Cranberry Lake Subdivision

Canterbury, Connecticut

April 1989

EASTERN CONNECTICUT ENVIRONMENTAL REVIEW TEAM REPORT

Eastern Connecticut Resource Conservation and Development Area, Inc.

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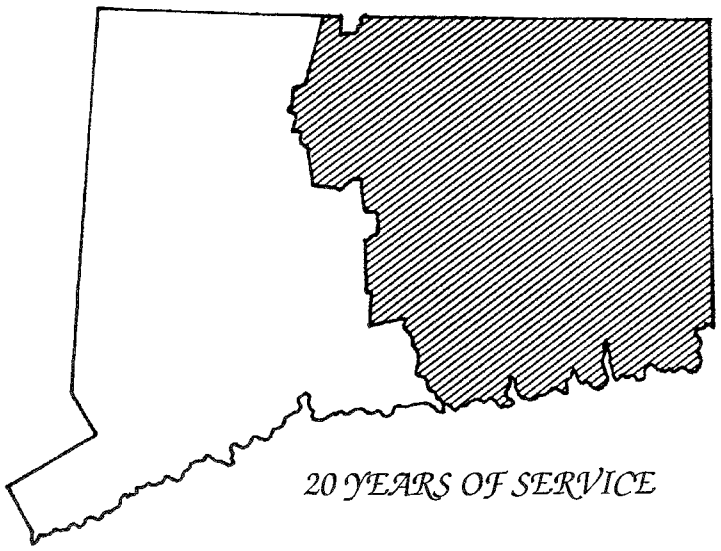
Review Date: March 14, 1989
Report Date: April 1989



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Eastern Connecticut Environmental Review Team
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ENVIRONMENTAL REVIEW TEAM REPORT
ON

CRANBERRY LAKE SUBDIVISION
CANTERBURY, CONNECTICUT

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

The ERT met and field checked the site on Tuesday, March 14, 1989. Team members participating on this review included:

Nick Bellantoni	**State Archaeologist**	**CT Museum of Natural History**
Howard Denslow	**District Conservationist**	**USDA-Soil Conservation Service**
Kevin DesRoberts	**Wildlife Assistant**	**DEP-Eastern District**
Mark Edmonds	**Soil Conservationist**	**USDA-Soil Conservation Service**
Steve Hill	**Wildlife Biologist**	**DEP-Eastern District**
Chuck Lee	**Environmental Analyst**	**DEP-Water Compliance**
Brian Murphy	**Fisheries Biologist**	**DEP-Eastern District**
Elaine Sych	**ERT Coordinator**	**Eastern CT RC&D Area**
Bill Warzecha	**Geologist**	**DEP-Natural Resources Center**

Prior to the review day, each Team member received a summary of the proposed project, a list of the town's concerns, a location map and topographic map. During the field review the Team members were given soils information, revised plans and proposed lake restrictions. The Team met with, and were accompanied by the Canterbury Zoning Enforcement Officer, the Chief Sanitarina for the NDDH, members of the Inland Wetlands Commission and the Planning and Zoning Commission, and representatives of the developer. Following the review, reports from each Team member were submitted to the ERT Coordinator for compilation and editing into this final report.

This report represents the Team's findings. It is not meant to compete with private consultants by providing site designs or detailed solutions to development problems. The Team does not recommend what final action should be taken on a proposed project -- all final decisions rest with the Town and landowner. This report identifies the existing resource base and evaluates its significance to the proposed development, and also suggests

considerations that should be of concern to the developer and the Town. The results of this Team action are oriented toward the development of better environmental quality and the long-term economics of land use.

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

If you require additional information, please contact:

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1. SETTING AND LAND USE

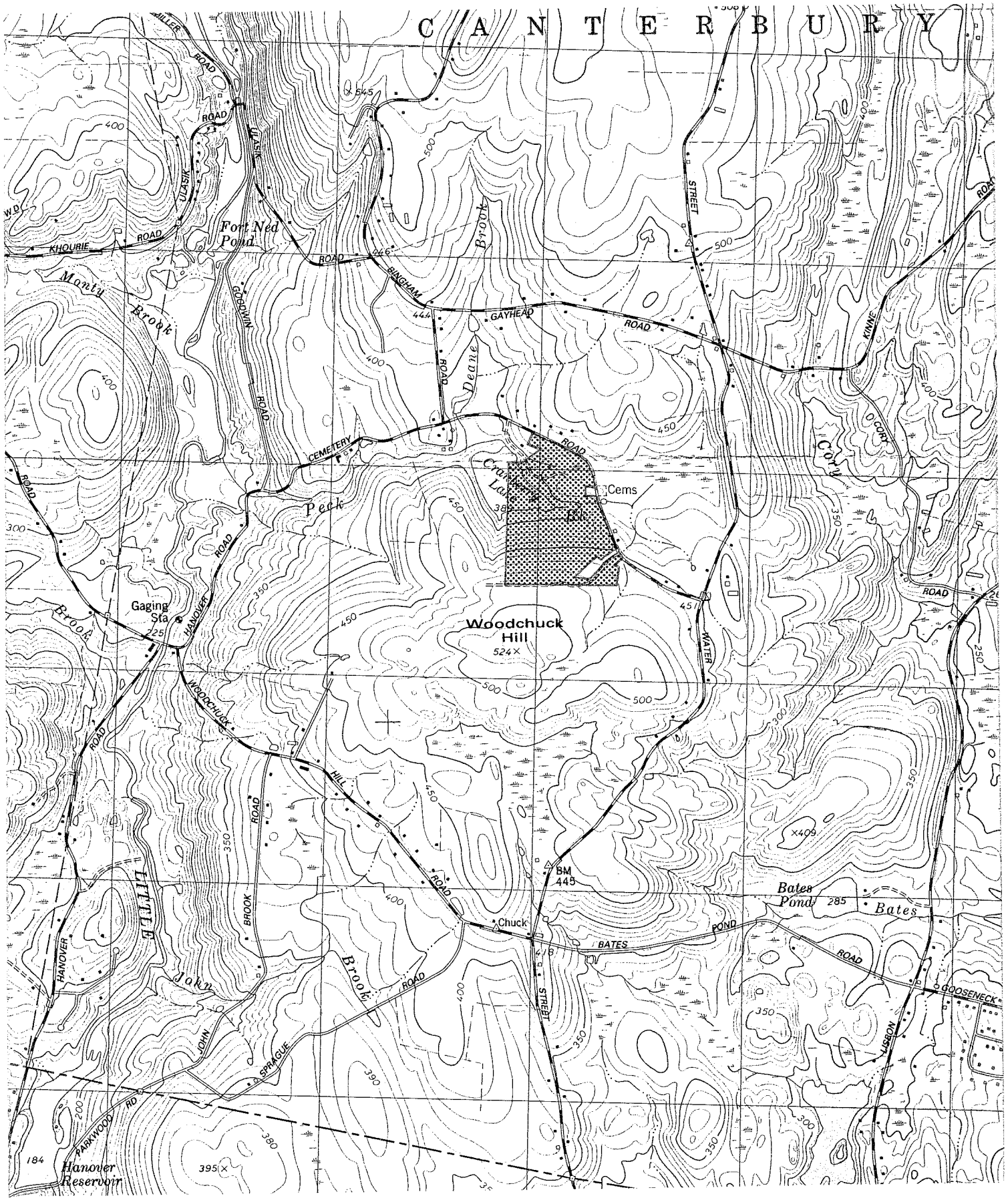
The site, about 64 acres in size, is located in the southwest corner of Canterbury. It flanks the north side of Woodchuck Hill. Cranberry Lake, a man-made (excavated) waterbody on Peck Brook, comprises about 5 acres of the site in the northwest corner. This represents just under one third of the +/- 17 acre water body.

The site is bounded on the north and east by Cemetery Road. To the south, the land is privately-owned wooded land, which is undeveloped. To the west, the land consists of open farm fields. Low density residential and agricultural land use mainly characterize the area. Remnants of a sand and gravel excavation are visible in the eastern parts near the Canterbury Cemetery.

According to town officials, the site is located in a 2 acre zone. The minimum lot size for residential purposes would be about 80,000 square or about 2 acres. Based on the present lot layout, the proposed subdivision is compatible with these regulations. Each lot in the proposed subdivision would be accessed by either Cemetery Road or Lakeview Drive, the proposed +/- 1350 foot cul-de-sac, and each home will be served by individual on-site septic systems and wells.

