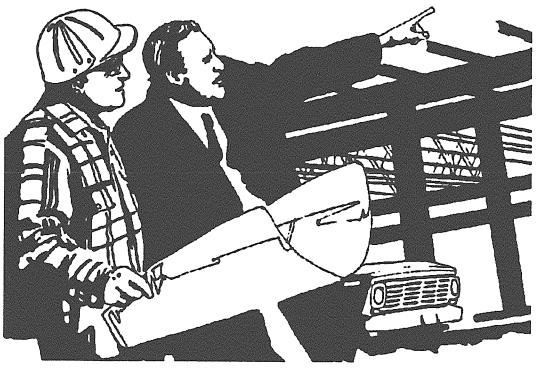
KING'S MARK
ENVIRONMENTAL REVIEW TEAM
REPORT

MUNICIPAL INDUSTRIAL PARK



Watertown, Connecticut

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

MUNICIPAL INDUSTRIAL PARK

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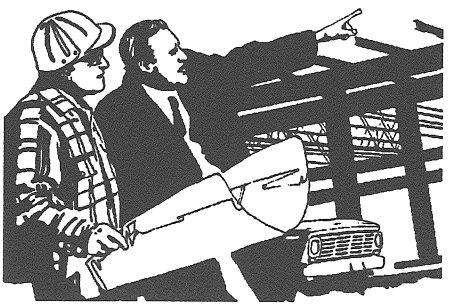

Environmental Review Team Report

January 1995

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

Haddam and Wallingford, Connecticut

for the
Watertown Economic Development Commission

This report is not meant to compete with private consultants by supplying site designs or detailed solutions to development problems. 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 Commission and the Town. The results of the Team action are oriented toward the development of a better environmental quality and long-term economics of the land use. The opinions contained herein are those of the individual Team members and do not necessarily represent the views of any regulatory agency with which they may be employed.

Acknowledgements

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

James Andrini	Transportation Planner CT DOT - Bureau of Policy and Planning
Patti Callahan	Soil Conservationist USDA - Natural Resources Conservation Service
Doug Hoskins	Environmental Analyst II CT DEP - Inland Water Resources Division
Stacey Kingsbury	Environmental Analyst CT DEP - NRC, Natural Diversity Data Base
Virginia Mason	Regional Planner Council of Governments of the Central Naugatuck Valley
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Mildred Powell	Geologist UCONN - Department of Geology and Geophysics
Larry Rousseau	Forester CT DEP - Western District

I would also like to thank Armand Derouin, chairman of the Watertown Economic Development Commission, John Salamone, town manager, Stanley Masayda, town planner and zoning enforcement officer, Mary Greene, assistant zoning enforcement officer, and Phillip Deleppo, director of public works for their cooperation and assistance during this environmental review.

Executive Summary

Introduction

An environmental review was requested by the Watertown Economic Development Commission for review of a proposed municipal industrial park.

The ±110 acre site is located along Echo Lake Road and Route 262 (Frost Bridge Road) in the northeast corner of town. Based on a preliminary estimate by the Town 40 to 50 lots could be developed. A more detailed evaluation of the site will allow for development of final project boundaries and highlight areas of limitations and concerns.

The review process consisted of an inventory of the site's natural resources, assessment of these resources, identification of resource problem areas and presentation of planning, management and land use guidelines.

Geology

The bedrock in the study area consists of layers of schist and gneiss, with knobs and lenses of granitic gneiss. Surficial material covering the site is bedrock or thin till. Bedrock is very close to the surface over much of the area, and bedrock outcrops are visible in several locations.

Topography and Hydrology

The terrain is uneven, with higher areas exhibiting bedrock and lower areas showing possible poor drainage with bedrock close to the surface. There may be the need for blasting to install foundations on some of the lots.

The slope of the site varies greatly. Some lots are fairly level (such as #26 and #42, while others are very steep (Lot #29 shows an 18% slope) and some lots in the southern portion are extremely steep showing 48% slopes. The Town may want to re-examine the lot lines to make sure that all the lots have enough buildable area to be attractive to industry.

Due to extensive bedrock outcrops and wetlands and the possibility of 60% of a lot being covered by buildings or pavement the Town may want to consider an overall stormwater management plan for the industrial park to handle runoff.

Soil Resources

A major portion of the site is made up of the soil type HxC, Hollis extremely rocky fine sandy loam, 3 to 15 percent slopes and HxE, Hollis extremely rocky fine sandy loam, 15 to 35 percent slopes. Stoniness and depth to bedrock are the most severe limitations to development. Areas rated with severe limitations would require the most costly and extensive measures to overcome

the natural soil limitations. In most places bedrock outcrops make up 5 to 50 percent of the land surface, and an area in the southeast has a designation describing it as more than 50 percent exposed bedrock (this area does not show a building lot). The most stony areas should be left in native vegetation to protect against erosion, and it would be very difficult to establish lawns, trees and shrubs on these shallow to bedrock soils. Limitations for roads and parking areas are also severe. The cost of establishing roads may be costly due to the need to blast to establish proper grades. Blasting may also be necessary for construction of foundations, and footing drains would be helpful to intercept seepage along the bedrock. Test pits should be dug to determine where pockets of deep soils may be found and then buildings could be located accordingly.

Road "A" on the proposed layout is shown to be very close to or within a to a wetland boundary, by moving it eastward toward Lot #47, it may be out of the wetland boundary. Lot #49 appears to contain
a major portion of wetland soil types so that it may not have enough room for a building and parking area without disturbing wetlands.

Increased runoff contributions to wetlands and streams needs to be evaluated to determine if there is a need for detention. Suitable areas for detention do exist.

An erosion and sediment control plan should be developed for this property with the objective of disturbing as little of the areas as possible and keeping sediment on the property and away from wetlands and watercourses.

Wetland Resources

Turkey Brook is located along the northeast border of the project site and the Litchfield County Soil Survey shows a small, linear band of inland wetland soil associated with it. Turkey Brook is rated as a Class B/A surface water, and the groundwater in the area is rated as Class GB.

Several additional areas of inland wetlands were observed in the field (delineated in the field by blue flagging). All of the wetland areas observed are classified as palustrine/forested wetlands, with areas of palustrine schrub-scrub located in the northwestern portion of the site (wetland #1). Wetland area #2 is located on the east side of the main access road in the southwest portion of the study area. Wetland area #3 is located in the middle of the parcel and is an unusual arrangement for a forested wetland in Connecticut. Wetland area #4 located between and slightly to the south of wetlands #2 and #3 is a possible wetland area and should be confirmed through field investigation. Total wetland area on the parcel (excluding the main branch of Turkey Brook) is approximately 3.1 acres.

The primary functions of the wetlands include flood control and wildlife habitat. Secondary values may include water quality improvement and forestry potential. Isolated wetlands surrounded by undeveloped upland habitats such as these provide a significant diversification of wildlife to the area. In a limited fashion, this study area could be considered an extension of the preserved habitats of the Mattatuck State Forest located across Echo Lake Road.

As currently proposed the project has several direct impacts to existing wetlands. Construction of Road "A" as it crosses wetland #1 would require filling of regulated wetland areas and it may also directly impact wetland #2 as result of the need for fill for widening the road. Construction on lots #45, #46, and #49 may also require filling of wetlands. Depending on the exact location of wetland #3, construction on lots #23, #24, #25, and #26 will need careful arrangement to avoid direct impacts to wetlands. Lot #15 may also impact on wetland #4, depending on its exact location.

Recommendations include:

1) Determine the existence of existing wetland delineation maps performed by a certified soil scientist. These would provide the most accurate detailed information concerning the location and type of wetland soils on the site, and they may provide more accurate topographic information.

2) Re-route Road "A" north of its intersection with Road "B" to avoid wetland impacts to wetland #1. Commit lots #45, #46 and #49 to open space to protect the integrity of wetland #1.

3) Direct impacts to wetland #2 may be unavoidable, however, restoration of the wetland #1 crossing may compensate for this loss.

4) Development of lot#26 may involve direct impacts to wetland #3.

5) If this project will impact more than 1 acre of wetlands it will require an Individual Permit from the U.S. Corps of Engineers and a Water Quality Certification (WQC) from the CT DEP. If this project will only impact .5 to 1 acre of wetlands a WQC must be obtained from the CT DEP.

6) Maintain drainage through lots #13, #8 and #7 which most likely contribute flow to wetland #2.

7) An adequate upland buffer area should be maintained around all wetland areas, as well as Turkey Brook. A minimum of 50 feet and preferably a distance of 100 feet is recommended. It would also be worthwhile to consider creating a conservation easement along Turkey Brook to permanently preserve any wildlife corridor attributes.

8) Due to location within the watershed, it may be wise to maintain a 0% increase in storm water runoff emanating from this site. This approach should ultimately be confirmed through a detailed hydrology/hydraulics study of pre- and post-development conditions, as well as downstream hydrology studies. Any required detention/retention basins should be located outside of existing wetlands. Requiring a certain amount of non-pervious open space on each lot would allow for stormwater infiltration to take place throughout the study area. Natural, non-landscaped open space would allow for even more infiltration/storage throughout the site. Minimum road widths would also reduce storm water quantities.

9) Reduction of storm water runoff amounts through storm water infiltration practices would be difficult due to the types of soil present, however, storm water quality may be improved through the use of Best Management Practices (i.e. grass lined swales and/or wet detention basins).

10) If this project is not phased, and construction activities covering 5 acres or more are approved, the applicant is required to apply to CT DEP for a general permit for the discharge of stormwater under the National Pollutant Discharge Elimination System (NPDES) program.

The Natural Diversity Data Base

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

Fisheries Resources

Approximately 1500 feet of Turkey Brook and an unnamed tributary stream are located on the project site. They may be classified as coldwater stream resources. Substrate of the streams consists of cobble, gravel and coarse sand. Dense growths of hardwoods and woody shrubs predominate as riparian vegetation and provide the streams a nearly complete canopy. Physical instream habitat is provided by undercut banks and fallen woody debris.

Formal fisheries resource inventories of Turkey Brook or the unnamed tributary have never been conducted. However, based upon similar streams in nearby watersheds, it is anticipated that Turkey Brook and its tributary contain an assemblage of brook trout, blacknose dace, longnose dace, and tessellated darter.

Development of the Watertown Industrial Park has the potential to adversely impact the fisheries resources of Turkey Brook and its unnamed tributary if mitigative measures are not implemented. Anticipated impacts include: soil erosion and sedimentation, stormwater drainage releasing pollutants, removal of riparian vegetation, nutrient enrichment stimulating aquatic plant growth, herbicide runoff resulting in fish kills and water quality degradation.

Recommendations to be considered to mitigate potential impacts include:

1) maintain a 100 foot open space buffer along the developments closest encroachment to all perennial streamcourses and 50 feet along intermittent watercourses. Alteration of riparian habitat should not be allowed in these areas.

2) Establish a comprehensive erosion and sediment control plan.

3) Design an effective stormwater management system.

4) Limit any permitted activities adjacent to riparian buffers to historic low flow precipitation periods.

5) Limit liming, fertilizing and the introduction of chemicals to developed land susceptible to runoff into watercourses.

Vegetation

The vegetation types for this parcel may be divided into 4 groups: old field, mixed hardwood on steep slopes, forested wetland and mixed hardwoods. Most of the property is heavily wooded with common tree species, which include red maple, sugar maple, black birch, aspen, hickory, black oak, chestnut oak, white oak, red oak, white ash and black locust. The economic value of the wood is low to moderate. The other values of the forest include aesthetics, stormwater capacity and diverse wildlife habitat.

Windthrow is a potential hazard in the wetland soils areas, light thinnings of trees in these areas may help to improve the stability of the remaining trees. Openings and clearings in and along wetland areas should be avoided. These soils are sensitive to disturbance and alterations that change the water table or restrict natural drainage which may have a negative impact on vegetation, and significant changes can cause widespread plant mortality.

