Health Consultation

EXPOSURE INVESTIGATION REPORT

PCB Fish Tissue Sampling

LOWER NEUSE RIVER, WALNUT CREEK, AND ROCKY BRANCH

RALEIGH, NORTH CAROLINA

SEPTEMBER 29, 2008

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

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HEALTH CONSULTATION

EXPOSURE INVESTIGATION REPORT

PCB Fish Tissue Sampling

LOWER NEUSE RIVER, WALNUT CREEK, AND ROCKY BRANCH

RALEIGH, NORTH CAROLINA

Prepared By:

North Carolina Department of Health and Human Services
Occupational and Environmental Epidemiology Branch
Under Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

Executive Summary

Since 2003 fish advisories have been issued from Little Brier Creek to where Crabtree Creek enters the Neuse River. The fish consumption advisories were issued when polychlorinated biphenyls (PCBs), specifically elevated Aroclor 1260[1], were found in certain fish species. The location and dates of issuance of these fish advisories are shown below in Table 1. Sampling locations and sample data for historical samples are listed in Appendix B.

Table 1. Fish consumption advisories for PCBs issued for Little Brier Creek and Crabtree Creek since 2003. Advisories based on Aroclor 1260 analysis.

Location	Fish Advisory	Date of Advisory
Little Brier Creek	Do not eat any fish	2003
Brier Creek Reservoir	Do not eat any fish	2003
Brier Creek	Do not eat any fish	2004
Lake Crabtree	No carp or catfish	2004
Crabtree Creek (down stream from Lake Crabtree at Neuse)	Limit consumption of carp, catfish, & largemouth bass to 1 meal/month	2005, 2006
Crabtree Creek (upstream of Lake Crabtree)	Limit consumption of carp, catfish, & largemouth bass to 1 meal/month	2007

Note: No carp were sampled at the above locations and no other Aroclors were evaluated. The feeding habits of carp and Redhorse Suckers (also known as Notchlip Suckers) are similar to catfish so the PCB levels for carp and Redhorse Suckers are assumed to be similar to catfish.

This Exposure Investigation report describes fish sampling at several additional locations conducted in 2007 by the North Carolina Division of Public Health. In July 2007, fish tissue samples were collected by Mr. Jeff DeBerardinis with the North Carolina Division of Water Quality at six locations (see Figure 2 in Appendix A). Those locations included from Walnut Creek and Rocky Branch, which drain into the Neuse River, as well as from the Neuse River at Crabtree Creek to just upstream of Auburn-Knightdale Road. Rocky Branch drains into Walnut Creek and Walnut Creek drains into the Neuse River at approximately one and a half miles downstream of where Crabtree Creek enters the Neuse River. The locations selected for sampling included the following:

- Rocky Branch off of City Farm Road (300 meters upstream of the Rocky Branch and Walnut Creek confluence)
- Walnut Creek at S. Wilmington and Bluff Street (200 meters above Rocky Branch and Walnut Creek confluence and 7.5 miles upstream of Neuse River)
- Walnut Creek at Barwell Road (0.2 miles upstream from where Walnut Creek enters Neuse River)
- Neuse River at mouth of Crabtree Creek
- Neuse River at Poole Road
- Neuse River above Auburn-Knightdale Road

[1] Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor. For example, the name Aroclor 1254 means that the mixture contains approximately 54% chlorine by weight, as indicated by the second two digits in the name. http://www.atsdr.cdc.gov/toxprofiles/tp17.pdf

The North Carolina Division of Water Quality attempted to collect 6 to 10 bottom feeders (i.e., carp, catfish), 6 to 10 sunfish from these locations, and 6 to10 largemouth bass. No carp were sampled. The feeding habits of carp are similar to catfish so the PCB levels of carp are assumed to be similar to catfish. Fish were composited for analysis. Composite fish samples are samples where several fillets of one species are blended and analyzed.

Limiting consumption of some species of fish in areas sampled in July 2007 due to accumulated tissue levels of PCBs is recommended. Using the May 30, 2007 North Carolina Risk-Based Approach for PCB Fish Advisories, recommended meal limits varied for different species in different water bodies. The recommended fish consumption advisory limits for the areas sampled in July 2007 are summarized in Table 2 below. Individual sample data by fish species is listed in Table 3.

Table 2. PCB fish consumption advisory limit recommendations for Rocky Branch, Walnut Creek, and Neuse River locations sampled in July 2007.

Location	Fish Advisory Recommended Limited Consumption
Walnut Creek and Rocky Branch (just upstream of Neuse River)	• Do not eat more than one meal per month of bottom feeders (catfish, carp) • Do not eat more than one meal per week of all other fish (including sunfish and large mouth bass)
Neuse River (from Crabtree Creek to Auburn-Knightdale Road)	• Do not eat more than one meal per month of bottom feeders (catfish, carp)

Objectives and Rationale

The objective of this exposure investigation was to determine if PCB levels (as Aroclor 1260) in largemouth bass, bottom feeders (e.g., carp and catfish), and sunfish in Neuse River, Rocky Branch, and Walnut Creek pose a health hazard and if so, to expand the fish advisory and communicate health risk to fishermen who consume fish containing the PCBs.

In March 2006, a fish consumption advisory was issued for the lower Crabtree Creek after finding elevated Aroclor 1260 levels in catfish and largemouth bass. Additional fish tissue sampling was done in July 2006 along the lower Neuse River where Crabtree Creek enters the Neuse River to determine if the fish advisory should be expanded. 2006 fish sampling locations are noted in Figure 1, and historical sample data is summarized in Appendix B. The 2006 limited fish sampling data indicated that a fish advisory may be warranted. The 2007 exposure investigation broadened the 2006 data by creating a large enough number of samples for the three species of fish typically caught by anglers to determine if the current fish advisory needs to be expanded.

Background

From May 2003 to July 2006, fish samples were collected from Little Brier Creek to where Crabtree Creek enters the Neuse River. As a result of finding elevated PCB levels in several fish

species, the North Carolina Department of Health and Human Services (NC DHHS) issued fish consumption advisories for several water bodies. The state of North Carolina has placed an advisory against eating carp or catfish from Lake Crabtree or any species of fish from Little Brier Creek downstream of Brier Creek Parkway, tributaries to Little Brier Creek leading from the Ward Transformer NPL site, Brier Creek, and Brier Creek Reservoir. The state of North Carolina also advises that consumption of fish species other than carp or catfish from Lake Crabtree be limited to no more than 1 meal per month. The state of North Carolina also advises people to eat no more than one meal per month of carp, catfish, and largemouth bass from Crabtree Creek (both upstream and downstream of Lake Crabtree) (see Figure 2).

