Appendix

Design and Construction Standards ("Gray Infrastructure")
Hanover *Subdivision Ordinance*

Introduction: This appendix contains findings and recommendations that have great relevance to the kind of character and livability, which your new neighborhoods will be able to attain. This assessment is based on the most current thinking in the engineering profession, and sources for these observations are cited in the text below.

A short section critiquing the Town's *Site Plan Regulations* is also included.

1. Streets

a) Cartway Width:

Section 8.08 offers special standards for streets in Open Space Subdivisions (OSS's) containing six or fewer lots, where the requirements are basically 16 feet wide and gravel surfaces.

All other subdivisions must meet the standards in Section 14.13, which calls for paved widths of 20 feet for both local and collector streets.

It is refreshing for me to review a code with such sensible standards for rural subdivisions, where little or no on-street parking is actually needed in practice. (In many other towns, streets are sized for unneeded, hypothetical on-street parking, resulting in wider pavements that cause traffic travel speed to increase, in turn decreasing public safety, particularly for pedestrians.)

The presence of an occasional parked vehicle blocking one of two travel lanes in rural subdivisions is not a problem but part of the solution. In the rare situation where two cars approach each other from opposite directions and would just happen to meet precisely where the parked car sits, one of the approaching vehicles slows down and allows the other one to pass. That is "traffic calming" at its best. This is how residential streets should be designed: to slow down traffic, in the interest of safety for pedestrians, pets, and drivers. When cars need not slow down for anything, they often don't, and they tend to travel at faster speeds though neighborhoods than is desirable from a safety standpoint.

On the other hand, Hanover's one-size-fits-all approach to street widths makes little sense in a town where higher building densities is being actively encouraged in infill situations to help maintain the Town's 3:1 urban/rural population ratio.

A critical element missing from most municipal street standards is the absence of any correlation to lot sizes along streets to be regulated in width. This is a huge omission, which my model rectifies by relating pavement width standards to lot widths. This additional factor is reflected in my table of recommended street dimensions, which recognizes the varying degrees that different neighborhood types generate actual on-street parking need.

In this situation, I would recommend that streets be sized to accommodate the on-street parking needs that can be reasonably anticipated when homes are built on lots that may be 80 feet or less in width. The standards I generally recommend are listed *Growing Greener* (Section 702A-1 in Appendix 3) and in *Crossroads, Hamlet, Village, Town.*

For higher-density streets in areas with lots smaller than 12,000 sq. ft., my recommended standard pavement width would be 26 feet (28 feet if curbed), allowing for one lane of on-street guest parking. Still wider streets (32 feet, for example) could accommodate two parking lanes in addition to two travel lanes, and should be reserved for areas with six or more du/ac, particularly when multi-family housing is provided (in which situations I also very strongly recommend the provision of back lanes (a.k.a. alleys) where the garages can and should be located).

One last point, regarding shoulders: In more rural situations where curbs would definitely not be required, the three-foot shoulders required on each side of new streets should be specified as

having to be provided with several inches of loam over the sand/gravel surface, seeded with a durable, trample-resistant vegetative cover, such as white clover. This would help keep the roadside verges green and attractive, and would also help to visually reduce the perceived width of the paved surface, thereby calming traffic speed.

b) Curbs and Stormwater. Section 14.17 states that the Board may require curbing in village or urban areas, and I would concur. I generally recommend curbing requirements that are sensibly linked to building density, instead of being an across-the-board standard for all streets, as is the case in many towns with less sensible ordinances. At lower densities, conservation planners generally favor open drainage swales. Besides imparting a needlessly urban aspect to residential streets, curbs channel all stormwater into pipes and detention basins, rather than allowing part of the stormwater to infiltrate into the ground as it flows along grassy swales. Such infiltration could be increased through the construction of so-called "rain gardens" at various points along the street (say for every 4-6 lots), which are designed to serve as infiltration areas landscaped with moisture-tolerant trees and flowers. Another effective stormwater management technique is to require that downspouts be connected to "French drains" located in yards. The design flexibility in the *Growing Greener* system permits extensive areas to be utilized for on-site infiltration, such as in conservation meadows or through infiltration trenches carefully located to snake between the larger trees in a woodland setting (as has been done behind the West Bradford Township Office building, in Chester County, PA).