The development of a municipal industrial park will have a significant impact on the present vegetation. Overall concern should be for maintaining and enhancing the vegetation that can remain. The retention of individual trees and clumps of trees and shrubs should be made part of the final site plan. The trees and shrubs should be identified and marked on the ground to ensure retention and protection.

An improvement thinning (removing unhealthy trees) would be beneficial to allow more sunlight, nutrients and water to get to the healthier trees. The thinning is designed to allow the residual trees to improve in health vigor, quality and stability. When done properly these thinnings can also improve the aesthetics of an area, the wildlife habitat and provide wood products. Any thinnings should take into consideration the value of the wood products. A public service forester or a private consulting forester may be of assistance in either the planning or the marketing of wood products.

Planning Comments

In 1993 the Regional Planning Commission voted that the proposed industrial park proposal was in compliance with the Regional Plan of Development. Although the 1978 Regional Plan of Development had labeled this area as a "natural area" it was felt by the staff of the Council of Governments of the Central Naugatuck Valley (COGCNV) and the Regional Planning Commission that the proposal did meet a goal of the Economic Development Element of the Plan for expansion of economic activities in the Region and that the extension of utilities to the site favored development of the site. The staff of (COGCNV) still agrees with the Regional Planning Commission finding. The excellent highway access, compatible surrounding land uses along with local support of the proposed use justify approval of the proposal.

Transportation Review

The project site is an ideal location for either light industrial or manufacturing use. Access to the site is from Route 262, Echo Lake Road and Route 8. Route 262 would provide the safest and most efficient access to the site. Some minor modifications to Route 262 and Echo Lake Road might be required for the site drive and utility/drainage work, and some ramp lane turnout work at Route 262 and Echo Lake Road. Route 262 has sufficient capacity to handle any new traffic generated by this proposal. Based on the overall review this site is consistent with the town's development plans.

Table of Contents

Introduction

An environmental review was requested by the Watertown Economic Development Commission for a proposed municipal industrial park.

The proposed site of approximately ±110 acres is located in the northeast corner of town generally bounded by Echo Lake Road and Route 262 (Frost Bridge Road).The property is currently owned by several private landowners, and the final project boundaries would be determined by further site testing and analysis. The Town estimates that 40-50 two acre minimum size lots could be obtained based on preliminary analysis. Adjacent land uses include junkyards and industrial/business buildings.

The purpose of the ERT is to further evaluate the site's potential for a large industrial park. Issues discussed include natural restrictions and constraints to development, wetland and fisheries resources, forestry management, traffic access and site design.

The Environmental Review Team Process

Through the efforts of the Town of Watertown and the King's Mark ERT, this environmental review and report was prepared for the town. This report primarily provides a description of the on-site natural resources and presents planning, management and land use guidelines. The review process consisted of 4 phases:

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

The data collection phase involved both literature and field research. The ERT field review took place on October 5, 1994. Mapped data or technical reports were also perused, and specific information concerning the property was collected. Being on-site allowed some Team members to verify information and identify other resources.

Once Team members had assimilated an adequate data base, they were able to analyze and interpret their findings. Results of this analysis enabled Team members to arrive at an informed assessment of the property's natural resource opportunities and limitations. Individual Team members then prepared and submitted their reports to the ERT coordinator for compilation into the final ERT report.

LOCATION MAP

Scale 1" = 2000'

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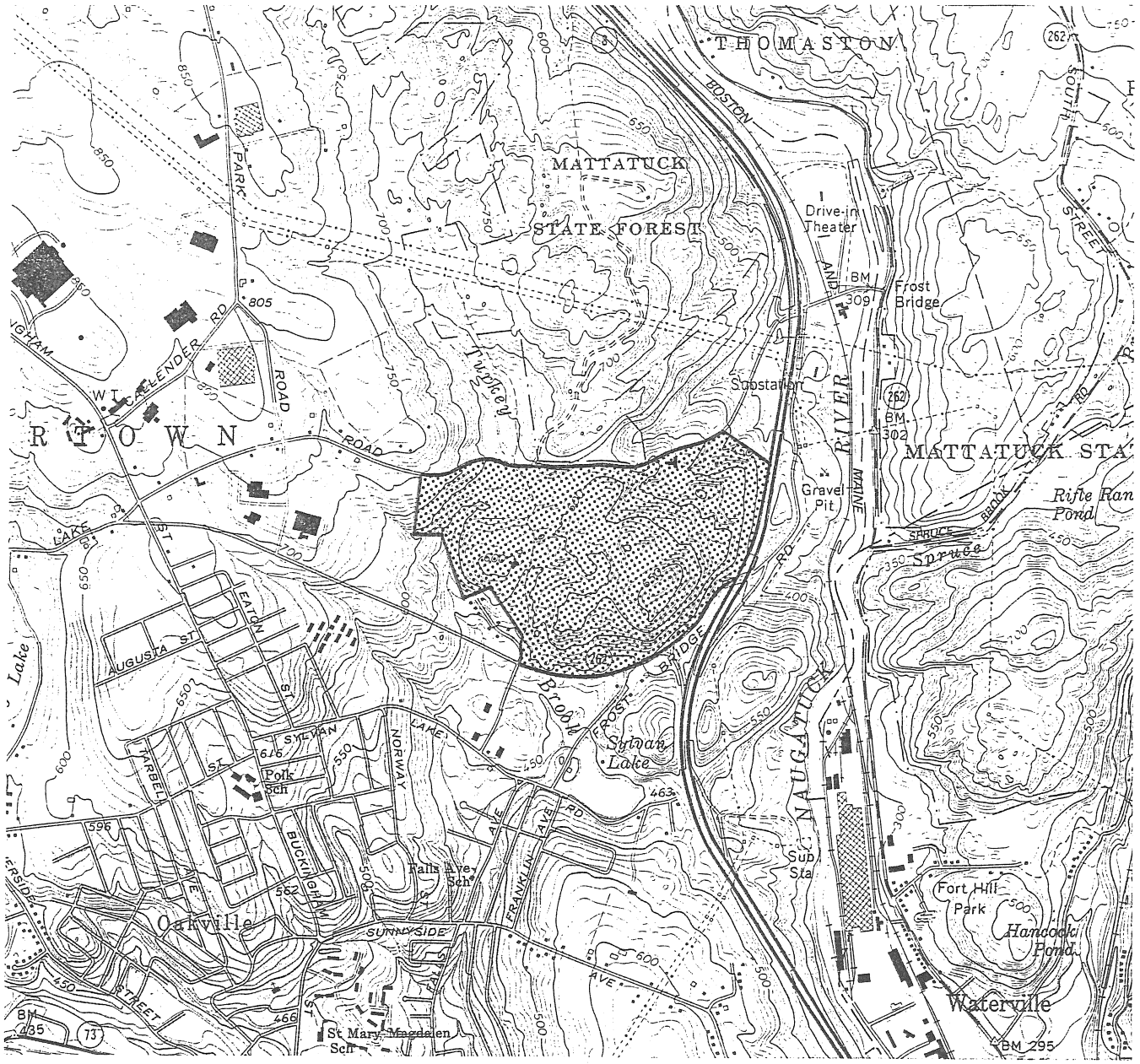
Approximate Site



Geology

The bedrock consists of layers of schist and gneiss, with knobs and lenses of granitic gneiss. The most detailed map of the area is by Gates and Martin (1967). *The Connecticut Bedrock Geologic Map* (Rogers, 1985) shows the same rock types, but different formation names, based on an unpublished master's thesis at Yale University. These differences are probably not important for our purposes, since the reported lithologies and structures are similar in both maps. According to the more recent map (Rogers, 1985), the rocks range from Ordovician to Devonian in age, approximately 480 million to 400 million years old. The rocks have been folded, but both sides of the fold dip at the same angle. The foliation, or plane of weakness, of the rocks dips at about a 35° angle to the northeast.

Glacial debris covering the study area is not extensive. For the most part, the surficial material is bedrock or thin till. The 1967 map shows extensive areas of outcrop in the study area, totaling up to 30% in some parts. During our site visit, outcrops were evident in several locations. Test pits taken during a previous study of the area show shallow (less than 5-10 foot) refusals in many test pits. This is another indication that the bedrock is close to the surface.

Topography and Hydrology

Examination of aerial photos shows uneven terrain, with higher areas consisting of bedrock, and lower areas showing possible poor drainage, with bedrock close to the surface. Depending on the requirements for an individual builder or company, blasting may be required to install adequate foundations for buildings on some lots.

The slope of the area varies greatly. It is fairly level on some of the planned lots, such as lots #26 and #42. Other lots, such as lot #29, show an 18% (10°) slope throughout their area. Slopes at the

southern and southwestern margin are very steep - up to 48% (25°). Most of the steepest slopes are in lot #27, which is larger to accommodate the uneven terrain. The town may wish to re-examine its planned lot lines to make sure that each lot has enough buildable land to be attractive to industry.

Given the amount of bedrock close to the surface in the study area, groundwater flow is probably controlled by fractures in bedrock. In the areas between outcrops, drainage appears to be poor. During the site visit, it appeared that wetlands were more extensive than the town had previously realized. Because of the topography, much of the area shows little evidence of channelization of runoff. If 60% of the terrain is to be covered with buildings or pavement, the theoretical maximum for industrial zoning, the drainage patterns will undoubtedly be altered. While individual building plans may be expected to provide for methods to handle increased runoff, it may be desirable for the town to include overall plans for the additional runoff that can be expected.

References

Gates, R.M., and Martin, C. W., 1967. *The Bedrock Geology of the Waterbury Quadrangle*, Conn. Geol. Nat. History Survey Quad. Rept. 22, 36p, map.

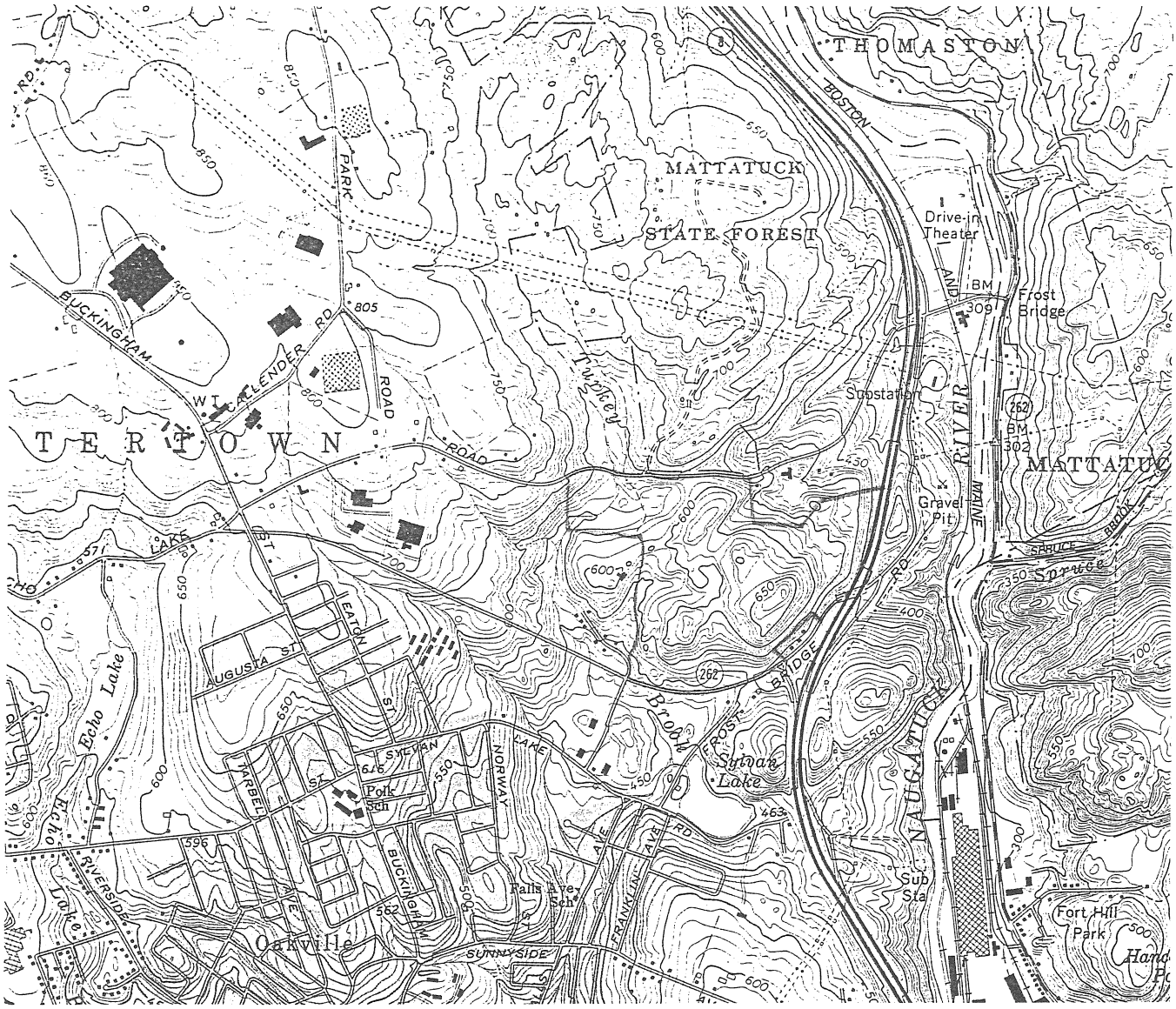
Rogers, John, 1985. *Bedrock Geological Map of Connecticut*, Connecticut Natural Resources Atlas Series, Connecticut Geological and Natural History Survey.

