned excavation activity to drop the land elevation 6 to 12 inches to allow water overflow.
  - b) Exterior to wetland flags 201 and 210 - creation of a mitigated wetland area here necessitates the containment of disturbed soils from the central wetland corridor.
  - c) Exterior to wetland flags 187 and 178 - per reason b.
  - d) Exterior to wetland flags 178 and 176 (slightly beyond this marker, as it does not extend to the end of the created wetland) - per reason b.
  - e) Exterior to wetland flags 152 and 157 - per reason b.
  - f) Exterior to wetland flags 110 and 125 - per reason b.
  - g) Interior to proposed mitigated area approximately between wetland flags 90 and 100 to protect the new area from silts migrating from the slope above.
  - h) Interior to proposed mitigated area approximately between wetland flags 158 and 163.
  
7. Per the *Guidelines for Soil Erosion and Sediment Control*, one silt fence is capable of maintaining 1-acre of erodible land. As such, additional silt fences would need to be installed on the site (between the main wetland corridor and the proposed pond location on the grassy ridge, and between the proposed pond location and the most westerly portion of the site). These fences should parallel land contours. Additional silt fences would also be necessary at proposed hole locations 8, 9, and 11 with respect to the guidelines. At present, the proposed silt fence installations are inadequate to handle potential siltation.
  
8. A detailed planting index and planting sequence narrative should be provided for each proposed mitigation area and appropriately designated on the site plans. In addition, provision should be made and documented in the plans for an inspection of the mitigation areas to ensure their health and functionality.
  
9. A wetland disturbance permit from the Army Corps of Engineers is required for any disturbance over 1-acre. The site currently has 2.8 acres of proposed wetland disturbance according to the developer.

10. Proposed pond location:

- a) It is recommended that deep test holes be dug to determine the depth to water table during the dry summer months.
- b) A licensed, professional engineer should review the structure, hydraulics, and design of the proposed pond, including the outlet/overflow area and accompanying channel. This review does not address the functionality of the proposed pond. Hydraulic calculations for the channel should also be provided.
- c) Soils mapping indicates PbB and SvB soils. Paxton (Pb) soils are typically well drained, derived from glacial till. For pond purposes, Paxton soils exhibit slow to very slow permeability below hardpan. Sutton (SvB) soils are typically moderately well drained, nearly level to sloping soils, also developed in glacial till. For pond purposes, they have a seasonally high water table with moderate seepage when the water table is low. They exhibit moderate to rapidly moderate permeability.

11. Proposed island "905": Alternatives should be sought to minimize the intrusion into the central wetland corridor by this landing. Relocating this landing to another area is an option.

12. There are 7 boardwalk crossings on the current site plans, 6 of which cross existing wetland areas while 1 crosses a proposed mitigated area.

- a) It is unclear as to how pedestrian traffic will travel from the tee area to the fairway and green at hole #12. The site walk revealed an old road along this southeasterly portion of the land. Clarification should be made for this location.
- b) Boardwalk serving hole #10: An alternative placement for this 120' boardwalk is recommended to minimize wetland intrusion. It appears possible to shift the boardwalk from the existing position to crossing the narrow wetland channel (between flags 214-215 and 223 respectively). Allowing for overlap, this new boardwalk would have to be no longer than 60' in length.
- c) Boardwalks serving holes #8, 9, and 18: Three boardwalks, providing access across the central wetland corridor, are proposed. Lengths are approximately 180', 320', and 290', respectively. Consideration should be given to eliminating one or both of the wing crossings and establishing a singular crossing in the area of wetland flags 179-180 to 151-152. This would further reduce the wetland disturbance.
- d) Boardwalk serving hole #18: This proposed boardwalk parallels the existing Webster Road and will result in construction activity through the central wetland corridor. The necessity of placing the boardwalk next to the existing road should be evaluated.

13. If an irrigation system is to be installed, its location should be indicated on the map. Consideration should be given to the water source and outlet or drainage patterns. Any redistribution of water on site may result in adverse hydrologic impacts to the surrounding wetlands. Additionally, the installation of an irrigation system may necessitate additional wetland disturbances or crossings which are not indicated. Sediment and erosion control measures would be necessary if any trenching were to occur.
  
14. When grading, it would be beneficial from an erosion control standpoint to leave as much existing vegetation as possible remaining in place. Trees and other vegetation protect the soil, as well as beautify the site after construction. A proper staging plan would entail stabilizing one part of the site before disrupting another. In this way, the entire site is not all disturbed at once and the time without vegetative cover is minimized. Temporary seeding and mulching would prevent the entire area from being subject to exposure, thereby reducing erosion. Detailed plans can be designed to direct this activity.