I would suggest that aquifer replenishment is another worthy reason why the Town should take a strongly affirmative stance encouraging conservation design and actively discouraging continued platting of land into standard layouts with typical "impact crater" detention basins providing virtually no infiltration.

The stormwater management section (15.06) is one of the least detailed sections of its type I have encountered for decades. It speaks quaintly of "adequate" systems, and "adequate drainage" without ever mentioning the frequency of storm to which these systems should be designed. In addition, the ordinance makes no mention as to the specific goal, usually expressed as "no net increase in rate of discharge" from the property, to points downstream. A more progressive standard would strictly limit the post-development runoff volume as well as its rate, and would also contain standards for infiltration, ranking on-site infiltration as a priority above retention and detention.

Accordingly, I would recommend that the Town consider adopting a target goal of zero increase in runoff volume after development, through various infiltration techniques. A good source of information on this approach can be found at www.cwp.org, the website of the Center for Watershed Protection, a nonprofit in Ellicott City, MD, which helps municipalities update their stormwater practices. Conservation design offers many opportunities to disperse stormwater over much broader areas, so that deep engineered structures with steep sides and spillways are not needed in most situations. Even more important than the aesthetic advantage is the aquifer recharge benefit that such infiltration-focused stormwater design brings.

d) Sidewalks. Section 14.18 states that pedestrian walks shall be required "where necessary in the judgment of the Board". The absence of any criteria to guide Board decision-making on this point is a most serious omission, as it can lead to arbitrary, discretionary, and inconsistent decisions that violate applicants' constitutional rights to "equal protection under the law". This glaring gap should be plugged in the very next code revision, in my professional opinion.

Regarding sidewalks, I firmly believe sidewalks are an essential part of any residential neighborhood, to provide a place for people to walk other than other than on the streets themselves. It is sometimes assumed by municipal code-writers that sidewalks are necessary only when homes are near shops, schools, or bus stops. As such facilities are nearly always absent in situations involving new subdivisions in rural areas, sidewalks are rarely required in those communities, and that is a huge mistake. Such thinking misses the most important point about sidewalks, as it fails to recognize the benefits that such amenities contribute. Numerous surveys have revealed that the No. 1 recreational pastime of Americans is walking. Sidewalks provide basic separation between motor vehicles and pedestrians (children walking to/from the school bus, kids on tricycles or scooters, parents pushing baby carriages, couples out for an evening stroll around the neighborhood, etc.), not to mention joggers. When sidewalks are waived or not even required, officials are essentially saying that all those folks really belong right out there on the streets, together with cars, trucks, and SUVs whizzing past. I strongly doubt that this is anyone's true intention, but that happens to be the net result of such policies or waivers. MY

earnest recommendation is that sidewalks be required with a grassy "tree-lawn" separating them from the street pavement. Sidewalks constructed adjacent to curbs are extremely ugly and provide little psychological or actual protection to pedestrians. More on this below.

e) Street Trees. An extremely important provision of most subdivision ordinances is the one that sets standards for street trees. Section 14.21 fails to do so. It lamely states that the Board "may require" them, and then fails to provide any standards for their selection and placement, whatsoever.

Based on much experience, my very strong recommendation is that canopy street trees are one of the most important improvements any community can require of developers. They should be deciduous varieties of hardy species capable of attaining a mature height of at least 60 feet (not flowering ornamentals, which are more suited to courtyard situations and areas of lawn decoration), they should be planted with a minimum dbh of 2-1/2", at intervals of 40 feet or less on both sides of each street, in "tree-lawns" at least six feet wide located between the sidewalk and the curb or edge of pavement. Some ordinances specify that street trees be planted outside the right-of-way, a vestigial a carry-over from the old highway engineer mentality which views trees as "fixed deadly objects". This is appropriate along interstates and other major highways with traffic speeds of 55 mph or more, but is highly inappropriate along neighborhood streets. Achieving a canopy effect over such residential streets is nearly impossible when shade trees are spaced outside the right-of-way, a most unfortunate requirement of many ordinances we have reviewed.

