RECORD OF DECISION
SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

ECUSTA MILL SITE OPERABLE UNIT 2
RIVER INVESTIGATION AREA

BREVARD, TRANSYLVANIA COUNTY, NORTH CAROLINA

PREPARED BY:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA, GEORGIA

SEPTEMBER 2009

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PART 1: THE DECLARATION

1.1 Site Name and Location

This Record of Decision (ROD) is for Operable Unit 2 (OU-2), River Investigation Area, at the Ecusta Mill site (the "site"). The Former Ecusta Mill is located at 1 Ecusta Road in Brevard, Transylvania County, North Carolina. The U.S. Environmental Protection Agency (EPA) Site Identification Number for the Ecusta Mill site is NCD003166675.

1.2 Statement of Basis and Purpose

This decision document presents the basis for the no action decision for OU-2, the River Investigation Area, at the Ecusta Mill site that was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for the site. This decision represents a final remedy for OU-2.

The State of North Carolina, as represented by the North Carolina Department of Environmental and Natural Resources (NCDENR), has been the support agency during the remedial investigation/feasibility study process for the site. The State of North Carolina concurs with the Selected Remedy.

1.3 Description of Selected Remedy

EPA has concluded that no action is necessary to ensure protection of human health or the environment at OU-2, the River Investigation Area.

1.4 Statutory Determinations

Current conditions at OU-2, the River Investigation Area, do not pose an unacceptable risk to human health or the environment for current or future uses. A five-year review for the River Investigation Area will not be required because hazardous substances, pollutants, or contaminants will not remain on site above levels that would not allow for unlimited use and unrestricted exposure.

1.5 Authorizing Signatures

Franklin E. Hill, Director
Superfund Division
U.S. Environmental Protection Agency, Region 4

9/29/09
Date

PART 2: DECISION SUMMARY

This Decision Summary provides a description of the site-specific factors and analyses that led to the no action decision for OU-2, the River Investigation Area, at the Ecusta Mill site. It includes background information about the site, the nature and extent of contamination found at OU-2, and the assessment of human health and ecological risks posed by the contaminants at OU-2.

2.1 Site Name, Location, and Brief Description

The site is located at 1 Ecusta Road in Brevard, Transylvania County, North Carolina. The geographic coordinates for the site are 35.255 degrees north latitude and 82.40917 degrees west longitude (WGS 84). The EPA Site Identification Number for the site is NCD003166675.

The site is comprised of the former Ecusta Mill property (Property), designated as Operable Unit 1 (OU-1), referred to as the Redevelopment Area; and OU-2), referred to as the River Investigation Area. The Ecusta Mill is a former pulping and paper manufacturing facility comprising approximately 527 acres situated in a mixed-use commercial/residential setting near the confluence of the Davidson and French Broad Rivers. The Site consists of the former manufacturing facility, as well as industrial solid waste landfills and an Aerated Stabilization Basin (ASB) (Figure 1). The River Investigation Area consists of specifically defined portions of the Davidson and French Broad Rivers potentially impacted by operation of the former Ecusta paper mill. The River Investigation Area generally includes the reach of the Davidson River from the intersection of State Route 280 and U.S. Route 64 to the confluence with the French Broad River and within the French Broad River from the confluence to a point immediately below the outfall for the Aerated Stabilization Basin (ASB) or the former mill (Figure 2). In addition to the pulping and paper making operations, the following activities have occurred at the Site: chlorine production operations using Sorenson mercury cells; caustic storage; water and wastewater treatment; and printing. Mercury contamination associated with the chlorine production operations has been documented in the soils and groundwater beneath and adjacent to the mercury cell building. Historically, mercury has been released into the Davidson River via the East and South Drainage Ditches, and mercury and dioxin/furans have been released through the permitted ASB outfall.

EPA is the lead agency for the current site removal response actions at OU-1 and remedial activities at OU-2. NCDENR is the support agency. The Responsible Parties (RPs) identified for the site conducted Remedial Investigation activities for OU-2 under an Administrative Order on Consent (AOC) with EPA. Removal activities at OU-1, the Redevelopment Area, are being conducted by a different party under an Administrative Order on Consent by a Bona Fide Prospective Purchaser (BFPP AOC).

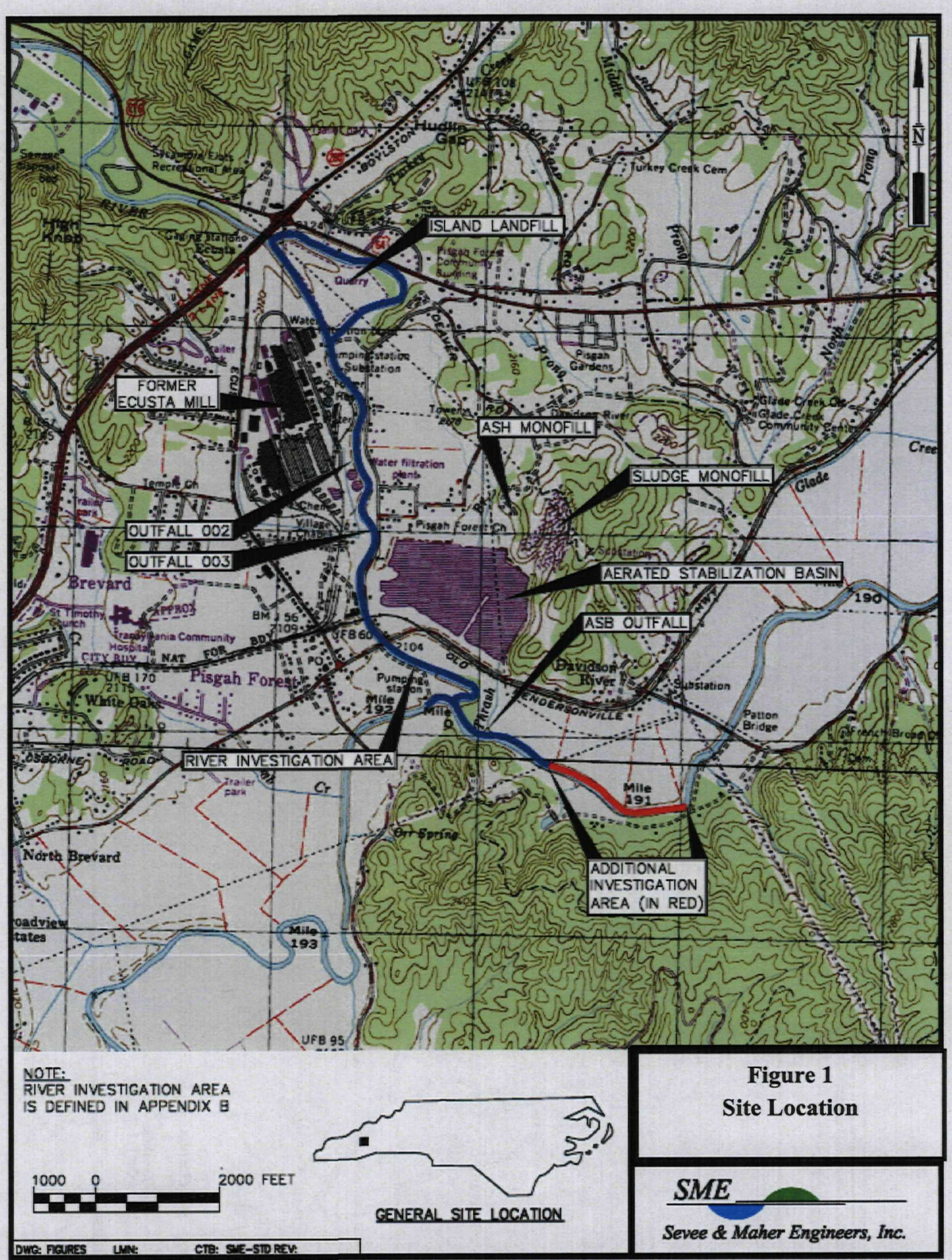


Figure 1 Site Location Map

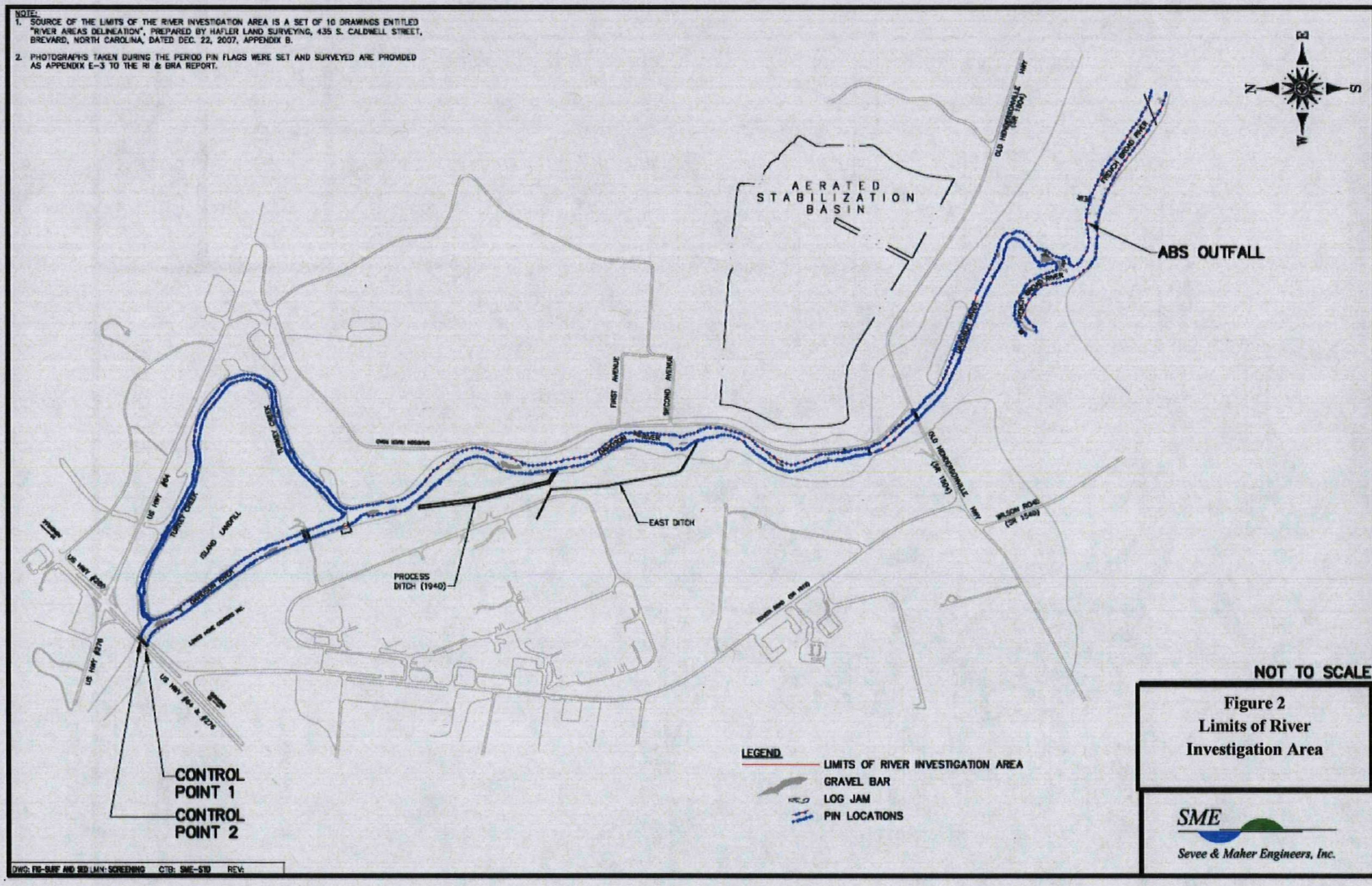


Figure 2 Limits of River Investigation Area

2.2 Site History and Enforcement Activities

This section of the ROD provides the history of the site and a brief discussion of EPA's and the State's removal, remedial, and enforcement activities. A combination of Superfund Removal and the Superfund Alternative Agreement approach investigation and cleanup strategies, along with reliance on current State permit requirements, are being used to accomplish needed risk reduction and property redevelopment. Specifically, the Superfund Alternative Approach agreement applies only to the River Investigation Area (OU-2) and not to the Redevelopment Areas (OU-1).

2.2.1 Operational History

The Ecusta Mill property was initially developed in 1938 as a cigarette paper manufacturing plant operated by Ecusta Paper Company. Olin Matheson Chemical Corporation (Olin) purchased the Property in 1949. Olin owned and operated the mill from 1949 to 1985. Cellophane production, comprising the film plant, was added to mill operations in the mid-1950s, and construction began on machines to produce printing and lightweight papers in 1958. The Ecusta Corporation purchased the facility in 1985. That same year, cellophane manufacturing operations were terminated at the facility.

P.H. Glatfelter Company (Glatfelter) became the owner/operator of the mill in 1987 when Glatfelter merged with Ecusta Corporation. In August 2001 PURICO (IOM) Limited purchased the mill and formed RFS Ecusta, Inc. In August 2002 manufacturing operations ceased at the mill, and in October 2002 RFS Ecusta, Inc., declared bankruptcy. Renova Partners, which specializes in redevelopment of environmentally contaminated property, purchased the Property on January 25, 2008. The Property was renamed Davidson River Village, LLC, which is a wholly owned subsidiary of Brownfield Development, Inc., a company owned by Renova Partners. The mill is in the process of being dismantled and will from here on be referred to as the former mill.

The former mill was located at 1 Ecusta Road in Pisgah Forest, North Carolina, and the Property has recently been annexed by the City of Brevard, North Carolina. A closed process waste landfill is located to the northeast of the former mill on an island in the Davidson River (a.k.a, the Island Landfill). An ASB is located approximately one-quarter mile southeast of the former mill, east of the Davidson River. Ash and sludge monofills exist southeast of the former mill and are located slightly northeast of the ASB (see Figure 1). The former mill occupied approximately 367 acres inside its fence boundaries and used to contain, along with the manufacturing facilities, a water filtration plant, a wastewater treatment plant, a boiler house, and an electrical generating plant. The former mill was bounded on the west by Ecusta Road and on the east by the Davidson River. The East Ditch and the South Ditch both currently drain water from the former mill to the Davidson River through permitted outfalls.

The Ecusta Mill generated its own supplies of chlorine and caustic soda beginning in early 1948, utilizing the mercury cell variation of the chlor-alkali process using a design called a Sorenson Cell. In this process, sodium chloride salt solution (brine) is introduced into an electrolytic cell containing a liquid mercury cathode. The Sorenson Cell process was conducted in the bleach makeup room in the Electro-Chemical Building. The sewer system serving the Electro-Chemical Building, during the time it contained the mercury cells, discharged to what are now the East and South Ditches prior to discharge to the Davidson River. Documents found in the mill's Process Engineering Department indicate that the discharge from the mill varied from a quarter of a pound of mercury per day with some tests indicating daily discharges in the four to eight pound range. Mercury associated with the chlorine production operations has been documented in soils and groundwater beneath and adjacent to the Electro-Chemical Building, and in the sediments and surface water in the on-site drainage ditches, the ASB and the outfall from the ASB to the French Broad River.

The pulp mill operation at the former mill was a non-wood pulping operation. The main raw material that was used in the pulping operation was flax toe, decorticated from Canadian oilseed flax straw. The pulp mill used the Kraft process to produce pulp from the flax toe. When chlorine interacts with the lignin in the flax pulp, it forms chlorinated phenolic compounds and other chlorinated organic compounds. Dioxins attributed to historical mill operations have been documented in environmental media at the Site. 2,3,7,8-TCDD was never detected in the mill effluent. However, fish tissue studies conducted in 1989 and 1990 indicated a high level of 2,3,7,8-TCDF in fish downstream of the mill. In 1991, it was discovered that a pulping process chemical, anthraquinone, contained high levels of 2,3,7,8-TCDF precursors and a higher quality anthraquinone without 2,3,7,8-TCDF precursors was substituted. Fish studies conducted through 2001 documented a continual decline of these phenolic compounds in fish tissue.

2.2.2 Regulatory and Enforcement History

In November 2006 EPA engaged in discussions with Renova Partners, a brownfield redeveloper interested in performing cleanup work at the mill property under CERCLA authority. Renova Partners created Davidson River Village LLC (DRV) to purchase the mill property and conduct the cleanup. On February 9, 2008, EPA and DRV entered into an Agreement and Order on Consent for a Removal Action by a Bona-fide Prospective Purchaser (BFPP Agreement), in which DRV agreed to perform the work outlined in a time-critical removal action memo issued by EPA on January 22, 2008, which covers building demolition activities and sub-slab soil testing and removal. In addition, DRV committed to perform certain non-time critical removal actions that may be identified in two Engineering Evaluation/Cost Assessments currently underway for subsurface contamination beneath the Electro-Chemical Building and for site-wide subsurface contamination. These activities comprise OU-1 at the site.

At the same time, EPA entered into negotiations with Glatfelter, a previous owner/operator of the facility, for performance of a Remedial Investigation/Feasibility Study on the River Investigation Area (OU-2) using the Superfund Alternative Agreement approach. The effective date of the Administrative Settlement Agreement and Order on Consent between EPA and Glatfelter is January 28, 2008.

On December 14, 2007, EPA sent a notice letter to Olin Corporation explaining its intention to enter into agreements with DRV and Glatfelter and its decision not to use special notice procedures. Over the course of the negotiations, EPA informally contacted Olin concerning its potential participation in discussion about the site, but Olin declined to participate, citing the existence of an indemnification agreement with Glatfelter as the basis for their unwillingness to participate.

In addition to the agreements entered into with EPA, the parties also entered into a four-party Memorandum of understanding with the State outlining the regulatory framework for all activities to be performed at the site. DRV intends to enter into an Administrative Agreement and Brownfields Agreement with the State to cover long-term redevelopment activities, including Institutional Controls, following the completion of the removal actions outlined above. Glatfelter has retained the responsibility under existing permits with the State for closure and post-closure maintenance and monitoring of all of the landfills at the site. Operation and maintenance of the waste water treatment system and associated ASB are subject to a National Pollutant Discharge Elimination System (NPDES) Permit under the oversight of the State. The NPDES Permit was transferred to DRV and they continue to operate and maintain the ASB in accordance with the terms of the NPDES permit.

2.3 Community Participation

This section of the ROD describes EPA's community involvement activities. EPA has been actively engaged in dialogue and collaboration with the affected community and has strived to advocate and strengthen early and meaningful community participation during EPA's removal and remedial activities at the site. These community participation activities during the remedy selection process meet the public participation requirements in CERCLA and the NCP.

2.3.1 Community Involvement Plan

The Community Involvement Plan (CIP) for the site was prepared in March 2009. This CIP specifies the community involvement activities that EPA has undertaken, and will continue to undertake, during the remedial activities planned for the site.

2.3.2 Community Involvement for the RI

On February 21, 2008, EPA held a Public Meeting and Availability Session at Brevard College to inform the public about the agreements reached with DRV and Glatfelter regarding work at the site, and to kick-off both the removal and remedial activities covered by the agreements. EPA and the State attended the meeting and presented information regarding the regulatory structure negotiated between all parties as well as technical information regarding investigation and cleanup activities. This meeting was advertised in the local paper, the Transylvania Times. A press conference announcing the sale of the property was also held earlier that day and was attended by local and State representatives, community leaders, regional press and the public.

2.3.3 Community Involvement for the Proposed Plan

The RI report and Proposed Plan for OU-2 were made available to the public in July 2009. They can be found in the Administrative Record file and the information repository maintained at the EPA Superfund Records Center in Region 4 and at the Transylvania County Public Library. The notice of the availability of these two documents was published in The Transylvania Times on July 16, 2009. A public comment period was held from July 21 to

August 19, 2009. In addition, a public meeting was held on July 21, 2009, to present the Proposed Plan to the community. EPA's response to the comments received during this period is included in the Responsiveness Summary, which is part of this ROD. EPA also used this meeting to update the community on the demolition and removal activities still on-going at the site.

2.4 Scope and Role of Operable Unit

As with many sites, the problems at the Ecusta Mill site are complex. As a result, EPA has organized the work into two Operable Units: OU-1, the Redevelopment Area; and OU-2, the River Investigation Area. The purpose of this ROD is to document the no-action decision for OU-2.

Removal Response- Operable Unit 1, Redevelopment Area

- EPA entered into an Agreement and Order on Consent for a Removal Action by a Bona-fide Prospective Purchaser which covers the following actions at the Redevelopment Areas:
- Time critical removal action including demolition of building structures and sub-slab investigation with excavation of contaminated soils as needed, demolition of Electro-Chemical Building and proper disposal of contaminated materials, excavation of contaminated sediments in the East and South Ditches, excavation of lead-impacted soils at the rifle range, and investigation and excavation of contamination from the former Olin Disposal Area.
- Non-time critical investigation, preparation of the EE/CA report, and implementation of EPA selected remedy for sub-surface contamination below the Electro-Chemical Building.
- Site-wide EE/CA documenting the need for any additional remedy for contamination discovered during the time-critical removal activities not immediately excavated.

Remedial Response-Operable Unit 2, River Investigation Area

- **Investigation of the extent of contamination from past operation of the former mill within the designated River Investigation study area.**
- **Calculation of Human Health Risks and Ecological Risks from contamination detected during the investigation.**
- **Documentation of the decision in a Record of Decision. This ROD documents the final remedy for OU-2.**

Future Response Plans

- Administrative Agreement with the State for any long-term groundwater remediation or monitoring.
- Brownfields Agreement with the State to facilitate redevelopment and the continued implementation of Institutional Controls (ICs) for portions of the property not cleaned up to unrestricted use/unlimited exposure.

2.5 Site Characteristics

This section of the ROD provides a brief comprehensive overview of the site's soils, geology, surface water hydrology, and hydrogeology; the sampling strategy chosen for the site; the Conceptual Site Model; and the nature and extent of contamination at the site. Detailed information about the site's characteristics can be found in the RI Report (EPA 2009c).