# AQUATIC RESOURCES

## Site Description

An unnamed stream and pond are located within the 147 acre parcel proposed for development as the Teaticket Golf Course. The site is bisected by roughly 2200 feet of the unnamed stream. The stream is contained in a channel approximately 12 feet in top of bank width and normal flow depths averaging 2 feet. Surface flow within the low gradient, nearly vertical side-sloped channel is predominated by deep moving pool. Stream substrate is composed of gravel, coarse sand, and sand-silt fines. Dense growths of hardwoods and woody shrubs predominate as riparian vegetation in a relatively broad wetland adjacent to the stream. Physical in-stream habitat is provided by water depth, undercut banks, and fallen or overhanging vegetation. The uniform characteristic of the stream channel is indicative of previous modification likely related to the long standing agricultural use of the parcel. The unnamed 1.5 acre pond on the parcel is artificial in origin. Reportedly the pond has a maximum depth of 10 feet and average depths of 4 feet. Moderate growths of submergent aquatic vegetation are found throughout much the pond along with emergent aquatic vegetation species along the pond's irregular shoreline. Surface water from the pond discharges to the site's unnamed stream.

Although the site has been subject to agricultural development, primarily hay fields, buffers of wetlands and/or unused field have been maintained adjacent to the site's surface waters. This has provided an effective means of protecting aquatic habitats and surface water quality. Reportedly due to an off-site contaminant source however, the Department of Environmental Protection classifies the surface waters of the Teaticket Golf Course site as *Class B/AA* surface waters. Surface waters of such a classification do not currently meet *Class AA* standards but are considered candidates for upgrade to that classification. Designated uses for *Class AA* surface water are existing or potential public drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply, and other purposes. Recreational uses may be restricted.

## Aquatic Resources

The unnamed stream is a prime examples of a warm-water wetland stream. Although a formal finfish resource inventory of this watercourse has never been conducted by the Fisheries Division, such had been conducted on Butternut Brook, a nearby stream of similar characteristics. Results of the 1992 survey indicated the finfish population of Butternut Brook as composed of pumpkinseed sunfish (*Lepomis gibbosus*), redbreast sunfish (*Lepomis auritus*), black crappie (*Pomoxis nigromaculatus*), largemouth bass (*Micropterus salmoides*), chain pickerel (*Esox niger*), yellow perch (*Perca flavescens*), golden shiner (*Notemigonus crysoleucas*), blacknose dace (*Rhinichthys atratulus*), tessellated darter (*Etheostoma olmstedii*),

white sucker (*Catostomus commersoni*), and brown bullhead (*Ameiurus nebulosus*). The unnamed stream can be anticipated to contain a similar finfish species composition. In addition to the above listed species, northern pike (*Esox lucius*) are reported to inhabit the stream, migrating to the area from nearby Bantam Lake.

One species found in Butternut Brook the brown trout (*Salmo trutta*), is stocked in that watercourse by the Division and is not anticipated to inhabit the unnamed stream on the Teaticket Golf Course site.

With a shallow average water depth and moderate aquatic plant growth, the unnamed pond can be classified as a warm-water resource. Formal surveys have never been conducted to evaluate the resident finfish population. Information provided by representatives of the site's current owners indicate the pond has a finfish population composed of bluegill sunfish (*Lepomis macrochirus*), pumpkinseed sunfish (*Lepomis gibbosus*), largemouth bass (*Micropterus salmoides*), northern pike (*Esox lucius*), golden shiner (*Notemigonus crysoleucas*), and white catfish (*Ameiurus catus*).

## **Resource Impacts**

As previously mentioned, the site has been subject to agricultural development conducted in a manner maintaining buffers of wetlands and/or unused field adjacent to the site's surface waters which has subsequently provided an effective means of protecting aquatic habitats and surface water quality. Taken as a whole, redevelopment of the existing agricultural property to a "links style" golf course as proposed should not produce a physical land use change adversely impacting aquatic resources proximate the site. However, the following components of site design and future maintenance are of concern:

1. **Boardwalk crossings of the unnamed stream and associated wetlands.** The integrity of localized instream habitats may be compromised by the two proposed boardwalk crossings between Hole #8 and Hole #9 and the single crossing at Hole #11. These crossings will alter riparian habitats and may result in instream modification.
2. **Volume of ground water required for irrigation.** It is suggested that the "links style" golf course proposed limits intensive maintenance, including irrigation, to greens areas which comprise approximately 2.5% of the site. Despite limited intensive maintenance, irrigation needs of the course will require use of 150,000 to 200,000 gallons of water per day. While a source for supply of irrigation water has yet been specified, it is presumed to involve direct withdrawal from surface waters of the site or from groundwater of the underlying aquifer. Withdrawals of the magnitude required for irrigation can result in a decrease of surface water elevations which in turn could eliminate aquatic habitat.
3. **Fertilizer, herbicide, and pesticide application.** "Links style" are noted to make use of native grass species selected for resistance to various turf problems such as

