Keach Pond View Subdivision
Woodstock, Connecticut

Eastern Connecticut
Environmental Review Team
Report

Eastern Connecticut
Resource Conservation & Development Area, Inc.

Keach Pond View Subdivision
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Environmental review Team report

Prepared by the
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of he
Eastern Connecticut
Resource Conservation and Development Area, Inc.

for the

Planning and zoning Commission
Woodstock, Connecticut

Report #616

November 2007

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Acknowledgments

This report is an outgrowth of a request from the Woodstock Planning and Zoning Commission to the Eastern Conservation District (ECD) and the Eastern Connecticut Resource Conservation and Development Area (RC&D) Council for their consideration and approval. The request was approved and the measure reviewed by the Eastern Connecticut Environmental Review Team (ERT).

The Eastern Connecticut 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 Wednesday, September 26, 2007.

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I would also like to thank Delia Frey, town planner, Tina Lajoie, P&Z clerk, Gail Dickinson and Dotti Dubt, P&Z commission members, Jean Pillo, conservation commission member, Cheryl Peterson, project engineer, James Ruskowski and Matthew Watsky, applicants and the several project abutters 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 received additional information and plans. 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 applicant. This report identifies the existing resource base and evaluates its significance to the proposed use, and also suggests considerations that should be of concern to the town. The results of this Team action are

oriented toward the development of better environmental quality and the long term economics of land use.

The Eastern Connecticut RC&D Executive Council hopes you will find this report of value and assistance in reviewing this proposed subdivision application.

If you require additional information please contact:

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INTRODUCTION

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The Woodstock Planning and Zoning Commission have requested Environmental Review Team (ERT) assistance in reviewing a proposed residential subdivision.

The project site is approximately 24 acres in size located between Keach Pond and Sherman Road. It is proposed as an Open Space Cluster development consisting of 6 lots. Five lots are proposed on the relatively flat portion near Sherman Road with access from common driveways. These lots back up to very steep slopes. The remaining lot is on the lower level of the property with pond frontage. This lot is accessed from Sherman Road with a shared driveway to also serve an existing non-conforming lot of record (Parcel A). The existing cabin on Parcel A is proposed to be demolished and replaced with a home with on-site sewage disposal and water supply further back from the pond edge.

OBJECTIVES OF THE ERT STUDY

The PZC is requesting the ERT to review the proposal due to unusually steep slopes and proximity to Keach Pond which is the headwater region for the Still River Greenway The subdivision is also located on a town designated Scenic Road. The ERT will aid the PZC in fully evaluating the property for residential development and what the impacts may be on the scenic road, water resources, open space and traffic and access.

THE ERT PROCESS

Through the efforts of the Planning and Zoning Commission this environmental review and report was prepared for the Town of Woodstock.

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, plans and supporting documentation provided by the applicant.

The review process consisted of four phases:

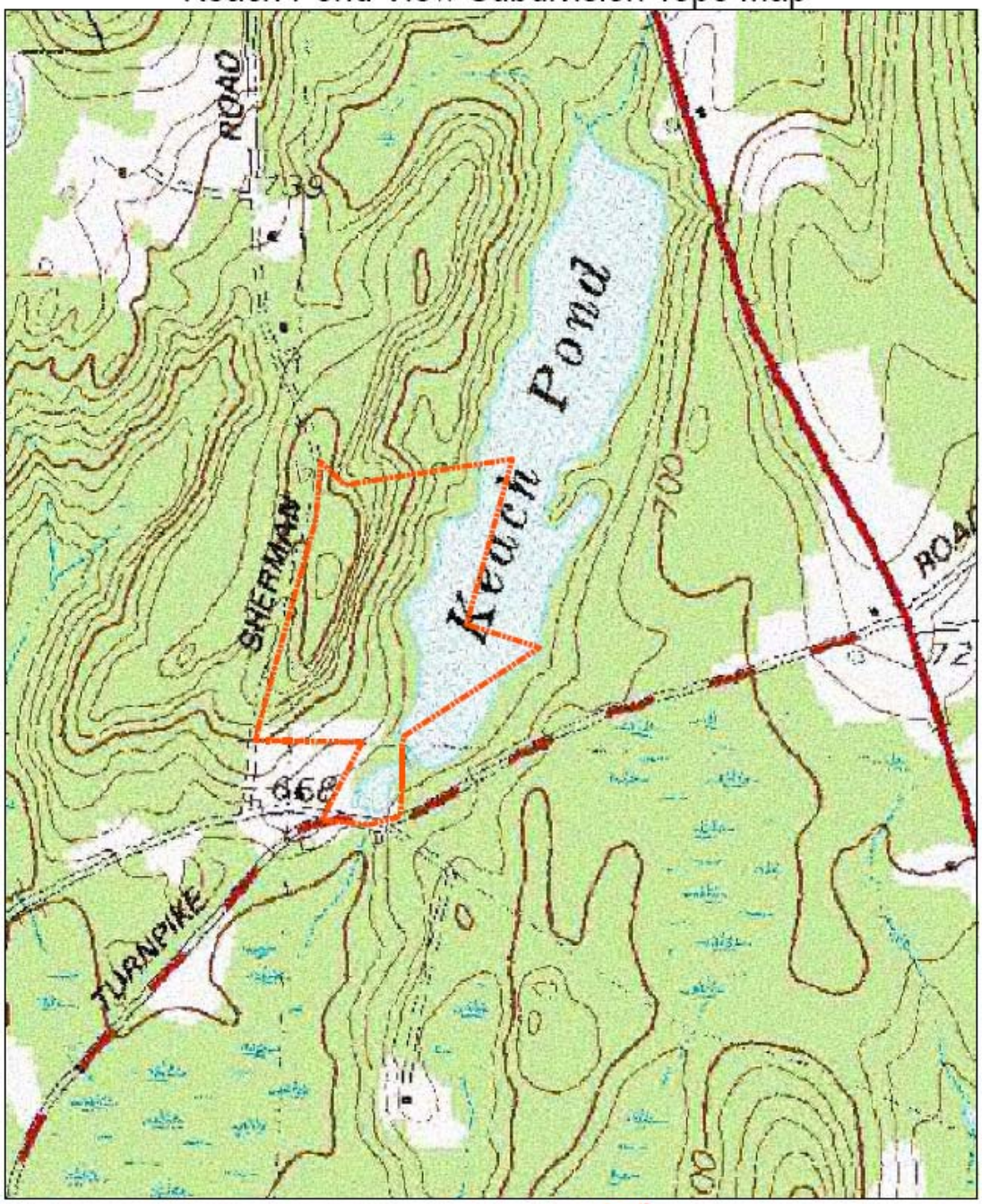
1. Inventory of the site's natural resources;
2. Assessment of these resources;
3. Identification of resource areas and review of plans; and
4. Presentation of education, management and land use guidelines.

The data collection phase involved both literature and field research. The field review was conducted Wednesday, September 26, 2007. 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.

Keach Pond View Subdivision Topo Map



The Connecticut Environmental Review Team

This map was prepared by Amanda Fargo-Johnson for the Connecticut Environmental Review Team.
This map is for educational use only.
It contains no authoritative data.
September 2007.