In March 2006, a fish consumption advisory was issued for the lower Crabtree Creek due to finding elevated Aroclor 1260 levels in catfish and largemouth bass. This area is routinely fished by local fishermen. The advisory issued for Crabtree Creek was "Limit consumption of carp, catfish, and largemouth bass from Crabtree Creek to no more than one meal per month. High levels of chemicals called PCBs have been found in carp, catfish, and largemouth bass from these waters." This advisory can be found at http://www.epi.state.nc.us/epi/fish/current.html. This advisory is an expansion of the previous advisory issued for the upper portion of Crabtree Creek from below Lake Crabtree to the Company Mill Trail crossing within William Umstead State Park.

In July 2006, additional fish tissue sampling was done along the lower Neuse River where Crabtree Creek enters the Neuse River to determine if the fish advisory should be expanded. The results of the sampling indicated that a fish consumption advisory for the Neuse River might be needed since one catfish had Aroclor 1260 levels at 0.32 mg/kg and a largemouth bass composite sample of two fish had levels at 0.11 mg/kg. This sampling was too limited to issue a fish consumption advisory and more sampling was needed to delineate a fish consumption advisory.

The surface waters sampled are fished regularly so there is an exposed population and immediate attention was needed to determine the threat to these fishermen. This exposure investigation addressed this data gap and impacted public health decision-making by providing the fish sampling results needed to determine the extent of the fish consumption advisory.

Methods

Exposure Investigation Design

During the summer months of 2007, the North Carolina Division of Water Quality made an attempt to collect bottom feeders such as carp or catfish (or Redhorse Suckers), largemouth bass, and sunfish from six locations along Rocky Branch, Walnut Creek, and the Neuse River (see Appendix C – Exposure Investigation Protocol). For this sampling, twelve (12) composite samples were collected for Aroclor 1260 analysis.

Target Population

The areas proposed for sampling is fished on a routine basis by fishermen. The fishermen may include women of childbearing age, children, and general public. Both subsistence and recreational fishing are conducted in the areas proposed for sampling. The preferred catch includes catfish and largemouth bass.

Sampling of Biota

Data Collection/Sampling Procedures

The North Carolina Division of Water Quality made an attempt to collect 6-10 bottom feeders (i.e., carp, catfish, redhorse suckers) and 6-10 largemouth bass at six locations (see Table 3 for fish species identification and composite make-up).

Those locations include:

- Rocky Branch off of City Farm Road (300 meters upstream of the Rocky Branch and Walnut Creek confluence)
- Walnut Creek at S. Wilmington and Bluff Street (200 meters above Rocky Branch and Walnut Creek confluence and 7.5 miles upstream of Neuse River)
- Walnut Creek at Barwell Road (0.2 miles upstream from where Walnut Creek enters Neuse River)
- Neuse River at mouth of Crabtree Creek
- Neuse River at Poole Road
- Neuse River above Auburn-Knightdale Road

Laboratory Analytic Procedures

SGS Labs used USEPA method 8082 for Aroclor 1260 analysis for each composited fish sample.

Data Analysis Procedures

The 12 composite samples were analyzed for Aroclor 1260 using USEPA Method 8082 (SW-846). Reporting limits were below the 0.050 mg/kg action level for issuing fish consumption advisories in NC. The results were reported on a wet weight basis and no lipid normalization was used since the purpose of this sampling is to determine if the levels are elevated enough to warrant expansion of the fish consumption advisory along the Neuse River, Walnut Creek, and Rocky Branch Creek. Lipid normalization would only be needed to compare levels from location to location to determine if the reason for the elevated levels is due to fattier fish at one location versus the other or another possible source is present if the % lipids are the same among locations.

A total of six stations were sampled along Rocky Branch, Walnut Creek, and the Neuse River. If the wet weight Aroclor 1260 level for a composite of the fillets falls within the levels below, then the following advice is given to women of childbearing age, children, and general public:

PCB concentration mg/kg (ppm)	Consumption advisory
<0.05	unlimited consumption
0.05 to 0.10	limit to one meal per week
0.11 to 0.50	limit to one meal per month
>0.50	do not eat

[1] NC DHHS 2007. As total PCB concentration in wet weight fish tissue.

Table 3 summarizes Aroclor 1260 data and fish tissue composite make-up for the samples collected in July 2007. At some of the locations top predator largemouth bass were not able to be collected. At these locations sunfish species were collected. Sunfish species represent insectivores, a lower trophic level than the piscivore largemouth bass. Aroclor 1260 concentrations in insectivore sunfish were considered to represent minimum piscivore largemouth bass concentrations in these waters.

Table 3. Aroclor 1260 Fish Tissue Concentrations from Brier Creek Reservoir to the Neuse River. Samples collected July 2007

Location	Aroclor 1260 average tissue concentration
Rocky Branch at City Farm Road (approximately 7.5 miles upstream from Neuse River)	**Redbreast Sunfish** 0.07 mg/kg (composite of 10 fish) **Largemouth bass were not found on the day sampled but PCB levels would be expected to be equal to or possibly higher than the levels observed in the Redbreast Sunfish.**
Walnut Creek at S. Wilmington and Bluff Streets (approximately 7.5 miles upstream from Neuse River)	**Notchlip Redhorse (bottom feeder)** 0.55 mg/kg (composite of 2 fish) **Redbreast Sunfish** 0.16 mg/kg (composite of 8 fish) **Largemouth bass were not found on the day sampled but PCB levels would be expected to be equal to or possibly higher than the levels observed in the Redbreast Sunfish.**
Walnut Creek at Barwell Road (0.2 miles upstream from Neuse River)	**Flathead Catfish** 0.08 mg/kg (1 fish) **Bluegill Sunfish** 0.09 mg/kg (composite of 4 fish) **Largemouth bass were not found but PCB levels would be expected to be equal to or possibly higher than the levels observed in the Bluegill Sunfish.**
Neuse River at mouth of Crabtree Creek and below Milburnie Dam (approximately 1.3 upstream of Walnut Creek)	**Channel Catfish** 0.13 mg/kg (composite of 8 fish) **Largemouth Bass** 0.05 mg/kg (composite of 2 fish)
Neuse River at Poole Road (1 mile downstream of Crabtree Creek)	**Flathead Catfish** 0.15 mg/kg (composite of 4 fish) **Channel Catfish** 0.20 mg/kg (composite of 2 fish) **Largemouth Bass** 0.03 mg/kg (1 fish (1 pound))
Neuse River above Auburn-Knightdale Road (3.6 miles downstream of Crabtree Creek)	**Channel Catfish** 0.34 mg/kg (composite of 3 fish) **Largemouth Bass** 0.03 mg/kg (composite of 3 fish ranging from 1.5 to 3.4 lbs)[1]

[1] Size variation of fish making up composite exceeds standard operating procedure guidelines. Guideline disregarded due to limited number of fish caught at this location.

