

Sunrise Coalition Comments on Stormwater Issues at Proposed Bradley Ridge Subdivision

Submitted to Chapel Hill Planning Board on December 17, 2007

Background

The Chapel Hill Planning Board considered a Preliminary Plat application for the Bradley Ridge Subdivision on December 4, 2007. Representatives of the Sunrise Coalition presented comments on several aspects of the application including stormwater. Warren Mitchell stated that he disagreed with the Coalition's comments about stormwater. The Planning Board determined that it would revisit stormwater issues associated with Bradley Ridge at its next meeting on December 18, 2007.

This report reiterates and documents the Coalition's December 4 comments on stormwater. Our comments are focused entirely on the eastern portion of the HHOC property that would drain into a stormwater retention pond known as Basin 1 in Applicants' *Stormwater Impact Statement for Bradley Ridge Subdivision* prepared by Mitchell & Westerndorf, PA and dated July 3, 2007. The Basin 1 drainage area covers lots 1-12 and 19-31 in Applicants' Preliminary Platt.

The hydrology of the Basin 1 drainage area is complex and has been the subject of considerable controversy. Town Engineers mapped a portion of this drainage area as an intermittent stream on March 7, 2003. The Engineers' field notes include the following important statements: (1) "Perched groundwater provides hydrology." (2) Wetland soils (hydric) persist in this area."

In March 2004, HHOC requested a review of the feature that Town Engineers had classified as an intermittent stream in the Basin 1 drainage area. Town Engineers revisited the site on March 4, 2007 and made the following determination (see Figure 1). "The eastern side of this property was visited 3/7/03. A low area there was previously determined to be an intermittent stream. However, although this "boggy area" may qualify as a "natural intermittent stream variant" by current LUMO guidance, it is not directly hydrologically connected to the perennial stream that crosses under I-40. This area does have some important hydrologic functions, and impacts to this seep should be avoided or minimized."

Coalition Concerns

The Applicants' Preliminary Plat and Stormwater Impact Statement do NOT indicate that measures will be taken to minimize impacts to the hydrologic functions of the boggy wet zone in the Basin 1 drainage area. The approximate boundaries of this wet zone are delineated in Figure 2. As noted above, this wet zone includes a "linear wetland" feature that was classified initially by Town Engineers as an intermittent stream and subsequently reclassified.

As currently proposed, the eastern portion of the Bradley Ridge development will disrupt the hydrologic functions of the wet zone shown in Figure 2 and the associated drainage line that

extends from the mapped wetland near the former Potted Plant to Basin 1. This area currently retains much of the stormwater, sediment and nutrients that pass through it. The area is effectively functioning now as a stormwater control. Seasonal perched water tables develop in this area with as much as 6" of standing water over extensive areas during wet periods. Seasonally wet soils with forest cover in the area are ideal for reducing stormwater quantity and improving quality.

Applicants' Proposed Stormwater Control

Development and piping of the wet boggy area delineated in Figure 2 will directly connect the entire drainage line with the proposed stormwater Basin 1. Runoff from the two-year storm, as estimated by Mitchell & Westendorf, will increase from 4,603 cubic feet in the current pre-development conditions, to 11,723 cubic feet post-development. The increased stormwater runoff will be accompanied by increases in Total Suspended Solids (TSS) as well as nitrogen, phosphorus and other pollutants. We note that the pretreatment runoff volume may be overestimated as the estimation method (Rational Runoff approach) assumes that the runoff is delivered from its source without the reinfiltration that has been described for this site. If pretreatment runoff is overestimated, a greater reduction in runoff volume from the post-development condition may be required.

The primary purpose of Basin 1 is to reduce peak discharge and runoff volume in accordance with the Chapel Hill LUMO. Specifically, the LUMO states that the runoff leaving the site post-development should not exceed the two-year, 24 hour predevelopment event. Basin 1 will reduce peak discharge by temporarily storing runoff, then releasing it slowly. This will likely achieve substantial TSS reduction by providing a longer settling time but will likely not be effective in reducing nutrient concentration in runoff. While TSS reduction (85%) is currently the only water quality improvement included in the LUMO, there is a significant chance that additional reductions in nitrogen and phosphorus may be required in the near future to protect the Jordan Lake water supply reservoir, which this area drains to. This may produce the need for an additional stormwater control designed for these pollutants.

