TOWN OF CARRBORO

NORTH CAROLINA

TRANSMITTAL **PLANNING DEPARTMENT**

DELIVERED VIA: ☒ *HAND* ☐ *MAIL* ☐ *FAX* ☐ *EMAIL*

To: **David Andrews, Town Manager**
Mayor and Board of Aldermen

From: **Randy Dodd, Environmental Planner**

Copy: **Patricia McGuire, Planning Director**
Christina Moon, Planning Administrator

Date: **May 7, 2014**

Subject: **Annual Report on Surface Water and Stormwater Management Activities**

Background and Summary

This memorandum is provided as an update of staff's continued involvement in both regulatory and nonregulatory activities related to surface water management. These efforts are associated with implementation of state rules passed in 2009 to restore Jordan Lake and the Town's National Pollution Discharge Elimination System (NPDES) stormwater permit, along with ongoing creek monitoring. Selected links to details beyond what is provided in this write-up are provided at the end of the memo.

Information

Town Required Response for Jordan Lake Rules

Staff have provided annual updates for several years to the Board related to Town compliance requirements for the existing development section of the Jordan rules. This update repeats some key information and provides new information. The most active area currently for Town staff with regard to the Jordan rules is continued identification of retrofit opportunities to comply with the Existing Development provisions of the rule. A summary of key points is provided in Table 1, below.

Table 1: Jordan Rule Provisions With Town Compliance Implications

Provision/Activity	Notes	Compliance Date
Establish Stage 1 Adaptive Management Program (Session Law 2009-216)	These efforts build on NPDES Phase II efforts.	2010
Identify and pursue projects to reduce nitrogen and phosphorus	The Town is required to identify, each year, two specific planned retrofits.	Beginning in summer, 2011 (repeats annually)
Jordan Rules Existing Development: Stage 2 Adaptive Management Program (Session Law 2009-216)	If monitoring continues to indicate water quality standards not being met, Stage 2 program (involving on-the-ground implementation of nutrient reductions) pursued to achieve 8% N and 5% P reduction. In 2013, the General Assembly delayed mandatory implementation pending additional study.	2017
	If 2023 monitoring report indicates water quality standards not being met, Stage 2 program modified to achieve 35% N reduction	2023

The Town has submitted to the North Carolina Division of Water Resources (DWR) a "Stage 1" Existing Development program plan that includes programs related to: 1) public education; 2) stormwater mapping; 3) illicit discharges; 4) maintenance of best management practices; and 5) identification of opportunities for retrofits and other projects to reduce nutrient loading from existing developed lands. Activities under items one thru four overlap with requirements of the Town's NPDES permit. For the fifth item, the Town continues to be required to identify (and submit to DWR) two retrofits per year to consider for Stage 2 program implementation. A summary of retrofits submitted through 2013 and included in the Capital Improvements Program along with additional retrofit opportunities identified is provided in Table 2. Projects have been included in the Capital Improvements Program for stormwater retrofits on public land along Morgan Creek, adjacent to Carrboro Elementary School, at Anderson Park, MLK Park, McDougle School, and on private land at Carrboro Plaza. Ongoing planning is occurring to assess the feasibility and effectiveness of retrofits at other sites; sites to be submitted as part of the 2014 annual report to DWR in the fall have not yet been identified.

It is important to note that since last year's staff update to the BoA regarding the Jordan Lake rules, the NC General Assembly delayed the initiation of mandatory implementation of the Existing Development rules from 2014 to 2017. The Town will still be able to receive credit for creditable activities pursued before 2017. Should the Town choose to move forward prior to 2017, State staff have provided guidance on crediting through an Existing Development Model Program developed with the help of affected parties and a state level Nutrient Scientific Advisory Board (NSAB; 50% of the membership from local government representatives), and have emphasized the importance of keeping good records. DWR staff have indicated that they envision that the model program will be updated in early- to mid-2016 by the adding of additional nutrient-reducing measures that can be used by local governments. Currently approved and anticipated new nutrient-reducing measures are shown in Tables 3 and 4. Table 3 shows primarily structural stormwater management projects, whereas Table 4 shows ecosystem measures/activities that restore or enhance the physical environment and ecosystem functions.

