LAND-TECH CONSULTANTS, INC.
ENVIRONMENTAL SCIENTISTS AND ENGINEERS

NATURAL RESOURCES INVENTORY
AND
IMPACT ASSESSMENT

HEBRON VILLAGE GREEN

HEBRON, CONNECTICUT

PREPARED FOR:
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APPENDICES

1.0 INTRODUCTION

This report presents the findings of a natural resource inventory and impact assessment for property included in the Hebron Village Green District. The property is located south of Main Street (Route 66) and Pendleton Drive, East of Church Street (Route 85), north of Kinney Road and west of Millstream Road.

A master plan has been developed for the Hebron Village Green District that will provide a diversity of land use in a planned design development. These land uses include retail, commercial, residential, and public uses including a village green and pedestrian trails.

The objectives of the natural resource inventory were to identify and describe the site's natural resources to enable an informed assessment of alternative development scenarios in the development of a master plan for the site. Part of the intent of the establishment of the Village Green District is to "protect and enhance natural resources." The natural resources inventory provides a base of information that guides development away from significant and sensitive natural resources, while utilizing those areas of the site which are suitable for development.

2.0 NATURAL RESOURCE INVENTORY

2.1 Topography

The majority of the site is gently sloped. The elevated northeast portion of the property is relatively flat. Slopes drop off to the south, east and west from this elevated plateau. Moderately steep slopes are found along the east and south slopes of the knoll on the eastern portion of the property. This knoll contains the highest elevation on the property, at approximately 620 NGVD. The low point is located at the property's southwest corner with an elevation of approximately 400 NGVD. The gentle topography of the site presents no significant restrictions to site development.

2.2 Geology

Canterbury Gneiss underlies the majority of the property. This metamorphic rock is a light-colored foliated gneiss composed of potassium, feldspar, quartz, and biotite mica. The bedrock foliation strikes southwest and dips 15-20° northwest. Occasional outcrops of bedrock are found on-site, particularly on the moderately steep east facing slope of the knoll facing Mill Stream.

2.3 Soils

The entire site is covered by glacial till of varying thickness. Glacial till is a poorly sorted mix of clay, silt, sand, gravel and rocks deposited by glaciers during the last ice age.

Upland Soils

Deep well drained soils, identified by the Soil Conservation Service as Charlton fine sandy loam are found mainly on the eastern portion of the site. These soil types are suitable for most development and present little in the way of restrictions.

Paxton fine sandy loam and Hollis fine sandy loam are found mainly on the southern portion of the site. Both of these soils are well-drained but present some restrictions to development. The Paxton soils have a dense hardpan layer at about 18 to 30 inches below grade. The hardpan restricts downward drainage, and requires special precautions to address potential erosion and drainage problems. The Hollis soils have bedrock at shallow depths which may require blasting for excavations.

Woodbridge and Sutton fine sandy loam are found throughout the site and cover large areas on the west side of the property. These are moderately well drained soils that possess a seasonal high water table at about 18". Special precautions are required when developing these soils to control groundwater and prevent erosion hazards.

Wetland Soils

Wetland soils on the project site are identified by the Soil Conservation Service as Ridgebury, Leicester and Whitman find sandy loams. These poorly to very poorly drained soils occur on wet hillside seeps and in low lying drainageways of the site. They are typically saturated to the surface or possess shallow inundation from late fall to early spring.

2.4 Water Resources

Surface Water

The Hebron Village Green project site is situated within the Raymond Brook watershed (DEP# 4701) which is part of the Salmon Regional Basin. Raymond Brook is a second order tributary to the Jeremy River. The site is located mainly within the upper watershed area of the 8.7 square mile Raymond Brook drainage basin.

Site drainage is directed to one of three drainageways on the property. A perennial watercourse along the western side of the property drains southerly to Raymond Brook. Runoff from the easternmost side of the property drains to a tributary of Raymond Brook along Mill Stream Road. The central portion of the property drains to a wetland and associated intermittent watercourse that also flows in a southerly direction to Raymond Brook.

Since the watercourses on the property are located within the headwaters of the drainage basin, flows emanating from the property would likely be quite variable. Flows would be their highest from late fall to early spring, when limited evapotranspiration results in soil saturation and wetland discharges within the glacial till soils. Base flows during the dry summer months are expected to be low and not supportive of a viable fisheries habitat. However, these headwater streams provide an important source of cool, clean water to downstream fisheries associated with the larger receiving watercourses.

According to the Adopted Water Quality Classifications for the Connecticut River Basin, the watercourses on and adjacent to the site are classified as Class A surface waters. This

designation indicates that this is uncontaminated surface water suitable for recreational use, fish and wildlife habitat, agricultural and industrial supply, and potential drinking water supply.

Groundwater

There are no stratified drift deposits of soil on the property capable of supplying large quantities of groundwater. The glacial till soils found on the property do not possess the ability to supply a significant source of groundwater. With most till uplands, water resources are mainly available from bedrock wells. The site's bedrock aquifer is likely suitable for supplying adequate water for small to moderate residential and business uses.

The groundwater beneath and in the vicinity of the site is classified as GA and GAA. Class GA groundwaters are presumed suitable for direct human consumption without the need for treatment. Class GAA waters are groundwaters contributing to existing public water supply wells.

2.5 Floral Communities

The project area contains a diverse mix of vegetative communities. Past and present agricultural uses of the property have resulted in classic examples of ecological succession throughout the parcel. A mosaic of floral associations results from the presence of cultivated agricultural fields and abandonment of fields over a protracted period of time. Fields that have been abandoned the most recently are in the earliest stages of ecological succession and are vegetated primarily by coarse grasses, wildflowers and weeds. Somewhat older fields are vegetated with aggressive pioneer species of shrubs such as multiflora rose and Japanese barberry. The earliest abandoned fields are now vegetated with hardwood stands comprised primarily of red maple, hickory, ash, tulip tree, locust and black cherry. An Existing Vegetation Associations map and detailed community descriptions are appended to this report.