The perceived threat that tree roots might possibly crack and lift sidewalks or rupture footpaths after decades of growth can be greatly diminished -- if not altogether eliminated -- by new techniques devised by urban foresters. One approach involves the developer installing vertical barriers 12 inches deep along the inside edge of sidewalks, to deflect root growth down deep under the sidewalk. The second approach requires that developers install a special "structural soil mix" developed at Cornell University, consisting of large stones with sizable gaps or spaces between them, through which the roots would grow. For further details, see: http://www.hort.cornell.edu/department/faculty/bassuk/uhi/ssoils/index.htm

Recommended species are listed in Section 702.B.3 of the model *Growing Greener* subdivision ordinance, and specifically exclude invasive exotics such as Norway Maple and structurally weak trees such as Silver Maple and Bradford Callery Pear (which is unsuitable due to structural weakness causing massive limb failure in ice storms and wet snow conditions). I also exclude the Gingko, which is a non-native tree that looks very out-of-place in the traditional New England landscape, with an ungainly shape for many years until it attains a height of 40 or 50 feet, at which time it begins to fill out and look a bit more like a North American tree, rather than an Asian variety dating from prehistoric times (which is in fact the case). In addition, columnar trees (such as the columnar Norway maple) are suitable only for extremely dense downtown situations where canopy spread is to be discouraged. How such a variety ever got into your ordinance mystifies us, as such trees never look like much more than fuzzy green pipe-cleaners, even after several decades of growth.

Utilities can and should be located either within the ROW or in a special utility easement located beyond the sidewalk. Such standards will ensure that residential streets created in Hanover will be leafy and shady in future years. By locating utilities (rather than trees) beyond the normal right-of-way, your residential neighborhoods will stand a decent chance of resembling the lovely streetscapes typically seen in late 19th-century photos of rural village streets, where the overwhelming visual impression is of leafy, shady, tree-lined streets. Maintenance requirements are also very important, with replacement assured within 18 months after planting, through a performance guarantee (such as a bond). We feel that shade trees are the single most important aspect of subdivision design, second only to open space preservation. If the Town takes no other advice from me, I hope it will be that shade trees shall be required in all new subdivisions (and in all new commercial projects as well), and they be planted at 40-foot intervals between the (unwaived) sidewalks and the curb (or edge of pavement).

Regarding the location of street trees in many codes (at least five feet outside the ROW), sidelining trees to front yards, instead of planting them between sidewalks and curbs (or between the ROW and the edge of pavement) effectively prevents any canopy effect from ever being attained. My brief recommendation is that canopy shade trees should definitely be *required* of all developers, in subdivisions of all densities. Many ordinances require that street trees be deciduous when planted within the right-of-way (where they truly belong), but do not require

that they be canopy shade trees, allowing developers to plant wimpy, relatively short-lived flowering ornamentals that will never attain the stature and grandeur needed to create stately residential neighborhoods.

The common practice of allowing developers to ignore the fundamental need to plant street trees in all new subdivisions — including those built in wooded settings -- is most unfortunate. Over several decades of observation, I have actually never encountered a situation where existing trees at the edge of a cleared right-of-way constituted an acceptable substitute for planting new shade trees closer to the street. The primary reason for this is that existing trees in wooded settings tend to be tall and spindly, with very little lateral branching, as they have grown all their lives in a cramped setting where only their tops have received direct sunlight. In addition, such trees often become stressed as a result of grading activities in their root zones, and also due to "sun scorching" when they are suddenly exposed to the hot rays of the sun.