Discussion

Fish collected in July 2007 showed elevated PCB levels (as Aroclor 1260) along Rocky Branch, Walnut Creek, and the Neuse River; therefore, fish consumption advisories are needed for

certain areas. For Walnut Creek and Rocky Branch, the recommended fish advisory is to limit consumption of carp and catfish to no more than one meal per month and limit consumption of all other fish (including but not limited to sunfish and largemouth bass) to no more than one meal per week from these waters. For the Neuse River from below Crabtree Creek to Auburn-Knightdale Road the recommended fish advisory is to limit consumption of carp and catfish to no more than one meal per month.

To make these determinations, we used the May 30, 2007 North Carolina DHHS Risk-Based Approach for PCB Fish Advisories (DHHS 2007). The recommended fish meal limits are determined using the non-cancer reference dose of 0.00002 mg/kg-day. Meal limits varied for different species in different water bodies.

For Walnut Creek, the fish tissue concentrations and corresponding recommended meal limits varied for bottom feeders. For instance, a no consumption meal limit is advised for Walnut Creek at S. Wilmington and Bluff Street, but a one meal per week limit is advised at Barwell Road, which is approximately seven miles downstream of S. Wilmington and Bluff Street. Based on this data, a one meal per month meal limit would be recommended for bottom feeders for this seven mile stretch of water which is between the recommended meal limits calculated for the two most extreme points sampled. Although no bottom feeders were sampled along Rocky Branch, fish from Walnut Creek could swim up to Rocky Branch. Therefore, the recommended meal limit of one meal per month for bottom feeders should be issued for the Rocky Branch.

Likewise, the fish tissue concentrations and corresponding recommended meal limits varied for sunfish for both Walnut Creek and Rocky Branch. For instance, for Rocky Branch at City Farm Road, the recommended meal limit for sunfish was calculated to be one meal per week whereas Walnut Creek at S. Wilmington and Bluff St. was calculated to be one meal per month. At Walnut Creek at Barwell Road, a one meal per week is the recommended meal limit. At the two most extreme points sampled, the recommended meal limits for sunfish (for Rocky Branch and for Walnut Creek at Barwell Road) is one meal per week. Therefore, the recommended meal limit for sunfish from Rocky Branch and Walnut Creek is one meal per week.

The PCB levels found in sunfish are expected to be similar to other fish (such as crappie, largemouth bass) except for bottom feeders. No largemouth bass were found on the day sampled along Rocky Branch and Walnut Creek. In the absence of PCB fish sampling data for other fish that may be found in Walnut Creek and Rocky Branch, the recommended meal limit for sunfish of one meal per week is also the recommended meal limit for other fish like largemouth bass found in Rocky Branch and Walnut Creek.

PCB levels found in largemouth bass along the Neuse River just below Crabtree Creek to Auburn-Knightdale Road were below the advisory level of 0.05 mg/kg; therefore, no fish advisory is needed for largemouth bass along the Neuse River. The PCB levels would be expected to be higher in largemouth bass than in sunfish. In the absence of sunfish data along the Neuse River, the largemouth bass data were used to evaluate the levels that may be present in sunfish.

Limitations

Only twelve composited fish tissue samples were collected. It is assumed that the fish tissue Aroclor 1260 concentrations for the twelve composited fish tissue samples are representative of PCB concentrations in fish that may be caught and consumed by the local fishermen.

Child Health Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children are shorter than are adults; this means they breathe dust, soil, and vapors close to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. The upper portion of the Neuse River, Walnut Creek, and Rocky Branch are frequently fished by men, women, and children. The fish advisories are needed to better inform those that do frequently fish from these areas so measures can be taken to prevent adverse health effects from occurring due to consumption of fish over the recommended meal limits.

Conclusions and Recommendations

- PCB levels in some types of fish sampled during this exposure investigation are a public health hazard if eaten frequently. Therefore, fish consumption advisories are warranted for Rocky Branch, Walnut Creek and a portion of the Neuse River.
- For Walnut Creek and Rocky Branch, the recommended fish advisory is to limit consumption of carp and catfish to no more than one meal per month and limit consumption of all other fish (including but not limited to sunfish and largemouth bass) to no more than one meal per week from these waters.
- For the Neuse River from below Crabtree Creek to Auburn-Knightdale Road the recommended fish advisory is to limit consumption of carp and catfish to no more than one meal per month.

Public Health Action Plan

- The State Health Director within the NC Division of Public Health will issue fish consumption advisories for Rocky Branch, Walnut Creek, and a portion of the Neuse River.
- Include these advisories on the NC Division of Public Health website and issue a news release.

Authors, Technical Advisors

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NC Occupational and Environmental Epidemiology Branch
NC Department of Health and Human Services

References:

North Carolina Risk - Based Approach for PCB Fish Advisories, Occupational and Environmental Epidemiology Branch, NC Department of Health and Human Services, May 30, 2007.

Standard Operating Procedures for Fish Tissue Assessments, June 2006. NC Department of Environment and Natural Resources, Division of Water Quality. http://h2o.enr.state.nc.us/esb/BAUwww/FinalNewSOPv2.pdf

NC Superfund Section letter to EPA March 30, 2006 Combined Preliminary Assessment/Site Inspection for Electric Motor & Transformer at 1900 South Saunders Street, Raleigh, NC.

NC Superfund Section letter to EPA March 30, 2006 Pre-CERCLIS Site Screening, South Dawn St. Jamaica Driver Transformer Sites, Raleigh, NC.

2004 – 2007 Risk Assessments and Fish Advisory Language for Surface Waters Surrounding Lake Crabtree. March 12, 2007. Medical Evaluation and Risk Assessment Unit, NC Department of Health and Human Services

CERTIFICATION

This Exposure Investigation on PCB Fish Tissue Sampling was prepared by the North Carolina Division of Public Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the report was written. Editorial review was completed by the cooperative agreement partner.

_____

Jennifer A. Freed
Technical Project Officer
Division of Health Assessment and Consultation (DHAC)
ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation, and concurs with its findings.

_____

Alan Yarbrough
Team Leader,
CAT, CAPEB, DHAC, ATSDR

Appendix A

Figures (1-2)

Figure 1. Map of July 2006 fish tissue sampling locations.