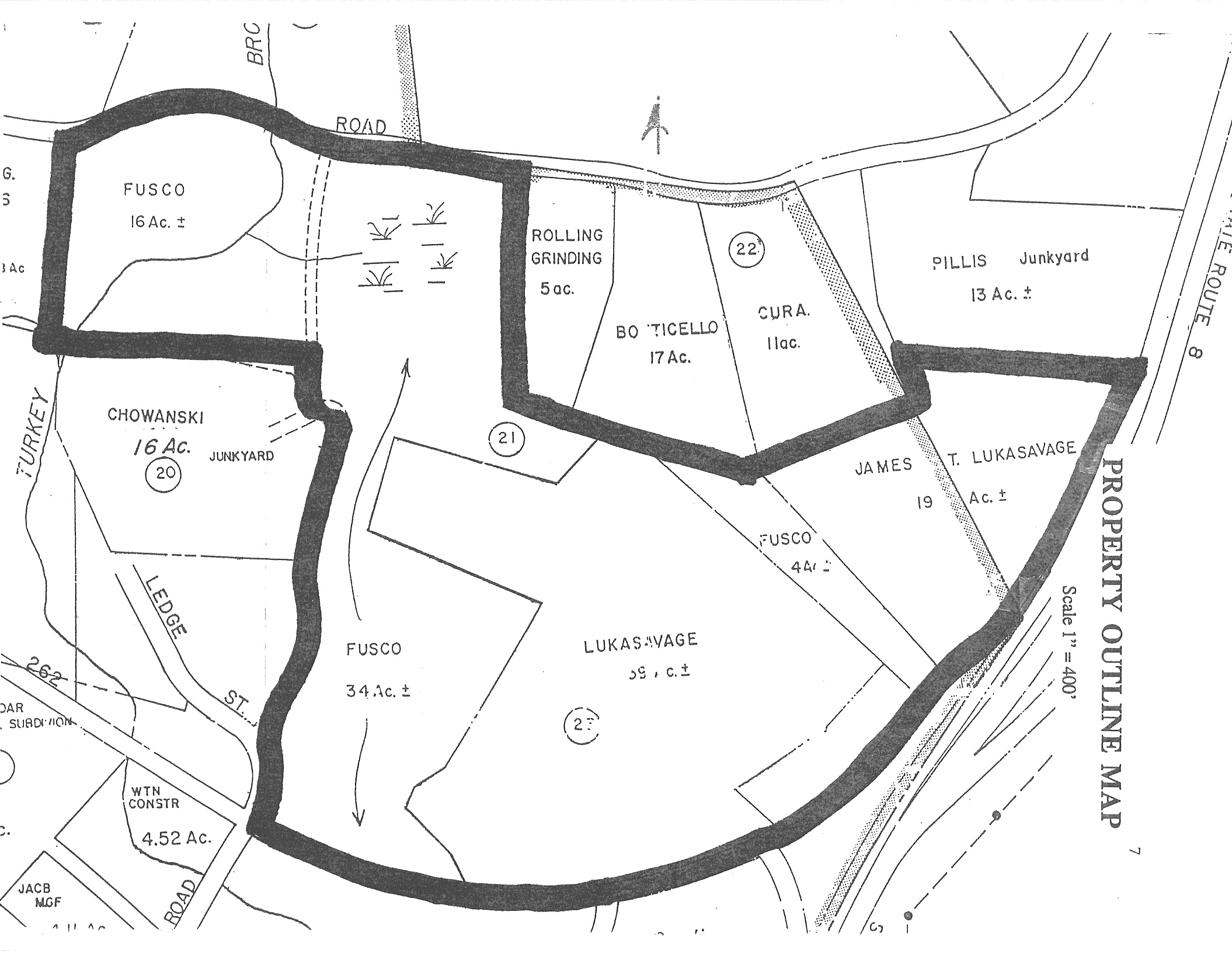
Stone, Janet R., et. al., 1992. *Surficial Materials Map of Connecticut*, U.S. Geological Survey and the Geological and Natural History Survey of the State of Connecticut, Department of Environmental Protection.

TOPOGRAPHIC MAP

N

Scale 1" = 2000'




ROAD
FUSCO
16 Ac. ±
ROLLING
GRINDING
5 ac.
22
PILLIS Junkyard
13 Ac. ±
BO TICELLO
17 Ac.
CURA.
11ac.
CHOWANSKI
16 Ac.
JUNKYARD
20
21
JAMES T. LUKASAVAGE
19
Ac. ±
FUSCO
44 ± Ac.
LEDGE
ST.
FUSCO
34 Ac. ±
LUKASAVAGE
27
WTN
CONSTR
4.52 Ac.
JACB
MGF
ROAD
TURKEY
ROUTE 8
PROPERTY OUTLINE MAP
Scale 1" = 400'

Soil Resources

A general soil map showing the extent of soil types in the tract of land under consideration is included in this section of the report. As can be seen on the map, a major portion of the soil is comprised of HxC, Hollis extremely rocky fine sandy loam, 3 to 15 percent slopes, and HxE, Hollis extremely rocky fine sandy loam, 15 to 35 percent slopes.

Stoniness and depth to bedrock are the most severe limitations of this site for development. Areas rated with severe limitations would require the most extensive and costly measures to overcome the natural soil limitations. The Hollis soils located on this site are extremely rocky, well drained to excessively drained, and generally have a depth of less than 20 inches to bedrock. In most places, outcrops of rock make up 5 to 50 percent of the land surface. The southeastern end of the property has an area designated as Rock Land (Rh) on the soil survey. This designation is described as areas where exposed bedrock occupies more than 50 percent of the surface. Limitations for landscaping are very severe in this area, stones, boulders and bedrock outcrops interfere with the establishment of lawns and shrubs. The most stony of these areas should be left in native vegetation to protect against erosion, it would be difficult to establish grass on the shallow soils, and the rooting ability of trees and shrubs is severely restricted by the bedrock. The proposed layout does not show lots in the area designated as Rock Land, this is beneficial for the project.

As a result of soils and topography, limitations for streets and parking lots are also severe. Slope, shallowness and rockiness make the establishment of roads costly because blasting is commonly required to establish the proper grade. In addition, blasting may be necessary for the establishment of building foundations. In these areas, footing drains would be useful to intercept lateral seepage along the bedrock. Test pit information should be used to investigate if pockets of deep soil were found on the site, buildings could then be sited accordingly in these areas.

The northwestern section of the parcel has the wetland soil type Lg, Leicester, Ridgebury and Whitman very stony fine sandy loams included in it as designated by the Soil Survey of Litchfield County, Connecticut (sheet 100). This unit is made up of poorly drained Leicester and Ridgebury soils and a very poorly drained Whitman soil. These three soils are generally level and very stony. Stoniness and depth to ground water are the natural limitations that are associated with this soil delineation. A permit is required for any disturbance within these soil types. Road "A" on the proposed layout appears to be very close or within the wetland boundary. By moving the road east, toward lot #47, it may be out of the wetland boundary. At least half of lot #49 may be comprised of wetland soil types, it is questionable if there is enough room for a building and parking area without disturbing the wetland.

Increased runoff contributions to the stream and wetland areas in the parcel should be investigated to determine if the existing outlets can handle additional water. If a need for detention is found for the water which outlets through the stream in the western piece of the parcel, a suitable area for a detention basin exists in the vicinity of lot #42 adjacent to the wetland. If erosion of the stream channels crossed by Road "C" is of concern as a result of increased runoff, a detention area for small storm events may be a consideration.

An erosion and sediment control plan should be included with the plan of development of the property. The objective of this plan should be to disturb as little of the area as possible and to keep sediment on the property and away from streams and wetlands. The erosion and sediment control plan should include such features as: phased construction; sediment fence erosion checks down slope from construction; temporary vegetation on stock piled top soil; permanent vegetative cover and other measures needed for the final development plan.

SOILS MAP

N

Scale 1" = 1320'

Wetland Resources

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

Existing Wetland Resources

As stated in the soils section, the USDA-Soil Conservation Service Soil Survey for this area indicates a small, linear, inland wetland soil map unit associated with Turkey Brook along the northeast border of the study area. No other wetland map units were included on the Survey. Turkey Brook continues past the study area, flows through the Oakville section of Watertown, joins Steele Brook shortly after flowing into Waterbury, which drains to the Naugatuck River. As stated elsewhere in this report, Turkey Brook is rated as a "Class B/A" surface water. Additionally, the groundwater in this area is rated as a "Class GB". See below for an explanation of these class ratings.

Surface Water Classification

Class A
Designated Uses: Potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply and other legitimate uses including navigation.
Class B/A
May not be meeting Class A water quality criteria or one or more designated uses. The goal is Class A.

Ground Water Classification

Class GB
Designated Uses: Industrial process water and cooling waters, presumed not suitable for direct human consumption without treatment.
Groundwaters within highly urbanized areas of intense industrial activity and where public water supply is available. May not be suitable for direct human consumption due to waste discharges, spills or leaks of chemicals or land use impacts. The goal is to prevent further degradation by preventing any additional discharges which could cause irreversible contamination.

As a result of the ERT site inspection, several additional wetland areas were observed. Their general location is marked on the enclosed map. The boundaries of these wetland areas appeared to be delineated in the field with blue flagging. Town personnel reported that the delineation may have been performed as part of a previous development proposal.

All of these wetland areas observed could be classified as palustrine/forested, with areas of palustrine/shrub-scrub located in the northwestern portion of the study site (indicated as wetland area #1 on the enclosed map). It has an area of approximately 1.5 acres. This wetland is situated at the end of a short tributary to Turkey Brook and is most likely a groundwater discharge point during wetter periods. This wetland contains an existing road crossing consisting of gravel fill rising approximately 2 feet above the surrounding wetlands. No culvert was found under this road allowing for surface flow from one side of the road to the other.

Indicated as a "spot symbol" on the USDA-SCS Soil Survey, wetland area #2, is situated on the east side of the main access road in the southwest portion of the study area. No wetland delineation flags were observed at this location. It has an area of approximately .3 acres. This wetland, like wetland #1, is situated at the end of a Turkey Brook tributary and provides flow to that watercourse. A culvert is located at the south end of this wetland area allowing water to flow to the west side of the access road to a small pond, continuing on to flow under Frost Bridge Road and shortly thereafter joining the main branch of Turkey Brook.