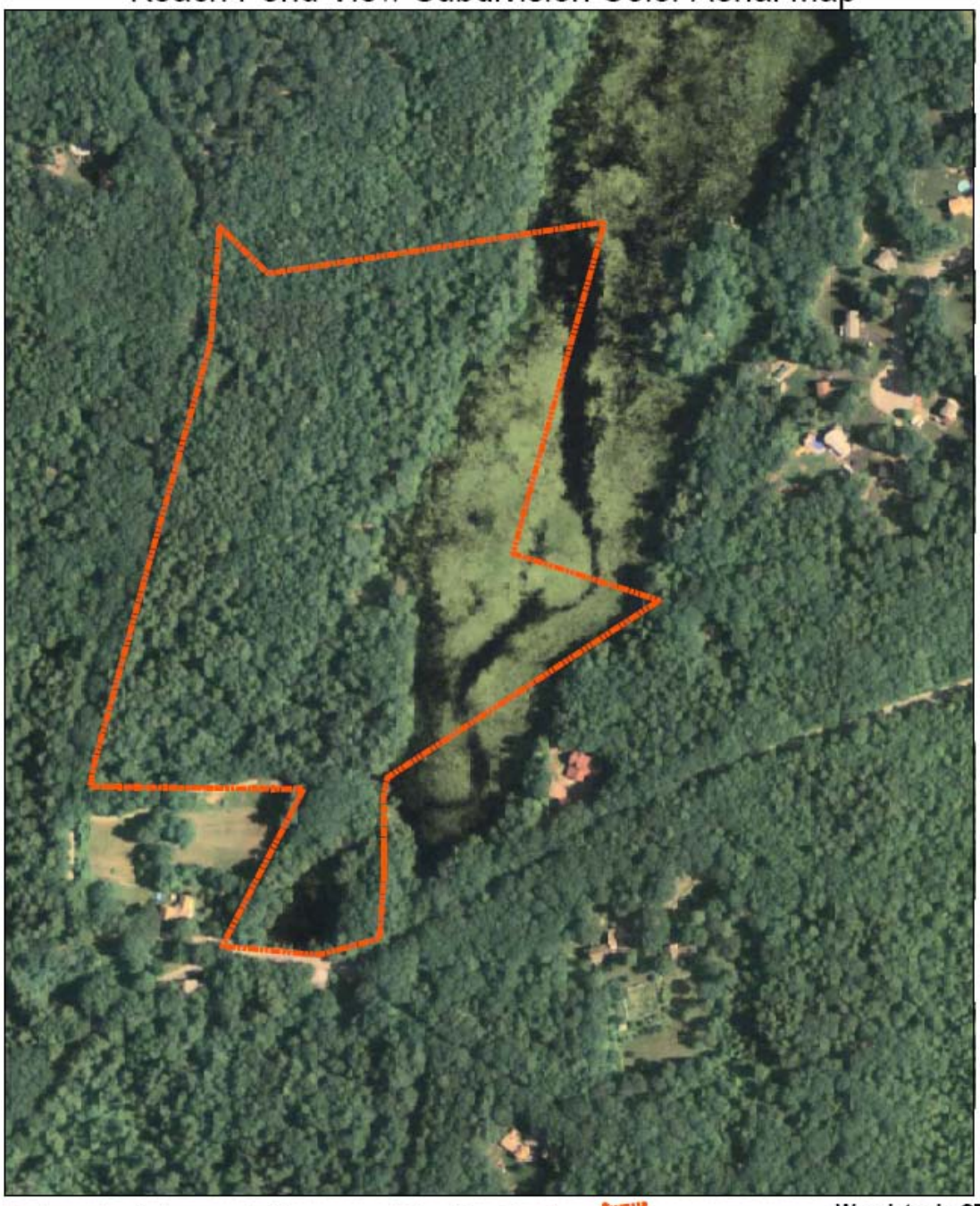
ERT Review Area

0 0.03 0.06 0.12 0.18
Miles

Woodstock, CT

N

Keach Pond View Subdivision Color Aerial Map



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This map is for educational use only.
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September 2007.

ERT Review Area

0 0.02 0.04 0.08 0.12
Miles

Woodstock, CT

N

Keach Pond View Subdivision Aerial Map

Topography, Geology and Hydrology

Topography

The subdivision proposes a 6-lot subdivision on a rather flat-topped hill adjacent to Keach Pond. Keach Pond is an impoundment with a dam spillway elevation of 668 feet above sea level. The hill is immediately west of the pond and has an elevation of just greater than 760 feet giving the area about 100 feet of relief. The flat top of the hill drops off dramatically to an east-facing slope that in places has about a 40% grade. The base of the southeastern part of the hill is a small area of hummocky topography with an elevation 10-15 feet above lake level.

Most of the topography in this area of Woodstock is controlled by erosion and deposition associated with past glacial events. Woodstock has a large area of drumlin shaped hills and, indeed, drumlins are found just east and west of the subdivision location (Stone and others, 2005, Pease, 1972). But the orientation of Keach Pond and the hill on which the subdivision is proposed were controlled by local bedrock geology, as will be explained below. The area of hummock topography at the bottom the hill is a product of deposition by glacial melt-water streams.

Bedrock Geology

Bedrock geology does not present much hindrance to this development. Ledge is close to the surface in some areas and crops out near the top of the steep slope on proposed lot #4. The rock that crops out is a calc-silicate gneiss of the Bigelow Brook Formation (Pease, 1972, Rodgers, 1985). Most of the Bigelow Brook Formation consists of gneiss and schist, but it contains notable layers of graphitic and sulfidic schist.

During one of the mountain building events to which these rocks were subjected, major eastward directed thrust faults (long since inactive) developed. The trace of one of such fault (oriented NNE-SSW) passes through the middle of Keach Pond. Rocks in the immediate vicinity of the fault were fractured making them more susceptible to erosion. Hence the shape of the valley in which Keach Pond occupies and the hill immediately to its west are controlled by the location of the fault.

Surficial Geology

The upland ground surface is covered by a thin veneer of glacial till that, from test pit data, ranges in thickness from 44 inches to greater than 93 inches. Some of the till is compact forming what the local environmental engineers refer to as “pan” or “hardpan.” The low land areas, adjacent to Keach Pond, are underlain by sand and gravel. That

sediment was deposited from glacial melt-water streams that flowed between the ice free hillside to the west and a left over block of ice that occupied the valley bottom. The surface has a characteristic hummocky topography caused by melting remnant ice on which parts of the sand and gravel were deposited.

The steep slope has an uneven, slightly rilled topography that suggests to this reviewer that it may have been unstable in the recent past and experienced down-slope mass movement of the soil. Today the slopes are subject to very slow soil creep in places. This is evidenced by slight bends in some of the tree trunks on the slope. (Figure 2). If the land is left undisturbed this should not be a hazard. In this reviewer's opinion, care should be taken when making cuts into the base of the slope, even the minor cut for the driveway on proposed lot #6. Possibly a retaining wall could be considered for that cut.

Evidence for past landslide activity includes the remnant of a head scarp at the top of the slope on proposed lot #5 (or #4?). (Figure 3) and a roll-over toe observed in several places near parcel A at the base of the slope. (Figure 4) Past down-slope movement may have occurred when the land was clear-cut.

HYDROLOGY

Residences on proposed lot #6 and parcel A may be able to derive their domestic water from shallow wells dug into the sand and gravel aquifer if the water quality is adequate. Domestic water wells for lots #1-5 will require drilled bedrock wells. Layers of sulfidic schist may be encountered in water well borings for the proposed dwellings. Sulfidic schists are acid leaching rocks that may produce water with high iron and possibly high manganese contents.

Bedrock beneath the soil appears close to the surface in the fronts of proposed lots #1-3 and at the surface on proposed lot #4. It is not clear that the rock is sufficiently fractured to allow water to soak in (thus recharging the groundwater). Water that drains through the soil may encounter the rock surface and then flow downhill along that surface. In the case of proposed lots #1-3 that would be toward Keach pond. Hence there is a real possibility that renovated septic-tank effluent, and low concentrations of house-hold chemicals, such as fertilizers and pesticides, may drain into Keach Pond.

The outcrop observed during the ERT field review was poorly fractured (Figure 5). Foliation parallel fractures dip into the hillside, away from Keach Pond. If groundwater recharge occurs beneath the soils, it would flow away from Keach pond in the foliation-parallel fractures. In addition, Pease (1972) shows south-dipping east-west fractures at numerous places on his map (one at an outcrop immediately south of the proposed subdivision). These cross-cutting fractures are important. If groundwater recharge to the bedrock occurs beneath the soils on this parcel, the east-west oriented fractures will allow that water access to Keach Pond.