insects and disease. For areas of the course other than greens, turf management programs are to have an emphasis placed on cultural practices such as mowing, watering, aerification/reseeding, rather than the more usual practices of fertilizer and chemical application. Maintaining vegetated filter strips along surface waters and applying compounds at curative rates are suggested as measures to minimize off-site transport. Should excess nutrients from fertilizer runoff reach surface waters, there will be a stimulation of aquatic plant growth potentially to levels decreasing habitat diversity. Herbicide or pesticide runoff may result in fish kills and water quality degradation.

4. **Soil erosion and subsequent sediment transport through runoff from areas removed of vegetation during site development.** Excessive erosion, sediment transport, and sediment deposition can degrade both water quality and physical habitat, in turn affecting the resident finfish population. Specifically, excessive siltation has the potential to cause a depletion of oxygen within the water column; disrupt fish respiration and gill function; reduce water depth resulting in a reduction of habitats used by finfish for feeding, cover, and spawning; reduce finfish egg survival; reduce aquatic insect production; and promote excessive aquatic plant growth
5. **Alteration of riparian habitats.** Changes to existing riparian vegetation from golf course encroachment can remove the natural "filtering" effect of vegetation which has the ability to prevent sediments, nutrients, fertilizers, and other non-point source pollutants from upland sources from entry into streams; such non-point source pollutants can degrade habitat and water quality; decrease stream bank stability thereby increasing surface water siltation and habitat degradation; eliminate or drastically reduce the supply of large woody debris provided to surface waters, streams, such material provides critical physical habitat features for numerous species of aquatic organisms; reduce a substantial proportion of food for aquatic insects which in turn constitutes a reduction in a significant proportion of food available for resident finfish; stimulate excessive aquatic plant growth; and decrease the riparian corridor's ability to serve as a "reservoir" storing surplus runoff for gradual release back into the streams during summer and early fall low flow periods.

## **Mitigative Recommendations**

A number of measures have been incorporated into preliminary design of the proposed Teaticket Golf Course in effort to protect the site's aquatic resources. In effort to further protection of those resources, the Fisheries Division recommends the following:

- **Eliminate the two boardwalk crossings of the unnamed stream between Hole #8 and Hole # 9.** The existing farm road crossing of the stream can apparently be utilized to provide access between these two holes. The existing farm road



crossing structure consists of a culvert. For a restoration of instream habitat, the existing structure should be replaced by a span bridge.

The proposed unnamed stream crossing proposed for Hole #11 should be relocated closer to Route 63 in an area(s) previously disturbed due to agricultural or roadway development.

- **Seasonally adjust the volume of groundwater water required for irrigation.** Dependent upon wellfield location(s) and time of year, the proposed rate of withdrawal of 150,000 to 200,000 gallons per day can directly impact surface water elevations subsequently limiting available aquatic habitat. On a seasonal basis, surface water elevations are generally the lowest during the summer months and primarily during the month of August. Therefore it is critical that a groundwater withdrawal schedule be adopted which balances the needs for golf course irrigation with the amount of water required for maintenance of healthy aquatic environments.

While there are numerous study designs available for determining the levels of stream flow adequate to meet aquatic resource needs, the Division usually recommends either of the following "desk-top" methods. First is maintaining a flow level equating to the historic, unregulated median August flow. This method presumes the median August flow to be the most stressful for the aquatic system and is the flow to which aquatic organisms have adapted. While median August flows are applicable to base flow conditions, higher flows may be required for finfish spawning and egg incubation periods. A minimum 25 year period of record is required to determine median August flow. In streams where such a record is lacking or if water diversions have occurred throughout the period of record, a surrogate stream(s) with an adequate flow record may be used. However, such a stream(s) must be of similar size, degree of drainage basin development, and be underlain by a similar percentage of stratified drift.

Secondly is maintaining flows as determined by standards of the U.S. Fish and Wildlife Service Aquatic Base Flow Policy (ABF). The ABF flow standard equating to 0.5 cfs/square mile drainage is to be applied at all times of the year only to be superseded by flows equating to 1.0 cfs/square mile drainage during the fall and winter and by flows equating to 4.0 cfs/square mile drainage as determined necessary for spawning and egg incubation.

The previously described methods deal specifically with flowing surface waters and not ponds. However, it is Division opinion that by establishing and maintaining a base flow within the unnamed watercourse on the Teaticket Golf Course site, water surface elevations of the pond will be preserved.