2.5.1 Overview of the Site

The Ecusta Mill is a former pulping and paper manufacturing facility located on Ecusta Road in Pisgah Forest (near Brevard), North Carolina. The facility is approximately 527 acres situated in a mixed-use commercial/residential setting near the confluence of the Davidson and French Broad Rivers.

The River Investigation Area, OU-2, consists of specifically defined portions of the Davidson and French Broad Rivers potentially impacted by operation of the former Ecusta Mill. The River Investigation Area generally includes the reach of the Davidson River from the intersection of State Route 280 and U.S. Route 64 to the confluence with the French Broad River and with the French Broad River from the confluence to a point immediately below the outfall for the ASB.

The Davidson River is located to the east of the former Ecusta Mill, in the Broad Basin sub-ecoregion (66j), and flows south into the French Broad River. The Davidson River is sub-divided into two reaches which are classified by the North Carolina Division of Water Quality (NCDWQ) as follows: 1) From the source to the water supply dam at Ecusta is classified as Water Supply V (WS-V), Class B river, Trout Waters (Tr) and High Quality Waters; and 2) From the water supply dam at Ecusta to the French Broad River is classified as a Class B river. The Davidson River is approximately 60 to 90 feet wide, averages 1.5 to 2.5 feet deep, and has an average flow rate of 127 cubic feet per second (cfs). The maximum record flow rate, recorded in 1944, was 224 cfs with a minimum recorded flow rate of 78 cfs that occurred in 1988. Based on preliminary visual inspection, the bottom substrate consists primarily of cobble, gravel, and sand. The banks are well vegetated and the riparian zone of this portion of the Davidson River averages between 10 and 40 feet wide.

The French Broad River originates in western North Carolina out of a temperate rain forest localized around Rosman, North Carolina, and flows into Tennessee. Its confluence with the Holston River at Knoxville, Tennessee, is considered to be the headwaters of the Tennessee River. The river follows a general northwesterly direction as it flows through Transylvania County and past its confluence with the Davidson River. It has long been understood that the Carolina region is geologically quite old, but the French Broad River bears the distinction of being the third oldest river in the world.

In the River Investigation Area, the French Broad River is classified by NCDWQ as a Class B river. It is approximately 90 to 120 feet wide, averages 1.5 to 5.0 feet deep, and has an average flow rate of approximately 1,040 cfs. The bottom substrate consists of cobble, gravel, and sand. The banks are well vegetated and the riparian zone of the French Broad River in the River Investigation Area at times surpasses a distance of 40 feet wide.

2.5.2 Soils and Geology

The River Investigation Area sits in a broad, relatively flat valley. The valley is a result of erosion of the surrounding mountains, with the valley floor filled with an unconsolidated alluvium that reportedly rarely exceeds 65 feet in thickness. This alluvial deposit consists of a wide range of soil particle sizes, from clayey silts to cobbles and boulders. Saprolite, which is a weathered bedrock that retains some of its original structural features, is typically 10 to 20 feet in thickness and underlies the alluvial deposit. Bedrock extends below the Saprolite and is made up of the Brevard Schist and Henderson Granite Gneiss. Fill placed adjacent to the Davidson River near the former mill has erased the meandering nature of the river, which as recently as 1940 included a series of islands adjacent to the former mill. Groundwater and surface water discharge to the Davidson River due primarily to regional topography. Moderately variable river flows have produced a dynamic river channel that generally shifts horizontally (meanders) and, to a lesser extent, vertically (erosion or deposition).

2.5.3 Geomorphology

At the confluence with the French Broad River, the entire Davidson River watershed comprises a drainage area of approximately 48 square miles, with 88 percent (i.e., 42 square miles) of that area contained within the Pisgah National Forest. In the Pisgah National Forest, upstream of the River Investigation Area, the Davidson River is a high energy step-pool system, but in the lower portions, from the intersection of State Route 280 and U.S. Route 64 to the French Broad River (i.e., the River Investigation Area), the stream bed gradient decreases, and the Davidson River transitions to a high to medium energy river with a river bed consisting primarily of medium-sized cobbles (i.e., stones between 3 inches and 12 inches in diameter).

Given that the bulk of the Davidson River watershed is contained within national forest lands, which have been subject to few, if any, recent disturbances, the flow and velocity of the river has remained reasonably consistent over recent history. The largely undisturbed land use within the watershed has also made it highly unlikely that any inputs of sediment sufficient to cause geomorphic instability of the channel have occurred in recent history. As a result of these factors, the Davidson River currently maintains a channel with very stable dimensions, pattern, and profile.

The river's recent period of relative channel stability is not reflective of its historical conditions. As with most of the Appalachian Mountain range, prior to the establishment of the national forest system, the Davidson River watershed was actively timbered over most or all of its area up until around the turn of the nineteenth century. Timber harvesting practices during the 1700s and 1800s were often associated with no or poor soil erosion control practices. As a result, large amounts of sediment were eroded down into alluvial valleys (i.e., the River Investigation Area) causing severe stream channel aggradation (deposition of sediment) and geomorphic instability. Historical maps and aerial photos show that the Davidson River near the Ecusta Mill was comprised primarily of braided channels as recently as 1940. These unstable braided channels are the result of highly mobile sediment conditions caused by highly variable flow velocities and the legacy of historical timber harvesting practices in the watershed. Over the last 80 to 100 years such variations have subsided, and the channel has gradually achieved its current state of relative stability. It should be noted that lateral channel movement within a river's floodplain is a natural geomorphic process and channel movement will continue. As a result of this ongoing process of channel movement, the cobble layer that forms the bed of the Davidson River extends well beyond the present channel within the alluvial valley.

2.5.4 Conceptual Site Model

The Conceptual Site Model (CSM) for the site identifies the sources of contamination, release mechanisms, pathways for contaminant transport, the impacted media, and potential human and ecological receptors. The Human Health Conceptual Site Model is presented in Figure 3 and the Ecological Receptors Conceptual Site Model is presented in Figure 4.

Elemental mercury and dioxin were historically released from the former mill. Mercury has been identified in the East and South Drainage Ditches, which carried process water from the chlor-alkali process area. The discharge from the ASB is a permitted point discharge to the French Broad River. Samples of surface water and sediment from within the ASB have indicated the presence of mercury and dioxins. The East and South Drainage Ditches provided a direct surficial discharge pathway into the Davidson River from the Electro-Chemical Building area and the ditches have been shown to have contained mercury.

Dioxin/furan and mercury were identified as the Contaminants of Potential Concern (COPCs) for the River Investigation Area Remedial Investigation. These COPCs are considered "environmentally persistent" due to their tendency to remain adsorbed primarily to organic matter in soil and sediment.

Organisms are physically exposed to sediments (e.g., by ingestion and/or dwelling) in a zone termed the bio-turbation zone. Within the River Investigation Area, the depth of this bio-turbation zone varies widely and is often species-specific as well as specific to sediment type. If significant concentrations of COPCs exist within the River Investigation Area, and assuming that the proper conditions are present within the bio-turbation zone, bioaccumulation can occur. The rate of bioaccumulation depends upon the concentration of COPCs measured in the sediments and on the chemical and physical conditions present. When bioaccessible and bioavailable, mercury and dioxin tend to be absorbed by organisms and can potentially bioaccumulate through the food chain to higher trophic level organisms.

Additional parameters that affect bioavailability, such as total organic content (TOC), were measured and reported in the RI report. The bio-turbation zone can be disturbed or altered by natural geomorphic river processes including erosion. If COPCs are continually replaced in the bioturbation layer due to erosion in areas where COPCs exist, the potential for bioaccumulation may cause an increased risk to human health and the environment.

The conceptual site model identifies human and ecological receptors that are considered in the risk assessment, as well as potential exposure pathways. Additionally, the conceptual site model was developed to estimate the potential for future bioaccumulation of COPCs within the River Investigation Area.

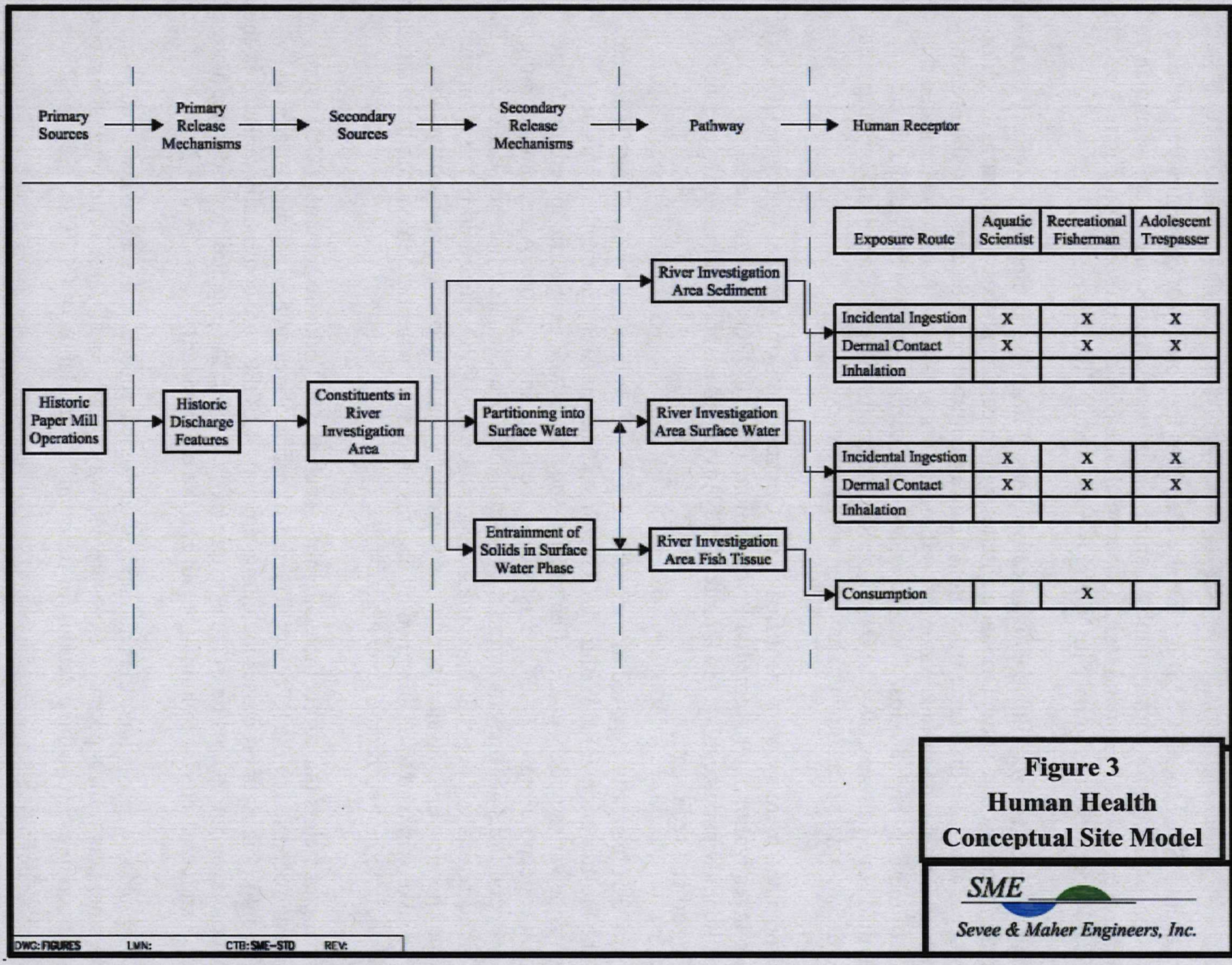


Figure 3 Human Health Conceptual Site Model

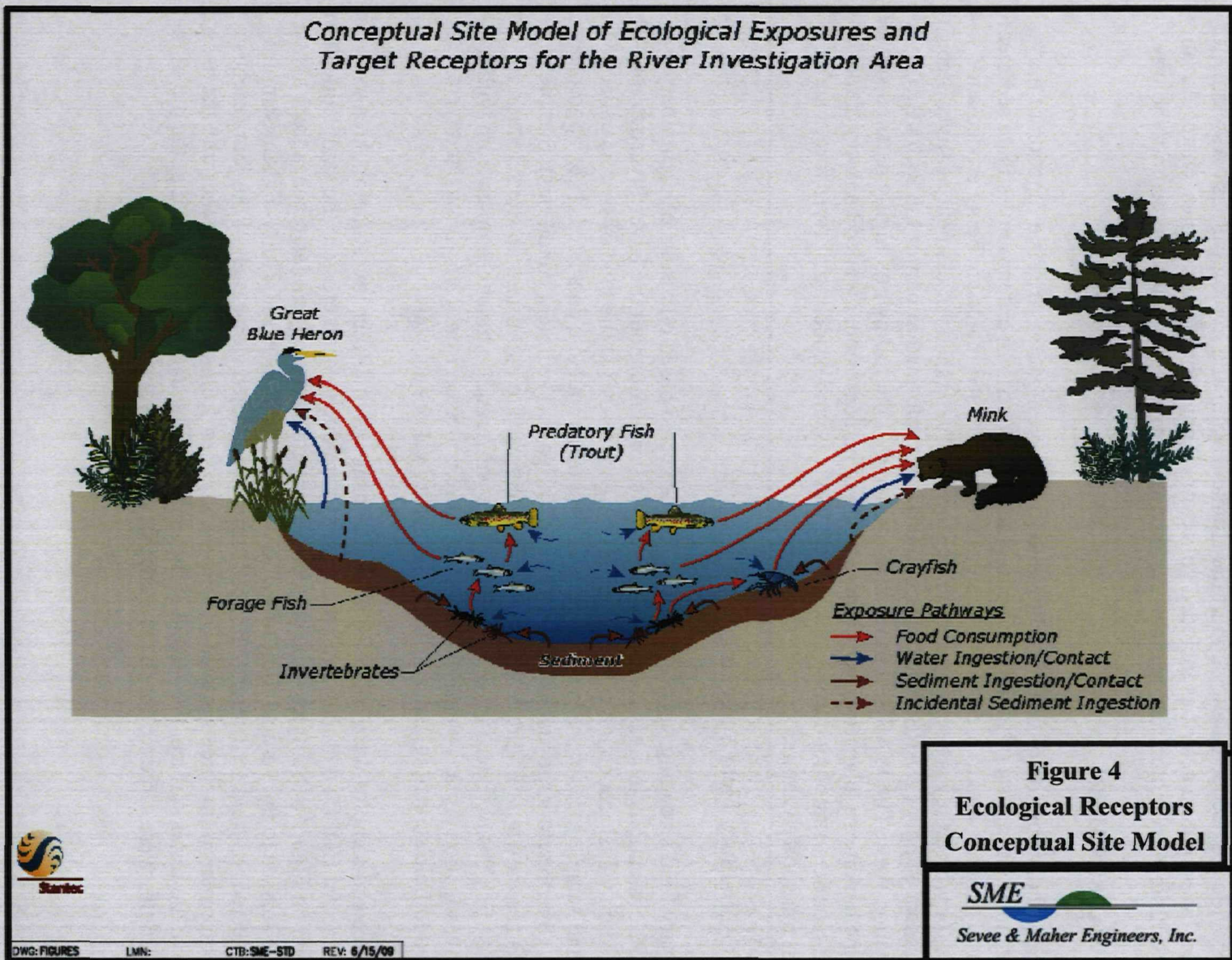


Figure 4 Ecological Receptors Conceptual Site Model

2.5.5 Sampling Strategy

This section describes the sampling strategy used during Remedial Investigation activities to support the assessment of the nature and extent of contamination in the River Investigation Area, and to provide the needed data to support the Human Health and Ecological Risk Assessment. Remedial Investigation activities included collection of environmental samples, characterization of local biological communities, and characterization of river hydraulics and geomorphology.

2.5.5.1 WARSSS Model

The potential distribution of COPCs within the River Investigation Area is a function of the transport and distribution of sediments within the river system. In order to investigate sediment transport dynamics, and to identify those areas where river sediments are being eroded and liberated, or where they are settling and being stored, a Watershed Assessment of River Stability and Sediment Supply (WARSSS) (Rosgen, 2006) was performed as part of the RI for the River Investigation Area. The WARSSS procedure consisted of the following: highly detailed surveys of existing conditions, elapsed-time measurements of bank erosion, detailed bank condition surveys, sediment sampling during bank full flow events, and modeling of river forces and sediment transport dynamics.

2.5.5.2 Preliminary Field Screening

Preliminary field screening sample locations were selected based on results of preliminary WARSSS evaluations in areas of erosion and deposition throughout the River Investigation Area and based on visual inspection of the River Investigation Area at the time of sample collection. Additional sample locations were determined based on overall site data needs (i.e., appropriate quantity to represent large reaches of the river or varied soil/sediment conditions). Sample locations are shown on Figure 5. These samples were used to aid in sample site selection for the co-located fish tissue, macro invertebrates, surface water, and sediment samples from within the River Investigation Area. Twenty-five samples were collected from 18 locations and were subjected to field screening using a PID and mercury vapor analyzer.

Subsurface soil samples were collected along the banks of the River Investigation Area to assess the presence of COPCs that may enter the river system due to bank erosion; the sample locations are shown on Figure 6. Samples were collected along four severely eroded reaches from above the water surface to the vertical limit of the River Investigation Area. Thirty-six soil samples were collected for field screening. Multiple samples collected along each of the four reaches were composited from three samples as follows: the first from zero to six inches into the bank just above the water surface, the second at the middle of the bank, and the third at the top of the bank. Samples were screened for the presence of mercury vapor.