References Cited

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Rodgers, John, 1985, Bedrock Geological Map of Connecticut. State Geological and Natural History Survey of Connecticut, Nat'l. Resource Atlas Series, 1:125,000, 2 sheets.

Stone, J.R., Schafer, J.P., London, E.H., and Thompson, W.B., 1992, Surficial Materials Map of Connecticut. State Geologic and Natural History Survey of Connecticut, 1:125,000. 2 sheets.

Stone, J.R., Schafer, J.P., London, E.H., DiGiacomo-Cohen, M.L., Lewis, R.S., and Thompson, W.B., 2005, Quaternary Geologic Map of Connecticut and Long Island Sound Basin (1:125,000). U.S. Geol. Surv. Sci. Invest. Map # 2784.

Figure 1. Topographic map showing location of fault trace and drumlin hills (after Pease, 1972).

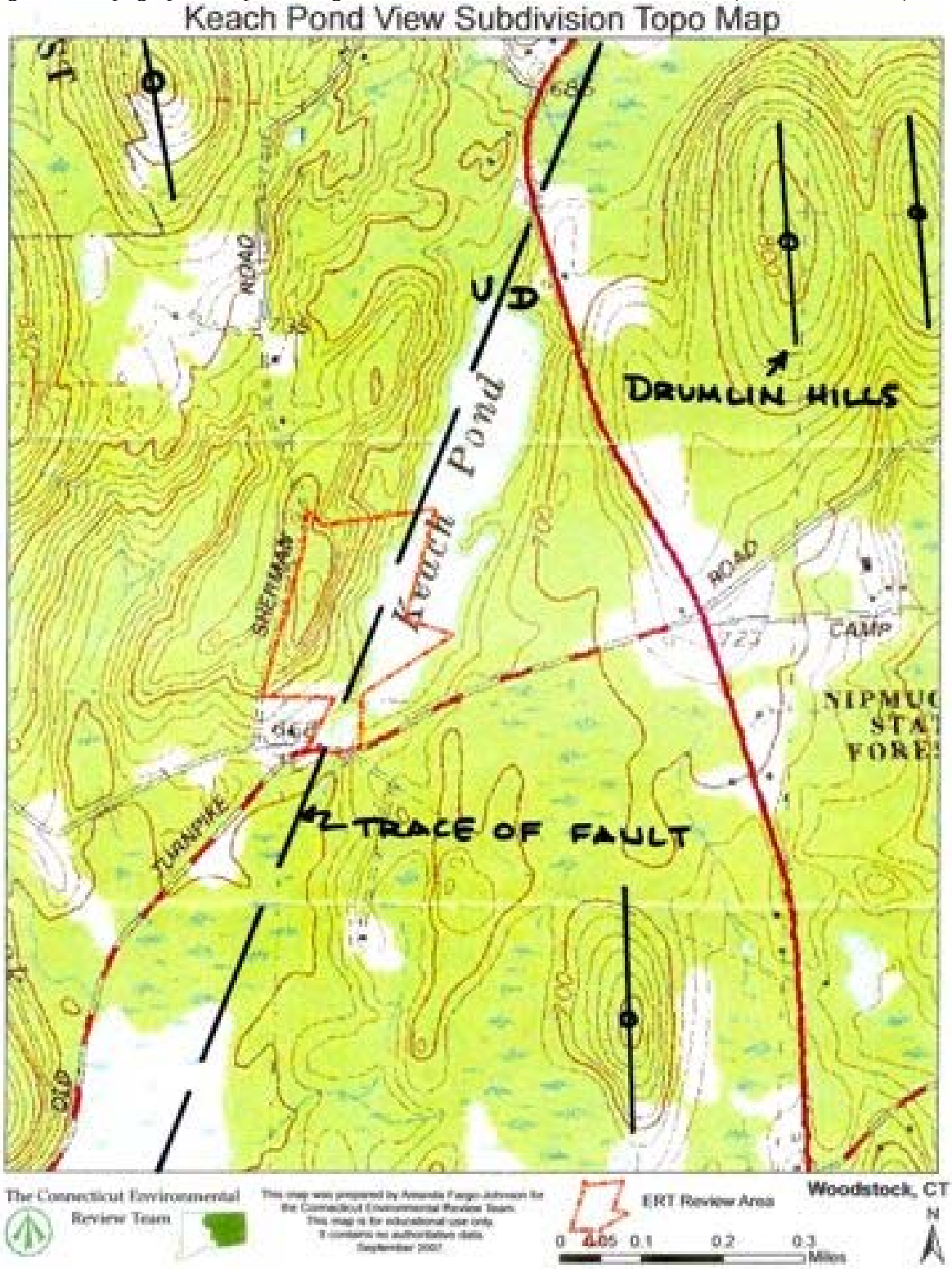


Figure 2. Deformed tree trunks indicate slow active soil creep near top of slope (proposed lots $4 or #5).

Figure 3. Crescentic depression at top of slope on proposed lot #5 (or #4?) suggests head-scarp at top of currently inactive slump.

Figure 4. Flat area near base of slope adjacent to parcel A. Although not shown, slope is very steep uphill slope (on the left). Note that slope again steepens downhill. This is interpreted as the toe of an inactive slump.

Figure 5. Low outcrop of calc-silicate gneiss of Bigelow Brook Formation exposed near rear of proposed lot #4. Out crop is 2-3' high. Note lack of apparent fractures in outcrop.

A Wetland Perspective

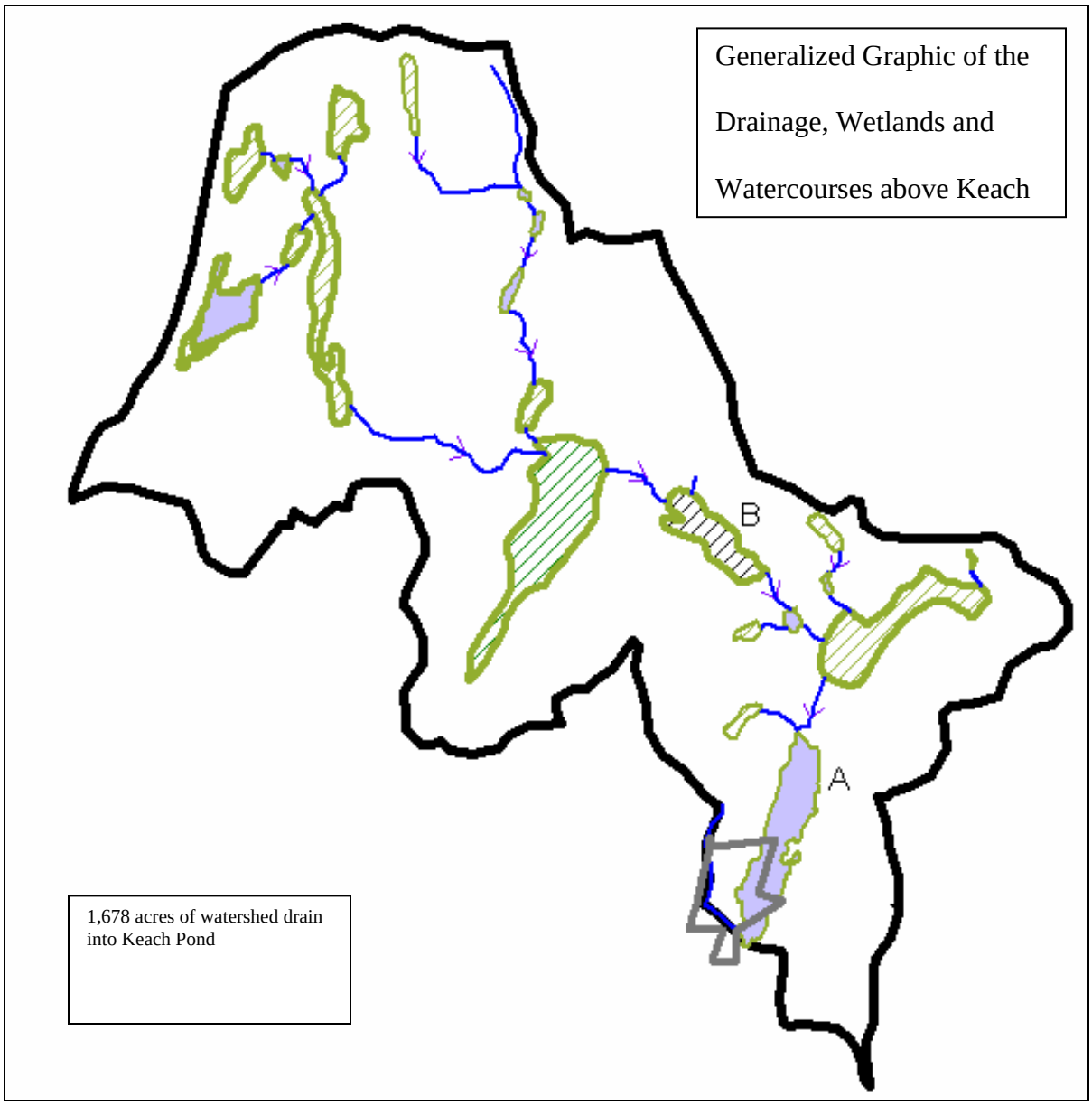
The landscape of the project site, moving east from Sherman Road, is relatively flat until the steep drop off down to lake level. Five of the seven proposed lots are on that relatively flat gradient. The steep sloping hill, which measures up to 40% slopes, is heavily wooded, stable and not proposed for any development. The two remaining lots are lake front along the southwest shore of Keach Pond. It is these two lots, known as Lot 6 and Parcel A, that have drawn concern.

