1 Beissel

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT JR.
GOVERNOR

DIVISION OF HIGHWAYS
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GARLAND B. GARRETT JR.
SECRETARY

June 10, 1997

Mr. Eric Alsmeyer
U.S. Army Corps of Engineers
6508 Falls of the Neuse Road, Suite 120
Raleigh, NC 27615

Dear Mr. Alsmeyer:

Re: South Buffalo Creek Mitigation Plan

Attached is our response to the comments received by you and the resource agencies on May 13, 1997 regarding the South Buffalo Creek Mitigation Plan. Comments made during the meeting included concerns about (1) a general construction schedule, (2) enhancement, (3) the effect of increased amount of inundation on mature trees in the mitigation areas, (4) success criteria and contingency plans, (5) vegetation monitoring, (6) reference ecosystem, (7) the sewage pipe, and (8) mitigation ratios.

We believe the attached information and additions to the Final Mitigation Plan are sufficient for your approval of the plan and issuance of a permit. This site is proposed as mitigation for wetland impacts from the Greensboro Bypass (I-2402) and the first section of the Urban Loop (U-2525-A). Any credits remaining after these impacts are debited will be used for impacts from future sections of the Urban Loop.

Thank you for your consideration.

Sincerely,

V. Charles Bruton

V. Charles Bruton, Ph. D.
Permits, Mitigation, and Natural Resources Unit Head

Attachments

cc: E. Galamb, DEHNR-DWQ
D. Cox, NCWRC
H. Hall, USFWS
K. Moody, USFWS
W. Gasteiger, FHWA
L. Pelej, USEPA
J. Maleug, P.E., Greensboro Stormwater Services
D.C. Robinson, Ph.D., P.E.
K.D. Beissel

mailed 6/13/97

also to Ted Devens 6/13/97

NCDOT'S Response to Comments on the South Buffalo Creek Mitigation Plan

1. Construction Schedule: The attached schedule outlines an approximate construction schedule for implementation of this mitigation plan. Due to the possibility of unforeseen delays, NCDOT may need to modify this schedule and will consult the resource agencies if such delays are necessary.

2. Wetland Enhancement: Please see the attached revision of section 7.4 on the Mitigation Plan. We feel this enhancement effort, along with the restoration of the wetlands between the enhancement area and the creek, will restore the area to historical wetland conditions based on observations made in the reference wetland.

3. The effect on existing vegetation of restoring wetland hydrology to the site: Because there are mature trees in both the enhancement and restoration areas, there is concern that the increased water levels and/or hydroperiod may have a detrimental effect on the health of the trees. As you know, there is little or no published data on the effects of restoring wetland hydrology to forested wetlands with mature trees. It is anticipated that the effects of increased water levels and/or longer hydroperiods will stress and possibly kill UPL and FAC trees. These species include: *Fagus grandifolia, Prunus* spp., *Quercus velutina, Acer saccharum, Hamamelis virginiana, Carya glabra, and Carya ovata.* The other species in the areas of concern are: *Fraxinus pennsylvanica, Platanus occidentalis, Celtis laevigata, Q. phellos, A. saccharinum,* and *A. negundo* (all FACW) and *A. rubrum, Ulmus americana, U. rubra, Liriodendron tulipifera, and Liquidambar styraciflua* (all FAC).

Resource Southeast (RSE) has looked carefully at the potential effects of increased groundwater levels on existing trees. They are confident that while the increased water levels may stress many of the trees, those designated as FAC and FACW should survive the increased hydroperiod. Species found in the reference wetland were *Q. phellos*, *F. pennsylvanica, A. negundo, A. rubrum, C. laevigata,* and *U. americana.* The reference wetland has a similar composition of FAC and FACW species to the restoration and enhancement areas and has been inundated to approximately 12 inches and higher above the soil surface in some areas from April through May 1997.

4. Success Criteria and Contingency Plans: The agencies requested that monitoring of the vegetation in the mitigation areas be included in the monitoring plan for this site. NCDOT agrees that it would be appropriate to set up vegetative monitoring plots in the restoration and enhancement areas to monitor the success of the mitigation. These surveys would include an assessment of the tree mortality as well as some assessment of the stress the trees are undergoing, if any. Success of the site will depend on hydrology and vegetation. If the hydrologic regime of the restoration area is similar to that of the reference ecosystem, hydrologic success criteria will have been met. If the regimes are dissimilar, measures will be taken to assess the causes of that difference. It may be necessary at that point to modify the hydrologic barrier or re-evaluate the site in terms of other activities that could be performed to achieve hydrologic success.

Success will also depend on the condition of the forest tree species. It can be expected that as wetland hydrology is restored and enhanced, species composition will gradually change in response with an increased percentage of FACW species. As stated above in (3) several species will die out and be replaced by those better able to compete in the restored hydrologic conditions. Success in the enhancement area will be assessed in a similar manner. If mortality

of FACW and FAC tree species is high, but hydrologic conditions are similar to those in the reference ecosystem, it may be necessary to plant the site with species more tolerant of wet conditions. This contingency plan will be discussed with the resource agencies at the appropriate time during the 5 year monitoring period. We hope that continued cooperation through the partnering agreement will facilitate these discussions and decisions.

5. Vegetation Monitoring: Vegetative monitoring plots will be set up in the enhancement and restoration areas to monitor the survival of the tree species.