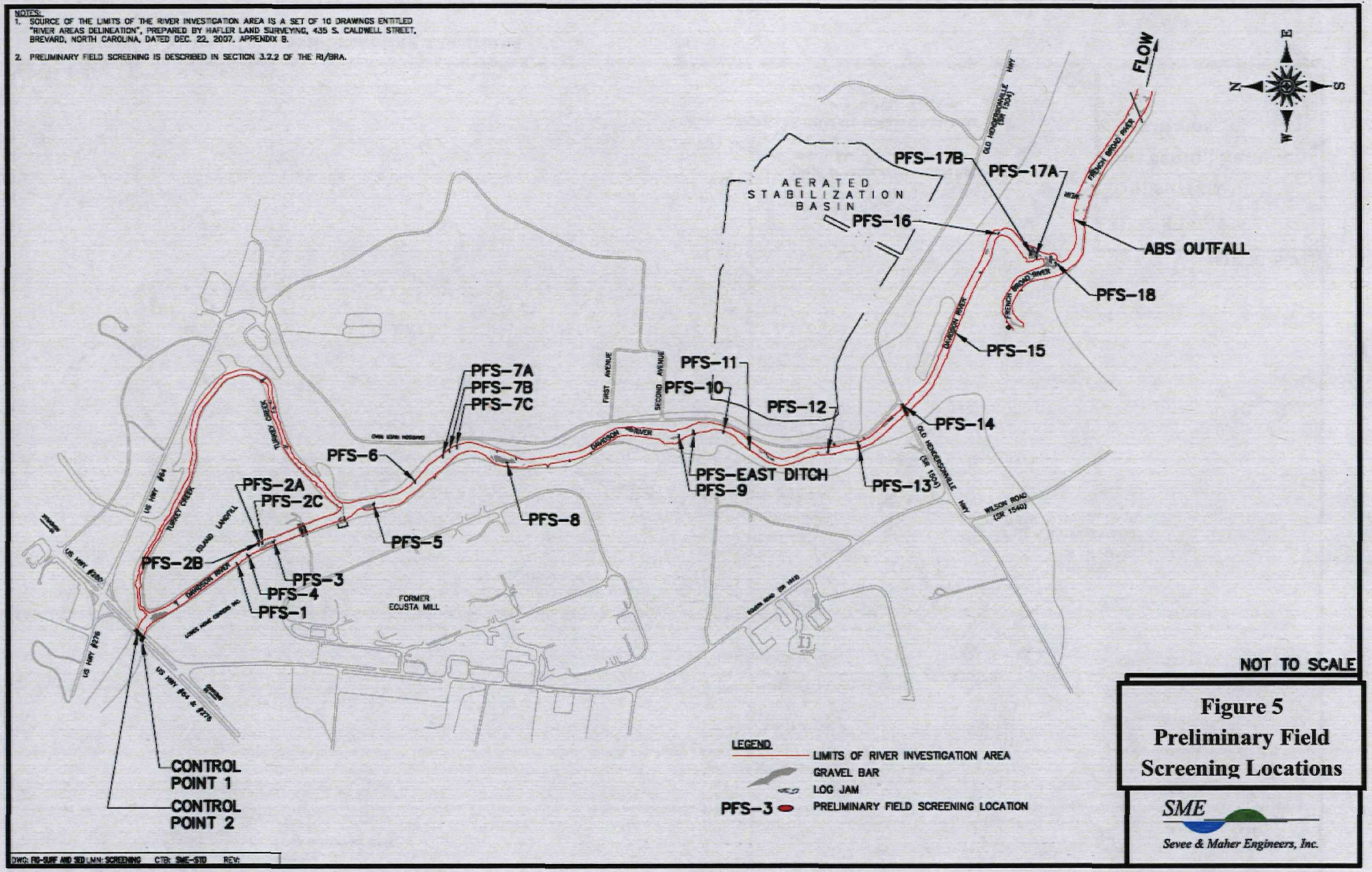


Figure 5 Preliminary Field Screening Locations

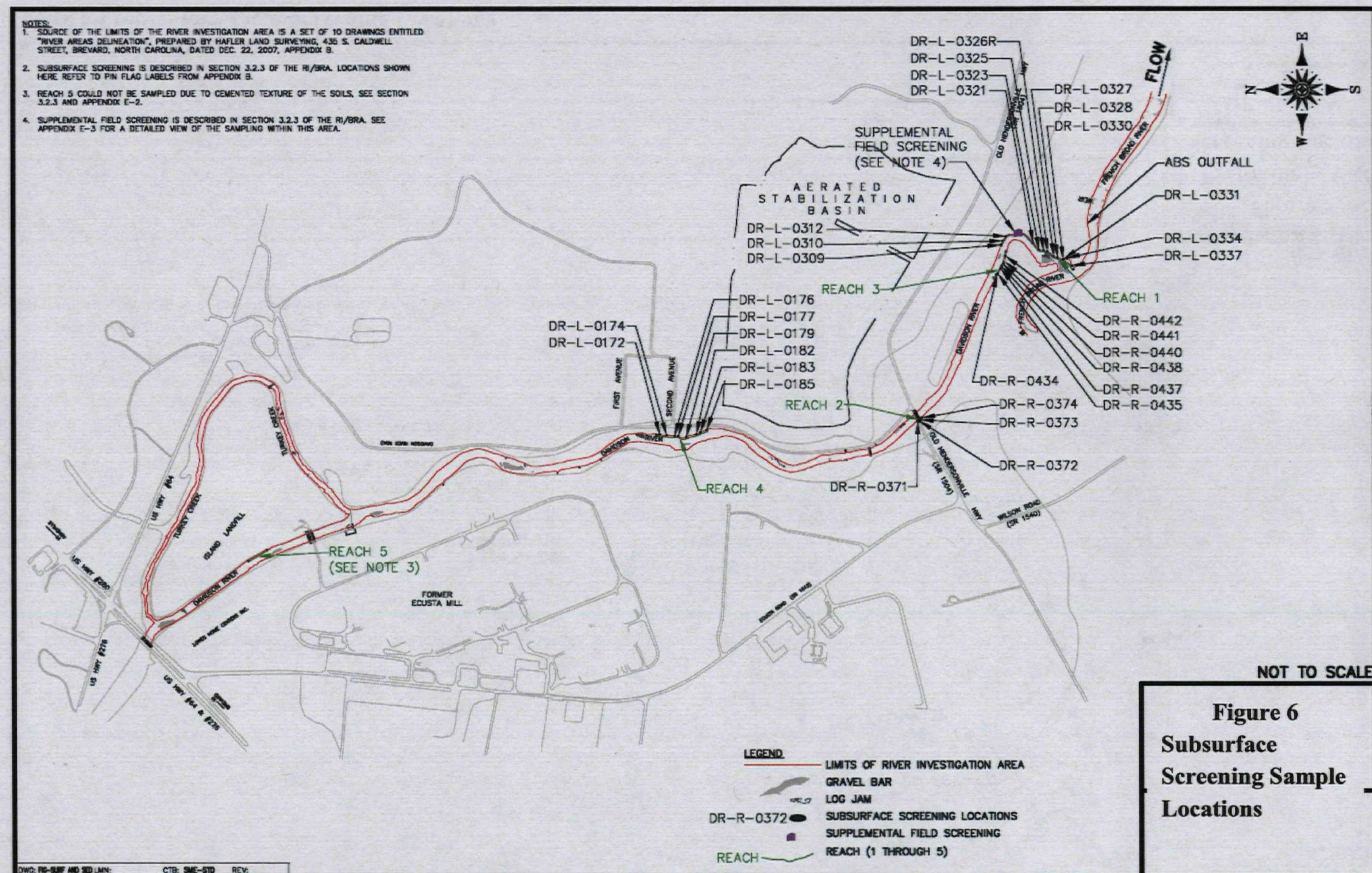


Figure 6 Subsurface Soil Sampling Locations

2.5.5.3 Co-located Sampling for Laboratory Analysis

Based on the detailed surveys of existing geomorphic conditions for the WARSSS analysis and preliminary field screening, eight sites were identified for co-located sampling of surface waters, sediments, and animal tissues for COPCs (Figure 7). The WARSSS survey data was utilized to identify active bank erosion sites, or portions of the channel where sediment was being deposited and stored in point bars (on the inside edge of river bends) or in mid-channel bars. The co-located sampling sites were selected at or immediately downstream of these potential areas where sediment was being liberated or stored and where suitable habitat for benthic organisms and/or fish was also present. Depending on variability of sediment types, samples were collected from three to five locations within the selected sampling area and composited.

2.5.6 Investigation Results

2.5.6.1 WARSSS Model Results

The WARSSS procedure was used to determine the potential for sediment disturbance, loading, and movement within 10,000 linear feet of the Davidson River system ending at the confluence with the French Broad River. The WARSSS study area is part of the larger River Investigation Area that extends into the French Broad River and was established to study the potential ecological and human health risks associated with former mill activities (Figure 8). WARSSS is a "geomorphology-based procedure for quantifying the effects of land uses on sediment relations and channel stability." (Rosgen, 2006). One of the major concerns at the River Investigation Area was the possibility that COPCs have bound to the sediments and are stored in deposits within the active channel and alluvial floodplains. If sediments containing COPCs are repeatedly disturbed and allowed to replenish the bio-turbation zone, COPCs may become available for bioaccumulation in organisms.

The WARSSS procedure was intended not only to help determine sediment transport characteristics, but also to investigate the likelihood of future sediment disturbance that would redistribute COPCs in the study area or further downstream as a result of liberation, resuspension, and transport of sediments. The WARSSS procedure consists of the following: a highly detailed survey of existing conditions, placement of scour chains, detailed bank condition surveys, sediment sampling during bankfull flow events, and modeling of river forces and sediment transport dynamics using the Flowsed and Powersed modules. In addition, a cursory watershed assessment was performed to examine the potential for changes to the Davidson River's sediment balance and transport dynamics as a result of likely land use changes within the watershed.

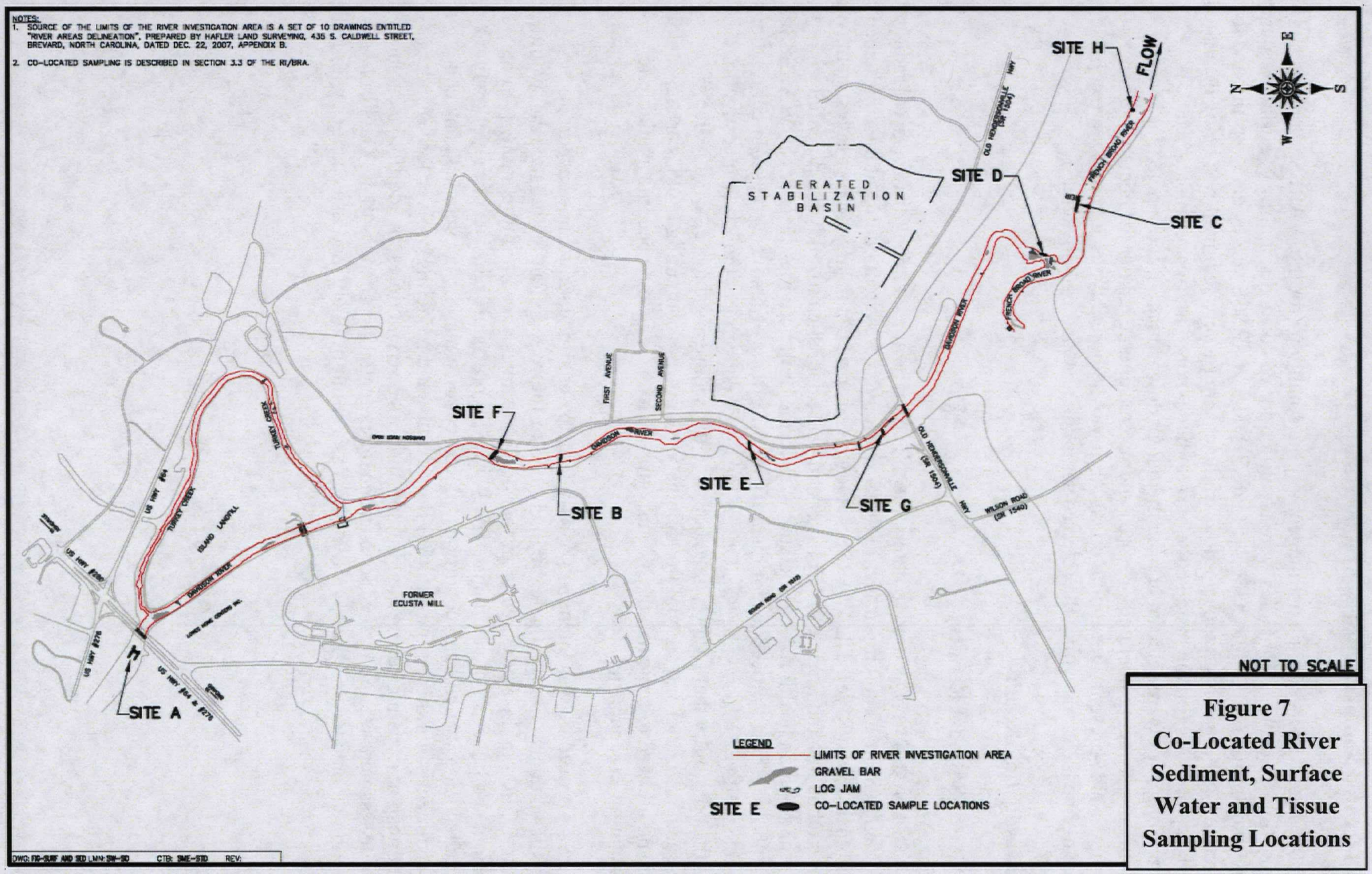


Figure 7 Co-located Sample Transects

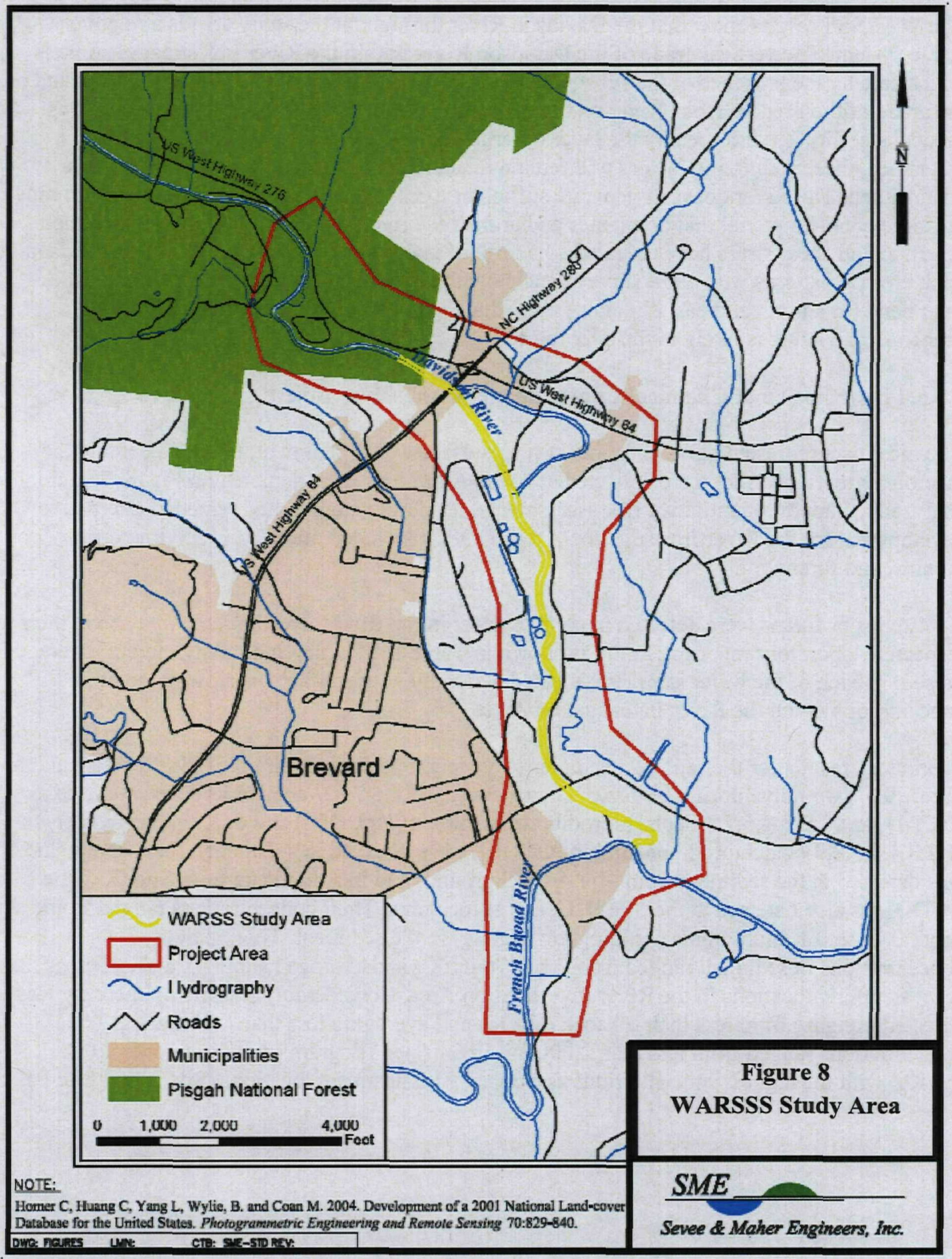


Figure 8 WARSSS Study Area

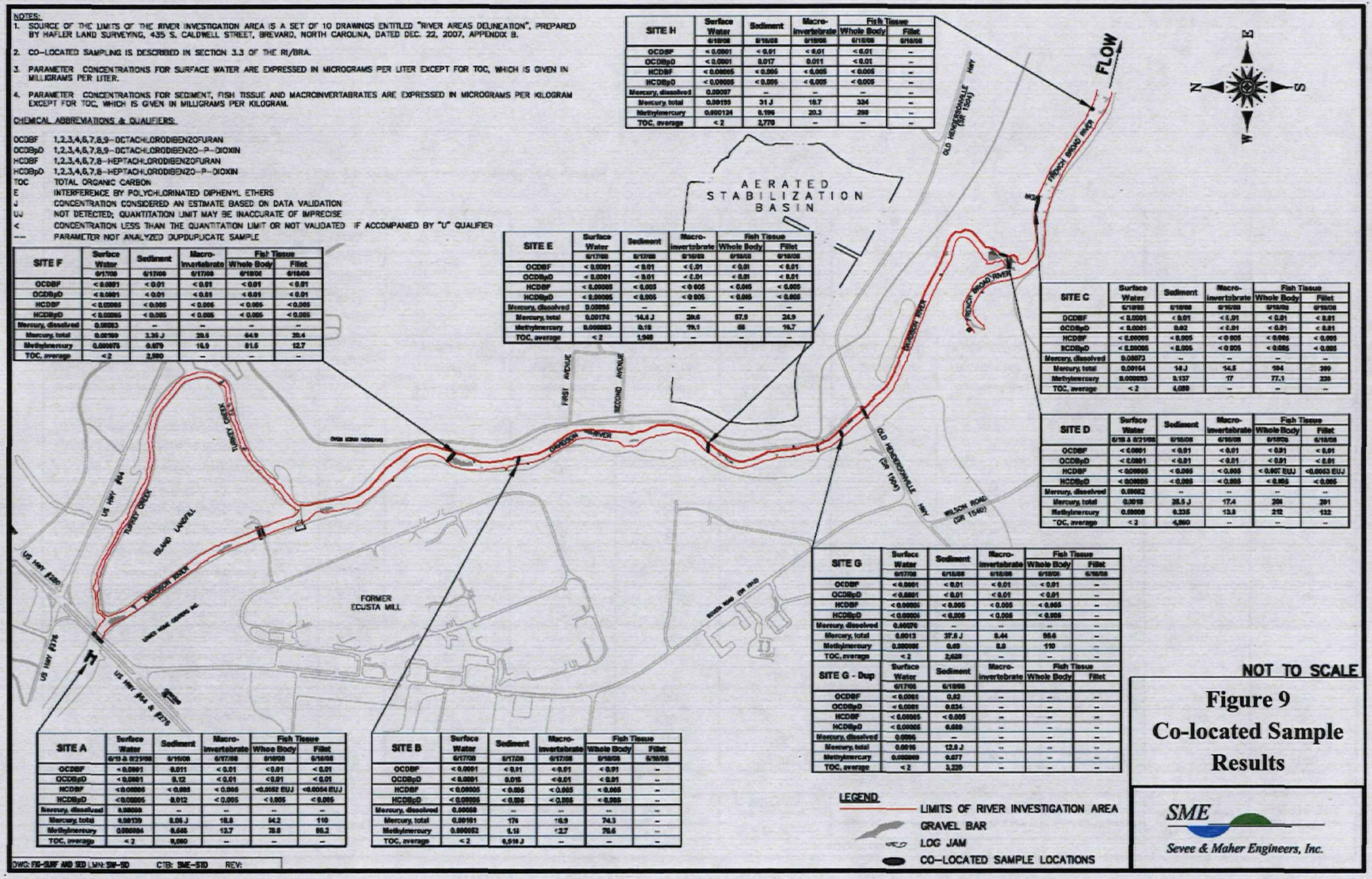
The WARSSS results show that the Davidson River throughout the study area is a relatively stable system. The vertical grade of the Davidson River within the River Investigation Area is held stable by the presence of the substantial bedrock formations in the upstream portions and by the grade of the French Broad River on the downstream end. In the intervening reaches, this vertical stability is reinforced by the layer of large cobbles. Regardless of changes in the watershed, these stabilizing factors will remain intact resulting in a highly, vertically stable channel bed. The River does not generate sufficient force, even during high flow events, to move the large cobble material that dominates and armors the riverbed. Evaluation of bank erosion potential and shear stress have revealed a handful of isolated areas of concern, and comparison of bank erosion patterns with 1974 survey data show that a continued outward migration of the river bend (in a north and east direction) immediately upstream of the confluence with the French Broad River is likely in the near future.

2.5.6.2 Distribution of Chemical Contaminants in the River Investigation Area

Chemical data representing various media (i.e., surface water, sediment, fish, and benthic macroinvertebrate tissue) were collected at Areas A through H, as depicted on Figure 7, and analyzed to support quantitative risk assessments, feasibility studies, and remedial alternative development for the River Investigation Area. COPCs included mercury, methylmercury, dioxins, and furans.

No dioxins or furans were detected in surface water in the River Investigation Area above their respective laboratory reporting limits as shown in Table 1. Mercury and methylmercury were present in each of the water samples collected generally within a fairly narrow range of concentration along the River Investigation Area.

Laboratory results for the sediment samples (dry weight basis) are summarized in Table 2 and on Figure 9. Two polychlorinated dioxin congeners (1,2,3,4,6,7,8,9-octachlorodibenzo-*p*-dioxin [OCDD] and 1,2,3,4,6,7,8-heptachlorodibenzo-*p*-dioxin [HpCDD]) and one furan congener (1,2,3,4,6,7,8,9-octachlorodibenzofuran [OCDF]) were detected in sediments. Each compound was detected in the sediment from Site A (background) and in a duplicate from Site G, while OCDD was also detected at the Site B, C, and H locations. Their concentrations ranged from about 0.01 to 0.1 micrograms per kilogram (µg/Kg) in the sediment. Total mercury concentrations in sediment ranged from 3 to 176 µg/Kg and averaged about 42 µg/Kg across the eight sampling locations in the River Investigation Area. Considerably less methylmercury was detected, ranging from less than 0.1 to 1.1 µg/Kg and averaging less than 0.34 µg/Kg. TOC concentrations ranged from less than 2,000 milligrams per kilogram (mg/Kg) to over 8,000 mg/Kg, with the highest concentrations associated with upstream locations (Site A and Site B).