There are no wetlands on the slopes or in the location of the five proposed home sites east of Sherman Road. The interest in wetlands centers on the potential impacts from the two lake front lots. Specifically, concern was voiced about adding nutrients to the pond in the form of fertilizer from lawn runoff and septage moving down slope from the two proposed septic systems on the western lake shore. Of the two lots, Parcel A is of most concern, it having more than 300 feet of water frontage. At issue is the current state of the lake, now covered with lily pads, versus the state of the lake 10-12 years ago when no such infestation occurred.

Keach Pond is fed by Herridean Brook which winds its way from the top of the watershed (elevation ~950 feet above Mean Sea Level (MSL)) down slope through ponds and wetlands to Keach Pond (elevation ~665 feet MSL). Above the Keach Pond dam, the contributing area, that is, all the landscape that drains into Herridean Brook and its tributaries and then feeds into Keach Pond, measures 1,678 acres or 2.6 square miles. The pond acts as sort of a sink to all that goes on above it in the watershed.

The pond itself measures 29.7 acres in surface area. It is reported to be seasonally variable in depth, but generally six feet or less, becoming increasingly shallow to the north with distance away from the southern outlet. It is an impoundment of Herridean Brook* which enters it from the north. Reportedly the pond is deepest near the outfall (although that was not visually apparent from the shore.)

**DEP has as of record that the reach of the Still River above the impoundment is referred to as Harridean Brook. Locally, Keach Pond is known as an impoundment of the Still River.*



In this generalized graphic, the extent of the contributing watershed - everything that drains into Keach Pond - is delineated in black. The site of this project is outlined by the gray line trapezoid towards the lower left. The green approximates the wetland areas and the light blue shows the ponded areas. The deeper blue lines represent the streams and brooks that tie the whole system together (arrows added to show direction of flow). The letters 'A' and 'B' are the two study sites of land use change as described below.
With a depth of less than two meters or about six feet, Keach is a true pond in the scientific sense of the word. That is, being shallow it has no limnetic stratification, or layering of water temperature, and thus is considered fairly uniform of temperature throughout the water depth. At the time of the visit the pond was very nearly covered with common water lilies (*Nymphaea odorata*).

Reportedly the pond was free of floating vegetation 10 to 12 years earlier. A review of the recent land use which neighbors the pond and the large wetland six tenths of a mile upstream of the pond has changed noticeably in that time span.

This view of the pond from the top of the dam looking north shows the surface water of the pond at the time of the ERT visit to be green with floating vegetation.

Historical Land Use Abutting Keach Pond

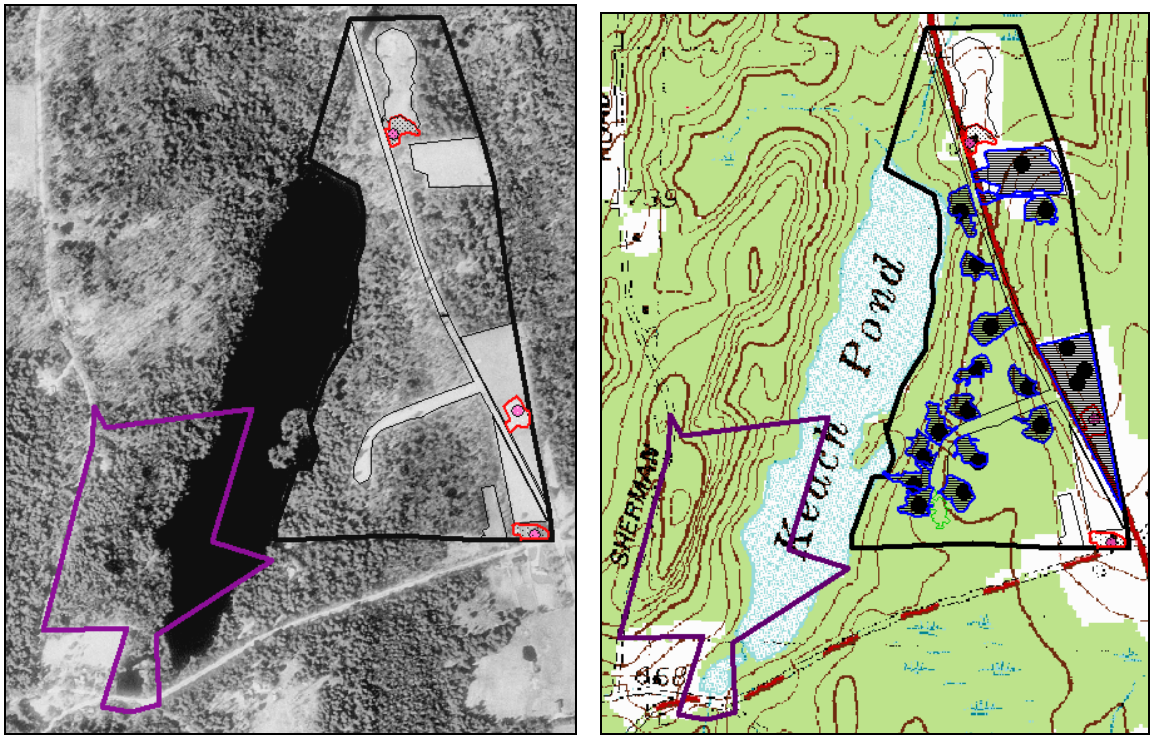
For the purpose of contrasting recent land use, the aerial photographs from 1990 and 2004 were compared. A look at the imagery from 1990 shows that the land around the pond, location 'A' on the watershed graphic above, was free of residential development.

For the purposes of this report, a ~64.5 acre study area has been delineated along the northeast shore of Keach Pond to focus on the land use changes. Within the study area "A", five different land uses are recognized: agricultural fields, home/yard, roads, open field, and forest. The changes have been broken down by acreage in the table below.

In 1990, the photograph at left below, there were three houses in the study area, all close by the road. Their combined grassy yards totaled a little over one acre.

