Stonebridge Commons Residential Development
Waterbury, Connecticut

King's Mark Environmental Review Team Report

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

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Waterbury, Connecticut

Environmental Review Team Report

Prepared by the
King's Mark
Environmental Review Team

Of the

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

For the

Inland Wetlands and Watercourses Commission
Waterbury, Connecticut

May 2007

Report #343

CT Environmental Review Team Program
www.ctert.org

Acknowledgments

This report is an outgrowth of a request from the Waterbury Inland Wetlands and Watercourses Commission (WIWWC) to the Southwest Conservation District (SWCD) and the King's Mark Resource Conservation and Development Area (RC&D) Council for their consideration and approval. The request was approved and the measure reviewed by the King's Mark Environmental Review Team (ERT).

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

The field review took place on Wednesday, February 28, 2007.

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I would also like to thank Nancy Shea, Waterbury wetland agent, Gail McTaggart, attorney for the applicant, Curt Jones, project engineer, David Lord, soil scientist for the applicant, Stan Dynia, geo-environmental consultant for the applicant, Brian Miller, planning consultant, and Dan O'Neill, traffic engineer for their cooperation and assistance during this environmental review.

Prior to the review day, each Team member received a summary of the proposed project with location and soils maps. During the field review Team members were given plans and additional information. Some Team members conducted a plan review only and others made separate and/or multiple field trips. Following the review, reports from each Team member were submitted to the ERT coordinator for compilation and editing into this final report. There were changes and updates made to the plans and materials Team members received on the field review day. Some Team members have based their reports on the materials received on 2/28/07 or shortly thereafter, while others used the updated materials. The project name has been changed from "Renaissance" to "Stonebridge Commons," and the number of units has been reduced from 330 to 280 units. There is a note in each section of the report stating which materials were used by Team members for their review so as to avoid confusion.

This report represents the Team's findings. It is not meant to compete with private consultants by providing site plans or detailed solutions to development problems. The Team does not recommend what final action should be taken on a proposed project - all final decisions rest with the city and landowner/applicant. This report identifies the existing resource base and evaluates its significance to the proposed use, and also suggests considerations that should be of concern to the city. The results of this Team action are oriented toward the development of better environmental quality and the long term economics of land use.

The King's Mark RC&D Executive Council hopes you will find this report of value and assistance in the review of this proposed residential development.

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Introduction

Introduction

The Waterbury Inland Wetlands and Watercourses Commission have requested Environmental Review Team (ERT) assistance in reviewing a proposed residential community.

The 38.15 acre project site is located at Highland Avenue and New Haven Avenue just north of the Naugatuck town line. The site is mostly wooded with two wetland systems and one isolated wetland all within the Naugatuck River watershed drainage basin. A CL&P power line right-of way bisects the property. The site is zoned RM which permits 6000 square foot lots for single family homes or group dwellings with 12 dwelling units per building. The site is bordered by residential apartments and single family homes. Murray Park abuts the western end of the site.

The proposal as discussed at the February 28th ERT field review meeting involved 330 one and two bedroom units in 30 buildings, but Team members were informed that that number was very likely to be reduced. There is also a stand alone community building. A new roadway system will be built with access to Highland Avenue and New Haven Avenue. The new roads will require two wetland crossings.

Subsequent to the ERT field review the applicant has revised the name and the plans for the project. The “Renaissance” development is now known as “Stonebridge Commons” and the number of units has been reduced to 280 units in 28 buildings. The roads have been renamed but remain in their original locations. There are still two wetland crossings.

Some Team members have based their reviews on the original plans distributed on 2/28/07 or shortly thereafter while others reviewed the updated plans and changes. An attempt has been made in this report to change road names and unit numbers if practical.

Objectives of the ERT Study

The city has requested the ERT to assist in review of this project because of the challenging topography, ledge, and inland wetland areas and watercourses adjacent to the proposed development. There is concern for the protection of wetlands and watercourses, impacts from blasting, runoff and overall site design and engineering. The public have raised concerns about over development and cumulative impacts.

The ERT Process

Through the efforts of the Waterbury Inland Wetlands and Watercourses Commission this environmental review and report was prepared for the City of Waterbury.

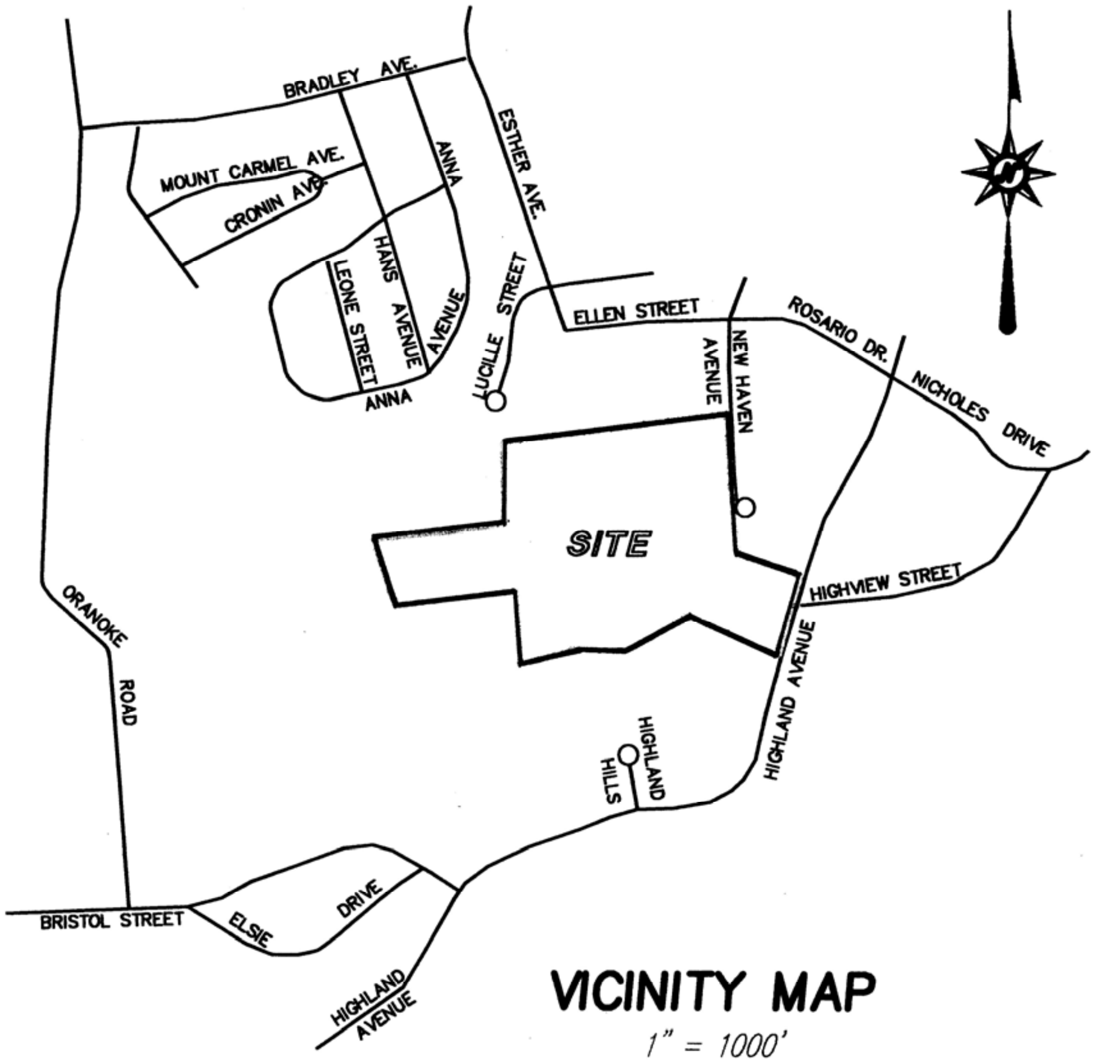
This report provides an information base and a series of recommendations and guidelines which cover the topics requested by the city. Team members were able to review maps, plans and supporting documentation provided by the applicant.

The review process consisted of four phases:

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

The data collection phase involved both literature and field research. The field review was conducted Wednesday, February 28, 2007. The emphasis of the field review was on the exchange of ideas, concerns and recommendations. Being on site allowed Team members to verify information and to identify other resources.

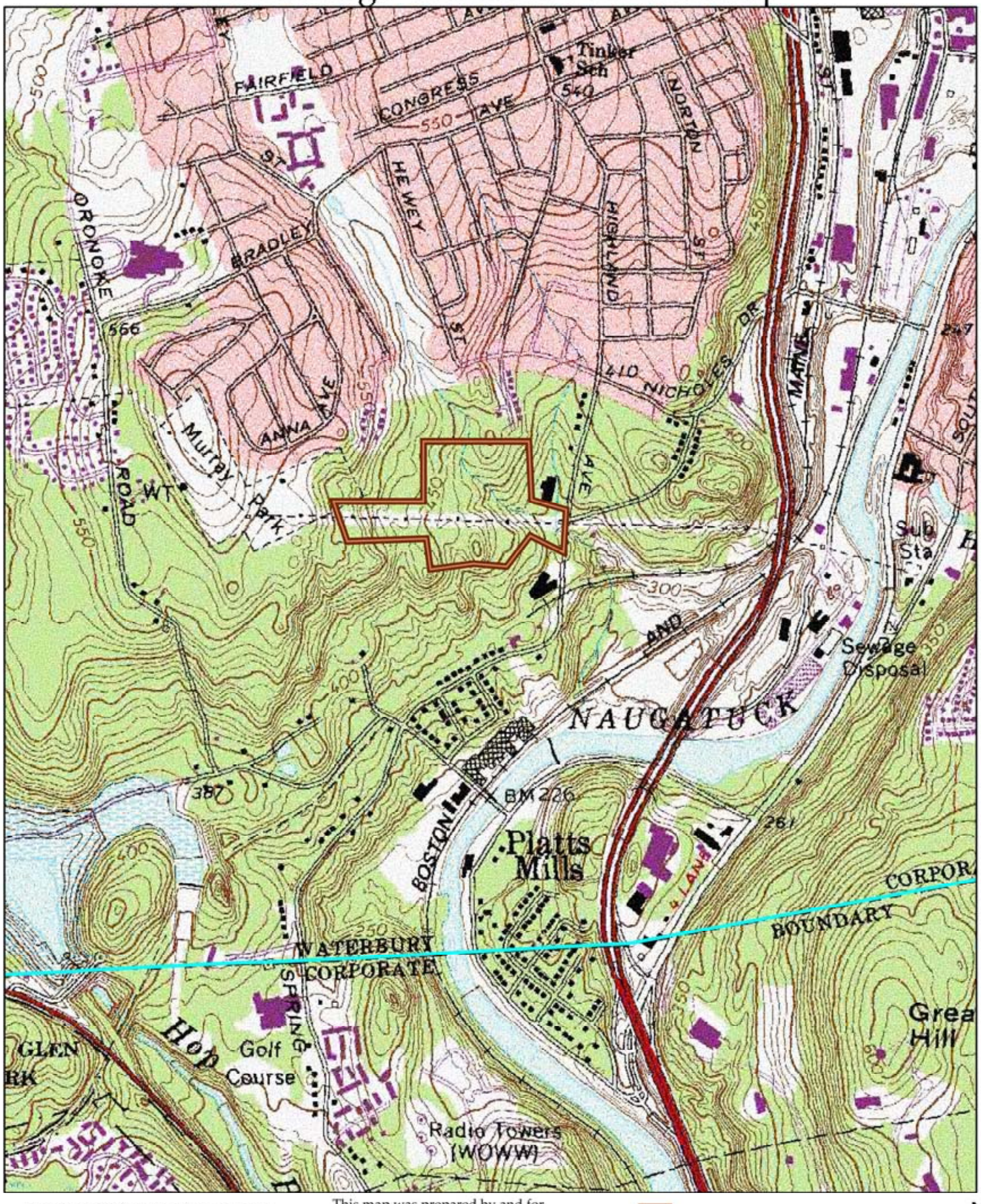
Once Team members had assimilated an adequate data base, they were able to analyze and interpret their findings. Individual Team members then prepared and submitted their reports to the ERT coordinator for compilation into this final ERT report.



VICINITY MAP

1" = 1000'

Stonebridge Commons Location Map



The Connecticut Environmental Review Team

This map was prepared by and for the Connecticut Environmental Review Team. This map is for educational use only. It contains no authoritative data. May 2007.

Proposed Area for ERT Review

0 0.05 0.1 0.2 0.3 Miles

N

Stonebridge Commons Aerial Map

The Connecticut Environmental Review Team

This map was prepared by and for the Connecticut Environmental Review Team.
This map is for educational use only.
It contains no authoritative data.
May 2007.

Proposed Area for ERT Review

0 0.05 0.1 0.2 0.3 Miles

N

Topography and Geology

(Please Note: This reviewer is using materials distributed at the 2/28/07 field review meeting and road names and unit numbers may have changed with updates to the plan.)

A multi-unit development is proposed for a southeastward facing hillside at the southerly extension of Town Plot Hill. The hillside is part of the upper slopes of the Naugatuck River Valley. The proposed development is located a few thousand feet north of the Naugatuck-Waterbury town boundary. A local unnamed stream that passes through the parcel has it's headwater in a highly-disturbed wetland just north of the parcel and drains directly into the Naugatuck River.

Topography

The first order topographic feature of this area is the southeasterly sloping valley-side of the generally southward flowing Naugatuck River. The parcel is well up on the side of the valley. The Naugatuck River Valley has about 300-350 feet of cross-sectional relief and the parcel is about 200 feet (average) above the local river-elevation. Elevation on the property ranges from about 340' above sea level where the small unnamed stream exits the property to higher than 580 feet at the western corner of the property, a relief of about 240'. A second order topographic feature is the shallow-valley carved by the local stream that traverses the property. That valley has between 10-25' cross-sectional relief. Several bedrock-cored knobs interrupt the valley slope along the southern bound of the property.

Slopes on the property are mostly moderate to locally steep, with an area, occupied by a seasonal wetland, which is rather gentle-sloped. The steepness of the terrain is bed-rock controlled with steep slopes being oriented north-northeast/south-southwest. This is the orientation of a prominent set of bedrock fractures. Steep-slopes are related to fractures found in better foliated gneiss layers. Bedrock fractures also affect the gradient of the stream-course in the same manner as the topographic steepness. High gradient sections of the stream occur where the stream crosses better-fractured and better-foliated rocks.

Bedrock Geology

Bedrock is composed of the Waterbury Gneiss (Gates and Martin, 1967; Rodgers, 1985). It is a poorly foliated gray to dark gray gneiss with local areas of distinct foliation (Fig. 1). The gneiss is composed of mica (both biotite and muscovite), quartz and plagioclase feldspar. Foliation is related to compositional (mineral) differences of the layers, notably mica and quartz-feldspar concentrations: where mica, particularly biotite is more concentrated, foliation is better developed and where quartz/feldspar is more concentrated foliation is better developed. The gneiss is intruded by small amounts of granitic pegmatite (Fig. 2) that both cuts across foliation and intrudes parallel to the foliation. Most granitic pegmatite is weakly foliated. The Waterbury Gneiss also includes volumetrically minor amounts of amphibolite, a dark-gray to black gneiss rich in the mineral hornblende.

The bedrock seen on the south-central part of the parcel weathered rusty (Fig. 3). This is likely due to the chemical weathering of iron-bearing silicate minerals. It would be prudent, however, to determine that iron-sulfide minerals, such as pyrite, are **not** the cause of the rusty weathering. Acid drainage may occur if sulfide-bearing minerals are used as fill on site. The rock foliation strikes north-northeast and dips (is tilted) steeply toward the southeast. The foliation indicates that the local area is on the southeast flank of the Waterbury Dome. Some of the fractures in the rocks observed are parallel to foliation; but most fractures cross-cut the foliation (Fig. 1). Several prominent zones of N.20 E. oriented fractures occur on the site. Each zone is associated with steeper slopes. Underground fractures are the reservoirs and transmission conduits of groundwater. Some of the rock fractures at near-by artificial rock cuts are water-bearing and this reviewer would expect some fractures on the parcel to be water bearing also. It is unfortunate that no hydrologic data are available for the parcel (as of 3/28/07).

Figure 1. Bedrock outcrop forming valley bottom of an unnamed stream that traverses parcel. This outcrop is at the base of a "ledge" of bedrock that forms a sill and backs-up a wetland upstream. Note outcrop is fractured and foliated. Fractures enhances erodability of rock during the last ice age. As a result where this rock is exposed or near the surface, topographic and stream gradients are steep. Prominent fractures oriented N.20 E. Note also paucity of cross fractures.

Figure 2. Granitic pegmatite that intrudes parallel to foliation. The pegmatite likely is an accumulation of dissolved (melted) material formed during heat of metamorphism of the region.

Figure 3. Rusty weathering gneiss.

Surficial Geology

Although thick deposits of glacial till cover the uplands of Town Plot Hill (Stone and others, 2005) to the north, most of the parcel is underlain by extremely thin glacial soils. Indeed, outcroppings of rock occur where the local stream has steep gradients and on the south side of most of the knobs. In addition many areas have rock that was dislodged from the immediate ledge just inches below the surface.

Large areas of the parcel are covered with large cobbles and boulders. Some are angular (Fig. 4) and of merely dislodged bedrock (ledge) but many are rounded and have been transported into the immediate area and left by the ice-age glaciers or glacial melt-water streams (Fig. 5). Some are large (up to 2 m. in diameter) and properly referred to as erratics (Fig. 6). They are composed of rocks similar to the Waterbury Gneiss and are not likely far traveled. This area is close to a mapped ice margin (16,500 y.b.p; Stone and others, 2005) and these rocks may owe their origin to moraine-forming processes. Some, however, are concentrated in the through-going stream valley. The cobbles/boulders are composed of locally derived rock, but also contain clasts of quartzite and white quartz, both of which are derived from the Straits Schist. The closest outcrops of Straits Schist are north of Waterbury. The cobbles/boulders are rounded (water-worn). The unnamed stream valley was likely a melt-water drainage channel when the last of the glaciers melted.

Figure 4. Small angular boulder near center recently broken from ledge exposed in the foreground. Note that many boulders have some angular edges that indicate local derivation from the ledge that is near the surface or exposed. Note also that some boulders are completely rounded. Compare with Figure 5.

Figure 5. Field of rounded boulders and large cobbles in wetland along through-going stream. Some of the lighter colored cobbles are composed of quartzite derived from off site (north of Waterbury). Most of cobbles are locally derived. Note bedrock is poorly foliated and has a few foliation parallel fractures and a few cross-fractures that form the flat sloping and intersecting surfaces that forming V cross-sections.

Figure 6. Glacial erratics along power-line at eastern part of parcel.

Discussion

The moderate to steep slopes on the site indicate considerable rearrangement of the topography will occur during development. Indeed the plans show cuts into the hill-side of up to 14 feet in places. The thin soils on the site suggest that many of these cuts will be made into the ledge, likely with the aid of blasting in some of the deeper excavations. This reviewer has several concerns with this.

If blasting is necessary, the shock of each blast may enlarge local fractures, increasing the fracture-permeability and thus possibly exacerbating any possible ground-water discharge problems at the site (see later discussion). The local environment may be exposed to perchlorate contamination, a residue of the explosives used for the blast.

If sulfide minerals are present in any of the rock layers, which this reviewer considers unlikely but possible in these rocks, acid drainage could be a problem if the sulfide bearing rocks are used as fill on site. The freshly exposed sulfide minerals will react chemically with rain-water releasing rust (iron oxide) and sulfuric acid. The acid will leach into the surface water and could be exported downstream. The reaction will be rapid at first but will gradually diminish with time as the freshly exposed sulfide is weathered. Thus, it will be a short term impact.

If water-bearing fractures are encountered in the excavation water leakage will occur more or less constantly. They will be supplied by a large up-slope groundwater reservoir. Impact of this will be local, but during winter could present a persistent ice hazard to parking areas and possibly back-yards of some of the residential units. One can recall seeing this phenomenon at many spots along the highways around Waterbury in winter because of the formation of ice (Fig. 7). Water purportedly seeps from the ground into two of the wetlands on the property. This water may come from surface water flowing through the soil at the soil/bedrock interface or it may be groundwater coming from bedrock-fractures just below the soil. In one case flow from an intermittent stream feeds into the edge of the wetland.

Figure 7a. Groundwater seeping from fractures in artificial cuts during winter: spectacular ice-falls result.