In a general sense, the property can be viewed as meadow habitat that has been used for agricultural purposes and forested areas. Overall, there is a nearly even mix of forested and meadow/old field habitat on the property. There are approximately 65 acres of forested uplands and wetlands and about 67 acres of meadow and old field habitat. Overall, the site's floral communities can be divided into the following categories.

Upland Communities

The **Agricultural Field** community comprises about 47 acres. There are total of twelve individual fields. They include a mixture of tilled, hay, mowed and pastured fields.

Hedgerows are located between individual Agricultural Fields and are typically less than 50 feet in width. The Hedgerows are vegetated primarily with pole and saw-timber size trees comprised of sugar maple (*Acer sacharum*), white ash (*Fraxinus americana*), black oak (*Quercus vellutina*), red oak (*Quercus rubra*), white oak (*Quercus alba*), black cherry (*Prunus serotina*), hickory (*Carya sp.*), sassafras (*Sassafras albidum*), crabapple, eastern red cedar (*Juniperus virginiana*) and red maple (*Acer rubrum*). Wolf-trees (large trees with spreading crowns) are commonly found within the hedgerows. The transition from field edge to wooded hedgerow is vegetated with dense shrub and vine growth comprised of multiflora rose (*Rosa multiflora*), speckled alder (*Alnus rugosa*), Japanese

barberry (*Berberis thunbergii*), autumn olive (*Eleagnus angustifolia*), poison ivy (*Toxicodendron radicans*), grape (*Vitis sp.*), and bittersweet (*Celastrus scandens*).

Approximately 20 acres of the site consists of recently abandoned agricultural fields. These fields are in varying stages of **Old Field Succession** as pioneer vegetation colonizes these areas. These youngest fields are vegetated with a variety of grasses and wildflowers such as goldenrod (*Solidago sp.*) and milkweed (*Asclepias sp.*). Somewhat older fields are vegetated with a mix of invasive pioneer shrubs such as multiflora rose and Japanese barberry. More advanced stages of Old Field Succession are vegetated with pole-sized red maples, eastern red cedar, white pine, choke cherry, white ash and crab apple.

Forested Upland Communities including the hedgerows between fields comprise about 38 acres of the site. The larger, more contiguous areas of forested habitat are found primarily on the eastern portion of the property. They contain a mix of deciduous trees such as red maple, sugar maple, black oak, black gum, tulip tree, ash, American beech, black birch and black cherry. A fairly sparse understory of shrubs including viburnums, highbush blueberry, multiflora rose, Japanese barberry and hardwood saplings is found under the hardwood canopy.

Wetland Communities

Forested Wetlands and **Red Maple Swamp** communities comprising about 27 acres are found within the lower elevations of the site and on wet hillside seeps. The **Forested Wetlands** are vegetated with a mix of pole to sawtimber size red maple, white ash, American elm, yellow birch and black gum. Saplings of red maples, white ash and American beech are found in the understory. Japanese barberry, spicebush, winterberry, speckled alder and multiflora rose are also found in the understory. The **Red Maple Swamp** communities are found within the wetter portions of the site. They possess pit and mound topography with vegetated hummocks interspersed among seasonally inundated pockets. These communities are dominated by red maple and American elm. The understory is comprised of spicebush winterberry and speckled alder. Skunk cabbage is also common.

Low lying drainageways within active and abandoned agricultural fields contain **Wet Meadow** communities. These are vegetated with a variety of grasses, sedges, rushes and wildflowers.

An **Emergent Marsh** community has developed with an area of abandoned field on the west side of the property as a result of beaver activity in a small stream. This marsh contains groupings of speckled alder, multiflora rose, sweet pepperbush, irises, tussock sedge and various rushes.

Scrub Shrub Wetlands have developed in some of the wet areas of abandoned fields. These are vegetated with dense impenetrable thickets of multiflora rose, Japanese barberry, wild grape, speckled alder, Russian olive and pussy willow.

2.6 Wetlands and Watercourses

The site's wetlands are associated with three major drainageways on the property. A large contiguous wetland occupies the westernmost portion of the property and drains into a perennial watercourse that flows southerly to Raymond Brook.

A centrally located wetland drains into an intermittent watercourse that also flows in a southerly direction to Raymond Brook. A narrow wetland, draining southwesterly, interconnects the central and western drainageways.

Wetlands within a drainageway on the eastern side of the property drains to a tributary of Raymond Brook along Mill Stream Road.

The soil and vegetative characteristics of the wetlands are described above in Sections 2.3 and 2.5.

Wetlands bordering perennial and intermittent watercourses, such as those found on site, function to protect these on-site, as well as downstream, water resources. They provide a source of cool water to these headwater streams through soil exfiltration. They provide a buffer to the watercourses, filtering out sediments and other pollutants in overland runoff. And, they provide soil stabilization and some flood control functions.

2.6.1 Wetland Functions

Wetlands perform many beneficial functions that are not performed by many other ecological systems. Wetlands can provide flood control by attenuating storm flows; recharge groundwater systems; enhance water quality by filtering out sediment, pollution and excessive nutrients; provide additional plant diversity; and support wildlife and fisheries. The productivity of a particular wetland is dependent on many factors including, hydrology, size, adjacent resources, topography and vegetation. These characteristics vary widely and therefore the functions performed by an individual wetland may vary considerably. The recognized functions of inland wetlands are presented in Table #1, and important functions associated with the wetland system on the subject site are discussed below.

Table 1. List of Dominant Wetland Functions

(Adapted from Metzler and Tiner, 1992).

Fish and Wildlife
* Fish and Shellfish Habitat
* Waterfowl and Other Bird Habitat
* Furbearer and Other Wildlife Habitat
Environmental Quality
* Water Quality Maintenance
* Pollution Filter
* Sediment Removal
* Oxygen Production
* Nutrient Recycling
* Chemical and Nutrient Absorption
* Aquatic Productivity
* Microclimate Regulator
Socio-Economic Values
* Flood Control
* Wave Damage or Shoreline Protection
* Erosion Control
* Groundwater Recharge and Water Supply
* Timber and Other Natural Products
* Boating
* Education and Scientific Research

Wildlife Habitat

As discussed below in Section 2.7, the property contains a diverse wildlife population due to the variety of community types available. The inland wetland systems on the property provide wildlife with a diversity of plant species from which to forage and use as cover.