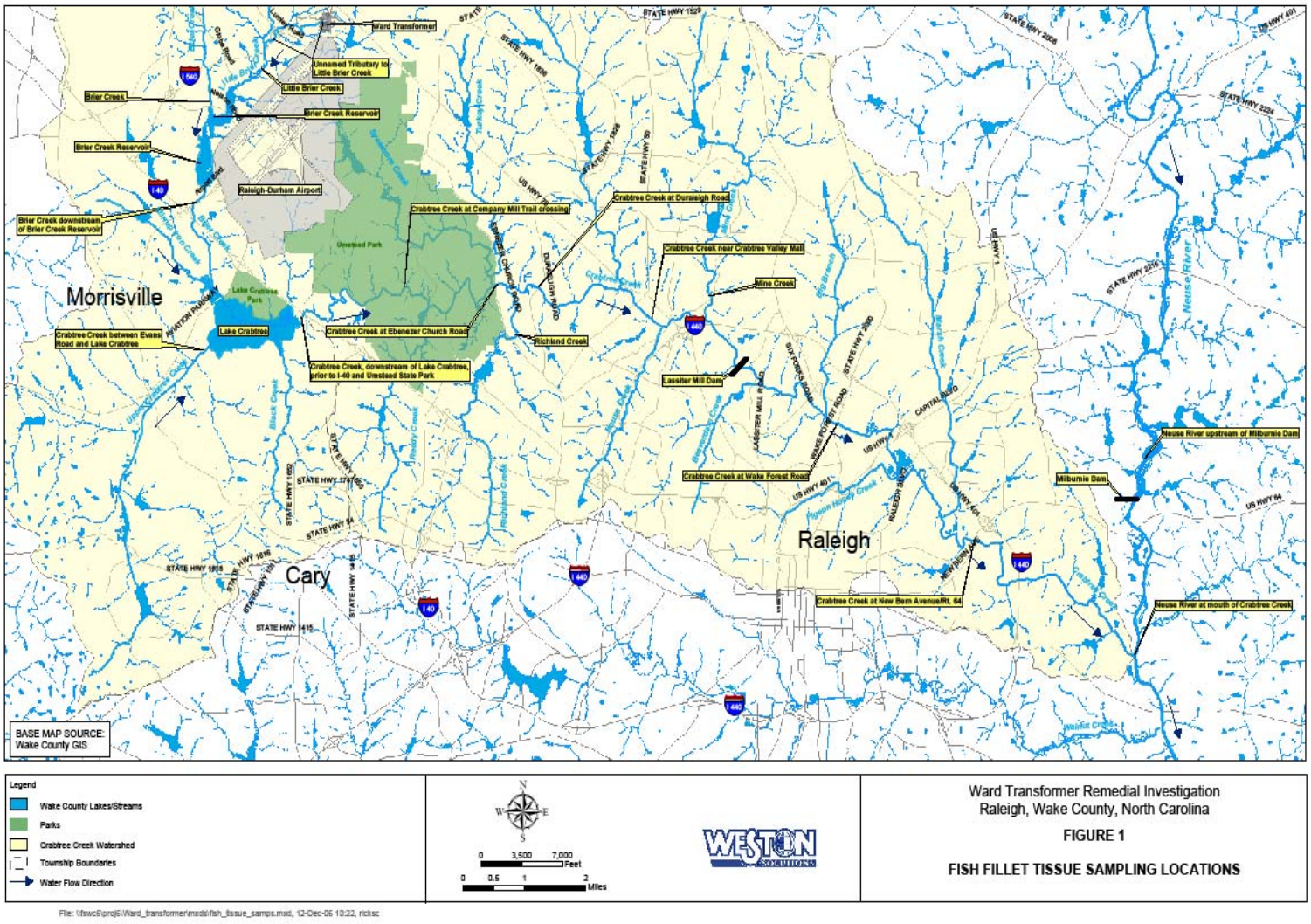
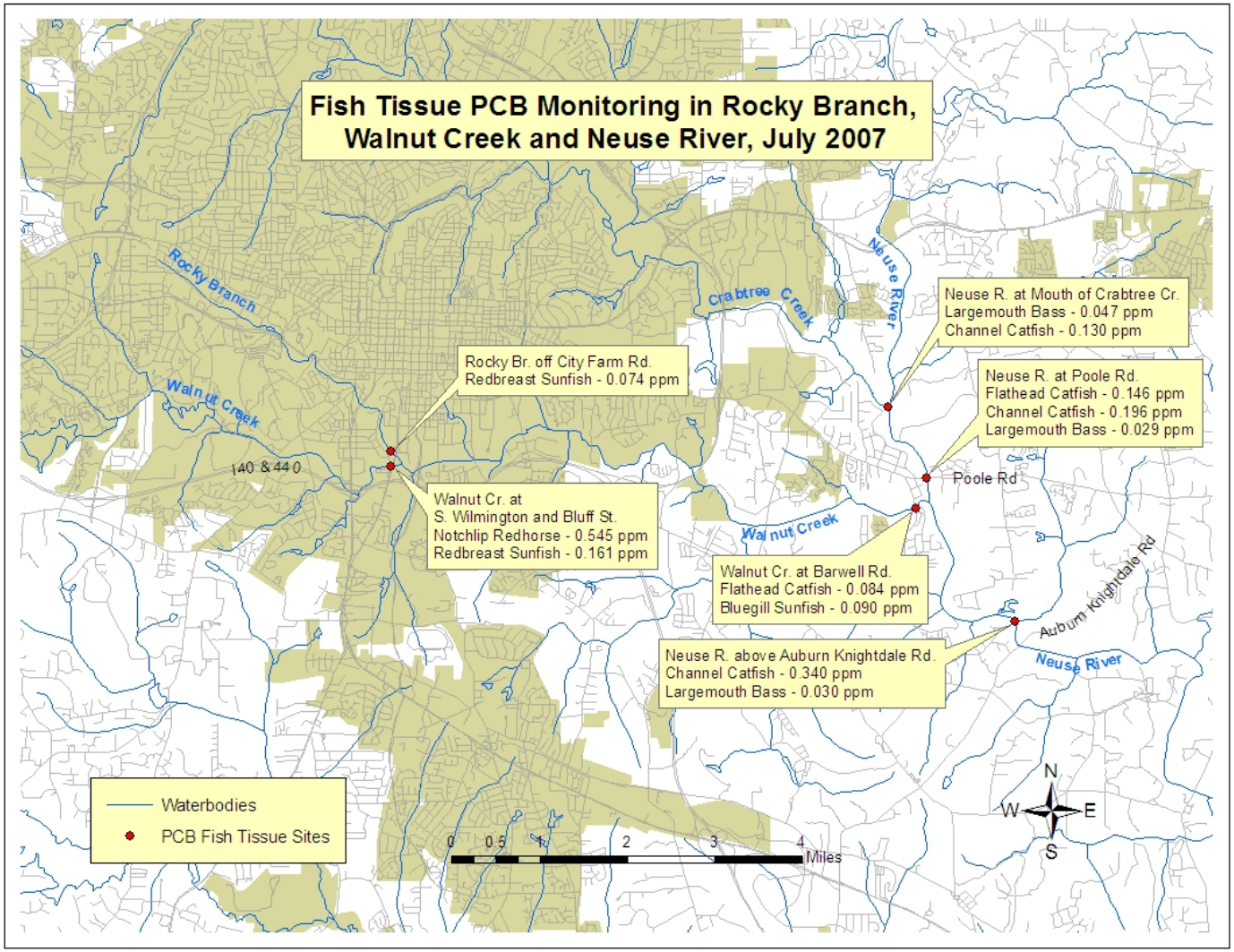


Figure 2. Map of July 2007 PCB fish tissue sampling locations.