7b. Groundwater seeping from fractures in artificial cuts during winter: spectacular ice-falls result. Note considerable ice coming out onto paved area.

Water seeping from the rock after excavation, may affect the local water-table. In most places this will not be a problem, but a local decrease in the water-table elevation may affect adjacent wetlands. For instance, if water bearing fractures are encountered in excavation for the foundations for Units 18 and 19 on Renaissance Drive (now Units 17 and 18 on Old Country Road), it is likely that foundations drains installed will rapidly move that water off site. This possible groundwater-discharge will have an affect on the local water table and possibly could reach into the adjacent upland wetland. This could have the effect of draining at least part of the wetland. If that wetland owes its origin to water accumulating at the soil-rock interface in a small glacially scoured bedrock basin the excavation of the foundations of Units 18-19 will have minimal affect on the wetland. If, however, the wetland is fed by groundwater discharging from fractures at a slope break the excavation and footing drains could have the effect of draining the wetland. Hydrologic data are (and a trained hydrologist) needed to resolve this issue.

It is likely the “Stormwater Wetlands” A, B, and C (and possibly D which this reviewer did not check) will intersect the local water table. Plans show that “Stormwater Wetland A” will have a bottom 2-3 feet lower than the local water table as indicated by the adjacent stream elevation. That will likely result in lowering of the water table of the small knob to its east. In this location that will have minimal impact. But it could also cause the stream to run dry immediately adjacent to the stormwater wetland.

“Stormwater Wetland B” is west of a natural water-course wetland that receives seepage along the edge that borders the proposed stormwater wetland. The north end of the wetland is shown to have an elevation that is at least 4 feet below the local water table (indicated by the wetland elevation). The south end of the stormwater wetland has a bottom elevation considerably higher than the adjacent wetland. The north end of the proposed stormwater wetland likely will drain groundwater into it and may cut off seepage into the adjacent natural wetland. On the other hand, the stormwater wetland outflow is into the natural wetland slightly down stream.

Stormwater Wetland C will behave similarly to Stormwater Wetland B. Wetland C however, is located in a bedrock layer that is ridge-like both north and south of the wetland. It is underlain by poorly foliated and poorly fractured bedrock that acts like a sill to the natural watercourse wetland, which backs up behind (north of) it. This stormwater wetland has an outflow downstream from the bedrock sill and ground water seepage into the stormwater wetland may have the affect of draining part of the water-course wetland. It is possible that more water could seep into the stormwater drainage (to be discharged downstream of the wetland sill) than flows in the natural channel of the wetland, in which case part of the wetland and the watercourse could go dry.

The above are speculations on this reviewer's part based on observed elevations on the plans and the proposed elevations of the development. Hydrologic data were not presented to deny (not to confirm for that matter) this reviewer's speculations. Some water table data are needed for ground truth and then the interpretation of a trained hydrologist.

References

Gates, R.M., and Martin, C.W., 1967, The bedrock geology of the Waterbury Quadrangle,
with map. State Geol. And Nat'l Hist. Surv. Quadrangle Rpt. #22, 36p.

Rodgers, John, 1985, Bedrock Geological Map of Connecticut. State Geological and Natural
History Survey of Connecticut, Nat'l. Resource Atlas Series

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

Southwest Conservation District Review

(Please Note: The materials reviewed for this section are the plans and reports distributed on the 2/28/07 field review date under the name "Renaissance." These recommendations are advisory in nature and are intended to assist the town manage their natural resources.)

Soils

Soils information form the USDA NRCS Soils Survey is provided with this report. Soils limitations for road construction and for buildings with basements are also given in Appendix One. Note that Appendix One has three sections: general soil information, Dwellings with Basement Rating, and Local Roads and Streets Rating.

The site has a hilly topography, shallow soils and bedrock-controlled groundwater. (See site photo below). The shallow soils indicate limitations for buildings with basements and for roads. In Appendix One, section 2, Dwellings with Basements Rating , page 1, the map indicates that the entire site is "very limited" for dwellings with basements due to slope and depth to bedrock, and depth to a saturated zone (AppendixOne Section 2, page 5). "Very limited" is defined as that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected." (Section 2, page 10).

For road development the area of "very limited" soils is generally confined to the first 200 meters of the proposed access from Highland Avenue, in the region of steep sloped ("E" slope) Charlton-Chatfield soils. Note that instability or erosion issues related to road construction on steep slopes is compounded by the fact the road is proposed to be upslope and adjacent to a watercourse and associated wetlands. Refer to Section 3 of Appendix One. The specific limitations include slope, depth to hard bedrock and depth to saturated zone, as well as frost action.

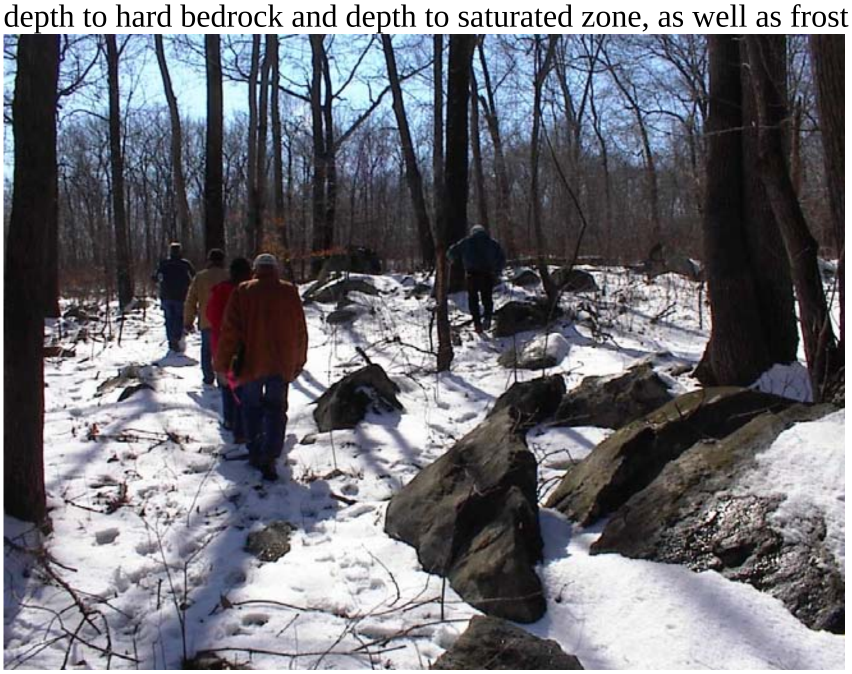


Photo One: Areas of the site have shallow soils with exposed rock.

Recommendations

1) Minimize disturbances whenever possible. In areas of disturbance on steep slopes mandate field inspections to ensure that erosion and sedimentation controls as specified in the plans are installed and that they are installed correctly. Also, measures should be inspected before anticipated rainfalls of ½ inch or greater and post rainfall to assure that they have performed adequately.
2) Areas of disturbance should be re-vegetated with a mix of ground cover, shrubs and overstory wherever possible to best duplicate a natural environment, minimize maintenance requirements such as mowing , irrigation and fertilization, and provide natural habitat. Steep slopes that are mulched or have a natural, not manicured surface, retain stormwater more effectively and can be more stable with less maintenance.
3) Areas that require blasting should be determined and quantified –total cut and fill volumes and locations on site should be indicated. Geologic profiles should be provided.
4) Soil profiles should be provided for building, parking and stormwater basin locations. The design plans for the stormwater wetlands call for utilizing topsoil at proposed basin sites as the planting medium for the basin bottoms. Information as to the quantity and quality of the soils at these locations should be given in detail. The soils or bedrock conditions at the proposed bottom elevations of the proposed basins should be known
5) Drainageways should not be filled or disturbed (**See Figure One**). In particular the area as indicated in **Figure One** was found to have some running water during the site review field inspection. Drainageways can be used to convey stormwater, but stormwater structures and other development should not intrude into the drainageways. Stormwater should be treated before entering the natural drainageways and outflow should be moderated to duplicate natural flow conditions.
6) Field inspect for groundwater at building and road excavation sites at time of excavation and adjust drainage infrastructure as conditions indicate. These field inspections should be written into the job sequencing at the appropriate points, such as the Phase One step “The cuts and fills will be made for proposed driveways, parking areas and buildings sites.” Special consideration should be given for drainage on slopes adjacent to proposed stockpile locations.
7) It should be demonstrated (soil and bedrock cores) that stormwater detention structures will not interrupt groundwater flows thereby potentially decreasing detention capacity and or affecting recharge of wetland areas.(See 3, 4, and 6) above). Keeping structures outside of a buffer zone of undisturbed ground is one method of minimizing potential impacts (See “ Leaving the upland review area intact” section below).

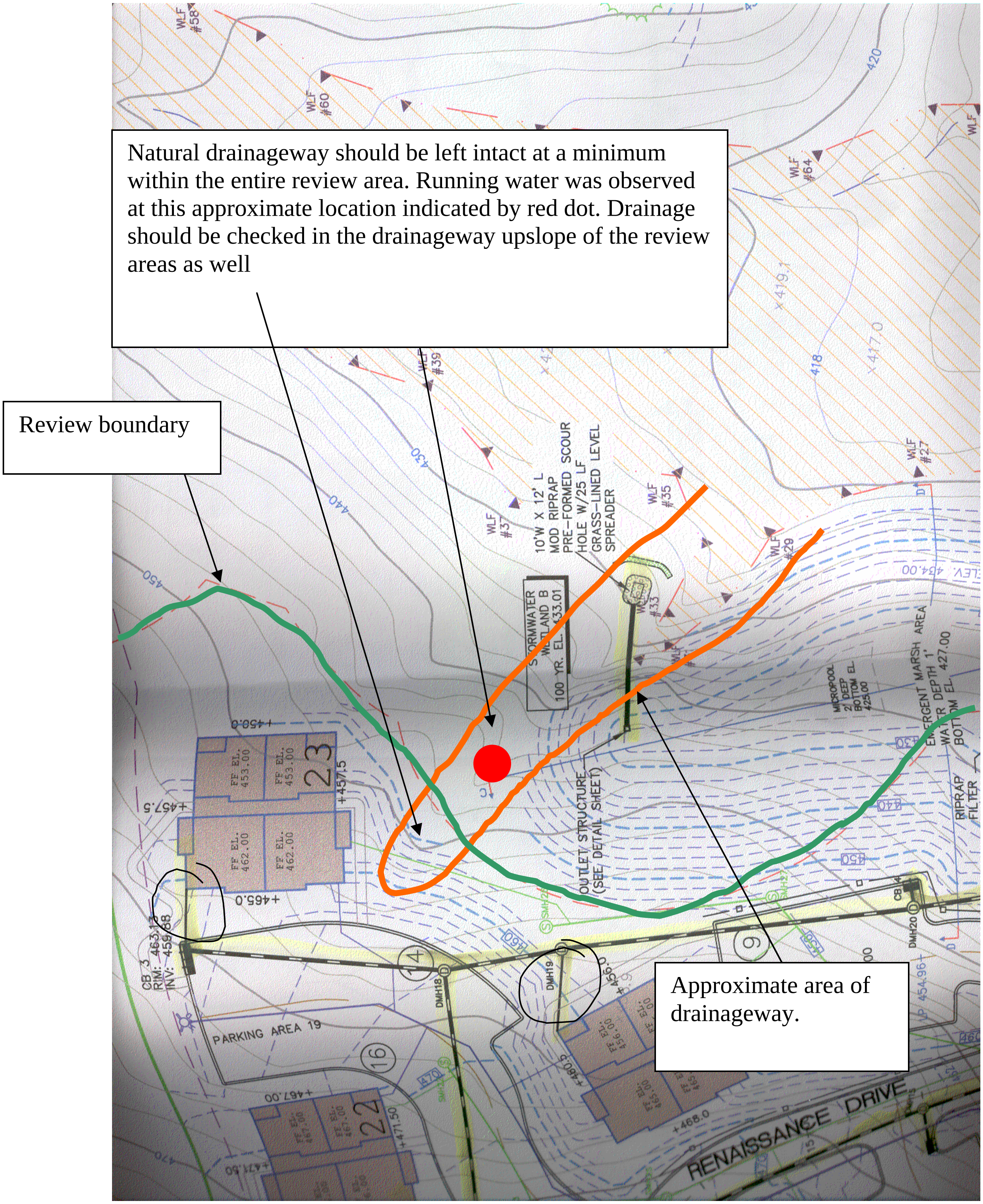

Natural drainageway should be left intact at a minimum within the entire review area. Running water was observed at this approximate location indicated by red dot. Drainage should be checked in the drainageway upslope of the review areas as well
Review boundary
Approximate area of drainageway.
10'W X 12' L MOD RIPRAP PRE-FORMED SCOUR HOLE W/25 LF GRASS-LINED LEVEL SPREADER
STORMWATER WETLAND B 100 YR. EL. 433.01
OUTLET STRUCTURE (SEE DETAIL SHEET)
MICROPOOL 2' DEEP BOTTOM EL 425.00
EMERGENT MARSH AREA
RIPRAP FILTER
PARKING AREA 19
RENAISSANCE DRIVE

Figure One

Low Impact Development (LID) Considerations

> Low impact development storm water management systems can reduce development costs through the reduction or elimination of conventional storm water conveyance and collection systems. LID systems can reduce the need for paving, curb and gutter, piping, inlet structures, and storm water ponds by treating water at its source instead of at the end of the pipe. However, developers are not the only parties to benefit from the use of LID storm water management techniques. Municipalities also benefit in the long term through reduced maintenance costs. The Practice of Low Impact Development; U.S. Department of Housing and Urban Development Office of Policy Development and Research.

LID development can assist with reducing the overall impact of a site development. The first step is to identify the important natural resources on site and then development a means for protecting them while maintaining a design that meets development requirements. On this site a primary consideration is the riparian area running north to south on the eastern portion of the site. Ideally a riparian buffer would remain that not only minimizes direct impacts such as grading and removal of vegetation, but indirect impacts such as increased runoff from the adjacent developed area, pedestrian intrusion, dumping, invasive plant intrusions and the like.

There are some LID techniques as proposed in the application. Other techniques that can limit the impact to the site as well as possibly reduce costs are included below.

Leaving the upland review area intact (100 foot corridor on each side of the stream) would be preferred (**Figure Two**). Where disturbances must take place within the review area such as the road crossings, the impact should be minimized as much as possible. For example the proposed open bottom box culvert for the crossing on “Alexandria Way” allows for adequate conveyance of stream flows and provides riparian connection by providing a continuous natural bottom for the stream. It is beneficial that the road is narrow, but the disturbance for the road should also be minimized as much as possible. Particularly at the stream crossing, the vegetation including existing overstory trees should be left and or new trees planted.

Detention basins, and stormwater outlets adjacent to wetlands impact the riparian area and stream by 1) the required removal of vegetation that provides cover for wildlife and shade for the stream; 2) excavation of existing soils and rock that can disrupt the ground water hydrology adjacent to the stream and wetland areas; 3) creation of disturbances that encourage the replacement of natural vegetation with invasive species which are then at or in the wetland areas; 4) require intrusive maintenance activities such as mowing adjacent to wetland boundaries; 5) reduce the capacity for the riparian area to act as a greenbelt for wildlife and vegetation connected to other open space areas and 6) in general, “Minimizing land disturbance helps dampen the impacts to ecological and biological processes both on and off the site.” (HUD, 2003).

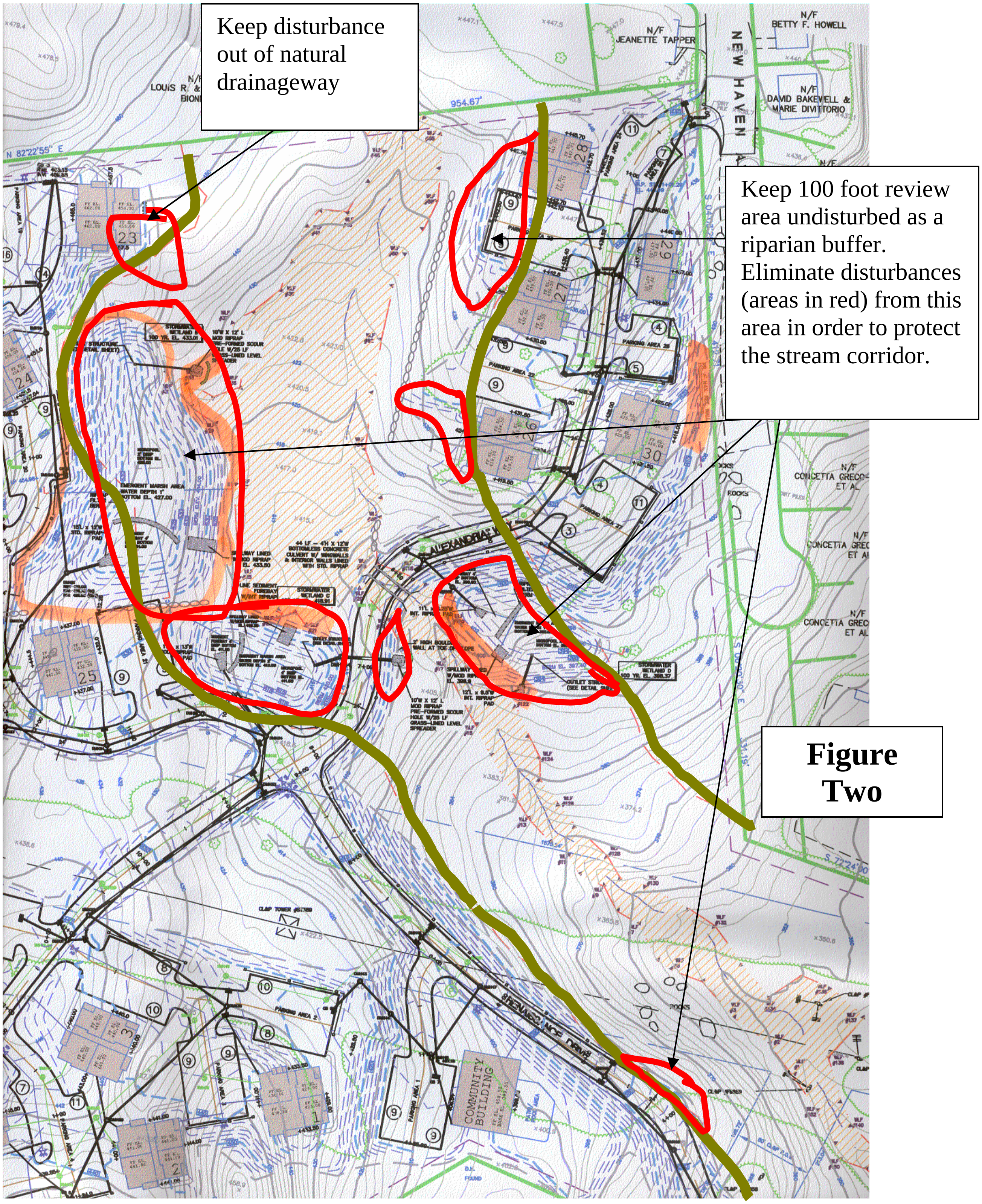
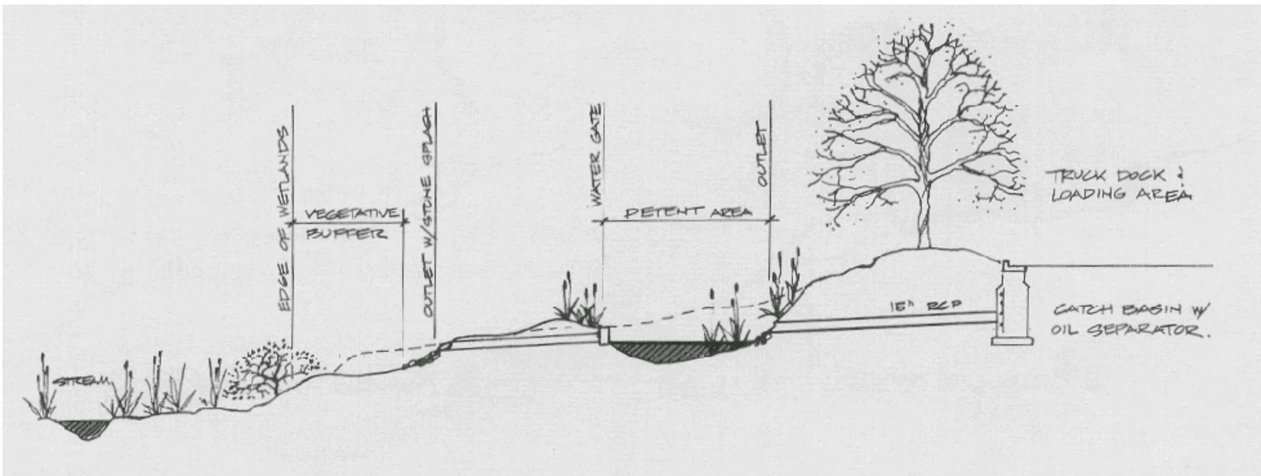


Figure Two

Riparian corridor buffer- leave 100 foot review area in natural state, keep development including detention structures outside of 100 foot zone. Minimize road disturbance at crossing and through 100 foot wide riparian corridor. Eliminate disturbance in natural drainageway.