Volume control using a bioretention facility such as Basin 1 is accomplished by infiltration, with the pond designed with a deep soil with high storage capacity, such as a loam, underlain by a sand drain and planted with vegetation that will promote evapotranspiration of the stored water. The stored water is first designed to be ponded at shallow depth (typically not exceeding 6" by EPA recommendations), then infiltrated to the soil, and then ultimately evaporated or drained through the sand bed or surrounding soil. However, in order to achieve the infiltration, EPA recommends that these facilities not be used where the groundwater table is within 6 feet of the surface, or in areas of soil exceeding 25% clay¹. The developer's soil boring report, as well as our own observations in the area shows that both of these conditions may pertain to this site. These concerns were summarized in slide #10 of the Sunrise Coalition's Dec. 4 presentation to the Planning Board (Figure 3).

¹ US Environmental Protection Agency, Office of Water. 1999. *Storm Water Technology Fact Sheet – Bioretention*. EPA 832-F-99-012.

Recommendation

A standard stormwater control strategy is to use what is referred to as a “treatment train” in which several stormwater controls are placed in series to benefit from their combined treatment. The Applicants should implement this approach by incorporating into the stormwater management plan the existing ecological functions of the boggy soils and “linear wetland” in the drainage line to Basin 1. Applicant should be required to conduct a detailed evaluation in and around the area delineated in Figure 2 to determine the extent of seasonally inundated areas associated with boggy soils. The evaluation should be conducted immediately after several days of heavy rain. Following the evaluation, the stormwater management plan for the site should be revised to include (a) a prohibition on placement of homes in seasonally inundated areas, and (b) a commitment to design and maintain a swale drain or constructed wetland in the boggy wet area in the Basin 1 drainage area.

Justification for Recommendation

The site conditions noted above (high groundwater table and high clay content of soil) will compromise the ability of Basin 1 to infiltrate stormwater, limiting the volume reduction that will be realized. The problem with Basin 1 is not its design, but rather its placement in a wet area with no other stormwater controls.

A reasonable solution is to make use of the existing “linear wetland” and surrounding area as a natural stormwater treatment, functioning either as a swale drain, or modified to increase its retention as a constructed wetland for which it is hydrologically suited. This solution is compatible with Chapel Hill LUMO Section 5.4.7. *Integrated Management Practices* which states: “Applicants shall utilize integrated management practices/best management practices to meet the standards established in subsection 5.4.6, using one (1) or more approved design options. Low impact design options are encouraged.”

The recommended solution has several advantages.

1. A natural stormwater treatment zone would help reduce nitrogen loads to Jordan Lake while also reducing TSS and stormwater volume.
2. During dry seasons, areas near the boundaries of the natural stormwater treatment zone would be suitable for recreational use and could be developed for that purpose to reduce or eliminate the 3.3 acre shortfall in required recreation area in the Applicants’ Preliminary Plat. Most current stormwater control guides view the potential dual purpose of stormwater control and neighborhood amenity as desirable².
3. The recommended approach would remove areas with high water tables from construction, thus reducing the potential for residents to have to deal with wet crawl spaces and unstable soil conditions.

² For example, see *Fundamentals of Urban Runoff Management: Technical and Institutional Issues 2nd Edition* by E. Shaver, R. Horner, J. Skupien, C. May, and G. Ridley. Published in 2007 by North American Lake Management Society (http://www.nalms.org/Resources/PDF/Fundamentals/Fundamentals_full_manual.pdf)

Figure 1. Slide #8 from Sunrise Coalition presentation to Chapel Hill Planning Board on Dec. 4, 2007. This slide shows the field sheet used by Town Engineers during second review of the eastern portion of HHOC property within the proposed Bradley Ridge Subdivision. The first review on March 6, 2003 had determined that an intermittent stream was present on the eastern portion of this property. At HHOC's request, the second review was conducted on March 2, 2004.

Nov 10 '94 13:26 P.02/02

REQUEST FOR REVIEW

GE-3 PERENNIAL STREAM

DATE March 2, 2004 RCD

NAME Warren Nibell

ADDRESS 210 N. Columbia Street

NAME OF FIRM Nibell Westendorf

PHONE NO. 919-932-4567

LOCATION Habit for Humanity - Sunrise Road @ I-40

TAX MAP 7 BLOCK 17 LOT 22 TOPO

MAPS REQUIRED TO MAKE DETERMINATION PIN: 9890-06-572

3 Acres or less - Plat or Tax Map
3 Acres or more - Plat and Topo

ENGINEERING DEPARTMENT USE

DATE OF INSPECTION(S) 3/4/04

WEATHER clear TEMPERATURE _____

INSPECTED BY D'Arconte & Royal

COMMENTS

The eastern side of this property was visited 3/7/03. A low area there was previously determined to be an intermittent stream. However, although this "boggy area" may qualify as a "natural intermittent stream variant" by current LUMCO guidance, it is not hydrologically connected to the directly perennial stream that crosses under I-40. This area does have some important hydrologic functions, and impacts to this seep should be avoided or minimized.

