Water Quantity and Quality Considerations of the Extension of SW 24th Avenue through NATL

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Summary

According to chapter 40C-42 F.A.C., construction of 4,000 sq ft or more of impervious surface subject to vehicular traffic may require mitigation on the part of the developer in the form of a stormwater basin.

A stormwater retention/detention basin required to mitigate for stormwater runoff resulting from increased impervious area, if situated within NATL, will result in land conversion in excess of the presently proposed 90 ft. right-of-way.

Presently the area proposed for a right of way within NATL is in close proximity to one active sinkhole already receiving direct stormwater runoff from Archer road, and will be directly adjacent to at least one partially collapsed sinkhole that presently receives stormwater runoff from the south sloping areas of NATL and parts of the Regency Oaks apartment complex.

Establishment of the road and stormwater basin within a Sensitive Karst Area Basin will require additional consideration of water quantity and water quality with respect to connectivity to the Floridian Aquifer (40C-41, F.A.C).

Stormwater mitigation requirements

Mitigation for increased runoff rate and volume resulting from impervious surfaces is required under chapter 40C-42 F.A.C. These requirements are an effort to mitigate for the increased amplitude and volume in downstream discharge resulting from increased impervious surface areas and routing of stormwater runoff within the watershed. Increased amplitude in stormwater runoff events can result in flooded properties, infrastructure and impacts to natural ecosystems. Mitigation can vary depending on site location and soil characteristics, however, the overall mitigation objective is to try to have post-development runoff rates and water elevations more closely resemble pre-development conditions. To implement this, pre and post development models of the stormwater runoff during a simulated storm event can be used. Specific determination of the amount of water that will have to be retained or detained in a stormwater basin will require additional analysis. However, based on the proposed 90 foot wide right of way that is approximately 1400 feet long and 90% impervious area, runoff from this road surface would be 140 cubic feet for the first 1.5 inches of a rain event, 400 cu. ft. for the 2 year storm event (4.25 inches of rain), 800 cu ft for the 25 year storm event (8.64 inches of rain) and 1100 cu. ft. for the 100 year storm event (11.5 inches of rain). Along the western most 150-200 feet of the road, this runoff will likely be directed toward Hogtown creek as the slope of the land is within that watershed. In the case of the remaining area of the road surface the slope of the land is internally drained (Figure 1). Thus, all runoff flows to a depression just south of the NATL property boundary at approximately the midpoint of the road (Figure 2). Any runoff within this area would have to be stored in this depression or a retention basin until the water volume infiltrates into the ground or is lost to evapotranspiration.

Figure 1. Area of proposed 24th avenue right of way looking west. Fence line along left side of clearing designates southern NATL boundary. Stormwater runoff follows downward slope to collapsed sinkhole pond indicated by arrow.

Figure 2. Pond at bottom of internal catchments presently receiving runoff from southern sloping areas of NATL and storm runoff from Regency Oaks. The fence is on NATL's south

Potential additional storage requirements

As a result of the internal drainage pattern along most of the proposed right of way, some consideration needs to me made with respect to where is this water going to go? Presently the natural runoff pattern directs water toward a collapsed sink hole that is located in the low spot of the area. However, the storage volume of this collapsed sink may not be sufficient to handle the additional runoff volume of water especially in light of the reality that some storage may be lost due to the close proximity of the proposed right of way to the depression. If any additional fill is required to stabilize the road surface some loss of storage capacity will occur. The three alternatives to directing stormwater to the collapsed sink area are to redirect flow to Hogtown creek, add additional storage areas to the south of the proposed right of way (on privately owned land) or add additional storage somewhere along the right of way. Discharge to Hogtown creek would be undesirable due to excessive flow in that system already. Creation of a stormwater basin(s) on the privately owned land to the south may be possible, but will be expensive. Additional retention storage along the proposed right of way would require additional land to be developed within NATL.

Water quantity considerations

According to rule 40C-41.063 F.A.C. additional conditions may be required to address not only stormwater quantity but also stormwater quality when a stormwater runoff mitigation requirement occurs within a Sensitive Karst Area Basin. Sensitive Karst Area Basins are identified due to their potential direct connectivity between surface waters and the Floridian Aquifer. Stormwater management systems within a Sensitive Karst Area Basin should be designed to assure adequate treatment (pursuant to section 62-28.700, F.A.C.) of the stormwater before the water enters the Floridian Aquifer, and preclude the formation of solution pipe sinkholes in the stormwater system. The full length of the 24th street expansion falls within the Sensitive Karst Area Basin according to St. Johns River Water Management District. However, the topography and existing sinks within NATL appear to indicate areas east of 34th within NATL may be more active than other areas within the basin. Meeting the District's requirements for basins within Sensitive Karst Areas is not necessarily difficult as many system designs can reduce the potential direct linkage between surface water and groundwater. However, several minimum design features are required that may necessitate a greater surface area required for stormwater management due to the limited depth to which a stormwater basin within a Sensitive Karst Area can be constructed. In addition these basins are still more prone to fail due to their inherently unstable underlying geology (Fig 3)

Figure 3. Sinkhole opening in a stormwater basin at northwest corner of Archer Road and I-75. Sinkholes such as this provide a direct link between contaminants in stormwater runoff and the Floridian Aquifer. Repair of such design failures are the responsibility of the basin owner as designated in the original permit.

Water quantity considerations

Surface runoff during storm events enters sinkholes and solution holes throughout the north Florida landscape and provides significant contributions to the Floridian aquifer water budget (Figure 4). These connections are direct and provide a maximum recharge potential of water quantity to the aquifer and if not degraded in quality should therefore be maintained as much as possible. However, these same direct connections to the Floridian aquifer are also potential point sources of contamination should water quality entering a sink hole be degraded (Figure 5). Most of the creeks in Gainesville's four principal watersheds end in sinks meaning that much of the stormwater runoff in Gainesville and its' immediate suburbs will eventually end up in the Floridian Aquifer. Eliminating factors that would degrade water quality while maintaining groundwater recharge mechanisms should be a consideration in any development especially those in areas of high potential connectivity between surface waters and groundwater.

Figure 4. NATL area pond and sink hole, approximately 150 feet east of proposed SW 24th Avenue extension. Sinkhole in foreground, flow conditions are that of base flow between storm events.

Figure 5. Sinkhole and pond as in figure 2 during minimal storm event. Stormwater runoff from Archer road is directed into pond and sinkhole with direct connection to the Floridian Aquifer. Floating trash and increased turbidity indicate degraded water quality.

If you found anything in the above that is inaccurate or misleading, please let me know the details so that I can correct or clarify.--Mark Clark (clarkmw@mail.ifas.ufl.edu)