LOCATION MAP

Scale 1" = 2000'



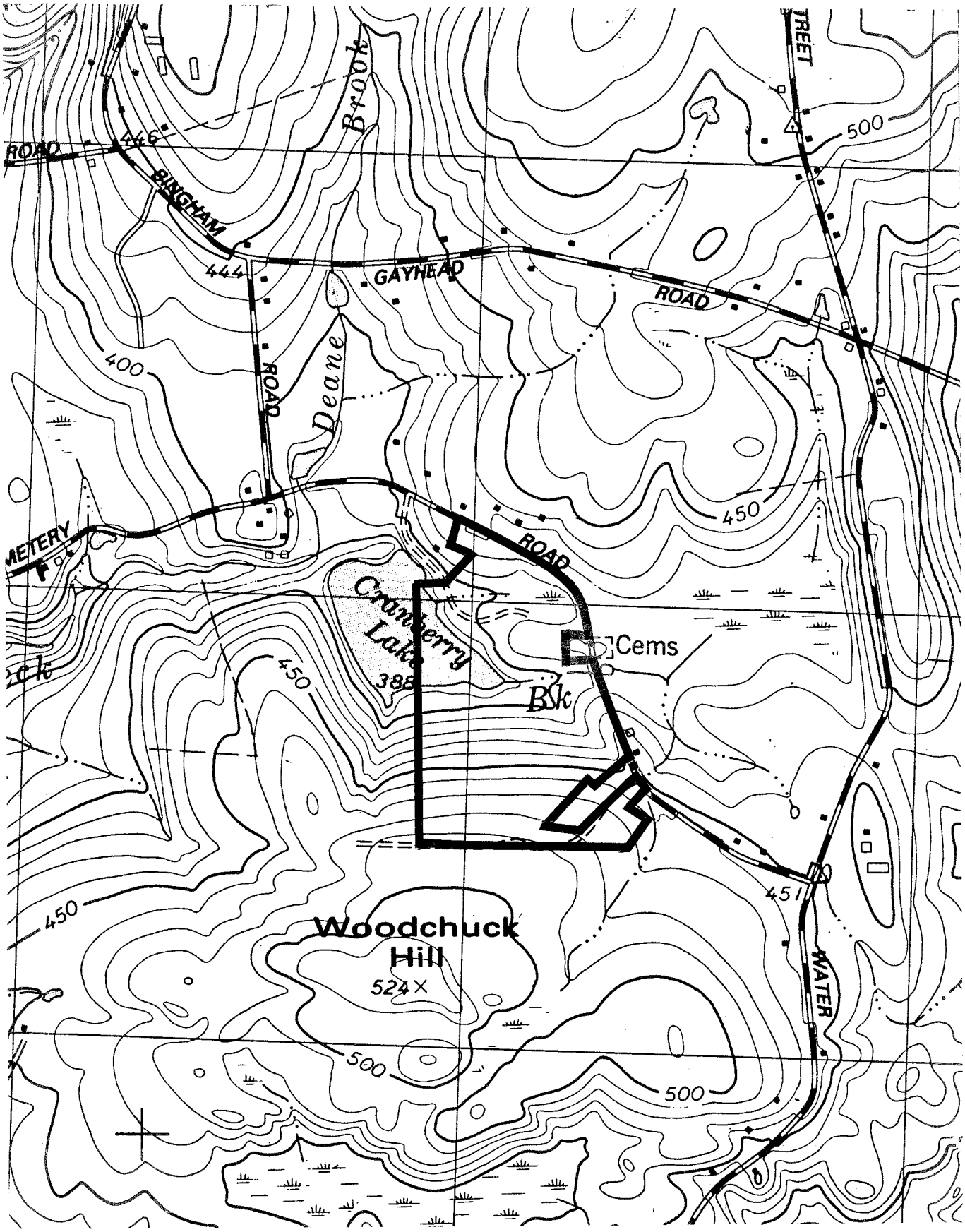
2. TOPOGRAPHY

The major topographic feature in the area is Cranberry Lake. Cranberry Lake, about 17 acres in size, is a man-made pond created by excavating unconsolidated materials below the water table in the Peck Brook Valley. It is understood that this activity took place between 1963 and 1964.

The site consists of an area of moderately sloping land north of Woodchuck Hill. Slopes northeast of the lake are more gentle. The steepest slopes (8-35 percent) occur in the southern parts. Site elevations range from a low of 388 feet above mean sea level, represented by the surface of Cranberry Lake, to a high of about 490 feet above mean sea level at the southern limits.

TOPOGRAPHY

Scale 1" = 1000' Approximate Site Boundary



3. GEOLOGY

Three distinct east-west trending belts of bedrock have been described for the site: Canterbury Gneiss, Hebron Formation, and Tatnic Hill Formation-Yantic Member (Geologic Map of the Scotland Quadrangle. H.R. Dixon and C.E. Shaw, Jr., GQ 392, 1965, and Bedrock Geological Map of Connecticut. J. Rodgers, 1985). The central and southern parts of the site are underlain by Tatnic Hill Formation(Yantic Member). It is described as a gray to dark gray, fine to medium grained schist. The north central parts are underlain by Hebron Formation, an interlayered dark-gray schist and greenish gray, fine to medium grained calc-silicate (calcium and silica-rich minerals) gneiss. Finally, the northern limits are underlain by Canterbury Gneiss. These rocks are described as light-gray, medium grained, locally and strongly lineated gneisses.

The exact depth to ledge is unknown on the site. Based on deep test hole information supplied to Team members, it is shallowest along the southern limits of the site (Lots 14-20) where it was encountered at depths ranging between 3 and 7 feet. It probably does not exceed 10 feet in most places on the site.

Most of the subdivision site is covered by till. Till is a glacial sediment that was deposited directly from glacier ice. The sediment consists of varying proportions of sand, silt, gravel, clay, and boulders. Particles of different sizes are generally mixed together in a complex fashion.

The texture of most of the till on the site is silty and tightly compact. The compact zone is encountered below the weathered and rooted surficial soil zone (2-3 feet below ground surface). Above the compact soil zone, the texture of soil is normally loose or only moderately compact. The compact till ("hardpan") is characterized by seasonal high water tables and slow percolation rates. A sandy till which lacks a "hardpan" occurs at the northern limits.

A small area generally east of Cranberry Lake contains stratified, gravelly sands which were deposited by streams of glacial meltwater. These deposits have been mined in the past on the parcel.

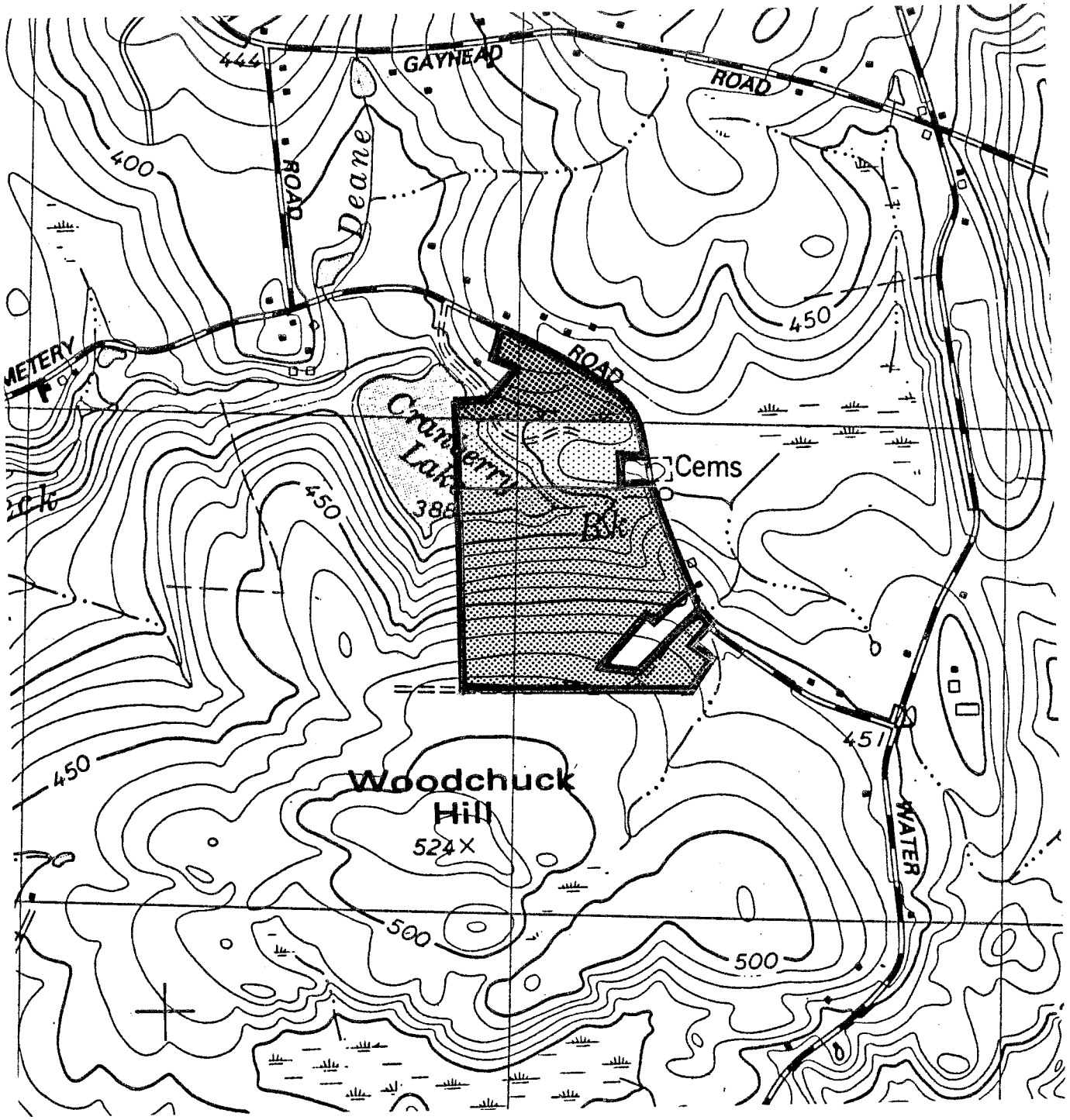
BEDROCK GEOLOGY

Canterbury Gneiss - light-gray, medium grained,locally strongly lineated gneiss.