Wetland area #3 is located in the middle of the parcel area. Not indicated in the USDA-SCS Soil Survey and not easily identified on aerial photographs, this area was an unexpected find during field inspection. The total area may be as much as 1 acre. This area was delineated with blue flagging and could be more precisely sized if a delineation map exists, and is acquired by the Town. It exists in a topographic bowl at a higher elevation than the other wetland areas. No outlet was found, but may

exist during wetter periods of the year. This wetland area seemed to have a dominant tree cover consisting of red oak which grew on high hummocks among the wetland soil. This is an unusual arrangement for a forested wetland in Connecticut.

One other possible wetland area was observed during aerial photo interpretation (wetland area #4). A linear topographic depression, approximately 300 feet in length exists between and slightly to the south of wetland areas #2 and #3. It is likely that this area contains certain amount of wetland soils and should be confirmed through field investigation.

Other regulated areas may include the main branch of Turkey Brook as it flows through the extreme western portion of the study area. Although the conceptual proposal presented to the ERT Team included lots adjacent to the brook, none of the lots actually include the brook within its boundaries. This portion of the study area was not field investigated.

According to the above approximated figures, total wetland area on this parcel, not including the main branch of Turkey Brook, totals 3.1 acres which is 3% of the total area of the study site (116± acres once the northern tier of properties are omitted).

Wetland Functional Values

The primary functional values for wetland areas #1 - 4, as described above, include flood control and wildlife habitat. Other secondary values may include water quality improvement and forestry potential.

These wetland areas are all located towards the upper reaches of Turkey Brook. As a general rule, the natural ability of wetlands to slow down or "buffer" the flow generated by large storm events are best utilized in areas on the perimeter of its watershed. This "flood control" function occurs more efficiently in forested and shrub/scrub wetlands such as these, where runoff can be stored in dry vegetation,

depressions and deflected by woody vegetation.

Isolated wetlands surrounded by undeveloped upland habitats such as these provide a significant diversification of wildlife to the area. Both plant and animal species abundance increase dramatically under these conditions. In a limited fashion, this study area could be considered an extension of the preserved habitats of the Mattatuck State Forest located across Echo Lake Road to the north of this site. Although Echo Lake Road may provide a barrier to most animals it would not limit the ability for birds to move back and forth between the State Forest and the study area.

Proposed Activities

This study area is being considered by the Town of Watertown for use as a municipal industrial park. The project is still in the conceptual stage. The current configuration includes approximately 50 lots, most between 2 and 4 acres in size, as well as a road system of approximately 8000 linear feet. Sewer and water hook-ups to existing systems outside of the study area are anticipated. The primary access road (Road "A") would basically follow the unimproved, existing access road from Frost Bridge Road on the south border to Echo Lake Road on the north border.

Impact of Proposed Activities on Watercourses and Wetlands

Several direct impacts to existing wetlands would occur as a result of construction as currently proposed. Construction of Road A as it crosses wetland #1 would require filling of regulated wetland areas. Construction on lots #45, #46 and #49 in this area may also possibly require filling of wetlands. Construction of Road "A" may also directly impact wetland area #2 as a result of fill material needed for widening and/or provision of adequate snow shelves. Depending on the exact location of wetland #3, construction on lots #23, #24, #25, and #26 would need to be carefully arranged to avoid direct impacts. Similarly, depending on verification of wetland #4, construction on

lot #15 may directly impact existing wetlands.

Construction or alteration within upland buffer areas surrounding wetlands and watercourses on this site would be considered an impact, but of an indirect nature. The value of buffer areas is covered by others in this report.

The proposed construction of more than 50 individual, industrially zoned lots with their buildings and parking lots as well as 8000 linear feet of paved roads will create a significant amount of impervious surfaces which will require some sort of planned storm water management system. The introduction of pollutants commonly found in storm water run-off generated from urbanized areas (oil, grease, salt, heavy metals, road sands and eroded sediments) would be considered an indirect impact to wetlands and watercourses on this site due to reduced water quality.

Recommendations/Comments

1) Determine the existence of existing wetland delineation maps drafted as a result of previous development proposals. If the delineation was performed by a certified soil scientist and a record of that delineation was properly acquired by the Town of Watertown, this information would provide the most complete and accurate record of inland wetland soils throughout all or most of the study site. It may also provide more accurate topography.

2) Re-route Road "A" north of its intersection with Road "B" to avoid the direct impacts made upon wetland #1 discussed earlier. Follow the contour to the northeast and connect with Echo Lake Road approximately 500, to the east of the proposed intersection. Commit lots #45, #46 and #49 to open space use to protect the integrity of wetland #1.

3) Direct impacts to wetland #2 may be unavoidable due to space limitations, however, removal and

restoration of the wetland #1 crossing may compensate for this loss.

4) Development of lot #26 may involve direct impact to wetlands depending on the exact location of wetland #3.

5) If this project will impact more than 1 acre of wetlands, it will require an Individual Permit from the U.S. Army Corp of Engineers (A.C.O.E.) and a Water Quality Certification (WQC) from CT DEP. If this project will impact only .5 to 1 acre of wetlands, a WQC must be obtained from CT DEP. For questions regarding these regulatory programs contact Ruth Ladd of the A.C.O.E. at 617/647-8338 or 800-343-4789 or Sally Snyder of the CT DEP at 203/424-3019.

6) Maintain drainage through lots #13, #8 and #7 which most likely contributes flow to wetland #2.

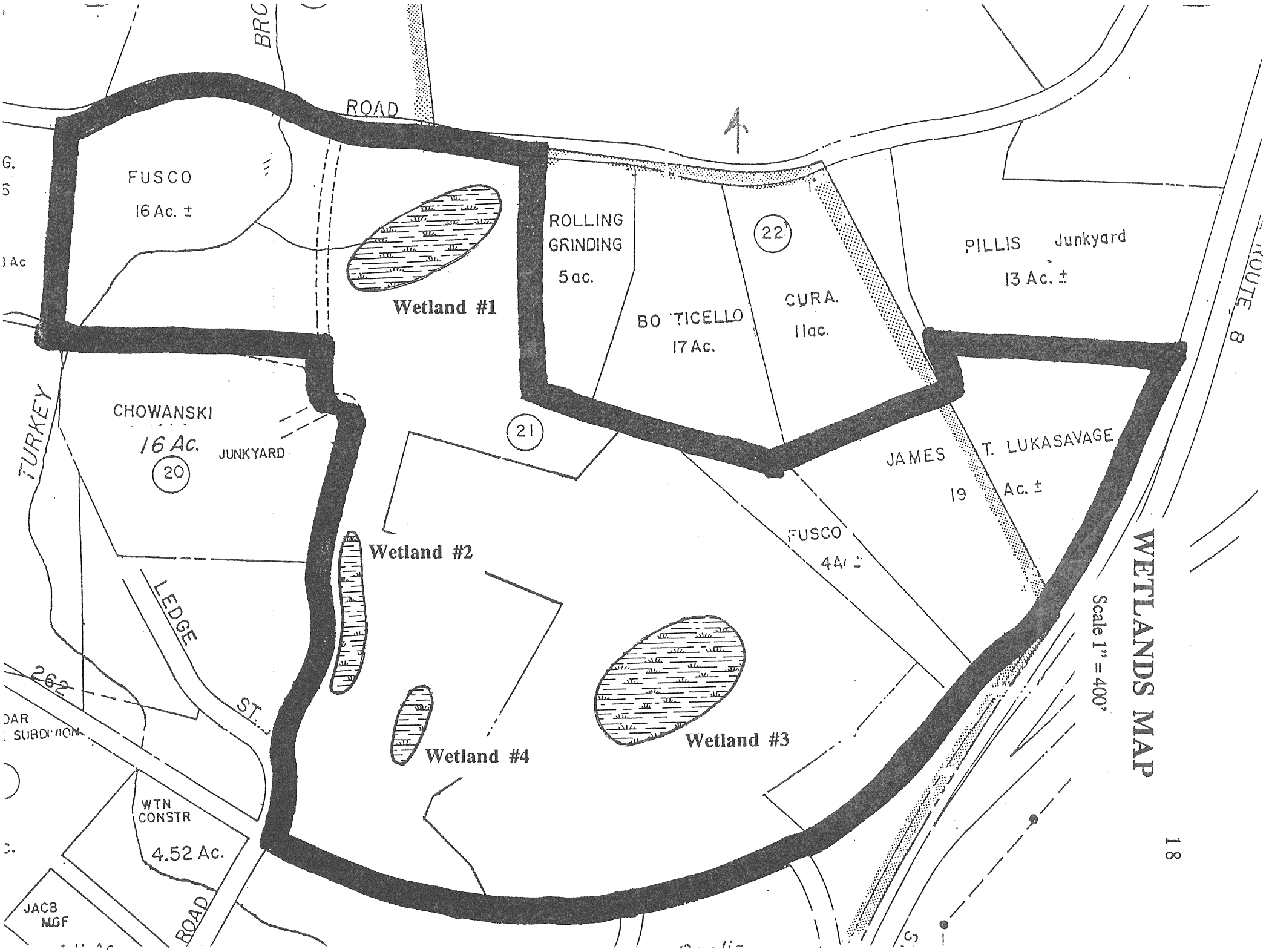
7) Due to their flood control and wildlife values, strive to maintain an adequate upland buffer area around all wetland areas as well as Turkey Brook. A distance of at least 50 feet and preferably 100 feet is recommended. It would also be worthwhile to create a conservation easement along Turkey Brook to permanently preserve any wildlife corridor attributes in conjunction with Mattatuck State Forest.

8) Due to the location within the watershed, it may be wise to maintain a 0% increase in storm water run-off emanating from this site. This may avoid aggravating or creating flood-prone areas downstream of the study area. It may also avoid channel erosion which usually accompanies increased channel flows. This approach should ultimately be confirmed through a detailed hydrology/hydraulics study of pre- and post-development conditions as well as downstream hydrology studies. Any required storm water detention/retention basins should be located outside of existing wetland areas. Requiring a certain amount of non-pervious open space on each lot would allow for storm water infiltration to take place throughout the study area. Natural, non-landscaped open space would allow

for even more stormwater storage/infiltration throughout the site. Minimum road widths would also reduce storm water quantities.

9) Reduction of the quantity of storm water run-off amounts through storm water infiltration practices would be difficult due to the nature of the soils within the study area, however, storm water quality may be improved through the use of Best Management Practices such as grass-lined swales and/or wet-detention basins.

10) If this project is not phased, and construction activities covering five acres or more are approved, the applicant is required to apply to the CT-DEP for a general permit for the discharge of stormwater under the National Pollutant Discharge Elimination System (NPDES) program. For further information on this permit program contact Christopher Stone of the DEP Permitting Enforcement and Remediation Division at 203/424-3850.


ROAD
FUSCO
16 Ac. ±
Wetland #1
ROLLING
GRINDING
5 ac.
22
BO TICELLO
17 Ac.
CURA.
1 lac.
PILLIS Junkyard
13 Ac. ±
ROUTE 8
TURKEY
CHOWANSKI
16 Ac.
JUNKYARD
20
21
JAMES T. LUKASAVAGE
19
Ac. ±
FUSCO
44 Ac. ±
Wetland #2
LEDGE
ST.
262
Wetland #4
Wetland #3
WTN
CONSTR
4.52 Ac.
JACB
MGF
ROAD
WETLANDS MAP
Scale 1" = 400'

The Natural Diversity Data Base

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

Natural Diversity Data Base information includes all information regarding critical biologic resources available to us at the time of the request. This information is a compilation of data collected over the years by the Natural Resources Center's Geological and Natural History Survey and cooperating units of DEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site specific field investigations. Consultation 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.

Also be advised that this is a preliminary review and not a final determination. A more detailed review may be conducted as part of any subsequent environmental permit applications submitted to DEP for the proposed site.

