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Surface Water Hydrology
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June 23, 2000

[redacted]
Knoxville, Tennessee 37918-3524

Dear [redacted]

At your request, I have made a preliminary study of the hydrology and drainage characteristics of the upper portion of the watershed draining onto Cloverdale Lane, under and over Beverly Place and through an unnamed ditch behind houses on the west side of Ada Lane and eventually emptying into Whites Creek (a tributary to First Creek and the Tennessee River). This watershed is located in the Fountain City area in the northern portion of the City of Knoxville on Tazewell Pike about 1.5 miles east of Broadway. Also as requested, I have considered what the possible effect of the construction of the proposed 3.8-acre Turnberry Square subdivision would likely have on the watershed and the receiving drainage system. However, without more detailed information and data and associated computations, my discussions and conclusions should be considered very preliminary.

The headwaters for the subject watershed are along the hilltop just northwest of Tazewell Pike. The southeast slope of this hill drains down to the roadside ditch along Tazewell Pike and, based on City drainage maps (see copy attached), is collected in a 15-inch concrete culvert which collects water from about six or seven acres on the northwest side of Tazewell Pike which includes some drainage from along Briercliff Road and some runoff from the road surface of Tazewell Pike, itself. Also based on City drainage maps, this 15-inch concrete culvert connects to another culvert which takes the drainage under Tazewell Pike and empties in the southern third of the 3.8-acre Turnberry Square property. From this culvert outfall location the drainage flows in a grassed depression to where it discharges onto the northern end of Cloverdale Lane. At this location more runoff enters by way of overland flow and from a plastic culvert carrying runoff and discharge from a wet-weather spring located on property northeast of the Turnberry Square property. Based on the Knox County Soil Series (dated 1955), two natural drainageways drained the area now discharging to the north end of Cloverdale Lane. These natural drainageways (one across the Turnberry Square property and the other draining the wet-weather spring to the northeast) formed a single drainage feature (which apparently has been replaced with Cloverdale Lane) which fed into the ditch which parallels Ada Lane.

Numerous problems with the existing drainage system have been experienced in the neighborhood and have been discussed with me by local residents. Because Cloverdale

Lane was apparently sited in what used to be a natural drainageway, it frequently experiences a heavy flow of storm runoff whenever runoff-producing precipitation events occur in the contributing watershed. Based on reports by local residents, it also receives drainage from the contributing wet-weather spring(s) on a seasonal basis when groundwater levels are high (typically winter and spring). Photographs taken along Cloverdale Lane in spring of 1994 during an "average" rain attest to the existing drainage problems. The existing drainage network has numerous apparent problem areas with limited flow capacity along much of its length to Whites Creek. The house on the north end of Cloverdale Lane has had "three feet" of water in the lower level of the house and now must run a sump pump for months at a time to keep the lower level dry (according to the owner). Based on the Knox County Soil Series maps, the soils on the Turnberry Square property and the Cloverdale Lane area are either Leadvale or Whitesburg silt loams and Sequoia silty clay loams. These Leadvale and Whitesburg soils are typical of those that lie in and along natural drainageways. According to the Soil Survey, " . . . internal drainage is slow and during wetter periods the water table is at or near the surface . . . "

The existing drainage system in the subject watershed appears to have limited ability to effectively transport existing runoff waters to the natural receiving water bodies (Whites Creek / First Creek / Tennessee River). Based on reports by local residents and on photographs, numerous situations arise following storms of varying magnitudes where stormwaters back up on neighborhood roadways and adjacent properties. The natural drainageway has been impaired in several locations due to development encroachment and road construction. Some enhancements to the natural drainage system have been made in the upper end of the watershed (e.g., culverts along Tazewell Pike), but these enhancements were not continued along the remainder of the drainageway to provide adequate capacity for existing development. Any further development of property in the watershed which would result in increases in either runoff volume or runoff peak flows would likely have a negative impact on downstream properties. These negative impacts would likely consist of an increased frequency of nuisance and/or property-damaging flooding, reduction of aesthetic values associated with the drainageway, channel erosion, and sediment deposition. See Table 1 for a summary of estimates of runoff associated with different size storms and different dwelling unit densities on the Turnberry Square property. Note that the largest changes occur for the smaller but more frequent storms. Even if the stormwater management system for the Turnberry Square property is designed, constructed, and maintained to meet the minimum requirements of the Knoxville Ordinance for property in the Whites Creek basin (attenuation of peak flows up to the 100-year storm), many of the negative impacts listed above would still likely occur. Photographs depicting the current conditions of the receiving drainage area are shown in Exhibits 1 – 6.