Hydrology	Absent	Weak	Moderate	S
1) This Year's (Or Last Year's) Leaf litter Present In Streambed?	1.5	1	5	
2) Is Sediment On Plants (Or Debris) Present?	0	5	1	
3) Are Wrack Lines Present?	0	5	1	
4) Is Water In Channel And >48 Hrs. Since Last Known Rain? (NOTE: If Ditch Indicated In #9 Above Skip This Step And #5 Below*)	0	5	1	
5) Is There Water In Channel During Dry Conditions Or In Growing Season?	0	5	1	
6) Are Hydric Soils Present In Sides Of Channel (Or In Headcut)?		<u>1.5</u>		Nr=0
SECONDARY HYDROLOGY INDICATOR POINTS: <u>3.5</u>				
III. Biology	Absent	Weak	Moderate	Str
1) Are Fish Present?	0	5	1	1
2) Are Amphibians Present?	0	5	1	1
3) Are Aquatic Insects Present?	0	5	1	1
4) Are Crayfish Present?	0	5	1	1
5) Are Macroinvertebrates Present?	0	5	1	1
6) Are Iron Oxidizing Bacteria/Fungus Present?	0	5	1	1
7) Is Filamentous Algae Present?	0	5	1	1
8) Are Wetland Plants In Streambed?	SAV	Mostly OBL	Mostly FACW	Mostly FACU
(* NOTE: If Total Absence Of All Plants In Streambed At Head Above Skip This Step (INDICATE SELF PRESENT)*)				
SECONDARY BIOLOGY INDICATOR POINTS: <u>1.5</u>				

TOTAL POINTS (Primary + Secondary) = 19.5 (If Greater Than Or Equal To 12 Points At Least Intermittent)

This would be a Natural Intermittent Stream

Notes: Variant if it were directly connected

The eastern side of this property is hydrologically complex. There appears to be a seep on/near the southern property line (by the potted plant). A ditch has been northwards, and its channel shape becomes more like that of an intermittent stream when it runs through a second seep. This channel tapers out quickly though, and channel or linear wetland connects it with the perennial stream by I-40. This area is an isolated wetland, though formal wetland identification and delineation should be conducted by the Army Corps of Engineers.

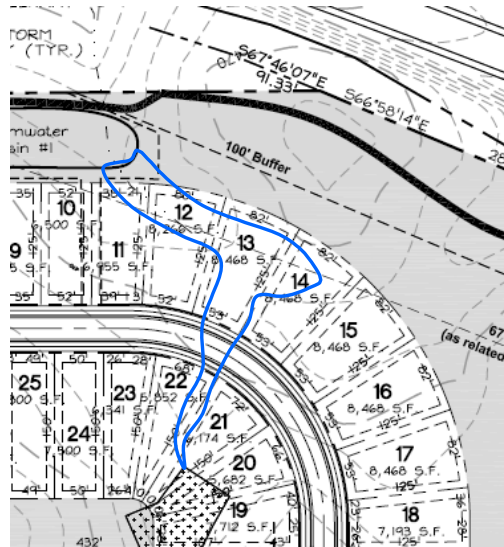
Figure 2 – Slide #9 from Sunrise Coalition presentation to Chapel Hill Planning Board on Dec. 4, 2007

Seasonally saturated area: Intermittent Drainage

CH stormwater engineers cited the **significance of the area** and recommended that **disturbance be avoided or minimized.**

Request the determination be revisited to confirm adherence to LUMO –

- important precedent for Town
- Clearly state reasons for determination with reference to LUMO guidelines



12/16/2007

Sunrise Coalition re: Bradley
Ridge Concept Plan

Figure 3. Slide #10 from Sunrise Coalition presentation to Chapel Hill Planning Board on Dec. 4, 2007

Soil types and location of bioretention facilities

- Soil engineering report cites high water tables in some areas, and potential for seasonally high water tables
- Stormwater basin #1 built in areas of seasonally high water tables which may compromise stormwater infiltration capacity performance

12/16/2007

Sunrise Coalition re: Bradley
Ridge Concept Plan

Summary of Sunrise Coalition Comments on Stormwater Issues at Proposed Bradley Ridge Subdivision

Chapel Hill Planning Board
December 18, 2007

Scope of Comments

- Eastern portion of HHOC property that would drain into “Basin 1.”
- Basin 1 drainage area includes linear feature classified by Town Engineers as intermittent stream in 2003.
- At request of HHOC, intermittent stream reclassified in 2004. Town Engineers note that “boggy area” has “important hydrologic functions” and recommended that impacts be “avoided or minimized.”