6. Reference Ecosystem: A transect was used to characterize the species composition in the reference ecosystem area. A number 10 prism was used to establish plots and tree species within the plots were recorded. Groundwater and surface water monitoring wells will be installed at the reference site to monitor the hydrologic conditions. This area is owned by North Carolina A & T University and is primarily used for research. The University intends to preserve the area in its natural condition. This would allow for long-term monitoring of the area if necessary. The composition of the reference site is as follows:

71.4%	*F. pennsylvanica*	2.6%	*A. rubrum*
12.9%	*U. americana*	2.6%	*A. negundo*
5.2%	*C. laevigata*	1.3%	*Robinia pseudoacacia*
3.9%	*Q. phellos*		

7. Effects of the Sewage Pipe: There was concern that the pipe would act as a French drain. When the impermeable barrier is installed, the slurry mixture will be injected around the pipe to prevent leakage of groundwater at that area. RSE modeled the barrier using the present site conditions and taking the presence of the sewage pipe into account.

8. Mitigation Ratios: In the mitigation plan, ratios of 1:1 for restoration on 15.53 acres and 3:1 for enhancement of 16.2 acres are proposed. We feel we are justified in proposing ratios lower than those suggested in the EPA Guidelines. Restoration and enhancement on this site will occur relatively quickly as compared to other mitigation sites such as those on PC farmland. There will be no "lag time" while trees become established and hydrology will be restored and enhanced once the barrier is constructed. We are proposing to improve a former wetland in which the hydrology was removed when South Buffalo Creek was channelized. We feel confident the restoration and enhancement will succeed and when hydrology is restored we will have provided high quality mitigation for wetland impacts. This site will not have many of the undesirable characteristics other mitigation sites often have such as compacted soils, nutrient-poor soils, ditches, and nursery trees. The site has an established seed source, healthy herbaceous and shrub layers, existing wildlife habitat, natural microtopography, and will provide Greensboro with a wetland educational area near a City Park. Since the site is likely to succeed, given we are only manipulating hydrology to achieve success, we feel a 1:1 ratio for restoration providing for no net loss is fair. Furthermore, we feel the enhancement ratio of 3:1 is justified since we are increasing flow through this site and providing water quality benefits in a major urban area. We have spent much time, effort , and money purchasing and studying the site and have thoroughly investigated a number of mitigation options. The enhancement of 16.2 acres and restoration of 15.53 acres (31.73 acres total) are proposed to mitigate for 20.93 acres of impact from the Greesboro Bypass (I-2402) and the Urban Loop (U-2525).

Addendum to South Buffalo Creek Mitigation Plan

7.3 Restoration

7.3.1 Restoration of wetland functions

The installation of a low-permeability barrier along South Buffalo Creek will affect the hydrodynamics of the wetland restoration area. These wetland areas consist of 15.53 acres and are identified in Figure 24. The barrier will inhibit outflow of groundwater from the system. However, some outflow is necessary to prevent stagnation and to ensure flushing and migration of toxicants and nutrients to and from and within the system; therefore, continued multi-directional flow and mixing will be maintained by providing a breach in the barrier. This breach will be provided at the location of the existing breach in the berm. Calibration of the groundwater model included these parameters.

The resulting model predicts the following changes in hydrodynamics for the wetland restoration areas:

- Table 3 illustrates an increase in the water table of 11.6 inches per year due to the installation of the barrier.
- Figures 8 and 12 illustrate groundwater contours before and after construction.
- Figures 9, 10, 13, and 14 present cross sections illustrating changes in groundwater elevations before and after construction.

These studies and illustrations portray an amplification of three qualitative categories of hydrodynamics for the systems; (a) vertical fluctuations of the water table, (b) unidirectional flows that range from strong channel-contained currents to sluggish sheet flow, and (c) bi-directional, surface, or near-surface flows. These dynamic parameters will result in the following changes to the fluctuations and values of the wetland ecosystem:

- The capacity of the system to temporarily store flood waters will be restored.
- Upstream immigration and downstream emigration of aquatic organisms will increase.
- Increased flows will augment the potential for colonization by aquatic organisms where dry-downs cause local extinctions
- Nutrients supplied by groundwater flows will be
- The flush potential for plant growth inhibitors will expand

(source: Brinson, Mark. *A Hydrogeomorphic Classification for Wetlands,* U.S. Army Corps of Engineers Wetlands Research Program Technical Report WRP-DE-4, August, 1993.)

TABLE 1
SOUTH BUFFALO CREEK LEVEE
WETLAND INDICATOR SHEET

SPECIES	COUNT	RELATIVE ABUNDANCE	INDICATOR STATUS
Sycamore (*Platanus occidentalis*)	64	23%	FACW-
Hackberry (*Celtis laevigata*)	34	12%	FACW
Willow Oak (*Quercus phellos*)	11	4%	FACW
Silver Maple (*Acer saccharinum)*	7	2%	FACW
Box elder (*Acer negundo*)	2	1%	FACW
Green Ash (*Fraxinus pennsylvanica*)	64	23%	FACW
TOTAL FACW	**182**	**65%**	
Sweet Gum (*Liquidambar styraciflua*)	26	9%	FAC+
Tulip Poplar (*Liriodendron tulipifera*)	2	1%	FAC
Red Maple (*Acer rubrum*)	6	2%	FAC
Slippery Elm (*Ulmus rubra*)	18	6%	FAC
TOTAL FAC	**52**	**18%**	
Sugar Maple (*Acer saccharum*)	6	2%	FACU-
Witch Hazel (*Hamamelis virginiana)*	3	1%	FACU
Shagbark Hickory (*Carya ovata*)	3	1%	FACU
Pignut Hickory (*Carya glabra*)	22	8%	FACU
Beech (*Fagus grandifolia)*	1	<1%	FACU
Cherry (*Prunus sp.*)	1	<1%	FACU
TOTAL FACU	**35**	**13%**	
Oak Species	4	1%	NA
Black oak (*Quercus velutina*)	3	1%	NI
Unknown	5	2%	
TOTAL	**282**	**100%**	