	Ag Fields	Home/Yard	Road	Open Field	Forest
1990	8.03 acres	1.11 acres	4.10 acres	1.9 acres	49.26 acres
2004	1.88 acres	13.37 acres*	4.10 acres	1.9 acres	43.15 acres
Changes:	-76.4%	+1200%	--	--	- 12.4%

*(Comparable to 13 new football fields)



In the photograph above the outline of the current project site and the 64.5 acre study area are seen on top of the 1990 aerial photograph. Open fields, roads and fluffy tree tops dominate. Three houses in 1990 can be seen as circles within the polygons that outline their accompanying lawn area. On the right is the topographic map of the same area but with 15 new houses and their accompanying lawn area, as digitized from the 2004 aerial photography. The topo map is used as the base to show the significant slopes down to the pond on both the east shore, >20 per cent and west shore, >40 per cent.

Study area 'B' is upstream of 'A' and abuts a 14.6 acre wetland. It displayed similar change over the 14 year span. The images below document the changes to pasture/hay fields into lawn/yard area and the loss in the width of the forested riparian buffer.

These two photographs show land use change abutting a wetland 6/10 of a mile north of Keach Pond during the 14 years from 1990 (top photo) to 2004. In 1990 farm fields ran along the road (Route 171) leaving a wide swath of trees between the fields and the wetland boundary. 14 years later, the fields are gone, seven homes have been constructed, yards and grass dominate, in some cases to within 40 to 100 feet of the wetland edge.

Today the surface of Keach Pond is dominated by water lilies (*Nymphaea odorata*). In discussion with local residents it would seem that this was not the case before the upstream developments took place. Thus it would be a simple task to apply cause and

effect – with development activity on land abutting the pond comes the change in pond based (hydrophytic) vegetation. Unfortunately, in this case, the connection is not quite so simple.

There was no current sign of recent beaver activity in the lower/southern reaches of Keach Pond at the time of the ERT visit. The work of past beaver populations, the weathered beaver-felled trees and stumps, however, is testament to their past presence. Had there been a small colony of lilies in 1990 and the beavers chose to include the roots in their diet, then easy and massive spreading of the plant could have occurred. For once pieces of the bottom 'rooted' lily rhizome are broken off they easily transfer to other locations and re-establish themselves as a new lily community. Frequently in the true ponds such as this where the bottom is loose and mucky, it would be little problem for rhizomes to take hold anew. Add to this the *possibility* of nutrient enhanced water from development, and slightly warmer winters (hence a longer, less harsh growing season than decades past) the conditions would be optimized for explosive aquatic growth. Indeed rhizome transfer within the pond seems a reasonable possibility for the explosion of lilies since there is no similar situation in the small pond below the dam, whereas, if only nutrients were the cause they easily would have passed downstream.

Past beaver sign on site.

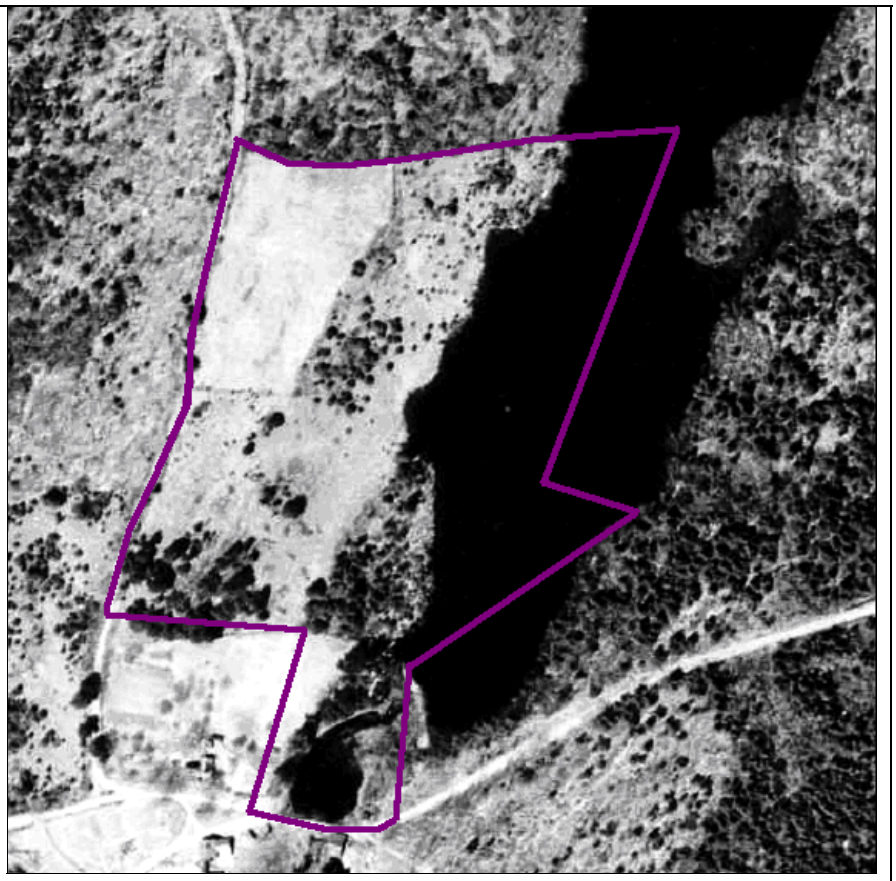
However, that is not to say waterfront development is reasonable. The domestication of the shoreline has only and will only lead to water quality issues in the future. It should be noticeable that in the two review areas described above both kept a significant riparian buffer between development and water/wetland edge. There is nothing better than a wooded riparian buffer to filter surface runoff of sediment fertilizers and pesticides.

Clean water is one of rural Connecticut's greatest assets. Herridean Brook is classified as "AA" by the DEP. There is no better water quality. The protection of it in all ongoing and future development will pay dividends in the quality of life for decades to come.

Never say Never

In the year 1934 the state of Connecticut completed the first-in-the-nation photographic inventory of the state's surface from the air. The State Library has these aerial images available on-line. Below is the aerial photograph of the development site taken in the spring of the year 1934. As can be seen the landscape was far more open than it is today. Almost the entire site was dedicated to what was probably pasture, including the steep hillside leading right down to the water's edge. Today the hillside will be protected from further cutting, but the farmer of seven decades ago sold off all merchantable lumber possible. So, while it seemed highly unlikely that the steep wooded slope would ever be lumbered, the history of it happening actually precedes us.

At right is Keach Pond as it appeared in April 1934. The west hills and shore had been very nearly cleared of harvestable timber leaving the land open for pasture. Even the steep hillsides were fair game for cutting. Today these trees will be protected as a woodland buffer.



This is Photograph number 01414 from the on-line archives at the Connecticut State Library and is available to the public at: http://cslib.cdmhost.com/index.php

From the same photograph as above, this is a close up of the Keach Pond dam and spillway as it appeared in April, 1934.

Fisheries Resources

The Inland Fisheries Division does not have any fish population survey or water quality data for Keach Pond, an approximate 29 acre impoundment within the headwaters of the Still River Watershed. The pond most likely supports a warmwater fish community typical of small ponds in Connecticut, which may include the presence of largemouth bass, chain pickerel, yellow perch, bluegill, pumpkinseed sunfish and brown bullhead. The Team's fisheries biologist has reviewed proposed subdivision plans and has no outstanding fisheries resource concerns regarding this project proposal as long as best management practices are implemented and maintained for soil erosion and sediment control during project construction.

Conservation District Review

Introduction

This proposal is for a 6 lot subdivision on a 24.12 acre parcel in the town of Woodstock. The area to be dedicated for permanent conservation is 17.0 acres. Also shown on the site plan is a land-locked .92 acre parcel with an existing cabin and outbuilding (Parcel A). The cabin is proposed to be razed and a new house constructed with associated utilities.

The parcel fronts on Sherman Road, an unimproved one lane dirt access, which has been designated as a "scenic road." Development restrictions that would alter the scenic nature of the road are in place including, limitations on the number of driveway cuts, widening of the access and removal of significant vegetation and/or stone walls.