Flood Control

Inland wetlands help reduce the effects of flooding by slowing the flow of surface water runoff and temporarily storing floodwaters within the wetland basin. Floodwaters are released slowly from these wetlands, thus reducing flow rates and minimizing impacts to downstream areas. The three main wetland corridors provide some flood storage and stormwater retention. Flooding of the riparian zone especially along the stream on the west side of the property provides for removal of suspended solids (pollutants) by direct settlement and adsorption.

Water Quality Maintenance/Enhancement

Wetlands improve water quality by retaining or transforming excess nutrients, particularly phosphorus and nitrogen, and by trapping sediments and heavy metals. When stormwater runoff is detained in wetlands, nutrients present in the runoff can be removed via uptake by wetland vegetation, attenuated by soil microorganisms and immobilization by soil chemical interactions. The inland wetlands on the property are densely vegetated and therefore have the capacity to uptake and transform nutrients during the growing season. The riparian wetlands along the watercourse on the west side of the property contain a dense layer of herbaceous and shrub vegetation that take up nutrients.

2.7 Fish and Wildlife Habitat

While the site's watercourses are too small or intermittent to harbor significant populations of fish, the site's wetlands and watercourses form the headwaters of Jeremy Brook, which has been identified as a cold water stream capable of supporting trout and Atlantic salmon. Protection of the on-site wetlands and watercourses from development impacts including stormwater discharges and erosion and sedimentation must be carefully evaluated in order to protect these downstream resources.

The presence of open fields, mixed old field succession, mature canopied woodlands, wetland areas, and watercourses on and adjacent to the property, provide a diverse assemblage of habitats. The mosaic of floral communities creates an abundance of "edge" habitat, which tends to enhance wildlife use. Dense shrub thickets provide abundant escape cover and food sources for wildlife. Wildlife species expected to make use of the site are those that are common to rural and suburban settings.

As described above, the past agricultural disturbance on the property has created a diversity of floral habitats from early to late-successional stages. This floral diversity allows for a greater number of wildlife species to be supported when compared to a monoculture or one community type.

The meadow/old-field community on the property is suitable for species such as meadow voles (*Microtus pennsylvanicus*), various species of mice, and snakes such as garter snakes. The wooded areas are suitable for many species of mammals such as the white-footed mouse (*Peromyscus leucopus*), short-tailed shrew (*Blarina brevicauda*), eastern chipmunk (*Tamius striatus*) and other species preferring the thick canopy and dead fall of the forest.

The ecotonal edge habitat created by the interface of these two communities (meadow/old field) creates suitable habitat for species utilizing the dense cover for protection and open area for foraging. Species utilizing this edge habitat include white-tailed deer (*Odocoileus virginianus*), eastern cottontail (*Sylvilagus floridans*), striped skunk (*Mephitis mephitis*), and numerous songbirds.

The site's wetlands provide habitat for certain reptiles and amphibians. Reptiles and amphibians are ectothermic, meaning that they cannot produce internal body heat and rely on external sources of heat to maintain their metabolism. Therefore, these organisms must actively regulate the amount of heat that reaches their skin. They do this by basking on rocks or in meadows to warm up or hide under logs or in tunnels to cool off. Due to this requirement, they need a variety of habitats nearby. In addition, most amphibians (redback salamanders being a regional exception) require standing water to incubate their eggs and live out the larval stage of their life cycle. Typically, two months of standing water and a depth of 6 to 18 inches are required for egg hatching and larval development.

Red back salamanders are the exception to regionally found salamanders in that they are completely terrestrial and do not require a standing water body in order to reproduce. This species is very common in the area and is typically found in damp/moist areas usually under logs or rocks. The cool crevasses of the abandoned buildings may also provide suitable areas to regulate their body temperature and hide from predators.

The xeric (dry) to mesic (moderately dry) meadows and ecotonal woodland buffers along with the rock outcrops provide suitable habitat for snakes on the property. The thick vegetation of the riparian community provides cover and access to water. The proximity to open meadow communities and the creek bed during low tide provides areas for snakes and turtles to bask and forage.

2.8 Protected and Special Concern Species

A review of the Connecticut Department of Environmental Protection's Natural Diversity Database (CT DEP Environmental Data 2002 edition) indicated that no protected or special concern species are known on or within ½ mile of the subject parcel.

A memorandum from the CT DEP Office of Environmental Review dated February 9, 2004 confirms that the Natural Diversity Database contains no records of extant populations of Federally listed endangered or threatened species or species listed by the State as endangered, threatened or special concern at the project site. The memorandum also states however that there are reports of the eastern box turtle (*Terrapene carolina*), a State species of special concern, nearby. Eastern box turtles inhabit old field and deciduous forest habitats such as those found on-site. They are often found near small streams and ponds. Adults are completely terrestrial and hibernate underground from October to April. Juveniles may be semi-aquatic. Eastern box turtles have small home ranges and usually inhabit the same area for many years. The principal threat to this species is loss of suitable habitat.

A survey of potential eastern box turtle habitats will be conducted to evaluate the presence of the eastern box turtle on the site. If eastern box turtles are found on-site, specific conditions such as habitat preservation, construction scheduling, etc. will be evaluated and incorporated into the Site Development plan where applicable.

3.0 NATURAL RESOURCES IMPACT ASSESSMENT

3.1 Development Pattern

The overall pattern of development for the Village Green District consists of three distinct components: Village Center, Village General, and Village Edge. The Village Center and Village General are intended to be the areas of more concentrated development while the Village Edge is intended to be less densely developed. The Village Edge is intended primarily for residential, civic, recreational, and open space uses. Some of the objectives of the Village Edge are to preserve natural features, accommodate greenways, and create buffer areas along the edge of the Village Green District.

