4.0 RECOMMENDED ACTIONS FOR PHASE II

This section of the report presents recommended actions for the next phase of the Local Watershed Plan project in the Swift Creek Watershed. Recommendations are based on available information and address the following components:

- Recommended analysis for Phase II including:
  - Traditional compensatory mitigation methods of analysis
  - Watershed restoration methods of analysis
- Potential solutions and mitigation opportunities
- Priority sub-watersheds
- Other general recommendations

Due to the developed nature of the Swift Creek Watershed, continued analysis for many of the sub-watersheds is recommended. Specific additional information is provided in the following sections.

4.1 Recommended Methods of Analysis

Preliminary recommendations for Phase II analysis are presented in the following two categories with associated components:

4.1.1 Traditional Compensatory Mitigation Methods of Analysis

- Stream modification trends assessment
- Stream walks/assessments (geomorphological)
- Aerial photograph interpretation
- Aerial reconnaissance
- Stream Functional Assessment Team (SFAT) approaches (under development)
- Wetlands Functional Assessment Team (WFAT) approaches (under development)

4.1.2 Watershed Restoration Methods of Analysis

- Monitoring including:
  - Chemical, wet and dry weather
  - Aquatic habitat
  - Fish
  - Benthic macro-invertebrates
- Modeling
  - Water quality – pollutant loading
  - Peak flows/erosive velocities/flood elevations
  - Sediment transport
- Field Work – BMP locations
- Stakeholder Meetings – Program Assessments
- Terrestrial Habitat Modeling

Results of the analysis are presented for each sub-watershed on page 4 of the Sub-watershed Characterization forms in Appendix D. **As previously mentioned, the Sub-watershed characterization forms will be updated as new data and information are available.** This applies most specifically to the traditional compensatory mitigation methods (including the SFAT and WFAT approaches which are under development). Recommendations were, however, provided for mitigation for Sub-watersheds 2B1, 2B2, 4BX and 5XX based on observations during the Phase I Visual Assessment (presented in Section 2.3). For example, Sub-watershed 2B1 was recommended for stream and wetland restoration opportunities during the visual assessment. Therefore the characterization form indicates that both SFAT and WFAT approaches be applied to address the stream and wetland opportunities.

All 20 of the ll sub-watersheds in the study area were recommended for additional analysis in monitoring and modeling due to the developed nature of the watershed. Additional information is presented below.

4.1.2.1 Monitoring

In developing the monitoring recommendations outlined in this section, the following information was considered:

- Data is unavailable for some tributaries in the study area. While the majority of the unmonitored streams are small, gathering physical stream condition for some of these streams could provide valuable information to aid in mitigation site identification.
- Time is limited to gather additional data. Data for identifying potential mitigation sites must be gathered by July to be included in the decision-making process for Phase II.
- Staff resources are limited. DWQ has a limited amount of resources to address the monitoring needs of this study area as well as several other study areas.
- Staff have indicated that streams with drainage areas larger than 2 square miles have typically been the focus of previous monitoring efforts.
- Development in the area indicates additional monitoring is warranted in several sub-watersheds. Cary has experienced an increase in high impervious development in the last 10 years, as depicted in Figure 2-19 and Figure 2-21. However, in the past 5 years, the Town of Garner has experienced a rapid increase in impervious area in portions of the town, specifically along Timber Drive.
- An abundant amount of monitoring data is available above Holly Springs Road. Less monitoring data is available below this road.

The following outlines the monitoring recommendations to be conducted by DWQ for Phase II:

(1) Benthic macro-invertebrate and chemical monitoring and habitat assessments are recommended for the following two locations:

- Swift Creek at US 401 (Fayetteville Road) and
- Yates Branch at US 401.

Monitoring in these locations has recently begun. The purpose of this monitoring would be to document existing conditions at these locations and characterize water quality.

Monitoring locations on both creeks further downstream than US 401 would have been preferable, since more of the respective drainage areas would be captured. However, the only downstream access for Swift Creek is at Old Stage Road, and Swift Creek at this location appears to be too deep to be wadable, precluding a benthic community survey. Yates Branch enters Swift Creek just upstream of the bridge at Old Stage Road. Immediately above the confluence, Yates Branch is a single channel stream for approximately 150 feet, where it becomes a braided channel draining a large swampy area, including beaver impoundments. It would not be advisable to sample benthos here due to the short single channel reach. Also, the swamp drainage would likely confound interpretation. For this reason it is recommended that both streams be sampled upstream at US 401. For both streams, this is the next crossing upstream of Old Stage Road.