Keach Pond, a dammed portion of the Still River, is partially located on this parcel. The Still River is a major tributary to the Natchaug River. In recognition of the importance of the Natchaug River and its tributaries, Woodstock has issued a resolution in support of the Natchaug River Greenway. Furthermore, the Town has adopted a Plan of Conservation & Development and a Plan of Open Space & Conservation which establish preservation priorities and recommends providing linkages between the Greenway and other open space parcels.

Site Resources

The majority of the site is wooded with a mixture of deciduous species such as oak, hickory, maple and birch. Coniferous species including white pine and hemlock are also present in colonies. Where present, the herbaceous layer consists of grasses, ferns, goldenrod, wood aster, calico aster, day flower, partridge berry, wild strawberry, baneberry and poison ivy. Two invasive species noted, barberry and bittersweet, are both associated with past soil disturbances and appear in only small colonies.

The main water feature on site is Keach Pond, which is formed by a dam on the Still River. The Still River flows in a southerly direction and is a main tributary to the Natchaug River. The Still River and

its tributaries contain important headwater streams that are part of the Willimantic Water Supply watershed. At this time, the dam forming Keach Pond is in disrepair and has been partially breached, lowering the pond water depth and allowing deepwater vegetation such as fragrant water lily and water shield, to become established. Along the shallower edges, vegetation such as pickerel plant, bur-reed and tussock sedge are present. At the time of inspection, surface coverage of the pond with vegetation was almost 100 percent. The banks of Keach Pond, with the exception of some clearing associated with a few residential developments, are well vegetated with species such as maples, white pines, sweet pepper bush and high and low bush blueberry.

Due to breaching of the dam and establishment of vegetation, the pond has developed into a deepwater marsh habitat. In its present condition, the pond and associated river offer high habitat value to a variety of species including muskrats, raccoon, mink, otter, turtles and waterfowl. At the time of inspection, there were also signs of previous beaver activity.

Additional regulated areas on site consist of edge wetlands adjacent to the pond and the Still River. These wetland areas are mostly wooded and would classify as red maple riparian swamps.

In viewing aerial photographs of the watershed, there are some significant wetlands associated with the river corridor. In this part of the watershed, large areas of land remain undeveloped with much of the river corridor undisturbed. Large contiguous undisturbed parcels, especially those associated with permanent water resources, provide critical habitat to some species of larger mammals, birds of prey and deep-wood song birds.

Surface water quality for the Still River is designated as A/AA indicating that it is good to excellent. Groundwater is designated as GAA/GA indicating that it is of natural quality or suitable for drinking.

The site terrain ranges from gently to very steeply sloping topography. A gentle to moderate slope is present along Sherman Road and along portions of Keach Pond. In addition, a significant steep slope runs through the middle of the property somewhat parallel to the wetland/watercourse system. These grades exceed 40 percent with some outcroppings present in this area. Presently, the steep slopes are well vegetated and appear stable.

Soil types and approximate locations are shown on the plan view maps and appear to match the official NRCS Web Soil Survey. A Selected Soil Interpretation table for soil suitability is included at the end of this section. The soils with the least amount of restrictions for residential development, according to the Soil Survey, include Canton and Charlton soil series with 3-8 and 3-15 percent slopes. On the site plan these are soils 60B and 62C. The most restricted are Ridgebury, Leicester and Whitman soils and the Charlton-Chatfield 15-45 percent slopes. On the site plan these are represented as soil 3

and 73E respectively. On-site testing in terms of deep test pits and percolation tests are used to confirm soil conditions and determine appropriateness for development purposes.

No species of concern have been noted for this area based on a review of the Connecticut DEP Natural Diversity Database Maps.

In summary, Keach Pond and the Still River are valuable resources that offer high wildlife habitat potential. The undeveloped nature of the watershed in this area supports the high water quality associated with the Natchaug River and the Willimantic Water Supply.

Recommendations

- While numbers are still limited, invasive species should be removed to reduce their spread to other areas of the river corridor.
- Preservation of "buffer areas" adjacent to the Still River and Keach Pond will enhance their function as a connecting corridor and help preserve water quality.
- Maintaining water quality should be a high priority in this watershed.
- ECCD recommends that the town of Woodstock recognize the impact of land uses in close proximity to the system and make decisions that balance the proposed land uses with the value of the resources.

General Lot Layout

Overview

As proposed, there will be 5 (#1-5) lots developed on the gently to moderately sloping part of the site adjacent to Sherman Road. Due to the "scenic road" designation, driveway cuts are only permitted every 1000 feet and therefore an 18 foot common driveway with a cul-de-sac is proposed to serve the five lots. Off this common driveway, three driveways are proposed, two as shared (18') and one single (12'). At the base of slope adjacent to the pond, another new lot (#6) is proposed. A separate existing parcel of record, with an unimproved residential structure, is located immediately adjacent to the pond and the proposed lot #6. This structure is proposed to be removed and a new residential house with associated utilities is shown. The house to be rebuilt will be approximately 50 feet from the wetlands, with clearing and disturbance shown at approximately 20 feet away. Present access to this parcel is by an overgrown right-of-way. The two lots adjacent to the pond will be served by a lengthy 18 foot wide shared driveway.

Due to the scenic road requirements, some of the land that could be used for development is proposed for a common driveway. Although pavers have been used to promote infiltration, additional driveway coverage, which represent a reduction in pervious surface, is a result of the common driveway.
The site disturbance for the proposed 5 lots adjacent to Sherman Road will extend up to the top of the steep bank, which runs through the middle of the property. Stormwater generated from the development will be collected, treated and distributed by bio-retention basins.

Recommendations

- Reducing the number of lots at the top of the site would reduce driveway coverage, stormwater generation and allow more room to collect stormwater and discharge it in a location that is less steep. Specifically, if lot #5 is eliminated, and the cul-de-sac shortened, driveway reductions in the area of approximately 400 linear feet could be gained, thus reducing site disturbance and stormwater quantity.
- The development should be laid out to preserve a 25 foot undisturbed vegetated buffer at the top of bank to prevent long term slope erosion.

Wetlands Impacts

Overview

The wetland resources on site, Keach Pond, the Still River and associated riparian wetland, are considered high value wetlands. The Town has already taken several steps to ensure resource protection including the adoption of regulations aimed at minimizing site development impacts, identifying significant resources, and incorporating planning tools to promote preservation and linkage of parcels.

It is ECCD's opinion that the development of land within close proximity to resources such as Keach Pond and the Still River is in direct contradiction to the Town's intent to protect of the river corridor. Even though the applicant has incorporated several measures to treat stormwater and control soil erosion, the development proposal represents a greater impact to the corridor by means of clearing, land grading and discharge of stormwater.

Recommendations

- If the development of Parcel A is inevitable, since it is an established right, redevelopment can still be minimized by allowing a smaller house footprint, less bedrooms (which translates to a smaller septic system), reducing driveway widths, limiting site clearing and requiring additional buffer plantings.
- The majority of lot #6 activities are outside of the Town's 125 foot regulated setback, with the exception of the bio-retention area for the treatment of driveway runoff. As noted above, minimizing the width of the shared driveway (and

perhaps creating a pull-off to deal with occasional 2-way traffic) will reduce runoff and overall site disturbance.

- The placement of the bio-retention basins serving lots #1-5 at the top of a steep slope represents a potential erosion hazard to the wetland system below. See General Lot Layout and Stormwater Sections for additional recommendations.
- A conservation easement should be considered for any private land that is not being developed and is located within the 125 foot wetland buffer setback. This would apply to Parcel A and lot #6. Clearing along the pond edge should be limited. If a view is desired, native shrubs can be used to enhance the pond edge which will provide some buffer benefits.

STORMWATER

OVERVIEW

The applicant has included several Low Impact Development (LID) measures for stormwater treatment with the proposed development. LID measures are designed to reduce the impacts of stormwater discharge by promoting infiltration and minimizing runoff. ECCD strongly supports this methodology over the traditional curb and pipe design for controlling runoff.