Examples of alternative/new approaches of potential interest to the Town include load reductions through redevelopment, exceeding state requirements for new development, local government purchasing of

nutrient reduction credits from the NC Ecosystem Enhancement Program or private banks, land cover modification (e.g., reforestation/ revegetation, impervious surface reduction, permeable pavement retrofits), improved street sweeping, stream restoration/enhancement, and diversion of runoff from impervious surfaces to pervious areas. Staff will be keeping apprised of DWR, Triangle J COG, and NSAB progress in determining alternative approaches that are "creditable" for compliance with Jordan Lake rules requirements.

Table 2: Opportunities Identified To Date for Existing Development Requirements of Jordan Rules

Site	Retrofit Type	Status	CIP
Bolin Creek Greenway Phase 1b	Stormwater wetland retrofit	Detailed engineering/construction 2014?	
Hillsborough Rd./James St	Demonstration Rain garden	Detailed engineering/construction 2014	
Town property (Morgan Creek)	Stormwater wetland	Preliminary planning	FY 14/15*
CHCCS land (Carrboro Elem)	Stormwater wetland	Preliminary planning	FY 14/15*
Anderson Park	Swale/bioretention	Preliminary planning	FY 16/17
Carrboro Plaza	Stormwater retrofit	Preliminary planning	FY 16/17
McDougle School	Stormwater retrofits	Preliminary planning	FY 17/19
MLK Park	Swale/bioretention or wetland	Preliminary planning	FY 17/18
Sunset Creek	Stormwater retrofit	Awaiting further planning	
Winmore retrofits(2-3)	Stormwater retrofits	Awaiting further planning	
Toms Creek at Main Street	Stormwater wetland	Awaiting further planning	
Tar Heel Manor	Stormwater retrofit	Awaiting further planning	
Broad St.	Stream daylighting	Awaiting further planning	
USPS	Stormwater retrofit	Awaiting further planning	
Transportation infrastructure	Impervious reduction/retrofit	Awaiting further planning	
CHHS/Smith/Seawall/utility lines	Stormwater/riparian	Awaiting further planning	
Lake Hogan retrofits (5)	Stormwater retrofits	Awaiting further planning	
Cedar Court	Stormwater (new)	Awaiting further planning	
Cobblestone/Carolina North (2)	Stream repair/retrofit	Awaiting further planning	
Roberson Place	Pocket wetland	Awaiting further planning	
Carrboro Tracks	Stormwater retention	Awaiting further planning	
Hillcrest Apts Stream Repair	Stream repair	Awaiting further planning	
Jones Ferry P&R	Stormwater retrofit/stream repair	Awaiting further planning	
Bolin Creek at Homestead Road	Riparian restoration	Awaiting further planning/landowner interest	

*80k included in 2013/14 operating budget for preliminary engineering.

Table 3: Stormwater Practices for Credit for Jordan Lake Rules

Bioretention	Removal of impervious surface
Constructed Wetland	Permeable Pavement
Sand filter	*Off-line regional treatment systems*
Filter Strip	**Redirecting runoff from impervious areas/downspout disconnection*
Grassed swale	**Pond Retrofits*
Infiltration device	**Remedy Malfunctioning Septic System*
Extended dry detention	**Remedy Discharging Sand Filter*
Rainwater harvesting system	*Improved Street Sweeping*
Treatment of redevelopment	*Retrofitting bioretention & grassed swales*
Overtreatment of new development	*Soil Amendments*

(*Italics*): practice in need of DWR approved accounting before being implemented

*: practices actively being studied by Nutrient Scientific Advisory Board

Table 4: Ecosystem Practices for Credit for Jordan Lake Rules

Wetland or riparian buffer restoration	*Land conversion to wetlands*
Reforestation w/ conservation easement or protective covenant	*Stream Restoration/Enhancement*
Land Improvement (e.g., bare patches -> vegetation)	