Monthly chemical monitoring (nutrients, metals, TSS, field parameters) is also recommended at these two sites, to characterize overall water chemistry in the two drainages.

(2) Monthly sampling of Swift Creek at Holly Springs Road by the Lower Neuse River Basin Association (LNRB) will continue, along with USGS monitoring of temperature and specific conductance. LNRB monitoring had previously documented periodic low dissolved oxygen (DO) concentrations. In order to provide additional data on the extent of DO problems, data sondes monitoring for DO should be conducted for three four-day periods during the summer of 2004.

(3) There are numerous small tributaries in each Primary Watershed that could be assessed for a baseline evaluation of stream habitat and riparian corridors. Having this data would aid in evaluating the effectiveness of local regulatory and planning programs. Wake County, and the Cities of Cary, Raleigh and Garner all have stormwater programs that meet or exceed the requirements of the state's Model Stormwater Program for Nitrogen Reduction. The Town of Apex is a NPDES Phase II community. All of these communities also fall within the Neuse River Basin Riparian Buffer requirements. Establishing a

baseline for stream and riparian area habitat could prove useful in the future in assessing the success of these programs. However, given the limited time and resources available for performing assessments, Table 4-1 outlines the priority streams selected for habitat assessments. These streams are identified by sub-watershed and were selected based upon drainage area (2 square miles or more), accessibility, amount of other monitoring in the area, and the potential for future problems based on development. Figure 4-1 indicates the proposed assessment site locations.

Table 4-1: Priority Streams for Stream Assessments

Sub-Watershed ID	Stream name or location	Potential Monitoring Location	Reason for Priority
1CX	UT (spell out)	Atchison Dr	>2 mi^2 DA; located in Garner in a developing area
1DX	Reedy Branch	Timber Dr.	>2 mi^2 DA; downstream from residential area in Garner
1EX	Buck Branch	Timber Dr.	~2 mi^2 DA; increased high density development in Garner
2A3	UT	Old Stage Rd	> 3 mi^2 DA; older, existing residential development with light commercial
2A3	Yates Branch	US 401	Large DA; proposed chemical monitoring site
2B1	UT to Yates Branch	Mid Pines Rd	> 2 mi^2 DA; DA experiencing increased residential development
3AX	UT to Swift Creek; southeastern-most UT	Spring Garden Circle	> 2 mi^2 DA; more rural watershed
3AX	UT to Swift Creek; northwestern-most UT	Manor Ridge Rd	> 2 mi^2 DA; more rural watershed
4A2	Swift Creek	Holly Springs Rd	Large DA; proposed chemical monitoring site
4A2	Speight Branch	Lilly Atkins Rd	> 2 mi^2 DA
4BX	Long Branch	US 1	> 2 mi^2 DA; no data on this tributary yet
4CX	Lynn Branch	US 1	> 2 mi^2 DA; no data on this tributary yet
4DX	UTto Macgregor Downs Lake	Cary Blvd	> 2 mi^2 DA; no data on this tributary yet; highly urbanized area
4E2	Williams Creek	US 64	> 2 mi^2 DA; don't have habitat data
4E2	Williams Creek	US 1	> 2 mi^2 DA; don't have habitat data

4.1.2.2 Modeling Approaches

Recommended modeling for the sub-watersheds includes:

- Water quality to assess annual pollutant loadings
- Peak flows, erosive velocities and flood elevations

As indicated in the previous section, modeling of annual pollutant loads and erosive velocities will assist in prioritizing sub-watersheds for protection and restoration. In addition, results of the erosive velocity modeling will help address the most pervasive problem identified by the WARP report which is stormflow scour. It is recommended that the water quality modeling be conducted using a spreadsheet tool to

estimate pollutant loads from stormwater runoff as well as from municipal or industrial wastewater treatment plants. The spreadsheet tool could be adapted from several available models or could be developed from scratch. The model would be developed to use land use and associated runoff volume and event mean concentrations (EMCs) for constituents of concern. The model would also be capable of estimating the effectiveness of BMPs for reducing the pollutant loads and evaluating various scenarios.

The spreadsheet water quality models typically model the following water quality parameters:

- Biological oxygen demand (BOD)
- Chemical oxygen demand (COD)
- Total suspended solids (TSS)
- Dissolved solids
- Total Kjeldahl nitrogen (TKN)
- Nitrite-nitrogen plus nitrate-nitrogen
- Total phosphorus (TP)
- Dissolved phosphorus (SP)
- Cadmium (Cd)
- Copper (Cu)
- Lead (Pb)
- Zinc (Zn)

The water quality models typically estimate pollutant loads for the following sources:

- stormwater runoff
- baseflow
- point sources (such as wastewater treatment plants) and
- Combined sewer overflows (as appropriate)

The modeling is most often conducted using existing land use and future land use to assess increases in pollutant loads associated with land use changes. The analysis is beneficial in identifying potential "hot spots" and in targeting sub-watersheds for protection and analysis.