- **Maintain at a minimum a 100 foot open space buffer zone along developed golf course areas encroachment to the unnamed stream or pond.** Research has indicated that a buffer zone of this widths prevents damage to aquatic ecosystems that are supportive of diverse species assemblages. Buffers absorb surface runoff,

and the pollutants they may carry, before they enter wetlands or surface waters. Please refer to the attached documentation presenting Division policy and position regarding riparian buffers for additional information.

- **Limit liming, fertilizing, and the introduction of chemicals to developed land susceptible to runoff into the unnamed stream or pond surface waters.**
- **Establish comprehensive erosion and sediment control plans with mitigative measures (haybales, silt fence, etc.) to be installed prior to and maintained through all development phases. Land clearing and other disturbance should be kept to a minimum with all disturbed areas being protected from storm events and restabilized in a timely manner.**
- **Limit regulated activities adjacent to riparian buffer zones to historic low precipitation periods of the year. Reduced precipitation periods of summer to early fall provide the least hazardous conditions when working near sensitive aquatic environments.**
- **Redirect discharge from the compartmentalized detention area adjacent to the proposed parking lot. Discharge should outlet to wetlands created at the pond's northern end rather than discharging directly to the main body of the pond.**
- **Reconsider creating the 1.8 acre pond in uplands of the site. With an extremely limited drainage area, possible limitations for groundwater supply, and the likelihood of an extremely permeable bottom, the pond may not receive and maintain a supply of water suitable for the support of a viable aquatic ecosystem.**

# THE NATURAL DIVERSITY DATA BASE

The Natural Diversity Data Base maps and files regarding the project site have been reviewed. According to the information, there are two Species of Special Concern in the immediate vicinity of the proposed golf course. They are *Ambystoma laterale* (blue-spotted salamander "complex") and *Ardea herodias* (great blue heron). The area may also be important for neotropical migrant birds, especially *Dendroica coronata* (yellow-rumped warbler).

This blue-spotted salamander "complex" results in the hybridization of the blue-spotted salamander with the Jefferson salamander. The hybrids can only be reliably distinguished by karyological and biochemical analyses. Blue-spotted salamanders are associated with riparian red maple swamps. They breed in March and April and may be found on the road surface on wet rainy nights. They favor grassy, flood plain wetlands for breeding.

The great blue heron rookery is in Cranberry Swamp. This is an important wetland complex. The possible degradation of the wetland from drainage and lawn chemicals leaching from the golf course maintenance are of great concern. The impact of the golf course to this species would depend on the golf course design and chemicals used on the greens and fairways.

The yellow-rumped warbler is not a state listed species but is a neotropical migratory bird that breeds in the north and winters in the south. They prefer to nest in coniferous areas around wetlands. The decline of migratory birds is primarily due to the destruction and degradation of habitat throughout the Americas.

In addition, there are historic records of three State Endangered plant species from Cranberry Swamp: Bog Rosemary (*Andromeda glaucophylla*), Arethusa (*Arethusa bulbosa*), and Bog Sedge (*Carex limosa*). These plants have not been observed since 1917 and their present status will have to be determined prior to DEP-NRC-Natural Diversity Data Base review of the potential impacts which the proposed golf course may have. This site will need to be inventoried in the Spring by a qualified botanist with the results submitted to the DEP-NRC-Natural Diversity Data Base for further review.

Natural Diversity Data Base information includes all information regarding critical biological 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 note that the Team members that comprised this section of the report have not made an onsite inspection of this area, nor have they seen detailed plans of the work to be done. If you need more information about these species please feel free to contact the Team members.

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

This section was not received in time to incorporate into the final report. It will be added at a later date.

# GROUND AND SURFACE WATER QUALITY

The site of the proposed Teaticket Golf Course is a highly aesthetic and historic farm. Adjacent to the White Memorial Foundation Preserve, the site is surrounded by significantly productive, and therefore, valuable wetlands. Simply considering the inherent values of the site and the surrounding property, it is this Team member's opinion that public funds should be sought to purchase the property, to be preserved as public land.

Nonetheless, the proposal for a golf course is feasible given proper management and monitoring of environmental impacts typically associated with turfgrass management. Owing to the soils, position on the landscape, and surrounding environmentally sensitive areas impact, assessment and careful management is essential.

Soils beneath the site are derived from dense basal glacial till. Although water infiltration into the soil surface is moderate to rapid, just 2 feet below the surface, the dense till severely restricts downward percolation of soil water. The result is a lateral subsurface flow of soil water, which is discharged to the surrounding wetlands. This is not to say that some soil water will not seep through the dense till into the overburden and fractured bedrock aquifers.