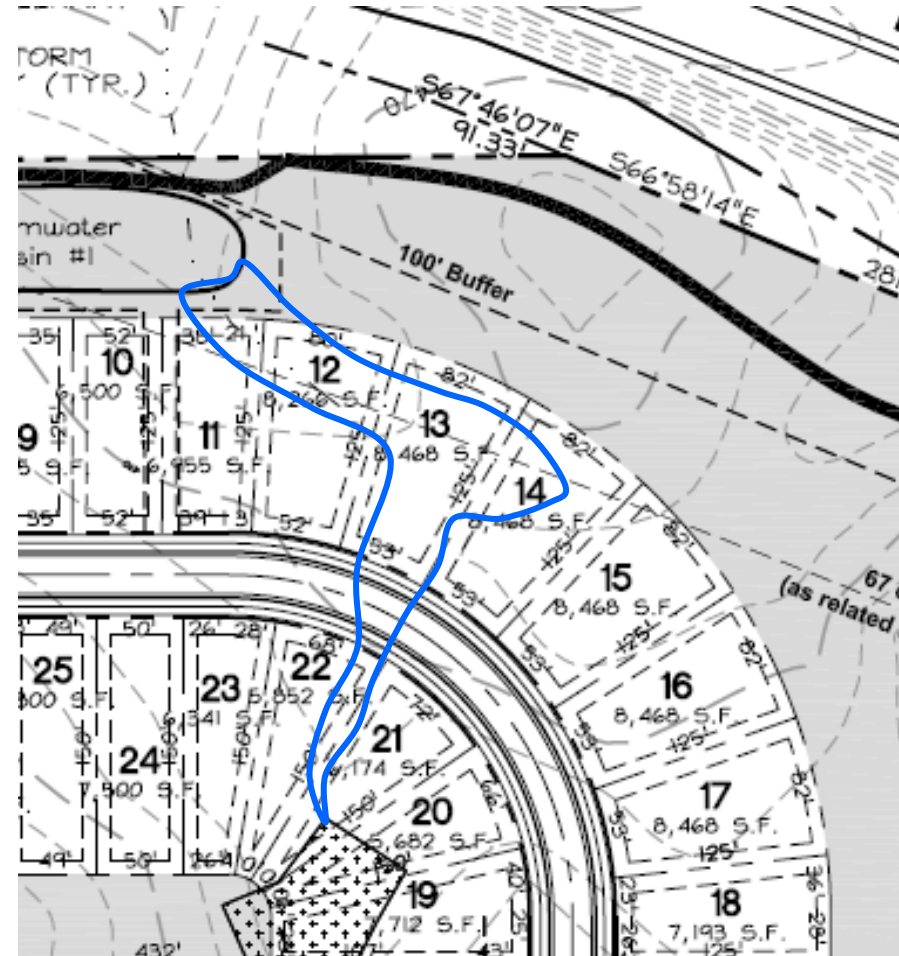
Concerns

- No measures proposed by Applicant to minimize impacts to boggy wet area in Basin 1 drainage.
- This wet area currently functions as a natural stormwater treatment zone.
- Development and piping of the wet area will eliminate and bypass the natural stormwater treatment in this area, directly connecting the entire drainage area to Basin 1.
- Basin 1 performance may be impaired by its placement on seasonally wet soils and high water tables, with high clay content.

Recommendation – Part 1

Applicant should be required to conduct a detailed hydrologic study in and around area delineated by blue line in map to right.

Study should concentrate on mapping hydric soil and should include wet periods to observe seasonal high water tables.



Recommendation – Part 2

- Following hydrology study of Basin 1 drainage area, revise stormwater management plan to incorporate natural stormwater treatment provided by boggy wet area and “linear wetland” feature.
 - Prohibit structures in seasonally inundated areas.
 - Make commitment to design and maintain a swale drain or constructed wetland.

Advantages of Recommended Solution

- Natural stormwater treatment zone would help reduce nitrogen load to Jordan Lake.
- Parts of natural treatment zone could be developed for recreational use.
- Prohibiting construction in seasonally wet areas would protect future homeowners from problems associated with wet crawl spaces and unstable soil conditions.