The modeling should focus on select parameters of concern in the watershed. As indicated in the WARP report, toxicity was determined to be an important stressor causing impairment in Swift Creek. Because of this, the modeling should focus on metals concentrations and other parameters that cause toxicity (such as organic contaminants). Parameters can be easily added to the spreadsheet model once adequate data is available to determine the EMCs associated with the parameter for the various land uses in the watershed. Enrichment was also determined to play an important role in the impairment but on a more localized level. Because of this, modeling of the larger lakes and impoundments to examine eutrophication may be warranted using a model such as EUTROMOD which estimates lake response to non point loadings.

The other recommended modeling involves analysis of peak flows, erosive velocities and floodplain elevations using models such as HEC-1 and HEC-RAS. Analysis of peak flows is important to identify areas where hydrologic alterations in streams (such as channelization) may occur. Erosive velocities (in conjunction with an analysis of soil type and vegetation) are important to identify stream reaches targeted for stream bank restoration. As previously mentioned, the State of North Carolina is in the process of developing floodplain maps for the area – however, these will not be available until the Spring of 2004. These models may be used along with additional field cross sections to assess erosive velocities as well as changes in floodplain elevations.

4.1.3 Summary of Recommended Methods of Analysis

Based on the analysis of available data on a sub-watershed basis, the most commonly recommended methods of analysis included:

- Traditional compensatory mitigation (based on findings of the visual assessment)
- Monitoring and
- Modeling

Additional methods of analysis recommended in the WARP report include:

- **Development of a wet-weather and dry-weather sampling strategy** to provide the necessary information to target pollution removal and source reduction strategies for toxic parameters. Specific locations for this sampling should be screened using the results of the spreadsheet water quality model.
- **Implementation of stream channel restoration activities in targeted areas** and in conjunction with stormwater retrofit BMPs. Priority areas identified in the WARP report include Williams Creek from Gregson Drive to US 1, the portion of Swift Creek flowing through Lochmere Golf Club and Apex Branch between Parliament Place in Apex and MacKenan Drive in Cary.

4.2 Potential Solutions and Mitigation Opportunities

Potential solutions and mitigation opportunities were evaluated using available data on a sub-watershed basis as well as on an overall watershed basis.

4.2.1 Sub-watershed Potential Solutions and Mitigation Opportunities

Potential solutions and mitigation opportunities addressed in the analysis included the following:

- Wetland restoration/enhancement
- Stream restoration/enhancement
- Buffer restoration/enhancement
- Urban BMPs (including retrofits)
- Rural BMPs (including retrofits)
- Agricultural BMPs (including retrofits)
- Silviculture BMPs (including retrofits)
- Point Source Controls
- Municipal/Industrial Wastewater
- Commercial/Other
- Agriculture (CAFO)
- Non-point Source Controls
- Hydraulic Modifications (dam removal, restored flow)
- Preservation
- Public Education/outreach
- Policy/Program Development (land use - development controls/standards)
  - Existing BMP Maintenance
  - Enforcement (development controls)

Each of the sub-watersheds was evaluated for the above listed potential solutions. Results of this analysis are presented on page 4 of the Sub-watershed characterization forms in Appendix D. Nonpoint source controls and public education and outreach are recommended for all sub-watersheds based on the development and community characteristics of the study area. In addition, for sub-watersheds with potential pollution sources such as confined animal operations and point source discharges (presented in Section 2.2.3.4), point source controls are recommended. For example, sub-watershed 2A1 contains a confined animal operation and therefore, point source controls are recommended for this sub-watershed.