Hebron Formation - interlayered dark gray schist and greenish -gray, fine to medium grained calc-silicate gneiss.

Tatnic Hill Formation (Yantic Member) - gray to dark gray , fine to medium grained schist.

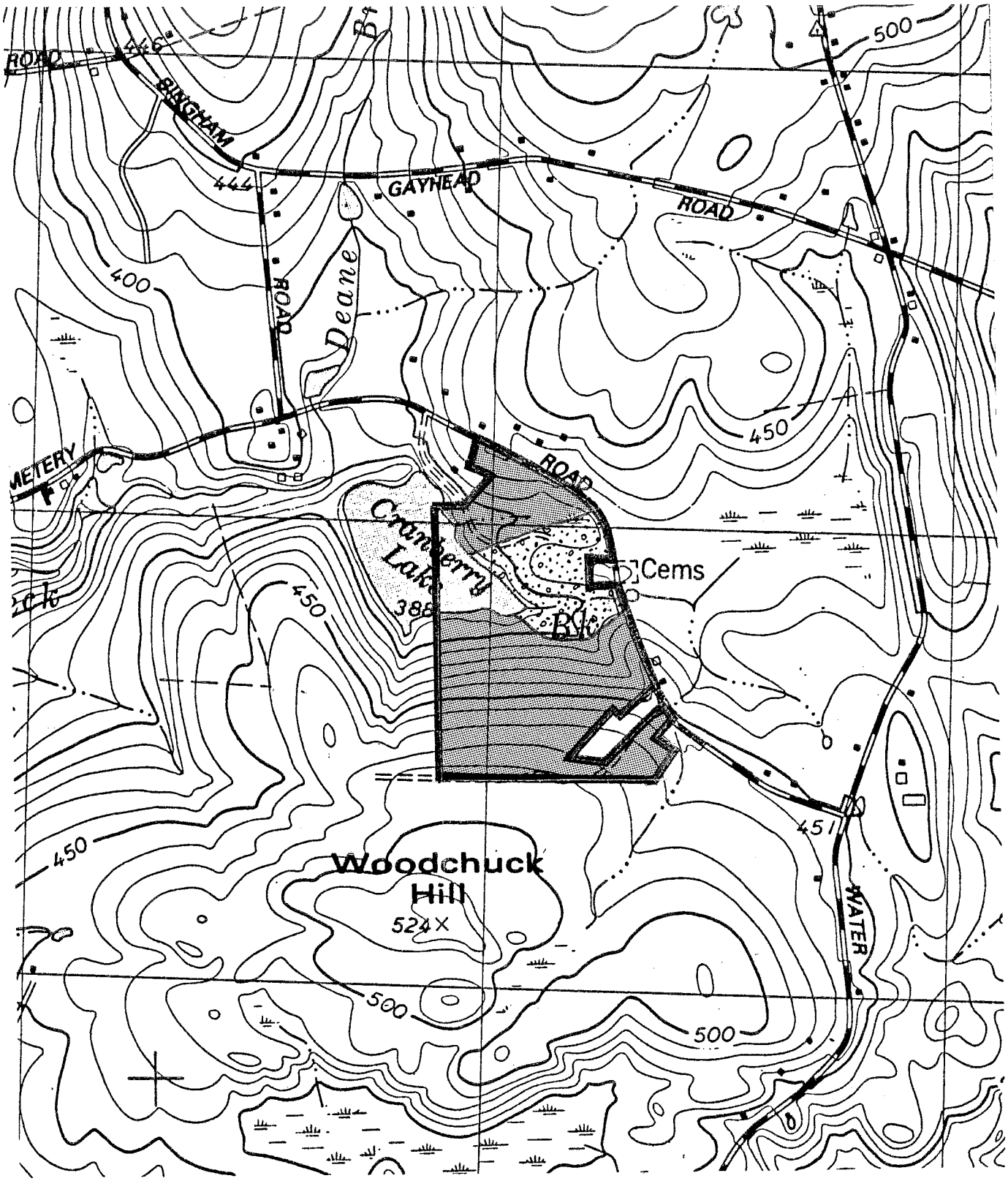
Scale 1" = 1000'



SURFICIAL GEOLOGY

Till Stratified Drift

Scale 1" = 1000'



4. SOIL RESOURCRES

General

The major feature of the proposed 64 acre subdivision is Cranberry Lake. The 17± acre lake is man-made, held by a dam at its northern end. The proposed subdivision lies to the south and east of the lake, bordering about one-third of its perimeter. The blend of open water, wet meadow, woods, wetlands and uplands not only provides scenic beauty, but also a diverse habitat for upland and wetland wildlife. Protecting such features will benefit wildlife and maintain the aesthetic quality of the area.

Soils

The southern portion of the parcel is primarily wooded upland. Here there are glacial-till soils which generally have a compacted hardpan creating a seasonal high water table. The center of the parcel is open land, containing a band of wetland soils and stratified drift soils. The northern portion of the parcel is wooded, with wetland and glacial-till soils. The primary land use around the remainder of the lake is agricultural. A general soil map of the site from the Windham County Soil Survey is included in this section of the report. The wetland soils have been flagged by Enviro-Tech Consultants, certified soil scientists.

Development Concerns

The primary concern regarding the proposed subdivision is protecting the quality of the lake. The developer has proposed a conservation easement around the lake which would limit land use to specific activities. In addition to the proposed restrictions distributed during the ERT field review, the following are suggested:

1. No ground disturbance with mechanical equipment.
2. No beach creation by filling or dredging.
3. On lots 8 - 12 specify the easement as 25 feet into the woods instead of limiting it to 100 feet from the edge of the water.

Concern was expressed regarding the steep driveways proposed, especially for lots 14 through 19. Driveways cut through seasonally wet soils can be prone to erosion and

wash from wetness. Even well-graveled surfaces could wash into the new road and possibly clog the storm drainage system. It is suggested that driveways leading up slope from Lakeview Drive be paved for at least 100 feet if the slope is 10% or greater. A water-break dip should be installed within the upper limit of the paving if the drive is not within a cut at that point. The paved dip will divert surface runoff into the woods. From discussion with the developer it is understood that lots 14, 15 and 16 will be combined into two lots, allowing less steep driveways to be constructed.

The limits of disturbance for construction should be kept to a minimum. Where trees must be removed for safety, ground disturbance should be minimized to maintain stability. Care should also be taken to avoid placing fill around trees, as this often kills them.

The four inch underdrain along Lakeview Drive is a good idea due to the perched water table typical of these soils. Similar drains may be beneficial along some of the driveway cuts, and could be tied into the road drainage.

Rip rap is shown at the 15 inch pipe outlet on the lot 7 and 8 boundary, and at the outlet from the catch basin in the cul-de-sac. Rip rap is also recommended at the pipe outlet in the corner of lot 12. This will prevent scouring of the existing channel as the water leaves the pipe. Considering the distances to the water and rock rip rap, water quality should not be affected as long as the vegetation is maintained.

The major asset to the subdivision is the lake. It is suggested that Patton Corp. have an engineer evaluate the integrity of the lake's dam and spillway, owned by other property owners, to assure town officials and future lot buyers of the stability of the dam and lake level.

Erosion and Sediment Control

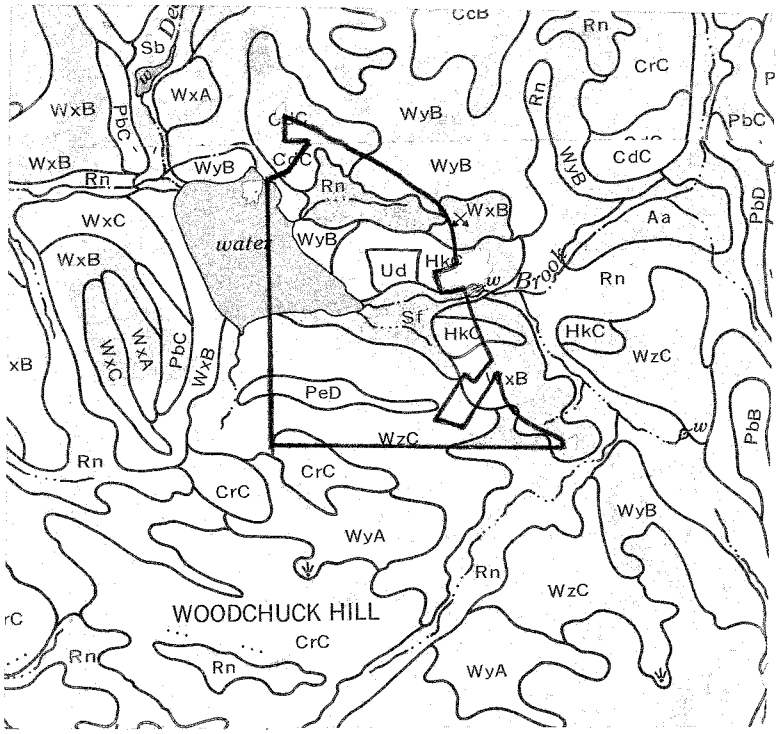
From the plans it is understood that the road will be constructed first, followed by development of individual lots over a period of time. Erosion and Sediment Control plans only cover road development. It should be made clear to potential lot buyers that an erosion and sediment control plan must be submitted to the town, and approved, prior to any construction activity. A statement on the subdivision plan to this effect, and in the property deed, is appropriate. It should also be clearly stated who is to be contacted

regarding the installation and maintenance of the erosion and sediment control systems included in the present plan.