Fisheries Resources

Site Description

A significant reach (approximately 1,500 feet) of Turkey Hill Brook and one unnamed tributary stream are located on the 110 acre site proposed for the Watertown Industrial Park. Turkey Hill Brook and the unnamed stream can be classified as coldwater stream resources. Moderate to steep stream gradient has produced surface stream flow predominated by shallow riffle interspersed by moving pool. Being within a relatively unaltered watershed, surface water has been protected from degradation. The Department of Environmental Protection has classified this reach of Turkey Hill Brook and tributary as "Class B/A" surface waters.

Through the Watertown Industrial Park site, Turkey Hill Brook has a channel approximately 10 feet in width having bank full flow depths of averaging 1 foot. The unnamed tributary is contained within a channel averaging 5 feet in width and less than 1 foot in bank full flow depth. Substrate of all streams is composed of cobble, gravel, and coarse sand. Dense growths of hardwoods and woody shrubs predominate as riparian vegetation and provide the streams a nearly complete canopy. Physical instream habitat is provided by undercut banks and fallen woody debris.

Aquatic Resources

Formal fisheries resource inventories either of Turkey Hill Brook or the unnamed tributary have never been conducted by the Fisheries Division. However, based upon surveys of similar streams in nearby watersheds, Turkey Hill Brook and tributaries are anticipated to contain a fishery assemblage of brook trout, blacknose dace, longnose dace, and tessellated darter.

Impacts

Land use changes associated with the proposed Watertown Industrial Park have the potential to adversely impact aquatic resources of Turkey Hill Brook and the unnamed tributary stream should mitigative measures not be implemented. Anticipated impacts include:

◆ Soil erosion and subsequent sedimentation through increased runoff from unvegetated areas. Excessive erosion and sedimentation can degrade water quality and in-stream habitats in turn impacting the resident fishery population. Specifically, excessive siltation has the potential to:

- cause a depletion of oxygen within the water column

- disrupt fish respiration and gill function

- reduce water depth resulting in a reduction of habitats used by fish for feeding, cover, and spawning

- reduce fish egg survival

- reduce aquatic insect production

- promote growths of aquatic plants

◆ Influx of stormwater drainage may cause aquatic habitat degradation due to the release of "pollutants" from developed areas; such pollutants include gasoline, oil, heavy metals, road salt, fine silts, and coarse sediments.

◆ Removal of riparian vegetation along stream courses can result in the following:

- remove the natural "filter" effect of vegetation which has the ability to prevent sediment, nutrients, fertilizers, and other non-point source pollutants from upland sources from entry into streams; such non-point pollutants can degrade water and habitat quality

- increase stream water temperature during the summer months (thermal loading) while decreasing winter water temperatures to levels where there may be a complete cover of ice

- decrease streambank stability thereby increasing instream siltation and aquatic habitat degradation

- eliminate or drastically decrease the supply of large woody debris to the stream; such material provides critical instream habitat features for numerous species of aquatic organisms

- reduce a substantial proportion of food for aquatic insects which in turn constitutes a reduction in a significant proportion of food available for resident stream fish

- stimulate excessive aquatic plant growth

- decrease of the riparian corridor's ability to serve as a "reservoir" storing surplus runoff for gradual release back into streams during summer and early fall base or low flow periods

◆ Nutrient enrichment from fertilizer runoff from manicured lawns will stimulate aquatic plant growth. Herbicide runoff from those areas may result in fish kills and water quality degradation.

Recommendations

The following should be considered in effort to mitigate impacts potentially affecting the aquatic resources of Turkey Hill Brook and the unnamed tributary streams:

◆ Maintain, at a minimum, a 100 foot open space buffer zone along the developments closest encroachment to all perennial watercourses and 50 feet along those surface waters of intermittent duration. Activities resulting in alteration of riparian habitat should not be allowed within these zones. Research has indicated that buffer zones of this width prevent damage to aquatic ecosystems that are supportive of diverse species assemblages; these buffers absorb surface runoff, and the pollutants they may carry, before they enter wetlands and aquatic habitats. Please refer to attached documentation which presents Fishery Division policy and position regarding riparian buffers.

◆ Establish a comprehensive erosion and sediment control plan with mitigative measures (hay bales, silt fence, etc.) to be installed prior to and maintained through all development phases; land disturbance and clearing should be kept to a minimum with all disturbed areas being protected from storm events and restabilized as soon as possible.

◆ Design and implement an effective stormwater management plan to contain storm water runoff on-site and not be allowed to discharge directly into surface water courses; the stormwater detention basins/ponds should not be constructed in watercourses rather be located in upland areas.

◆ Limit any permitted activities adjacent to riparian buffers to historic low precipitation periods of the year; reduced precipitation periods of summer - early fall provide the least hazardous conditions to work near sensitive aquatic environments.

◆ Limit liming, fertilizing, and the introduction of chemicals to developed land susceptible to runoff into watercourses.

DEPARTMENT OF ENVIRONMENTAL PROTECTION
INLAND FISHERIES DIVISION

POLICY STATEMENT
RIPARIAN CORRIDOR PROTECTION

I. INTRODUCTION, GOALS, AND OBJECTIVE

Alteration and exploitation of riparian corridors in Connecticut is a common event that significantly degrades stream water quality and quantity. Inasmuch as riparian ecosystems play a critical role in maintaining aquatic resource productivity and diversity, the Inland Fisheries Division (Division) recognizes that rigorous efforts are required to preserve, protect, and restore these valuable resources. Consequently, a riparian corridor protection policy has been developed to achieve the following goals and objective:

Goals

Maintain Biologically Diverse Stream and Riparian Ecosystems, and

Maintain and Improve Stream Water Quality and Water Quantity.

Objective

Establish Uniform Riparian Corridor Buffer Zone Guidelines.

II. DEFINITIONS

For the purpose of implementing a statewide riparian corridor protection policy, the following definitions are established:

Riparian Corridor: A land area contiguous with and parallel to an intermittent or perennial stream.

Buffer Zone: An undisturbed, naturally vegetated area adjacent to or contained within a riparian corridor that serves to attenuate the effects of development.

Perennial Stream: A stream that maintains a constant perceptible flow of water within its channel throughout the year.

Intermittent Stream: A stream that flows only in direct response to precipitation or which is seasonally dry.

III. RIPARIAN FUNCTION

Naturally vegetated riparian ecosystems perform a variety of unique functions essential to a healthy instream aquatic environment. The delineation and importance of riparian functions are herein described. Vegetated riparian ecosystems:

* Naturally filter sediments, nutrients, fertilizers, and other nonpoint source pollutants from overland runoff.

* Maintain stream water temperatures suitable for spawning, egg and fry incubation, and rearing of resident finfish.

* Stabilize stream banks and stream channels thereby reducing instream erosion and aquatic habitat degradation.

* Supply large woody debris to streams providing critical instream habitat features for aquatic organisms.

* Provide a substantial food source for aquatic insects which represent a significant proportion of food for resident finfish.

* Serve as a reservoir, storing surplus runoff for gradual release into streams during summer and early fall base flow periods.

IV. RIPARIAN CORRIDOR BUFFER ZONE GUIDELINES

Recognizing the critical roles of riparian corridors, the Division provides buffer zone guidelines that are designed to bring uniformity and consistency to environmental review. The guidelines are simple, effective, and easy to administer. The following standard setting procedure should be used to calculate buffer zone widths.

Perennial Stream: A buffer zone 100 feet in width should be maintained along each side.

Intermittent Stream: A buffer zone 50 feet in width should be maintained along each side.

Buffer zone boundaries should be measured from either, (1) edge of riparian inland wetland as determined by Connecticut inland wetland soil delineation methods or (2) in the absence of a riparian wetland, the edge of the stream bank based on bank–full flow conditions.

The riparian corridor buffer zone should be retained in a naturally vegetated and undisturbed condition. All activities that pose a significant pollution threat to the stream ecosystem should be prohibited.

Where the Division policy is not in consonance with local regulations and policies regarding riparian corridor buffer zone widths and allowable development uses within these areas, local authorities should be encouraged to adopt the more restrictive regulations and policies.

12/13/91
Date

James C. Moulton
Acting Director

POSITION STATEMENT
UTILIZATION OF 100 FOOT BUFFER ZONES TO PROTECT RIPARIAN AREAS IN CONNECTICUT

BY
BRIAN D. MURPHY
TECHNICAL ASSISTANCE BIOLOGIST
INLAND FISHERIES DIVISION

I. INTRODUCTION

One tenet of the Inland Fisheries Division Policy on Riparian Corridor Protection is the utilization of a 100 foot buffer zone as a minimum setback along perennial streams. The adoption of such a policy is sure to be controversial. Laymen, developers and natural resource professionals alike will ask questions such as: Why was a standard setting method adopted? What's magical about 100 feet? Will 100 feet be sufficiently protective, or will it be overly protective? In response, this paper outlines the ramifications of adopting a riparian corridor policy including the use of a 100 foot buffer zone.

II. STANDARD SETTING VERSUS SITE SPECIFIC BUFFER ZONES

There are two approaches for determining buffer zone width; standard setting and site specific. Standard setting methods define an area extending from the streambank edge or highwater mark to some landward fixed point boundary. Site specific methods utilize formulas that incorporate and consider special site specific land characteristics, hence, the calculation of a variable width buffer zone. In both case, buffers are employed to define an area in which development is prohibited or limited.

A major advantage of standard setting methods is that they are easy to delineate and administer, thereby improving the consistency and quality of environmental assessments. Furthermore, valuable staff time would not be required to determine site specific buffer zones along each and every watercourse of concern.

The exact width of a buffer zone required for riparian corridor protection is widely disputed (Bottom et al. 1985 and Brinson et al. 1981). Buffer width recommendations found in the literature vary from as little as 25 feet to as great as 300 feet (Palfrey et al. 1982). The 100 foot buffer is widely accepted in Connecticut having been adopted by numerous inland wetland and conservation commissions as an appropriate minimum setback regulation for streambelts. In addition, Division staff have been recommending the utilization of the 100 foot buffer zone to protect streambelts since the early 1980's. Scientific research has not been generated to dispute the adequacy of utilizing 100 foot buffer zones to protect Connecticut's riparian corridors. In fact, to ensure that riparian functions are not significantly altered, recent scientific information points towards maintaining buffer zones that would be at a minimum, 100 feet in width (see section III).

Site specific methods define buffer widths according to the character and sensitivity of adjacent streamside lands. These buffer widths, also referred to as "floating buffers," consider physical site characteristics such as slope, soil type, and vegetative cover. The advantage of site specific methods is that buffer widths are designed using site characteristics and not an arbitrary predetermined width. Unfortunately, there is no "one" universally accepted formula or model and none have been developed for use in Connecticut. Most formulas are based on the degree to which sediment can be removed or filtered by natural vegetation, thus, the primary useage is sediment control. Other weaknesses of site specific techniques are (1) all areas must be evaluated on a case-by case basis and, (2) the subjectivity of different techniques (i.e. if the evaluation technique is inadequate, the buffer width will also be inadequate).

Additionally, these formulas only concentrate on one specific riparian function at a time and do not take into account multiple riparian functions, especially those of inland fisheries values as discussed in Section III. Consequently, site specific formulas approach riparian function on a single dimension rather than taking a more realistic, holistic approach.

In the absence of a scientific model to determine buffer widths suitable to protect Connecticut's riparian corridors, the utilization of a standard setting method is environmentally and politically prudent.

III. RIPARIAN FUNCTION

To assess the efficacy of a 100 foot buffer zone, the literature was searched to identify studies which have applied a quantitative approach to buffer width determination. Literature was searched for studies which both support and dispute the 100 foot zone. The following is a summary "by riparian function" of quantitative studies which assess buffer widths.