For sub-watersheds with buffer encroachment of 20% or more, buffer restoration and enhancement are recommended. For sub-watersheds with high increases in imperviousness resulting from development, urban and rural best management practices are recommended. In sub-watersheds that are not very developed currently but with high potential for future development (such as Dutchmans Creek), policy and program development and enforcement is recommended to minimize development impacts. Based on the available information, the three most commonly recommended solutions for the sub-watersheds included:

- Nonpoint source controls
- Public education and outreach
- Urban and rural BMPs

Compensatory mitigation opportunities are an important element of the Local Watershed Plans. As illustrated in Figure 4-1, projects that address the following components have higher priority:

- Water quality and habitat improvements
- Community priorities
- Mitigation Credits

Section 2.3.3 of the report presented potential mitigation opportunities identified during the limited visual assessment conducted in Phase I of this project. However, these opportunities were only incidental to this effort. Additional efforts should be directed toward identification of potential mitigation opportunities in Phase II of the project. Placeholders for these opportunities are included in page 4 of the Sub-watershed characterization forms presented in Appendix D and include the following:

- Wetland restoration and enhancement
- Stream restoration and enhancement'
- Buffer restoration and enhancement
- Preservation

4.2.2 Overall Watershed Potential Solutions and Mitigation Opportunities

The analysis of potential solutions and mitigation opportunities on a sub-watershed basis using available information was consistent with the recommended management strategies identified by the WARP study. More specifically, the WARP report identified the following recommended solutions to impairment in the Swift Creek Watershed:

- Implementation of feasible and cost-effective **stormwater retrofit projects** to address the hydrologic impacts of development.
- Implementation of **BMPs and other source reduction activities** for control of stormwater volume and stormwater velocities as well as pollutant removal aimed at addressing toxicity issues in the watershed.
- Investigation of the technical, economic and regulatory feasibility of **requiring minimum releases from the larger impoundments** in the watershed (Apex Reservoir – referred to as the Apex Reservoir in the report, MacGregor Downs Lake, Loch Lomond, and Lake Lochmere). Note that Lake Wheeler and Lake Benson should be added to this list even though these areas were not included in the WARP study.
- As an extension to the recommended methods of analysis listed above, **stream channel restoration activities should be implemented** in targeted areas and in conjunction with stormwater retrofit BMPs. Priority areas identified in the WARP report include Williams Creek from Gregson Drive to US 1, the portion of Swift Creek flowing through Lochmere Golf Club and Apex Branch between Parliament Place in Apex and MacKenan Drive in Cary.
- Implementation of additional efforts to **reduce nutrient and organic loading** including identification and elimination of illicit discharges; education of homeowners, commercial applicators, and other regarding the use of fertilizers; street sweeping; catch basin cleanout procedures; and the installation of additional BMPs targeting biological oxygen demand and nutrients.
- Regulation and enforcement of **post-construction stormwater controls** for all new development.
- Regulation and enforcement of **sediment and erosion control measures**, specifically in Apex and Cary to reduce the considerable sediment load to Lake Wheeler documented in the WARP report.
- Implementation of **watershed education programs** by local governments aimed at directing runoff to pervious areas, protecting riparian areas on ephemeral streams, replanting riparian vegetation when absent and reducing pesticide and fertilizer use.

4.3 Priority Sub-watersheds

Sub-watershed prioritization and ranking were presented in Section 3.4 and summarized in Tables 3-1 and 3-2. Based on available data, the analysis indicated two sub-watersheds to be of higher priority including:

- **4BX** (located in a highly developing area within Cary)
- **4E1** (located in a highly developing area within Apex)
- **4A1** (located in a highly developing area within Cary)
- **4DX** (located in a highly developing area within Cary)
- **4E2** (located in a highly developing area within Cary)

As new data and information is available, additional sub-watersheds may be targeted for watershed restoration.

4.4 Other General Recommendations

As indicated in the characterization and prioritization analysis presented in this report, the Swift Creek Watershed contains some critical natural resources that are being threatened by development. This fact is recognized by various agencies within the State of North Carolina as well as many environmental and citizen groups. Because of this, many of these organizations may be willing to assist EEP with restoration and preservation activities. Therefore it is recommended that EEP contact the following organizations to inquire about willingness to assist with field work activities and/or public outreach activities:

Neuse River Foundation – The foundation has an active network of volunteers that monitor streams and rivers in the Neuse River Basin. Swift Creek has an active "creek keeper" that provides some level of monitoring. Additional volunteers could potentially be trained to collect chemical monitoring samples or could be trained in physical stream assessments to cover more streams.

Lower Neuse Basin Association - This group historically has been more active in the nutrient trading piece of the NSW management strategy. However, they should be included in the request for help.

Triangle J COG - The COGs are a regional council established by the General Assembly in the 70's. Their focus has historically been on water supply. However, as the NPDES Phase II regulations came about, Triangle J COG began coordinating some aspects of program development, specifically the public education requirement. They have supported the Clean Water Education Partnership Program, which is a cooperative nonpoint source pollution education and awareness campaign involving many local governments (including those located in and around the Swift Creek Sub-basin).

North Carolina Ag Cooperative Service. This group does many stormwater-related activities and has many interns that could be employed to monitor streams.