The installation of GravelPave2 for driveway surfaces is proposed for this development. These are pervious surfaces, designed to infiltrate stormwater runoff, thus reducing runoff rates, while providing some stormwater treatment. GravelPave2 surfaces have the additional benefit of reducing thermal impacts as they can be designed to collect and hold the first several inches of rainwater.

Stormwater from the driveways, roofs and other developed areas will then be directed to bio-retention basins for further treatment. These basins would be designed with level spreaders to discharge stormwater overland. Level spreaders, as a design concept, will provide for the even distribution of stormwater, resulting in flow velocities that will not cause erosion. However, even when designed and built properly, level spreaders constructed of fill/earthen materials can settle over time. Once low points develop, water flow velocities will increase. Several of the basins are designed to discharge over the very steep slope located to the rear of lots #1-5. The concern with the discharge of stormwater over steep slopes is that the surface has low points which will collect and channel water resulting in long term erosion.

The plans include a list of species and references to “rain garden” plantings that could be used in the bio-retention basins. All species selected appear acceptable and many are rated high for wildlife food value.

A stormwater treatment plan is only as good as the future maintenance plan is implemented. The more requirements for maintenance of the stormwater system there are, the higher the likelihood of future failure. While pervious driveway surfaces and

bio-retention basins are excellent tools in terms of stormwater treatment, long term maintenance must be conducted for these methods to continue to function as designed.

Recommendations

- It is not clear whether the GravelPave2 is planned for all driveway surfaces. The Town should verify whether the pavers are intended and appropriate for all driveway surfaces. GravelPave2 surfaces have been used for a parking lot at Fort Shantock State Park in Uncasville, Connecticut, and the Town may wish to contact them if it has any questions on overall performance.
- As the bio-retention basins and GravelPave2 surfaces are designed to infiltrate stormwater, the correct separating distances between basins, driveways and septic systems should be verified with the Health Department.
- A stormwater management plan including anticipated pollutant removal rates, and maintenance requirements of all stormwater treatment methods should be submitted for review by the Town.
- The Town should consider including reference to the LID measures, their intended purposes and upkeep requirements in individual deeds to ensure that new owners will not eliminate these design features (such as paving driveways) and are aware of their maintenance responsibilities.
- The State Health Code has a requirement for a separation distance of 25 feet between wells and drains that carry surface water. The plans should be reviewed, relative to the placement of wells adjacent to stormwater bio-retention basins, to ensure they are code compliant.
- The plans include a list of species to be used to plant the bio-retention areas. While all plants appear suitable, additional information on seeding rates or density and size requirements should be identified in the permitting process to minimize post construction issues.
- Harvesting of rainwater through the use of rain barrels offers another opportunity to reduce stormwater run-off.
- As mentioned under the General Lot Layout Section, discharge of stormwater over steep slopes should be avoided.

Sediment and Erosion Control

Overview

Topography on this site is gently to very steeply sloping. The steep soils are shown as Charlton-Chatfield soils. These are well drained and excessively drained soils with outcroppings and stones covering up to 20 percent of the ground surface. Tree windthrow can be common due to shallow depth to bedrock and runoff with these soils is typically rapid. The plans call for the preservation of most of

these steep slope areas, however stormwater from the bio-retention areas will be distributed at the top of the slope contributing to increased runoff.

One of the most important components with development of a site is a well designed sediment and erosion control plan. The plan as presented includes many of the details which should be incorporated into a plan.

Recommendations

- Phasing of development is unclear. Public or shared improvements are typically constructed up front in single family unattached developments, with lots being developed individually. If it is intended for lots to be sold and developed individually, then the erosion control plan should reflect this. Phasing is recommended for the development of the area along Sherwood Road.
- A preconstruction meeting should be held prior to initiating construction. This allows the town and contractor to review and discuss plans, inspections and expectations. An emergency call list should also be submitted.
- Limits of disturbance should be flagged in the field by a licensed surveyor and be reviewed by town staff prior to the initiation of any work.
- Floc logs are proposed as a measure to treat turbidity. Soil and water testing is typically recommended by the manufacturer to ensure that the product chosen is appropriate for on-site conditions and that there will be no negative impacts associated with its use. ECCD recommends that the conditions under which the Floc logs are used are verified with the manufacturer. Also, there may not be enough water retained for them to be used effectively.
- The “walking path” should be located to avoid collection and channeling of stormwater and to minimize erosion.
- Inspections should be conducted weekly during active construction with reports being submitted to the Town.
- See comments relating to discharge of stormwater over steep slopes under General Lot Layout and Stormwater Sections.

Conclusion

In summary, the plans submitted for Keach Pond View Subdivision incorporate many of the aspects of LID developments. The applicant has obviously exerted a substantial amount of effort to address stormwater and soil and erosion issues. By implementing the recommendations offered by ECCD, as well as other ERT participants, the environmental impacts to Keach Pond and the Still River can be further minimized.

Soil Data

Soil Data

Stormwater Management Review

DEP Stormwater Discharge Permit

Since the site construction involves the disturbance of over one acre, the project must comply with the requirements of Connecticut*'s General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities* (general permit) reissued 10/1/07. The developer must submit a registration to the Department of Environmental Protection (CTDEP) *at least* thirty days before the start of construction activities. If 10 or more acres of land will be disturbed, regardless of phasing, the developer must also submit the Stormwater Pollution Control Plan (the "Plan") with the registration. The permit requires that the "Plan shall ensure and demonstrate compliance with the Connecticut Guidelines for Soil Erosion and Sediment Control (the "guidelines"). Also, the Plan must be flexible to account for adjustment of controls as necessary to meet field conditions. Please note that many erosion, sediment control, and stormwater detention issues must be dealt with on a local level before being included in the Plan.

Stormwater Pollution Control Plan

The Stormwater Pollution Control Plan must include a site map as described in Section 6(b)(6) of the permit, a description of the erosion and sediment controls that will be used during each phase of construction, details of each control used, details of all outlet structures and velocity dissipation controls, a description of procedures to maintain all erosion and sediment control measures, and a description of post-construction stormwater management. Specific dewatering procedures must be addressed. Section 6(b)(6)(C)(ii) recommends that dewatering wastewater be infiltrated into the ground where feasible, but if the discharge must be directed to a surface water then measures must be taken to minimize discoloration of the receiving stream. The locations of all stockpiled materials must be shown along with necessary erosion control measures. The permit requires inspections by qualified personnel provided by the permittee at least once every seven calendar days and after every storm of 0.1 inches or greater. In addition, monthly inspections of stabilized areas must be conducted for at least three months *following* stabilization. The plan should note the qualifications of personnel doing the inspections and must allow for the inspector to require additional erosion and sediment control measures as necessary.

The permittee shall provide a copy of the Stormwater Pollution Control Plan to all contractors or developers conducting activities that may affect stormwater runoff on individual lots or buildings within the overall plan of development, regardless of

ownership. These additional contractors and developers must sign the contractor certification (Section 6(b)(6)(E)).

The Stormwater Pollution Control Plan must be maintained on site during construction and updated as necessary.

Site Development Plan

A review of the Site Development Plan dated 5/24/07, revised 9/10/07, resulted in the following comments:

GravelPave

The GravelPave system from Invisible Structures is proposed for the two driveways. According to the Invisible Structures website, GravelPave is a porous pavement system capable of handling vehicle traffic while promoting stormwater infiltration. Current research and literature indicates that porous pavement does provide a reduction in stormwater flows, a reduction in some stormwater pollutants, and that these systems do work successfully in cold weather climates with proper maintenance. The website for NEMO (Non-Point Education for Municipal Officials) at UCONN identifies other locations in Connecticut that have installed the GravelPave system.

It is recommended that an experienced contractor install the GravelPave system, and that the Site Development Plan outline specific long-term maintenance requirements and identify long-term responsible parties to ensure that this system works effectively in the future.