Appendix B

Historical Sampling Events

Aroclor 1260 (PCB) Fish Tissue Levels From Brier Creek Reservoir to the Neuse River, 2003-2007

Location – Date of sampling	Average PCB Fish Fillet Sample Results (Number of Composites and Number of Fish per Composite)
Brier Creek Reservoir (downstream of Little Brier Creek, and upstream of Brier Creek) May 2003, November **2003**	**Catfish** Aroclor 1260 1.0 mg/kg (2 composites of 3 to 4 fish per composite) **Largemouth bass** Aroclor 1260 0.65 mg/kg (1 composite of 4 fish) **Sunfish** Aroclor 1260 0.22 mg/kg (1 composite of 5 fish)
Brier Creek (downstream of Brier Creek Reservoir)	**No fish samples collected**
Lake Crabtree – November **2003**	**Catfish** Aroclor 1260 1.2 mg/kg (3 composites of 3 to 4 fish per composite) **Largemouth bass** Aroclor 1260 0.25 mg/kg (average of 2 composites of 2 to 3 fish per composite) **Sunfish** Aroclor 1260 0.29 mg/kg (average of 3 composites of 5 fish per composite)
Crabtree Creek Just Below Lake Crabtree prior to William Umstead State Park– November **2004**	**Catfish** Aroclor 1260 0.18 mg/kg (1 composite of 3 fish) **No largemouth bass found** **Sunfish** Aroclor 1260 Not detected (2 composites of 3 fish each)
Crabtree Creek below Lake Crabtree at Company Mill Trail crossing within William Umstead State Park – August and September 2005	**Catfish** Aroclor 1260 0.340 mg/kg (1 composite of 5 fish) **Largemouth bass** Aroclor 1260 0.160 mgkg (1 composite of 5 fish) **Sunfish** Aroclor 1260 Not detected (1 composite of 5 fish)
Crabtree Creek below Lake Crabtree in the southeastern corner of William Umstead State Park at Ebenezer Church Road – November 2004	**No catfish or largemouth bass found** **Sunfish** Aroclor 1260 0.033 mg/kg (1 composite of 5 fish)
Crabtree Creek at Duraleigh Road – August and September 2005	**Catfish** Aroclor 1260 0.250 mg/kg (1 composite of 5 fish) **Largemouth bass** Aroclor 1260 0.06 mg/kg (1 composite of 5 fish
Crabtree Creek near Crabtree Valley Mall – August and September 2005	**Catfish** Aroclor 1260 0.110 mg/kg (1 composite of 5 fish)

Location – Date of sampling	Average PCB Fish Fillet Sample Results (Number of Composites and Number of Fish per Composite)
	Largemouth bass Aroclor 1260 0.180 mg/kg (1 composite of 4 fish)
Crabtree Creek at Wake Forest Road – August and September 2005	**Catfish** Aroclor 1260 0.170 mg/kg (average of 2 composites of 7 fish for each composite) **No largemouth bass found**
Crabtree Creek Near New Bern Avenue (near a large wetland area located downstream of Capital Blvd which was suspected of being a large sediment trap and thus an area with potentially elevated PCB levels in sediment and fish) – **July 2006**	**Flathead Catfish** Aroclor 1260 0.05 mg/kg (1 fish) **Largemouth bass** Aroclor 1260 Not detected (1 fish)
Tributaries to Crabtree Creek (downstream of Lake Crabtree - Two of the larger more accessible creeks that lead into Crabtree Creek **Richland Creek June 2006** **Mine Creek June 2006**	**Flat Bullhead Catfish** Aroclor 1260 Not detected (composite of 2 fish) **Largemouth bass** Aroclor 1260 Not detected (1 fish) **V-Lip Redhorse (bottom feeder like catfish)** Aroclor 1260 Not detected (composite of 3 fish) **Largemouth bass** Aroclor 1260 Not detected (1 fish) **Yellow Bullhead Catfish** Aroclor 1260 Not detected (composite of 2 fish)
Neuse River Above Milburnie Dam (not impacted by contamination in Crabtree Creek) (Portion of the river sampled to determine typical PCB fish tissue levels for creeks located near but not impacted by PCB contamination from Crabtree Creek) **July 2006**	**Notchlip Redhorse (bottom feeder like catfish)** Aroclor 1260 Not detected (composite of 6 fish) **Largemouth bass** Aroclor 1260 Not detected (composite of 2 fish)
Neuse River at mouth of Crabtree Creek and below Milburnie Dam (approximately 1 mile upstream of where Walnut Creek enters the Neuse River) **July 2006**	**Flathead Catfish** (Flathead Catfish tend to have higher levels than Channel or White Catfish due to different feeding habits) Aroclor 1260 0.32 mg/kg (1 fish) **Channel Catfish** Aroclor 1260 Not detected (composite of 2 fish) Largemouth bass Aroclor 1260 0.11 mg/kg (composite of 2 fish)
Crabtree Creek (upstream of Lake Crabtree between Lake Crabtree and Evans Road) July 2006 Lake Crabtree is under the fish advisory of "Do not eat carp/catfish and 1 meal a month for all other fish." Since the fish that are under an	**Only White Catfish Were found. No Flathead Catfish were found which tend to have higher levels than White Catfish so advisory needs to be one meal per month** Aroclor 1260 0.06 mg/kg (composite of 6 fish)