Research studies have shown that in agricultural land use areas (functionally including golf courses), where till overlays bedrock aquifers, pesticides were detected in ground water samples taken from the overburden and bedrock (Mullaney et al, 1991). Till is commonly the medium through which recharge and contaminants are transmitted to bedrock aquifers. But, because ground water discharge to the bedrock is slow (7-8 inches per year), most ground water discharge from the till overburden is mainly to surface water bodies, including wetlands.

Mullaney et al showed that pesticides can persist in soil and may be leached to ground water long after application. Specifically, this data from upland till derived soils and bedrock beneath the till, indicate that these hydrologic settings are susceptible to contamination from agri-chemicals. However, high proportions of organic matter in soils (i.e., wetland soils) can, in some instances, buffer the export of contaminants to ground water. Further, a United States Geological Service water resources investigation (Grady and Weaver, 1988) found that ground water in agricultural areas had the highest nitrogen concentrations of land use settings evaluated. The application of agri-chemicals is cited as the most likely source of these elevated concentrations.

In evaluating the effects of land use on the quality of ground water, it is necessary to know the history of the subject site. Although agricultural areas (including golf

courses) may have elevated nutrient and pesticide levels, it is important to note that a wide variety of potential ground and surface water contaminants may be introduced from residential onsite septic systems, leaking municipal sewer lines, application of deicing chemicals on streets, lawn agri-chemicals, and wastes from domestic animals. Past animal husbandry practices of the Teaticket Farm are important factors. Additionally, waste disposal practices, including landfill and sewage treatment plants should be considered sources of a wide range of contaminants. A sewage treatment facility is located northeast of the Teaticket Farm. There are also ground water contamination issues associated with a nearby landfill that need to be appraised.

Prior to development of the golf course, baseline soil, sediment, and surface and ground water sampling and analysis for organic and inorganic constituents would be wise and prudent; for both the town and developers. Thereafter, a monitoring program should be implemented to aid in the assessment of environmental impacts of the golf course operations on the environmental receptors. The hydrogeologic investigation should include water table mapping, soil-water migration, ground water flow modeling, and development of irrigation and monitoring well placement. The elements of the program include: 1) specifications for monitoring wells and lysimeters (devices to measure the quantity or rate of water movement through or from a block of soil or to collect such percolated water for quality analysis); 2) a schedule for sampling and analysis; 3) specific concentrations of nitrates and pesticides compounds that require resampling and analysis, restriction of usage, or remedial actions; and 4) regular reports to local authorities. In an effort to ensure implementation of this program a table of responsibilities and a memorandum of understanding may be signed by the Town authorities and the golf course operators (Horsley and Moser, 1990). (See CT Remediation Standard Regulations: General Statutes of Connecticut §22a-133k-1 through 22a-133k-3 for guidance criteria on pollution parameters.)

A monitoring program will provide for an early warning system. The sampling network should include several strategically placed multilevel screened cluster monitoring wells, lysimeters, and drain fields. Any nitrate-nitrogen that might reach the ground water underlying the golf course could be recycled back into the course as irrigation water. Likewise, a collection system capturing lateral soil-water flow, before it enters the surrounding wetlands, could also be recycled (see article by Horsley and Moser in Appendix B). An innovative biofiltration wetland could also be constructed on areas of mitigated wetland soils. These capture zones could also be expected to collect exported pesticides. Such an approach may provide for a secondary benefit of reusing some agri-chemicals, and certainly would be applicable in any best management plan.

Much of the above recommendations relate to ground water issues. The area of the Teaticket site is classified as a GA ground water resource; presumed suitable for human consumption without treatment. There are private domestic drinking-water wells adjacent to the Teaticket farm. These wells should be monitored, because they

are likely receptors of any pollution from the proposed golf course. The ground water is also a resource to be preserved for future use, and therefore, to be protected from degradation. Because of the lateral flow of soil water discharging to the surrounding wetlands, the issue of surface water protection must also be considered.

The wetlands can metabolize much of the imported nitrate. How much nitrate can be accepted before wetland degradation occurs, needs to be evaluated and incorporated into the monitoring program. Sampling of leachate into the wetlands therefore needs to be conducted and the samples analyzed.

The pesticides will only be absorbed by the wetlands, rather than assimilated and metabolized into the system. The organic matter in the wetland soils will immobilize some pesticides from leaching to the ground water aquifer. The buffering capacity of the wetlands for pesticides needs to be evaluated, and also incorporated into the monitoring and management plan. Better yet, is a collection system intercepting agri-chemicals prior to their loading into the wetland system.

This Team member cannot accentuate enough the need for monitoring and managing the inevitable environmental impacts from the golf course operation, should it be approved. The applicants have presented plans without detailed evaluation of their use of copious amounts of agri-chemicals in an environmentally sensitive area. Further, during the ERT meeting, the applicant's consultants did not recognize the reality of export of agri-chemicals into the ground and surface waters at the site, and the need to monitor these environmental impacts. Somewhat encouraging is the applicant's hiring of a renowned golf course architect. However, even the very best intentions and plans are nothing more than that, if they are not followed through with equally impressive oversight for the life of the golf course's operations.