Some of my specific concerns relative to the proposed development plan for Turnberry Square (based on plans prepared by Benchmark Associates and dated 6/1/00) are listed below. I did not have access to the engineer's supporting documents to review them for appropriateness of assumptions and methods and accuracy of calculations.

1. The existing 15-inch culvert handling runoff from the north side of Tazewell Pike is shown to be abandoned on the drainage plan. Where will that runoff be handled. The perimeter swale does not appear adequate to carry it.

2. No mention was made of the location of the wet-weather springs on the property or

how their discharge would be accomodated.

3. The drainage control structure detail included with the plans showed the use of 2-inch and 3-inch diameter orifices for hydraulic control. No provision to keep these orifices free of debris during severe storms was shown. A well designed trash rack would be needed to insure hydraulic integrity during a severe runoff event.

4. All stormwater discharge from the property (and runoff from the contributing area north of Tazewell Pike) is directed to Cloverdale Lane without any provision to carry this extra runoff. Even if adequately detained, the extra volume of runoff would cause runoff onto Colverdale Lane to persist for longer durations following each runoff producing storm.

If development and redevelopment in the Whites Creek watershed proceeds it would be prudent, given the extensive history of flooding problems, to limit the increases in imperviousness to the greatest degree possible. This imperviousness typically increases with development density and leads to increased stormwater runoff volumes even with the use of multi-storm-sized detention ponds (such as those required by Knoxville Ordinance). Policies applied to a single development in a watershed may set a precedent and could lead to cumulative significant and detrimental hydrologic changes in the watershed. If the development of Turnberry Square proceeds as planned, the capacity and condition of the receiving stormwater conveyance system should be considered and significantly improved. The density of this development (approximately 1/4-acre lot sizes) is significantly higher than pre-development and surrounding property in the watershed. If that density is adopted for other development and redevelopment projects in the watershed, the cumulative hydrologic effects would be anticipated to be extremely negative and likely consist of increased property-damaging and nuisance flooding magnitude and frequency and channel erosion.

If you should have any questions concerning my above discussion, please do not hesitate to contact me.