The concept master plan complies with the intended pattern of development by locating shops, services, commercial and retail uses, and a public square within the northeast and north central portions of the district. Multi-family and single family residences are proposed along the southern portion of the site and abutting neighboring residential developments to the south. A large area of open space is proposed along the District's western boundary.

The design standards of the Village Green District include provisions that call for the preservation of stone walls, hedgerows, specimen trees and barways. As a result of past and present agricultural uses, the site contains numerous stonewalls, hedgerows and barways. While it would not be possible to preserve all stonewalls and hedgerows, a large percentage of them, especially within the south and west portions of the site will be preserved.

Specimen trees located along wooded hedgerows and within wooded areas along the east and west sides of the site will be located and preserved where possible. The wooded areas on the west side of the site will be set aside as open space, protecting any specimen trees that may reside there. Trees within the wetlands in the central and west sides of the property will also be preserved.

The open space standards of the Village Green District include provisions that call for the incorporation of buffers to preserve natural resources corridors, protect and include watercourses and wetlands and provide buffers to adjacent uses. The three major wetlands corridors that traverse the property from north to south will remain intact. These corridors will protect the associated watercourses, protect surface water quality, and provide concealed travel corridors for wildlife movement through the site. Design details for road crossings across the wetland corridors will be evaluated during the Site Plan development phase of the project to incorporate measures than do not hinder wildlife movement and protect the associated water resources.

3.2 Wetlands and Watercourses

Under the concept master plan for the Village Green District, all development activities other than road crossings are proposed outside of inland wetlands. A total of five wetland crossings are required under the concept plan to gain access to buildable areas on the property and to provide access from Main Street and Church Street. The crossings are located at narrow sections of the wetlands to minimize impacts. Specific designs for each of the wetlands crossings will be evaluated during the Site Plan development phase of the project to ensure minimal impact and to implement impact mitigation strategies where possible.

Other wetland protection guidelines that will be implemented for the Village Green development include the following.

- The preservation of wetland and watercourse buffers will be used to protect wetlands from construction and post development activities. A series of bio-remediation basins will be incorporated into the buffer between the Village Center development and wetlands to the northeast. The basins will act as sediment basins during construction to protect the wetlands from sedimentation impacts. The basins will also provide for advanced bio-filtration of stormwater discharges from the developed Village Center site.
- Large areas of open space, incorporating wetlands and watercourses, will be set aside to preserve habitat for wetland dependent species. Approximately 78 acres of open space will be preserved under the Master Plan. This represents about 58% of the overall 132.25 acre site.
- A comprehensive stormwater management plan that utilizes best management practices to protect wetlands and water resources will be designed and implemented. Descriptions of specific measures are include in Sections 3.4 below and in the Public Works Impact Statement prepared by Megson & Heagle.
- A comprehensive erosion and sediment control plan will be designed and implemented to protect wetlands and watercourses from sedimentation impacts.

3.3 Fish and Wildlife Habitat

As with any development there will be a loss of some wildlife habitat associated with the development project. However, the preservation of large areas of open space will mitigate these impacts by providing habitat for wildlife at the Village Green. The development pattern of the concept master plan preserves intact corridors of habitat to allow wildlife movement through the property from north to south. The preservation of stone walls and hedgerows within developed areas will provide additional wildlife habitat and preserve "edge" habitat that is currently used by wildlife. Since the site has been used over the years for agriculture, there are no large unfragmented habitats on the property. Thus, the concept master plan will not result in habitat fragmentation.

Downstream fisheries resources will be protected by preserving wetland habitats, providing wetland buffers, and implementing best management practices to control erosion and sedimentation during development and to manage and treat post development stormwater runoff.

A site survey to evaluate the presence of eastern box turtle, a species of special concern, will be undertaken. If eastern box turtles are found on-site, specific measures will be incorporated into the Site Development plans to protect the species and its habitat.

3.4 Stormwater Management

The drainage standards of the Village Green District dictate the minimization of impacts from stormwater discharges. Post-development peak run-off rates leaving the development must not exceed pre-development rates. Drainage designs must include components that treat stormwater to remove pollutants prior to discharge into natural systems. Stormwater control features must be functional, environmentally sensitive and, where visible, must be aesthetically pleasing.

The drainage systems will contain both structural and non-structural components to detain and treat runoff from developed portions of the site. The use of natural systems to treat runoff such as grassed swales, depressed parking islands, and water quality basins will be utilized where feasible. Specific aspects of the stormwater management plan are included the Public Works Impact Statement.

Development of the Village Green will result in an increase in impervious surfaces which will result in increases in stormwater runoff. Increases in impervious surfaces and stormwater runoff can have adverse effects on wetlands and watercourses, including changes in stream hydrology, stream morphology, water quality, and fish and wildlife habitat. The relationship between increases in imperviousness and water resource impacts has been documented in the literature. The Center for Watershed Protection has integrated research findings into a general watershed planning model known as the Impervious Cover Model. The Impervious Cover Model predicts that most stream quality indicators decline when watershed impervious cover exceeds 10%, with severe degradation expected above 25% impervious cover (Center for Watershed Protection, 2003).

Nathan L. Jacobson & Associates are currently preparing a Town Center Stormwater Management Study for the Town of Hebron. Their study area encompasses the upper region of the Raymond Brook watershed which includes the Village Green District.

According to their preliminary findings, it is estimated that less than 1% of the 3.27 square mile study area watershed is covered by impervious surfaces.

Build-out of the concept master plan for the Village Green would result in the creation of about 23 acres of impervious surfaces or about 17% of the Village Green district. Based on current zoning regulations, the Stormwater Management study estimates that future land development within the study area watershed would yield an increase in total imperviousness to 8% over the entire study area watershed.