Location – Date of sampling	Average PCB Fish Fillet Sample Results (Number of Composites and Number of Fish per Composite)
advisory for Lake Crabtree could swim into this portion of Crabtree Creek, these composites are needed to determine if the fish advisory should extend to this portion of Crabtree Creek	**Largemouth bass** Aroclor 1260 0.17 mg/kg (composite of 5 fish) **Black Crappie** Aroclor 1260 Not detected (1 fish)
Neuse River at mouth of Crabtree Creek and below Milburnie Dam July 2007 (approximately 1.3 upstream of where Walnut Creek enters the Neuse River)	**Channel Catfish July 2007** Aroclor 1260 0.130 mg/kg (composite of 8 fish) **Largemouth Bass July 2007** Aroclor 1260 0.0466 mg/kg (composite of 2 fish)
Neuse River at Poole Road July 2007 (1 mile from where Crabtree Creek enters the Neuse River)	**Flathead Catfish** Aroclor 1260 0.146 mg/kg (composite of 4 fish) **Channel Catfish** Aroclor 1260 0.196 mg/kg (composite of 2 fish) **Largemouth Bass** Aroclor 1260 0.0287 mg/kg (1 1 lb fish)
Neuse River above Auburn-Knightdale Road July 2007 (3.6 miles from where Crabtree Creek enters the Neuse River)	**Channel Catfish** Aroclor 1260 0.340 mg/kg (composite of 3 fish) **Largemouth Bass** Aroclor 1260 0.030 mg/kg (composite of 3 fish ranging from 1.5 to 3.4 lbs)
Rocky Branch on City Farm Road July 2007 (approximately 7.5 miles from where Walnut Creek enters the Neuse River)	**Redbreast Sunfish** Aroclor 1260 0.0737 mg/kg (composite of 10 fish) **Largemouth bass were not found on the day sampled but PCB levels would be expected to be equal to or possibly higher than the levels observed in the Redbreast Sunfish.**
Walnut Creek on S. Wilmington and Bluff Street July 2007 (approximately 7.5 miles from where Walnut Creek enters the Neuse River)	**Redhorse Sucker (bottom feeder)** Aroclor 1260 0.545 mg/kg (composite of 2 fish) **Redbreast Sunfish** Aroclor 1260 0.161 mg/kg (composite of 8 fish) **Largemouth bass were not found on the day sampled but PCB levels would be expected to be equal to or possibly higher than the levels observed in the Redbreast Sunfish.**
Walnut Creek on Barwell Road July 2007 (0.2 miles from where Walnut Creek enters the Neuse River)	**Flathead Catfish** Aroclor 1260 0.0842 mg/kg (1 fish) **Bluegill Sunfish** Aroclor 1260 0.0899 mg/kg (composite of 4 fish) **Largemouth bass were not found but PCB levels would be expected to be equal to or possibly higher than the levels observed in the Bluegill Sunfish.**

Appendix C

Exposure Investigation Protocol for PCB Fish Tissue Sampling for Lower Neuse River, Walnut Creek, and Rocky Branch Creek, Raleigh, North Carolina

Exposure Investigation Protocol for
PCB Fish Tissue Sampling for Lower Neuse River, Walnut Creek, and Rocky Branch Creek, Raleigh, North Carolina

March 22, 2007

Cost recovery # A0EB zero

Prepared by

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Under Cooperative Agreement with
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I. PROJECT OVERVIEW

i. Purpose

The exposure investigation is designed to provide critical missing data that will allow an evaluation of the exposure to eating fish contaminated with polychlorinated biphenyls (PCBs). In March 2006, a fish consumption advisory was issued for the lower Crabtree Creek after finding elevated Aroclor 1260 levels in catfish and largemouth bass. Additional fish tissue sampling was done in July 2006 along the lower Neuse River where Crabtree Creek enters the Neuse River to determine if the fish advisory should be expanded (see Figure 1). The limited fish sampling indicates that a fish advisory may be warranted. This exposure investigation would expand on that July data by creating a large enough number of samples for the two species of fish typically caught by anglers and determine if the current fish advisory needs to be expanded.

ii. Investigators and collaborators

Agency for Toxic Substances and Disease Registry	Funding for Aroclor 1260 fish analysis
Dr. Mina Shehee, Coordinator	Health Consultation, Health Assessment, Generate protocol/reports, Education Program
Dr. Luanne K. Williams, Toxicologist	Risk Assessment
NC Occupational and Environmental Epidemiology Branch	Issue fish consumption advisory Communicate advisory to public
Mr. Mark Hale Mr. Jeff DeBerardinis NC Division of Water Quality	Fish sampling for 12 composite samples
Mr. Matt Burns SGS Environmental Inc. Wilmington, NC	Aroclor 1260 analysis

II. INTRODUCTION

i. Background

The Ward Transformer NPL site is an operating transformer recycling facility located on Mount Herman Road in Raleigh, North Carolina. The facility is in a mostly industrial area close to U.S. 70, I-540, and the Raleigh-Durham International Airport. The facility has been in operation since about 1964. Before 1977, when the use of PCBs in transformer oil was discontinued, PCBs contaminated soils on the site and surface water and stream sediments downstream of the site. From May 2003 to July 2006, fish samples were collected downstream of the facility. As a result, the North Carolina Department of Health and Human Services (NC HHS) issued fish consumption advisories for water bodies approximately 27 miles downstream of this facility (see figure 1). The state of North Carolina has placed an advisory against eating carp or catfish from Lake Crabtree or any species of fish from Brier Creek, Brier Creek Reservoir, Little Brier Creek downstream of Brier Creek Parkway, and the tributary leading from the Ward Transformer site. The state of North Carolina also advises that consumption of fish species other than carp or catfish from Lake Crabtree be limited to no more than 1 meal per month. The state of North Carolina also advises people to eat no more than one meal per month of carp, catfish, and largemouth bass from Crabtree Creek (both upstream and downstream of Lake Crabtree) (see Figure 1).

According to Superfund reports dated March 30, 2006, Ward Transformer may have had other facilities located along Walnut and Rocky Branch Creek. Those facilities may have had similar practices to the facility in Raleigh (i.e., reconditioning transformers) and runoff from these facilities may have occurred along Walnut Creek and Rocky Branch Creek which lead into the upper Neuse River (see Figure 2).

In March 2006, a fish consumption advisory was issued for the lower Crabtree Creek due to finding elevated Aroclor 1260 levels in catfish and largemouth bass. This area is routinely fished by local fishermen. The advisory issued for Crabtree Creek was "Limit consumption of carp, catfish, and largemouth bass from Crabtree Creek to no more than one meal per month. High levels of chemicals called PCBs have been found in carp, catfish, and largemouth bass from these waters." This advisory can be found at http://www.epi.state.nc.us/epi/fish/current.html. This advisory is an expansion of the previous advisory issued for the upper portion of Crabtree Creek from below Lake Crabtree to the Company Mill Trail crossing within William Umstead State Park.

In July 2006, additional fish tissue sampling was done along the lower Neuse River where Crabtree Creek enters the Neuse River to determine if the fish advisory should be expanded. The results of the sampling indicate that a fish consumption advisory may be needed for this portion of the Neuse River. One catfish had Aroclor 1260 levels at 0.32 mg/kg and a largemouth bass composite sample of two fish had levels around 0.11 mg/kg. Based on these levels, a one meal per month fish consumption advisory would be needed. However, the sampling is too limited to issue a fish consumption advisory but enough to warrant concern and more sampling is needed to delineate a fish consumption advisory.