(*Italics*) practice in need of DWR approved accounting

DWR and the NSAB have been working to quantify local government existing development load reduction requirements for achieving reductions in collaboration with the Piedmont and Triangle J Councils of Government and through a contracted study. The study is wrapping up and is currently undergoing a final peer review. "Existing development" is defined as any development in place before the Town's New Development program was implemented (for Carrboro, June 2012). Carrboro will be assigned an existing development load reduction goal as soon as the peer review is complete, which will be estimated by applying the upper New Hope 2023 percent reduction goals for nitrogen (8%) and phosphorus (5%) to the Town's estimated existing development loading. The reduction goals are being estimated for all regulated parties using the results of a watershed model. (Information about this watershed model can be found at TJCOG's Jordan Watershed Model webpage included at the end of this memo.) This study will not change the reduction goals for nutrient loads reaching the lake, but rather the technical process by which this total load reduction goal is allocated to the different regulated parties, and the method by which compliance is tracked.

In previous staff reports, preliminary and conservative (low end) cost estimates for Carrboro (municipal limits) to meet the nutrient reduction requirement were completed using the following assumptions: 4100 developed acres subject to the rules; construction costs for new stormwater wetlands (40% nitrogen removal efficiency applied to 5% of the developed acres [approximately 200 acres]; an average cost of $10,000 for construction and $3500 for engineering per retrofitted acre; and, the expectation that costs beyond those associated with construction and engineering would be minimal. Based on these assumptions, staff have estimated that it will cost the Town a minimum of about $3M to meet the required reductions by 2023. This information is provided as a very rough and very conservative estimate of costs that could be incurred by the Town. It is intended solely to initiate further planning and consideration of strategies for Carrboro to pursue. Estimates of the cost to comply with a potential 35% reduction goal beginning in 2023 have not yet been developed. However, future costs would likely be proportionally greater since the more cost-effective projects will likely be pursued initially.

In considering the Town's requirements for Jordan Lake Existing Development compliance through 2023, a simple analysis was pursued as part of the 2012 staff report to see if the Town has identified sufficient projects based on the "two projects a year for 10 years" mandate to satisfy the 8% removal requirement by determining if "the top 20" projects identified to date will treat roughly 200 acres or more. The "top 20" sites cumulatively treat approximately 240 acres of land, with the total of all sites identified treating approximately 330 acres. Given the likelihood that retrofit projects will not actually come to fruition at some of the sites identified to date due to inability to obtain landowner cooperation, site constraints, and/or cost-effectiveness, staff will continue to identify additional retrofit opportunities in consideration of the 8% municipal level reduction requirement by 2023 and the Stage 2 program plan requirements.

NPDES Update

The State issued Carrboro a Stormwater Management Permit effective July 1, 2005. The permit required the Town to develop and implement a comprehensive stormwater management program that includes six minimum measures:

(1) Public education and outreach (PEO) on stormwater impacts,
(2) Public involvement/participation (PIP),
(3) Illicit discharge detection and elimination (IDDE),
(4) Construction site stormwater runoff control (CRC),
(5) Post-construction stormwater management (PCRC) for new development and redevelopment, and
(6) Pollution prevention/good housekeeping (PPGH) for municipal operations.

The Town's permit was reissued in 2011. The renewed permit is available at http://www.townofcarrboro.org/pzi/Env/Water/swhome.htm . The Town was required at that time to prepare a new Stormwater Management Plan that describes how it intends to fulfill the requirements of the renewed permit. The 2011 plan is more than just an update of the 2005 plan; it reflects new requirements and accounts for the lessons learned since the original permit was issued. This has been pursued in a way that maximizes compliance with permit performance measures, considers cost effectiveness and cross-department collaboration, and that ultimately minimizes the harmful effects of stormwater runoff on ecological and human health. The 2011 Stormwater Management Plan is seen as a living document that can be revised, although revisions will need to be submitted to the DWQ. The plan is available at http://www.townofcarrboro.org/pzi/Env/Water/swhome.htm.

Additional details regarding the Town's implementation of the permit are being provided in separate documents, that include an update to the Illicit Discharge Program Plan and outreach to the public, owners of best management practices (BMPs), developers, and staff regarding maintenance and inspection of BMPs. (When the update of the Town's website is complete, these additional details will be provided online.) Outreach classes and workshops have been offered through Recreation and Parks programing.