The overall sub-watershed area imperviousness is predicted to remain below the 10% threshold predicted by the Impervious Cover Model where stream quality indicators are expected to decline. However, stringent stormwater management measures will be needed to protect water resources within the Village Green District. Some of the stormwater management guidelines that will be implemented in the Village Green District to protect water quality, wetlands and fish and wildlife habitat are outlined below.

- The overall site design will cluster development in those areas most suitable for development and away from sensitive wetland and watercourse systems.
- Wetland areas and natural flood plains will be preserved.
- Buffers will be maintained between the development and wetland/watercourse habitats.
- Large areas of open space will be preserved.
- Existing drainage patterns will be maintained.
- Development will be phased to limit the area of disturbance in order to reduce potential erosion and sedimentation impacts.
- An erosion and sediment control plan will be developed and implemented that controls runoff during construction, provides erosion and sediment control structures, and emphasizes rapid re-establishment of vegetative stabilization.
- Both structural and non-structural best management practices (BMPs) will be designed and constructed for stormwater management. These measures will include sheet flow to parking lot islands and road shoulders, subsurface stormwater detention and recharge systems, catch basins with 2 foot sumps, swirl concentrators, water quality basins, vegetated swales for conveyance and treatment, and landscaping to enhance stormwater treatment such as depressed parking lot islands and rain gardens. Infiltration systems will be used to accept roof drainage where feasible. These structural and non-structural BMPs are further addressed in the Public Works Impact Statement.
- The first flush of stormwater runoff will be treated prior to discharge to natural systems.
- Post-development peak run-off rates leaving the development will not exceed pre-development rates.

The control of stormwater quality, that is, the removal of contaminants from stormwater prior to discharge to a receiving water, is accomplished by a combination of facilities and techniques known in the trade as Best Management Practices (BMPs). These include the discharge of runoff as sheet flow, rather than as a point discharge, the use of vegetated buffer areas to filter stormwater before it reaches a watercourse, the use of "swirl concentrators", the use of biofiltration to filter contaminants, and the use of constructed wetlands to polish the discharge.

The principal contaminants of concern from development are suspended solids, oil & grease, and heavy metals from parking areas, and to a lesser degree nutrients and pesticides from landscaped areas. Heavy metals are typically adhered to solids, so control of solids generally results in control of heavy metals as well. Control of oil & grease is accomplished by the use of swirl concentrators equipped with features for trapping "floatables" and by filtration.

Swirl Concentrators

The project includes numerous "swirl concentrators" to treat stormwater from the roads and from parking lots. These are manufactured structures designed to trap road sand and "floatable" debris. They include internal hydraulic controls to collect and treat the so-called "first flush" of stormwater (typically from one inch of rainfall) and to bypass excess stormwater resulting from more than an inch of rainfall.

Vegetated Buffers

The preservation or creation of vegetated buffers adjacent to wetlands and watercourses is an effective means of treating stormwater runoff and protecting surface water quality. Vegetated buffers trap pollutants in stormwater runoff through physical settling and vegetative filtering. Since most pollutants are adsorbed to sediments, the trapping of sediments within a buffer removes pollutants such as nitrogen, phosphorus and heavy metals. Chemical and biological processes in the soil, in turn, transform nitrogen and other pollutants into less harmful forms. Buffers also act as sinks when nutrients are taken up by root systems and stored in vegetative biomass.

Water Quality Basins

Research has shown that nearly 90 percent of all runoff occurs during storms of one inch of rainfall or less. Water quality basins will be designed to treat the first one inch of runoff and thus have the capability of capturing and holding nearly 90 percent of the contaminants associated with stormwater runoff entering the basins.

The water quality basins are designed to function in much the same way processes occur in the natural environment. Treatment processes in water quality basins reproduce the physical, chemical and biological processes that occur in nature. These processes include the capture of runoff by plants and soils; the downward migration and filtering of runoff through the soil; the settling out of suspended particles; evaporation and transpiration of captured runoff; absorption of water in soil pores and subsequent plant uptake; assimilation of nutrients by plants; adsorption of dissolved nutrients and other pollutants to soil; nitrification, denitrification and volatilization of nitrogen compounds; thermal attenuation of heated runoff from paved surfaces; and microbial degradation and decomposition of chemical and organic compounds.

Vegetated Swales

Vegetated swales function by collecting, holding, and filtering runoff. Much like water quality basins, natural processes remove sediments and chemical and organic compounds from runoff. Runoff is filtered by the vegetation and by underlying soils as is infiltrates the bottom and sidewalls of the swale.

3.5 Wastewater Disposal and Water Supply

The proposed Village Green development will utilize available public sewers for wastewater disposal. Water supply for the Village Green District will be provided by Birmingham Utilities which currently operates the Hebron Center water system. Assessments of these utilities are addressed in separate Impact Statements.

3.6 Hazardous Materials

Development of the Village Green will increase the potential for groundwater and surface water contamination from the storage and potential release of hazardous materials. In order to mitigate the potential for contamination, the following guidelines will be applied to the site:

- Fuel or chemical storage tanks will be above ground within well recharge areas and will be provided with secondary containment.
- Underground fuel or chemical storage tanks, outside of well recharge areas, will have double wall construction.
- There will be no outdoor storage of hazardous materials. Potentially hazardous materials sold at retail stores, such as lawn and garden care products will be stored indoors or within a roofed structure away from floor drains. Loading and handling areas will be covered and have spill containment devices.
- Industrial or retail facilities that store, use or generate hazardous materials will have specific hazardous material management plans addressing inventory, storage, handling, disposal and emergency response.
- Turf management in public areas including recreational fields and greens will emphasize an integrated pest management approach that minimizes the use of chemical pesticides, herbicides and fertilizers.

3.7 Air Quality

The impact to air quality as a result of development of the Village Green District is not expected to be significant. Temporary adverse air quality impacts may occur in the immediate vicinity of the project due to exhaust emissions from construction equipment and dust produced by construction activities. Construction equipment exhaust emissions will be negligible when compared to those produced by normal traffic flow in the vicinity of the town center. Generation of dust from construction activities can be mitigated by including dust control requirements in the Erosion and Sediment Control Plans. All of these impacts are of short duration and will cease with the completion of the construction phases of the project.