NC DHHS requested that the U.S. Environmental Protection Agency (EPA) conduct additional fish sampling determine the extent of the fish contamination. EPA declined to sample because

their sediment sampling in the area showed low concentrations of PCBs, and they couldn't justify fish sampling.

The surface waters proposed to be sampled are fished regularly by fishermen so there is an exposed population and immediate attention is needed to determine the threat to these fishermen. This exposure investigation will address this data gap and impact public health decision-making by providing the fish sampling results needed to determine the extent of the fish consumption advisory. The sites being proposed for sampling are just downstream of three sites that reconditioned transformers containing Aroclor 1260. These three sites have been investigated by the North Carolina Superfund Section, however, no fish tissue sampling was conducted.

(i) ii. Justification for the exposure investigation

The exposure investigation will provide the critical data needed to determine the threat to the fishermen that eat fish from these waters and will also determine where the fish consumption advisory should be delineated and if appropriate health education outreach should be conducted.

iii. Objectives

To determine if PCB levels (Aroclor 1260) levels in largemouth bass and catfish in Neuse River, Rocky Branch Creek, and Walnut Creek pose a health hazard and if so, to expand the fish advisory and communicate health risk to fishermen who consume fish containing the PCBs.

III. METHODS

i. Exposure investigation design

During the summer months of 2007, the North Carolina Division of Water Quality will attempt to collect bottom feeders such as carp or catfish and largemouth bass from six locations along Rocky Branch Creek, Walnut Creek, and the Neuse River. This sampling is contingent on the availability of staff resources and accessibility. Sampling will take place near where three former transformer reconditioning sites may have impacted those waterways.

Previous sampling for PCBs and dioxin-like PCB congeners in Crabtree Creek and water bodies downstream of the Raleigh Ward facility only had elevated levels of Aroclor 1260. For this sampling, twelve (12) composite samples are proposed for Aroclor 1260 analysis.

ii. Exposure investigation population

The areas proposed for sampling is fished on a routine basis by fishermen. The fishermen may include women of childbearing age, children, and general public. Both subsistence and recreational fishing are conducted on a weekly basis for the areas proposed for sampling. The preferred catch includes catfish and largemouth bass.

iii. Data collection/sampling procedures/QA

The North Carolina Division of Water Quality will attempt to collect 6-10 bottom feeders (i.e., carp, catfish) and 6-10 largemouth bass at six locations (depending on resource constraints and accessibility).

Those locations may include:

- the mouth of Crabtree Creek (where Crabtree Creek enters the Neuse River),
- along Neuse River near Poole Road at 1.1 miles below Crabtree Creek,
- along Neuse River near Auburn Knightdale Road at 3.6 miles below Crabtree Creek,
- along Walnut Creek just below former transformer facility location at 1900 South Saunders Street,
- along Walnut Creek at an accessible, fished location prior to Neuse River, and
- along Rocky Branch Creek just downstream of two former transformer facilities at 418 South Dawson Street and former intersection of South Saunders Street and Jamaica Drive.

For the Neuse River, a total of six composites of at least six to 10 fish for each composite would be needed (3 catfish composite samples and 3 largemouth bass composite samples). The North Carolina Division of Water Quality has agreed to collect bottom feeders such as catfish or carp and largemouth bass at the mouth of Crabtree Creek on the Neuse River, Poole Road (1 mile from the mouth of Crabtree Creek), and Auburn-Knightdale Road (3.6 miles from the mouth of Crabtree Creek) access areas along the Neuse River. At each sampling station, there will be one bottom feeder composite sample (catfish or carp) and one largemouth bass composite sample for a total of six composites for this portion of the Neuse River. The North Carolina Division of Water Quality will attempt to collect 6-10 individual fish per composite.

In addition to these samples, the North Carolina Division of Water Quality has conditionally agreed to collect fish tissue samples from other former Ward transformer sites located along two different water bodies that eventually connect to the Neuse River (river where fish were previously collected summer 2006 that showed elevated PCB levels in catfish and largemouth bass). These three former transformer reconditioning facilities were located at 418 South Dawson Street, former intersection of South Saunders Street and Jamaica Drive, and 1900 South Saunders Street. North Carolina Division of Water Quality will attempt to collect 6-10 largemouth bass and 6-10 bottom feeders (i.e., carp or catfish) from one location just downstream of the two former Ward sites located on Rocky Branch Creek, one location just downstream of the Ward facility located on Walnut Creek, and another accessible, fished location along Walnut Creek prior to entering the Neuse River. A total of six composite samples will then be needed for these water bodies which would bring the total composites needed to 12. Additional sampling in Walnut Creek and Rocky Branch Creek by the North Carolina Division

of Water Quality personnel is contingent on the availability of staff resources required for sample collection and processing as well as accessibility along the Walnut Creek watershed.

Fish must be of legal limit. As per USEPA's guidance, the smallest fish in the composite sample must be at least 75% of the length of the largest fish. More than five fish per species will be collected in order to meet this requirement.

North Carolina Division of Water Quality Standard Operating Procedures will be used in proper chain of custody, quality control, and in collecting, and preparing samples for pickup by the SGS laboratory in Wilmington, NC.

Fish sample preparation and Aroclor 1260 analysis for all composite samples will be conducted at SGS laboratory. The fish will be filleted and ground up.

iv. Data analysis and interpretation

The 12 composite samples will be analyzed for Aroclor 1260 using EPA Method 8082 (SW 846). The detection limits will be below the 0.050 mg/kg action level for issuing fish consumption advisories. The results will be reported on a weight basis and no lipid normalization is needed since the purpose of this sampling is to determine if the levels are elevated enough to warrant expansion of the fish consumption advisory along the Neuse River, Walnut Creek, and Rocky Branch Creek. Lipid normalization would only be needed to compare levels from location to location to determine if the reason for the elevated levels is due to fattier fish at one location versus the other or another possible source is present if the % lipids are the same from location to location.

A total of six stations are being proposed for sampling which represents a different section Rocky Branch Creek, Walnut Creek, and Neuse River. If the wet weight Aroclor 1260 level for a composite of the fillets falls within the levels below, then the following advice is given to women of childbearing age, children, and general public:

<0.05 mg/kg no advisory issued
0.05 mg/kg to 0.10 mg/kg advice is one meal per week
0.11 to 0.50 advice is one meal per month
>0.50 mg/kg advice is do not eat

v. Records management

In the field, a record will be kept for each fish caught and tagged with a chain-of-custody label as mentioned in the NC Division of Water Quality SOP manual. The record and the chain of custody tag will include date caught, location of where the fish was caught, and length of the

fish. Only fish caught in one location will be composited, and those fish to be composited will be indicated on the field record. The field record and the chain-of-custody tag will use indelible ink.

vi. Fieldwork coordination

The North Carolina Division of Water Quality will conduct the fish tissue sampling. SGS Environmental Inc. has a courier from Raleigh to Wilmington so the fish tissue samples will be carried to Wilmington on ice using this courier service. The sampling will take place summer 2007.