Stormwater infrastructure should be located away from existing wetlands as suggested in the figure below from “An Inland Wetland Commissioner’s Guide to Site Plan Review” page 55. Note that this diagram specifically refers to a “truck dock and loading area”, but the general design is also applicable to stormwater runoff from parking areas and roads, demonstrating the concept of leaving a natural buffering strip between constructed stormwater detention areas and the natural wetlands and or stream corridor.



Site Plan Review, page 55

Stormwater treatment design from “An Inland Wetland Commissioner’s Guide to Site Plan Review, page 55. Note that this design specifically applies to a loading area, but the buffers and treatment concepts can be applied to parking areas and other Stormwater sources. The constructed wetlands and the conveyances are all located outside of the riparian area and away from the existing wetlands.

Decentralize and Micromanage Storm Water at Its Source

Understanding the difference between pre- and post-development hydrologic patterns is critical to LID. The use of best management practices to reduce the amount of impervious surfaces, disconnect flow paths (i.e., downspouts connected to storm sewers), and treat storm water at its source all help minimize the impacts to local hydrology. Attainment of these goals can lead to the protection of water quality, reduction of impervious surfaces, increased open space, protection of trees, reduced land disturbance, decrease in infrastructure costs, and reduced homeowner energy bills. (HUD, 2003).

Methods for decentralizing Stormwater at its source for this site:

1) Separate roof stormwater from other stormwater.

Eliminate as much pipe conveyance as possible for roof stormwater and create detention structures such rain gardens, infiltrators and level spreaders as close to the source (buildings) as possible. Roof runoff should be directed to vegetated areas; supporting the growth of the vegetation and allowing for slow infiltration. An example of a possible design (conceptual only) is given in **Figure Three**.

2) Reduce overall impervious surfaces

Impervious surfaces = more runoff and more pollutants. Paved areas such as roads and parking lots should be reduced, but also lawn areas, which are less permeable than areas with natural vegetative ground cover and mulched areas. Providing more areas of mixed vegetation (groups of ground cover, shrub and over story) decreases lawn areas, and provides all of the other benefits of vegetated landscapes. Parking areas generate rapid stormwater runoff and carry along with it all of the pollutants from automobiles.

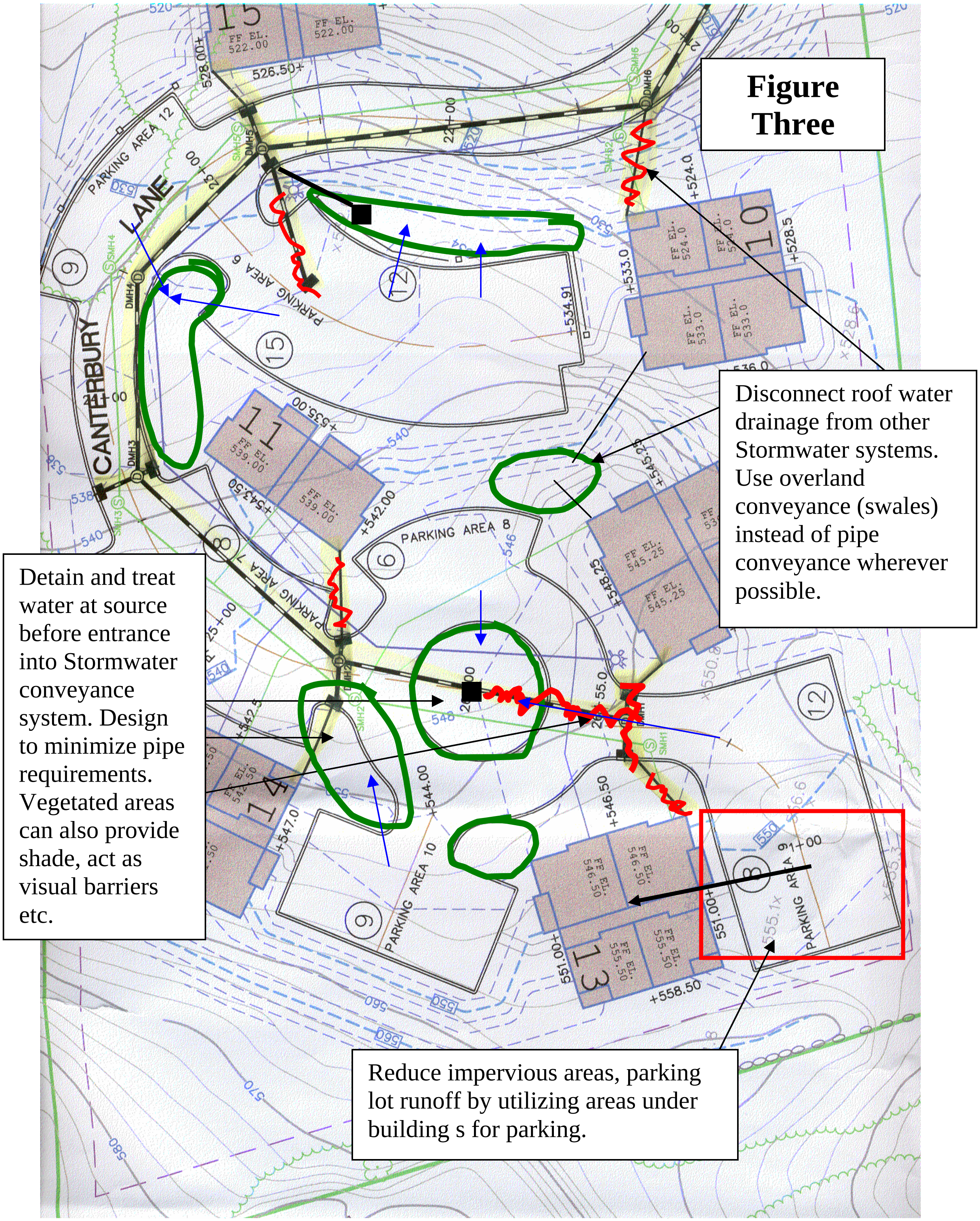
Designing buildings with parking underneath would reduce the impervious area of the development, reduce the overall required area of disturbance, allow for the retention of more natural areas, reduce the heat effect of pavement and could reduce overall infrastructure costs for parking lots and Stormwater structures. Contaminants from parked automobiles could more easily be contained and kept separate from cleaner Stormwater. If designed effectively “hiding” the parking underneath could significantly reduce the visual impacts on the site.

With reduction in the parking areas, it may be possible to redesign the building layout so that the six buildings proposed far western side of the property (Phase Three) can be integrated into the other areas, eliminating a wetland crossing and a significant amount of infrastructure, while leaving an upland forest area as open space.

3) Disperse runoff from impervious surfaces at the source, rather than convey to an end point treatment.

There are a variety of ways to retain stormwater close to the source (see examples below). This saves on conveyance structures (pipes and catch basins), and can reduce the size of end of system detention basins, which are, in this case, located near riparian areas. Retaining Stormwater upslope can assist with meeting the goal of increasing the stream buffer area as indicated under Minimize Overall Site Disturbance.

1) Eliminate curbing on parking areas and roads and use grass filter strips, grass lined swale bio retention areas etc. to accommodate runoff. Swales and similar measures should be used in conjunction with (reduced size) detention basins.
2) Use cul-de-sac bio-retention areas. In rectangular parking areas narrow (linear) vegetated stormwater retention structures can be used instead of raised vegetative strips as typically used in parking areas.



Note that this report indicated integrating these buildings into the other sections of the development and leaving this area undeveloped is an even better alternative for Stormwater as well as other purposes.

When properly constructed, inspected, and maintained, the grass swale represents a sustainable BMP design with no known limit on its life expectancy.

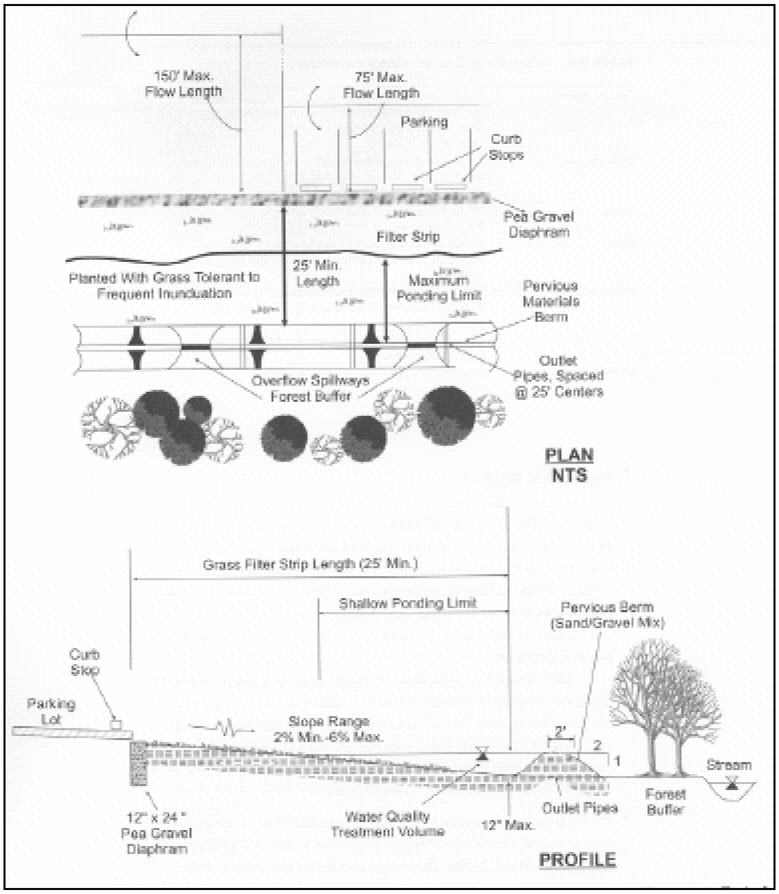
Figure 6-3 Grass Swale with Check Dams (VA DEC, 1999)

Grass swale for Stormwater on curb-less road. "Steep slopes can also be managed through the use of a series of check dams to terrace the swale and reduce the slope to within acceptable limits. The use of check dams with swales also promotes additional infiltration".

Filtering Practices

Cul De Sac used for Bioretention to retain Stormwater closer to its source.

Source: Nonpoint Education for Municipal Officials (NEMO).



Source: Prince George's County Bioretention Manual, 2001.

FIGURE 6. TYPICAL GRASS FILTER STRIP

Utilize level spreaders / Bioretention areas to treat Stormwater closer to the source.

Site Considerations for Stormwater Controls

The suitability of a swale at a site will depend on land use, size of the area serviced, soil type, slope, and imperviousness of the contributing watershed as well as the dimensions and slope of the swale system (Schueler et al, 1992). In general, swales can be used to serve small areas, less than 4 ha (10 acre) in size, with slopes no greater than 5%. The seasonal high water table should be at least 0.3 to 0.6 m (1 to 2 ft) below the surface and buildings should be at least 3 m (10 ft) from the site (GKY and Associates, Inc., 1991). Use of natural topographic lows is encouraged and natural drainage courses should be regarded as significant local resources to be kept in use (Khan, 1993). Drainage patterns and contributing areas can be determined from contour maps generated from surveys. Existing drainage facilities, conveyance system locations, and grading plans can be found in Hydraulics Reports from previous projects in the vicinity or from plans for the existing roadway (Washington State Department of Transportation, 1995). Roadside ditches should be regarded as potential sites as well (Khan, 1993). The suitability of swales may be reduced as the number of driveway culverts increases, and they

are not especially compatible with extensive sidewalk systems. One of the most appropriate layout of swales in combination with roads and sidewalks is to place the swale between two impervious ground covers (NVPDC, 1992). This placement provides water quality benefits as well as a safety barrier between pedestrians and vehicles.

Soil Permeability and Stormwater Treatment Structures

Swale systems require dry soils with good drainage and high infiltration rates for better pollutant removal (Yousef et al., 1985). Hayes et al. (1994) conducted model studies and field data collection showing that infiltration is the most important factor in trapping clay size particles. Since these particles are the active elements that contain absorbed ions, dry soils and high infiltration rates are essential to trapping nutrients absorbed by the clays. Further, since infiltrated water in vegetative filters carries nutrients and toxics into the soil as shown in field data collected by Barfield et al. (1992), infiltration is critically important to trapping dissolved solids. The suitable textural classes of the soil underlying the swale are sand, loamy sand, sandy loam, loam, and silt loam. Heavy clays that would not support good vegetation and would promote ponding should be avoided. Soil types in the area can be obtained through soil survey maps developed by local soil conservation services, or soil samples can be collected and analyzed in a lab.

Long-Term Site Maintenance Issues

Stormwater infrastructure is only effective if properly maintained. There should be a detailed long-term management plan for the site stormwater, road maintenance lawn care and landscaping. Included should be the contractual arrangements for such maintenance and the means to support it. The city should have a means of monitoring compliance.

Organic land care standards should be used to limit pollutants such as pesticides and excessive fertilizing. Only native plants should be utilized for landscaping and there should be a plan for addressing invasive vegetation that may grow in disturbed areas.

A stormwater maintenance schedule should be detailed and a means for monitoring it established.

Suitable maintenance access should be provided and indicated in the site plans. Access to forebays for sediment removal should not cause soil disturbances or other negative landscaping impacts.

Mitigation

Where vegetation is removed from the riparian areas, those areas should be re-established and overstory trees should be replaced according to existing conditions to minimize thermal impacts on the stream. Planting along the stream within the power line right-of-way should also be considered in terms of thermal impact.

Mitigation areas are proposed to compensate for wetland disturbances. There was discussion at the time of the site review about establishing a mitigation project near the Highland Avenue section of the development site.(See **Figure Four and Five**).

Mitigation in this area could alleviate existing erosion and sedimentation issues (See **Photos Two through Seven).** Areas of concern include the stormwater runoff on Highland Avenue that currently drains across exposed soils and a driveway before draining directly into a watercourse (**Photo Two).** Another concern is the drainage on Highland Avenue near the proposed access road for the development (**Photos 3,4,5**).

Creating a minimum buffer of 25 feet on each side of the stream could enhance the habitat characteristics and assure stable soils. Power line requirements would likely dictate plant species such as highbush or low bush blueberry, arrowood, winterberry and other shrub species such as Bankers Dwarf Willow (7 foot height maximum). Depending on height limitations speckled alder (maximum height 25 feet) might be useable.

Also the buffer would require establishing a defined boundary that was clearly indicated to maintenance personal. Pioneering taller plants may have to be removed periodically.

Existing areas of erosion such as indicated in **Photos Four and Five** should be stabilized and planted with appropriate native species. A Bioretention swale for the stormwater runoff from Highland Avenue could be created in the area as shown in **Photo Three and**

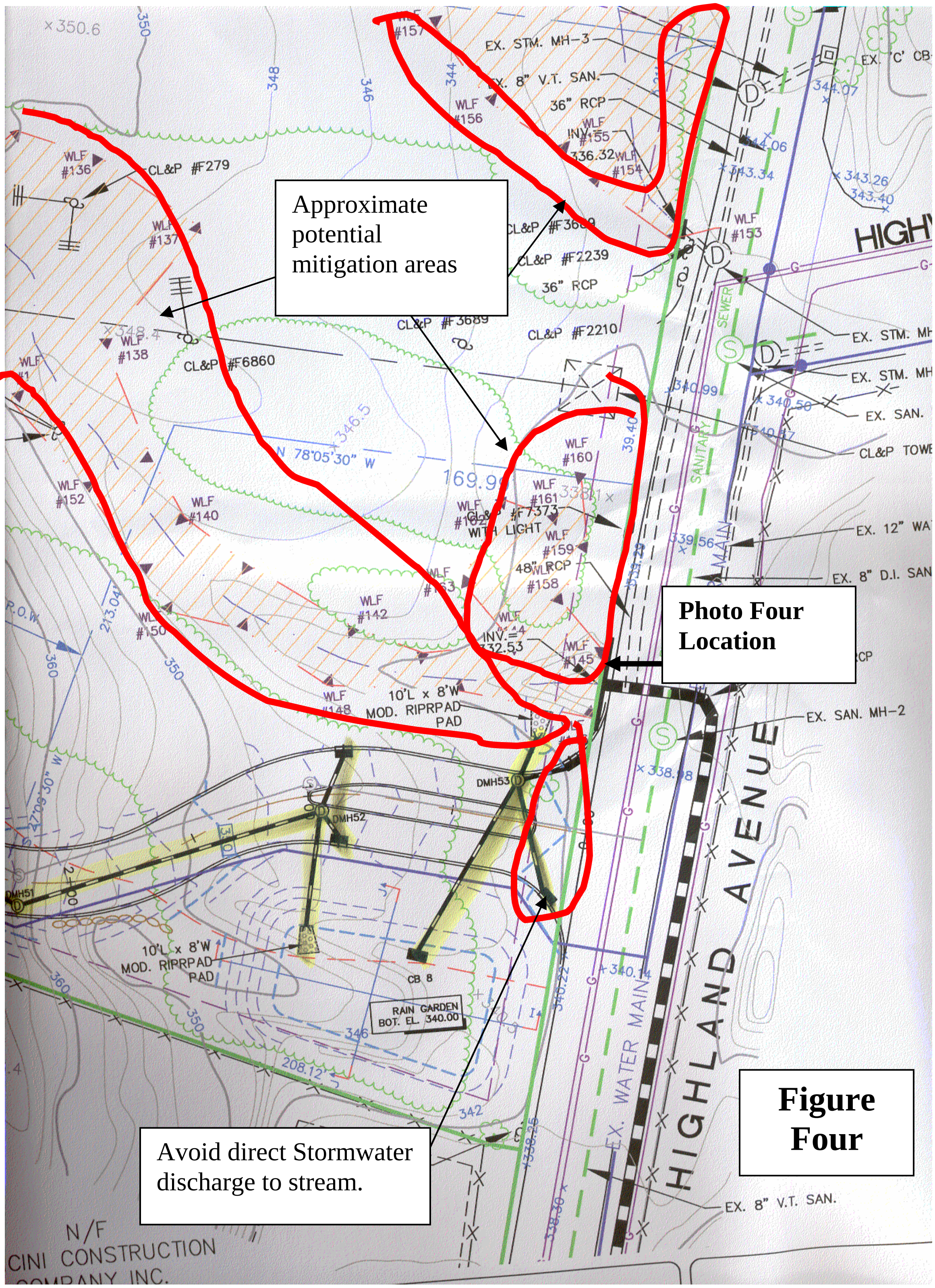
Five. Stormwater from Highland Avenue (**Photos Two, Three & Four**), should be directed to a water quality structure for treatment before entering the watercourse.