Current areas of investigation for ongoing permit implementation are summarized in Table 5.

Table 5: NPDES Permit Reissuance: Town Compliance/Impact Implications

New Provision/Activity	Notes
Administrative: annual analysis of the capital and operation and maintenance expenditures and staff resources; new annual reporting requirements	Additional staff time anticipated. No action taken to date.
Public Education, Outreach, Participation: annual evaluation of program effectiveness via interviews, surveys, and outreach tracking systems; new requirements for Stormwater Advisory Board; local nonprofits and others recruited to monitor construction sites, watershed hot spots, and streams and participate in programs such as Muddy Water Watch and Riverwatch on an ongoing basis and report to the Town; perform outreach to major economic and ethnic groups, to participate in program development and implementation	Additional staff time anticipated. The Clean Water Educational Partnership (Town is a member) is focusing a new campaign on reducing the amount of grass clippings in storm drains.
Illicit Discharge Detection and Elimination: detect dry weather flows; investigations into the source of all identified illicit discharges; employee training; public reporting mechanism; procedures to identify and eliminate failed septic systems; Enforcement Response Plan (ERP); enforcement tracking	Additional staff time anticipated. Some progress in 2013.
Post Construction Runoff Control: More detailed inventory of post-construction structural stormwater control measures; recordation of maintenance responsibility; fully implement program for long-term operation and maintenance of structural BMPs, including verification of maintenance and inspections; provide educational materials and training for developers; may also consider establishing incentives and/or requirements such that development projects design, install, implement, and maintain stormwater control measures that promote infiltration of flows and groundwater recharge for the purpose of maintaining stream base flow, evapotranspire, harvest, and use stormwater discharges; more fully implement Enforcement Response Plan (ERP), including recordkeeping and follow-up associated with enforcement actions; post-construction requirements for public transportation;	Staff have worked to develop program. Considerable additional staff time anticipated to implement.

Stream Monitoring

Benthic Monitoring

The Town has been pursuing benthic macroinvertebrate (aquatic insect) monitoring for over a decade as the a critical means for assessing creek health. Recent benthic sampling have revealed concerns that warrant close attention. Sampling on Bolin Creek since 2001 has consistently indicated Good-Fair water quality in upper Bolin Creek, especially at the most upstream site just upstream of Winmore. Areas further downstream have fluctuated between a Good-Fair and a Fair rating, with a Fair rating at all three downstream sites in 2011. ("Fair" is the threshold which triggers listing on the State's impaired streams list.) The declined benthic community between the most upstream site and the site at Homestead Road downstream of Winmore and Claremont was greatest in 2011, with some evidence of improvement in 2012 and 2013. Recent sampling indicate that stream fauna immediately above Homestead Road have been impacted by recent stresses that could include drought, nonpoint source runoff and habitat impacts. Declining water quality moving downstream along Bolin Creek is supported by the observation that the control site at Morgan Creek and the most upstream site on Bolin Creek (above Winmore) continue to

retain higher biotic ratings (Good or Good-Fair) relative to downstream sites. Summer/drought low-flow conditions (including the absence of water in the channel) continue to contribute to reduced biotic diversity in Bolin Creek.

Dave Lenat, the macroinvertebrate expert working with the Town, recommends that the Town continue to monitor both following droughts and following periods of higher flows to further evaluate the relative contributions of urban runoff and flow interruptions to the pattern of declining aquatic communities moving downstream along Bolin Creek. Much of upper Bolin Creek has been functioning at times in the past decade as an intermittent (rather than perennial) stream and may be difficult to evaluate using criteria for perennial streams. The degree to which recent droughts and associated low flow are associated with climate change and/or development induced changes in the hydrological regime is very difficult to discern. Qualitatively, it is a reasonable hypothesis to consider that more sections of the creek may be drying up more frequently because of increased impervious surfaces and a resulting change in streamflow and groundwater recharge in the Bolin Creek watershed (a pattern not occurring, however, in upper Morgan Creek). It is also reasonable to assert that changing precipitation patterns and possibly temperature and evapotranspiration rates are changing and impacting baseflow. The Carolina Slate Belt is known to be a geologic area that does not support high levels of baseflow as well; creek fauna in the Slate Belt may be more sensitive to climatic perturbations than other geologic provinces.