Regarding standards for protecting existing trees during construction, any filling, re-grading, or movement of heavy equipment should be prohibited anywhere within one foot of the outer edge of the canopy "drip zone". Such a standard might help encourage applicants to utilize the flexible conservation design options which give their site designers increased maneuverability to avoid impacting significant trees that should really be saved. The best way to save trees is to give them a wide berth when laying out streets, sidewalks, houses, driveways, and garages. Such care in site planning is far better than constructing tree wells, which are often way too small to save the trees they encircle.

For your information, Realen Homes (in Ambler, Pennsylvania) has produced, with the Morris Arboretum, an excellent set of standards for tree protection during development, which the Town should examine with a view toward adoption. If you are interested, we could obtain a copy for the Town.

Cul-de-Sacs. Section 808.c limits cul-de-sacs to 2000 feet in length, but sets no maximum number of homes that may be built there. While I welcome the ability to build longer cul-de-sacs in rural areas, I also believe that limiting the number of dwellings on them makes much more sense than limiting street length *per se*. For this reason, I would still want to ensure that an unduly large number of homes and residents would not be placed at risk in the event of an emergency where the only access street becomes blocked.

While I agree with the general intention, in my view the length of asphalt involved is relatively unimportant, the most significant factor instead being the number of households potentially at risk if a cul-de-sac is obstructed during an emergency situation. In fact, the national standard advocated by the American Society of Civil Engineers (ASCE) in its excellent volume *Residential Streets* does not mention length at all, but rather sets its limit at 25 households, before a second ("emergency") access is required. That volume is a standard work in the civil engineering profession, and was put together with input and review by public safety officials at the national level (meaning the national organizations representing local fire and police officials I strongly recommend that the Town purchase three copies (available through the Urban Land Institute: www.uli.org), which should then be read by Planning Board members and the Town Engineer. All could greatly benefit from that exercise (particularly when the larger issue of street pavement width is reconsidered, as recommended below).

As a site planner, I know the unnecessary design difficulties created by short cul-de-sac length limits. The genesis of the more typical 600-foot limit goes back to the 1920s when cul-de-sacs first began to appear in number, an era during which most development occurred adjacent to established neighborhoods served by water and sewer. Firefighters proposed a 600-foot standard because homes at the ends of cul-de-sacs that become blocked at their entrance could be served by attaching the standard 600-foot fire hose (carried on fire trucks) to the hydrant that was required where the cul-de-sac intersected with the older street. The 25-unit rule was based on the number of homes that could be built along a 600-foot cul-de-sac, on 50-foot wide lots, as was common in those days. I would therefore recommend a 25-unit limit, whether the cul-de-sac is in the serviced areas with hydrants, or in outlying areas without them.

I was favorably impressed by the requirement that cul-de-sacs be provided with central islands Section 8.08.c), and that those islands must be landscaped. However, the lack of standards for landscaping such islands is an oversight that should be addressed.

Just to see an island requirement is refreshing, as the common practice among engineers (both

those working for developers and those working for municipalities) is to favor fully-paved turnarounds. However, such areas are actually counter-productive, producing more stormwater runoff, more difficult snow-plowing, and more asphalt ugliness. I favor enlarging these turnarounds where they occur on the gentler terrain and generally *requiring* the creation of landscaped islands in the middle. This design approach provides additional areas for bio-retention of stormwater, improves the aesthetics, and actually makes it easier for snowplow drivers to do their job. However, these islands must be sized so that large trucks can drive around them without their back tires running over the landscaping. In most cases, these islands should be planted with shade trees that will mature to a great height and breadth over the fullness of time, occupying the "celestial space" created by this bulbous street form. When these islands are also designed to perform as "bio-retention areas" promoting groundwater recharge, the shade tree of choice might be red maple or sycamore.