Sincerely,

James L. Smoot

James L. Smoot, Ph.D., P.E.
Environmental Engineer and Hydrologist

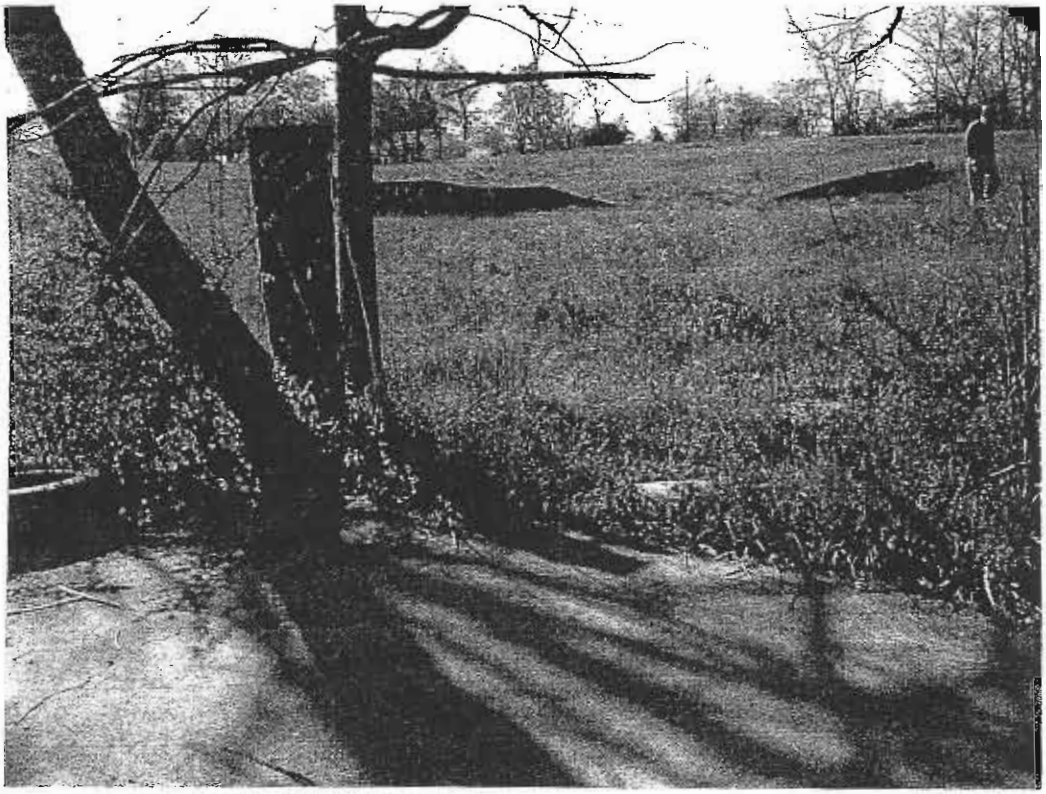

Exhibit 1
Turnberry Square property looking northwest from Cloverdale Lane

Exhibit 2
Cloverdale Lane looking

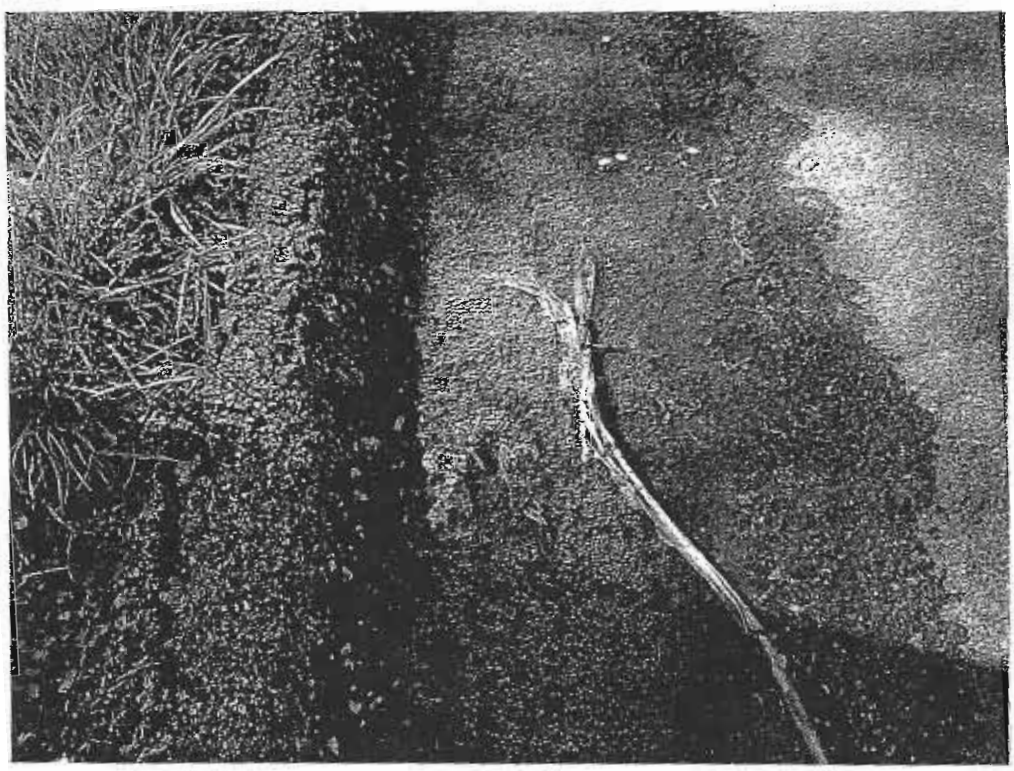

Exhibit 3
Cloverdale Lane pavement
(note the buildup of algae and moss growing on the pavement)