Sediment Control

Width, slope and vegetation have been cited as important factors in determining effectiveness of buffer zones as sediment filters (Karr and Schlosser 1977). Wong and McCuen (1981), who developed and applied a mathematical model to a 47 acre watershed, found that a 150 foot zone along a 3% slope reduced sediment transport to streams by 90%. Mannering and Johnson (1974) passed sediment laden water through a 49.2 foot strip of bluegrass and found that 54% of sediment was removed from the water. Trimble and Sartz (1957) developed recommendations as to width of buffer areas between logging roads and streams to reduce sediment load. They determined a minimum strip of 50 feet was required on level land with the width increasing 4 feet for each 1% slope increase. Buffer widths as determined by Trimble and Sartz (1957) have been characterized as evaluated guesses rather than empirically defined widths (Karr and Schlosser 1977). Rodgers et al. (1976) state that slopes greater than 10% are too steep to allow any significant detention of runoff and sediment regardless of buffer width. After a critical review of the literature, Karr and Schlosser (1977) determined that the size and type of vegetative buffer strip needed to remove a given fraction of the overland sediment load cannot be universally quantified. Existing literature does suggest that 100 foot riparian buffers will assist with sediment entrapment, although efficacy will vary according to site conditions.

Temperature Control

Brown and Brazier (1973) evaluated the efficacy of buffer widths required to ameliorate stream water temperature change. They concluded that angular canopy density (ACD), a measure of the ability of vegetation to provide shading, is the only buffer area parameter correlated with temperature control. Results show that maximum angular canopy density or maximum shading ability is reached within a width of 80 feet. Study sites were 9 small mountain streams in Oregon that contained a conifer riparian vegetative complex. Whether or not maximum angular canopy density is reached within 80 feet in a typical Connecticut deciduous forest riparian zone is doubtful. Tree height in Connecticut riparian zones is smaller than in Oregon (Scarpino, personal communication), therefore buffers greater than 80 feet in width would be required for temperature maintenance in Connecticut.

Nutrient Removal

Nutrient enrichment is caused by phosphorous and nitrogen transport from, among other things, fertilized lands and underground septic systems. Most research on nutrient enrichment has focused on overland surface flow. Karr and Schlosser (1977) report that 88% of all nitrogen and 96% of all phosphorous reaching watercourses in "agricultural watersheds" were found to be attached to sediment particles; thus, successful nutrient removal can be accomplished through successful sediment removal. There are conflicting reports on the ability of buffer widths to remove nutrients with most research being tested on grass plots. Butler et al. (1974) as cited by Karr and Schlosser (1977) found that a 150 foot buffer width of reed canary grass with a 6% slope caused reductions in phosphate and nitrate concentrations of between 0–20%. Wilson and Lehman (1966) as cited by Karr and Schlosser (1977) in a

study of effluent applied to 300 m grass plots found that nitrogen and phosphorous concentrations were reduced 4 and 6%, respectively. Studies on subsurface runoff as cited in Clark (1977) found high concentrations of nitrates at 100 feet from septic systems with unacceptable levels at 150 feet. Clark (1977) recommended that a 300 foot setback be used whenever possible, with a 150 setback considered adequate to avoid nitrate pollution. Environmental Perspective Newsletter (1991) states that experts who commonly work with the 100 foot buffer zone set by the Massachusetts Wetlands Protection Act are increasingly finding that it is insufficient since many pollutants routinely travel distances far greater than 100 feet with nitrate-nitrogen derived from septic systems moving distances of greater than 1000 feet. Research indicates that the adoption of 100 foot buffer widths for Connecticut riparian zones will assist with the nutrient assimilation; albeit, complete removal of all nutrients may not be achieved.

Large Woody Debris

The input of large woody debris (LWD) to streams from riparian zones, defined as fallen trees greater than 3 m in length and 10 cm in diameter has been recently heralded as extremely critical to stream habitat diversity as well as stream channel maintenance. Research on large woody debris input has mainly been accomplished in the Pacific Northwest in relation to timber harvests. Murphy and Koski (1989) in a study of seven Alaskan watersheds determined that almost all (99%) identified sources of LWD were within 100 feet of the streambank. Bottom et al. 1983 as cited by Budd et al. (1987) confirm that in Oregon most woody structure in streams is derived from within 100 feet of the bank. Based on research done within old-growth forests, the Alaska region of the National Marine Fisheries Service, recognizing the importance of LWD to salmonid habitat, issued a policy statement in 1988 advocating the protection of riparian habitat through the retention of buffer strips not less than 100 feet in width (Murphy and Koski 1989). All research findings support the use of a 100 foot buffer zone in Connecticut for large woody debris input.

Food Supply

Erman et al. (1977) conducted an evaluation of logging impacts and subsequent sediment input to 62 streams in California. Benthic invertebrate populations (the primary food source of stream fishes) in streams with no riparian buffer strips were compared to populations in streams with buffer widths of up to 100 feet. Results showed that buffer strips less than 100 feet in width were ineffective as protective measures for invertebrate populations since sediment input reduced overall diversity of benthic invertebrates. Buffer strips greater than 100 feet in width afforded protection equivalent to conditions observed in unlogged streams. The ultimate significance of these findings is that fish growth and survival may be directly impacted along streams with inadequate sized riparian buffer zones. All research supports the feasibility of implementing a 100 foot buffer zone in Connecticut to maintain aquatic food supplies.

Streamflow Maintenance

The importance of riparian ecosystems in terms of streamflow maintenance has been widely recognized (Bottom et al. 1985). In Connecticut, riparian zones comprised of wetlands are of major importance in the hydrologic regime. Riparian wetlands store surplus flood waters thus dampening stream discharge fluctuations. Peak flood flows are then gradually released reducing the severity of downstream flooding. Some riparian wetlands also act as important groundwater discharge or recharge areas. Groundwater discharge to streams during drier seasonal conditions is termed low flow augmentation. The survival of fish communities, especially coldwater salmonid populations is highly dependent upon low flow augmentation (Bottom et al. 1985). Research, although documenting the importance of riparian zones as areas critical to streamflow maintenance, has not investigated specific riparian buffer widths required to provide the most effective storage and release of stream flows.

IV. OTHER POLICY CONSIDERATIONS

Measurement Determination

The proposed policy states that buffer zone boundaries should be measured from either the edge of the riparian inland wetland as determined by Connecticut inland wetland soil delineation methods or in the absence of a riparian wetland, the edge of the streambank based on bank-full flow conditions. This boundary demarcation is absolutely necessary to ensure that all riparian wetlands are protected. For example, if all measurements were to start from the perennial stream edge and extend landward for a distance of 100 feet, many riparian zones that contain expansive wetlands greater than 100 feet in width would be left unprotected.

Also, since boundary demarcation includes wetland delineation, the ultimate width of the buffer will vary according to site specific features. Consequently, buffer width determination as stated by Division policy is a "hybridization" of both standard setting and site specific methods. This hybridization of methods is advantageous since it acknowledges the sensitivity of streamside wetlands.

Home Rule

Where the Division policy is not in consonance with local regulations and policies regarding riparian corridor buffer zone widths, local authorities would be encouraged to adopt the more restrictive regulations and policies. This feature incorporates flexibility to acknowledge the importance of local "home rule" regulations or policies already in accepted practice. Conversely, towns and cities without accepted policies and regulations could choose to enact the Division policy.

Allowable Uses in Buffer Zones

The Division policy states that "the riparian corridor buffer zone should be retained in a naturally vegetated and undisturbed condition and that all activities that pose a significant pollution threat to the stream ecosystem should be prohibited." In essence, the buffer zone becomes an area where no development should be allowed. For this policy to be effective, there should be no exceptions, a blanket restriction of all uses would be recommended. Further clarification and more precise definitions of allowable uses will, however, be required in the future if the policy evolves into a departmental regulation.

Recently, the Connecticut Supreme Court has ruled that local agencies can prohibit specific development within buffer zones. The *Lizotte v. Conservation Commission of the Town of Somers, 216 Conn.320 (1990)* decision ruled that the construction or maintenance of any septic system, tank, leach field, dry well, chemical waste disposal system, manure storage area or other pollution source within 150 feet of the nearest edge of a watercourse or inland wetland's seasonal high water level can be prohibited (Wetlands Watch 1990). If this decision is a precursor of the future, Connecticut courts will continue to the support the use of buffers, especially those which restrict or prohibit detrimental activities.

V. CONCLUSIONS

The following actions are required to preserve, protect, and restore Connecticut's riparian corridors:

1. The Inland Fisheries Division needs to adopt and implement the proposed policy so that staff can use it as a guideline to assist cities, towns, developers and private landowners with making sound land use decisions. This policy will act to solidify a collective position concerning riparian corridor protection.

2. While the proposed policy in its "current form," represents a recommendation from the CTDEP Inland Fisheries Division, the ultimate goal of the Division should be to progressively implement this policy as either a CTDEP regulation or State of Connecticut statute.

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Vegetation

The vegetation description for this area can be divided into four separate cover types. These types are described in detail under the heading **Vegetative Type Descriptions**. In general terms, most of the property is heavily wooded (with the exception of Type I) with common tree species. Theses include red maple, sugar maple, black birch, aspen, hickory, black oak, chestnut oak, white oak, red oak, white ash, and black locust. The dominance of one specie is primarily dictated by the depth of the soil to underlying ledge or the water table and the past use of the property.

In a economical sense, the value of the wood found on this parcel is low to moderate. The forest as a whole though can play a role in the aesthetics of the area, the storm water storage capacity of the landscape and provide a diverse wildlife habitat.

Vegetative Type Description

Type I , Old Field - This type is dominated by early successional species. These species include aspen, grey birch, pin cherry, sumac, highbush blueberry, sweet fern, blackberry, and sensitive fern. Also present are a variety of hardy grasses.

Type II, Mixed Hardwood - This area lies in the east and southeast section of the property and is differentiated from type IV primarily for topographic reasons. The slope here is rather steep facing Routes 8 and 262. This steepness of slope may limit the potential for development. Tree species present include scattered large sawtimber red oak as well as red maple, black birch, and hickory.

Type III, Forested Wetland - Red maple dominates this area. Associated species include aspen, elm, hemlock, white ash. Most of the trees are pole-sized with their stem diameters ranging from four to ten inches. The understory consists of highbush blueberry, spice bush, sweet pepper bush, shad

bush, and witch hazel. Areas with standing water had button bush, cattails and reed present. The high water table impedes tree growth potential.

Type IV, Mixed Hardwood - This type consists of pole and sawtimber sized hardwood trees. Species include black cherry, black birch, white birch, gray birch, black oak, chestnut oak, red oak, white oak, hickory, red maple, sugar maple, and beech. The understory contains low bush and high bush blueberry, ferns, witch hazel, shad bush, mountain laurel, club mosses, and assorted tree seedlings of the overstory species.

Type V - This area is already industrialized and is void of vegetation.

Limiting Conditions and Potential Hazards

Several factors have to be considered in the maintenance of a natural forest stand. Wetland soils (primarily cover Type III) will have a water table close to the surface of the ground. This allows for shallow root penetration into the ground. Windthrow of trees is a potential hazard because of these soil conditions. Light thinnings of trees in these areas may help to improve the stability of the remaining trees. Openings and clearings in and along wetland areas should be avoided when possible. These soils are more sensitive to disturbances. Alterations in the wetlands which permanently change the water table and/or restrict the natural drainage may have a negative impact on the vegetation in the immediate area. Significant changes to the water table adversely affect root systems which can cause widespread plant mortality.

Management Considerations

The proposed municipal industrial park if developed will have a significant impact on the present vegetation. Many small lots with individual establishments will break up the continuity of the tree

cover. Overall concern therefore, should be for maintaining and enhancing the vegetation that can remain. It would be desirable to incorporate the retention of individual trees and clumps of trees and shrubs into the final site plan. These trees and shrubs should be identified and marked on the ground so as to insure their retention and protection.