SOILS MAP

COUNTY: Windham **STATE : Connecticut**

SOIL SURVEY SHEET(S) OR CODE NOS.#54 & #59 APPROXIMATE SCALE: 1"=1320' PREPARED BY U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE COOPERATING WITH Windham County Soil and Water CONSERVATION DISTRICT.



SOILS

CdC - Canton & Charlton extremely stony fine sandy loams, 3 to 15 percent slopes.

CrC - Charlton-Hollis fine sandy loams, very rocky, 3 to 15 percent slopes.

HkC - Hinckley gravelly sandy loam, 3 to 15 percent slopes.

PeD - Paxton extremely stony fine sandy loam, 15 to 35 percent slopes.

***Rn** - Ridgebury, Leicester & Whitman extremely stony fine sandy loams.

***Sf** - Scarboro fine sandy loam.

Ud - Udorthents, smoothed.

#WxB - Woodbridge fine sandy loam, 3 to 8 percent slopes.

WyB - Woodbridge very stony fine sandy loam, 3 to 8 percent slopes.

WzC - Woodbridge extremely stony fine sandy loam, 3 to 15 percent slopes.

Prime farmland soil

* Designated wetland soil by P.A. 155

5. HYDROLOGY

The proposed subdivision site encompasses the eastern half of Cranberry Lake. As mentioned earlier, the lake was created by excavating unconsolidated materials in the Peck Brook Valley. Peck Brook formerly flowed through the site enroute to the Little River. Peck Brook originates in a small pond northeast of the site. Surface runoff on the site flows to Cranberry Pond. At its intersection with the Lake's outlet structure on the north side, the Lake drains an area of about 411 acres. The site therefore represents about 16 percent of the watershed area.

The watershed is characterized mostly by wooded, undeveloped land and agricultural fields. Low-density residential land use occurs along the road system in the watershed area.

Because of site's proximity to Cranberry Lake, the potential for affecting the Lake's environmental health and water quality will be high. Any development that takes place on the site should be done only with great caution, especially since there is another lake property owner. In this regard, it might be wise to document existing water quality conditions. Post-development photographs of Cranberry Lake would also be helpful for depicting present conditions.

Converting the wooded land on the site to a residential subdivision would be expected to increase the amount of runoff shed from the site. Increased runoff would result from soil compaction, removal of vegetation, and placement of impervious surface rooftops, roads, and driveways over otherwise pervious soil. Stormwater management has not been studied to date by the applicant. In order to clearly understand the impacts of post-development runoff, the applicant should be required to develop a detailed stormwater management plan which includes pre- and post-development runoff conditions. Connecticut's Guidelines for Erosion and Sediment Control should be closely followed with regard to stormwater management on the site.

From a flooding standpoint, Cranberry Lake appears to be in a hydrologic position which would be useful for natural detention capabilities. This will need to be carefully studied by the project engineer. Additionally, since the outlet structure is under different

ownership, the legalities of using the lake as a detention basin need to be fully understood. The DEP's Dam Safety Unit (566-7245) should also be contacted, if the lake is to be used for detention purposes.

The presence of silty soils (southern parts and moderate slopes) indicates the potential for erosion and siltation problems. Every effort should be made to protect Peck Brook and Cranberry Lake from sediment and silty soils. It seems likely that a temporary and/or permanent sediment basin(s) will be required, especially during the construction phase. Detailed plans for the sediment basin should be shown on the plan. Sediment basins will need to be maintained regularly, so access to the basins for maintenance vehicles should be provided and shown on the plan. Road sand, possibly laden with road salt, off Lake View Drive and driveways will also pose a potential threat to water quality and environmental health of Cranberry Lake.

As mentioned earlier, about one-third of Cranberry Lake's bottom is included with the proposed subdivision. It is understood that remaining lake bottom and its outlet structure are privately owned. Future property owners must fully understand that the outlet structure for the lake is not under their control. There is a possibility that the lake level could be increased or decreased to a point where certain lots may be adversely affected. For this reason, a statement regarding this potential problem should be recorded on the subdivision map. In addition, each property owner needs to understand the potential for maintenance, i.e., weed control of the lake, which will need to be shared by each property owner and/or homeowner's association should the need arise.

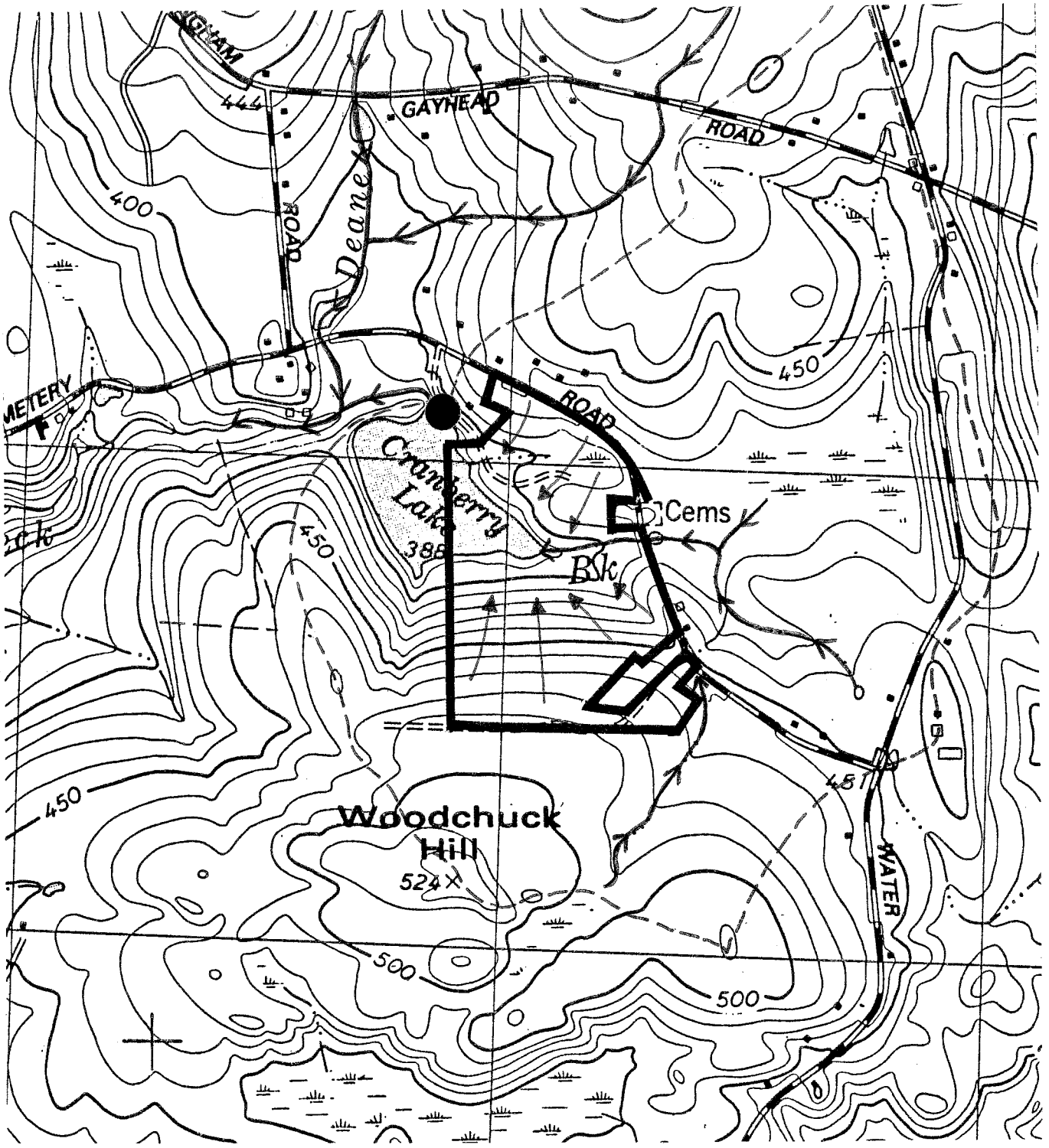
Present plans indicate that lot lines for lots 10-13 and lots 1-5 will extend to include the lake bottom. Additionally, the boundaries for the proposed recreation area will extend to include the lake bottom. Prior to subdivision approval, it is suggested that a thorough legal research concerning water rights for inland surface water bodies be conducted. The concern here is that a property owner may choose to erect a fence or other barrier along his/her respective property lines. This type of activity, which would require a inland wetland permit, may severely limit the recreational use and aesthetic values of the lake. Also, the liability potential for property owners on the lake should be assessed from a legal standpoint.