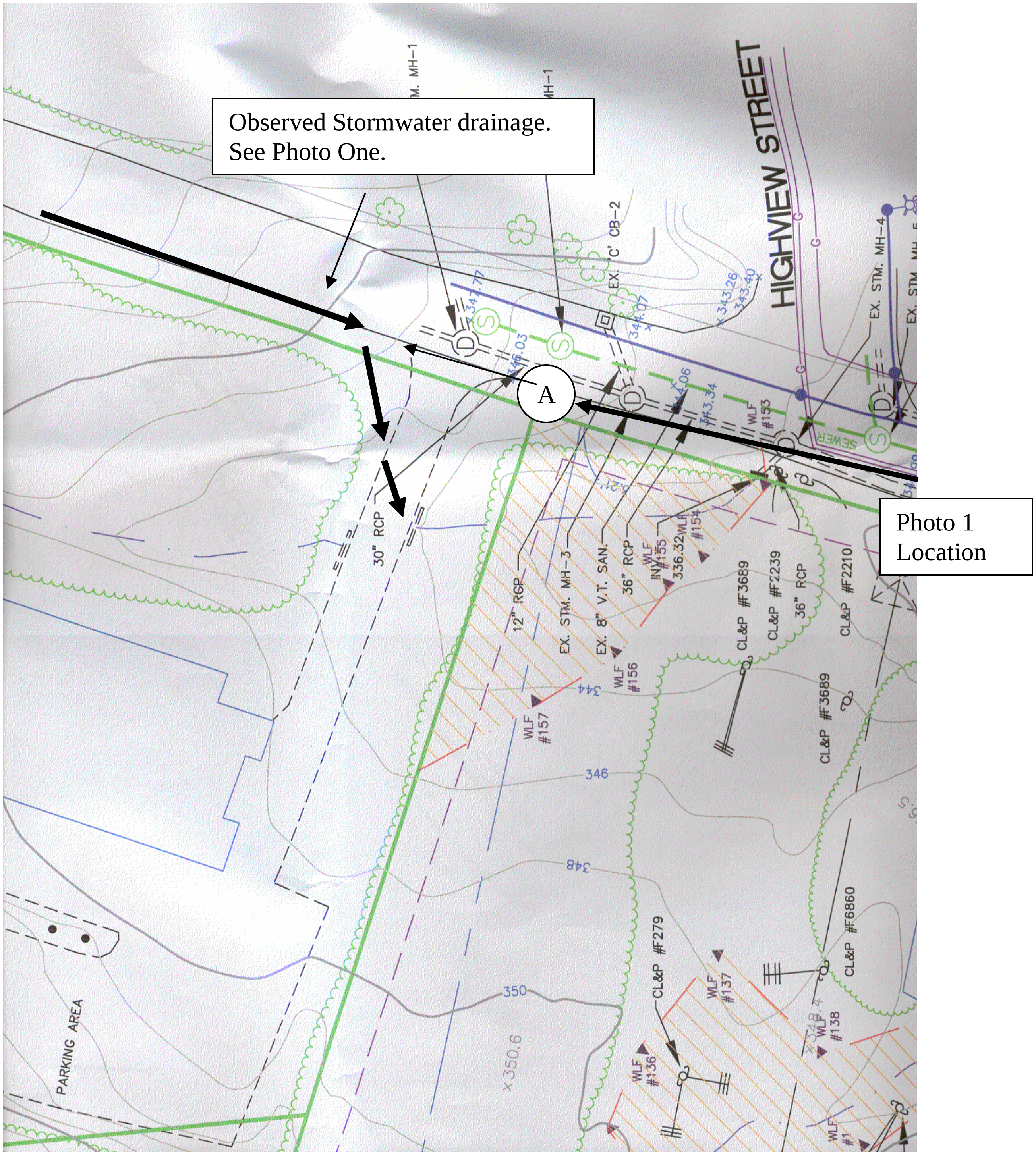
Creating mitigation in these already compromised areas will minimize the disturbance required in established upland forested areas and enhance water quality and riparian habitat of the stream. Also, the erosion near the Highland Avenue stream crossing point needs to be addressed to prevent damage to the road and as well as address the Stormwater running into the road as indicated in **Photo Three**.

The riparian buffers and other areas to remain as natural areas should be clearly marked.

The Stormwater raingarden (at CB 8) should be considered to be placed adjacent to the riparian area to provide continuity (and the road shifted away from the riparian area). This may be able to address the untreated outfall from the two catch basins indicated for the intersection of Renaissance Drive and Highland Avenue (refer to **Figure Four**). Construction activity for the Stormwater measures should not be immediately adjacent to the existing wetland boundary, but some natural vegetation buffer should remain whenever possible.

There does not appear to be any pedestrian access to the proposed Community Center. This encourages excessive driving and does not provide an opportunity for walking through the grounds.


Approximate potential mitigation areas
Photo Four Location
Avoid direct Stormwater discharge to stream.
Figure Four
HIGHLAND AVENUE
EX. WATER MAIN
RAIN GARDEN BOT. EL. 340.00
10'L x 8'W MOD. RIPRPAD PAD
N/F CINI CONSTRUCTION COMPANY INC.



Observed Stormwater drainage.
See Photo One.
Photo 1
Location
A
HIGHVIEW STREET
EX. 'C' CB-2
EX. STM. MH-4
30" RCP
12" RCP
EX. STM. MH-3
EX. 8" V.T. SAN.
36" RCP
CL&P #F3689
CL&P #F2239
36" RCP
CL&P #F2210
SEWER
WLF #153
WLF #154
WLF #155
WLF #156
WLF #157
WLF #137
WLF #136
WLF #138
CL&P #F279
CL&P #F6860
CL&P #F3689
344
346
348
350
PARKING AREA

Figure Five

Photo Two: Highland Ave. Drainage. Looking North From Point A on **Figure 4**. Drainage crosses factory driveway and discharges directly into stream on south side of driveway. Note travel over soils disturbed by road traffic.

Photo Three: Drainage on Highland Avenue just north of proposed road entrance to project. Drainage here includes stormwater that by passes factory driveway (up past the street sign) as shown in **Photo Two.** Note that there does appear to be some erosion along the edge of the pavement.

Photo Four: (Point A on Figure Four). Note sediment on pavement in foreground, eroded soil and damaged pavement at culvert headwall (Photo looks west).

Photo Five: Looking west northwest from culvert headwall at Highland Avenue. Note erosion from pavement runoff as shown in **Photo Four** in lower right corner. Also note erosion from overland flow above headwall in photo (in red).

Photo Six: Looking South at Highland Avenue stream crossing. Red line is approximate location of proposed access road to project. 10 feet minimum of natural vegetation should remain between top of bank and disturbance for road. The stormwater treatment structure should be on the streamside of the proposed road to make the open area contiguous and to provide a buffer from road use.

Photo Seven: Stream in power line right of way for possible mitigation measures.

Wetland Review

(Please Note: The site was visited by this reviewer on March on 15th along with two Team members and representatives from the applicant including the soil scientist for the applicant, David Lord. The site was revisited on March 26th with the team geologist. The plans reviewed and discussed below are the documents named "Renaissance" distributed to the ERT during the 2/28/07 field review.)

The plan proposes a total of 4,723* linear feet of 24 foot wide road. Two unnamed streams cross the property and each is proposed to be crossed by road. Construction will take place in three phases. The plan proposes 330 one and two bedroom residential dwelling units, within 24 building units, although the final count may be altered. The structures will be apartment-like with paved, outdoor, surface parking.

The site is 38.15 acres in size. It is completely wooded with deciduous trees except below the power line which is predominantly grassy with some shrubbery. Approximately 27.1 acres drains to the unnamed brook on the east side while the remaining 11 acres drains to the other unnamed brook along the west side. The site is slopey with grades frequently in excess of 10 per cent.

In the graphic below the black line represents the (very) approximate boundary of the parcel. The purple line represents the division of the property into two different drainage areas. The blue lines represent the two streams and the approximate boundary of the wetland at its west-central location. Also, note there is an intermittent steam depicted in a dashed blue line "above" the 0 of the number 450. The white band across the middle is the cleared area below the power line which is depicted in black.

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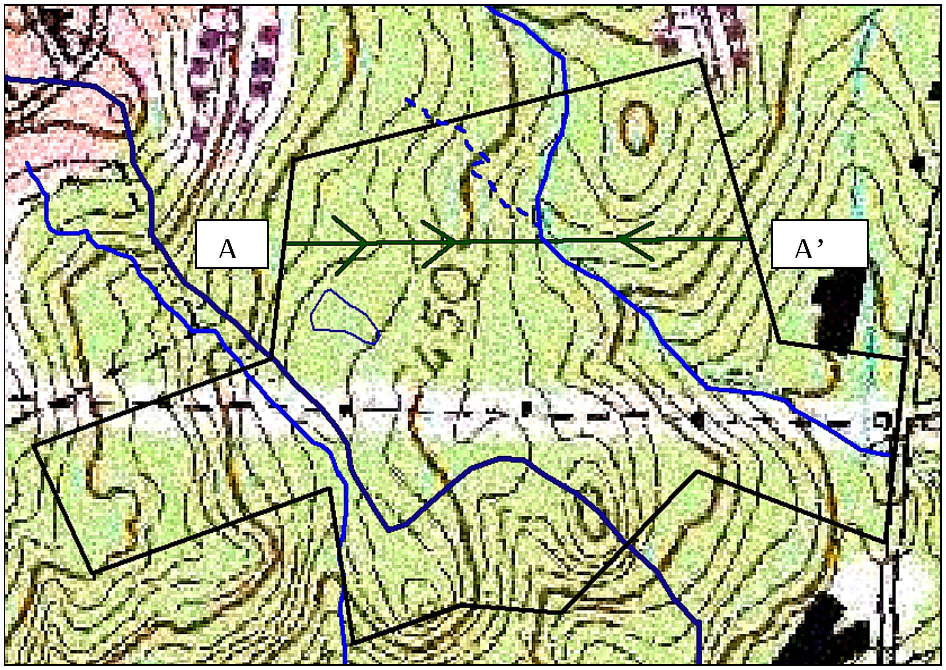
*This reviewer's calculations for road surface differ from those of the developer: This reviewer's total of road surface, which will be referred to in this section, was calculated as follows:

Renaissance Drive From Highland to end	1,740	
Alexandria Way from New Haven Ave. to Renaissance	820	
Canterbury Way from Renaissance to end:	1,835	
Harmony Way	340	
Misc. Road lengths from streets to parking lots	420	
Boulevard at entry (2 roads)	100	
Two traffic circles counted as 100' should be 314'	428	**Total**: 5,683 feet of road



A cross section (A to A’) measuring 1,172 feet passes across through the northern part of the parcel. Arrows show the direction of slope and therefore general direction of surface water flow. From the western boundary (A) to the stream the line measures 721 feet and changes 80 feet in elevation. This yields an 11% slope. From the stream to the eastern end (A’) the slope is less steep at 2.2%.

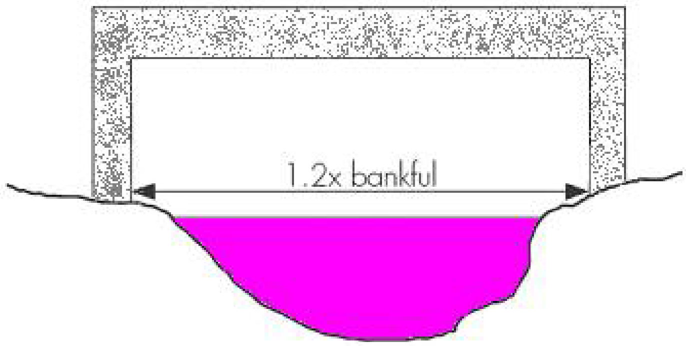
Wetlands and Watercourses

There are three mapped wetland/watercourse areas on the site. The most dominant is the unnamed stream that flows across the eastern portion of the property roughly from north to southeast for approximately one quarter of a mile. There is one proposed crossing of this stream. Second is a large ±four tenths of an acre seep wetland in the west central portion of proposed Phase Two. The third is a narrow, approximately two foot wide unnamed stream which is proposed to be crossed to access proposed Phase Three.

All of the wetlands can be classified as Palustrine ("Palustrine" comes from the Latin word “palus” and generally refers to non-tidal wetlands that are predominantly covered by, or in the midst of, vegetation such as shrubs and trees.) In this case, the tree layer dominates the vegetation almost to the exclusion of a shrub and herb layer. Various species of oak and maple dominate (*Quercus* sp. and *Acer* sp. respectively) the species mix. The floor of the woodland is dominated by leaf cover, glacial boulders, bedrock outcrops and large wood debris.

Discussion

The project is proposed to proceed in three phases. In the first phase a crossing of the eastern stream is proposed. This proposed crossing is located at a narrow width of the watercourse about 200 feet downslope of proposed unit number 26 on Alexandria Way. In conversation the proposal is for an open pipe bottomless culvert using the latest convention of (presumed) minimum 1.2 times bankfull width. This allows for small wildlife passage along the stream bank during periods of normal flow. This same convention is proposed for the smaller stream crossing along the proposed Canterbury Way east of unit 15. This design is currently among the most progressive being used. It is specified in The Army Corps of Engineers General Permit in the State of Connecticut, effective May 31, 2006 (http://www.nae.usace.army.mil/reg%5Cctpgp.pdf) and depicted in the *Massachusetts Stream Crossing Handbook* which is available at: http://www.nae.usace.army.mil/reg/Riverways%20Program%20Stream%20Crossings%20Handbook.pdf



The base image for this graphic was taken from the Massachusetts Stream Crossing Handbook *and depicts the concept of wider-than-bankful, open bottom, box culvert. The open bottom allows for natural stream substrate and the extra width allows for small animal passage.*

The third wetland is located on the west side of the parcel in the proposed phase two of the project. It has been well identified in the field and hydrologically it is fed primarily from upslope, that is, from the west/northwest. The plans show that proposed unit 18 is about 20 feet into the 100 foot upland review area. However, at this location the unit will be four feet *below* the level of the wetland and thus should have no impact on it.

Impervious Surface

The nature of the proposal is for apartment-like units with away-from-building, surface parking. Because of the density of people in a complex such as this, combined with the need for automobiles, there is much space dedicated to surface parking. Cursory tallies of impervious surfaces yielded the following:

27 individual parking areas: 134,000 square feet (~3.1 acres).

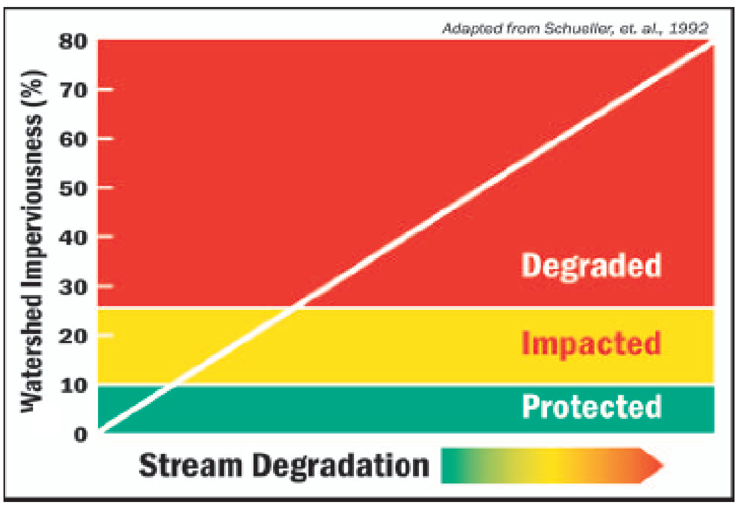
Roof-top tally of 24 four-unit structures, five two-unit structures and the Community Center showed: 108,975 square feet (~2.5 acres)

5,683 feet of 24 foot wide road 133,392 square feet (~3.1 acres)

In all, at least 8 3/4 acres of impervious surfaces will be introduced onto the landscape where there is virtually none now. These are the minimums of surface tallied. Likely there is more, since these numbers do not include the side slope and rights-of-way abutting the roads, patios as located at the Community Center, the highly compacted soils that result from the work of the heavy equipment, etc. Adding another acre is likely closer to the impervious total. That would yield 9.8 acres of the 38.1 acre parcel, or about 25.7 per cent.

Currently the DEP classifies the eastern stream with a water quality of "A". Many assumptions are made in this classification since not every stream can be field checked. But with no reported contamination sites in the immediate watershed "A" is likely a reasonable classification. DEP's *Water Quality Standards and Criteria* can be found on the web at: http://www.ct.gov/dep/lib/dep/water/water_quality_standardsl/wqs.pdf

As a general rule of thumb, the graphic below shows what happens to water quality as imperviousness in the watershed increases.



This graphic depicts the water quality of the stream as being generally well protected when the imperviousness in the watershed is 0-10 percent of the total land cover.

The numbers show that from that 10 percent to about 26 percent imperviousness, impacts compromise the water quality. After ~26 per cent definite degradation is taking place. As with many studies, the numbers are not absolute for every scenario, but the concept is sound.

The above graphic and additional impervious surface information may be found at the Non-point Education for Municipal Officials (NEMO) website: (this graphic is from Fact Sheet Number 3)

http://nemo.uconn.edu/tools/publications/fact_sheets/nemo_fact_sheet_3_s.pdf

Thus, with all of this imperviousness and being right on the border of definite water quality degradation, the importance and the long term performance of the detention basins and infiltration systems is critical.

Road Sand

As the number of road miles per basin increases so does the amount of road sand applied during the winter months. Some things to keep in mind:

Connecticut has a no tolerance level for snow and ice on its roads; large quantities of road sand are applied every winter to keep the travel ways safe. The DEP estimates that on average in urban settings more than 40,000 pounds (20 1/4 tons) of sand is applied per road mile every year. Of that total, approximately 30-50% is collected in the spring through street sweeping. Thus, ~12 tons of sand is left on every mile of road annually.

Because of the nature of the Waterbury's hill and valley topography, roads are often in close proximity to wetlands and watercourses. This aspect of the landscape makes it highly likely that over time most of the uncollected sand will move downslope into the wetlands and watercourses. These sediments can destroy aquatic habitat and fill in water bodies. The impact of sand deposition (typically in combination with elevated salt levels) on spawning streams and wetlands in close proximity to roads is well documented. Road sand can be a major pollutant source by carrying nutrients, oil, and heavy metals with it to the rivers, streams, and lakes. In the springtime, after the danger of icing, if the road sands are swept/collected later than sooner, the impacts are worse. This is because the constant grinding of automobile tires reduces sand particle size. These finer particles are held in suspension longer and thus carried further downstream.

As a result of these impacts towns are urged to sweep the roads as soon as possible in the spring and initiate and maintain a catch-basin clean out schedule.

(DEP road sand documentation is on the Web at:
http://www.ct.gov/dep/lib/dep/waste_management_and_disposal/solid_waste/street_sweepings.pdf)

Within this proposal is 5,683 feet (~1.1 miles) of road. Using the numbers provided above, each winter the roads herein will receive 22.25 tons of sand (that is 44,500 pounds). Assuming 40% is collected by street sweeping and sump cleanout, 60% remains on every road mile. That 60% equals 13 tons of uncollected sand or 26,000 pounds left to move downslope to detention basins, watercourses and wetlands every year. And the Team found all the hallmarks that in this basin road sand does indeed pass downstream.

Detention Basins

Storm water detention basins have evolved quite a bit in the last five years. The current proposal employs the latest design measures which include forebays and wetland plantings. These are especially critical components of long term wetland protection for reasons mentioned above (road sand, slope, etc.) In that regard long term access to the detention basins must be planned for now. The forebays, where the greatest amounts of sediment trapping takes place, will need to be cleaned/excavated at appropriate intervals to maintain their effectiveness. For that purpose, and especially with these slopey surfaces, accessible pathways to the ponds for heavy equipment should be included in the proposal plans. The plans of January 15, 2007 indicate sediment basins with very steep gradients approaching the forebays, with questionable long term accessibility as a result.

Temporary Sediment Procedures

There will be much earth moving/cut and fill to make this proposal work. Because of the slope factors, sediment and erosion controls must be fully enacted. That means the temporary sediment basins and the soil stockpiles should be well constructed to do their jobs as steep slopes and loose soils can easily lead to a sediment loaded, wetland impacting, runoff scenario.

Wetland Impact

There is less than 5,000 square feet of wetland impact. This reviewer agrees with the ideas discussed that a good use of the mitigation versus a creation plan would be to renovate the impacted riparian wetland of the easternmost stream that passes under the power line at the lower end of the parcel. This will likely produce some important gains in the stream environment that would have more value ecologically than a created wetland area.

There is question about the wetland hydrology that will result from the placement of Stormwater Wetland Basins B and C. Specifically, if Basin C becomes a discharge point for the subsurface flow that currently discharges to the stream, will it effectively draw down the water table below the existing wetland? While the ERT Team does not have a geohydrologist, it may be of interest to the town to understand the implications of the alteration of surface and subsurface flows due to the location of these basins.

The stream crossings should have minimal to no impact on the long term health of the watercourses. A major issue, as always when working in close proximity to a watercourse, is to minimize and monitor construction sedimentation.

Watershed Issues

It became readily apparent on the field walks that there is some source of intense sediment loading impacting the eastern stream. The stream, as it passes over the property, exhibits tremendous deposition of what appears to be road sand.

The upstream portion of the wetland/watercourse cannot be separated from the wetland/watercourse on the site. It is all one system and must be dealt with as such. In this case, both the watercourse and the watershed upstream of this project have been badly abused.