Increases in Hebron center traffic as a result of development are not anticipated to increase carbon monoxide levels substantially. Since high levels of carbon monoxide are typically associated with areas of heavy traffic congestion, the project is not anticipated to have an adverse impact on air quality in Hebron center.

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APPENDIX A
NDDB CORRESPONDENCE

STATE OF CONNECTICUT

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OFFICE OF ENVIRONMENTAL REVIEW

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From:	David J. Fox - Senior Environmental Analyst **Telephone:** (860) 424-4111
Date:	February 9, 2004 **E-Mail:** david.fox@po.state.ct.us
Subject:	Hebron Village Green District

The Department of Environmental Protection has reviewed the Notice of Scoping to prepare a Environmental Impact Evaluation for the proposed mixed use development in the village green district of Hebron. This project was previously the subject of a Stage I Site Review, and the Department submitted comments dated January 6, 2003. The information in that memo should be considered during preparation of the CEPA document. The following additional comment is also offered for your consideration.

As previously indicated, the Natural Diversity Data Base, maintained by DEP, contains no records of extant populations of Federally listed endangered or threatened species or species listed by the State, pursuant to section 26-306 of the Connecticut General Statutes, as endangered, threatened or special concern at the project site. However, there are reports of populations of a State species of special concern, the eastern box turtle (*Terrapene carolina carolina*), nearby.

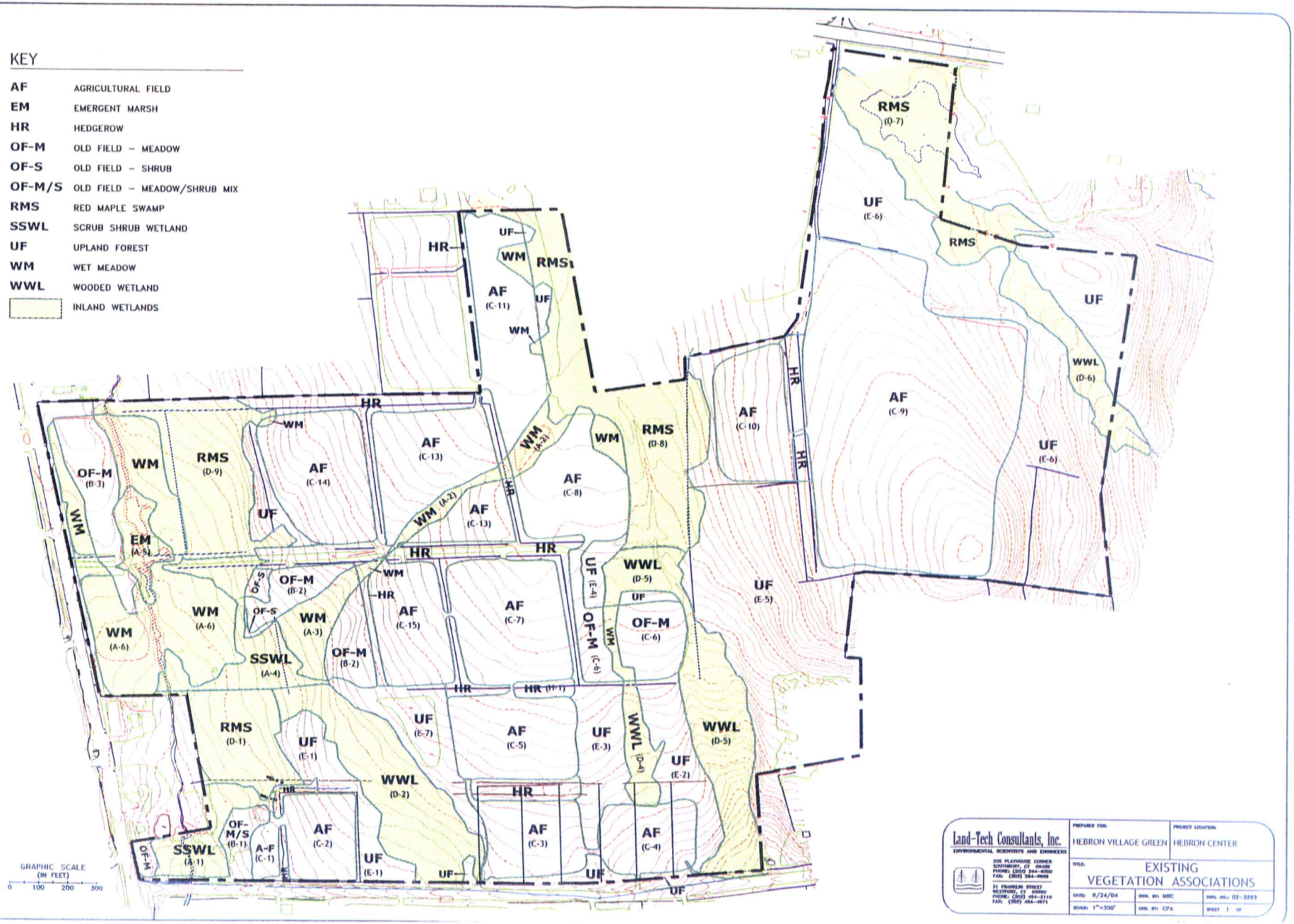
Eastern box turtles require old field and deciduous forest habitats, which can include power lines and logged woodlands. They are often found near small streams and ponds. The adults are completely terrestrial, but the young may be semiaquatic, and hibernate on land by digging down in the soil from October to April. They have an extremely small home range and can usually be found in the same area year after year. This species has been negatively impacted by the loss of suitable habitat. If the project area includes any Eastern box turtle habitat, the Wildlife Division recommends that a herpetologist familiar with the habitat requirements of the box turtle conduct site surveys. A report summarizing the results of such surveys should include habitat descriptions, reptile species list and a statement/resume giving the herpetologist's qualifications. The results of this investigation should be included in the EIE or can be forwarded to the Department independently, and after evaluation, recommendations for additional surveys, if any, will be made.