## References Cited

Grady, S. J. and M. F. Weaver, 1988, Preliminary appraisal of the effects of land use on water quality in stratified-drift aquifers in Connecticut, USGS, Water Resources Investigations: 87-40005, pp. 1-41.

Horsley, S. W. J. A. Moser, 1990, Monitoring ground water for pesticides at a golf course: A case study on Cape Cod, Massachusetts, GWMR: Winter, pp. 101-108.

Mullaney, J. R., R. L. Melvin and J. T. Adamik, et al, 1991, Pesticides in ground water, soil, and unsaturated zone sediments at selected sites in Connecticut, CT Res. Bul. #42, pp. 1-40.



# POTENTIAL IMPACTS BY PESTICIDES

## Hydrogeologic Setting

The proposed golf course site is dominated by a drumloidal hill bounded by Webster Road to the north and Route 63 to the east. The hill site with elevation ranging from 900' to 950' projects southerly in a peninsular manner into the Miry Brook/Cranberry Swamp hydrogeologic system, surrounded by it on three sides. A 500 to 700 foot width of very permeable glacial outwash deposits, consisting mainly of sand with scattered stones and boulders are part of the site and occupy the area from the east side of Teaticket hill to Route 63. The outwash deposits are bisected by another wetland/swamp area. To the north of the Teaticket hill is a large area of stratified drift containing very permeable sand and gravel. Surface water runoff and groundwater discharging from the hill are expected to migrate in a radial manner to these surrounding hydrogeologic features.

## Pesticide Usage

Pesticide usage at a golf course is an important issue since these products may solubilize into surface and groundwater or adsorb onto potentially erodible soil particles and be subject to runoff conditions. Besides the water resources in the area, one should consider the existence of other specific potential receptors in the vicinity, such as production and domestic consumption wells.

A prudent course of action would be to plan in advance for measures to avoid pesticide migration to the water resources. Dealing with the impact of pesticide occurrence in water resources after the fact is difficult, costly and often incomplete. An Integrated Pest Management (IPM) plan should be developed and customized for the Teaticket project. Three major principles of IPM are: 1) the correct identification of the pest; 2) monitoring for the pest; and 3) utilizing the concept of threshold limit which means identifying the occurrence level of the pest that can be tolerated without the need for chemical treatment. Normally, the incorporation of IPM concepts into a use strategy means that chemical pesticide usage is reduced or eliminated.

When considering the selection of herbicides, insecticides and fungicides for potential use on a golf course, it is recommended that a computerized risk assessment be conducted to determine the leachability and runoff potential of each pesticide evaluated with regard to the particular soil types at the site.

Three available systems are: 1) NPURG, National Pesticide/Soils Database and User Decision Support System for Risk Assessment of Ground and Surface Water Contamination; 2) the SCS/ARS/CED Pesticide Selected Properties Database and 3) NAPRA, the National Agricultural Pesticide Risk Analysis, an automated pesticide risk screening process.

A useful set of criteria to apply toward the evaluation of the leachability of pesticides would consist of the following:

- SOLUBILITY    less than 10 PPM, and
- KOC            more than 300, and
- HALF-LIFE    less than 7 days

Pesticides meeting that above criteria would have less tendency to leach.

## **Comments and Suggestions**

The following comments and questions are presented in response to the Turfgrass Management Plan included in the Teaticket Golf Course proposal.

1. A links golf course is not defined or explained.
2. Contrary to a statement in paragraph two, many of the pesticides mentioned in the plan *are* restricted use products in Connecticut.
3. Many of the pesticides mentioned in the Turfgrass Management Plan have been found to occur in groundwater in Connecticut; e.g., dicamba, 2, 4-D, chlorpyrifos.
4. The source for the water requirement of 150,000 to 200,000 gallons per day is not indicated. Will a water diversion permit be required?
5. In contrast to the first statement in paragraph two, tees and greens require different management than roughs and collars.
6. Under Item A, the term "economic threshold" related to IPM is not explained.
7. Some of the pesticide products noted in the Plan are highly to moderately leachable.
8. Buffer zones or setbacks should be established adjacent to streams and waterbodies.
9. Pesticide spillage should be avoided on paved areas or gravel paths to prevent pesticide runoff or infiltration.
10. The construction and design of a groundwater monitoring wells network should be considered at an early stage in the proposal period.