In order to protect the natural attributes and environmental health of the lake, consideration should be given to a conservation easement around Cranberry Lake within

the subdivision. The easement would limit the amount of vegetation cleared in the area, building construction, lawn area, fertilizers, septic systems, etc., thereby protecting water quality entering the Lake and preserving views.

The soils (Paxton and Woodbridge soils) in the area of this detention basin appear to be characterized by hardpan soils. Deep cuts in hardpan are extremely difficult to stabilize due to seepage of water over the hardpan layer. This water creates an unstable condition just below the seepage line. The weight of the unstable soil causes the soil to flow down the slope. Once this begins, the slope is very difficult to stabilize. The establishment of a good vegetative cover is practically impossible on the eroding slope. These conditions will hold true for all types of cuts in hardpan soils on the site and therefore need to be addressed very carefully.

WATERSHED BOUNDARY



6. SEWAGE DISPOSAL

Based on deep test hole data and soils mapping information, the proposed subdivision appears to be marginally suitable for on-site sewage disposal due to shallow to bedrock soils and the presence of a seasonally high water table condition. Those lots tested on the south side of Lakeview Drive recorded shallow to bedrock conditions (3-7 feet below grade). The concern here is that there may not be sufficient soil cover above bedrock in which to construct sewage disposal systems capable of functioning adequately without creating adverse effects, especially since all lots require individual on-site wells. In view of shallow to bedrock soils in the southern parts, it would be wise to excavate several deep test holes in the proposed leaching system area. This will provide the design engineer with a good profile of the bedrock surface on these lots, since the bedrock surface may undulate from point to point.

In general, the remainder of the lots revealed subsurface conditions which have the potential for seasonally high water tables as indicated by the presence of shallow soil mottling (soil staining indicative of high groundwater tables). The seasonally high water table is due to the presence of the compact till that characterizes most of the parcel. Since soil testing on the site was conducted during the dry time of year (October/November), it would be wise to use soil mottling as the high water mark for design purposes or monitor ground water levels through the wet time of year.

The main concern for those areas characterized by elevated water tables is to determine whether or not the naturally occurring soil in the vicinity of the leaching system can adequately absorb or disperse the expected volume of sewage effluent without overflow, breakout or detrimental effects on ground or surface waters. In general, suitable, well-drained fill material is used to elevate the bottom of the system above the high water table so that it does not hydraulically interfere with the proper functioning of the septic system.

Depending upon soil conditions and topographic conditions, curtain drains (groundwater control drains) may also be used to protect the leaching systems from a seasonally high ground water table. The curtain drain must be properly designed and constructed in compliance with the State Public Health Code. The outlet point for the curtain drain(s) should be in a location that does not pose a threat to water supply wells or create a nuisance condition such as flooding neighboring properties.

The presence of seasonally high water tables indicate the need for building/footing drains. They will hopefully keep basements from getting wet. Where feasible, building footing drains may be used in conjunction with curtain drains.

Before subdivision approval, the applicant's engineering firm must demonstrate that each of the proposed lots in the subdivision meets the minimum soil standards set forth in Section 19-13 B103e(a)(3) of the State's Public Health Code.

The process should be a coordinated effort between the design engineer and the Northeast District Department of Health (NDDH) certified sanitarian. Because most of the lots will be deemed of "special concern" by the State Public Health Code, plans for the design of the subsurface sewage disposal facilities (along with the placement of each on-site well water supply) must be prepared by a professional engineer and submitted to the Health Department for review and approval by their certified staff.

The final configuration of lots should not be approved until the NDDH is assured of the feasibility of each lot meeting all of the State Health Code Requirements and above-listed concerns.

7. WATER SUPPLY

From a sanitary and hydrogeologic standpoint, it appears that the underlying bedrock would be the most favorable aquifer on the site. Each lot would be served by an on-site well cased firmly with steel pipe into the underlying bedrock and completed as an open borehole.

Wells drilled in bedrock generally supply small but reliable yields of groundwater. Water moves largely in the joints and fractures that most often occur in the upper few hundred feet of the bedrock surface. Below that depth, fractures tend to become less concentrated. It has been shown that the probability of increasing the yield of a well decreases with depth below a few hundred feet.

The random nature of the fractures and seams prevent prediction of well yields in bedrock except on a statistical basis. For this reason, it is extremely difficult to predict the yield of a bedrock well prior to drilling. Water Resources Bulletin #11 (Shetucket River Basin) indicates that in a survey of 134 bedrock wells 90 percent yielded 3 gallons of water per minute or more.

A review of air photos and a topographic map of the area identifies the presence of linear features (fracture traces) such as straight stream segments, i.e., Little River, Cory Brook, etc. Although G. Snyder (map GQ-392) did not map fault zones in the area, these linear features may be surface expressions of fault zones or zones of joint contractions in the bedrock. If the bedrock is fractured beneath the site, then these openings would hopefully create conduits within the bedrock aquifer and promote satisfactory supplies of groundwater.

Using some basic assumptions, the Team's geologist evaluated available recharge and predicted water use of the subdivision to estimate the potential impact on the bedrock aquifer. Specifically, recharge calculations show that the amount of water available to the site each day is about 37,500 gallons. This is based on groundwater recharge amounts of 8 inches per year for an upland, mostly till-covered site and 63.0 pervious acres (less 1 acre for proposed road) allowing for infiltration. Predicted water use at the site is estimated at 6,300 gallons per day. This is based on a 75 gallons per day per capita water usage. An assumption of 4 persons per single family residence (21 lots) was used.

Based on these figures, it is estimated that the planned subdivision will receive about 6 times the recharge as is necessary to balance water demand. In addition, induced recharge by properly renovated septic system effluent (about 95%) plays an important role in the groundwater budget. The latter stresses the need for properly designed and installed septic systems.

It must be kept in mind that the computations in the preceding paragraphs assumes that the underlying bedrock is fractured and is capable of transmitting usable amounts of water to the proposed wells. This cannot be determined exactly without first drilling the well.

Every effort should be made to allow the spacing of about 200 feet between domestic wells in the proposed subdivision. This will provide about one acre of direct discharge to each well, which should help to minimize the chances for mutual interference between pumping wells. The latter assumes the fractures in the underlying bedrock are saturated and capable of transmitting water to a well.

Each well should ideally be located on a relatively high portion of the lot, properly separated from the sewage disposal system or any other potential pollutant (e.g., road drainage, curtain drain tank, etc.) and in a direction opposite the expected direction of groundwater movement. They should all be cased with steel pipe into the underlying bedrock. In order to provide adequate protection of the quality of bedrock water, all wells will need to be properly installed in accordance with all applicable State Public Health Code and Connecticut Well Drilling Board regulations. In addition, the District sanitarian will need to inspect and approve well locations.

The natural quality of groundwater should be satisfactory. However, the bedrock beneath the site may have elevated amounts of iron and/or manganese minerals, which could lower the overall quality. There are suitable treatment filters available to ameliorate these potential water quality concerns.

Groundwater in the area is classified by the Department of Environmental Protection (DEP) as GA, which means that it is suitable for private drinking water supplies without treatment.

Because of the site's existing water quality and because leakage from underground fuel storage tanks is a frequent cause of groundwater contamination in Connecticut, it is recommended that residential tanks of this nature be prohibited on the site.

8. LAKE MANAGEMENT

Cranberry Lake is a 17± acre impoundment of Peck Brook, which is a tributary of the Little River. The lake was constructed in 1964 when the Dean Family dredged and dammed an existing wetland. Cranberry Lake and its tributaries are Class A waterbodies. Class A means that the designated uses are, fish and wildlife habitat, and recreational use. The lake and its tributaries are not suitable for discharges of treated wastewater.

Recreational activity has been unorganized to date and therefore DEP Water Compliance has collected no biological or chemical data from this lake. However, the large watershed area to small lake surface area ratio of 24 to 1 (411 acre watershed, 17 acre lake surface area) indicates a high potential for fertilization of the lake from water draining through the watershed. The water quality of the lake has been protected from any introduced contaminants (sand, silt, etc.) in Peck Brook by a small pond on the east side of Cemetery Road. This pond drains into a culvert under Cemetery Road which forms a small waterfall that drains into a pool. The pond acts as a sedimentation basin, removing the suspended solids, while the pool dissipates the force created by the waterfall and reduces the potential for soil erosion. This type of watershed planning helped to preserve the water quality of the lake and should be continued to maintain desirable water quality.