If box turtles are present on the site, the time of year when construction work is scheduled will affect this species. Depending on site plans and construction schedules, specific restrictions or conditions relating to this species may apply. In this situation, additional evaluation of the proposal by the DEP should be requested. For additional information regarding the box turtle, contact Julie Victoria of the Wildlife Division at (860) 642-7239.

Thank you for the opportunity to again review this project. If there are any questions concerning these comments, please contact me.

cc: Jeff Smith, OPM
Arthur J. Rocque, Jr., DEP/COMM
Julie Victoria, DEP/WD

APPENDIX B
EXISTING VEGETATION ASSOCIATIONS PLAN

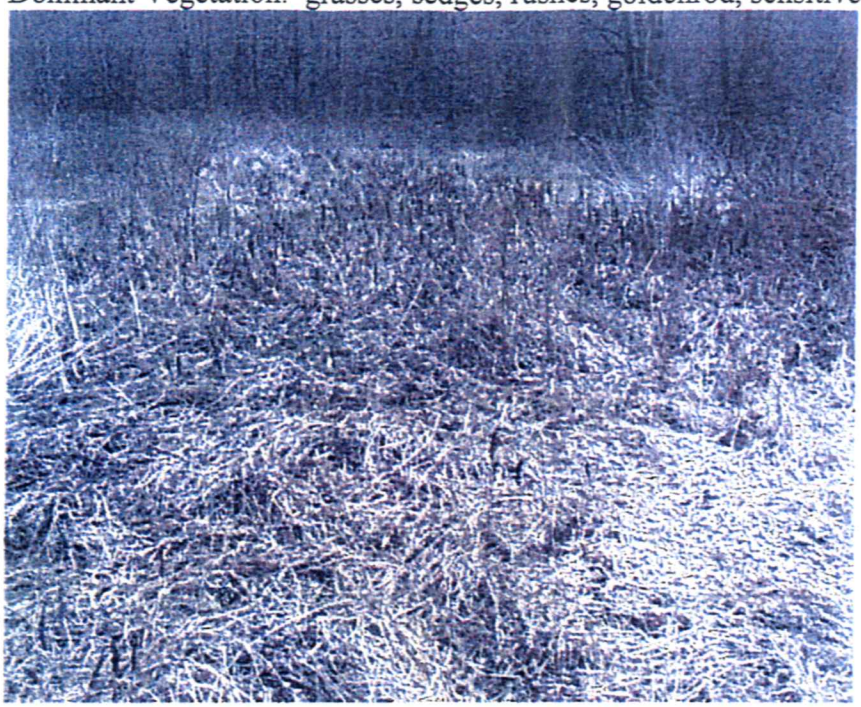


APPENDIX C
VEGETATION COMMUNITIES PHOTOS AND DESCRIPTIONS

Key: A-1
Community: Scrub Shrub Wetland
Soil Type: Ridgebury fine sandy loam
Dominant Vegetation: multiflora rose, apple, white ash saplings, goldenrod

Key: A-2
Community: Wet meadow
Soil Type: Leicester, Ridgebury and Whitman fine sandy loam
Dominant Vegetation: grasses, sedges, rushes, goldenrod

Key: A-3
Community: Wet meadow
Soil Type: Ridgebury stony fine sandy loam
Dominant Vegetation: grasses, sedges, rushes, goldenrod, sensitive fern, meadow sweet



Key: A-4
Community: Scrub shrub wetland
Soil Type: Ridgebury stony fine sandy loam
Dominant Vegetation: multiflora rose, speckled alder, Russian olive, pussy willow

Key: A-5
Community: Wet meadow/emergent marsh (remnant beaver dam)
Soil Type: Ridgebury stony fine sandy loam
Dominant Vegetation: multiflora rose, speckled alder, pussy willow, sweet pepperbush, meadow sweet, tussock sedge, irises, rushes

Key: A-6
Community: Wet meadow
Soil Type: Ridgebury stony fine sandy loam
Dominant Vegetation: multiflora rose, speckled alder, pussy willow, Russian olive, meadow sweet, tussock sedge, irises, rushes, sensitive fern

Key: A-5
Community: Wet meadow/emergent marsh (remnant beaver dam)
Soil Type: Ridgebury stony fine sandy loam
Dominant Vegetation: multiflora rose, speckled alder, pussy willow, sweet pepperbush, meadow sweet, tussock sedge, irises, rushes

Key: A-6
Community: Wet meadow
Soil Type: Ridgebury stony fine sandy loam
Dominant Vegetation: multiflora rose, speckled alder, pussy willow, Russian olive, meadow sweet, tussock sedge, irises, rushes, sensitive fern

Key: B-1
Community: Meadow/Shrub mix
Soil Type: Woodbridge fine sandy loam
Dominant Vegetation: grasses, multiflora rose, Russian olive, blackberry

Key: B-2
Community: Meadow
Soil Type: Woodbridge fine sandy loam
Dominant Vegetation: grasses, goldenrod, multiflora rose, Russian olive

Key: B-3
Community: Meadow
Soil Type: Woodbridge fine sandy loam
Dominant Vegetation: grasses, goldenrod, multiflora rose, Russian olive

Key: C-1
Community: Hay field
Soil Type: Woodbridge fine sandy loam
Dominant Vegetation: meadow grasses

Key: C-2
Community: Hay field
Soil Type: Woodbridge fine sandy loam
Dominant Vegetation: meadow grasses

Key: C-3
Community: Hay field
Soil Type: Paxton fine sandy loam and Woodbridge fine sandy loam
Dominant Vegetation: Meadow grasses

Key: C-4
Community: Hay field
Soil Type: Paxton fine sandy loam and Woodbridge fine sandy loam
Dominant Vegetation: Meadow grasses