SITE H	Surface Water	Sediment	Macro-invertebrate	Fish Tissue Whole Body	Fish Tissue Fillet
	6/18/08	6/18/08	6/18/08	6/18/08	6/18/08
OCDBF	< 0.0001	< 0.01	< 0.01	< 0.01	--
OCDBpD	< 0.0001	0.017	0.011	< 0.01	--
HCDBF	< 0.00005	< 0.005	< 0.005	< 0.005	--
HCDBpD	< 0.00005	< 0.005	< 0.005	< 0.005	--
Mercury, dissolved	0.00087	--	--	--	--
Mercury, total	0.00195	31 J	18.7	334	--
Methylmercury	0.000124	0.196	20.3	288	--
TOC, average	< 2	2,770	--	--	--

SITE F	Surface Water	Sediment	Macro-invertebrate	Fish Tissue Whole Body	Fish Tissue Fillet
	6/17/08	6/17/08	6/17/08	6/18/08	6/18/08
OCDBF	< 0.0001	< 0.01	< 0.01	< 0.01	< 0.01
OCDBpD	< 0.0001	< 0.01	< 0.01	< 0.01	< 0.01
HCDBF	< 0.00005	< 0.005	< 0.005	< 0.005	< 0.005
HCDBpD	< 0.00005	< 0.005	< 0.005	< 0.005	< 0.005
Mercury, dissolved	0.00083	--	--	--	--
Mercury, total	0.00189	3.35 J	29.6	64.9	20.4
Methylmercury	0.000075	0.079	16.9	81.5	12.7
TOC, average	< 2	2,580	--	--	--

SITE E	Surface Water	Sediment	Macro-invertebrate	Fish Tissue Whole Body	Fish Tissue Fillet
	6/17/08	6/17/08	6/16/08	6/18/08	6/18/08
OCDBF	< 0.0001	< 0.01	< 0.01	< 0.01	< 0.01
OCDBpD	< 0.0001	< 0.01	< 0.01	< 0.01	< 0.01
HCDBF	< 0.00005	< 0.005	< 0.005	< 0.005	< 0.005
HCDBpD	< 0.00005	< 0.005	< 0.005	< 0.005	< 0.005
Mercury, dissolved	0.00095	--	--	--	--
Mercury, total	0.00174	14.8 J	20.6	57.9	24.9
Methylmercury	0.000083	0.18	19.1	56	16.7
TOC, average	< 2	1,900	--	--	--

SITE C	Surface Water	Sediment	Macro-invertebrate	Fish Tissue Whole Body	Fish Tissue Fillet
	6/18/08	6/18/08	6/16/08	6/18/08	6/18/08
OCDBF	< 0.0001	< 0.01	< 0.01	< 0.01	< 0.01
OCDBpD	< 0.0001	0.02	< 0.01	< 0.01	< 0.01
HCDBF	< 0.00005	< 0.005	< 0.005	< 0.005	< 0.005
HCDBpD	< 0.00005	< 0.005	< 0.005	< 0.005	< 0.005
Mercury, dissolved	0.00073	--	--	--	--
Mercury, total	0.00164	14 J	14.5	104	399
Methylmercury	0.000093	0.137	17	77.1	238
TOC, average	< 2	4,080	--	--	--

SITE D	Surface Water	Sediment	Macro-invertebrate	Fish Tissue Whole Body	Fish Tissue Fillet
	6/18 & 8/21/08	6/16/08	6/16/08	6/18/08	6/18/08
OCDBF	< 0.0001	< 0.01	< 0.01	< 0.01	< 0.01
OCDBpD	< 0.0001	< 0.01	< 0.01	< 0.01	< 0.01
HCDBF	< 0.00005	< 0.005	< 0.005	< 0.007 EUJ	<0.0063 EUJ
HCDBpD	< 0.00005	< 0.005	< 0.005	< 0.005	< 0.005
Mercury, dissolved	0.00082	--	--	--	--
Mercury, total	0.0018	25.5 J	17.4	204	201
Methylmercury	0.00009	0.235	13.8	212	132
TOC, average	< 2	4,860	--	--	--

SITE G	Surface Water	Sediment	Macro-invertebrate	Fish Tissue Whole Body	Fish Tissue Fillet
	6/17/08	6/18/08	6/18/08	6/18/08	6/18/08
OCDBF	< 0.0001	< 0.01	< 0.01	< 0.01	--
OCDBpD	< 0.0001	< 0.01	< 0.01	< 0.01	--
HCDBF	< 0.00005	< 0.005	< 0.005	< 0.005	--
HCDBpD	< 0.00005	< 0.005	< 0.005	< 0.005	--
Mercury, dissolved	0.00076	--	--	--	--
Mercury, total	0.0013	37.8 J	8.44	98.6	--
Methylmercury	0.000086	0.49	8.8	110	--
TOC, average	< 2	2,620	--	--	--

SITE G - Dup	Surface Water	Sediment	Macro-invertebrate	Fish Tissue Whole Body	Fish Tissue Fillet
	6/17/08	6/18/08			
OCDBF	< 0.0001	0.02	--	--	--
OCDBpD	< 0.0001	0.024	--	--	--
HCDBF	< 0.00005	< 0.005	--	--	--
HCDBpD	< 0.00005	0.009	--	--	--
Mercury, dissolved	0.0006	--	--	--	--
Mercury, total	0.0016	12.8 J	--	--	--
Methylmercury	0.000069	0.077	--	--	--
TOC, average	< 2	3,220	--	--	--

SITE A	Surface Water	Sediment	Macro-invertebrate	Fish Tissue Whoe Body	Fish Tissue Fillet
	6/13 & 8/21/08	6/19/08	6/17/08	6/18/08	6/18/08
OCDBF	< 0.0001	0.011	< 0.01	< 0.01	< 0.01
OCDBpD	< 0.0001	0.12	< 0.01	< 0.01	< 0.01
HCDBF	< 0.00005	< 0.005	< 0.005	<0.0092 EUJ	<0.0054 EUJ
HCDBpD	< 0.00005	0.012	< 0.005	< 0.005	< 0.005
Mercury, dissolved	0.00090	--	--	--	--
Mercury, total	0.00139	8.06 J	18.8	64.2	110
Methylmercury	0.000084	0.648	13.7	78.8	60.2
TOC, average	< 2	8,080	--	--	--

SITE B	Surface Water	Sediment	Macro-invertebrate	Fish Tissue Whole Body	Fish Tissue Fillet
	6/17/08	6/17/08	6/17/08	6/18/08	6/18/08
OCDBF	< 0.0001	< 0.01	< 0.01	< 0.01	--
OCDBpD	< 0.0001	0.015	< 0.01	< 0.01	--
HCDBF	< 0.00005	< 0.005	< 0.005	< 0.005	--
HCDBpD	< 0.00005	< 0.005	< 0.005	< 0.005	--
Mercury, dissolved	0.00068	--	--	--	--
Mercury, total	0.00161	176	16.9	74.3	--
Methylmercury	0.000052	1.16	12.7	76.6	--
TOC, average	< 2	6,910 J	--	--	--

Figure 9 Co-located Sample Analytical Results

Table 1
Summary of Surface Water Laboratory Analytical Results

Parameter	Unit	Location/Sample Date								
		Site A Water 06/19/08 & 08/21/08	Site B Water 06/17/08	Site C Water 06/18/08	Site D Water 06/18/08 & 08/21/08	Site E Water 06/17/08	Site F Water 06/17/08	Site G Water 06/17/08	Duplicate Site G Water 06/17/08	Site H Water 06/18/08
Dioxins										
1,2,3,4,6,7,8,9-Octachlorodibenzofuran	pg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	pg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100
1,2,3,4,6,7,8-Heptachlorodibenzofuran	pg/L	<50	<50	<50	<50	<50	<50	<50	<50	<50
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	pg/L	<50	<50	<50	<50	<50	<50	<50	<50	<50
1,2,3,4,7,8,9-Heptachlorodibenzofuran	pg/L	<50	<50	<50	<50	<50	<50	<50	<50	<50
1,2,3,4,7,8-Hexachlorodibenzofuran	pg/L	<50	<50	<50	<50	<50	<50	<50	<50	<50
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	pg/L	<50	<50	<50	<50	<50	<50	<50	<50	<50
1,2,3,6,7,8-Hexachlorodibenzofuran	pg/L	<50	<50	<50	<50	<50	<50	<50	<50	<50
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	pg/L	<50	<50	<50	<50	<50	<50	<50	<50	<50
1,2,3,7,8,9-Hexachlorodibenzofuran	pg/L	<50	<50	<50	<50	<50	<50	<50	<50	<50
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	pg/L	<50	<50	<50	<50	<50	<50	<50	<50	<50
1,2,3,7,8-Pentachlorodibenzofuran	pg/L	<50	<50	<50	<50	<50	<50	<50	<50	<50
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	pg/L	<50	<50	<50	<50	<50	<50	<50	<50	<50
2,3,4,6,7,8-Hexachlorodibenzofuran	pg/L	<50	<50	<50	<50	<50	<50	<50	<50	<50
2,3,4,7,8-Pentachlorodibenzofuran	pg/L	<50	<50	<50	<50	<50	<50	<50	<50	<50
2,3,7,8-Tetrachlorodibenzofuran	pg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,3,7,8-Tetrachlorodibenzo-p-dioxin	pg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10
Metals										
Mercury, dissolved	mg/L	**0.00000069**	**0.00000068**	**0.00000073**	**0.00000082**	**0.00000095**	**0.00000083**	**0.00000076**	**0.0000006**	**0.00000097**
Mercury, total	mg/L	**0.00000139**	**0.00000161**	**0.00000164**	**0.0000018**	**0.00000174**	**0.00000169**	**0.0000013**	**0.0000016**	**0.00000195**
Methylmercury	mg/L	**0.000000084**	**0.000000052**	**0.000000093**	**0.00000008**	**0.000000083**	**0.000000078**	**0.000000085**	**0.000000069**	**0.000000124**
Wet Chemistry										
TOC Replicate 1	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TOC Replicate 2	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TOC Replicate 3	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TOC Replicate 4	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	**3.3**	**3.4**	**2.0**	<2.0
Total Organic Carbon, Average	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0

Notes:
< Concentration less than the Quantitation Limit or not validated if accompanied by "u" qualifier.
NA Not analyzed.
Bolding indicates constituent detection.

Table 2
Summary of Sediment Laboratory Analytical Results

Parameter	Units	Locations/Sample Data								
		Site A Sediment 06/19/08	Site B Sediment 06/17/08	Site C Sediment 06/18/08	Site D Sediment 06/18/08	Site E Sediment 06/17/08	Site F Sediment 06/17/08	Site G Sediment 06/18/08	Duplicate Site G Sediment 06/18/08	Site H Sediment 06/18/08
Dioxins										
1,2,3,4,6,7,8,9-Octachlorodibenzofuran	ng/Kg dry wt.	11	<10	<10	<10	<10	<10	<10	20	<10
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	ng/Kg dry wt.	120	15	20	<10	<10	<10	<10	24	17
1,2,3,4,6,7,8-Heptachlorodibenzofuran	ng/Kg dry wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	ng/Kg dry wt.	12	<5	<5	<5	<5	<5	<5	9	<5
1,2,3,4,7,8,9-Heptachlorodibenzofuran	ng/Kg dry wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,4,7,8-Hexachlorodibenzofuran	ng/Kg dry wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	ng/Kg dry wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,6,7,8-Hexachlorodibenzofuran	ng/Kg dry wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	ng/Kg dry wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,7,8,9-Hexachlorodibenzofuran	ng/Kg dry wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	ng/Kg dry wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,7,8-Pentachlorodibenzofuran	ng/Kg dry wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	ng/Kg dry wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
2,3,4,6,7,8-Hexachlorodibenzofuran	ng/Kg dry wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
2,3,4,7,8-Pentachlorodibenzofuran	ng/Kg dry wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
2,3,7,8-Tetrachlorodibenzofuran	ng/Kg dry wt.	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ng/Kg dry wt.	<1	<1	<1	<1	<1	<1	<1	<1	<1
Metals										
Mercury	mg/Kg	0.00806 j	0.176	0.014 j	0.0255 j	0.0144 j	0.00335 j	0.0376 j	0.0128 j	0.031 j
Methylmercury	mg/Kg	0.000546	0.00114	0.000137	0.000335	0.00018	0.000079	0.00009	0.000077	0.000196
Wet Chemistry										
Solids, percent	%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Solids, total	%	71.29	74.75	73.82	67.48	82.12	80.75	78.69	81.81	67.90
TOC Replicate 1	mg/Kg	7860	6560 j	3800	5110	1960	2090	2220	3770	2850
TOC Replicate 2	mg/Kg	8260	6460 j	4370	4600	1910	3080	3020	2670	2680
Total Organic Carbon, Average	mg/Kg	8060	6510 M0 R1 j	4080	4860	1940	2580	2620	3220	2770
Total Organic Carbon as NPOC	mg/Kg	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

A Analyte is detected in method blank.
N Spiked sample recovery not within control limits.
j Concentration considered an estimate based on data validation.
< Concentration less than the Quantitation Limit.
NA Not analyzed.
Bolding indicates constituent detection.

MO Matrix spike recovery was outside laboratory control limits.
R1 Relative percent difference was outside laboratory control limit.

Benthic macroinvertebrates were collected at each of the eight locations (Site A through H). Laboratory results (wet weight basis) for the benthic macroinvertebrate samples are summarized in Table 3 and on Figure 9. Site H was the only location where a dibenzodioxin congener (OCDBpD) was detected in a benthic macroinvertebrate sample from the River Investigation Area. The concentration of OCDBpD (0.011 μg/Kg) reported in the macroinvertebrate sample was similar to the value reported for the sediment (0.017 μg/Kg) at this location. Mercury and methylmercury concentrations in the macroinvertebrate population were fairly consistent between the eight sample locations, having a calculated average value of 17 and 15 μg/Kg, respectively. Benthic macroinvertebrate tissues were also analyzed for percent lipid, as dioxins and furans are lipophilic and tend to accumulate in fat-rich tissues.

Fish tissue was processed into fillets for human health risk assessment and whole body for ecological risk assessment. Fillet samples, taken from targeted fish species representative of those suitable for human consumption, consisted of the edible portion of the fish excluding head, bones, skin, and entrails. Fillet samples were not collected at three of the eight locations (Site B, Site G, and Site H) because of a lack of appropriate species. Whole body fish samples at the eight sampling locations consisted of natural species with small home ranges and those that are most representative of prey items for ecological receptors. Laboratory results for the fish tissue samples (wet weight basis) are summarized in Table 4 and on Figure 9. Polychlorinated dibenzodioxins or dibenzofurans were not present above the laboratory reporting limit for fish tissue samples from the River Investigation Area. The mercury concentrations detected in the whole body fish samples ranged from 58 to 324 μg/Kg and averaged 126 μg/Kg. The corresponding methylmercury concentrations varied between 58 and 260 μg/Kg and averaged about 120 μg/Kg. In the fish fillet tissue samples, mercury concentrations between 20 and 400 μg/Kg were reported, which averaged about 150 μg/Kg. Comparatively less methylmercury was detected in the fish fillet tissue samples, which ranged from about 13 to 238 μg/Kg and averaged about 90 μg/Kg. Three samples in Table 4, designated HB-B081071-Hg, HB-B081072-Hg, and HB-B081072-Hg (grinder), represent QC blanks collected from the equipment used to homogenize the fish tissue at the labs. Mercury was not detected in the equipment blank QC samples. Fish tissue samples (whole body and fillet) were also analyzed for percent lipid, as dioxins and furans are lipophilic and tend to accumulate in fat-rich tissues.

Surface water samples from the Site A and Site D locations were also submitted for an additional suite of chemical analyses to provide a comprehensive snapshot of the water quality of the river. These water samples were analyzed for the following set of analytes: volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), organochlorine pesticides, chlorinated herbicides, PCBs, and a group of metals (Table 1).

Table 3
Summary of Macroinvertebrate Laboratory Analytical Results

Parameter	Units	Location/Sample Date							
		Site A (MV-006) 06/17/08	Site B (MV-004) 06/17/08	Site C (MV-001) 06/16/08	Site D (MV-002) 06/16/08	Site E (MV-003) 6/16/2008	Site F (MV-005) 06/17/08	Site G (MV-007) 06/18/08	Site H (MV-008) 06/18/08
Dioxins									
1,2,3,4,6,7,8,9-Octachlorodibenzofuran	ng/Kg wet wt.	<10	<10	<10	<10	<10	<10	<10	<10
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	ng/Kg wet wt.	<10	<10	<10	<10	<10	<10	<10	**11**
1,2,3,4,6,7,8-Heptachlorodibenzofuran	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,4,7,8,9-Heptachlorodibenzofuran	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,4,7,8-Hexachlorodibenzofuran	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,6,7,8-Hexachlorodibenzofuran	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,7,8,9-Hexachlorodibenzofuran	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,7,8-Pentachlorodibenzofuran	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5
2,3,4,6,7,8-Hexachlorodibenzofuran	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5
2,3,4,7,8-Pentachlorodibenzofuran	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5
2,3,7,8-Tetrachlorodibenzofuran	ng/Kg wet wt.	<1	<1	<1	<1	<1	<1	<1	<1
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ng/Kg wet wt.	<1	<1	<1	<1	<1	<1	<1	<1
Metals									
Mercury	mg/Kg	**0.0188**	**0.0169**	**0.0145**	**0.0174**	**0.0206**	**0.0205**	**0.00844**	**0.0187**
Methylmercury	mg/Kg	**0.0137**	**0.0127**	**0.017**	**0.0138**	**0.0191**	**0.0169**	**0.0086**	**0.0203**

Notes:
< Concentration less than the Quantitation Limit or not validated if accompanied by "u" qualifier.
NA Not analyzed.
Bolding indicates constituent detection.

Table 4
Summary of Fish Tissue Laboratory Analytical Results

Parameter	Units	Location/Sample Date								
		Site A #6 Whole 06/18/08	Site A #6 Filet 06/18/08	Site B #4 Whole 06/18/08	Site C #1 Whole 06/18/08	Site C #1 Filet 06/18/08	Site D #2 Whole 06/18/08	Site D #2 Filet 06/18/08	Site E #3 Whole 06/18/08	Site E #3 Filet 06/18/08
Dioxins										
1,2,3,4,6,7,8,9-Octachlorodibenzofuran	ng/Kg wet wt.	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	ng/Kg wet wt.	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2,3,4,6,7,8-Heptachlorodibenzofuran	ng/Kg wet wt.	<5.2 Euj	<5.4 Euj	<5	<5	<5	<7 Euj	<5.3 Euj	<5	<5
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,4,7,8,9-Heptachlorodibenzofuran	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,4,7,8-Hexachlorodibenzofuran	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,6,7,8-Hexachlorodibenzofuran	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,7,8,9-Hexachlorodibenzofuran	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,7,8-Pentachlorodibenzofuran	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
2,3,4,6,7,8-Hexachlorodibenzofuran	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
2,3,4,7,8-Pentachlorodibenzofuran	ng/Kg wet wt.	<5	<5	<5	<5	<5	<5	<5	<5	<5
2,3,7,8-Tetrachlorodibenzofuran	ng/Kg wet wt.	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ng/Kg wet wt.	<1	<1	<1	<1	<1	<1	<1	<1	<1
Metals										
Mercury	mg/Kg	**0.0842**	**0.11**	**0.0743**	**0.104**	**0.399**	**0.204**	**0.201**	**0.0579**	**0.0249**
Methylmercury	mg/Kg	**0.0788**	**0.0592**	**0.0766**	**0.0771**	**0.238**	**0.212**	**0.132**	**0.058**	**0.0167**

2.6 Current and Potential Future Site and Resource Uses

This section of the ROD discusses the current and reasonably anticipated future land uses, and current and potential groundwater and surface water uses at the site. This section also discusses the basis for future use assumptions.

2.6.1 Land Uses-Redevelopment Area

For the Redevelopment Areas (OU-1) the site owner has planned a mixed-use development consisting of commercial, mixed commercial/residential and residential land use. Cleanup strategies during the removal activities have adopted State residential cleanup standards. The developer may, with the approval of the State, adopt a commercial/industrial cleanup level for a portion of the property. As described earlier, the State has maintained authority for long-term land use controls and monitoring.

2.6.2 Surface Water

All surface waters in the state are assigned a *primary* classification that is appropriate to the best uses of that water. In addition to primary classifications, surface waters may be assigned a *supplemental* classification. Most supplemental classifications have been developed to provide special protection to sensitive or highly valued resource waters. The Davidson River is sub-divided into two reaches which are classified by the North Carolina Division of Water Quality (NCDWQ) as follows: 1) from the source to the water supply dam at Ecusta is classified as Water Supply V (WS-V), Class B river (Primary Recreational), Trout Waters (Tr) and High Quality Waters; and 2) from the water supply dam at Ecusta to the French Broad River is classified as a Class B river. In the River Investigation Area, the French Broad River is classified by NCDWQ as a Class B river.

2.7 Summary of Site Risks

This section of the ROD provides a summary of the River Investigation Area (OU-2) human health and ecological risks. A Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (ERA) were completed on the data collected during the RI. The risk assessments estimated what risks the site poses if no action was taken. The results of the HHRA and the ERA form the basis for the no-action determination made in this record of decision.

2.7.1 Human Health Risk Assessment

The HHRA consisted of four parts

- Hazard identification (Identification of Contaminants of Concern),
- Exposure assessment,
- Toxicity assessment, and
- Risk characterization.

2.7.1.1 Identification of Contaminants of Concern (COCs)

Contaminants of Potential Concern (COPCs) are those chemicals, identified through a conservative screening process, which are most likely to contribute to an unacceptable human health risk. The selection of COPCs for the River Investigation Area was conducted by screening the maximum observed constituent concentrations in each media (sediment, surface water and fish fillets) against risk-based screening values. These screening values for carcinogenic compounds represent a target incremental risk level of $1x10^{-6}$ (or 1 in 1,000,000 incremental cancer occurrences). Screening values for non-carcinogenic chemicals were further adjusted to a level equivalent to a hazard quotient (HQ) of 0.1 before use in the human health COPC selection process. Constituents that exceed conservative risk-based screening levels are considered human health COPCs and are evaluated further in the HHRA. Constituents that are not detected at concentrations above conservative risk-based screening levels are determined to not pose potential adverse health effects and are eliminated from further evaluation.

Sediment. Approximately 200 sediment samples were subjected to field screening prior to the RI. A total of eight (8) sediment samples were collected during RI activities in the River Investigation Area and subjected to laboratory analysis. A total of fourteen (14) sediment samples collected during an earlier investigation were also included in the sediment data set. The maximum detected concentration of each preliminary human health COPC was below its respective screening value for sediment. No human health COPCs were identified for sediments based on the COPC screening results; however, for completeness, sediment was further considered in baseline risk characterizations. Sediment screening for COPCs is presented in Table 5.

Table 5
Selection of Human Health Contaminants of Potential Concern in Sediment

Constituent	Units	Minimum Detected Concentration	Maximum Detected Concentration	Location of Maximum Detected Concentration	Screening Values[1]	Detection Frequency	COPC Flag	Rationale
2378TCDD_TEQ_WHO 2005 Mammalian	ng/Kg dry wt.	1.144	1.29	SITE A SEDIMENT	4.5	5/8	No	BSL
Mercury	mg/kg dry wt.	0.0034	0.19	FB-1SED-3B (2006 sample)	6.7	8/8	No	BSL
Methylmercury	mg/kg dry wt.	0.000079	0.0011	SITE B SEDIMENT	7.8	8/8	No	BSL

(1) USEPA Region 4 Residential Soil Screening Values. http://www.epa.gov/region4/waste/ots/healtbul.htm, May 2008 Regional Screening Tables

Note: For samples where all individual dioxin congeners were non-detect, the corresponding dioxin TEQ = 0.

BSL= Below Screening Level

Surface Water. Surface water samples were collected from eight (8) locations during RI activities in the River Investigation Area. The maximum detected concentration (0.97 ng/L) of dissolved elemental mercury was below the respective screening value. Methylmercury had a maximum detected concentration of 0.12 ng/L. A screening value for methylmercury in surface water was not available for comparison. No individual dioxin/furan congeners were detected in surface water; therefore, a 2,3,7,8 TCDD TEQ (based on WHO 2005 TEFs) was not calculated for surface water. No human health COPCs were identified for surface water based on the COPC screening results; however, for completeness, mercury in surface water was further considered in baseline risk characterizations. Table 6 summarizes the screening of COPCs for Surface Water.