It is readily apparent that the stream has been segmented, channelized, polluted, and sediment loaded along most of its length above this parcel. Unfortunately, it begins right at the top of the watershed - the most sensitive area - and continues to this property and beyond. While much of the abuse is the result of land use decisions made years ago, the long term impacts of those decisions impact the streams today.

	On the Renaissance Property: *The coarse sand that fills the bed of this stream is consistent of grain size throughout the bed. It is also consistent with the grain size of the sand applied to the roads in winter.*
	On the Renaissance Property: *This Flood Plain photo is well downstream on the parcel, just above the power line clearing. The areal coverage and depth of this road sand deposit is quite extensive.*

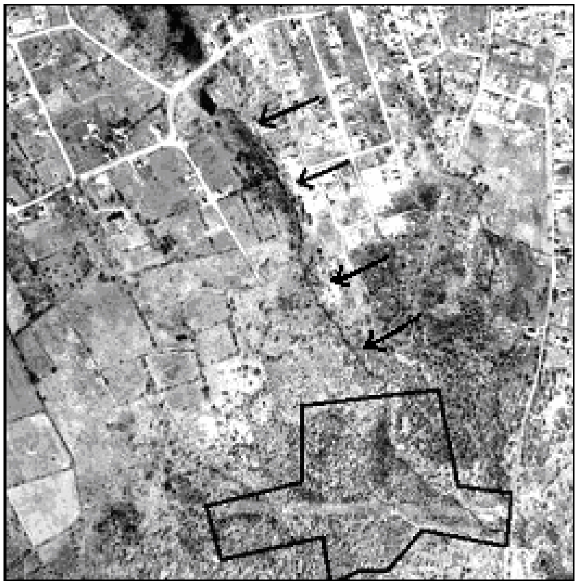
On the Renaissance Property:

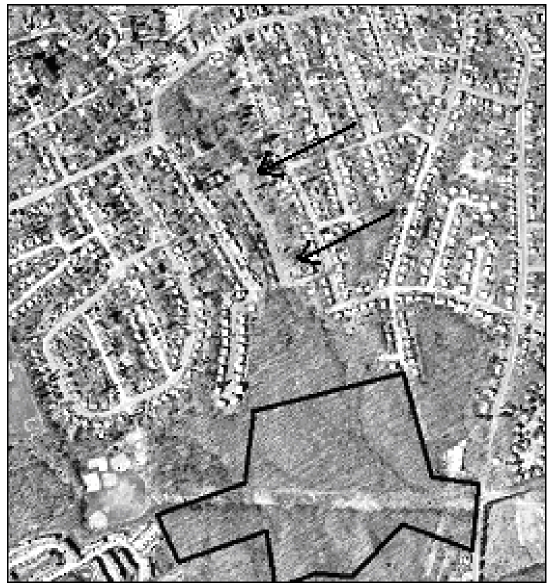
Visually fine silts can give the impression of river bottom fines. But as seen in this photo, once the thin veneer of fine silt is disturbed, as with this foot print, the coarser deposits of road sand are readily apparent.

On the Renaissance Property:

The soil scientist for the project, David Lord, brought up a core sample from a stream bed that has it headwaters on the property. As can be seen on the rock, the core sample is high in organics (dark color) and lacking in the coarse sand which dominates the bed of the stream to the east.

North/upstream of the property is the source of the sediment loading throughout the basin. In the comparative aerial photographs below, the intense use of the land for roads and subdivisions is readily apparent. The view on the left was taken in the spring of 1934. On the right is the area in the spring of 2004. The arching of Bradley Avenue to the north and the cleared strip for the power line to the south are consistent through the years.

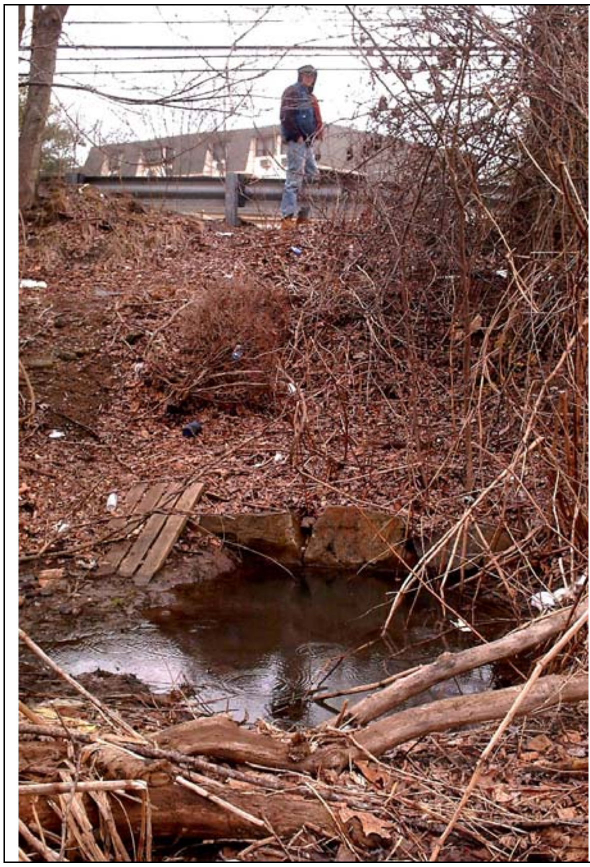




1934 CSL photograph number 07065
From: http://cslib.cdmhost.com/cdm4/browse.php

2004 Aerial Photography
From:http://clear.uconn.edu/imagery.html

As noted by the black arrows, streets and subdivisions have harshly impacted the stream north of the proposed development site.

	*It was apparent that the apartment complex north of Bradley Avenue drains into this unnamed stream. This adds an estimated 5.5 acres of nearly completely impervious surface runoff to the watershed. The plowed snowfall from the apartment's parking lot is in the above left photo. The above right is a street view of Bradley Avenue showing the road sands and storm drain. To the left a Team member straddles the guard rail which is the same guardrail behind the storm drain in the photo above. There appears to be two inlets from "upstream" that pass into this headwater wetland. It is possible there is other inflow from other sources as well.*

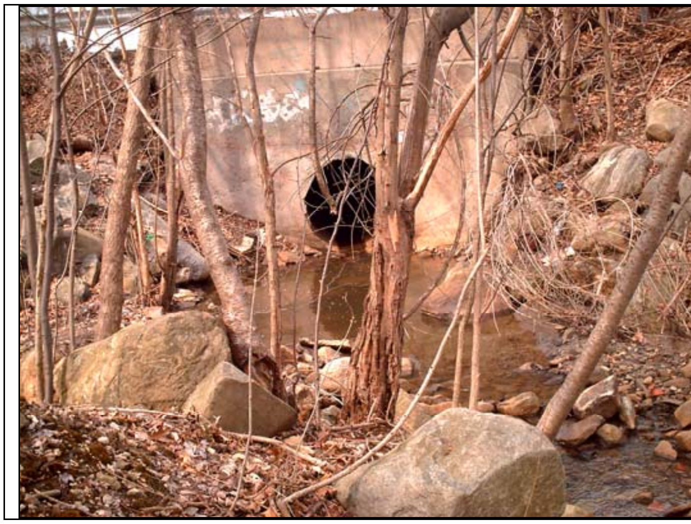
Additional views of the headwaters wetland immediately south of Bradley Ave. (below) show the tremendous depth of accumulated road sands. This sand is continually fed from Bradley Ave. and apartment parking upstream of the wetland. These are the sources of the sediment loading that affects the stream on the parcel proposed to be developed.

	*The tremendous depth of road sand with its unknown load of heavy metals appears in this wetland just below Bradley Avenue. Various scour paths cut into the unknown sand depths during periods of maximum flow.*

	*The main water course hosts a classic example of delta building as this small tributary empties into the main stream in the wetland immediately below Bradley Avenue.*

Danna Marcie Drive now occupies much of the riverway and floodplain that the stream did 70 years ago. Along this road the stream has been channelized (north) and culverted underground (south).

	
The concrete channel-way of the stream along Danna Marcie Drive is cracked, broken and scoured out.	*Just before the stream goes underground on Danna Marcie Drive it enters the culvert which has been scoured and eroded along the wing walls.*

	*This sand-embedded snow pile is left to melt and runoff at the dogleg of Danna Marie Drive.*
	*Immediately below the dog leg in Danna Marie Drive the culverted stream daylights and the sediments from the snow pile, which is at the top left in this photo, moves down slope to be carried downstream. A sediment/detention basin would have a great positive downstream impact here.*

* * * * * * * * * *

Conclusion

The proposal engages the most recent dictates of the land use and wetland protection. The crossings should provide minimal impact in the long term.

The stream renovation for the 4,918 feet of wetland disturbance will be a welcome addition to the ecology of the stream itself, in lieu of created wetlands.

The long term management of the detention basins is a key to the future health of the watercourse on the site. The detention basins do need to be addressed regarding access for maintenance and a cleaning schedule must be agreed upon.

As this section of the ERT report is being delivered, revised plans were being prepared encompassing decreased density, and hopefully decreased impervious surface totals. It is important that the proposal and the town understand the true total of impervious surface.

A geohydrologist should review the proposal and address the concern about possible altered groundwater flow specifically as it regards the impacts to the wetlands above detention basin “C”.

Neighborhood groups can use the stream for education, specifically to let abutting residents know that litter and the dumping of yard debris are not in keeping with the water quality goals of this stream.

The city should revisit the awful sand accumulation just below Bradley Avenue. It appears the deposition must be the result of years of road sand accumulation. The storm drains that lead directly into this wetland need to have the sumps cleaned so they can do their work. An easing of the spreading of road sands in the apartment parking lot north of Bradley Avenue and the street itself as it feeds this wetland may become a reality in the future as new applications for snow and ice become available. However, early street sweeping in the spring would help tremendously to reduce the sediment loading. The worst enemy of the stream and its ecology will be the continued downstream movement of road sands from up above in the basin.

It is often impossible for the city to clean the storm drain sumps regularly. However, it *is* possible for the conservation and/or wetlands commissions to offer a plan of cleaning that highlights those areas which are especially sensitive to the accumulation of these sediments. Only then can the stream obtain the level of protection the City is trying to ensure from this proposal.

Stormwater Management Review

Since the site construction involves the disturbance of over five acres, Connecticut's General Permit for the Discharge of Stormwater and Dewatering Wastewaters (the "Permit") will cover the project. The permit requires that the site register with the Department of Environmental Protection (CTDEP) at least 30 days before the start of construction. The registrant must also prepare, submit and keep on site during the construction project a Stormwater Pollution Control Plan (the "Plan"). The Plan must be followed and updated as needed during the course of construction. For example, if the single row of silt fence along the ponds and wetlands is inadequate then the erosion controls should be re-evaluated and updated to prevent pollutants from discharging off site.

Please note that while this review is based primarily on the Permit, many of the erosion and sedimentation issues are included in the Connecticut Guidelines for Soil Erosion and Sediment Control (the "guidelines"), and are issues that must be dealt with on a local level before being included in the Plan. Silt fence installation must comply with the guidelines, and may be used only in drainage areas of one acre or less.

The Plan must include a site map as described in Section 6(b)(6)(A) of the General Permit and a copy of the erosion and sedimentation (E & S) control plan for the site. The E & S plan that has been approved by the Town may be included in the Plan but may not be comprehensive enough to address all of the requirements in the Permit. This plan and site map must include specifics on controls and limits of disturbance that will be used during each phase of construction. Specific site maps and controls must be described in the Plan, as well as construction details for each control used including any temporary sedimentation ponds. Wherever possible, the site shall be phased to avoid the disturbance of over five acres at one time. The Department recommends each phase of construction be stabilized before proceeding to the next phase.

This project has steep slopes; many areas, which contain very poorly drained soils, and numerous wetland areas (both on-site and in close proximity off-site) to be protected and which will make ongoing inspections and adjustments of controls an important aspect of this project. Stabilization of cuts and fills will be critical during construction of this project. Also, when the cutting and filling portion of the project is conducted please ensure that the tops of the slopes are stabilized with berms or other means that comply with the guidelines. The Department recommends erosion control matting for slopes greater than 3 to 1.

Structural practices including sedimentation basins are required for any discharge point that serves an area greater than 5 disturbed acres at one time. The basin must be designed in accordance with the guidelines and provide a minimum of 134 cubic yards of water storage per acre drained. Placement and sizing of the basins must take into consideration the high water table. Particular care must be taken near surface waters and any other wetlands. Leave as large a vegetative buffer as possible in these areas. Maintenance of all structural controls shall be performed in accordance with guidelines and the Plan must identify these practices. Outlet structures from sedimentation basins shall not encroach upon a wetland. The present design includes the basin system to be in close proximity to wetlands, therefore care should be taken during designing and placement of sedimentation basins to ensure full storage capacity of basins.

The permit (Section 6(C)(i)) requires when construction activities have permanently ceased or been temporarily suspended for more than seven days or when final grades are reached at any portion of the site, stabilization must occur within three days.

Inspections

The permit (Section 6(b)(6)(D)) requires inspections of all areas at least once every seven calendar days and after every storm of 0.1 inches or greater. The plan must also allow for the inspector to require additional control measures if the inspection finds them necessary, and should note the qualifications of personnel doing the inspections. In addition, the plan must include monthly inspections of stabilized areas for at least three months following stabilization. There must be someone available to design and adjust E&S controls for changing site conditions, which has the authority and resources to ensure that such necessary changes are implemented.

For construction activities which result in the disturbance of ten or more acres of land area at one time, the Plan shall be submitted to the commissioner no later than thirty days before the initiation of construction activities.

Post-construction Stormwater Treatment

The permit (Section 6(b)(6)(C)(iii)) requires that the Plan include a design for post-construction stormwater treatment of 80% of total suspended solids from the completed site. The permit (Section 6(b)(6)(C)(iii)) requires that the plan include a design for post-construction stormwater treatment of 80% of total suspended solids from the completed site. In order to comply with this requirement, the Department recommends a treatment train including a combination of primary and secondary treatment. The key to obtaining the most beneficial stormwater treatment is regular maintenance. A maintenance schedule should be included as part of the plan which includes monthly maintenance and inspection plans.

Although, swirl concentrators are effective at removing sediment, they require a long-term maintenance commitment from the developer since the roads will remain private and not part of the city's maintenance program. Some newer generation swirl concentrators also incorporate filtration systems to address other pollutant issues, but these also require long-term maintenance plans. Maintenance reduction features should be employed as detailed in Chapter Eleven of the Stormwater Quality Manual. The maintenance plan should be developed during the design phase of the project.

Other Issues

Due to the size of the project and the variability and complexity of controls potentially needed, a full time erosion and sediment control inspector, should be required by the town during construction. Also, it is strongly recommended that the local wetland and zoning commissions ensure that the bond required for this project be adequate to remediate all wetlands and watercourses in the event of control failures on this site.

The Department recommends the evaluation and subsequent use of Low Impact Development controls such as rain gardens (already being used) and other BMPs which are outlined in the Stormwater Quality Manual.

A Watershed Perspective

The following set of comments is primarily intended to help paint the "big picture" of how this proposed subdivision project fits in with and/or affects what else is going on in the surrounding landscape. Because of this approach, this review may seem to address issues that are beyond the scope of the Waterbury Inland Wetlands and Watercourses Commission (Commission). However, in the end, it is primarily the many, individual land use decisions made at the local level that ultimately affect the "bigger picture" of what is happening with regard to maintaining or degrading the quality of our environment.

More specifically, these comments reflect the Connecticut Department of Environmental Protection's (CT DEP) growing commitment to address water resource concerns from a watershed perspective, taking into account the cumulative impact that assorted land use activities within a given watershed may have on water quality and quantity. Overall, these comments are given from the perspective of improving and maintaining water quality and supporting designated uses of the State's waters per the State of Connecticut Water Quality Standards[1].

The first three sections of this Watershed Perspective section on "Watershed Context", "Water Quality Classifications" and "Naugatuck River Restoration" are intended to provide basic information on the proposed Project site relative to the larger watershed picture. The last section on "Project Water Resource Concerns from a Watershed Perspective" focuses more specifically on the proposed Project and how what happens on the site influences water quality and quantity.

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[1] Connecticut Department of Environmental Protection. Effective 2002 & 1996. Water Quality Standards. Hartford, CT. (Available on the CT DEP website at: http://www.ct.gov/dep/cwp/view.asp?a=2719&q=325618&depNav_GID=1654)

Please note that some of these comments may overlap with those of other Environmental Review Team (ERT) members who are dealing with more specialized aspects of the review (ie. – wetlands, stormwater, etc.). In such cases, these comments are meant to support or supplement these specialized reviews, not supplant them.

Watershed Context

As a way of describing Connecticut's water resources in terms of the landscape, CT DEP has divided the state along natural drainage divides into eight "major basins" or watersheds. These, in turn, are divided into increasingly smaller watersheds which are described as "regional", "subregional" and "local" drainage basins. At each level, these watersheds are generally named after the brook, river or waterbody into which all of the water within that topographically-defined area ultimately flows. Each drainage area has also been assigned a number which reflects how it is connected to the rest of the watershed. Every water feature, no matter how small, has its own distinct watershed.

The surface and ground waters that flow off of and through the proposed Stonebridge Commons Subdivision (Project) site are contained within two small, watersheds – identified solely by number as local drainage basins 6900-00 & 6900-24. **(See map)** Roughly 75 - 80 percent of the water on the site drains through the latter watershed - 6900-24 - and discharges to a small unnamed stream that flows through the property. Both of these small watershed areas ultimately drain to the Naugatuck River which means that the entire Project site falls within the Naugatuck Regional Drainage Basin (regional basin number 69) [2]. The Naugatuck River, in turn, drains to the Housatonic River. The Naugatuck River is the largest of the ten regional basins which comprise the Housatonic Major Basin (major basin number 6) in Connecticut.

[2] Connecticut Geological and Natural History Survey. (Compiled by Marianne McElroy). 1981. Natural Drainage Basins in Connecticut (Map). CT DEP Natural Resources Center in cooperation with the USGS. Hartford, CT.

Water Quality Classifications

Per federal Clean Water Act requirements as well as Connecticut's own Clean Water Act, the State has adopted Water Quality Standards which establish policy for water quality management throughout the state. The State classes surface and ground water quality based upon these standards and describes water quality goals in terms of designated uses and criteria for each water quality class. Using these classifications, the State's water resources have been broadly evaluated and assigned a classification based upon presumed or known water quality as well as desired use goals. These classifications are used to make decisions as to how these water resources will be managed and what sorts of water-related withdrawals or discharges will be allowed or not allowed.

According to the CT DEP "Water Quality Classifications" map[3], the surface waters within the proposed Project area are classified as Class A[4], and ground waters are classified as Class GA[5]. These classifications mean that the surface and ground waters associated with the project site are presumed to be of high quality, and that it is the State's goal that these waters continue to be treated or used in a manner such that this high quality will be maintained.

The water quality classification of the Naugatuck River into which the waters from the Project site ultimately flow is a little more complicated. The surface water classification for the Naugatuck River – approximately 4/10 of a mile from the Project site – is Class C/B[6]. For waters with a dual classification such as C/B, the first letter – in this case "C" - represents the current water quality, and the second letter – in this case "B" - represents

[3] CT DEP Environmental and Geographic Information Center. Adopted March 1999 (Version 01/24/00-1). Water Quality Classifications - Housatonic River, Hudson River, and Southwest Coastal Basins (Sheet 2 of 3) (Map). CT DEP. Hartford, CT.

[4] **Class A surface waters** have overall excellent water quality and the following designated uses: potential drinking water supply; fish and wildlife habitat; recreational use; agricultural, industrial supply and other legitimate uses, including navigation.

[5] **Class GA ground waters** have overall excellent water quality and the following designated uses: existing private and potential public or private supplies of water suitable for drinking without treatment; baseflow for hydraulically connected surface water bodies.

[6] **Class B surface waters** have good to excellent water quality and the following designated uses: recreational use, fish and wildlife habitat, agricultural and industrial supply and other legitimate uses including navigation.

Class C surface waters are of unacceptable quality, and the goal is Class B or Class A. The designated uses for Class C waters are the same as for Class B waters.

the water quality goal for that surface water resource. Class C indicates that water quality is basically unacceptable and should be meeting the designated uses associated with Class B waters (ie. – "fishable-swimmable").