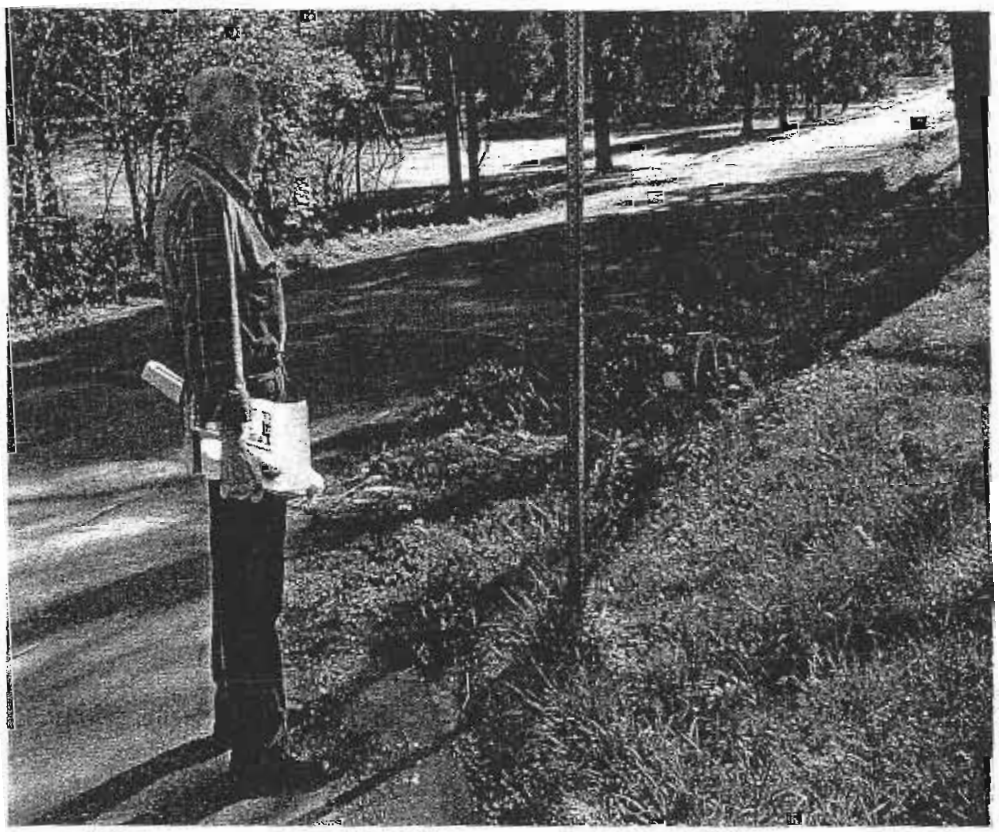

Exhibit 4
Corner of Cloverdale Lane and

Exhibit 5
Beverly Place looking west from Cloverdale Lane
(note: runoff in ditch needs to make 90-degree turn to pass under road through culvert)

Exhibit 6
Culvert under Beverly Place looking northeast toward Cloverdale Lane

TABLE 1. ESTIMATED RUNOFF CHANGES ASSOCIATED WITH CHANGES IN DWELLING UNIT DENSITY

DWELLING UNITS IN 3.8-ACRE DEVELOPMENT	ESTIMATED IMPERVIOUS PORTION (percent)	NRCS CURVE NUMBER	ESTIMATED RUNOFF FROM 24-HOUR RAINFALL DEPTH GIVEN (inches)			
			1 inch	2 inch	3.3 inch (2-year)	4.8 inch (10-year)
None (non-grazed meadow)	0	71	0	0.3	0.9	2.0
1	8	76	0	0.4	1.2	2.4
3	20	79	0.1	0.5	1.4	2.6
6	25	80	0.1	0.6	1.5	2.7
9	30	81	0.1	0.6	1.5	2.8
12 (proposed)	38	83	0.1	0.7	1.7	3.0