Key: C-5
Community: Hayfield
Soil Type: Paxton fine sandy loam
Dominant Vegetation: Meadow grasses

Key: C-6
Community: Meadow (recently abandoned agricultural field)
Soil Type: Woodbridge fine sandy loam and Ridgebury fine sandy loam
Dominant Vegetation: goldenrod, milkweed

Key: C-7
Community: Agricultural field
Soil Type: Paxton fine sandy loam
Dominant Vegetation: corn stubble

Key: C-8
Community: Agricultural field
Soil Type: Woodbridge fine sandy loam
Dominant Vegetation: corn stubble

Key: C-9
Community: Agricultural field
Soil Type: Charlton fine sandy loam and Woodbridge fine sandy loam
Dominant Vegetation: corn stubble

Key: C-10
Community: Agricultural field
Soil Type: Woodbridge fine sandy loam
Dominant Vegetation: corn stubble

Key: C-11
Community: Agricultural field
Soil Type: Woodbridge fine sandy loam
Dominant Vegetation: corn stubble

Key: C-12
Community: Meadow (recently abandoned agricultural field
Soil Type: Woodbridge fine sandy loam and Charlton fine sandy loam
Dominant Vegetation: grasses, goldenrod, milkweed

Key: C-13
Community: Hay field
Soil Type: Woodbridge fine sandy loam
Dominant Vegetation: meadow grasses

Key: C-14
Community: Agricultural field
Soil Type: Woodbridge fine sandy loam and Charlton fine sandy loam
Dominant Vegetation: corn stubble

Key: C-15
Community: Agricultural field
Soil Type: Woodbridge fine sandy loam and Paxton fine sandy loam
Dominant Vegetation: corn stubble

Key: D-1
Community: Red maple swamp
Soil Type: Leicester, Ridgebury, Whitman fine sandy loams
Dominant Vegetation: Red maple, American elm, spicebush, Japanese barberry
speckled alder, winterberry, spicebush

Key: D-2
Community: Forested wetland
Soil Type: Ridgebury fine sandy loam
Dominant Vegetation: red maple, American elm, shagbark hickory,
multiflora rose, Japanese barberry,

Key: D-3
Community: Forested wetland (with dense invasive shrub and vine thickets)
Soil Type: Leicester, Ridgebury, Whitman fine sandy loams
Dominant Vegetation: red maple, white ash, multiflora rose, Japanese barberry spicebush, american bittersweet, poison ivy, skunk cabbage

Key: D-4
Community: Forested wetland (with dense invasive shrub and vine thickets)
Soil Type: Leicester, Ridgebury, Whitman fine sandy loams
Dominant Vegetation: red maple, white ash, multiflora rose, Japanese barberry spicebush, american bittersweet, poison ivy, skunk cabbage

Key: D-5
Community: Forested wetland
Soil Type: Leicester, Ridgebury, Whitman fine sandy loams
Dominant Vegetation: red maple, white ash, American elm, spicebush, Japanese barberry, wild grape

Key: D-6
Community: Forested wetland
Soil Type: Leicester, Ridgebury and Whitman fine sandy loams
Dominant Vegetation: red maple, yellow birch, white ash, spicebush, skunk cabbage

Key: D-7
Community: Red maple swamp
Soil Type: Leicester, Ridgebury and Whitman fine sandy loam
Dominant Vegetation: red maple, sweet pepperbush, highbush blueberry, spicebush, skunk cabbage

Key: D-8
Community: Red maple swamp
Soil Type: Leicester, Ridgebury and Whitman fine sandy loams
Dominant Vegetation: red maple, white ash, spicebush, highbush blueberry, northern arrowwood, , Japanese barberry, skunk cabbage

Key: D-9
Community: Red maple swamp
Soil Type: Ridgebury stony fine sandy loam
Dominant Vegetation: red maple, spice bush, skunk cabbage

Key: E-1
Community: Forested upland
Soil Type: Paxton fine sandy loam and Woodbridge fine sandy loam
Dominant Vegetation: shagbark hickory, red maple, black cherry, multiflora rose, privet

Key: E-2
Community: Forested upland (with dense invasive shrub and vine thickets)
Soil Type: Woodbridge fine sandy loam
Dominant Vegetation: hickory, yellow birch, white ash, red oak, multiflora rose, Japanese barberry, American bittersweet.

Key: E-3
Community: Forested upland (with dense invasive shrub and vine thickets)
Soil Type: Woodbridge fine sandy loam
Dominant Vegetation: cottonwood, multiflora rose, blackberry, Japanese barberry, American bittersweet, poison ivy

Key: E-4
Community: Forested upland
Soil Type: Woodbridge fine sandy loam
Dominant Vegetation: red maple, cottonwood, white oak (wolf tree), spicebush, barberry

Key: E-5
Community: forested upland (with dense invasive shrub and vine thickets
Soil Type: Charlton fine sandy loam and Paxton fine sandy loam
Dominant Vegetation: white ash, apple, eastern red cedar, multiflora rose, Japanese barberry, wild grape, American bittersweet

Key: E-6
Community: Forested upland
Soil Type: Woodbridge fine sandy loam
Dominant Vegetation: red maple, black cherry, black locust, hickory, white ash, barberry

Key: E-7
Community: Forested upland
Soil Type: Woodbridge fine sandy loam
Dominant Vegetation: red maple, tulip tree, hickory, white ash, American beech, highbush blueberry

Key: H-1
Community: Hedgerow
Soil Type: Paxton fine sandy loam
Dominant Vegetation: red oak, white ash, red maple, shagbark hickory, multiflora rose

Key: H-2
Community: Hedgerow
Soil Type: Charlton fine sandy loam
Dominant Vegetation: black cherry, red maple, white ash, sugar maple, black birch, multiflora rose, blackberry

Key: H-3
Community: Hedgerow
Soil Type: Woodbridge fine sandy loam and Paxton fine sandy loam
Dominant Vegetation: black cherry, red maple, white ash, sugar maple, black birch, multiflora rose, blackberry