Although the surface water on the Project site is classified as Class A, it was noted on the ERT site visit (2/28/07) that there were sedimentation issues associated with the stream running through the property. It was presumed that these sediment issues are associated with existing development within the watershed, just upstream of the proposed Project site. Ideally, the causes of these sedimentation problems should be addressed at their source, so that they do not continue to impact the stream as it flows through the Project site. In addition, it is noted that on the CT DEP "Leachate and Wastewater Discharge" sources map[7] that there are two facilities immediately downstream of the proposed Project site, adjacent to the unnamed brook, that may be impacting surface and/or ground water that flows to the Naugatuck River. One of these facilities is the active Connecticut Resource Recovery Authority landfill, and the other is a City of Waterbury closed bulky waste landfill. Obviously, the applicants of the proposed Project have no control over the land use activities immediately upstream and downstream of their project site. However, from a watershed perspective, it does put more pressure on the applicant as well as the City of Waterbury to maintain the quality of the water leaving the Project site at the highest level possible so that it does not contribute to other existing or potential water quality issues associated with the unnamed stream as well as the Naugatuck River.

Naugatuck River Restoration Project

The CT DEP, in cooperation with federal agencies, municipalities, private industries and local citizen organizations, has been engaged in a comprehensive initiative to restore the water quality and ecological integrity of the Naugatuck River. Clean-up of the Naugatuck has been underway since state and federal clean water legislation was enacted in the late 1960s and early 1970s. Initial efforts focused on cleaning up discharges from

[7] CT DEP Environmental and Geographic Information Center. Revised 1997. Leachate and Wastewater Discharges – Housatonic River, Hudson River, and Southwest Coastal Basins (Sheet 2 of 3) (Map). CT DEP. Hartford, CT.

industries and the eight municipal wastewater treatment plants (WWTPs) located on the Naugatuck and its tributaries. In more recent years, attention has been focused on upgrading industrial wastewater treatment systems, reducing or eliminating industrial end-of-pipe discharges, and cleaning up stormwater discharges from industrial and construction sites. Between 1992 and 2000, per State pollution abatement orders, five of the larger municipal WWTPs upgraded their facilities to advanced wastewater treatment and a sixth facility's flow was redirected to the new Waterbury WWTP.

In conjunction with the Waterbury WWTP upgrade, five dams on the Naugatuck mainstem were removed or breached and plans are underway to construct a fish passage and recreational bypass around another. These efforts are part of a larger plan to restore anadromous fish passage to approximately 30 miles of the lower Naugatuck River up to the Thomaston Dam.

In addition to CT DEP's activities, communities, environmental organizations and citizen groups are working to improve the quality of the Naugatuck River and reconnect people with the river. Most notable is a growing vision among these entities to create a greenway along the entire length of the Naugatuck River from Torrington to Derby. The City of Waterbury is one of the communities that is considering creating a greenway along the Naugatuck River. (See the June 2006 King's Mark ERT "Naugatuck River Greenway" report compiled for the City of Waterbury on the Connecticut Environmental Review Teams website at: www.ctert.org .)

While the proposed Project is not located immediately adjacent to the river, it is located within the Naugatuck watershed and less than one-half mile from the river. In the overall scheme of things, it is necessary to recognize that land use activities and changes throughout the Naugatuck watershed ultimately influence the water quality of the Naugatuck River and the overall success of the Naugatuck River Restoration Project.

Project Water Resource Concerns from a Watershed Perspective

It is important that the quality of the surface and ground waters flowing off of the Project site continue to meet the existing criteria and support the designated uses associated with Class A and GA waters as described above. Likewise, it is essential that the waters flowing off of the Project site to the unnamed brook and ultimately to the Naugatuck River, continue to support the water quality goals of upgrading the Naugatuck River from a Class C to a Class B watercourse. Maintaining water quality also supports the goals of the Naugatuck River Restoration Project.

As undeveloped open space is gradually converted to more intensive land uses, it is necessary to keep in mind the cumulative impact that all of these changes have on water quality within a given watershed, over time. Studies have revealed that the "first flush" of stormwater surface flow from our developed landscapes (rooftops, roads, parking areas, lawns, etc.) to nearby streams and waterbodies is the leading contributor to non-point source pollution. Surface water runoff carries with it pollutants such as fertilizers, pesticides, oils, salts, sand, soil and other materials. With "end-of-pipe" sources of pollution largely under control through stringent federal and State regulation, stormwater runoff now represents the greatest threat to our State's water quality.

When a land use change such as this subdivision is proposed, careful consideration should be given not only to prevention of water quality impacts during the construction phase of the project, but also to the type of methods chosen for protecting water quality after the land use change has occurred. Protection of sensitive water resource features through the use of adequately sized vegetative buffers, selection of appropriate stormwater treatment methods and structures that will be properly operated and maintained as well as education of property owners about environmentally sound methods of caring for their homes, lawns and water resources are all a part of the equation.

Likewise, it is also important that the proposed subdivision is planned in a manner such that the quantity and flow patterns of surface and groundwater on the Project site continue to support or mimic the existing natural conditions and processes as closely as possible. One of the increasingly important water resource issues in Connecticut is maintaining adequate groundwater recharge and streamflow in order to maintain healthy wetlands, waterbodies and watercourses. As with water quality impacts, the cumulative impacts that changes in land use have on water quantity dynamics should be borne in mind.

At the local level, measures are in place which require developers to design stormwater systems such that there is no net increase in the rate of surface water flow off of the property during storm events to avoid "downstream" flooding problems. However, the manner in which water is handled on-site must go a step farther. As undeveloped land is converted to other uses, the amount of impervious surface created by roofs, driveways, roads, etc., and how the stormwater coming off these sites is managed affects the quantity of groundwater being recharged on the project site and the rate of surface water runoff. The reduction and disconnection of impervious surfaces, the use of pervious pavements, the elimination of street curbs and the use of vegetated swales and buffers are just some the techniques currently being used to manage stormwater in a way which promotes increased groundwater recharge throughout a development in a manner that more closely sustains or imitates natural processes.

Other ERT participants with specific expertise are commenting on this proposed Project with regard to stormwater management considerations where State permits apply (ie. – general permit for construction sites greater than one acre[8]) or where State issued guidelines should be considered (ie. – 2002 Connecticut Erosion & Sedimentation Guidelines[9]). However, in reviewing the proposed Project, the Commission is strongly

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[8] Connecticut Department of Environmental Protection "General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities" (Available on CT DEP website at: http://www.ct.gov/dep/cwp/view.asp?a=2709&q=324154&depNav_GID=1643#StormConstructGP)

[9] The Connecticut Council on Soil and Water Conservation in cooperation with the Connecticut Department of Environmental Protection. 2001. 2002 Connecticut Guidelines for Soil Erosion and Sediment Control (DEP Bulletin 34). Hartford, CT.

encouraged to compare the application to the site planning and design recommendations, and stormwater treatment practices presented in the 2004 Connecticut Stormwater Quality Manual[10]. (The manual can be viewed on the CT DEP website and a weblink is provided in the footnote.) The following two chapters should be of particular interest to the Commission with regard to reviewing this proposed Project: Chapter 4 "Site Planning and Design" and Chapter 9 "Developing a Site Stormwater Management Plan". Chapter 4 is especially relevant as it discusses "alternative site design" and "low impact development management practices" with regard to stormwater management.

Additional information on state-of-the-art stormwater management practices and other Low Impact Development (LID) techniques can be obtained through the University of Connecticut - Cooperative Extension System – Nonpoint Education for Municipal Officials program – also known as NEMO - at their website at: http://nemo.uconn.edu/ .

Although it is beyond the scope of this reviewer's ability to analyze all of the specific construction details associated with this proposed Project, it is noted that the applicant appears to be consciously designing the subdivision to conform with many state-of-the-art stormwater practices to reduce water resource impacts in terms of both water quality and quantity. The number of housing units on the site, compared to the number originally proposed, has been reduced as the plan evolved; and road widths are narrower than "traditionally" sized roads. These types of measures help to minimize the amount of impervious surface proposed. During the 2/28/07 ERT site visit, the possibility of using pervious pavement for roads and parking areas was briefly discussed. At the time, the applicant had reservations about the ability to use these types of surfaces on the site, given shallow soils which limit the amount of infiltration that can take place. Reliability and practicality of using pervious surfaces in this climate is another issue that is often raised. While these concerns are understandable, the applicant is still encouraged to investigate the possibility of using pervious pavements, especially in the parking areas

[10] Connecticut Department of Environmental Protection. 2004. 2004 Connecticut Stormwater Quality Manual. Hartford, CT. (The manual can be found on the CT DEP website at: http://www.ct.gov/dep/cwp/view.asp?a=2721&q=325704&depNav_GID=1654)

associated with the housing units. Disconnecting impervious surfaces is another technique which the applicant is encouraged to explore in greater detail.

In addition to paying attention to the amount of impervious surface, the Project applicant also has plans to create four stormwater wetland detention basins as well as a rain garden to capture and infiltrate runoff. The applicant has indicated that these have been designed according to the 2004 Connecticut Stormwater Quality Manual. In order to operate correctly over the long haul, regular maintenance of these structures will be especially important.

In addition to retaining a buffer along the unnamed stream that flows through the wooded section of Project site, the applicant is also pursuing recommendations posed at 2/28/07 ERT site review to create a vegetated buffer along the portion of the stream that crosses through the CL&P right-of-way on the property. Creating a vegetated buffer (composed of native plant species) will greatly benefit this section of stream in the right-of-way by shading the stream and lowering water temperatures, filtering out sediments and other pollutants from surface flow to the stream, and providing additional habitat and a travel corridor for wildlife.

The degree to which the City of Waterbury requires or allows new and innovative stormwater management designs and techniques to be incorporated into the plans of a proposed project such as this determines, in large part, whether or not the best possible stormwater management plan is developed for the site.

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http://www.ct.gov/dep/cwp/view.asp?a=2709&q=324154&depNav_GID=1643#StormConstructGP)

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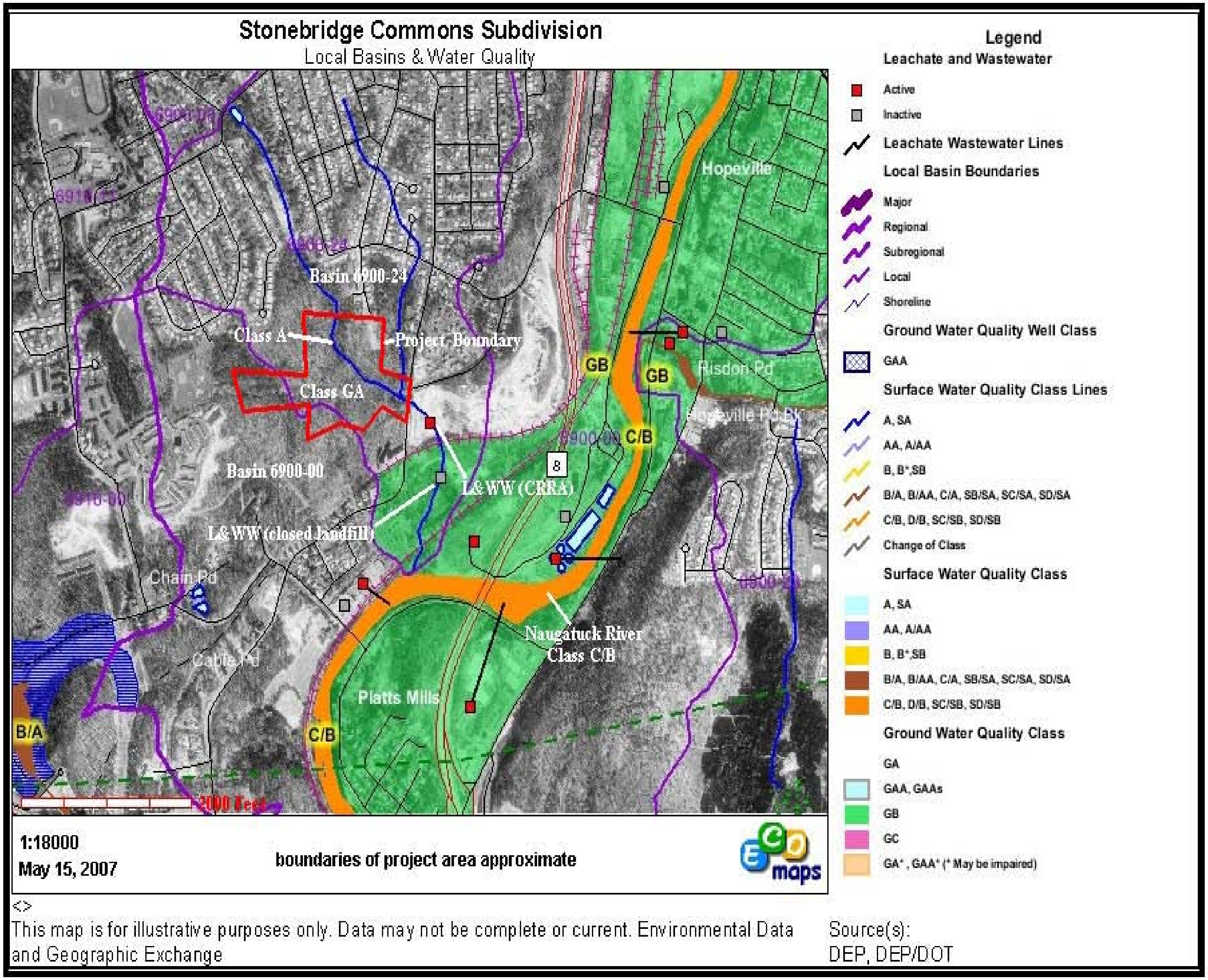
Connecticut Geological and Natural History Survey. (Compiled by Marianne McElroy). 1981. Natural Drainage Basins in Connecticut (Map). CT DEP Natural Resources Center in cooperation with the USGS. Hartford, CT.


Stonebridge Commons Subdivision
Local Basins & Water Quality
Hopeville
Risdon Pd
Hopeville Pd Bk
GB
GB
C/B
C/B
B/A
8
Basin 6900-24
Class A
Project Boundary
Class GA
Basin 6900-00
L&WW (CRRA)
L&WW (closed landfill)
Chain Pd
Cable Rd
Naugatuck River
Class C/B
Platts Mills
2000 Feet
1:18000
May 15, 2007
boundaries of project area approximate
maps
Legend
Leachate and Wastewater
Active
Inactive
Leachate Wastewater Lines
Local Basin Boundaries
Major
Regional
Subregional
Local
Shoreline
Ground Water Quality Well Class
GAA
Surface Water Quality Class Lines
A, SA
AA, A/AA
B, B*,SB
B/A, B/AA, C/A, SB/SA, SC/SA, SD/SA
C/B, D/B, SC/SB, SD/SB
Change of Class
Surface Water Quality Class
A, SA
AA, A/AA
B, B*,SB
B/A, B/AA, C/A, SB/SA, SC/SA, SD/SA
C/B, D/B, SC/SB, SD/SB
Ground Water Quality Class
GA
GAA, GAAs
GB
GC
GA*, GAA* (* May be impaired)
<>
This map is for illustrative purposes only. Data may not be complete or current. Environmental Data and Geographic Exchange
Source(s):
DEP, DEP/DOT

Aquatic Habitats & Resources

(Note: This reviewer had access to updated plans and materials.)

Site Description

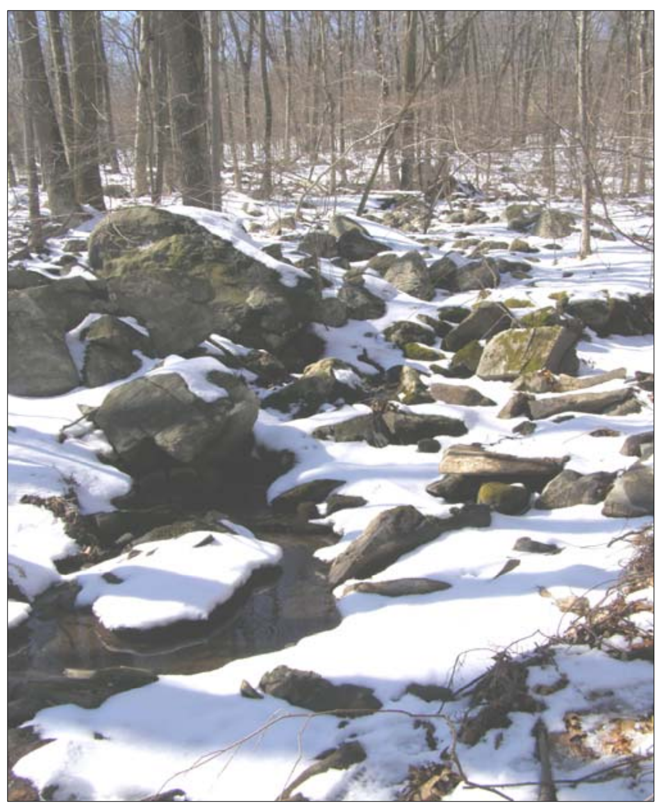
With the exception of 7.8+ acres maintained as low growing brush beneath a 165-foot wide power line right-of-way, the remainder of the 38.15-acre site proposed for the Stonebridge Commons residential development is forested. A 1,500+ - foot reach of a stream, locally known as Sled Haul Brook, flows northwesterly to southeasterly across the site. An unnamed intermittent stream crosses the western portion of the site flowing in a southerly direction. Both streams are within DEP Drainage Basin #: 6900.

Aquatic Habitats

Sled Haul Brook is physically characteristic of a coldwater stream found in Connecticut. The brook channel is moderate in grade through much of the site then transitions to lower gradient near the eastern property bound near Highland Avenue. The Sled Haul Brook channel approximately 10 to 15 feet in bankfull width. The substrate of the brook is composed of small boulder, cobble, gravel, coarse sand, and sand-silt fines.

The channel of the unnamed stream varies in width of less than 10 feet and in some areas becomes diffuse with no defined channel. The substrate of the stream within the defined channel segments is composed of small boulder, cobble, gravel, coarse sand, and sand-silt fines.

Sled Haul Brook Channel



Dense growths of hardwoods and woody shrubs predominate as riparian vegetation along the unnamed stream and most of Sled Haul Brook, however, vegetation along the Sled Haul Brook segment within the power line right-of-way is maintained in a manner that limits plant height. The long-term maintenance has also reduced the plant species composition.

Physical in-stream habitat in Sled Haul Brook is provided by primarily by water depth in pools, boulders, undercut banks and fallen or overhanging vegetation. Maintenance of the riparian vegetation has lead to bank failure randomly along a several hundred foot long reach of Sled Haul Brook.

The Department of Environmental Protection classifies the Sled Haul Brook reach on the Stonebridge Commons site as *Class A* surface waters. Designated uses for surface water of this classification are potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply and other legitimate uses.

Aquatic Resources

The Inland Fisheries Division has never conducted fish surveys of Sled Haul Brook. However, streams of similar physical characteristics in the Naugatuck River watershed that have been surveyed were found to contain fish populations composed of brook trout, blacknose dace, and tessellated darter. The Sled Haul Brook reach on the Stonebridge Commons site is anticipated to support a similar fish assemblage.

The unnamed stream is not anticipated to support a fishery population due to the intermittent flow regime.

Sled Haul Brook is a tributary of the Naugatuck River with the confluence being immediately upstream of the former Platt's Mill Dam. The inflow of cooler water from Sled Haul Brook provides an important thermal refuge for coldwater stream fish (including trout) within the Naugatuck River at the point of confluence. These fish seek cooler tributary water to escape from the warm and low-oxygenated water of the Naugatuck River during low-flow periods of summer.

Aquatic Habitat/Resource Enhancement and Protection

The current layout of the proposed Stonebridge Commons residential development has incorporated a number of design features to enhance and/or protect the habitats and living resources of Sled Haul Brook. These features include:

1. Reducing the number of residential units from 330 to 280 (142 two bedroom and 138 one bedroom) on 28 lots. This has allowed for the preservation of the existing vegetated riparian corridor along both sides of Sled Haul Brook at widths exceeding 100 feet. A well vegetated, species diverse riparian area is critical to the health of the Sled Haul Brook ecosystem. Roots of trees, shrubs, and grasses bind the brook bank soils and provide a resistance to the erosive forces of flowing water. Stems and leaves of brook bank vegetation provide shade that prevents high water temperatures. Leaves, stems, and other plant parts that fall into the brook provide food for aquatic insects. Large woody

debris that fall into the brook enhance physical habitat. Abundant riparian vegetation softens rainfall and enables the riparian area to serve as a reservoir storing surplus runoff for a gradual release to the brook during low flow periods of summer and early fall. The riparian area is a natural filter that removes nutrients, sediments, and other non-point source pollutants from overland runoff.