Although much of Bolin Creek is exhibiting reduced benthic diversity, several tributary sites appear to support more intolerant aquatic communities. Excellent water quality (as indicated by the benthos) has been demonstrated in unnamed tributaries at Seawell School Road and Hornehollow Road, and Good-Fair water quality was observed in Jolly Branch. Sampling in the spring of 2014 (report pending) on Dry Gulch downstream of the 319 restoration project preliminarily indicates potential for increased benthic abundance relative to prior to the restoration project.

In summary, recent benthic monitoring has indicated that:

1) The main stem of Bolin Creek from immediately above Homestead Road downstream is demonstrating reduced benthic macroinvertebrate health relative to the most upstream site and a reference site on Morgan Creek. Bolin Creek from below Pathway Drive to its confluence with Little Creek in Chapel Hill has been listed on the State/federal impaired streams (303d) for many years. The 2011 sampling in particular raises some concern that biological diversity is being impacted upstream of Pathway Drive, although some slight improvements were observed in 2012 and 2013.

2) The relative impact from drought stresses and non-drought stresses is difficult to determine; continued monitoring may help discriminate between these stresses. The monitoring record for the macroinvertebrates does raise a concern that the past decade of drought stresses may be contributing to a shift in the aquatic community to one more representative of intermittent streams relative to a perennial stream aquatic community in upper Bolin Creek.

3) There is also information from the last several years of monitoring suggesting that conditions favoring filamentous blue green algae growth (abundant nitrogen and phosphorus, disturbed

riparian areas) may be a contributing stress to the benthos in the area immediately above Homestead Road.

4) New monitoring on tributary streams has indicated more diverse communities on several sites relative to the main stem of Bolin Creek.

5) Continued benthic monitoring is essential to assess the overall aquatic health, trends, and gain insight into changes in aquatic diversity and abundance.

Benthic reports sponsored by Carrboro since 2000, can be found at http://www.townofcarrboro.org/pzi/Env/Water/bcmonitor.htm.

Other Monitoring

With installation funds provided by the North Carolina Ecosystem Enhancement Program, streamflow measurement using a permanent United States Geological Survey (USGS) gage on Bolin Creek near Carrboro/Chapel Hill municipal boundary (on Umstead Road) was initiated in 2012. Chapel Hill and Carrboro staff have worked out a cost sharing agreement for the ongoing operation and maintenance of the gage. Chapel Hill and Carrboro staff have also been investigating nutrient monitoring to support studies related to Jordan Lake Rules implementation, although a recommendation has not yet been developed. Chapel Hill has also recently initiated extensive benthic sampling for creeks in Chapel Hill. DWR conducts fish and benthic sampling in the watershed once every five years. The entire monitoring program for the watershed continues to be reviewed by the staff in collaboration with other stakeholders.

Recommendation

Staff recommend that the Board of Aldermen accept this update and provide feedback to guide future efforts.

Links to additional information

NCDWR Jordan Rules: http://portal.ncdenr.org/web/jordanlake/implementation-guidance-archive

Nutrient Scientific Advisory Board: http://portal.ncdenr.org/web/wq/nutrient-scientific-advisory-board

TJCOG Jordan Jurisdictional Allocation Model Development: http://www.tjcog.org/jordan-jurisdictional-allocation-model-development.aspx

Carrboro Stormwater: http://www.townofcarrboro.org/pzi/Env/Water/swhome.htm

Carrboro Benthic Sampling Studies: http://www.townofcarrboro.org/pzi/Env/Water/bcmonitor.htm

Carrboro Bolin Creek Website: http://www.townofcarrboro.org/pzi/Env/Water/bcwrt.htm

NCSU Bolin Creek Website: http://www.bae.ncsu.edu/programs/extension/wqg/srp/bolin_creek.html

Chapel Hill Bolin Creek Website: http://www.townofchapelhill.org/index.aspx?page=1757