# REVIEW OF THE TURFGRASS MANAGEMENT PLAN

In general, the proposal is incomplete due to a number reasons some of which are discussed below. Appendix C contains the original Turfgrass Management Plan with further notes and questions in the margins.

## Cultural Practices and Integrated Pest Management

There are next to no recommendations (one sentence) about specific cultural practices (irrigation, mowing, aeration, seeding, etc.). Also there are no specific turfgrass cultivar recommendations. "Emphasis will be placed on cultural practices ... over more usual practices of chemical and pesticide applications." This report consists mainly of lists of insecticides, fungicides, herbicides, and fertilizers. If the emphasis on management is to reduce pesticide use and to rely on Integrated Pest Management (IPM), then the proposal should discuss what IPM is and specific strategies to use instead of pesticides.

IPM is the use of a variety of pest control methods designed to protect public health and the environment, and maintain high quality ornamental turfgrass with the most judicious use of pesticides. Specific instructions for pest monitoring should also be included (correct pest identification, when, where, and how often to monitor) in the management plan for budgeting purposes. Enclosed is a general fact sheet about IPM for your information (see Appendix C).

## Soils

There is little stated about soils, (types, structure, compaction) and no information that is site specific. More information is and should be required.

## *Poa annua* (Annual bluegrass)

This plan does not include management of *Poa annua* and Hyperodes weevil (annual bluegrass weevil).

## Fertilizers

Fertilizers selected for all areas are synthetically based. A management plan's goal to reduce pesticide use should include the use of natural organic compost-type fertilizer materials, especially on greens and tees. Published and unpublished information demonstrate these fertilizers can suppress some turfgrass diseases, and lower (reduce) fungicide rates or applications.

The plan recommends the use of poly-coated fertilizers. These are slow-release nitrogen fertilizers which release nitrogen as the air temperature increases. Un-irrigated course areas may not benefit from this type of fertilizer and other nitrogen sources should be considered in these areas.

From general conversations with other golf course superintendents, the fertilizer rates for the course have been suggested to be on the high side and may need to be reviewed and adjusted.

## **Pesticides**

The small collection of pesticides listed in the proposal is limited. There are many concerns about how these pesticides were selected and what the selection was based upon.

Also, stated in the report was a product known as Azadirachtin (Margosan-O). Turplex is the same product but it is a different formulation. Check with the State DEP for product registration and the label for use on turfgrass in Connecticut. Azadirachtin has a pesticide label and is categorized as a growth regulator not a biological control. A biological control is the use of a living organism to control another living organism. Examples of biological controls for turfgrass omitted from this proposal include entomopathogenic nematodes, *Bacillus thuringiensis* (Bt), and milky spore.

Pesticide resistance can develop if the same pesticides are used repeatedly. Fungus, insects, and weeds may develop resistance to a chemical which may result in poor control or chemical failure. The limited selection of fungicides and insecticides were particularly a concern. The only insecticide listed for use on white grubs is carbaryl. With carbaryl, control can sometimes be inconsistent, it is extremely deadly to earthworms, and has an 8 pounds of active ingredient (AI) per acre rate (high). Chlorpyrifos, (Dursban) (one in the same), is briefly mentioned on page 2 section A, but was not included in any of the recommendations.

## **Recommendations**

It is recommended that a consultant review this management proposal. Hire a local expert (Soil Scientist, Agronomist) who is familiar with golf course management, knowledgeable in soils and golf course construction in Connecticut. Dr. William Dest, an Emeritus Professor of Agronomy from The University of Connecticut (and experienced golf course superintendent) would be an excellent resource person. Dr. Dest could make management recommendations (cultural practices, pesticide and fertilizer selections) and provide other insight into this report that this Team member cannot do. Dr. William Dest can be reached at (860) 296-6279. In addition, The University of Massachusetts (Dr. William Torello (413) 545-2860) or the

University of Rhode Island (Dr. Bridget A. Ruemmele (410) 792 2791) may be another avenue to pursue for hiring a turfgrass consultant.

# PLANNING CONSIDERATIONS

## Zoning and Compatibility with Surrounding Land Uses

The project site is located within Litchfield's R-80 residential zone where the minimum lot sizes are 80,000 square feet. Outdoor recreational uses, such as a golf course, may be allowed within this zone upon granting of a special exception permit.

Land use to the north and east of the project site consists of pastureland, woodland and scattered residential development on large lots. The White Memorial Foundation owns property along the southern and western borders of the site.

Provided sufficient environmental controls are implemented to protect the integrity of water quality and wetlands on the property, the project appears to be generally compatible with adjacent land uses and zoning. The landscaping plan that is prepared for the parking area in the northeast corner of the property should include a generous vegetative buffer zone to help soften the transition between the proposed project and adjacent residential uses. The existing stone wall in this location should also be preserved and integrated into the landscaping plan. Care should also be taken, pursuant to Litchfield's Zoning Regulations, in the development of signage, outdoor lighting, and parking lot design to ensure that the project does not detract from the appearance of the existing neighborhood.