An alternative to standard short cul-de-sacs is the "loop lane" or "close" (as illustrated in *Crossroads, Hamlet, Village, Town* and in *Growing Greener*). Instead of there being a 50-foot wide right-of-way leading up to a turnaround with a 130' outer-edge diameter, the street would be designed as two parallel one-way travel lanes 14 feet wide within a 130-foot wide right-of-way separated by a central bio-retention area or planting strip perhaps 60 feet wide. Such streets could be limited in length to 750 feet, if desired. The turning radius at the end would be identical to that which is currently required for cul-de-sac "bulbs", for ease in maneuvering long vehicles. This street form is essentially a "boulevarded cul-de-sac" and, as such, probably does not require any special waivers from your existing ordinance to be created. However, I suggest that the ordinance be amended to specifically require these in place of the standard bulbous form. They can also be constructed so their surfaces pitch inward to the center, without curbs on the inside edge, to irrigate a central planting area that is not elevated but instead is a foot or so lower (in the middle) compared with the street. This kind of "bio-retention" area is represents an innovative improvement over current practice, adding grace and beauty as well as utility. The median should be planted with canopy shade trees that do well in both wet and dry conditions, such as red maple and sycamore.

Another variation endorsed by the ASCE is the "Turning-T" (illustrated in *Rural by Design*), which it feels is fine for cul-de-sacs serving 12 or fewer homes (our recommendation would be allow them for half that number of houses).

I would also recommend requiring developers to erect signs reading "Temporary Cul-de-sac" whenever a future street connection has been required.

g. Alleys. I did not see any mention of alleys, and this is not surprising both because most past development in Hanover has been on larger lots in rural areas, and also because alleys are not common in New England except in cities. (In Pennsylvania and south of that, they are common in older small towns and even in villages.)

I would probably not mention them in this memo except for the Town's enlightened policy of trying to maintain its 3:1 urban/rural population ratio. To achieve that very ambitious goal, some serious infilling and higher-density expansion of the Town's historic built-up area will be essential. To do that gracefully, with results that are both livable and pleasing to the eye, narrow-lot single-family development will be necessary, and also multi-family attached construction. How this can be achieved in an attractive manner is the subject of the *Crossroads, Hamlet, Village, Town* book, and my newest video (released just several weeks ago). Suffice it to say here, with respect to alleys, that such "back lanes" are absolutely indispensable, because narrow lots (50 feet or less in width) and attached housing cannot be done well (aesthetically) with garages accessed from the front, unless those front-facing garage doors are set back well beyond the front façade of the house. (One way to ensure that this will be done would be to establish a minimum front setback of say 40 feet for front-facing garages, and a *maximum* setback of say 20 feet for houses.)

Regarding alleys or "back lanes", a paved width standard of 12 feet would be appropriate, as they function essentially as common driveways, serving only residents entering and exiting their garages.

I recommend that such back lanes be strongly encouraged when lot sizes are less than 12,000 sq. ft., and when lot widths are 50 feet or less. Experience has shown that 12 feet is plenty adequate, given their true function, essentially as common driveways. In fact, their ownership and

maintenance can be privatized so that the Town need not be concerned about plowing snow on them. Homeowners' associations can and should maintain them as common private drives. Twelve feet of paved width (uncurbed) is definitely wide enough for two cars or pick-up trucks to pass each other, going slowly. The very low levels of traffic these driveways typically experience justify these narrower travel lanes. Such back lanes are a very handy device in "traditional neighborhoods" of compact village-scale lots and/or townhomes.

I also recommend requiring rear lanes wherever multi-family development is likely to occur. These lanes are an essential ingredient of traditional neighborhood design when attached residential units are built, where dwellings tend to be less than 30 feet wide and where two front-facing garage doors would consume nearly the entire ground-level facade of the units. In some neo-traditional developments (such as The Kentlands in Gaithersburg, and Celebration near Orlando, Florida) garages are effectively used to give privacy to back yards by screening them from rear service lanes. In addition, they are often built with habitable floorspace above the garages (offering a place for a quiet study or a bedroom for a "boomerang kid" or in-law).