Table 6
Selection of Human Health Contaminants of Potential Concern in Surface Water

Constituent	Units	Minimum Detected Concentration	Maximum Detected Concentration	Location of Maximum Detected Concentration	Screening Value	Detection Frequency	COPC Flag	Rationale
2378TCDD_TEQ_WHO 2005 Mammalian	pg/L	0	0	--	0.005 (1)	0/6	No	BSL
Mercury, dissolved	ng/L	0.68	0.97	SITE H WATER	2000 (2)	8/8	No	BSL
Mercury, total	ng/L	1.4	2.0	SITE H WATER	2000 (2)	8/8	No	BSL
Methylmercury, total	ng/L	0.052	0.12	SITE H WATER	2000 (2)	8/8	No	NSL

(1) National Recommended Water Quality Criteria - Water and Organisms

(2) Federal Safe Drinking Water Act Maximium Contaminant Level used as a surrogate.

Note: For samples where all individual dioxin congeners were non-detect, the corresponding dioxin TEQ = 0.

ASL= Above Screening Level

BSL= Below Screening Level

NSL= No Screening Level is Available

Fish Tissue Fillets. Five (5) fish tissue fillet samples were collected during RI activities in the River Investigation Area. The maximum detected concentration of elemental mercury in fish tissue fillet was 0.4 mg/Kg. No screening values were available for elemental mercury. The maximum detected concentration of methylmercury observed in fish fillet tissue was 0.24 mg/Kg, which is above the respective screening value of 0.135 mg/Kg. Individual dioxin/furan congeners were not detected in fish tissue fillets, therefore, a 2,3,7,8 TCDD TEQ (based on WHO 2005 TEFs) was not calculated for this media. Methylmercury and total mercury in fish fillet tissue were further evaluated in the refinement of COPCs and baseline risk characterizations. Table 7 summarizes the COPC screening of fish tissue.

Table 7
Selection of Human Health Contaminants of Potential Concern in Fish Tissue

Constituent	Units	Minimum Detected Concentration	Maximum Detected Concentration	Location of Maximum Detected Concentration	Screening Value	Detection Frequency	COPC Flag	Rationale
2378TCDD_TEQ_WHO 2005 Mammalian	ng/kg wet wt.	0	0	--	0.0243 (1)	0/5	No	BSL
Mercury	mg/kg wet wt.	0.020	0.40	SITE C #1	NA	5/5	Yes	NSL
Methylmercury	mg/kg wet wt.	0.010	0.24	SITE C #1	0.135 (1)	5/5	Yes	ASL

(1) USEPA Region 3 Fish Tissue Screening Levels. May 2006. http://www.epa.gov/reg3hwmd/risk/human/pdf/fish.pdf

Note: For samples where all individual dioxin congeners were non-detect, the corresponding dioxin TEQ = 0.

ASL= Above Screening Level

BSL= Below Screening Level

NSL=No Screening Level

The potential exposure to site-related COPCs for each receptor is represented by a chronic daily intake (CDI). The CDI for an individual receptor is estimated from the exposure point concentration of each COPC in each environmental medium. Consistent with Region IV Supplemental Guidance (U.S.EPA, 2000), the exposure point concentrations used for estimating CDIs are the lesser of the maximum detected concentration for each COPC or the 95 percent upper confidence limit (95 percent UCL) of the mean concentration. A value equivalent to one-half the quantitation limit was used in the exposure point concentration calculations for inorganic constituents reported as not detected. The exposure point concentrations for the COPCs from the various environmental media are presented in Table 8.

Table 8
Exposure Point Concentrations

Environmental Media	COPC	Maximum Observed Concentration	Calculated 95% Upper Confidence Level	Exposure Point Concentration
Sediment	Mercury (mg/Kg)	0.19	0.051	0.051
	Methyl mercury (mg/Kg)	0.0011	6.04E-04	6.04E-04
	2,3,7,8-TCDD TEQ[1] (ng/Kg)	1.29	NC	1.29
Surface water	Mercury (total) (mg/L)	2.0E-06	1.8E-06	1.8E-06
	Methyl mercury (mg/L)	1.2E-07	9.5E-08	9.5E-08
	2,3,7,8-TCDD TEQ[1] (pg/L)	ND	NC	NC
Fish Tissue	Mercury (mg/Kg)	0.40	0.3	0.3
	Methyl mercury (mg/Kg)	0.24	0.18	0.18
	2,3,7,8-TCDD TEQ[1] (ng/Kg)	ND	NC	NC

Notes:
1. WHO, 2005, mammalian.
NC Not Calculated
ND Not Detected

2.7.1.2 Exposure Assessment

The purpose of the Exposure Assessment is to identify current and potential future receptors and exposure pathways for Contaminants of Concern. Exposure pathways are the means by which potentially exposed populations (receptors) come into contact with site-related COPCs. Figure 3 presented the conceptual site model used to derive the exposure scenarios used in the HHRA. The exposure pathways considered in the conceptual site model for potential human receptors at the River Investigation Area were as follows:

- Aquatic scientist exposure to COPCs in sediment and surface water;
- Recreational fisherman exposure to COPCs in surface water, sediment and edible fish tissue; and
- Adolescent trespasser exposure to COPCs in sediment, surface water and edible fish tissue.

The exposure routes associated with the potentially completed exposure pathways evaluated for the River Investigation Area were as follows:

Aquatic Scientist.

- Incidental ingestion of surface water and sediment
- Dermal contact with surface water and sediment

Recreational Fisherman.

- Incidental ingestion of surface water and sediment
- Dermal contact with surface water and sediment
- Consumption of fish (The River Investigation Area lies entirely within the reaches of the Davidson and French Broad Rivers leased to an Outfitter for private recreational fishing. The Outfitter indicated in interviews that they operate a catch-and-release only program

and actively enforce their lease against non-client fishermen. However, to be conservative, the HHRA assumed consumption of fish.)

Adolescent Trespasser.

- Incidental ingestion of surface water and sediment
- Dermal contact with surface water and sediment
- Consumption of fish (see note above regarding fish consumption)

Specific assumptions about exposure frequency, duration, and other exposure factors that were included in the exposure assessment are included in Table 9.

Table 9
Exposure Assumptions

Variable	Value	Basis
Aquatic Scientist		
Age	Adult	
Incidental Sediment Ingestion Rate	25 mg/day	Professional Judgment
Incidental Water Ingestion Rate	0.01 L/hour	Region IV Guidance[1]
Skin Surface Area Available for Dermal Contact with Sediment and Surface Water	1,360 cm^2/day	Exposure Factors Handbook[2] Table 6-4 (Maximum forearms)
Adherence Factor	1.0 mg/cm^2	Region IV Guidance[1]
Exposure Time	3 hours/day	Professional Judgment
Exposure Frequency	24 days/year	Professional Judgment
Exposure Duration	25 years	Region IV Guidance[1]
Body Weight	70 Kg	Region IV Guidance[1]
Recreational Fisherman		
Age	Adult	
Incidental Water Ingestion Rate	0.01 L/day	Region IV Guidance[1]
Incidental Sediment Ingestion Rate	25 mg/Kg	Professional Judgment
Skin Surface Area Available for Dermal Contact with Surface Water	2,490 cm^2/day	Exposure Factors Handbook[2]
Adherence Factor	1.0 mg/cm^2	Region IV Guidance[1]
Exposure Time	4 hours/day	Professional Judgment
Exposure Frequency	50 days/year	Professional Judgment
Exposure Duration	25 years	Region IV Guidance[1]
Body Weight	70 Kg	Region IV Guidance[1]
Fish Ingestion[3]	284 g/meal 21 meals/year	Exposure Factors Handbook[2] Chapter 10 Fish meal size: Table 10-45, represents the 95th percentile for fish meal sizes for all ages. Fish meals frequency: based on Table 10-61, mean recreational fish meals per week for licensed anglers of all ages.
Body Weight	70 Kg	Region IV Guidance[1]
Adolescent Trespasser		
Age	7-16, Adolescent	Region IV Guidance[1]
Incidental Water Ingestion Rate	0.01 L/day	Region IV Guidance[1]
Incidental Sediment Ingestion Rate	100 mg/day	Professional Judgment
Fish Ingestion[3]	255 g/meal 15 meals/year	Exposure Factors Handbook[2] Chapter 10, Meal Size: Table 10-45 95th percentile for males age 9-14 Fish meals frequency: based on Table 10-61, mean recreational fish meals for 6-10 years old.
Total Body Surface Area Available for Dermal Contact with Surface Water	1,240 cm^2/day	Exposure Factors Handbook[2] (Table 6-6 50th percentile –average for ages 6-15)
Adherence Factor	1.0 mg/cm^2	Region IV Guidance[1]
Exposure Time	4 hours/day	Professional Judgment
Exposure Frequency	50 days/year	Professional Judgment
Exposure Duration	10 years	Region IV Guidance[1]
Body Weight	45 Kg	Region IV Guidance[1]

Variable	Value	Basis

Notes:
1. Region IV Guidance: U.S.EPA, 2000. Supplemental Guidance to RAGS: Region IV Bulletins – Human Health Risk Assessment.
2. Exposure Factors Handbook: U.S.EPA, August 1997. Exposure Factors Handbook. U.S.EPA/600/P-95/002F.
3. The River Investigation area lies entirely within the reaches of the Davison and French Broad rivers leased to Davidson River Outfitters for private recreational fishing. The outfitter indicated in interviews that they operate a catch and release only program and actively enforce their lease against non-client fishers.

2.7.1.3 Toxicity Assessment

The toxicity value for evaluating non-carcinogenic effects resulting from chemical exposure is the chronic reference dose (RfD). The chronic RfD is an estimate of a daily exposure level for the human population (including sensitive populations) that should not cause an appreciable risk of harmful effects during a lifetime of exposure. For the HHRA, mercury was evaluated for noncarcinogenic health effects.Oral RfDs (RfDo) are published exposure dose estimates derived from ingestion-based studies. RfDo values will be used in estimating potential hazards associated with the incidental ingestion pathway and with modification, the dermal contact pathway. Table 10 presents a summary of the available quantitative toxicity information for mercury for noncarcinogenic effects to be used in the estimation of hazard through incidental ingestion and dermal contact exposure pathways.

Table 10
Summary of Non-Carcinogenic Toxicity Data

Constituent Of Potential Concern	Chronic/ Subchronic	Oral RfD Value (mg/Kg-day)	Oral To Dermal Adjustment Factor [1]	Adjusted Dermal RfD (mg/Kg-day)	Combined Uncertainty/ Modifying Factors	Sources Of RfD	Dates Of RfD [2][4] (mm/yyyy)
Mercury, elemental	NA	NA	NA	NA	NA	IRIS	11/2008
Methyl mercury	Chronic	1.0E-04	1.0	1.0E-04	10	IRIS	11/2008
2,3,7,8-TCDD	N/A	1.0E-09	1.0	1.0E-09	N/A	ATSDR	5/2009

Notes:
1. OSWER (USEPA 2008)
2. For IRIS values, date IRIS was searched.
3. Toxicity Values for Mecuric Chloride.
4. Oral RfD for dioxin (ATSDR)

NA Not Available.

Toxicity values for COPCs with potential carcinogenic effects are expressed as slope factors (SF). The SF is the upper bound estimate of the probability of a response per unit intake of a chemical over a lifetime. It is the value used to define the probability of an individual developing cancer as a result of exposure to a particular level of a potential carcinogen. For the HHRA, dioxins/furans, methylmercury, and mercury were evaluated for carcinogenic health effects.

Oral slope factors (SFo) are published exposure dose estimates derived from ingestion-based studies. SFo values will be used in estimation of potential hazards associated with the incidental ingestion pathway and with modification, the dermal contact pathway. The California Environmental Protection Agency (CalEPA) has relied upon a cancer slope factor (CSF) of 130,000 $(mg/Kg\text{-}day)^{-1}$ for estimating cancer risks resulting from exposures to dioxin (and dioxin-like compounds), which was used in the River Investigation Area HHRA. Table 11 presents a summary of the available quantitative toxicity information for 2,3,7,8- CDD for carcinogenic effects to be used in the estimation of hazard through incidental ingestion and dermal contact exposure pathways.

Table 11 also shows the EPA Weight of Evidence (WOE) for each of the COPCs that are considered by EPA to be potential carcinogenic compounds. WOE is a classification system for characterizing the extent to which the available data indicate that an agent is a human carcinogen. Group A chemicals are listed as "known human carcinogenic compounds" by U.S.

EPA. Group B1 chemicals are listed as "probable human carcinogenic compounds" based on limited evidence of carcinogenicity in humans. Group B2 chemicals are listed as "probable human carcinogenic compounds" based on evidence of carcinogenicity in animals; human evidence is inadequate. Group C chemicals are "possible human carcinogenic compounds" based on limited evidence of carcinogenicity in animals; human evidence is inadequate. Group D chemicals are not classifiable as to human carcinogenicity. Group E chemicals show evidence of non-carcinogenicity in humans.

Table 11
Summary of Carcinogenic Toxicity Data

Constituent Of Potential Concern	Oral Cancer Slope Factor (mg/Kg-day)$^{-1}$	Oral To Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (mg/Kg -day)$^{-1}$	Weight Of Evidence/ Cancer Guideline Description	Source	Dates Of RfD [2] (mm/yyyy)
Mercury, elemental	N/A	N/A	N/A	D	IRIS	11/2008
Methyl mercury	N/A	N/A	N/A	C	IRIS	11/2008
2,3,7,8-TCDD	1.3E+05	1.0	1.3E+05	B2	CalEPA	5/2009

Notes:
1. Supplemental Guidance to RAGS, U.S.EPA 1996.
3. For IRIS values, date IRIS was searched. For HEAST values, date of HEAST publication.
3. CalEPA
NA Not Available

2.7.1.4 Risk Characterization

The risk characterization section of the ROD summarizes and combines outputs of the exposure and toxicity assessments to characterize baseline risk at the site. Baseline risks are those risks and hazards that the site poses if no action were taken.

To characterize the overall potential for noncarcinogenic effects associated with exposure to multiple chemicals, EPA uses a Hazardous Index (HI) approach. This approach assumes that simultaneous chronic exposures to multiple chemicals are additive and could result in an adverse health effect. For each non-carcinogenic COPC, a hazardous quotient (HQ) is calculated using the equation for HQ:

$$\mathbf{HQ = CDI/RfD}$$

Where:
CDI = chronic daily intake
RfD = reference dose

The HI is calculated by summing all of the HQs for the evaluated exposure pathways. Calculation of an HI greater than 1 (unity) indicates the potential for adverse health effects. Indices greater than one will be generated any time intake for any of the COCs exceeds RfD. The HQs and HI for potential receptors representing the RME scenario at the River Investigation Area are included in Table 12. For the aquatic scientist, recreational fisherman, and adolescent trespasser, the calculated total HI at the River Investigation Area was well below 1.0.

Carcinogenic risk is expressed as a probability of developing a cancer as a result of lifetime exposure. For a given chemical and route of exposure, excess lifetime cancer risk is calculated as follows:

$$\textbf{Risk} = \textbf{CDI} \times \textbf{CSF}$$

Where:

CDI = chronic daily intake
CSF = carcinogenic slope factor

These risks are probabilities that are generally expressed in scientific notation (i.e., 1×10^{-6} or $1E^{-6}$). An incremental lifetime cancer risk of 1×10^{-6} indicates that, as a plausible upper-bound, an individual has a one-in-one-million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at the site. For exposures to multiple carcinogens, EPA assumes that the risk associated with multiple exposures is equivalent to the sum of their individual risks.

EPA has established an acceptable excess lifetime cancer risk (ELCR) range between 1×10^{-4} and 1×10^{-6}. ELCRs calculated to be less than the low end of the range, 1×10^{-6}, are said to be *de minimis* (minimal) and generally do not need to be considered further. Risks greater than 1×10^{-6} but less than 1×10^{-4} are within EPA's acceptable risk range. Risks greater than 1×10^{-4} exceed the risk range and may require that an action be taken to reduce the potential risks. For each receptor evaluated at the River Investigation Area, the total estimated RME risk was less than the conservative end of the risk range, or $1\text{x}10^{-6}$. The results are included in Table 12.

Table 12
Summary of Risk Calculations

Receptor/Media of Concern	Hazard	Incremental Risk
Target Risk	**1.0**	**1.0×10^{-4}-1.0×10^{-6}**
Aquatic Scientist		
Sediment	3.6×10^{-5}	2.2×10^{-9}
Surface Water	3.3×10^{-7}	NC
Total Receptor Risk	**0.0000056**	**2.2×10^{-9}**
Recreational Fisherman		
Sediment	1.3×10^{-5}	5.8×10^{-9}
Surface Water	1.2×10^{-6}	NC
Fish Tissue	0.65	NC
Total Receptor Risk	**0.65**	**5.8×10^{-9}**
Adolescent Trespasser		
Sediment	5×10^{-4}	7.3×10^{-9}
Surface Water	1.4×10^{-6}	NC
Fish Tissue	0.43	NC
Total Receptor Risk	**0.43**	**7.3×10^{-9}**
NC Not Calculated- COPCs not detected in this media		

2.7.1.5 Uncertainty Analysis

The primary goal of the uncertainty analysis is to provide a discussion of the key assumptions made in the assessment of risk that may significantly influence the estimate of potential risk. Uncertainty is inherent in all of the principle components of a risk assessment. A discussion of the sources of uncertainty associated with estimates of risk and effects (overestimation or underestimation of risk) of these factors is presented in this section.

The potential non-carcinogenic risk estimates for the River Investigation Area are based on a number of assumptions that incorporate varying degrees of uncertainty resulting from many sources, including the following:

- Environmental monitoring and data evaluation;
- Assumptions in the selection of exposure pathways and scenarios;
- Assumptions in the expression of potential non-carcinogenic risk; and
- Estimation of the magnitude of exposure under selected exposure scenarios.

Several factors introduced in the risk assessment may contribute to the uncertainty of the potential risk estimates, including the following:

- Sampling that is concentrated in areas at the Site believed to be affected by constituents (biased sampling) is likely to overestimate exposure.
- Using toxicity values with low confidence ratings and high uncertainty factors typically overestimate potential risk.
- Using toxicity values that are largely based on animal studies and extrapolated to humans most likely overestimate potential risk.
- Compounding conservative assumptions in the risk assessment yield overestimated potential risk estimates.
- Assuming that constituents present in the sediment have a significant tendency to desorb from the sediment and pass through the skin is likely to overestimate exposure.
- Using 95 percent UCL and maximum detected concentrations are likely to overestimate intakes because actual exposure is probably at lower concentrations.
- The assumption that aquatic scientists spend their workdays within the localized affected areas of the River Investigation Area overestimates exposure.

2.7.2 Baseline Ecological Risk Assessment (BERA)

The specific objective of the BERA for the River Investigation Area was to evaluate the risk of ecological harm associated with COPCs (i.e., dioxins/furans and mercury) related to former mill activities. The BERA was intended to determine if specific areas or environmental media (surface water, sediment, and/or tissue) represent a risk to ecological receptors.

The EPA Ecological Risk Assessment process is comprised of an eight-step approach to ecological risk assessment. The eight-step approach consists of two tiers. The first tier is the Screening Level Ecological Risk Assessment (SLERA), and the second tier is a more comprehensive BERA. Steps 1 and 2 of the EPA process were followed in preparing the SLERA. Steps 3 and 4 of the EPA process were followed in preparing the Study Design and Sampling Plan. Step 5 is verification of field sampling design and Step 6 is the Site investigation and data analysis; these steps were implemented as described in the Work Plan and study design. The preparation and completion of the BERA comprise Step 7, Risk Characterization. The final step, Step 8, of ecological risk characterization is Risk Management .

2.7.2.1 Identification of COPCs

Identification of COPCs specifically for ecological risk and determining exposure point concentrations (EPCs) was conducted as part of the BERA. The surface water data used in this BERA are from samples collected during the RI sampling activities described in Section 2.5.4.3. The surface water data are used in the BERA to identify concentrations of COPCs in surface water and to characterize risks to aquatic receptors through direct comparisons of surface water EPCs to literature screening values and through aquatic food chain modeling.

The sediment data used in this BERA are from shallow (0 to 6 inches) sediment samples collected during a sampling effort performed in support of the BERA. The sediment data are used in the BERA to identify COPCs in sediment and to characterize risks to aquatic receptors through direct comparisons of sediment EPCs to literature screening values and through aquatic food chain modeling.

The following biota data were used in the BERA:

- Benthic macroinvertebrate tissue data are from freshwater benthic organisms and crayfish samples collected from the eight (8) co-located sampling sites. Benthic macroinvertebrate tissue data were used to characterize risks to higher trophic level receptors. In addition, risks to benthic macroinvertebrates were characterized through direct comparison of tissue concentrations to critical body residue screening values.

- Fish tissue (whole body) data are from fish that were collected from the River Investigation Area during RI sampling activities. The fish tissue data were used directly in food chain modeling to characterize risks to higher trophic level receptors. In addition, risks to fish were characterized through direct comparison of fish tissue concentrations to critical body residue screening values.

Each data set developed for the BERA was summarized to provide the arithmetic mean of reported concentrations. In addition, the 95th percentile upper confidence limit (UCL) of the arithmetic mean (95 percent UCL) concentration was calculated for use in identifying Exposure Point Concentrations (EPCs). The following procedures were applied when summarizing the analytical data:

- For samples in which analyte concentrations were detected over the calibration range, the samples were diluted and reanalyzed by the laboratory. For analytes that exceeded the calibration range in the original analysis, only the reanalyzed results within the calibration range were used in the ecological risk assessment.

- The arithmetic mean concentration was calculated for each chemical using one-half the Quantitation Limit for nondetects for use in the bioaccumulation models.

- The 95 percent UCL values for each parameter in each data set were calculated using EPA's ProUCL software (v. 4.0). For each data set, the ProUCL software identifies the statistical distribution of each parameter as normal, lognormal, non-parametric, or gamma, and then selects a 95 percent UCL algorithm that is appropriate for the statistical distribution and data set population; 95 percent UCL values are not calculated for data sets with four samples or fewer.