The average daily traffic for Route 63 in the project vicinity is 4200 trips according to ConnDOT and, unlike portions of Route 202 in Litchfield, this segment of roadway is not projected by ConnDOT to have capacity deficiencies over the next twenty years. Sight line distances appear adequate at the intersection of Route 63 and Webster Road for safe access to, and egress from, the proposed project.

## Consistency of Project with State, Regional and Local Plans

The Conservation and Development Policies Plan for Connecticut 1992-1997 is a statement of growth, resource management and public investment policies of the State. The Plan was prepared by the Office of Policy and Management (OPM) and adopted by the Connecticut General Assembly in 1992. The objective of the Plan is to give a balanced response to human, environmental and economical needs in a manner which best suits the future of Connecticut. Regional planning organizations and local governments have been encouraged by OPM to foster implementation of the Plan at the local level.

According to the Locational Guide Map that accompanies the State Plan, the wetlands portion of the subject site is classified as a preservation area and the remainder of the property is classified as a conservation area. The State action strategy for preservation areas is to foster their identification, advocate their protection, and avoid support of structural development except as directly consistent with preservation values. The State action strategy for conservation areas is to plan and manage, for the long term public benefit, the lands contributing to the state's need for food, fiber, water and other resources, open space, recreation, and environmental quality and ensure that changes in use are compatible with the identified conservation values. The subject site is classified as a conservation area because it is located within the watershed of the Bantam River, a potential public water supply watershed. Provided adequate water quality protection measures are defined and implemented with project construction, the proposed plan appears to be generally compatible with the goals established by the State Plan.

The Litchfield Hills Council of Elected Officials (LHCEO) is the official regional planning organization for the Litchfield Hills Region which includes the town of Litchfield. According to LHCEO's "Regional Growth Policy Map", the subject site is classified as a rural watershed area. The proposed project is generally compatible with this regional plan designation provided care is taken to minimize disturbance to wetlands and water quality with project implementation.

The LHCEO has also prepared a Regional Economic Development Plan entitled "Building on a Diverse Foundation: An Economic Development Strategy for the Litchfield Hills Region." Although the development of additional outdoor recreational facilities is not specifically addressed in the Plan, the Plan does recognize the importance of maintaining the region's rural character while at the same time encouraging appropriate new business development for job creation and tax revenues. According to information provided by the applicant, the project is expected to employ between 20 to 25 people during the height of the golfing season.

The "Vision Plan" for the Town of Litchfield also envisions a rural town with a healthy economy. A major recommendation in the Plan is to promote economic opportunities that enhance the quality of life in Litchfield. Another recommendation is to broaden the economic diversity and tax base of the community. The protection of significant open space lands and natural resources is another major recommendation in the Town Plan. The Plan also recommends the improvement of recreational opportunities in the community. Essentially the "Vision Plan" recommends that a balance be achieved in encouraging economic development and protecting rural character. As stated in the Plan, "economic development initiatives must be balanced with the desire to preserve the rural and historical character of the community."

To conclude, the proposed project generally appears to be compatible with state, regional and local plans provided the project is sensitively designed to maintain

rural character and sufficient environmental controls are implemented to protect water quality and wetlands on the property.



# ARCHAEOLOGICAL REVIEW

A review of the State of Connecticut Archaeological Site Files and Maps shows no known archaeological resources in the project area. However, three known archaeological sites are located in close proximity to the north and west of the project area. These sites represent prehistoric Native American occupations, primarily campsites utilizing the natural resources along Miry Brook, Cranberry Swamp, and the Bantam River. The sites date to over 4,000 years ago and are hunter-gatherer camps. These sites are located in similar environmental and topographic features as the proposed golf course property. The area of highest archaeological sensitivity is the lower elevated and extended land to the southeast of the project area surrounded on three sides by Cranberry Swamp. In addition, areas where stone tools may have been collected from the previously plowed agricultural fields should be recorded.

The Office of State Archaeology recommends an archaeological survey for the portions of the project area described above as most sensitive. The survey can locate any archaeological sites which may exist and remove any artifacts prior to landscaping activities. The Office of State Archaeology is available for any technical assistance in regards this survey.

# Appendix

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

# ABOUT THE TEAM

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

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

## Purpose of the Environmental Review Team

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

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

## Requesting an Environmental Review

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

For additional information regarding the Environmental Review Team, please contact the King's Mark ERT Coordinator, Connecticut Environmental Review Team, P.O. Box 70, Haddam, CT 06438. The telephone number is 860-345-3977.