The proposed Cranberry Lake subdivision composes approximately 15.5% of the Cranberry Lake drainage basin. A development that changes land use from wooded to residential is considered unfavorable when water quality is an issue. Septic systems, fertilizers, and other nutrient sources from residential areas increase phosphorous loading in receiving waterbodies which augments plant productivity (eutrophication). Additionally, runoff from stormwater sewers carries sand, silt, salt, and oil into a body of water resulting in the polluting of many ponds. The extent of degradation can be controlled by proper planning and maintenance of the subdivision.

The plans provided to the review team were lacking information pertaining to stormwater structures and maintenance. A stormwater drainage system should be developed with consideration of physical suitability, peak discharges, and targeted pollutants to be removed. Physical restrictions include topography, water table depth, depth to bedrock, proximity to foundations, space consumption, land use, sediment input, and thermal impacts. Peak discharge is calculated by the amount of precipitation during a storm with a statistical occurrence interval of a given number of years. This is then

calculated for the area which will receive the precipitation and structures should be designed accordingly. Pollutant removal should be based on the waterbody which is receiving the stormwater, in this case Cranberry Lake. Pollutants that impair lake water quality include phosphorous, nitrogen, trash, debris, and sediments.

Methods of treating stormwater include wet ponds, infiltration trenches, infiltration basins, porous pavement, grass swales, and wetlands. Each system is referred to as a best management practice or BMP when it is designed and maintained correctly. Other BMPs include various types of catch basins. If a catch basin is properly placed and maintained it will enhance the effectiveness of the previously described treatment systems. Catch basins can have sumps which allow solids to settle and a skimming mechanism to remove road oil. The plans for this subdivision are unclear as to the type of catch basin that will be used. The minimum catch basin BMP that directs water to the lake should be of the sump type. More information on stormwater management can be found in Controlling Urban Runoff: A Practical Manual For Planning and Designing Urban BMPs, Metropolitan Washington Council of Governments.

Once the water leaves the treatment system a non-erosive drainage system should be used. This may be a riprap channel, underground pipe, or grass swale. If the natural swale mentioned at the ERT field review is used as a drainage path the channel may erode as stormwater becomes more concentrated during storm events. This may result in development of a sandbar and increased turbidity within the lake.

Other areas of concern are impervious surfaces. Driveways should be constructed at a grade that will allow the use of gravel instead of pavement. This will decrease the stormwater runoff from impervious surfaces. Reducing the impervious surfaces will decrease the volume of water draining through surface drainage systems and thus decrease the potential of soil erosion.

The developer should put the stormwater management plan in report form so that commission members can clearly review the conclusions. If commission members feel they do not have the expertise to evaluate the stormwater management plan, professional guidance should be sought from the town engineer, county Soil Conservation District, or a consulting engineer with experience in this area. The cost of this service will be justified if it will prevent a costly lake restoration program.

Public Act 83-388 designates authority to municipalities to enforce soil erosion control regulations through inland wetland commissions. Strict continuous enforcement of these regulations by the towns during construction of the subdivision is essential to protecting Cranberry Lake.

Soil erosion from poorly managed construction activities have filled in sections of many lakes. Although construction is short in duration, disturbed and exposed soils are highly susceptible to erosion. These filled areas become suitable habitat for aquatic weeds by increasing shallow areas and providing a nutrient rich substrate.

Turbidity levels will increase if particulate size is sufficiently small. Small particles or colloids do not settle as quickly as larger particles such as sand. These fine particulates will remain suspended in the water column resulting in higher than background turbidity headings. This may be detrimental to aquatic organism such as fish and zooplankton.

The Inland Wetland Commission should be aware that lots abutting the lake or its tributaries, and lots with slopes greater than 15% may require additional soil protection. In order to assure that critical areas are protected, the wetland commission could request the developer to produce a map which would depict lots with these characteristics. This will serve to inform both the wetlands commission and the developer of the location of these erosion prone areas.

The conservation easement presented by the developer lacks details which should be addressed by the town for clarity and water quality protection. The initial paragraph is wordy and confusing and should be removed. A new paragraph should be added that will assure enforcement of the conservation easement.

Consideration should be given to developing a sub-committee of the home owners association, whose specific responsibilities would be to manage the lake. This sub-committee could seek the assistance of the Department of Environmental Protection, Water Compliance Unit, Lake Management Section for technical assistance (566-2588).

Particular segments of the contract which could be changed or added to the agreement which would further protect the quality of the lake are as follows:

Natural color houses such as shades of brown, blue, and green should be considered. This will give Cranberry Lake the appearance of being undeveloped.

Septic systems should be pumped once every two years.

Cleared land usually adds more phosphorous to a waterbody than land covered by natural vegetation. Therefore a restriction controlling the percentage a lot can be cleared would be beneficial to the water quality of the lake

Waste disposal procedures should be outlined so that lawn or garden debris is is not discarded near the lake or its tributaries.

Development setbacks or buffer zones should be included. A recommended buffer zone of 150 feet will help prevent soil and phosphorous from reaching the lake. Within this buffer zone no vegetation or leaf litter should be disturbed. These buffer zones should include the lake and its tributaries.

If the buffer zone recommendation is considered too restrictive, than a viewing corridor of 25 - 50 feet wide could be allowed. Although this would not be as effective as a complete buffer strip, it would allow property owners access to the lake.

Fertilization of lawns within the Cranberry Lake Subdivision should be prohibited. If fertilization of lawns is permitted soil analysis of each lawn should be conducted to determine the ratio of phosphorous to nitrogen to potassium needed given the intended use.

As mentioned previously, the committee should promote the use of porous materials for the construction of driveways. This will reduce the amount of impervious surface within the watershed which is advantages for water quality. Consideration should also be given to a restriction of driveway size and slope which would help accomplish the same objective.

Any proposal to alter the shoreline or the lake bottom should be brought before the town inland wetlands commission. These activities may be regulated by the commission and residents should be aware of this.

Restrictive agreements can be a valuable tool to manage development in lake watersheds. With restriction similar to the ones outlined property owners will enjoy increased property values due to the proper management of the lakes watershed.

When a community is involved in lake management a number of legal and technical issues can develop which will effect all members using the lake. The current plan gives ownership of the bottom of the lake to members whose property abuts the lake, while it is unclear who actually owns the rights of the water. It should be arranged so that the association owns the bottom of the lake. This will allow for less complicated and more comprehensive lake management decisions. Additionally, an agreement should be made with whomever is the owner of the water rights to assure the lake's water level will not affect the activities of the association's members.

References

DEP Water Compliance 1988
Grants to Municipalities and Lake Associations to Improve The Water Quality of Recreational Lakes Priority Rating Point System V.
Natural Trophic Tendency

DEP Water Compliance 1988
A Watershed Management Guide for CT Lakes

W.A. Norvell, C.R. Frink 1975
Water Chemistry and Fertility of
Twenty-Three Connecticut Lakes
Connecticut Agriculture Experiment Station Bulletin 759

Thomas Soueler 1987
Controlling Urban Runoff
A practical Manual For Planning and Designing of BMPs Dept. of Environmental Programs
Metropolitan Council of Governments

9. WILDLIFE RESOURCES

Wildlife Habitat Description

The area of the proposed Cranberry Lake subdivision is composed of four major habitat types; mixed hardwoods, agricultural field, wetland areas, and open water. There is a lack of vegetative diversity on the property, which limits wildlife utilization. With sparse understory cover and little presence of deadwood (snags and fallen trees) in the mixed hardwood habitat there is a lack of basic habitat requirements (i.e. food and cover) for many wildlife species. The small amount of available wetland habitat and lack of aquatic vegetation in the lake further limits wildlife use.

Mixed hardwoods occupy most of the property south of the lake and north of the cemetery. The overstory is dominated by black birch, gray birch, beech, and red oak There is little understory cover in many areas. Dominant vegetation consists of viburnum spp, witchhazel, beech and birch seedlings, beaked hazelnut, highbush blueberry, and mountain laurel. Ground cover is sparse and consists primarily of club moss spp and Christmas ferns.

The open field areas consist of a hay field located south of the cemetery adjacent to Cemetery Road. Another open area exists north of the cemetery extending west toward the lake. Open fields provide habitat for field dwelling mammals and provide an abundance of insects for foraging songbirds during spring, summer, and fall.

There are two small wetlands located on the property. Peck Brook flows into the lake just south of the cemetery. Overstory vegetation along the brook and the associated wetland is dominated by red maple. Understory vegetation consists of spicebush, sweet pepperbush, arrowwood, ironwood, and Vitas spp. Ground vegetation is sparse and consists of skunk cabbage, and a variety of sedges, ferns, mosses and grasses. Some cordwood cutting has taken place in this wetland. Vegetation is regenerating, but there are remaining tire ruts and one brook crossing. Further disturbances to wetlands should be discouraged. A seasonal brook originates at the western corner of the hay field and flows west into Peck Brook carrying runoff from upland areas. A small meadow type wetland with some open water exists north of the cemetery. Some cat-tail growth exists in open water areas and a variety of grasses and sedges occupy the seasonally wet areas.