Table 13
Identified COPC for the BERA

Media	COPC [1]	Detected Concentration		U.S.EPA Region 4 ESV[3]	Reference Site "A"
		Mean or 95% UCL	Maximum[2]	Benchmark	
Surface Water (values in µg/L) (n=9)	2,3,7,8-TCDD [4]	8.85E-07	1.50E-06	1.0E-05	8.8E-07
	2,3,7,8-TCDF [4]	8.42E-07	1.30E-06 (ND)	1.0E-06 [5]	7.5E-07
	Total TEQ	1.45E-06	2.00E-06	NA	1.4E-06
	Mercury, total	9.0E-04	1.95E-03	1.2E-02	1.39E-03
	Methyl Mercury	9.5E-05	1.2E-04	1.2E-02	8.40E-05
	Mercury, Dissolved	8.6E-04	9.7E-04	NA	6.9E-04
Sediment (values in mg/Kg - dw) (n=9)	2,3,7,8-TCDD [4]	1.21E-07	2.90E-07 (Site A, ND)	2.50E-06	2.9E-07 (ND)
	2,3,7,8-TCDF [4]	1.07E-07	2.30E-07 (Site A, ND)	2.50E-07 [5]	2.3E-07 (ND)
	Total TEQ	2.28E-07	6.60E-07 (Site A, ND)	NA	6.60E-07
	Mercury, total (Note 6)	9.49E-02	0.176	1.74E-01 0.2 [6]	8.06E-03
	Methyl Mercury	5.1E-02 historical data	1.9E-01 historical data	1.74E-01 0.2 [6]	8.06E-03

Notes:
1. COPC: Constituent of Potential Concern.
2. Maximum detected concentration of COPC in sample.
3. U.S.EPA Region IV Ecological Screening Value (ESV).
4. 2,3,7,8-TCDD and 2,3,7,8-TCDF isomers: 2,3,7,8-tetrachlorodibenzo-p-dioxin and 2,3,7,8-tetrachlorodibenzofuran.
5. U.S.EPA Region IV Ecological Screening Value for 2,3,7,8 TCDD used as a surrogate for 2,3,7,8 TCDF at one-tenth the potency.
6. MOE 1993 = 0. 0.2 mg/Kg dw in sediment is protective for ecological effects

NA Not Available
ND COPC concentration was not detected in this sample; therefore it is reported as the RL for non-detected.
dw dry weight

Media	COPC [1]	Detected Concentration [2]		Effects Level	Reference Site "A"
		Mean or 95% UCL	Maximum	CBR	
Macroinvertebrates (mg/Kg, ww) [6] (n=8)	2,3,7,8-TCDD [4]	6.28E-08	1.30E-07	NA	ND
	2,3,7,8-TCDF [4]	1.25E-07	3.00E-07	NA	ND
	Total TEQs	1.46E-7	2.80E-07	NA	9.10E-08
	Mercury, Total	2.0E-02	2.06E-02	0.2 [c,7]	1.88E-02
	Methyl Mercury	1.8E-02	2.03E-02	NA	1.37E-02
Fish Tissue (Whole Body) (mg/Kg, ww) [6] (n=8)	2,3,7,8-TCDD [4]	1.28E-07	2.00E-07	0.018 [b]	8.40E-08
	2,3,7,8-TCDF [4]	3.40E-07	9.50E-07	NA	1.60E-07
	Total TEQs	3.24E-07	6.40E-07	NA	1.9E-07
	Mercury, Total (2008 Data)	1.26E-01 (mean) 0.216 (95% UCL)	3.24E-01	0.2 [d]	8:4E-02
	Mercury, Total (n=16)	2.7E-01 historical data	6.1E-01 historical data	0.2 [d]	8.4E-02
	Methyl Mercury	1.19E-01	2.60E-01	NA	7.8E-02
	Methyl Mercury (n=16)	1.8E-01 historical data	3.4E-01 historical data	NA	7.8E-02

Notes:
1. COPC: Constituent of Potential Concern.
2. Maximum detected concentration of COPC in sample.
3. U.S.EPA Region IV Ecological Screening Value (ESV).
4. 2,3,7,8-TCDD and 2,3,7,8-TCDF congeners: 2,3,7,8-tetrachlorodibenzo-p-dioxin and 2,3,7,8-tetrachlorodibenzofuran.
5. U.S.EPA Region IV Ecological Screening Value for 2,3,7,8 TCDD used as a surrogate for 2,3,7,8 TCDF at one-tenth the potency.
6. Concentrations of COPC in tissue samples are reported in milligram per kilogram, on a wet weight (ww) basis.
7. Water concentration of mercury for the protection of aquatic life is 0.87 ug/L for aquatic invertebrates (Suter and Tsao, 1996) as an Effects Level.

a. NER = No Effect Residue for Brook Trout *(Salvelinus fontinalis)* Beckvar *et al.*, 2005.
b. Jones *et al.* (2001) and Giesy *et al.* (2002).
c. MOE, 1993 Direct contact TRV for benthic invertebrates.
d. Beckvar *et al.*, 2005

2.7.2.2 Exposure Assessment

The River Investigation Area was designated in the settlement agreements for the Ecusta Mill Site as being restricted to the area within the river banks, as noted on Figure 2. The focus of information and data for the BERA is limited to aquatic habitat. Therefore, discussions regarding sources, release mechanisms, and COPCs in media for terrestrial habitat was not included as part of the BERA.

Habitat Characterization. Habitat characterizations were conducted at the eight co-located sampling locations described earlier and presented on Figure 7. The EPA Rapid Bioassessment Protocols for "*Use in Streams and Wadeable Rivers*" was used to characterize habitat conditions of each sampling site. The habitat characterization identified target receptors and exposure pathways and also identified factors that could potentially affect the fate, transport, and exposure of organisms to COPCs.

Conceptual Site Model. Figure 4 presents an overview of the CSM and its components. Only the complete and primary exposure pathways (such as water, sediment, and prey item consumption) are illustrated. There are several pathways through which resident biotic populations may be exposed to COPCs in the River Investigation Area. These include direct contact with sediment-associated COPCs, direct contact with COPCs via surface water, and indirect exposure through ingestion of contaminated food and bioaccumulation.

Because exposure of terrestrial wildlife is expected to be limited for the River Investigation Area and the exposure factors are expected to be less than those for aquatic and semi-aquatic species, dietary exposure modeling to determine risk to terrestrial species would only be conducted if apparent risk was determined for aquatic and semi-aquatic receptors. Consequently, complete terrestrial exposure pathways were not expected within the River Investigation Area; therefore, exposure modeling for terrestrial receptors was not included in the BERA.

The receptors that are potentially exposed to COPCs in environmental media from within the River Investigation Area include aquatic receptors exposed to surface water, sediment, and aquatic prey species, as well as semi-aquatic receptors exposed to surface water, sediment, and prey.

Threatened, Endangered, and Rare Species. A review was conducted of species identified in the region as being threatened, endangered, and rare (TER) to determine if any TER species would likely be present within the River Investigation Area. The review of TER species was based on species information recorded by the North Carolina Natural Heritage Program (NCNHP), which tracks occurrences of TER species in the region. Species with occurrences within and surrounding the River Investigation Area were reviewed and evaluated. Species listed as Species of Concern (SC) were also included in this evaluation. Potential TER and SC species that were identified are listed in Appendix A to this ROD. The Table in Appendix A describes each species based on the species' scientific name, common name, listing status (federal status, state status), and justification as to the potential of being present in the River Investigation Area and whether the species was retained for risk evaluation. Of the TER and SC species listed, many species occupy habitats other than the River, or utilize the River for only part of their life-cycle. The result is that there are incomplete exposure pathways for those species; therefore, these species are not supported by the riverine environment included within the River Investigation Area boundaries. Of the TER and SC species identified, one amphibian and one invertebrate, the creeper and the hellbender, are known to occur within the River Investigation Area boundaries.

Dietary Exposure Modeling. Exposures for aquatic life are assumed to be equivalent to EPCs. Exposures for both terrestrial and semi-aquatic wildlife receptors were quantified in the BERA using a food chain model. The dietary exposure model estimates the daily exposure of the endpoint receptor to the COPCs through their diet. Measured site-specific media concentrations (surface water, sediment, and biota EPCs) were used in the food chain model to estimate total body dose (TBD) to which the receptor may be exposed. TBD is defined as the concentration or total amount of a substance in a living organism, which implies accumulation of a substance above background levels in the exposed organisms. TBD is in units of milligram of a specific chemical per kilogram body weight per day (mg/Kg BW-day). Tissue concentrations in prey items were directly measured and provided data to estimate potential bioaccumulation to receptors. A dietary exposure model was used to estimate the daily exposure of an ecological endpoint to a specific chemical.

To model a conservative exposure scenario, a couple of the key exposure variables, *Time Allocation* and *Area Use Factor*, were over-estimated to include a maximum possible exposure for the receptors. **Time Allocation** or time use factor is included to account for migratory species that do not occur in the geographic region of a site on a permanent, year-round basis. **Area use factor** is incorporated into the food chain model to account for differences between the area of the River Investigation Area and the foraging range of a receptor. Fractional area use factors (i.e., values less than 1) are applied for species with foraging ranges larger than the size of the River Investigation Area. Area use factors are applied for a species that is migratory and forages over a range larger than the River Investigation Area during its period of residency in the geographic region of the Site.

For each upper trophic level endpoint, the exposure modeling results in a range of daily exposure estimates for each COPC to represent the following:

Conservative Exposure Scenario (Screening)

- Maximum observed constituent concentrations (for screening purposes); and
- Maximum usage and ingestion rates.

Alternative Exposure Scenario

- 95 percent UCL (or the mean) of observed constituent concentrations; and
- Site-specific conditions and factors (i.e., percent of the diet made up of fish and area use factors).

The estimated daily exposure derived from bioaccumulation modeling was compared with relevant and appropriate toxicity data from the literature, including existing laboratory studies, to arrive at numerical estimates of potential risk. These numerical risk estimates, in consideration of appropriate uncertainties, were used to assess whether the upper trophic level endpoints associated with the River Investigation Area were potentially at risk.

2.7.2.3 Ecological Effects Assessment

Selection of Target Receptors. Representative aquatic receptors included in the BERA were benthic macroinvertebrates and fish. Representative semi-aquatic wildlife receptors included in the Risk Charcterization of the BERA were the great blue heron (*Ardea herodias*) for wading; piscivorous (fish-eating) birds; and the mink (*Mustela vison*) for the semi-aquatic, piscivorous mammals. The exposure model used in the BERA represents site-specific conditions for each representative species to accurately reflect the species specific feeding habits, foraging range, habitat preferences, and life history. The assessment endpoints included in the BERA were:

- **Assessment Endpoint #1: Protection of benthic community structure.**
- **Assessment Endpoint #2: Protection of fish**
- **Assessment Endpoint #3: Protection of piscivorous birds**
- **Assessment Endpoint #4: Protection of piscivorous mammals**

Benthic Community Assessment. Samples for the benthic community assessment were collected from six (6) locations of the lower Davidson River below the South Ditch and extending into the French Broad River. Collection methods consisted of the following: collection of two kick net samples from riffle areas, three sweep net samples from productive bank areas, a leaf pack, three epifaunal collections from dominant substrate material, and a visual inspection of the collection area for unusual/cryptic taxa. The collected samples were field "picked" and preserved on site. Benthic insects were then enumerated as *Abundant* (10 or greater number of specimens), *Common* (3 to 9 specimens), or *Rare* (1 or 2 specimens). The complete results are included in Appendix A to this ROD.

Fish Community Survey. The assemblage of fish species identified in the River Investigation Area during this on-site sampling and investigation is characteristic of a mixed cool/warm water fishery. A complete list of fish species identified is included in Appendix A.

2.7.2.4 Ecological Risk Characterization

Risk characterization involves the integration of exposure and effects data to determine the likelihood of adverse effects to the selected ecological receptors that may be posed by the combination of exposure and effects. In the BERA for the River Investigation Area, the risk characterization encompassed both qualitative and quantitative presentations of the exposure and effects assessments for risk that are relative to each assessment endpoint. For each assessment endpoint, individual measurement endpoints are evaluated as detailed below. For each measurement endpoint, the magnitude of the risk of population-level effects was characterized as *negligible*, *low*, *moderate*, or *substantial* (or *high*). These categories, which tend to be based on professional judgment, are qualitative and are intended to provide a general indication of the likelihood and severity of adverse effects.

2.7.2.4.1 Assessment Endpoint # 1 Protection of Benthic Community Structure

Selected Measurement Endpoints for Benthic Macroinvertebrate Communities

- Measured concentrations of COPCs in the tissue of field-caught benthic macroinvertebrates (i.e., caddisfly, Dobsonfly, mayfly, crayfish) to determine uptake and bio-availability. Tissue chemical results were compared with critical body residues (CBRs) identified from the literature. The tissue chemical results were also used in food chain models to determine ingestion doses for wildlife receptors that feed on these benthic macroinvertebrates.
- Comparison of surface water and sediment COPC concentrations with aquatic effects criteria/guidelines to provide measure of effect.
- Benthic community structure assessment using Rapid Bio-assessment protocols to evaluate taxa abundance, species diversity, tolerant species assemblage, and so on.
- Consideration and comparison of available historical benthos survey data for the River Investigation Area.

Tissue Benchmark Comparison

Benthic macroinvertebrate tissue concentrations are typically compared with identified tissue benchmark concentrations, referred to as CBRs (tissue benchmark concentrations developed from available literature sources) to evaluate the potential for the risk of harm. Tissue levels were lower than available CBR No Adverse Effects Level (NOAELs). Tissue concentrations were also generally below background concentrations for COPCs. *Benthic macroinvertebrate* *tissue concentrations were relatively consistent between all sampling locations, including the tissue data from Site A (the reference location), therefore, indicating that risk is negligible.*

Biocriteria for Benthic Macroinvertebrates

The presence, condition, and numbers of types of benthic macroinvertebrates are data that provide direct information about the health of specific bodies of water. The biological criteria (biocriteria) used in the benthic community assessment are considered narrative or numeric expressions that describe the biological integrity (structure and function) of the aquatic communities inhabiting the River Investigation Area and provide an interpretation of designated aquatic life use. Biocriteria used for this assessment are based on the numbers and kinds of organisms present and are regulatory-based biological measurements.

In brief, the following biocriteria were summarized for each sample:

- Total Taxa Richness, which is the number of unique taxa present in a sample. Taxa Richness generally increases with improved water quality, habitat diversity, and habitat suitability (U.S.EPA, 1989b). Taxa were identified to the lowest possible level of species and genus.
- EPT Taxa Richness, which is the count of the number of different genera from the Order Ephemeroptera (E), Plecoptera (P), and Trichoptera (T) in all replicate samples, and is often called generic richness.
- EPT Abundance, which is the total number of individual organisms in a sample.
- Hilsenhoff Biotic Index score – The Hilsenhoff Biotic Index is a measure of how pollution tolerant the typical organisms are in a given sample. The index is calculated based on the relative abundance of each taxon and its pollution tolerance score, which ranges from 0 (very pollution sensitive) to 10 (very pollution tolerant); larger values for the biotic index suggest that the particular community has been subjected to contaminant or other anthropogenic stress factor(s). National tolerance values were used to calculate the biotic index.
- Percent Contribution of Dominant Taxa, which is a metric that measures the dominance of the single most abundant taxon. In general, the higher the percent contribution, the more stressed a community may be.

The benthic macroinvertebrate data are provided in Appendix A of this ROD. In evaluating this measurement endpoint, the sample results were not different from the background sample. It was concluded that the slight differences that were observed were due to natural environmental factors and thus do not suggest an adverse impact due to site-specific COPCs. *The results of the benthic macroinvertebrate community assessment indicate that the risk of harm to benthic macroinvertebrates is negligible.*

Surface Water and Sediment Benchmark Comparison

Table 13 presents the comparison of surface water and sediment contaminant levels to ecological benchmarks. For surface water, total and dissolved mercury and methylmercury concentrations were below screening benchmarks, thus, indicating that mercury was not of concern for adverse impacts or risk of causing harm to benthic macroinvertebrates through bioaccumulation within the River Investigation Area surface water. *Surface water benchmark comparison indicates that the risk of harm to macroinvertebrates from COPCs in surface water is negligible.*

Sediment benchmark comparison indicates that the risk of harm is low. As stated above, the concentrations of the selected COPCs, including mercury, methylmercury, and dioxin/furan measured in site collected macroinvertebrate tissue were lower than available CBR No Adverse Effects Level (NOAELs). This indicates that COPCs present in sediment may not be bio-available to benthic macroinvertebrates and do not appear to be accumulating to levels considered toxic to macroinvertebrates. *These results indicate that the risk of harm to macroinvertebrates exposed to COPCs in sediment is negligible to low.*

2.7.4.2.2 Assessment Endpoint #2: Fish Community

Selected Measurement Endpoints for Fish Community

- Comparison of fish tissue chemical data with tissue residue effects data.
- Comparison of surface water and sediment COPC concentrations with aquatic effects criteria/guidelines to provide measure of effect.
- Consideration and comparison of available historical fish survey data for the River Investigation Area.

Fish Metrics

The following metrics were recorded for each individual fish collected and/or surveyed in the River Investigation Area.

- Total length of fish (TL cm), which is a measurement based on the greatest dimension of a fish from its anterior-most extremity to the end of the tail fin. For fish with a forked tail, the two lobes were pressed together, and length of the longest lobe was recorded. This metric provides data on age class, recruitment, and reproductive function of the species for this Area.
- Sex (M/F). When possible, fish sex was identified by external morphological characteristics, providing a ratio of males to females.
- A general physical examination consisting of a gross surficial pathological exam of all collected fish for Deformities, Erosions, Lesions, and Tumors (DELTs) was conducted and documented. No pathology was detected in the fish that were examined. Qualitative data on fish species richness and relative abundance was also characterized as a general representation of the fish community for this Area. Abundance was classified as: (1) abundant (large numbers recorded); (2) common (many recorded); or (3) uncommon (present, but only a few recorded).
- Species composition was reviewed based on species tolerance ratings and adult trophic guild assignments (Appendix A).

Historical data for the River Investigation Area were also reviewed and compared with the current general survey. Based on available data, it appears that fish populations in the Area are stable and healthy. Additionally, a qualitative assessment and comparison of historical data indicate increased species diversity in the Area. Therefore, the BERA concluded that the risk of harm to fish community structure is *negligible.*

Whole Body Fish Tissue Benchmark Comparison

Fish tissue (WB) concentrations were compared with identified tissue benchmark concentrations (CBRs) for aquatic life to evaluate the potential for the risk of harm to fish. When using the CBR value of 0.2 mg/kg ww for total mercury, there was one exceedance from the sample collected at "Site H" where the total mercury concentration in fish tissue was reported at 0.324 mg/kg. The BERA provided risk estimate for site-specific conditions based on the distribution of individual observations
for each measured species across the entire River Investigation Area, including additional evidence to support the overall conclusion of effects.

Fish tissue (WB) concentrations were compared with identified tissue benchmark concentrations (i.e., CBRs) for aquatic life to evaluate the potential for risk of harm to fish. As can be seen from the summary data in Table 13, the means or 95 percent UCL for detected concentrations of site COPCs (mercury, methlymercury, and dioxin/furan) are below available tissue benchmarks, thus, indicating no significant risk to fish from exposure to the concentrations of these COPCs within the River Investigation Area. Benchmarks for whole fish tissue were limited to total mercury and 2,3,7,8-TCDD, so risks associated with other dioxin/furan constituents were evaluated based on the available data, as well as by using TEQ concentrations, and methylmercury was compared against the total mercury benchmark. With the exception of the one fish tissue (WB) sample (maximum concentration from "Site H"), site-related tissue concentrations were below benchmark values, thus, indicating that risk is *negligible to low* for fish populations. In addition to these comparisons, a review of available regional and national reference stations provides a comparison of dioxin and mercury levels in fish tissue across the United States and within North Carolina. All fish tissue samples from the River Investigation Area were below average values, as summarized in Table 14.

Table 14
Background Dioxin and Mercury Concentrations in Fish Tissue

CATEGORY/DESCRIPTION	MAXIMUM OBSERVED CONCENTRATION	MEAN OF OBSERVED CONCENTRATION
DIOXIN TEQ (in ng/kg wet weight)		
NASQAN (background) (1)	7.18	1.12
Background (1)	3.02	0.59
Agricultural (1)	4.44	1.02
North American Background (2)	--	1.16
European Background (2)	--	0.93
Roanoke River (upstream of Weyerhaeuser mill) (3)	3.28	0.69
River Investigation Area	**0.640 (Site D)**	**0.32**
MERCURY (in mg/kg wet weight)		
NASQAN (background) (1)	0.98	0.29
Background (1)	1.77	0.34
Agricultural (1)	0.82	0.27
United States Background (4)	1.8	0.26 0.4 (5)
Northwestern Ontario (6)	0.94 to 1.88 0.6 to 1.1	
USF&WS Survey (7)	1.09	0.11
Regional Background (Georgia)	1.4 (8)	1.72 (9)
Albemarle and Pamlico Sounds (10)	2.4	0.36
Pettigrew State Park lakes (11)	3.8	0.37
Roanoke River (upstream of Weyerhaeuser mill) and Cashie River (12)	1.9	0.45
River Investigation Area (Hg)	**0.324 (Site H)**	**0.126**
River Investigation Area (MMHg)	**0.260 (Site H)**	**0.119**

(1) Excerpted from the National Survey of Chemical Residues in Fish (USEPA, September 1992)
(2) Reported in USEPA's Dioxin Reassessment (USEPA, 1994)
(3) Fish carcass results reported for background locations; USEPA 2001; Lower Roanoke River Study – Compilation of Analytical Data Tables and Maps.
(4) Reported by Bahnick et al., (1994)
(5) Reported mean concentration from Bahnick et al., (1994) for higher trophic level species
(6) Reported by Halbrook et al., 1997
(7) Lowe et al., 1985; Schmitt and Butterworth, 1990
(8) Reported by Cumbie et al, (1975), for Suwannee River, Georgia
(9) Reported by Halbrook et al, (1994) for Satilla River, Georgia
(10) Reported by USF&WS (1992)
(11) Sampling for Pettigrew State Park.
(12) Reported by NCDENR (2001).