Bioretention Basins

The Site Development Plan proposes four-bioretention basins for long-term stormwater management, and also proposes to use these basins as temporary sediment traps during construction. Section 6(b)(6)(C) of the construction stormwater general permit requires that sediment basins/traps receiving runoff from 2-5 acres be sized to provide a minimum of 134 cubic yards of water storage per acre drained. In addition, sediment basins/traps must be designed in accordance with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control. Silt fence should not be used within a sediment basin because of difficulties with appropriate installation and maintenance. A stone filter berm could instead be installed to create a sediment forebay within the basin/trap.

The use of APS Floc Logs in the sediment traps is mentioned as a sediment control measure during construction. The Erosion and Sediment Control Plan must include more specific instructions to ensure that the floc logs are installed in the proper locations so as to be in contact with flowing stormwater and to best promote settling of fine particles.

The Site Development Plan shows a "Typical Bio-Retention Basin Cross-Section". Because each of the upper basins is oriented differently to the steep slope, and the lower basin is in close proximity to flagged wetlands, it is recommended that the Site Development Plan show greater detail as to how stormwater runoff will be directed into and exit each of the basins both during and after construction, and describe measures to be taken if the discharge from any basin results in channeling and erosion down the steep slope or towards the wetlands.

As with the GravelPave system, the Site Development Plan must address the issue of long-term maintenance of the basins.

Additional Comments

- The DEP recommends the use of erosion control matting for slopes that are 3:1 and steeper.

- Erosion and sediment controls must be inspected at least once every seven calendar days and after every storm of 0.1 inches or greater.

- Soil stabilization measures must be implemented within three days of reaching final grade or when construction activities have permanently ceased or are temporarily suspended for more than seven days.

- Areas that will remain disturbed but inactive for 30 days, including stockpiles, must receive temporary seeding in accordance with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control.

Dam Safety Review

The Keach Pond dam, AKA Lower Chamberlin Pond (CT dam # 16917), was inspected in March of 2006 by DEP Inland Water Resources Division staff. The purpose of the inspection was to prepare an estimate of repair costs, since the DEP was considering purchasing the property which included the dam. At that time, the estimated cost of repairing the dam, including the engineering, permitting and construction was 362K. This information was shared with Cheryl Peterson of the Heritage Design Group in October of this year (2007).

The dam itself is of earth/ masonry construction, approximately 190 feet long, with a 30 foot wide spillway and is eight feet high. The dam varies from six to ten in width and at the time of inspection it had numerous trees growing on the dam embankment and the spillway was blocked with beaver debris. Water was observed flowing around the left dam abutment and the existing drawdown structure appeared inoperable.

According to DEP records Keach Pond is approximately 26.5 acres in size and has a 2.6 square mile drainage area. The dam is under the jurisdiction of the department pursuant to Chapter 446j of the Conn. Gen. Statutes (Dams and Reservoirs). Therefore its repair or removal would require a permit from the DEP in accordance with the aforementioned statutes.

ERT field review – viewing the area around the left dam abutment.

Existing drawdown structure 9/26/07.

The Natural Diversity Data Base

The Natural Diversity Data Base maps and files for the project site have been reviewed. According to our information, there are no known extant populations of Federal or State Endangered, Threatened or Special Concern Species at the site in question.

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 Environmental and Geographic Information 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 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.

Planning Considerations

A 6 lot subdivision is proposed for a 24 acre parcel to the west of Keach Pond and the east of Sherman Road. The parcel contains a .92 acre nonconforming lot within the center directly adjacent to the pond. The nonconforming lot, referred to in the plan as parcel A, includes a small cabin used seasonally. Access to the cabin is along an old logging road from the south. Steep slopes run from north to south through the center of the property. An earthen dam is located at the south end of the pond. The property boundary to the south west divides an earthen dam that holds the water level of the pond. The abutting property line splits the dam creating questions of ownership and maintenance responsibilities.

The subdivision is within the Community District Zone that allows for single family detached dwellings. To promote open space preservation, cluster development has been incorporated into the town's subdivision regulations. These regulations require 50% of the Gross Buildable Area (GBA) be preserved as open space while allowing the Maximum Lot Yield to be placed upon the remaining 50%. Minimum lot sizes are .75 acres. Building site and street locations are to conform to the natural topography of the land while minimizing adverse impacts on the Conservation Land. Conservation Land is determined based on a list of Contextual Priorities listed within the regulations. Priorities include : Agricultural Land and Prime Agricultural Soils, Ridge Lines and Scenic Roads, Natural Diversity Habitat Area, Historic and Archaeological Resources, Stone Walls, Wetlands and Watercourses, Large forest Blocks, Trails and Trees.

The surrounding area is predominantly residential and agricultural uses. A subdivision on the northeastern side of the pond was developed around 1998. Land to the west of Sherman road is owned by the Wyndham Land trust.

Site Design

The subdivision proposes the creation of 5 lots in the northwestern corner accessed by a 30' common driveway ending in a cul-de-sac with two 20' common driveways serving lots 1 and 2, and 3 and 4. The primary common drive runs south parallel to Sherman Rd following its entry onto the parcel. Lot 6 is located adjacent to the nonconforming lot along the pond and is accessed via a variable width common driveway serving parcel A and lot 6. Lots 1-5 are on top of a steep slope that runs down toward the pond.

The scenic road, steep slopes and existing watercourses make site design challenging. Primary environmental concerns should be for the wetlands. The development of parcel A and lot 6 along the pond should be closely examined in regards to water runoff and potential contamination of the watershed. Development within the 125' wetlands buffer may have adverse impacts on water quality as well as wildlife habitat.

The topography of the land reduces the area for locating the 6 allowable lots. The proposed configuration of the common drive seems to needlessly push the lots 1-5 closer to the edge of the steep slops while creating a sliver of conservation land along the eastern side of Sherman Rd. Reconfiguring the access to lots 1-5 could give further relief from the steep slope and decrease the separation of conservation land.

The proposed 17 acres of Conservation land, half of which is wetlands, is essentially divided by parcel A and lot 6. The creation of the common drive creates a sliver of conservation land that is used only for the common drive and as a buffer for Sherman Rd. A contiguous strip of land following along the waters edge may provide for a higher level of wildlife habitat and decrease the chance of wildlife conflicts with residential properties.

The development of lots 1-5 may have some visual impact along Sherman Rd although the grade of the road in comparison to the building sites may decrease them. Limited disturbance of vegetation along Sherman Rd as well as curved access ways to the properties may help to preserve the scenic quality of the road.

Archaeological and Historical Review

The Office of State Archaeology (OSA) and the State Historic Preservation Office (SHPO) suggest that the project area has a high sensitivity for archaeological resources associated with Native American campsites and Euro-American farming and industrial activities. Elevated, well-drained soils adjacent to the Keach Pond wetlands would have provided ideal environmental and topographic locales for hunters/gathers during Pre-Contact time periods. In addition, the numerous stone walls and early sawmill and pond emphasizes the use of the property during the Historic Period.

Both the OSA and SHPO are pleased that the standing sawmill below the dam and project area will remain intact. The Office of State Archaeology is working with The Nature Conservancy for long term preservation of the structure and equipment. The historic sawmill is eligible for the National Register of Historic Places.

The Office of State Archaeology and State Historic Preservation Office recommend an archaeological Phase Ib reconnaissance survey for the proposed development to identify and preserve significant cultural resources prior to any land use activities. This recommended survey should be conducted in accordance with the State Historic Preservation Office's *Environmental Review Primer for Connecticut's Archaeological Resources.*

The OSA and SHPO are available to provide technical assistance including a list of consultants to conduct the above recommendations. Should you have any questions regarding this review, do not hesitate to contact them at the university.

About the Team

The Eastern Connecticut Environmental Review Team (ERT) is a group of professionals in environmental fields drawn together from a variety 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.

Purposed 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, active adult, 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 and/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 Conservation District and the ERT Coordinator. A request form should be completely filled out and should include the required materials. When this request is reviewed by the local Conservation District and approved by the ERT Subcommittee, 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, e-mail: connecticutert@aol.com.