IV. COMMUNITY INVOLVEMENT

Fish consumption advisories are shared with the public through website, signs, press releases, and local fishing areas. This information is disclosed to public when requested as well.

V. RISK/BENEFIT INFORMATION

The benefits include knowing what the health threat or risks are to people who eat fish. The risk would be reduced use of waters as a fishing resource, particularly to people who subsist on fish.

VI. INFORMED CONSENT PROCEDURES

Human subjects are not a part of this EI. Fish samples will be collected in public waterways.

VII. PROCEDURES FOR NOTIFYING PARTICIPANTS OF INDIVIDUAL AND OVERALL RESULTS

Advisory information will be disclosed to the public through website, signs, press releases and local fishing areas.

(ii) **VIII.** *ASSURANCES OF CONFIDENTIALITY*

Reports will not include any personal identifiers.

VIII. ESTIMATED TIME FRAME

The fish tissue samples, results, risk assessment, health consultation, and possible advisory will be summer 2007.

Beginning the Summer 2007:

Fish sampling	1 month
Analysis	2 months
Risk assessment	1 month
EI Final Report	1 month
Health Consult	1 month
Total Project:	5 months

IX. PROJECTED BUDGET AND SOURCE OF FUNDING

An estimated $600.00 is needed for Aroclor 1260 analysis. The analysis has an estimated cost of $50.00 per composite x 12 = $600.00.

X. REFERENCES

NC Division of Water Quality, June 2006 Standard Operating Procedures

Williams LK, Risk Assessments and Fish Advisory Language for Surface Waters Surrounding Lake Crabtree

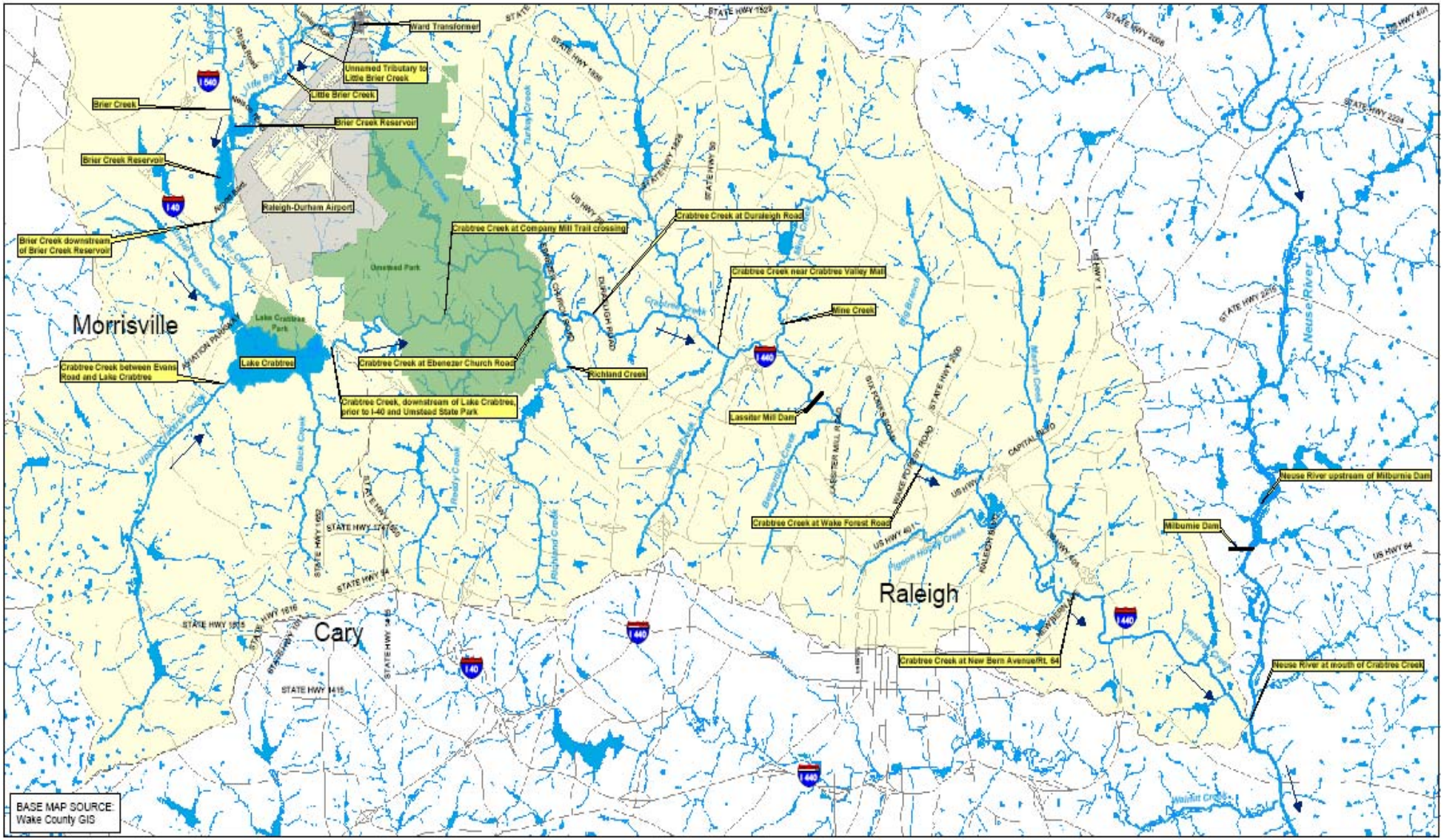
NC Superfund Section letter to EPA March 30, 2006 Combined Preliminary Assessment/Site Inspection for Electric Motor & Transformer at 1900 South Saunders Street, Raleigh, NC.

NC Superfund Section letter to EPA March 30, 2006 Pre-CERCLIS Site Screening, South Dawn St./Jamaica Driver Transformer Sites, Raleigh, NC.

XI. APPENDICES

See maps.

Figure 1. Map of Surface Waters from Little Brier Creek to Crabtree Creek



Legend
- Wake County Lakes/Streams
- Parks
- Crabtree Creek Watershed
- Township Boundaries
- Water Flow Direction

0 3,500 7,000 Feet
0 0.5 1 2 Miles

Ward Transformer Remedial Investigation
Raleigh, Wake County, North Carolina

FIGURE 1

FISH FILLET TISSUE SAMPLING LOCATIONS

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Figure 2. Map of July 2007 PCB Fish Tissue Sampling Locations Along Walnut Creek, Rocky Branch, and Neuse River