In a *Policy Statement* and *Position Statement*, the Inland Fisheries Division recommends that 100-foot wide riparian buffers be established along perennial watercourses and 50-foot wide buffers along intermittent streams.

2. Protecting the riparian corridors from future development by conservation easement.

3. Installing arch ("bottomless") culverts for the road crossings of both Sled Haul Brook and the unnamed intermittent stream. The Inland Fisheries Division routinely recommends arch culverts (in lieu of bridges) as this structure design allows for the preservation of instream habitat and does not create a barrier to fish passage. In accordance with Inland Fisheries Division guidelines for stream crossings, the culverts will have a height and width to:

a) provide sufficient light within the culverts for primary production, which is the growth of benthic algae. Primary production creates the food supply available for aquatic insects and sequentially the amount of food available for fish and other obligate aquatic species; and
b) span the stream channels to also provide suitable passage areas for other obligate aquatic species and a variety of wildlife.

4. Entering into agreement with Northeast Utilities (CL&P) to restore a species diverse vegetated buffer along Sled Haul Brook riparian within power line right-of-way.

Sled Haul Brook riparian vegetation restoration site.

Recommendations

The developers of the proposed Stonebridge Commons site have made laudable efforts to enhance and protect the habitats and resources of Sled Haul Brook and the unnamed intermittent stream. The following are recommended to advance those efforts:

1. The placement of scour protection measures at the culverts and stormwater energy dissipaters should be minimized to the fullest extent possible. Native stone should be utilized rather than quarried rip-rap.

2. Unconfined instream activities associated with the culvert installations should be allowed only during the time period of June 1 through September 30.

3. Institute a phased development of the site with an approved, functional stormwater management system installed initially.

The Natural Diversity Data Base

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

Natural Diversity Data Base information includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Natural Resources Center's Geological and Natural History Survey and cooperating units of DEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Data Base should not be substitutes for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Data Base as it becomes available.

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

Archaeological Review

The Office of State Archaeology (OSA) and the State Historic Preservation Office (SHPO) believe that the proposed project area possesses a high sensitivity for archaeological resources, especially in the western portions of the property adjacent to the wetlands that drain to the Naugatuck River. This review is based on known prehistoric Native American sites in the State of Connecticut's archaeological site files and maps, and topographic and environmental characteristics of the land. Native American sites have been located in the immediate proximity of the project area. These sites include hunting and gathering camps dating over 4,000 years ago and associated with outcroppings of bedrock. The project area also suggests a high probability for undiscovered archaeological resources. Eastern portions of the project area appear disturbed and do not possess any archaeological concerns.

The OSA and SHPO concur in the need for a professional reconnaissance survey that should be undertaken in order to locate, identify and evaluate all archaeological resources that may exist within the ERT study area. A reconnaissance survey would provide the Town of Waterbury, OSA and SHPO with important cultural resource information for assisting in the local land use decision-making processes. All archaeological investigations should be carried out pursuant to SHPO's *Environmental Review Primer for Connecticut's Archaeological Resources*.

The OSA and SHPO offices are available to provide technical assistance to the applicant and the City of Waterbury in conducting the recommended survey. A list of qualified archaeological consultants can be forwarded.

Planning Considerations

(Please Note: This section is based on materials from the field review 2/28/07 which showed 330 units, the road names have been changed to reflect the new road names on updated plans labeled Stonebridge Commons.)

Overview

Karlen Management proposes to build approximately 330 one and two bedroom dwelling units and a community building on 38.15 acres located south of the Town Plot neighborhood of Waterbury. The land is in the Moderate Density Residence District (RM). The site has public water and sewer.

City Plan

Waterbury's *Plan of Conservation and Development* (2005) recommends that the future land use of this area be single family or two family residential (RL district). The proposal submitted is for multi-family housing, and therefore this development is not in conformity with the city's *Plan*. However, the proposal does conform to the existing RM district zoning.

Regional Plan

This portion of Waterbury is identified as a "growth area" in the *Regional Plan of Conservation and Development* (1998), due to the availability of public utilities and public transit. The *Regional Plan* recommends the preservation of historic stone walls, and they are found extensively on the property. The walls contribute to the unique character of the region and should be preserved and incorporated into the development.

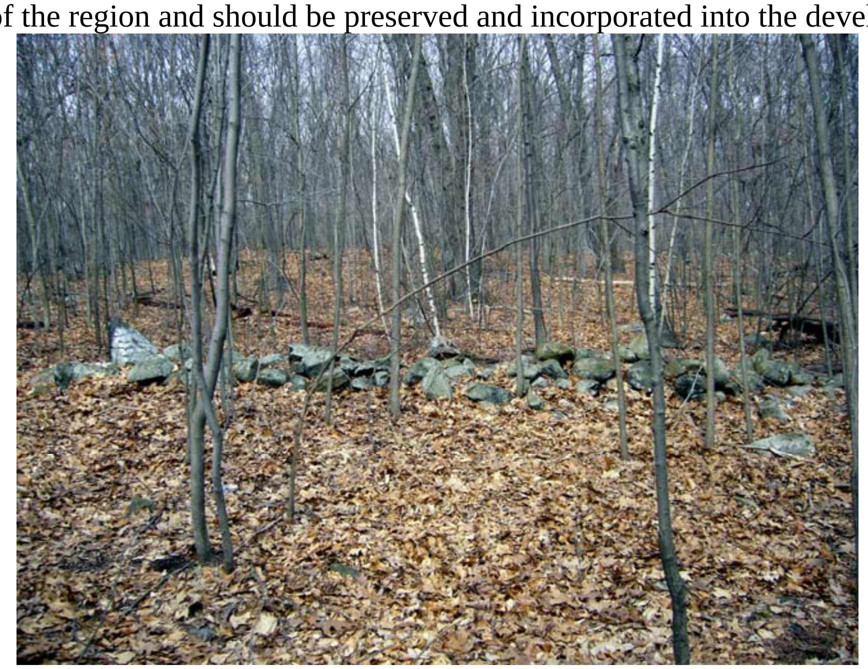


Image: One of the stone walls found on project property

State Plan

The development is being proposed in a portion of Waterbury identified as a "growth area" in the *State Plan of Conservation and Development* (2005). Therefore, development is in conformity with the *State Plan*.

Pedestrian and Transit Connections

The Stonebridge Commons Residential Development has no internal pedestrian facilities or external pedestrian connections and is thereby isolated from the surrounding neighborhood. Walking paths should be incorporated into the development to provide a safe way for residents to get around their neighborhood without driving. A pedestrian path to neighboring Murray Park would be desirable to allow residents and their children direct access to the park on foot. A pedestrian connection to the bus stop at New Haven Avenue and Rosario Drive would be beneficial, at least for residents living within close proximity of the bus stop on Stonebridge Lane (what was Alexandria Way).

Internally, there should be some pedestrian connections or facilities to allow residents to walk to other sections of the development and the community building without driving. These pathways should provide direct connections between the different parts of the development and the community. The paths would allow children to get around their neighborhood safely, without walking in the road or across neighbors' yards. Also the paths would provide adults with a safe place to walk and get exercise. Pedestrian paths will also be important in getting people to large events at the community building, since the small parking lot may not be adequate.

Roads

Karlen Management proposes to build three roads to serve the Stonebridge Commons Residential Development. The roads are proposed to be 24 feet in width. Narrower streets will cause cars to drive slower, increasing pedestrian safety. Also narrower streets will reduce the amount of imperious surface in the development and the amount of stormwater runoff generated.

The proposed development will be connected to Waterbury's existing road network by Renaissance Drive (updated to Old Country Road) and Alexandria Way (updated to Stonebridge Lane), which will connect to New Haven Avenue and Highland Avenue respectively. These two roads should provide adequate emergency vehicle access to the development.

All of New Haven Avenue and Highland Avenue north of the proposed development are residential streets lined by single family houses. Construction traffic from the development could pose a safety hazard, particularly to neighborhood children, and an annoyance to the Town Plot neighborhood. To minimize the conflict, all construction traffic should access the site from the south via Highland Avenue. During the construction of the units on Stonebridge Lane, construction traffic should use Old Country Road to Highland Avenue south and not New Haven Avenue. There should also be limits on the hours and days on which construction can take place, to limit the impact that construction noise and traffic will have on surrounding residential neighborhoods.

Two wetlands crossings are proposed for Stonebridge Lane. All the units on the first section of Stonebridge Lane (formerly Alexandria Way) could be accessed from New Haven Avenue, and therefore this wetlands crossing might not be necessary. On the other hand, the units proposed in phase 3, at the far end of Stonebridge Lane (formerly Canterbury Lane) would require a wetlands crossing. Furthermore, to access the steep western portion of the site for development in phase 3, Stonebridge Lane must take the form of a switchback road. Given the wetland crossing needed and the amount of engineering required to get Stonebridge Lane (formerly Canterbury Lane) to the western portion of the site, development of phase 3 will be more difficult.

Traffic

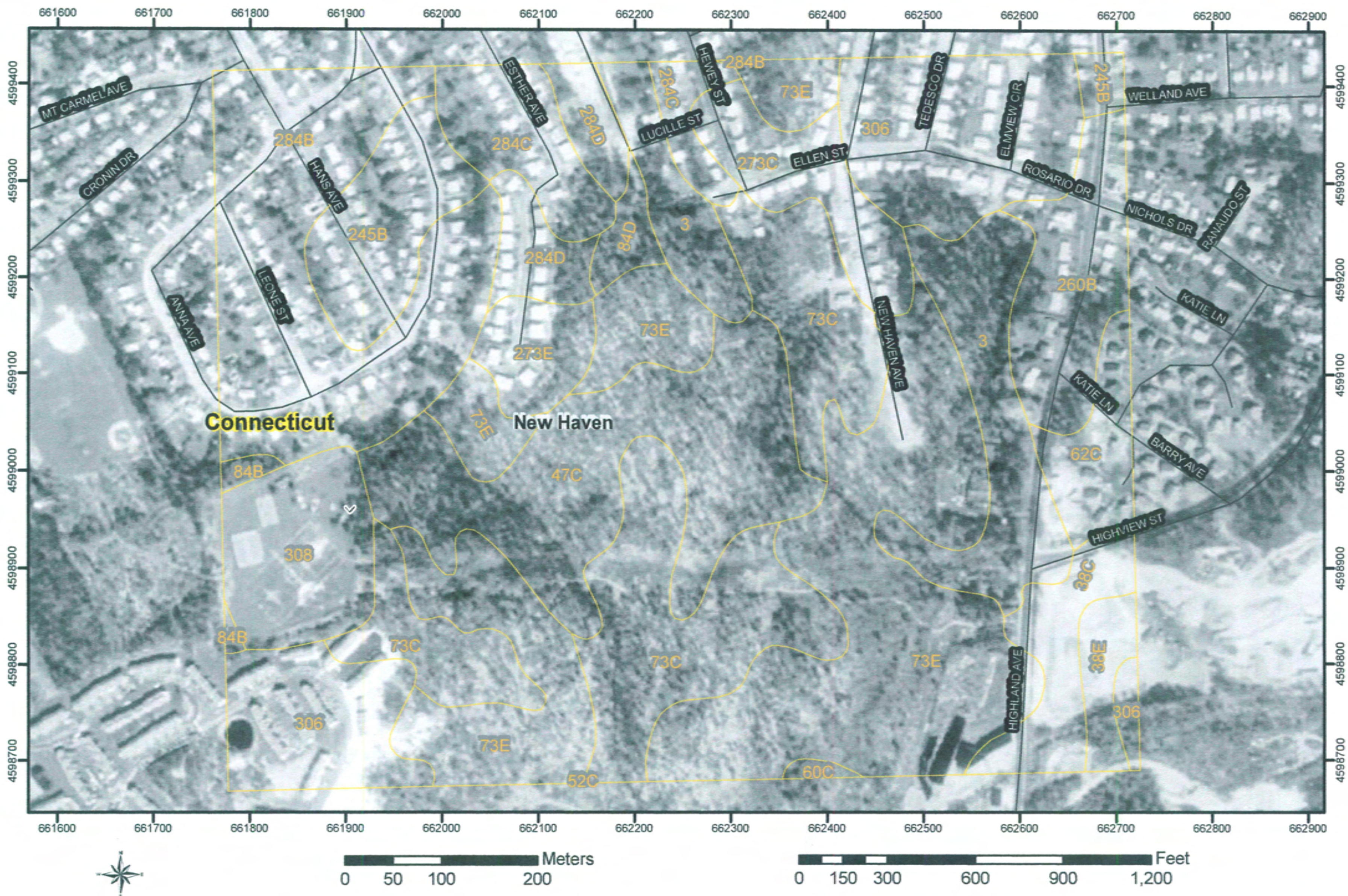
Multi-family condominium developments like Stonebridge Commons Residential Development generally generate less traffic than the same number of single family housing units. Nevertheless, the traffic impact of this proposal could be significant, especially for New Haven Avenue, which will no longer be a dead end street. According to the Institute of Transportation Engineers *Trip Generation*, *7th Edition*, this development (330 dwelling units) will generate approximately 145 new trips on adjacent streets during the weekday a.m. peak rush hour and 172 new trips during the weekday p.m. peak rush hour. On an average weekday, a total of 1,980 new vehicle trips will be added to New Haven Avenue and Highland Avenues upon completion of the Stonebridge Commons Residential Development.

Appendix

Soil Survey State of Connecticut-Attachment One
Dwellings with Basements Rating
Local Roads and Street Rating
State of Connecticut Map Unit Description

Attachment One

SOIL SURVEY OF STATE OF CONNECTICUT



SOIL SURVEY OF STATE OF CONNECTICUT

MAP LEGEND

- Soil Map Units
- Cities
- Detailed Counties
- Detailed States
- Interstate Highways
- Roads
- Rails
- Water
- Hydrography
- Oceans
- Escarpment, bedrock
- Escarpment, non-bedrock
- Gulley
- Levee
- Slope
- Blowout
- Borrow Pit
- Clay Spot
- Depression, closed
- Eroded Spot
- Gravel Pit
- Gravelly Spot
- Gulley
- Lava Flow
- Landfill
- Marsh or Swamp
- Miscellaneous Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Slide or Slip
- Sinkhole
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Perennial Water
- Wet Spot

MAP INFORMATION

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov

Coordinate System: UTM Zone 18

Soil Survey Area: State of Connecticut
Spatial Version of Data: 3
Soil Map Compilation Scale: 1:12000

Map comprised of aerial images photographed on these dates:
4/12/1991

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

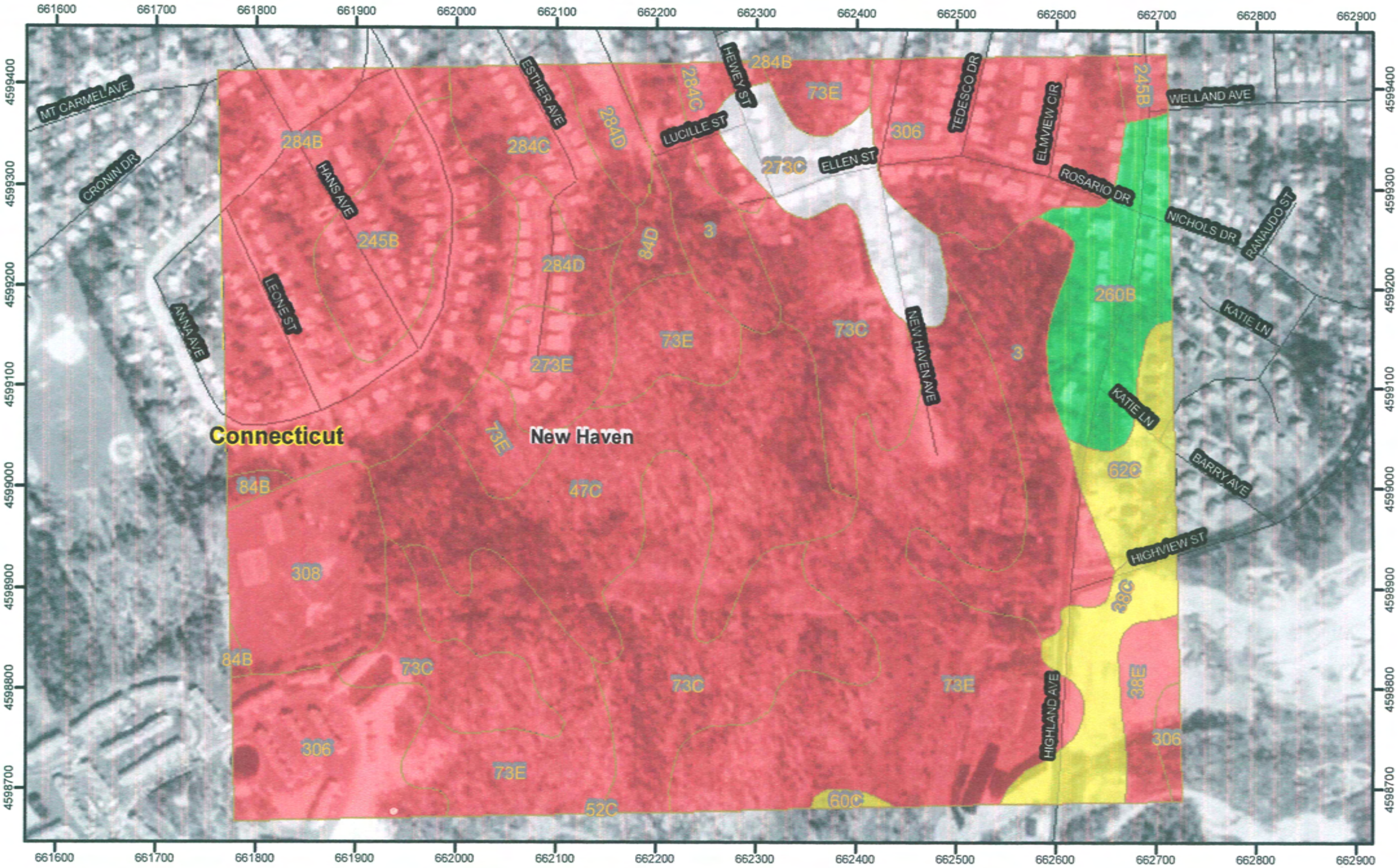
Map Unit Legend Summary

State of Connecticut

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
3	Ridgebury, Leicester, and Whitman soils, extremely stony	12.1	6.9
38C	Hinckley gravelly sandy loam, 3 to 15 percent slopes	4.5	2.5
38E	Hinckley gravelly sandy loam, 15 to 45 percent slopes	2.0	1.1
47C	Woodbridge fine sandy loam, 2 to 15 percent slopes, extremely stony	17.1	9.7
52C	Sutton fine sandy loam, 2 to 15 percent slopes, extremely stony	0.0	0.0
60C	Canton and Charlton soils, 8 to 15 percent slopes	0.3	0.2
62C	Canton and Charlton soils, 3 to 15 percent slopes, extremely stony	3.4	2.0
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	21.4	12.2
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	37.2	21.2
84B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes	0.5	0.3
84D	Paxton and Montauk fine sandy loams, 15 to 25 percent slopes	1.3	0.7
245B	Woodbridge-Urban land complex, 0 to 8 percent slopes	6.9	3.9
260B	Charlton-Urban land complex, 3 to 8 percent slopes	7.0	4.0
273C	Urban land-Charlton-Chatfield complex, rocky, 3 to 15 percent slopes	5.3	3.0
273E	Urban land-Charlton-Chatfield complex, rocky, 15 to 45 percent slopes	3.0	1.7
284B	Paxton-Urban land complex, 3 to 8 percent slopes	19.3	11.0
284C	Paxton-Urban land complex, 8 to 15 percent slopes	6.3	3.6
284D	Paxton-Urban land complex, 15 to 25 percent slopes	4.1	2.3
306	Udorthents-Urban land complex	17.0	9.7
308	Udorthents, smoothed	6.8	3.9

Dwellings with Basements Rating

DWELLINGS WITH BASEMENTS RATING FOR STATE OF CONNECTICUT



DWELLINGS WITH BASEMENTS RATING FOR STATE OF CONNECTICUT

MAP LEGEND

Dwellings with Basements

{Dominant Condition, >}

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available
- Soil Map Units
- Cities
- Detailed Counties
- Detailed States
- Interstate Highways
- Roads
- Rails
- Water
- Hydrography
- Oceans