Surface Water and Sediment Benchmark Comparison for Fish

Total and dissolved mercury and methylmercury, and dioxin/furan concentrations were below surface water screening benchmarks. Surface water benchmark comparison indicates the risk of harm to fish from COPCs in surface water is *negligible.*

Sediment benchmark comparison indicates that the risk of harm to fish is low. The concentrations of the selected COPCs, including mercury, methylmercury, and dioxin/furan in invertebrate tissue were lower than CBR NOAELs. One sample result was above the screening benchmark presented. *Based on this, these results indicate that the risk of harm to fish exposed to COPCs in sediment in the River Investigation Area is negligible to low.*

Summary of Risks to Fish in the River Investigation Area

Although the 95 percent UCL (0.216 mg/Kg) for total mercury in fish (WB) tissue was just above the CBR benchmark (0.2 mg/Kg), based on the above information, the mean (0.126 mg/Kg) and the 80th percentile concentration (0.184 mg/Kg) in fish (WB) tissue were below the CBR benchmark, thus, indicating no significant risk. Surface water and sediment benchmark comparisons indicate that the risk of harm to fish from surface water is negligible. The risk of harm to fish from COPCs in sediments would be considered *negligible to low.* Fish survey data, although limited, do not demonstrate the potential of site-related impacts to fish populations. In fact, the available data suggest community structure has been improving. *Based on the overall weight of evidence, it is concluded that the risk of harm to fish populations in the River Investigation Area from site-related COPCs is negligible to low.*

2.7.4.2.3 Assessment Endpoint #3: Fish-Eating (Piscivorous) Birds

Selected Measurement Endpoints for Assessment Endpoint #3: Fish-Eating (Piscivorous) Bird Populations

- The BERA estimated dietary doses of site COPCs to piscivorous avian species potentially present within the River Investigation Area using a food chain model. Input parameters were based on site-specific environmental media (surface water and sediment) and biota tissue data to represent concentrations in prey items, and literature-derived exposure factors (e.g., receptor-specific ingestion rate, body weight, home range, and dietary composition). Comparing estimated doses with literature-derived Toxicity Reference Values (TRVs) provides a measure of effect for biota.

Summaries for food chain modeling, including calculated HQs and HIs for semi-aquatic birds, and spreadsheets containing the food chain calculations are presented in Table 15.

For the great blue heron, the HQs determined for mercury, methylmercury, and dioxin/furans (based on TEQs) were below 1. Fish ingestion is the primary pathway contributing to the calculated HQ values. Site-specific concentrations of COPCs in fish tissue collected on site were used to estimate the potential for bioaccumulation from prey to predator.

It was determined that the home range of a great blue heron would potentially exceed the area identified within River Investigation Area boundaries, suggesting that only a portion of a heron's time would be spent on site. For comparison to the 100 percent time allocation in terms of foraging time (AUF), models were also completed using an estimated 10, 50 and 75 percent AUF in the River Investigation Area. The results of those models were also evidence of no apparent risk to heron from exposure to on-site COPCs. The HQs for mercury, methylmercury, and dioxin TEQs for maximum detected concentrations were below 1, resulting in NOAEL HQs of 1.28E-01, 6.72E-01, and 8.21E-03, respectively. Additionally, the unrealistic but conservative exercise to eliminate cumulative risk due to exposure of the three COPCs resulted in a NOAEL Hazard Index (HI) of 8.08E-01, for exposure at 100 percent AUF to maximum concentrations reported from site-collected media, and assuming total concentrations were bio-available (which is an overestimation of exposure). These results demonstrate that there is no apparent risk to heron from exposure to site-related COPCs, thus, the risk is *negligible.*

Based on the results (determined by calculating HQs and a HI), it is concluded that adverse population level effects are unlikely for the piscivorous great blue heron at the River Investigation Area.

Table 15
Great Blue Heron Exposure Modeling

GBH Tables: GBH 100%

Bioaccumulative models for great blue heron (GBH) (estimating a conservative100% of time spent on site) exposed to COPCs (mercury, Methyl mercury, and dioxin TEQs) measured in the River Investigation Area in environmental media and biological tissues.

MMHg GBH

Analyte (COPC)		Contaminant Concentrations (Maximum, Mean, Minimum) in Media				Contaminant Exposure (mg/kg bw/d)							
MMHg, Total		Water Total	Sediment Solids	Food: MV	Food: Fish	Water	Sediment	Food	Total	NOAEL	HQ	LOAEL	HQ
		n=9 (mg/L)	n=9 (mg/kg)	n=8 (mg/kg)	n=16 (mg/kg)					(mg/kg bw/d)	NOAEL	(mg/kg bw/d)	LOAEL
Maximum		1.20E-07	1.10E-03	2.03E-02	3.40E-01	5.31E-09	3.87E-06	5.97E-02	5.98E-02	4.50E-01	***1.33E-01***	9.00E-01	***6.64E-02***
Mean (or 95% UCL)		9.50E-08	6.04E-04	0.018	0.018	4.21E-09	2.12E-06	3.16E-03	3.17E-03	4.50E-01	***7.03E-03***	9.00E-01	***3.52E-03***

Hg GBH

Analyte (COPC)	Contaminant Concentrations (Maximum, Mean, Minimum) *in Media*					Contaminant Exposure (mg/kg bw/d)							
Hg, Total	Water Dissolved	Water Total	Sediment Solids	Food: MV	Food: Fish	Water	Sediment	Food	Total	NOAEL (mg/kg bw/d)	HQ NOAEL	LOAEL (mg/kg bw/d)	HQ LOAEL
	n=9 (mg/L)	n=9 (mg/L)	n=35 (mg/kg)	n=8 (mg/kg)	n=16 (mg/kg)								
Maximum	9.70E-07	1.95E-06	0.19	2.06E-02	0.61	8.63E-08	6.68E-04	1.07E-01	1.08E-01	4.50E-01	***2.40E-01***	9.00E-01	***1.20E-01***
Mean (or 95% UCL)	8.60E-07	1.76E-06	0.051	0.02	0.27	7.79E-08	1.79E-04	4.74E-02	4.76E-02	4.50E-01	***1.06E-01***	9.00E-01	***5.29E-02***

* Historical (2006) data were added to determine an overall statistical distribution and 95% UCL for mercury.

TEQ-1 GBH

Analyte (COPC)		Contaminant Concentrations (Maximum, Mean, Minimum) in Media				Contaminant Exposure (mg/kg bw/d)							
Dioxin TEQs, Total (based on QL for ND)		Water total	Sediment Solids	Food: MV	Fish	Water	Sediment	Food	Total	NOAEL (mg/kg bw/d)	HQ NOAEL	LOAEL (mg/kg bw/d)	HQ LOAEL
		n=9 (mg/L)	n=9 (mg/kg)	n=8 (mg/kg)	n=8 (mg/kg)								
Maximum		1.70E-09	1.29E-06	2.80E-07	6.40E-07	7.53E-11	4.53E-09	1.12E-07	1.17E-07	1.40E-05	***8.36E-03***	1.40E-04	***8.36E-04***
Mean (or 95% UCL)		1.31E-09	2.20E-07	1.46E-07	3.24E-07	5.79E-11	7.73E-10	5.69E-08	5.77E-08	1.40E-05	***4.12E-03***	1.40E-04	***4.12E-04***

* Dioxin TEQs were based on the Quantitation Limits (QLs) in order to provide values for use of th ebioaccumulation model, and not the Reporting Limits (RLs) as was the case in the table below.

TEQ-2 GBH

Analyte (COPC)		Contaminant Concentrations (Maximum, Mean, Minimum) in Media				Contaminant Exposure (mg/kg bw/d)							
Dioxin TEQs, Total (based on RL and zero for ND)		Water total	Sediment Solids	Food: MV	Food: Fish	Water	Sediment	Food	Total	NOAEL (mg/kg bw/d)	HQ NOAEL	LOAEL (mg/kg bw/d)	HQ LOAEL
		n=9 (ug/L)	n=9 (mg/kg)	n=8 (mg/kg)	n=8 (mg/kg)								
Maximum		0.00E+00	1.29E-06	0.00E+00	0.00E+00	0.00E+00	4.53E-09	0.00E+00	4.53E-09	1.40E-05	***3.24E-04***	1.40E-04	***3.24E-05***
Mean (or 95% UCL)		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.40E-05	***0.00E+00***	1.40E-04	***0.00E+00***

* Dioxin TEQs were based on the Reporting Limits (RLs) and not the Quantitation Limits (QLs) as was the case in the above table.

2.7.4.2.4 Assessment Endpoint #4: Semi-Aquatic, Piscivorous Mammal Populations

Selected Measurement Endpoints for Semi-Aquatic, Piscivorous Mammal Populations

- The BERA estimated dietary doses of site COPCs using a food chain model. Input parameters were based on site-specific data for COPC concentrations in media parameters (surface water and sediment), prey items, and literature-derived exposure factors. Comparing estimated doses with literature-derived TRVs provides a measure of effect.

Summaries for food chain modeling, including calculated HQs and HIs for the mink, and spreadsheets containing the food chain calculations are presented in Table 16.

For mink, the HQs determined for the 95 percent UCL concentration of mercury, methylmercury, and dioxin/furans (based on TEQs) were below 1. Fish ingestion is the primary pathway contributing to the calculated HQ values. Site-specific concentrations of COPCs from fish tissue collected on site were used to estimate the potential for bioaccumulation from prey to predator. It was determined that a diet of 100 percent fish does not realistically reflect the mink's dietary composition (see discussion above); therefore, a diet of 85 percent fish was used as an overly conservative estimate of dietary exposure in the model. It was also determined that the home range of a mink most likely would not be contained within the identified site boundaries, suggesting that only a portion of the mink's time would be spent onsite. However, the model was completed using a 100 percent AUF allocation for time on site to maintain a conservative estimation.

Exposure was also modeled with alternative AUF allocations, including 10, 50 and 75 percent of foraging time on site, for comparison purposes. Based on these results, it was determined that there was no apparent risk to mink from exposure to on-site COPCs. The HQs for mercury and dioxin TEQs for 100 percent AUF and 100 percent fish in diet, as well as maximum detected concentrations, were below 1. This same conservative exposure scenario applied to methylmercury (100 percent AUF, 100 percent fish in diet, and maximum detected concentrations) resulted in an HQ of 1.1. Because the methylmercury resulted in an HQ of 1.1, the exposure assessment was modified to assess site-specific conditions by using the 95 percent UCL and not the maximum COPC concentrations as was done in the screening. In addition, the percent of fish in the diet was reduced to a realistic yet conservative value of 85 percent (a value still considered to be high), while still maintaining a conservative AUF of 100 percent, which, therefore, was considered to be a conservative exposure assessment for mink. When the site-specific scenario was modeled for mercury, methylmercury, and dioxin TEQs, the resulting HQs for mink are NOAEL HQs of 3.18E-02 (Hg), 4.34E-02 (MMHg), and 3.85E-02 (TEQ), respectively. Additionally, the cumulative risk due to exposure to the three COPCs resulted in a NOAEL Hazard Index (HI) of 1.13E-01. These results demonstrate that there is no apparent risk to mink from exposure to site-related COPCs thus, indicating *negligible* risk.

For the semi-aquatic, piscivorous mink, it is concluded that adverse population level effects are unlikely from exposure to site-related COPCs within the River Investigation Area, based on the results as determined by calculating HQs and a HIs.

Table 16
Mink Exposure Modeling

Mink Tables: Mink 100%

Bioaccumulative models for mink (estimating a conservative 100% of time on site) exposed to COPCs (mercury, methyl mercury, and dioxin TEQs) measured in the River Investigation Area environmental media and biological tissues.

MMHg Mink

Analyte (COPC)		Contaminant Concentrations (Maximum, Mean, Minimum) in Media				Contaminant Exposure (mg/kg bw/d)							
MMHg		Water Total n=9 (mg/L)	Sediment Solids n=9 (mg/kg)	Food MV n=8 (mg/kg)	Food Fish n=16 (mg/kg)	Water	Sediment	Food	Total	NOAEL (mg/kg bw/d)	HQ NOAEL	LOAEL (mg/kg bw/d)	HQ LOAEL
Maximum		1.20E-07	1.10E-03	2.03E-02	3.40E-01	1.19E-08	3.01E-06	4.66E-02	4.66E-02	1.00E+00	***4.66E-02***	1.00E+01	***4.66E-03***
Mean (or 95% UCL)		9.50E-08	6.04E-04	1.80E-02	1.80E-02	9.41E-09	1.65E-06	2.47E-03	2.47E-03	1.00E+00	***2.47E-03***	1.00E+01	***2.47E-04***

Hg Mink

Analyte (COPC)	Contaminant Concentrations (Maximum, Mean, Minimum) in Media					Contaminant Exposure (mg/kg bw/d)							
Hg, Total	Water Dissolved n=9 (mg/L)	Water Total n=9 (mg/L)	Sediment Solids n=35 (mg/kg)	Food MV n=8 (mg/kg)	Food Fish n=16 (mg/kg)	Water	Sediment	Food	Total	LOAEL (mg/kg bw/d)	HQ NOAEL	LOAEL (mg/kg bw/d)	HQ LOAEL
Maximum	9.70E-07	1.95E-06	1.90E-01	2.06E-02	6.10E-01	1.93E-07	5.21E-04	8.36E-02	8.41E-02	1.00E+00	***8.41E-02***	1.00E+01	***8.41E-03***
Mean (or 95% UCL)	8.60E-07	1.76E-06	5.10E-02	2.00E-02	2.70E-01	1.74E-07	1.40E-04	3.70E-02	3.71E-02	1.00E+00	***3.71E-02***	1.00E+01	***3.71E-03***

* Historical (2006) data were added to determine an overall statistical distribution and 95% UCL for mercury.

TEQ-1 Mink

Analyte (COPC)		Contaminant Concentrations (Maximum, Mean, Minimum) in Media				Contaminant Exposure (mg/kg bw/d)							
Dioxin TEQs, Total (based on QL for ND)		Water total n=9 (mg/L)	Sediment Solids n=9 (mg/kg)	Food MV n=8 (mg/kg)	Food Fish n=8 (mg/kg)	Water	Sediment	Food	Total	LOAEL (mg/kg bw/d)	HQ NOAEL	LOAEL (mg/kg bw/d)	HQ LOAEL
Maximum		1.70E-09	1.29E-06	2.80E-07	6.40E-07	1.68E-10	3.53E-09	8.77E-08	9.14E-08	1.00E-06	***9.14E-02***	1.00E-05	***9.14E-03***
Mean (or 95% UCL)		1.31E-09	2.20E-07	1.46E-07	3.24E-07	1.29E-10	6.03E-10	4.44E-08	4.51E-08	1.00E-06	***4.51E-02***	1.00E-05	***4.51E-03***

* Dioxin TEQs were based on the Quantitation Limits (QLs) in order to provide values for use of th ebioaccumulation model, and not the Reporting Limits (RLs) as was the case in the table below.

TEQ-2 Mink

Analyte (COPC)		Contaminant Concentrations (Maximum, Mean, Minimum) in Media				Contaminant Exposure (mg/kg bw/d)							
Dioxin TEQs, Total (based on RL and zero for ND)		Water total n=9 (ug/L)	Sediment Solids n=9 (mg/kg)	Food MV n=8 (mg/kg)	Food Fish n=8 (mg/kg)	Water	Sediment	Food	Total	LOAEL (mg/kg bw/d)	HQ NOAEL	LOAEL (mg/kg bw/d)	HQ LOAEL
Maximum		0.00E+00	1.29E-06	0.00E+00	0.00E+00	0.00E+00	3.53E-09	0.00E+00	3.53E-09	1.00E-06	***3.53E-03***	1.00E-05	***3.53E-04***
Mean (or 95% UCL)		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-06	***0.00E+00***	1.00E-05	***0.00E+00***

* Dioxin TEQs were based on the Reporting Limits (RLs) and not the Quantitation Limits (QLs) as was the case in the above table.

Additional Modeling for the Great Blue Heron and Mink

To further evaluate risks, HQs for individual COPCs (summarized on Tables 15 and 16) were examined to identify COPCs and pathways that would contribute to HQs. For both heron and mink, chemical-specific HQs were all below one, as well as the cumulative HI based on maximum exposure to the three COPCs simultaneously.

Adverse population level effects are unlikely for both semi-aquatic receptors (great blue heron and mink) at the River Investigation Area.

2.7.4.2.5 Conclusions of the BERA

The BERA evaluated risks to ecological receptors from exposure to site-related COPCs. Risks were evaluated for aquatic macroinvertebrates; fish; piscivorous bird (great blue heron); and semi-aquatic, piscivorous mammal (mink). Based on the risk evaluation and additional qualitative information regarding the overall health of the ecosystems, ***no further action*** is recommended to manage risks to the River Investigation Area, as no unacceptable risk was determined for benthic macroinvertebrates or fish. No actions are necessary to manage risks to semi-aquatic wildlife, great blue heron or mink, within the River Investigation Area, as no unacceptable risk was determined from bioaccumulation and food chain modeling.

2.8 Documentation of Significant Changes

The Proposed Plan for the Ecusta Mill Site, River Investigation Area (OU-2) was released for public comment in July 2009. The Proposed Plan recommended no-action for the River Investigation Area, based on the findings of the RI and the risk assessments. EPA reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the no-action proposal were necessary or appropriate.

PART 3: RESPONSIVENESS SUMMARY

The public comment period for the Proposed Plan was from July 21, 2009, until August 19, 2009. During the EPA public meeting on July 21, 2009, EPA provided verbal answers to questions from the public. The questions and answers discussed during this meeting can be found in Appendix B (Transcript of Public Meeting) to this ROD.

The following is a summary of comments received during the Proposed Plan Public Meeting and responses given:

1. **Were the results of the RI similar to findings of previous EPA investigation of the River Investigation Area?**

   Yes. However, EPA conducted very compulsory investigation activities as part of a pre-remedial Expanded Site Inspection in 2004, and this type of sampling design is different than the investigation conducted as part of a Remedial Investigation. The levels of contaminants detected in the River Investigation in 2004 are similar to the results of the RI sampling.

2. **Why did EPA allow the PRP to conduct the investigation activities during the RI instead of doing an independent investigation?**

   EPA entered into an Administrative Order on Consent (AOC) with Glatfelter Corporation as a former owner/operator of the Ecusta Mill using Superfund legal authority in order to compel this responsible party to conduct the investigation. EPA uses its legal enforcement authority to compel those potentially responsible for contamination releases to pay for the costs of investigation and cleanup work when ever possible. EPA uses review and approval authority and oversight of field activities to ensure that the same investigation is conducted by the responsible party as would be done if EPA were doing the work itself.

In addition to comments received at the public meeting, the following comments were received in writing during the public comment period:

1. **The risk factors and study of surrounding areas, i.e., the Aerated Stabilization Basin (ASB) and the Dump Site (DS) / Island Landfill located at the upper end of the study area (western loop of the Davidson River) have not been studied and if they have been studied they have not been mentioned as realistic potential hazard for toxic exposure to the DR, FBR and surrounding areas especially those downstream from the Ecusta Mill Site.**

   The ASB is part of the National Pollution Discharge and Elimination System (NPDES) permitted wastewater treatment system of the former Ecusta Mill, and is still an operating wastewater treatment system. The NPDES program was established by the federal government to control point-source discharges of water pollution. The NPDES Permitting and Compliance Programs of North Carolina's Division of Water Quality is responsible for administering the program for the state. Information on the NPDES program can be found at http://h2o.enr.state.nc.us/NPDES.

The landfills are also subject to permit by the State, under NC DENR Division of Waste Management-Solid Waste Program. The landfills on the Former Ecusta Mill site have all operated as permitted landfills and, as such, are subject to the operation and closure requirements of those permits. To date, all landfills have been closed in compliance with their State permits, and routine monitoring is being conducted by Glatfelter as the permit holder.

2. **Present regulations include a pumping and treatment process, however, this does not include catastrophic situations such as heavy rain storms and heavy winds (as recent as 9/2004 when 30 plus inches fell in this area) or even misguided air flights causing crashes [from nearby Transylvania County Airport] that might cause damage to the pumping system and/or even rupture of the dam area that now seem to be under control according to the present regulation. Even as recent as 7/19/2009 the Asheville Times (Section B. page 1) indicated that Earthquake tremors have been felt as close as Laurel Park and in 2006 two were felt, one in Hot Springs with a magnitude of 3.7 and the second in Burnsville at 2.8 were recorded. What happens when the big one comes?**

Please see the above citation for more information on design requirements for wastewater treatment systems and landfills in North Carolina. Specific questions should be addressed to the appropriate Division within NC DENR.

3. **The contents of any off streams that might occur from the dump site and/or any sludge components found in and at the bottom of the ASB should be made available to the public. The impact of all of these toxins that could/might find their way into the large flood plain surrounding Ecusta and downstream with the possibility that farm land could be contaminated for many years to come should be estimated and made available to the public. Clean-up of this magnitude would pale in relationship to the total clean-up of the DR and the Ecusta Site together. Who would be responsible for this type of clean-up?**

Information on the ASB and the landfills can be obtained from the appropriate Division at NC DENR as indicated in the response to question no. 1 above.