h) Horizontal Curves. With respect to horizontal curves, having grown up on a local street with a curve designed to a 72-foot radius (and until recently living in a neighborhood with a right-angle curve even tighter than that), I feel that radii longer than 100 feet for curves along local access streets are generally unnecessary and encourage higher travel speeds. Section 14.13 appropriately requires a 100-foot minimum for local streets, but excessively requires 200 feet for collectors, where I believe that 150 feet would exercise a desirable degree of traffic-calming, encouraging drivers to slow down a little more when proceeding around these curves. In recent years the advantage of shorter curve radii have become more appreciated for the traffic-calming effects they have in slowing down the speed of vehicles traveling through residential neighborhoods filled with children, pets, and pedestrians. This new thinking is, of course, counter to the traditional engineering philosophy of designing thoroughfares for maximum volume and speed.

i) Reverse Curves. I was pleased not to see the typical engineering requirement for straight tangents joining two curves bending in opposite directions. Such tangents between curves going in opposite directions effectively prevent graceful, serpentine "S"-shaped curves. I generally recommend that these curves be allowed without these tangent sections on local access streets, with a minimum radius of 250 feet. The reason for this recommendation is to allow site designers to design streets with grace and beauty, without compromising public safety. The normal prohibition against S-curves is understandable as a carry-over from highway design standards (such as promulgated by AASHTO), upon which many local street requirements are based. While there may be excellent reasons for this in terms of high-speed arterials, there is little justification at the minor collector street level.

j) Roadway Grading. I did not see any provisions specifically relating to roadway grading. Many ordinances require that the full right-of-way be completely denuded of trees and regarded. My view is that such a practice is excessive and usually unnecessary, ensuring that new streets constructed through wooded areas will look like airfield landing strips. The origin of such requirements is probably the highway design manual again, when engineers were worried about people traveling at highway speeds crashing their cars into trees growing within the rights-of-way. In most rural communities with which I am familiar, the older town roads running through wooded areas are never graded out to the right-of-way lines, and it is likely that residents would complain loudly if that kind of clearing were to be undertaken.

k) Shared Driveways and "Country Lanes". In most ordinances, shared driveways are limited to two or three dwellings, but no specific design or construction standards are included to ensure they will be built at least to a satisfactory minimum. To avoid future problems, such access drives should be required to be built according to reasonable ordinance standards governing the depth and type of base and sub-base material, the wearing course, crowning, drainage, maximum gradient, and minimum horizontal curvature (to permit long fire engines to negotiate sharp turns, e.g.). Such standards exist in the *Growing Greener* model codes. Shared drives are particularly useful in situations involving rear lots (flag lots).

A related thought would be to introduce a special category of low-volume rural street called a "country lane" which might be either public or private, but which would recognize the practicability of gravel-surfaced lanes serving a small number of homes (perhaps up to 8 or 10 households). In Vermont, studies have shown that gravel roads are more cost-efficient than asphalt until the average daily traffic reaches about 500 vehicles (the load produced by 50-60

homes). Certainly a gravel cul-de-sac serving up to 10 homes would not come even close to the 500 ADT level. Again, minimum standards addressing the factors noted with respect to shared driveways would also be in order. Perhaps this kind of access could be reserved for Option 4 "Country Property" developments, where the maximum density is ten acres per principal dwelling. With this in mind, a private street standard could be adopted to permit cartway widths of 16 feet when four or fewer homes are involved. This width would not be at all unreasonable given the very light traffic load.

l) **On-Lot Septic and Wells.** Because so much of the Town is not served by public water and sewer, I looked specifically for language in the ordinance allowing (or prohibiting) the location of individual wells and/or septic system drainfields within eased areas in the permanently protected common open space. Having not seen such language, I would suggest that the Town seriously consider separating septic drainfields from individual lots in the same way I advocate separating lot size from density. Just as density is confused with lot size in many older codes, septic drainfields are also assumed to be located within in individual houselots, because that has been the norm in the past. However, just as common drainfields can be located within common open space under state environmental regulations, so too may individual drainfields be located within the common open space, at least in PA and probably also in NH.