MAP INFORMATION

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov

Coordinate System: UTM Zone 18

Soil Survey Area: State of Connecticut
Spatial Version of Data: 3
Soil Map Compilation Scale: 1:12000

Map comprised of aerial images photographed on these dates:
4/12/1991

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables - Dwellings with Basements

Summary by Map Unit - State of Connecticut

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Component Name (Percent)	Rating Reasons	Total Acres in AOI	Percent of AOI
3	Ridgebury, Leicester, and Whitman soils, extremely stony	Very limited	Ridgebury (40%)	Depth to saturated zone	12.1	6.9
			Leicester (35%)	Depth to saturated zone		
			Whitman (15%)	Ponding		
				Depth to saturated zone		
			Sutton (2%)	Depth to saturated zone		
			Woodbridge (2%)	Depth to saturated zone		
38C	Hinckley gravelly sandy loam, 3 to 15 percent slopes	Somewhat limited	Hinckley (80%)	Slope	4.5	2.5
			Windsor (5%)	Slope		
			Merrimac (5%)	Slope		
			Agawam (3%)	Slope		
38E	Hinckley gravelly sandy loam, 15 to 45 percent slopes	Very limited	Hinckley (80%)	Slope	2.0	1.1
			Sudbury (2%)	Depth to saturated zone		
			Walpole (1%)	Depth to saturated zone		
			Scarboro (1%)	Ponding		
				Depth to saturated zone		

Summary by Map Unit - State of Connecticut

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Component Name (Percent)	Rating Reasons	Total Acres in AOI	Percent of AOI
47C	Woodbridge fine sandy loam, 2 to 15 percent slopes, extremely stony	Very limited	Woodbridge (80%)	Depth to saturated zone	17.1	9.7
				Slope		
			Paxton (5%)	Depth to saturated zone		
				Slope		
			Montauk (3%)	Depth to saturated zone		
				Slope		
			Ridgebury (3%)	Depth to saturated zone		
			Sutton (2%)	Depth to saturated zone		
			Leicester (2%)	Depth to saturated zone		
			Georgia (1%)	Depth to saturated zone		
			Whitman (1%)	Ponding		
				Depth to saturated zone		

Summary by Map Unit - State of Connecticut

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Component Name (Percent)	Rating Reasons	Total Acres in AOI	Percent of AOI
52C	Sutton fine sandy loam, 2 to 15 percent slopes, extremely stony	Very limited	Sutton (80%)	Depth to saturated zone	0.0	0.0
				Slope		
			Paxton (3%)	Depth to saturated zone		
				Slope		
			Leicester (3%)	Depth to saturated zone		
			Woodbridge (2%)	Depth to saturated zone		
				Slope		
			Rainbow (2%)	Depth to saturated zone		
60C	Canton and Charlton soils, 8 to 15 percent slopes	Somewhat limited	Canton (45%)	Slope	0.3	0.2
			Charlton (35%)	Slope		
62C	Canton and Charlton soils, 3 to 15 percent slopes, extremely stony	Somewhat limited	Canton (45%)	Slope	3.4	2.0
			Charlton (35%)	Slope		
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	Very limited	Chatfield (30%)	Depth to hard bedrock	21.4	12.2
				Slope		
			Sutton (5%)	Depth to saturated zone		
			Leicester (5%)	Depth to saturated zone		

Summary by Map Unit - State of Connecticut

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Component Name (Percent)	Rating Reasons	Total Acres in AOI	Percent of AOI
			Hollis (5%)	Depth to hard bedrock		
				Slope		
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	Very limited	Charlton (45%)	Slope	37.2	21.2
			Chatfield (30%)	Slope		
				Depth to hard bedrock		
			Sutton (5%)	Depth to saturated zone		
				Slope		
			Leicester (5%)	Depth to saturated zone		
			Hollis (3%)	Slope		
				Depth to hard bedrock		
84B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes	Very limited	Paxton (55%)	Depth to saturated zone	0.5	0.3
			Montauk (30%)	Depth to saturated zone		
			Woodbridge (3%)	Depth to saturated zone		
			Ridgebury (3%)	Depth to saturated zone		

Summary by Map Unit - State of Connecticut

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Component Name (Percent)	Rating Reasons	Total Acres in AOI	Percent of AOI
84D	Paxton and Montauk fine sandy loams, 15 to 25 percent slopes	Very limited	Paxton (55%)	Slope	1.3	0.7
				Depth to saturated zone		
			Montauk (30%)	Slope		
				Depth to saturated zone		
			Woodbridge (3%)	Depth to saturated zone		
				Slope		
			Ridgebury (3%)	Depth to saturated zone		
			Charlton (3%)	Slope		
			Canton (2%)	Slope		
			Stockbridge (1%)	Slope		
245B	Woodbridge-Urban land complex, 0 to 8 percent slopes	Very limited	Woodbridge (40%)	Depth to saturated zone	6.9	3.9
			Sutton (5%)	Depth to saturated zone		
			Paxton (5%)	Depth to saturated zone		
			Rainbow (3%)	Depth to saturated zone		
			Ridgebury (3%)	Depth to saturated zone		
			Leicester (2%)	Depth to saturated zone		
			Montauk (2%)	Depth to saturated zone		
260B	Charlton-Urban land complex, 3 to 8 percent slopes	Not limited	Charlton (40%)		7.0	4.0

Summary by Map Unit - State of Connecticut

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Component Name (Percent)	Rating Reasons	Total Acres in AOI	Percent of AOI
273C	Urban land-Charlton-Chatfield complex, rocky, 3 to 15 percent slopes	Not rated	Urban land (35%)		5.3	3.0
			Rock outcrop (2%)			
273E	Urban land-Charlton-Chatfield complex, rocky, 15 to 45 percent slopes	Very limited	Charlton (25%)	Slope	3.0	1.7
			Chatfield (15%)	Slope		
				Depth to hard bedrock		
			Hollis (8%)	Slope		
				Depth to hard bedrock		
			Sutton (5%)	Depth to saturated zone		
				Slope		
			Leicester (5%)	Depth to saturated zone		
284B	Paxton-Urban land complex, 3 to 8 percent slopes	Very limited	Paxton (40%)	Depth to saturated zone	19.3	11.0
			Woodbridge (5%)	Depth to saturated zone		
			Ridgebury (3%)	Depth to saturated zone		

Summary by Map Unit - State of Connecticut

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Component Name (Percent)	Rating Reasons	Total Acres in AOI	Percent of AOI
284C	Paxton-Urban land complex, 8 to 15 percent slopes	Very limited	Paxton (40%)	Depth to saturated zone	6.3	3.6
				Slope		
			Woodbridge (5%)	Depth to saturated zone		
				Slope		
			Ridgebury (3%)	Depth to saturated zone		
284D	Paxton-Urban land complex, 15 to 25 percent slopes	Very limited	Paxton (40%)	Slope	4.1	2.3
				Depth to saturated zone		
			Woodbridge (5%)	Depth to saturated zone		
				Slope		
			Charlton (5%)	Slope		
			Stockbridge (3%)	Slope		
			Ridgebury (3%)	Depth to saturated zone		
			Canton (2%)	Slope		
306	Udorthents-Urban land complex	Very limited	Udorthents (50%)	Slope	17.0	9.7
				Depth to saturated zone		
308	Udorthents, smoothed	Very limited	Udorthents (80%)	Slope	6.8	3.9
				Depth to saturated zone		

Summary by Rating Value

Rating	Total Acres in AOI	Percent of AOI
Very limited	155.1	88.4
Somewhat limited	8.2	4.7
Not limited	7.0	4.0
Not rated	5.3	3.0

Description - Dwellings with Basements

Dwellings are single-family houses of three stories or less. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet.

The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Parameter Summary - Dwellings with Basements

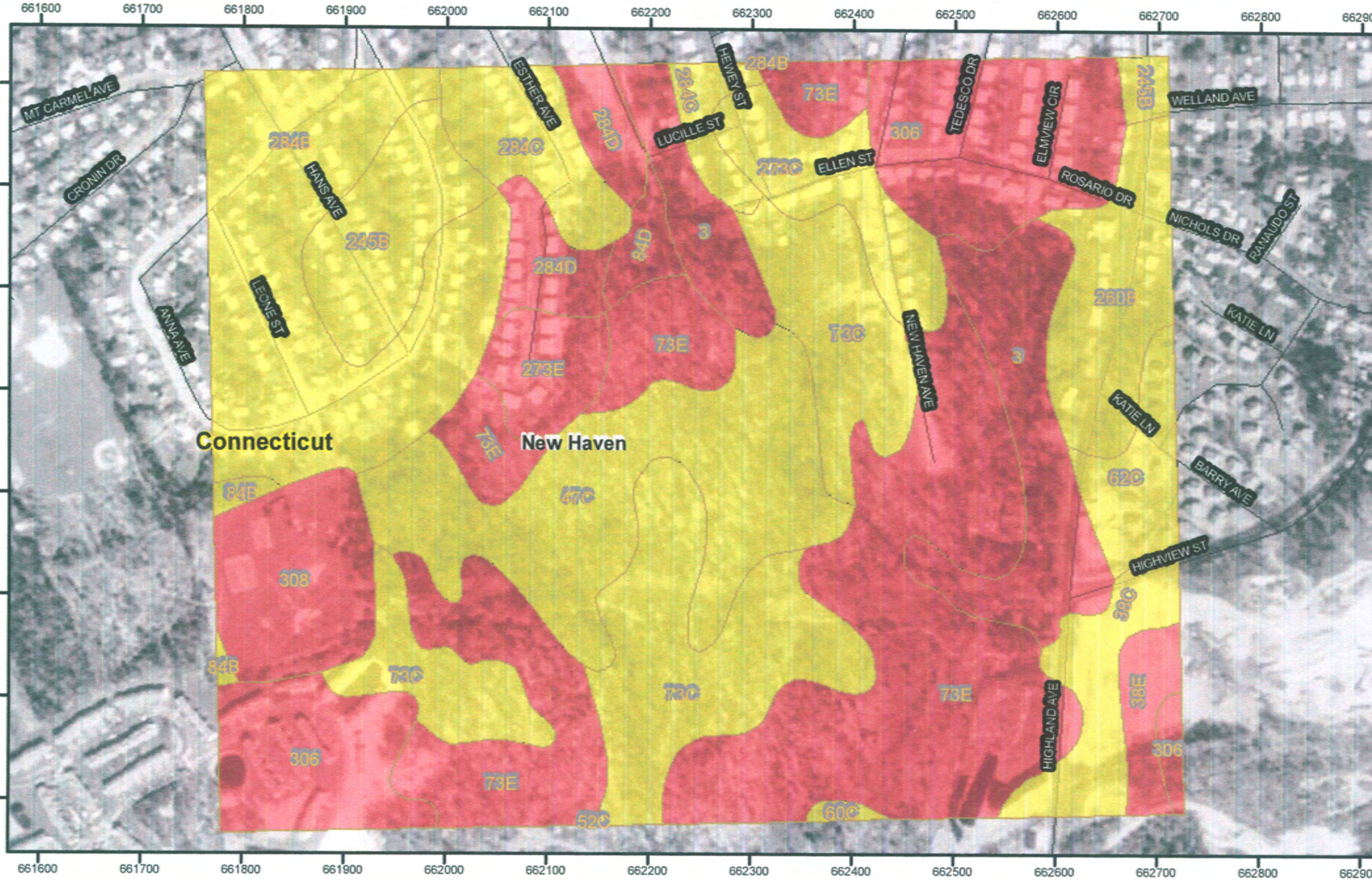
Aggregation Method: Dominant Condition

Component Percent Cutoff:

Tie-break Rule: Higher

Local Roads and Streets Rating

LOCAL ROADS AND STREETS RATING FOR STATE OF CONNECTICUT



Meters
0 50 100 200

Feet
0 150 300 600 900 1,200

USDA Natural Resources Conservation Service

Web Soil Survey 1.1
National Cooperative Soil Survey

MAP LEGEND

Local Roads and Streets

{Dominant Condition, >}

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available
- Soil Map Units
- Cities
- Detailed Counties
- Detailed States
- Interstate Highways
- Roads
- Rails
- Water
- Hydrography
- Oceans

MAP INFORMATION

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov

Coordinate System: UTM Zone 18

Soil Survey Area: State of Connecticut
Spatial Version of Data: 3
Soil Map Compilation Scale: 1:12000

Map comprised of aerial images photographed on these dates:
4/12/1991

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Tables - Local Roads and Streets

Summary by Map Unit - State of Connecticut

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Component Name (Percent)	Rating Reasons	Total Acres in AOI	Percent of AOI
3	Ridgebury, Leicester, and Whitman soils, extremely stony	Very limited	Ridgebury (40%)	Depth to saturated zone	12.1	6.9
				Frost action		
			Leicester (35%)	Depth to saturated zone		
				Frost action		
			Whitman (15%)	Ponding		
				Depth to saturated zone		
				Frost action		
38C	Hinckley gravelly sandy loam, 3 to 15 percent slopes	Somewhat limited	Hinckley (80%)	Slope	4.5	2.5
			Windsor (5%)	Slope		
			Merrimac (5%)	Slope		
			Agawam (3%)	Slope		
				Frost action		
			Sudbury (2%)	Depth to saturated zone		

Summary by Map Unit - State of Connecticut

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Component Name (Percent)	Rating Reasons	Total Acres in AOI	Percent of AOI
38E	Hinckley gravelly sandy loam, 15 to 45 percent slopes	Very limited	Hinckley (80%)	Slope	2.0	1.1
			Walpole (1%)	Depth to saturated zone		
				Frost action		
			Scarboro (1%)	Ponding		
				Depth to saturated zone		
				Frost action		
47C	Woodbridge fine sandy loam, 2 to 15 percent slopes, extremely stony	Somewhat limited	Woodbridge (80%)	Frost action	17.1	9.7
				Depth to saturated zone		
				Slope		
			Paxton (5%)	Slope		
				Frost action		
				Depth to saturated zone		
			Montauk (3%)	Slope		
				Frost action		
				Depth to saturated zone		
			Sutton (2%)	Frost action		
				Depth to saturated zone		
			Stockbridge (1%)	Frost action		
			Georgia (1%)	Frost action		
				Depth to saturated zone		

Summary by Map Unit - State of Connecticut

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Component Name (Percent)	Rating Reasons	Total Acres in AOI	Percent of AOI
52C	Sutton fine sandy loam, 2 to 15 percent slopes, extremely stony	Somewhat limited	Sutton (80%)	Frost action	0.0	0.0
				Depth to saturated zone		
				Slope		
			Charlton (5%)	Frost action		
			Canton (4%)	Frost action		
			Paxton (3%)	Slope		
				Frost action		
				Depth to saturated zone		
			Woodbridge (2%)	Slope		
				Frost action		
				Depth to saturated zone		
			Rainbow (2%)	Frost action		
				Depth to saturated zone		
			Narragansett (1%)	Slope		
				Frost action		

Summary by Map Unit - State of Connecticut

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Component Name (Percent)	Rating Reasons	Total Acres in AOI	Percent of AOI
60C	Canton and Charlton soils, 8 to 15 percent slopes	Somewhat limited	Canton (45%)	Slope	0.3	0.2
				Frost action		
			Charlton (35%)	Slope		
				Frost action		
			Sutton (5%)	Frost action		
				Depth to saturated zone		
			Chatfield (5%)	Depth to hard bedrock		
				Frost action		
				Slope		
62C	Canton and Charlton soils, 3 to 15 percent slopes, extremely stony	Somewhat limited	Canton (45%)	Frost action	3.4	2.0
				Slope		
			Charlton (35%)	Frost action		
				Slope		
			Sutton (5%)	Frost action		
				Depth to saturated zone		
				Slope		
			Chatfield (5%)	Depth to hard bedrock		
				Frost action		
				Slope		

Summary by Map Unit - State of Connecticut

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Component Name (Percent)	Rating Reasons	Total Acres in AOI	Percent of AOI
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	Somewhat limited	Charlton (45%)	Frost action	21.4	12.2
				Slope		
			Chatfield (30%)	Depth to hard bedrock		
				Frost action		
				Slope		
			Sutton (5%)	Frost action		
				Depth to saturated zone		
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	Very limited	Charlton (45%)	Slope	37.2	21.2
				Frost action		
			Chatfield (30%)	Slope		
				Depth to hard bedrock		
				Frost action		
			Leicester (5%)	Depth to saturated zone		
				Frost action		
			Hollis (3%)	Depth to hard bedrock		
				Slope		
				Frost action		

Summary by Map Unit - State of Connecticut

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Component Name (Percent)	Rating Reasons	Total Acres in AOI	Percent of AOI
84B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes	Somewhat limited	Paxton (55%)	Frost action	0.5	0.3
				Depth to saturated zone		
			Montauk (30%)	Frost action		
				Depth to saturated zone		
			Woodbridge (3%)	Frost action		
				Depth to saturated zone		
			Charlton (3%)	Frost action		
			Canton (2%)	Frost action		
			Stockbridge (1%)	Frost action		
84D	Paxton and Montauk fine sandy loams, 15 to 25 percent slopes	Very limited	Paxton (55%)	Slope	1.3	0.7
				Frost action		
				Depth to saturated zone		
			Montauk (30%)	Slope		
				Frost action		
				Depth to saturated zone		
			Ridgebury (3%)	Depth to saturated zone		
				Frost action		
			Charlton (3%)	Slope		
				Frost action		

Summary by Map Unit - State of Connecticut

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Component Name (Percent)	Rating Reasons	Total Acres in AOI	Percent of AOI
			Canton (2%)	Slope		
				Frost action		
			Stockbridge (1%)	Slope		
				Frost action		
245B	Woodbridge-Urban land complex, 0 to 8 percent slopes	Somewhat limited	Woodbridge (40%)	Frost action	6.9	3.9
				Depth to saturated zone		
			Sutton (5%)	Frost action		
				Depth to saturated zone		
			Paxton (5%)	Frost action		
				Depth to saturated zone		
			Rainbow (3%)	Frost action		
				Depth to saturated zone		
			Montauk (2%)	Frost action		
				Depth to saturated zone		
260B	Charlton-Urban land complex, 3 to 8 percent slopes	Somewhat limited	Charlton (40%)	Frost action	7.0	4.0
			Sutton (5%)	Frost action		
				Depth to saturated zone		

Summary by Map Unit - State of Connecticut

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Component Name (Percent)	Rating Reasons	Total Acres in AOI	Percent of AOI
			Chatfield (5%)	Depth to hard bedrock		
				Frost action		
				Slope		
273C	Urban land-Charlton-Chatfield complex, rocky, 3 to 15 percent slopes	Somewhat limited	Charlton (25%)	Frost action	5.3	3.0
				Slope		
			Chatfield (15%)	Depth to hard bedrock		
				Frost action		
				Slope		
			Sutton (5%)	Frost action		
				Depth to saturated zone		
				Slope		
273E	Urban land-Charlton-Chatfield complex, rocky, 15 to 45 percent slopes	Very limited	Charlton (25%)	Slope	3.0	1.7
				Frost action		
			Chatfield (15%)	Slope		
				Depth to hard bedrock		
				Frost action		
			Hollis (8%)	Depth to hard bedrock		
				Slope		
				Frost action		

Summary by Map Unit - State of Connecticut

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Component Name (Percent)	Rating Reasons	Total Acres in AOI	Percent of AOI
			Leicester (5%)	Depth to saturated zone		
				Frost action		
284B	Paxton-Urban land complex, 3 to 8 percent slopes	Somewhat limited	Paxton (40%)	Frost action	19.3	11.0
				Depth to saturated zone		
			Woodbridge (5%)	Frost action		
				Depth to saturated zone		
			Charlton (5%)	Frost action		
			Stockbridge (3%)	Frost action		
			Canton (2%)	Frost action		
284C	Paxton-Urban land complex, 8 to 15 percent slopes	Somewhat limited	Paxton (40%)	Slope	6.3	3.6
				Frost action		
				Depth to saturated zone		
			Woodbridge (5%)	Slope		
				Frost action		
				Depth to saturated zone		
			Charlton (5%)	Slope		
				Frost action		
			Stockbridge (3%)	Slope		
				Frost action		
			Canton (2%)	Slope		
				Frost action		

Description - Local Roads and Streets

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Parameter Summary - Local Roads and Streets

Aggregation Method: Dominant Condition

Component Percent Cutoff:

Tie-break Rule: Higher

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 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 Conservation District and approved by the King's Mark RC&D Executive Council, the Team will undertake the review. At present, the ERT can undertake approximately two reviews per month depending on scheduling and Team member availability.

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