Open water habitat consists of Cranberry Lake. Vegetation growth surrounding the lake is dominated by spirea spp, sweet pepperbush, sensitive fern, and a variety of grasses, mosses, and sedges. The shoreline is open throughout most of the lake. A planted grove of hemlock, scotch pine, and spruce exists along the southern shore. The adjacent pasture to the west provides an abundance of forage for numerous geese the utilize the lake in the fall. The lack of aquatic vegetation within the lake limits use by other waterfowl except as a rest area during migration.

Wildlife Species

Mammalian species inhabiting or utilizing the area include grey squirrels, white-tailed deer, raccoons and a variety of other small mammals.

Bird species observed utilizing the area included downy woodpeckers, black-capped chickadees, and a red-tailed hawk. A number of Canada geese were observed on the lake.

The existence of the lake and small amount of wetlands provides habitat for amphibians and reptiles.

Impacts of Development on Wildlife

As the preliminary plans indicate, development will occur in the mixed hardwood and open field habitats. This will result in fragmentation and elimination of these habitat types which will in turn reduce species diversity and richness. Species that are intolerant of human disturbance will be forced to emigrate into adjacent habitat. Species dispersion into adjacent habitats may result in competition with species already occupying the area, decreasing survivability. Species more tolerant to man such as starlings, robins, house sparrows, and raccoons may increase in number and become a nuisance.

The proposed discharge of stormwater into Cranberry Lake and the wetland associated with Peck Brook may have negative impacts on invertebrates, amphibians, and reptiles due to increased pollution, sedimentation, and water levels (Campbell 1973). The use of riprap plunge pools and staked hay bales will help reduce water flow and filter out heavy sediments, but will allow fine silt and pollutants to enter wetlands. The use of grass

drainage swails will help reduce sedimentation, but may be ineffective during periods of heavy precipitation.

Mitigation of Impacts of Development on Wildlife

Several measures can be taken to minimize impacts of development on wildlife. It would be beneficial to wildlife if the proposed 100 foot buffer surrounding the lake included adjacent wetlands. Owners of lots with easements containing lake frontage should be discouraged from any removal of vegetation or application of fertilizer within the buffer. Areas along the shoreline that have been cleared (i.e. south shore) should be allowed to revegetate to discourage geese. A cleared grassy shore will attract geese and create nuisance problems. The Association should also discourage any feeding of geese. Owners of lots containing wetlands should be discouraged from any removal of vegetation within 100 feet of wetlands. This buffer will help protect wetlands from sedimentation and provide travel corridors for a number of wildlife species.

Since many of the proposed building lots in forested areas are 2+ acres in size, as much of each lot as possible should be left wooded. This would reduce vegetation removal, habitat destruction, and be more aesthetically pleasing for the residents of the development.

Owners of lots in open field areas should be encouraged to plant tree and shrub species that are utilized by wildlife. To attract birds, a variety of plants are needed that are fairly small, bear fruit and have thorns (Geis 1986).

Literature Cited

Campbell, C.A. 1973. Survival of reptiles and amphibians in urban environments. Pages 61-66. in (Wildlife In An Urbanizing Environment). Proc. symp. Nov.27-29, 1973, Springfield, Mass. Coop. Extn. Serv., Univ. of Mass., U.S. Dep. Agric., Cnty. Serv. 182pp.

Geis, A.D. 1986. Wildlife habitat considerations in Columbia, Maryland and vicinity. Pages 97-99. in (Wildlife Conservation and New Residential Development). Proc. symp. Jan. 20-22, 1986, Tuscan, Ariz., Estes Co., Cottonwood Prop., Nat. Wildl. Fed. 203pp.

10. FISH RESOURCES

Site Description

A. Proposed Development Location - The proposed subdivision will surround the southeastern portion of Cranberry Lake, the primary surface hydrological feature of fisheries concern in the immediate area. A total of 21 buildings lots, minimum size 80,000 square feet are proposed. All residential lots will be served by on-site water and sewage disposal. Surface drainage from the sloping lands that characterize this property will ultimately drain into the lake. Consequently, development at this location will have to be carefully planned to avert man-induced water pollution inputs to the lake and surrounding streams.

B. Cranberry Lake - Cranberry Lake, approximately 17 acres in size, is an impoundment of Peck Brook. The lake's watershed is characterized by agricultural and forest lands. No detailed limnological data exists for this water body. Surface waters of the lake are classified by the Department of Environmental Protection (DEP) as "Class A". Designated uses for this classification are: potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply, and other legitimate uses. The lake appears to be shallow with a very extensive (greater than 40 feet in width) littoral zone. The littoral zone is the shallow interface between land and open water of lakes. This zone appears to contain minimal amounts of rooted aquatic vegetation. Bottom type is a sand/silt mixture. The headwaters of Peck Brook appear to be intermittent in nature. Average width is 6 feet. It contains mainly shallow riffle habitat with some pools. Upper reaches of riffles are commonly used as feeding areas by fish since aquatic insects, their primary food source, reside in these areas, conversely, pools are used by fish for hiding and resting areas. Bottom substrate is mainly comprised of cobble and gravel.

Fish Populations

Cranberry Lake's fish population has not been sampled, but the lake would be expected to support a variety of warmwater fish species including largemouth bass, chain

pickerel, yellow perch, brown bullhead, bluegill sunfish, pumpkinseed sunfish and golden shiner. Apparently, the pond has been stocked with trout in the past. Peck Brook would be expected to support blacknose dace, white sucker, and fallfish populations.

Impacts

The following impacts of the subdivision on Cranberry Lake and Peck Brook can be expected if proper mitigation measures are not implemented:

1. **Construction site soil erosion and sedimentation on the lake and Peck Brook through increased runoff from unvegetated areas:** devegetation of sloped land that drains into the lake presents a situation conducive to the development of serious soil erosion problems. Erosion and sedimentation due to residential housing construction has long been regarded as a major stimulus in the lake eutrophication or aging process. Silt is considered a serious pollutant. Lake eutrophication can be accelerated by excessive erosion and sedimentation and seriously impact resident fishes, water quality, and overall lake recreational value. In particular, excessive siltation of Cranberry Lake will:

   * Reduce the amount of usable fish habitat used for spawning purposes - preferred substrate that becomes compacted with silt is no longer available for spawning. Fish will be forced to disperse to other areas not affected by siltation.

   * Reduce fish egg survival - water free of sediment particles is required for egg respiration (biological process of extracting oxygen from water) and successful hatching. Silt deposits will smother eggs.

   * Reduce aquatic insect production - sediment-free water is also required for successful aquatic insect egg respiration and hatching. Aquatic insects are the primary food source of young and adult fishes. Reduced insect levels will adversely affect fish growth during their early growth period. Ultimately, this will lead to reduced growth rates and negatively impact fish survival.

   * Reduce water depth within the lake - this occurrence will result in a further reduction of usable fish habitat.

* Contribute to the depletion of oxygen - organic matter associated with soil particles is decomposed by micro organisms contributing to the depletion of oxygen in waters overlying sediments.

* Adversely affect "gill" function and impair feeding activities - studies have documented that high sediment concentrations and turbidity will disturb fish respiration and gill function.

* Encourage the growth and survival of rooted aquatic plants along the lake shoreline and precipitate dense "algae blooms" - eroded soils contain plant nutrients such as nitrates and phosphates. Although these plants require nutrients for growth, most lakes and streams contain very limited amounts. Consequently, these nutrients act as fertilizers once they are introduced into a aquatic habitats resulting in accelerated plant growth. Extensive algae blooms may turn the water a pea-soup or soupy brown color. Fish kills due to oxygen depletion in the summer called "summerkill" may occur in lakes when algae populations die. Dead algae are rapidly decomposed by bacteria in the summer sometimes causing low oxygen levels. Unfortunately, summer lake dissolved oxygen levels are naturally at their lowest and the introduction of nutrients can only serve to make a bad situation critical.

2. **Percolation of septic effluents into Cranberry Lake:** a failure of individual septic systems to operate properly is potentially dangerous to aquatic habitats. Nutrients and assorted chemicals that may be placed in septic systems could enter surface waters in the event of a failure or possible infiltrate groundwater, especially when water tables are seasonally close to the surface. The introduction of septic effluent could result in a major threat to fish, public health, and overall water quality conditions. Effluent will stimulate the growth of rooted nuisance aquatic weeds along a lake shoreline and stimulate nuisance unicellular algae blooms. Septic tank leachate can rapidly accelerate the lake eutrophication process.

3. **Water quality and habitat degradation due to the influx of stormwater drainage from nearby residential housing:** stormwaters can contain a variety of pollutants that are detrimental to aquatic organisms and their habitat.

Pollutants commonly found in stormwaters are: hydrocarbons (gasoline and oil), herbicides, heavy metals, road salt, fine silts, and coarse sediment. Once introduced into the lake, stormwater runoff will accelerate the lake eutrophication process and lead to degraded water quality. Spilled petroleum based chemicals or other toxicants can precipitate partial or complete fishkills.

4. **Transport of lawn fertilizers and chemicals to the lake:** runoff and leaching of nutrients from fertilizers placed on lawns can stimulate nuisance aquatic weed growth and help precipitate algae blooms. The introduction of nutrients will accelerate the lake eutrophication process. Introduction of lawn chemicals may result in fish kills and water quality degradation.