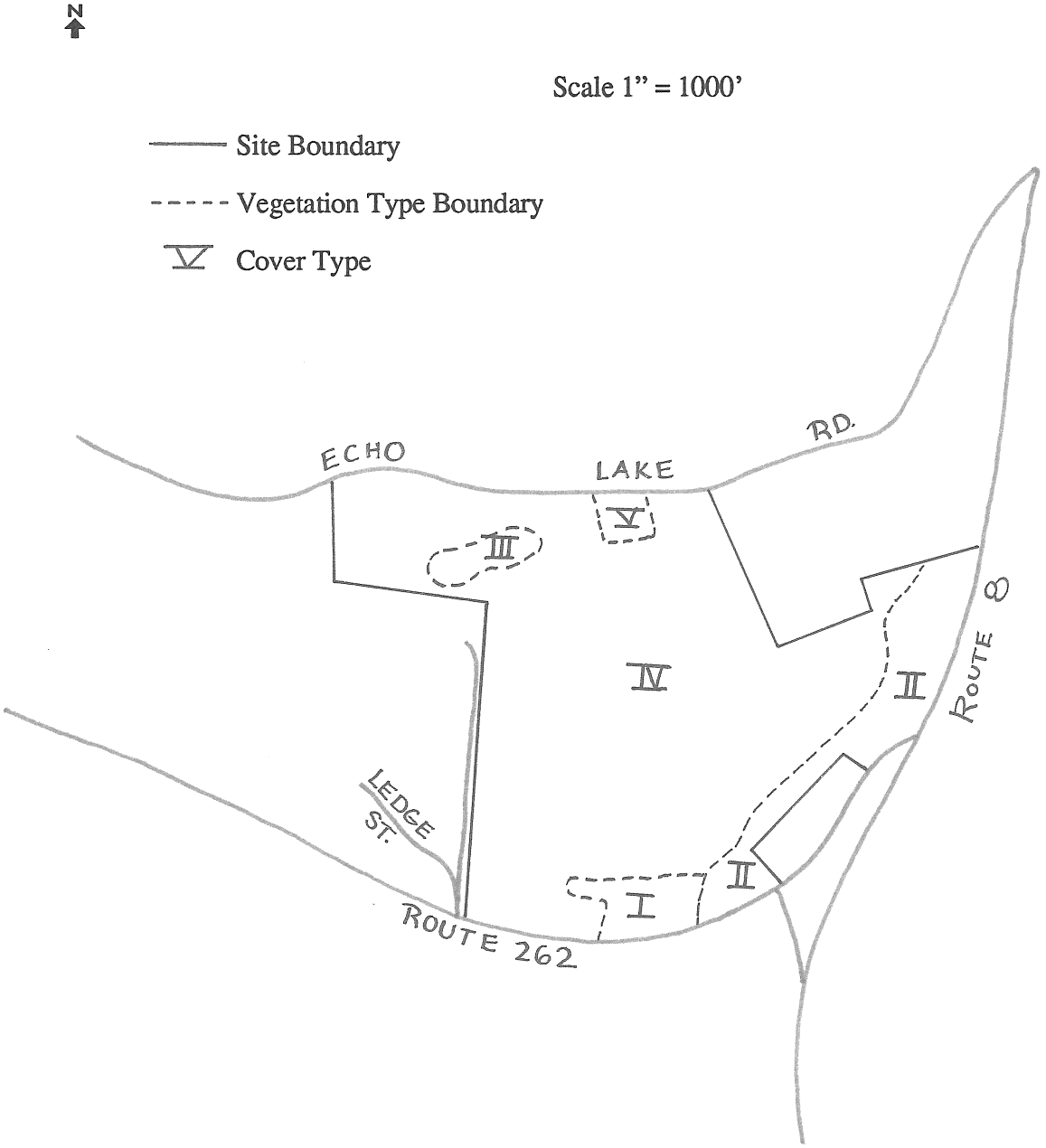
Tree are quite sensitive to changes in soil conditions. Development practices near trees may disturb the root zone and ultimately the trees' health and vigor. Dead and dying trees reduce the aesthetic appeal of the area, become a safety hazard and may be expensive to remove. Where possible clumps or clusters of trees should be left to lower the possibility of soil disturbance and mechanical injury to individual trees.

Trees which are presently unhealthy and not growing vigorously due to crowded conditions are most susecptable to further degradation from the stresses from development activities and environmental factors. It would be beneficial to remove these undesirable tress, thus reducing the competition for sunlight, nutrients and water with the healthier more desirable stems. This improvement thinning is designed to allow the residual trees over time to improve in health vigor, quality and stability. Properly implemented, these thinnings can also improve the aesthetics of an area, the wildlife habitat and provide wood products.

Any tree cutting, whether it is done for thinnings or site clearing, should take into consideration the value of the potential wood products. The proper marketing of these products should be planned for. A public service forester or a private consulting forester may be of assistance in either on the ground planning or the marketing of the wood products.

Following is information regarding protecting trees during construction and improvement cutting .

VEGETATION TYPE MAP



CONNECTICUT DIVISION OF FORESTRY
FOREST PRACTICE DESCRIPTION

Improvement Cuttings

An improvement cutting is just that - a cutting intended to improve the forest condition. It is a type of intermediate cut made in older stands for the purpose of controlling the growth, composition, and quality of a forest stand by removing trees of undesirable species, form, or condition from the main canopy.

Improvement cuts can be done in stands which are either even or unevenaged, regardless of species composition, so long as the purpose and goal of the cuts is for the elimination of poorer trees to favor the good trees. These types of cuttings are not designed for the regeneration of the stand.

Wood products may or may not be a result of an improvement cut, although, realistically, economics usually plays a role in the decision to practice management. Products are usually pulpwood, cordwood, or sawlogs.

Typically, the traditional thinnings in a pole stand would be classified as an improvement cut, as well as what many landowners call a "selective" timber harvest. Technically and correctly used, "selection" has as its goal the regeneration of an unevenaged stand, whereas an improvement cut is not intended to regenerate a stand, even though some regeneration may occur.

The key things to remember about improvement cuts are: 1) cutting is done in stands past the sapling stage; 2) eliminate poor trees to favor the good ones; and 3) removals should come from the main stand canopy.

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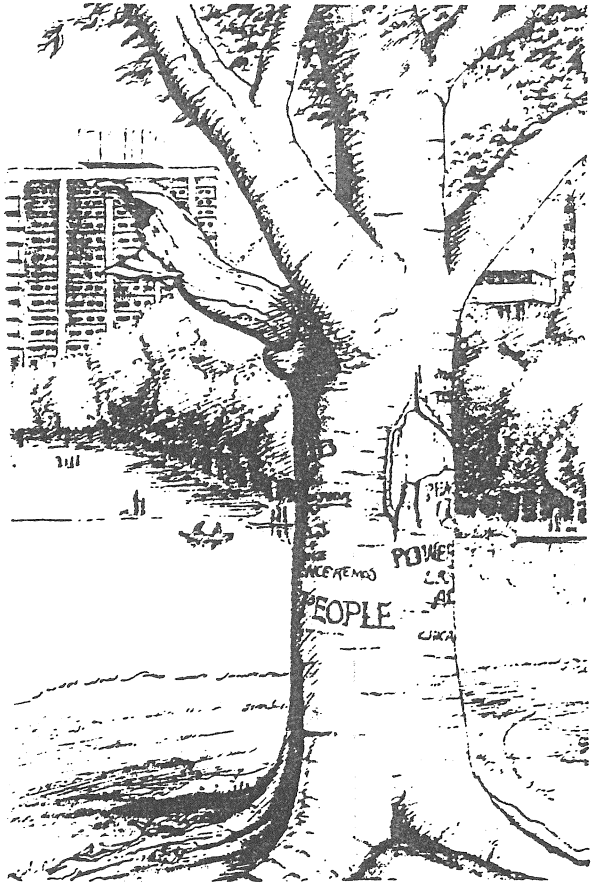
WHAT'S WRONG WITH THIS PICTURE?



Yankee Forest
COOPERATIVE PROJECT

P.O. Box 760 Chepachet, RI 02814

A Cooperative Natural Resource Management Agreement

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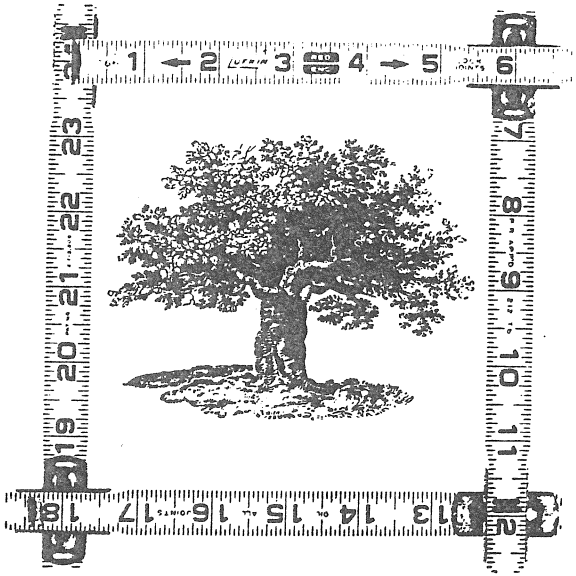
USDA Forest Service,
Northeastern Area
State & Private Forestry

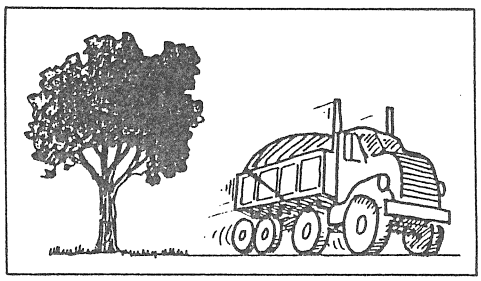
PROTECTING SHADE TREES DURING HOME CONSTRUCTION



PROTECTING SHADE TREES DURING HOME CONSTRUCTION

Should trees be removed from residential property before home construction or should they be saved?

Shade trees can add thousands of dollars to the value of residential property -- yet developers and home building contractors often remove them before starting construction. It's a known fact that saving trees can increase a developer's profit margin. Site preparation, landscaping and maintenance costs can be lower, and by saving existing trees one will increase the value -- and selling price -- of the property. Sound environmental planning is good for a developer's public image as well.



Many trees can be saved with little effort or expense; many are valuable enough to justify considerable effort and expense in protecting them. Besides, saving trees can mean savings on . . .

- **Tree removal costs:** escalating costs of fuel, labor and machinery make site preparation economy a necessity; leaving solid areas of native vegetation, with only minimal clearing, is especially economical.
- **Landscaping costs:** leaving trees can reduce expensive grading, planting, and follow up watering and maintenance.
- **Maintenance of unsold areas:** remember, landscaping and lawns require constant care.
- **Installation costs of drainage systems:** utilizing natural drainage patterns, leaving natural vegetation in place along streams, ponds and swampy areas can eliminate expensive site work to handle runoff and retention requirements. Where allowable and feasible, sheet drainage -- using wide right-of-way in a natural state to absorb runoff from streets, etc. -- is cheaper, more attractive, and requires less maintenance than curb and gutter installation.

Saving established, healthy, well developed trees on construction sites will also increase consumer demand for the property, lower energy consumption for heating and cooling costs, create quieter and more private living conditions, and improve the environmental quality of the area following construction.

IS THE TREE WORTH SAVING?

Some trees may be worth less than realized by the average homeowner and may not warrant the time, effort, and expense of attempting to protect them. One must evaluate each tree carefully by considering its location, type of tree or species, age, and condition. One must also consider what type of protection will be necessary to save the tree, how much work it will involve and how much it will cost.