I would therefore recommend that homes in conservation subdivisions be specifically permitted to be served by individual drainfields located within the common open space, to encourage smaller lots and higher percentages of conservation land. I would also recommend explicitly allowing individual wells to be located within the common open space too, in areas specifically reserved for them on the *Final Plan*. This would enable such individual utility systems to be located under "conservation meadows", playing fields, or village green-type areas that could also serve as an invaluable buffer area between suburban back yards and working farmland next door. This very important concept is more fully explained (and illustrated) on page 47 of the *Growing Greener* book

These modification will be highly desirable to implement if conservation design is to have a bright future within your unsewered zoning districts. While low, one-or-more-acre density is a good policy for unserviced locations, there is no sound public health or engineering reason to continue requiring such lots *per se*. In fact, superior results can be achieved by permitting drainfields to be located off-lot, within the common open space. This is because those open space locations can be identified at the beginning of the design process to encompass the deepest, driest, best-perking soils on the entire property.

Without such design flexibility, some lots would hog all the better soils, and the others would have to make-do with the mediocre and borderline soils. That leads to sub-optimal results, where septic system life is not as long as it could easily otherwise have been. In addition, the homeowner association can be required to pump everyone's individual septic tank every five years, so that the solids never accumulated to the extent that the tanks become filled and begin to overflow, thereby clogging the drainfields. With septic systems, an ounce of prevention (a $100 pumping every five years) is often worth a pound of cure ($10,000 to repair a drainfield).

Site Plan Review Regulations

Although the central focus of these review memos is definitely on the subdivision regulations and the zoning ordinance, I would like to add a few brief comments on your *Site Plan Review Regulations*.

The two most serious shortcomings of this regulation is its lack of requirements for a really complete inventory of site features (such as locating significant trees, vernal pools, rock outcrops, etc.), and its failure to require that concept plans be prepared showing how the most significant features have been respected, designed around, and preserved. Only slightly less serious is the omission of a required Site Visit by Town staff and officials prior to decision-making.

Specifically, the Submission Requirements in Section IX should be amplified by specifying a tree survey such as discussed in my *Detailed Memo* for subdivisions, and mentioning in particular such features as vernal pools, stone walls, and rock outcrops. The language in this section is currently too broad and unspecific.
Section X.A.1 states that "site clearing shall be kept to the minimum" but fails to require that clearing shall be strictly limited to the areas with the least impact on the most significant trees on the site. There is a huge difference to these two ways of expressing site-clearing criteria. Similarly, I did not see requirements that other site features should be consciously designed around, to the greatest extent

practicable.

Without the benefit of s Site Visit, it is impossible for staff and officials to fully understand the relative merits of the various site features noted on the submission drawings.

In Section X.D there is no mention of any preference for the use of native species of flowers, shrubs, and trees in landscaping. (Without such an expressed emphasis, there is little chance that the plant material selected by developers will blend harmoniously with the natural landscape in the Upper Valley, and that their development will capture "the essential spirit of the place".)

Even more worrisome, in Section X.D.3.b, is the paltry 5% standard for tree planting in parking lots. By my calculations, only one (and perhaps two) trees would be required to be planted in interior locations in parking lots covering 10,000 sq. ft. (33 spaces). A better number for trees in interior planting islands would be one canopy shade tree per eight spaces. Additionally, the requirements for trees of 2.5" diameter, with no reference to mature height or canopy spread, is another serious omission. So these trees could be flowering ornamentals or (worse) tapering evergreens, which are unsuited to the fundamental task of shading large areas of ground and filling the vast "celestial space" above these ugly asphalt expanses.

Regarding such islands, it is curious that they are usually elevated above the parking lot surface, which ensures they receive no benefit from the rainwater falling on that asphalt. It would be much better to design them to be several inches below the parking lot surface, with the asphalt pitched to direct runoff into them as "rain-gardens". Pre-cast concrete curbing could be pinned in place with steel re-bars to serve as wheel-stops for keeping vehicles back from these planting areas. These rain gardens should of course be provided with grated overflow inlets connected to the normal underdrain system, to carry away excess stormwater.

The areas receiving such overflow runoff could be designed as infiltration trenches to recharge aquifers, and/or as broad, shallow basins landscaped with native grasses and managed as wildlife meadows to be mown annually. Again, see www.cwp,org for further ideas in this vein.