5. **Impacts to downstream environments:** any water quality problems and habitat degradation that directly occurs within Cranberry Lake and its outlet stream will eventually be observed in downstream areas such as the Little River. The Little River is annually stocked by the Bureau of Fisheries with more than 5,000 adult brook, brown, and rainbow trout. It is considered one of the better trout streams in Eastern Connecticut. Nutrient enrichment of the Little River can result in the creation of sediment accumulation, nuisance amounts of aquatic vegetation, and increased production of microorganisms that cause fish disease.

Recommendations

Impacts on Cranberry Lake and Peck Brook may be somewhat reduced by implementing the following recommendations:

1. **Install and maintain proper erosion and sedimentation controls during site construction activities:** this includes such mitigative measures as silt fences and staked hay bales. Only small areas of soil should be exposed at one time and these areas should be reseeded as soon as possible. If this development is approved, the Town of Canterbury should have an appointed official that would be responsible for inspecting this development on a **daily** basis to ensure that contractors have complied with all stipulated mitigation devices. Past lake siltation disturbances in Connecticut associated with residential housing developments have occurred when individual contractors either improperly deployed mitigation devices or failed to maintain these devices on a regular basis.

2. **Maintain at the minimum a 100 foot open space buffer zone along the edge of Cranberry Lake and wetlands associated with Peck Brook:** no construction or alteration of natural vegetative habitat should be allowed in this zone. Research has shown that 100 foot buffer zones help prevent damage to aquatic ecosystems that support diverse fish and aquatic insect life (USFWS 1984; USFWS 1986; ODFW 1985). These buffers will absorb surface runoff and other pollutants before they can enter wetlands and aquatic habitats.

3. **The developer should submit a detailed stormwater management plan for town review:** The effective management of stormwaters and roadway runoff can only be accomplished through proper design, location, and maintenance of catch basins. Stormwaters should only be outletted into non-wetland habitat; thus, avoiding initial and direct contact with wetlands. Maintenance of catch basins is very critical. Roadway catch basins should be regularly maintained to minimize adverse impacts to lake and wetland habitats. The use of road salt to deice roads should be prohibited.

4. **Properly design and locate individual septic systems (refer to sewage disposal section for specific recommendations):** the addition of septic effluent to Cranberry Lake can lead to accelerated eutrophication. All septic systems should be maintained on a regular basis. Prevent the disposal of harmful chemicals into septic systems which may negatively effect operation and possibly result in system failure.

5. **Limit liming, fertilization, and the introduction of chemicals to subdivision lawns:** this will help abate the amount of additional nutrients to the lake and stream environments. Non-phosphorus lawn fertilizers are currently available from various lawn care distribution centers.

Bibliography

ODFW (Oregon Department of Fish and Wildlife) 1985. The Effects of Stream Alterations on Salmon and Trout Habitat in Oregon. Oregon Department of Fish and Wildlife, Portland, Oregon.70 pp.

USFWS (United States Fish and Wildlife Service) 1984. Habitat Suitability Information: Rainbow Trout. United States Fish and Wildlife Service, Biological Report FWS/OBS-82(10.124). 64 pp.

USFWS (United States Fish and Wildlife Service) 1986. Habitat Suitability Index Models and Instream Flow Suitability Curves: Brown Trout. United States Fish and Wildlife Service, Biological Report FWS/OBS-82/(10.60). 65 pp.

11. ARCHAEOLOGICAL REVIEW

The State Historic Preservation Office notes that the Woodchuck Hill Burying Ground is located in the midst of the project area. The chief interest of this late 18th century burying ground is the large and varied number of stones of the Walden-Loomis style. It is recommended that no house construction occur within two hundred feet of the cemetery. Previous studies have demonstrated that burials may have been placed outside the stone walling. To ensure the preservation of these possible burials, either an archaeological survey of the area be conducted, or, a significant historic preservation buffer be established around the cemetery. The Office of State Archaeologist recommends at least two hundred feet.

A review of the State of Connecticut's Archaeological Site Files and Maps indicate no prehistoric sites in the project area. The project area would appear to have low to moderate potential for Native American cultural resources. Although there are significant natural wetlands, Cranberry Lake appears to be man-made and some related ground disturbance has occurred.

Two 18th-century residences located on Cemetery Road are of local historic and architectural interest. However, these are located (See map) a significant distance from the proposed development area.

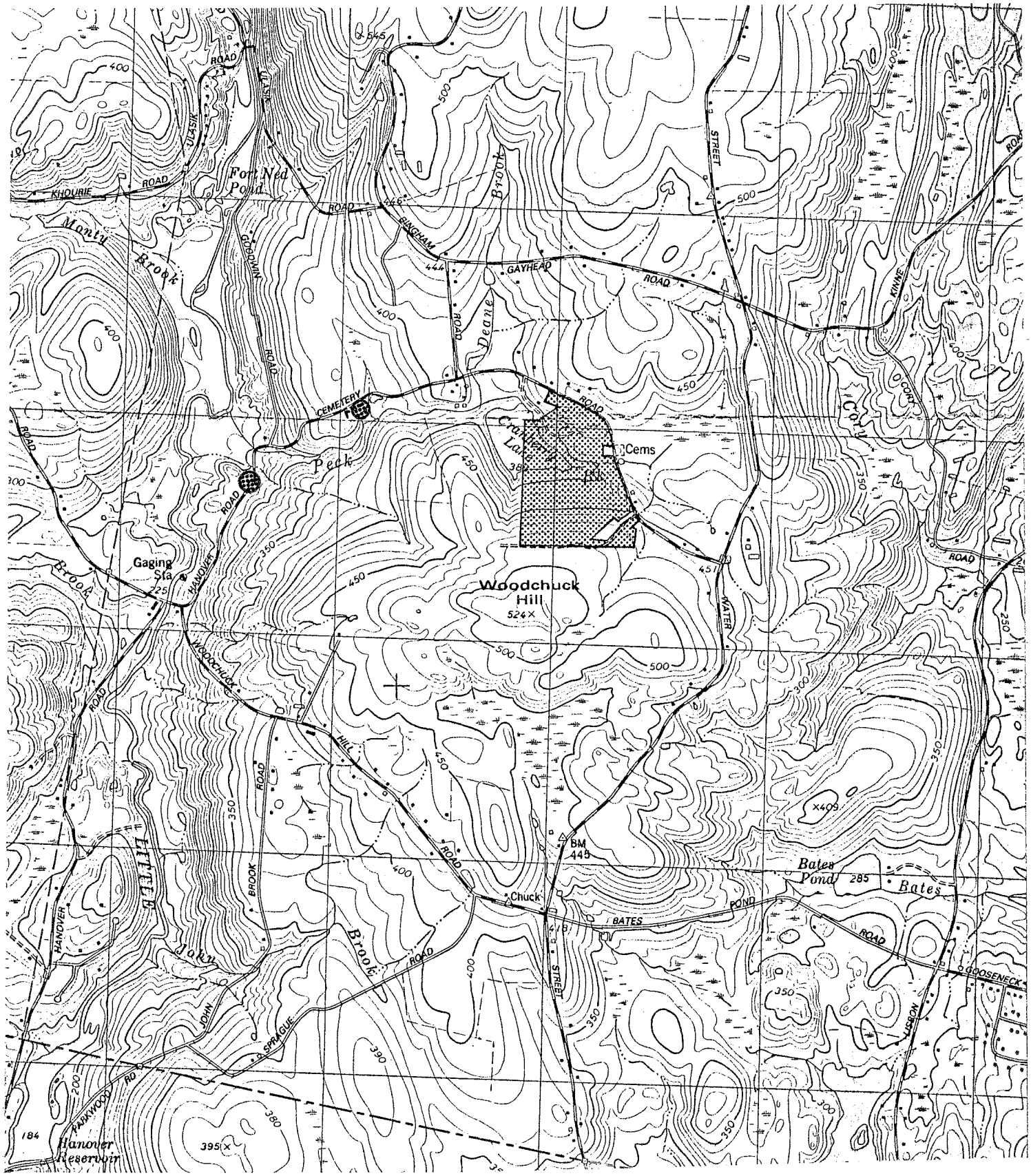
In summary, the location of the Woodchuck Hill Burying Ground in the midst of the development project requires the establishment of an extensive buffer around the cemetery, or, an archaeological survey to determine the extent of the cemetery. We cannot assume that all the burials took place within the stone enclosure. The project area has a low to moderate potential for prehistoric archaeological sites. Should an archaeological survey of the burying ground boundaries be desired, all studies should be undertaken in accordance with the Connecticut Historical Commission's Environmental Review Primer for Connecticut's Archaeological Resources.

HISTORIC INTEREST

Site

Houses of Historic Interest

Scale 1" = 2000'



ABOUT THE TEAM

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

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

PURPOSE OF THE TEAM

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

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

REQUESTING A REVIEW

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

For additional information and request forms regarding the Environmental Review Team please contact the ERT Coordinator: **203-345-3977, Eastern Connecticut RC&D Area, P.O. Box 70, Haddam, Connecticut 06438.**