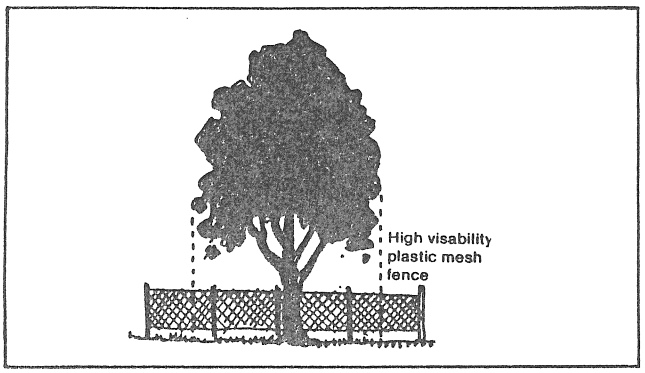
Whatever the size and scope of the development, to make the most of what you have it pays to bring in a professional, qualified arborist, urban forester, environmental planner, or landscape architect who knows and understands trees. This professional should be able to determine:

- which trees are desirable, healthy, which need pruning or removal.
- which will survive anticipated changes in grade, drainage, etc. and how to accomplish these changes.
- which trees should be removed from near buildings, weak root systems make trees prone to wind throw, invasive roots cause problems with sewer lines, shallow roots may upheave driveways, sidewalks, etc.
- which trees are relatively pest and disease resistant, and those that cause major problems in this respect.
- which areas of the site, from the standpoint of economy, ecology and beauty, would best be left natural or minimally cleared.
- how to protect single trees, groups of trees, or natural areas of vegetation before, during and after construction.
- where and what trees should be planted, or transplanted, and how to do it.
- whether you can market trees that must be removed for timber, firewood, etc.

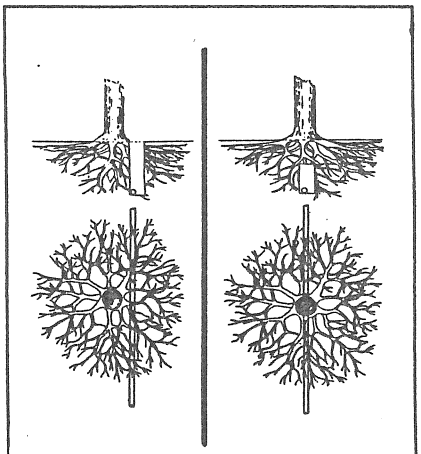
WHY IS PROTECTION NECESSARY?

Once the decision has been made to save certain trees on the construction site they must be protected from one or more of the following:

* **Construction equipment and machinery:** impact injuries from heavy equipment like trucks, bulldozers, etc; cutting of roots, soil compaction over roots, wounds to trunk, roots, and low-hanging branches.
  - all are hazards that can be avoided. Areas of vegetation, single trees, or groups of trees should be fenced with **barricades.** These should be:
  - large enough to include everything inside the spread of the branches or dripline of the tree.
  - constructed of sturdy scrap wood (4 X 4 or 2 X 4 stock is ideal).

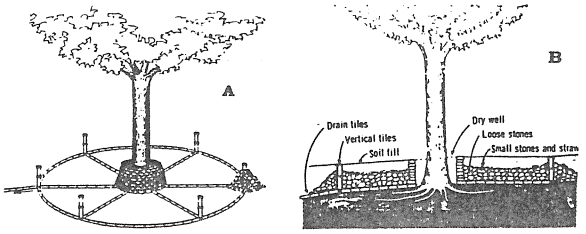


* **Chemical poisoning:** run off from washing down equipment, petroleum products, lime and mortar, misuse (including overuse) of fertilizers, insecticides, herbicides or soil sterilands; residue of chemicals like calcium chloride used to keep down dust on dirt roads -- all can harm or kill trees. Such dangers can be avoided by keeping the area within the dripline of trees free of building materials and run off; by seeing that chemicals are used only by trained personnel and strictly according to directions, and by having closely controlled disposal of excess chemical materials. Preferably off the site.
* **Excavations:** trenching for utility lines, etc., can remove vital tree roots, change drainage patterns. Where possible, trenches should be routed away from trees and outside the dripline. If this is impossible, the next best approach is tunneling under roots, using a power driven soil auger. Tunneling should be offset to one side of the truck to protect major roots. Excavations should be filled immediately, leaving no air pockets.

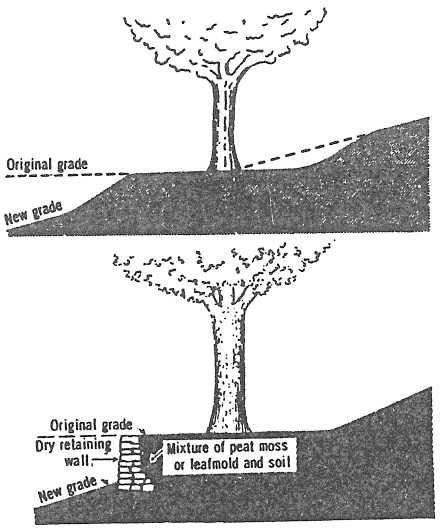


Tunnel beneath root systems. Drawings at left show trenching that would probably kill the tree. Drawings at right show how tunneling under the tree will preserve many of the important, feeder roots.

* **Grade Changes:** there are two types of grade changes that can be detrimental to tree health. One is raising the grade; the other is lowering it. Tree roots need air, water, and minerals to survive. When the grade level is changed by removing soil from the top of roots or by adding soil or filling over the top of roots, the tree has difficulty obtaining its normal amount of air, water, or minerals. Cutting away or smothering of tree roots affects their water and oxygen supply, often with fatal results. A light fill up to 4 inches of porous gravelly material or good topsoil high in organic matter and loamy in texture usually does little harm to healthy trees.

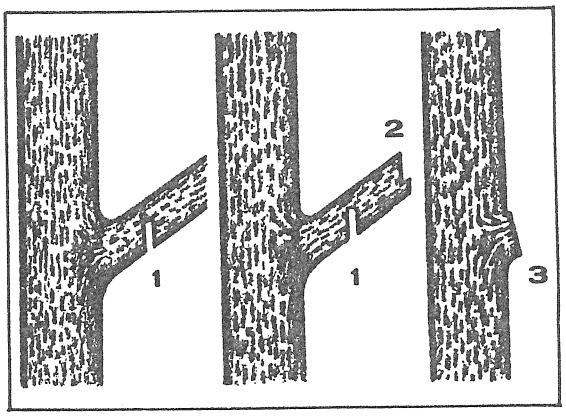


A tile system protects a tree from a raised grade. A, The tile is laid out on the original grade, leading from a dry well around the tree trunk. B, The tile system is covered with small stones to allow air to circulate over the root area.



A retaining wall protects a tree from a lowered grade.

Proper tree maintenance including watering, soil aeration, pruning or thinning of the crown to compensate for root injury, wound treatment and fertilization will help trees survive grade changes.



To prevent splitting wood and stripping bark on large limbs, make the first cut part way through from below (1.) Cut off the limb from above (2.) Remove stub with a smooth cut (3.)

More severe grade changes will require you to supply air to the roots of the tree. This is usually done by installing drainage tiles and constructing a drywell under the spread of the tree before gravel and porous fill is added. The tiles are laid on the original grade; they form a wagon wheel shape with the spokes of the wheel opening into a dry well built around the tree trunk. The dry well acts as the hub of the tile system and holds fill away from the tree trunk.

It may also be necessary to place a series of bell tiles vertically over the roots and connected to the wagon wheel system to allow for additional air and water circulation.

For shallow fills, the fill material may be gently sloped down to the level of tree roots, leaving the tree in a depression larger than the spread of its crown.

Deep grade lowering around a tree or group of trees means building a retaining wall at a sufficient distance from the trunk to save most of the roots -- out at the dripline should be adequate.

For shallow grade lowering, the soil may be sloped gently away from the tree roots down to the level desired, leaving the tree on a sort of island a bit larger than the dripline.

* **Transplanting existing plant materials:** with modern tree moving equipment, it may be possible to move especially desirable native trees and shrubs from construction sites to other locations in the landscape. when selecting native trees for transplanting, choose those that are healthy, young, vigorous specimens of species that move successfully. It is important to get professional advice on all aspects of tree protection during construction!

* **Adding new trees to the construction site:** after all site changes have been completed the final stage of the construction plan may be to add new trees and shrubs to the landscape. Proper plant selection for particular sites is of utmost importance. Select plant materials that will be assets as they mature instead of liabilities. Carefully consider the growing conditions, diversity of plant materials in the area, insect and disease resistance of plant materials and maintenance requirements. Be sure new trees and shrubs are properly planted and watered when necessary.

Planning Comments

The Council of Governments of the Central Naugatuck Valley (COGCNV) staff has reviewed this site for the Watertown Industrial park twice. The site is adjacent to existing industrial development except for a very limited number of homes on Frost Bridge Road. The majority of surrounding land uses are modern industrial plants, several junkyards, and a solid waste transfer station. Several dilapidated stone walls were evidenced during site review, but their condition did not warrant staff to recommend preservation. The site was probably used previously for farming or charcoal supply for the brass mills.

The parcel is zoned as a restricted industrial area and is shown as an industrial park site on the 1992 Watertown Plan of Development. The State Plan of Conservation and Development shows this site as an urban growth area which means it is an area with the "opportunity for staged urban expansion..." and has "potential for future mixed use and intensive development of areawide significance".

In 1993, staff comments were discussed at a Regional Planning Commission (RPC) meeting in conjunction with the pre-application by the town to the Department of Economic Development. The Commission voted at that time that the proposal was in compliance with the Regional Plan of Development. This finding recognized that the land use map of the 1978 Regional Plan of Development labeled this area as a "natural area", to remain as open space. A natural area designation was given because of the anticipated cost of developing the parcel due to soil limitations such as visible wetlands, shallow bedrock, and slope and the lack of utility services in the area at that time. Staff and RPC Commission felt, however, that the proposal did meet a goal of the Economic Development Element of the Plan which called for the expansion of economic opportunities in the Region. In addition, extensions of the utility service over the years favored the development of the site as they now reach the site's boundaries.

Staff sees no conditions which would warrant a change in the previous RPC finding. The excellent

highway access and compatible surrounding land uses coupled with the local support of the proposed use as evidenced in the zoning and the town plan of development all justify approval of the proposal.

Transportation Review

The subject site, an approximate 110 acre parcel of land located on the east side of Watertown, is an ideal site for either light industrial or manufacturing land use, or a combination thereof.
Access to the proposed site is provided by State Route 262 which borders the site on the south, Echo Lake Road to the north, and State Route 8, a fully access controlled roadway with full interchange surface to the area, to the east. The Route 8 interchange is split, between southbound on and off ramps to Echo Lake Road, and northbound on and off ramps to Route 262. Route 262 an east -west roadway, which provides four lanes of travel through the study area, would provide safe and efficient access to the site. Most likely, only minor modifications consisting mainly of site drive and utility/drainage work, and some ramp lane turnout work at Route 262 and Echo Lake Road would be required. Route 262 which would most likely be used as the main access way to the proposed site, i.e. where the main drive to the proposed industrial park would be located, consists of adequate geometrics and sufficient capacity to serve the site in a safe and efficient manner. Route 262 consists of two lanes of travel in each direction in the vicinity of the site. Based on the magnitude of the 1992 recorded traffic counts on Route 262 in the vicinity of the site, it is safe to assume that sufficient capacity exists along Route 262 to meet the capacity demands of the proposed development. Route 8, the north-south roadway which would provide the bulk of the access to the site, serves the area with a full interchange in the form of a half diamond at Route 262, and a half diamond at Echo Lake Road. Ideally, all the ramps of the interchange would be located at a common terminus, in this case Route 262. However, given the population densities in the region, a large percentage of the traffic destined for the proposed site would be attracted from points south and southeast of the proposed site, thereby arriving via Route 8 south, which is served by southbound on and northbound off ramps. Trips arriving the site from the north along Route 8 could access the proposed site via either Bridge Street (Route 262), or a secondary rear drive to Echo Lake Road.

Based on the overall review this site is consistent with the towns development plans.

ABOUT THE TEAM

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

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

Purpose of the Environmental Review Team

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

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

Requesting an Environmental Review

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

For additional information regarding the Environmental Review Team, please contact the King's Mark ERT Coordinator, Connecticut Environmental Review Team, P.O. Box 70, Haddam, CT 06438. The telephone number is 203-345-3977.