APPENDIX A

Additional Supporting Documents for the BERA

BENTHIC COMMUNITY ASSESSMENT

Taxa-NCDWQ Biotic Index #	Davidson River – Sampling Sites					FBR
	Site 1A	Site 2A	Site 3A	Site 4A	Site 5A	Site 6A
Ephemeroptera						
Family Baetidae						
Acentrella spp –4.0	R					
Acentrella turbida – 4.0	C	R	R	A	C	C
Baetis alachua –4.0		R			R	C
Baetis intercalaris – 7.0	A	A	A	A	A	C
Baetis bimaculatus – 6.0	R	R	R	C		
Baetis pluto –4.3	A		R	A	A	R
Baetis propinquus – 5.8		C	C	C		C
Diphetor hageni – 1.6	C	R		C	R	
Plauditus dubius – 5.8				C		
Centroptilum spp – 6.6	R					
Family Baetiscidae						
Baetisca carolina – 3.5		R		R		
Family Caenidae						
Caenis spp –7.4		R	C	R	R	R
Family Ephemerellidae						
Drunella allegheniensis – 0.8	C	C				
Drunella conestee - 0	C					
Eurylophella bicolor – 4.9	R					
Eurylophella temporalis – 4.3		R	R	R	C	R
Serratella deficiens – 2.8	A	A	C	A	A	C
Serratella serratoides – 1.7	C	C	C	C		R
Ephemerella dorothea – 6.0	R					
Family Ephemeridae						
Hexagenia spp – 4.9						R
Family Heptageniidae						
Epeorus rubidus – 1.2	A	R	A	C		
Heptagenia marginalis – 2.3	A	C	C	R		
Leucrocuta spp – 2.4		C	C	R		
Stenacron interpunctatum – 6.9	R					
Stenacron pallidum – 2.7	C	C	A	A	R	A
Stenonema integrum – 5.8						R
Stenonema modestum – 5.5	C	C	A	A	A	A
Stenonema pudicum – 2.0						C
Stenonema ithaca – 3.6	A	A	A	A	A	R
Family Leptophebiidae						
Paraleptophlebia spp – 0.9	R	R	C	C	C	C
Family Neoephemeridae						
Neoephemera purpurea – 1.6				R		R
Family Oligoneuridae						
Isonychia spp – 3.5	C	A	C		R	A
Plecoptera						
Family Leuctridae						
Leuctra spp - 2.5	C	R	A	C	A	C
Family Peltoperlidae						
Tallaperla spp – 1.2	A	R	C	C	C	
Family Perlidae						
Acroneuria abnormis – 2.1	C	R	R	R		
Paragnetina immarginata – 1.4	C	R	R	R		
Perlesta placida – 4.7	A	A	A	A	A	C
Family Perlodidae						
Isoperla holochlora – 2.0				R		

Taxa-NCDWQ Biotic Index #	Davidson River – Sampling Sites					FBR
	Site 1A	Site 2A	Site 3A	Site 4A	Site 5A	Site 6A
Family Pteronarcyidae						
Pteronarcys spp – 1.7	A	C	C	C	C	
Family Brachycentridae						
Brachycentrus spinae – 0.1	C				R	R
Brachycentrus nigrosoma – 2.3					R	
Micrasema wataga – 2.6	R	C	C	A	R	A
Family Glossosomatidae						
Glossosoma spp – 1.6	C	C	C	R		
Family Goeridae						
Goera spp – 0.1			R		R	
Family Hydropsychidae						
Cheumatopsyche spp – 6.2	R	C		A	A	A
Hydropsyche venularis – 5.0			R	R		C
Symphitopsyche bronta – 5.3	A	A	A	A	A	
Symphitopsyche morose – 2.6		R	R	R	C	R
Symphitopsyche sparna – 2.7	A	C	A	A	A	C
Family Hydroptilidae						
Hydroptila spp – 6.2	R	R	R	R	R	A
Family Lepidostomatidae						
Lepidostoma spp – 0.9	R	C	C	R	R	R
Family Leptoceridae						
Ceraclea ancylus – 2.3		R				
Nectopsyche exquisite – 4.1			R			C
Mystacides sepulchralus – 2.7						R
Oecetis spp – 4.7						R
Family Limnephilidae						
Pycnopsyche guttifer – 2.6	A	C	C	R	C	A
Family Philopotamidae						
Chimarra spp – 2.8				R		
Dolophilodes spp – 0.8	A	C		C	C	
Family Polycentropodidae						
Polycentropus spp – 3.5	R	R				R
Family Psychomyiidae						
Lype diversa – 4.1					R	R
Family Rhyacophilidae						
Ryhacophila fuscula – 1.9	R					
Family Uenoidea						
Neophylax consimilis – 1.5	C	R	C	R		
Diptera: Miscellaneous families						
Family Empididae – 7.6						R
Family Simuliidae						
Simulium spp – 6.0	A	C	C	A	A	C
Family Tabanidae						
Chrysops spp – 6.7			R			
Family Tanyderidae						
Protoplasa fitchii – 4.3			R			
Family Tipulidae						
Antocha spp – 4.3	A	C	A	C	A	A
Dicranota spp - 0	R		R		R	
Tipula spp – 7.3			R	C	C	
Diptera: Chironomidae						
Ablabesmyia mallochi – 7.2					R	
Ablabesmyia parajanta/janta – 7.4	C	C	C	R		R
Brillia spp – 5.2		C		R	R	
Cardiocladius spp – 5.9						R
Chironomus spp – 9.6					R	R

Taxa-NCDWQ Biotic Index #	Davidson River – Sampling Sites					FBR
	Site 1A	Site 2A	Site 3A	Site 4A	Site 5A	Site 6A
Conchapelopia Group – 8.4	R	C	R	R	C	
Corynoneura spp – 6.0		R				
Cladotanytarsus spp – 4.1	C		C		C	
Cryptochironomus fulvus – 6.4		R	R		C	C
Cricotopus bicinctus: C/O sp1 – 8.5		C	A	C	C	C
Cricotopus/Orthocladius sp2 – 2.1	A			C		
Cricotopus vieriensis gp: C/O sp46	A	(BI – 4.4)				
Diamesa spp – 8.1	R					
Dicrotendipes neomodestus – 8.1						C
Eukiefferiella devonica gp: E sp2 – 2.6	A	A			R	R
Labrundinia spp – 5.9	R					
Microtendipes spp – 5.5	R	R	R	R	R	
Nanocladius spp – 7.1	C			R		R
Natarsia spp – 10.0	R			R		
Nilotanypus spp – 3.9		R	R	R		R
Orthocladius obumbratus gp: C/O sp10	C	(BI – 8.5)				
Orthocladius clarkei gp: C/O sp54 – 5.7	A	R				C
Pagastia spp – 1.8			C			
Parametriocnemus lundbecki – 3.7	R	C		R	C	
Parakiefferiella spp – 5.4	R					
Phaenopsectra spp – 6.5	C	C	C	R	C	
Phaenopsectra flavipes – 7.9						A
Polypedilum convictum – 4.9	C	A	A	A	A	A
Polypedilum fallax – 6.4					R	
Polypedilum illinoense – 9.0					R	
Polypedilum scalaenum – 8.4			A		R	
Procladius spp – 9.1			R			R
Rheocritcotopus spp – 7.3		C				
Rheotanytarsus spp – 5.9	R	C	A	C		A
Tanytarsus spp – 6.8		A	C	C	C	A
Thienemaniella spp – 5.9	C	R	C			R
Tvetenia discoloripes gp (E sp3) – 3.6			C	R		
Coleoptera						
Family Dryopidae						
Helichus spp – 4.6	A	A	C	R	C	R
Family Dytiscidae						
Hydroporus spp – 8.6				R		
Family Elmidae						
Macronychus glabratus – 4.6						C
Optioservus spp – 2.4	C	C	C	C	R	C
Promoresia tardella - 0	C	C		A		C
Family Psephenidae						
Psephenus herricki – 2.4		C	C	A	R	R
Odonata						
Family Aeshnidae						
Boyeria vinosa – 5.9	C	C		C	C	C
Family Calopterygidae						
Calopteryx spp – 7.8		R				
Family Coenagrionidae						
Argia spp – 8.2						R
Family Gomphidae						
Gomphus spp – 5.8		R	R	R		R
Gomphus spiniceps – 5.1						C
Lanthus spp – 1.8		R				
Stylogomphus albistylus – 4.7	R		R			

Taxa-NCDWQ Biotic Index #	Davidson River – Sampling Sites					FBR
	Site 1A	Site 2A	Site 3A	Site 4A	Site 5A	Site 6A
Oligochaeta						
Family Lumbriculidae – 7.0	C	C	C	C	C	
Family Nadidae						
Nais spp – 8.9	C	C	C	C	C	
Pristina spp – 9.6						
Megaloptera						
Family Corydalidae						
Nigronia serricornis – 5.0	R	R			R	
Corydalus cornutus – 5.2				R		
Family Sialidae						
Sialis spp – 7.2						R
Crustacea						
Family Cambaridae						
Cambarus (immature crayfish) - 7.5	R	R	C	R		C
Mollusca						
Family Ancylidae						
Ferrissia spp – 6.6	C	C	A	A	C	C
Family Planorbidae						
Helisoma anceps – 6.2						R
Family Pleuroceridae						
Elimia spp – 2.5	A	A	A	C	A	C
Other Miscellaneous Taxa						
Hydracarina spp – 5.5	C	R		C	R	
Polyclad						
Prostoma graecens – 6.1						R
Summary Statistics	**Davidson River**					**FBR**
	Site 1A	**Site 2A**	**Site 3A**	**Site 4A**	**Site 5A**	**Site 6A**
Total Taxa Richness	74	73	67	72	61	69
EPT Taxa Richness	40	39	35	40	30	34
EPT Abundance	185	123	146	170	136	119
Biotic Index	3.70	4.30	4.52	4.45	4.77	4.98
Bioclassification	**Excellent**	**Good**	**Good**	**Good**	**Good**	**Good/Fair**

Notes:
1. Benthic macroinvertebrates collected from the Davidson and French Broad Rivers, Transylvania County, NC on July 2008.

R Rare means one or two specimens.
FBR French Broad River
C Common means 3 to 9 specimens.
A Abundant means 10 or greater number of specimens.

FRESHWATER FISHES COLLECTED

Family/Species	Common Name	Tolerance Rating	Trophic Guild of Adults
Oncorhynchus mykiss	Rainbow trout	Intermediate tolerance	Insectivore
Salmo trutta	Brown trout	Intermediate tolerance	Piscivore
Salvelinus fontinalis	Brook trout	Intolerant to low water quality	Insectivore
C. spiloptera	Spotfin shiner	Intermediate tolerance	Insectivore
Hypentelium nigricans	Northern hogsucker	Intermediate tolerance	Insectivore
M. salmoides	Largemouth bass	Intermediate tolerance	Piscivore

Notes:
NCDWQ 1999: North Carolina Division of Water Quality (NCDWQ): Stream Fish Community Structure Assessment, 1999 (in the river investigation area in June 2008 including their tolerance ratings and adult trophic guild assignments).

Table 7-B2. Fish species surveyed at each site location (fish included those collected, processed, and/or released).

		Site							
Common Name	**Species**	**H**	**C**	**D**	**G**	**E**	**B**	**F**	**A**
Rainbow Trout	*Onchorhyncus mykiss*					x		x	x
Brown Trout	*Salmo trutta*			x					x
Rock Bass	*Ambloplites rupestris*		x			x			x
Mottled Sculpin	*Cottus* bairdi				x		x	x	
Redbreast Sunfish	*Lepomis auritus*	x	x	x					x
Rosyface Shiner	*Notropis rubellus*						x	x	
Spottail Shiner	Notropis budsonius			x		x	x	x	
Norther Hognose Sucker	*Hypentelium nigricans*			x	x	x	x	x	
Longnose Dace	*Rhyinichthys cataractae*	x			x	x	x	x	x
Blacknose Dace	*Ryinichthys atratulus*				x	x		x	x
Redhorse Sucker	*Moxostoma* sp.			x		x		x	x
Stone Roller	*Campostoma* sp.					x		x	
Redline Darter	*Etheostoma rufilineatum*							x	
Chub	*Erimystax* sp.					x			
Least Brook Lamprey	*Lampetra aepyptera*				x				

Table 7-C1. Target fish sampled (grouped by fish species) for ecological (Eco) receptors within the Davidson and French Broad Rivers for each sampling site.

Common Name	Scientific Name	TL (cm)	Sample (target)	Site
Brown Trout	*Salmo trutta*	8.0	Eco	A
Rock Bass	*Ambloplites rupestris*	10.0	Eco	A
Rock Bass	*Ambloplites rupestris*	12.5	Eco	A
Rock Bass	*Ambloplites rupestris*	9.0	Eco	A
Mottled Sculpin	*Cottus bairdi*	6.0	Eco	G
Mottled Sculpin	*Cottus bairdi*	7.0	Eco	B
Mottled Sculpin	*Cottus bairdi*	6.5	Eco	F
Redbreast Sunfish	*Lepomis auritus*	15.5	Eco	H
Redbreast Sunfish	*Lepomis auritus*	14.5	Eco	H
Redbreast Sunfish	*Lepomis auritus*	13.8	Eco	C
Redbreast Sunfish	*Lepomis auritus*	10.0	Eco	D
Redbreast Sunfish	*Lepomis auritus*	12.0	Eco	A
Rosyface Shiner	*Notropis rubellus*	8.0	Eco	B
Rosyface Shiner	*Notropis rubellus*	6.5	Eco	F
Spottail Shiner	*Notropis budsonius*	6.0	Eco	F
Spottail Shiner	*Notropis budsonius*	6.0	Eco	F
Spottail Shiner	*Notropis budsonius*	6.0	Eco	F
Spottail Shiner	*Notropis budsonius*	6.0	Eco	F
Spottail Shiner	*Notropis budsonius*	5.5	Eco	F
Spottail Shiner	*Notropis budsonius*	5.5	Eco	B
Spottail Shiner	*Notropis budsonius*	5.5	Eco	B
Spottail Shiner	*Notropis budsonius*	5.5	Eco	B
Spottail Shiner	*Notropis budsonius*	6.0	Eco	E
Spottail Shiner	*Notropis budsonius*	5.5	Eco	E
Spottail Shiner	*Notropis budsonius*	7.3	Eco	D
Norther Hognose Sucker	*Hypentelium nigricans*	15.0	Eco	F
Norther Hognose Sucker	*Hypentelium nigricans*	15.5	Eco	F
Norther Hognose Sucker	*Hypentelium nigricans*	14.5	Eco	B
Norther Hognose Sucker	*Hypentelium nigricans*	11.0	Eco	B
Norther Hognose Sucker	*Hypentelium nigricans*	10.5	Eco	E
Norther Hognose Sucker	*Hypentelium nigricans*	11.5	Eco	G
Norther Hognose Sucker	*Hypentelium nigricans*	11.5	Eco	G
Norther Hognose Sucker	*Hypentelium nigricans*	13.0	Eco	G
Norther Hognose Sucker	*Hypentelium nigricans*	23.5	Eco	D
Longnose Dace	*Rhyinichthys cataractae*	13.5	Eco	A
Longnose Dace	*Rhyinichthys cataractae*	15.0	Eco	A
Longnose Dace	*Rhyinichthys cataractae*	7.0	Eco	A
Longnose Dace	*Rhyinichthys cataractae*	12.5	Eco	F

Longnose Dace	*Rhyinichthys cataractae*	12.5	Eco	F
Longnose Dace	*Rhyinichthys cataractae*	8.0	Eco	F
Longnose Dace	*Rhyinichthys cataractae*	9.0	Eco	F
Longnose Dace	*Rhyinichthys cataractae*	8.0	Eco	F
Longnose Dace	*Rhyinichthys cataractae*	6.0	Eco	B
Longnose Dace	*Rhyinichthys cataractae*	10.0	Eco	B
Longnose Dace	*Rhyinichthys cataractae*	10.0	Eco	B
Longnose Dace	*Rhyinichthys cataractae*	9.5	Eco	B
Longnose Dace	*Rhyinichthys cataractae*	11.5	Eco	E
Longnose Dace	*Rhyinichthys cataractae*	11.0	Eco	G
Longnose Dace	*Rhyinichthys cataractae*	13.5	Eco	G
Longnose Dace	*Rhyinichthys cataractae*	9.0	Eco	H
Longnose Dace	*Rhyinichthys cataractae*	10.0	Eco	H
Blacknose Dace	*Rvinichthys atratulus*	6.0	Eco	A
Blacknose Dace	*Rvinichthys atratulus*	7.0	Eco	A
Blacknose Dace	*Ryinichthys atratulus*	6.5	Eco	G
Blacknose Dace	*Rvinichthys atratulus*	9.5	Eco	G
Blacknose Dace	*Rvinichthys atratulus*	6.0	Eco	G
Redhorse Sucker	*Moxostoma* sp.	11.0	Eco	E
Redhorse Sucker	*Moxostoma* sp.	45.5	Eco	D
Stone Roller	*Campostoma* sp.	9.5	Eco	E
Redline Darter	*Etheostoma rufilineatum*	5.5	Eco	F
Redline Darter	*Etheostoma rufilineatum*	6.0	Eco	F
Redline Darter	*Etheostoma rufilineatum*	6.0	Eco	F
Redline Darter	*Etheostoma rufilineatum*	4.5	Eco	F
Chub	*Erimystax* sp.	11.0	Eco	E
Least Brook Lamprey	*Lampetra aepyptera*	14.0	Eco	G

TL = Total Length (measure nose tip to fin tip)
cm = centimeter

APPENDIX B

Proposed Plan Public Meeting Transcript

Certified Transcript

Proposed Plan Meeting for

Ecusta Mills River Site

July 21, 2009

Reported By: Meredith Johnson
Court Reporter
Notary Public

Job No. 153335

APPEARANCES

Linda Starks, EPA Public Affairs Specialist

Jennifer Wendell, EPA Project Manager

MS. STARKS: Good evening. Can you hear me now? Okay. I want to thank you all for coming out tonight. My name is Linda Starks and I am the community involvement coordinator for this site.

The purpose of the meeting is, this is a proposed plan meeting for the clean-up of the river for the Ecusta Mills site. I hope everyone received a fact sheet. If you didn't, there are some out on the table should you have to make any comments or anything.

This is the time that the public gets a chance to participate in the outcome of the remedy of the site. There's a public comment period that we have that runs between July 21 and August 19, 2009. Feel free to comment on that now or write in to Jennifer Wendell for the comments. If you need any further information, the administrative record is here at the library, the Transylvania County library.

The way the meeting is set up tonight is Jennifer is going to give a presentation and then we have Mike Singer that's going to give a presentation. And then we'll take questions at the end. But between the two, we're going to take questions between Jennifer's and Mike's comments.

We have a court reporter here and she needs to get your name and your comments. If you could, speak clearly and loudly so that she can hear. If you don't want to give your name, you don't have to. She'll just write it down as person number one and person number two. But if you choose to be in the administrative record with your comments, you just have to say your name and address and comments.

The project manager for the site is Jennifer Wendell. I'm sure you all know her.

Mike Singer is the project manager for Davidson River Village.

And we have representatives from the state, Jim Bateson and Roger Edwards if you'd like to comment to them you can also.

I will present to you now Jennifer Wendell and she will give her interpretation of the proposed plan.

MS. WENDELL: As Linda said, tonight the purpose of our meeting is to begin the formal public comment period for the record of decision for this portion of the work that the EPA has been involved with at the Ecusta site. This river investigation area is just limited to those areas of the Davidson and the French Broad River which we anticipated may have experienced some effects from the operation of the mill during the historic operation time. We conducted the investigation, the field work in the summer of last year and the results were summarized in an investigation report that has been approved by the EPA.

And what we do now is we do a proposed plan which will present the information from the investigation, propose an action, and put that in for a 30-day public comment period. And I'll go through more of that process in just a minute.

I'm going to go through the investigation as Linda said. And then we'll take questions or comments on that portion. At that time, the official transcript of the meeting will be stopped and Mike is going to do an update of what's been going on at the redevelopment area and the demolition progress to date.

Most of you know what Ecusta was, but the plant was constructed in the early 30s and operated until 2001. And the construction went on there for about 40 years 'til they finally finished. It operated until about 2001 when it was shut down.

The plant was a big employer here in town as most of you already know. They produced high quality paper that was used in publishing and printing, cigarette, and Bible paper. It's about 550 acres and it's located at the confluence of the Davidson River and the French Broad River off of Ecusta Road down by Lowe's off of Highway 64.

There's about 2.1 million square feet of buildings that were under roof during the time and Mike will give you a little bit of an update on that progress. Some of the other buildings, they produce their own water, drinking water for the plant, sewage treatment for the plant, wastewater treatment was all conducted right there at the site.

This is an overview of the property. You can see the plant site in the bottom corner down here. Up on top is the area of stabilization basin which was part of the wastewater treatment facility when the plan was operating. Also, up in the very top corner are two process landfills that were used during the time of the operation of the plant. And there's also an additional landfill down here in the corner.

The primary areas of concern when the

EPA came to the site, we identified the electrochemical building which is in the center of building -- or in the center of the process area of the buildings. Historically, that operation incorporated mercury into the bleach manufacturing. Usually, there's a historical legacy of mercury, so that was an area of concern.

Of course, there were numerous process tanks and drums and Mike will give you an update on that. There was a former caustic leak of material in the back part of the property so that was a potential concern. And then of course, ecological impacts from -- to the river areas and then the rifle range which is down across the street from the Transylvania County dump.

The river investigation area started at the bridge that goes over Highway 64 and went all the way down to the confluence with the French Broad River down the French Broad River, past where the stabilization basin outfall is currently to the French Broad River down just about a quarter mile downriver from it.

And some of these maps are up here if you want to look at them a little more closely. I knew they wouldn't translate well, but you can look at them. I've got them up here in the corner.

The upstream location which was our backup location was up on the other side of the bridge.

The first thing we did was conducted a watershed assessment of water stability and sediment supply model. And this is the procedure that we used to determine where the potential sediment deposition areas were along that stretch of the river. And we did that to target where we thought, if there was contamination that was released from the plant where it might have been deposited over time. So this model -- let me just make sure I get it correct -- the key issues we examined with the model were the channel stability, the stability of the river channel itself, the stream bank, and the erosion potential of the stream bank itself, and then where sediment was stored or transported to. And the purpose was to identify any risk areas for further sampling.

This was a state of the art approach. It was really a top-shelf job that was done and I was really impressed when -- I should have said this in the beginning -- Glatfelter undertook this work under administrative order by the EPA. So they were the primary in charge of their contractors. And they brought in contractors that proposed work under a work plan to us. We reviewed it, myself and the state of North Carolina reviewed it. And then they went out and conducted the field work last summer.

We were really happy with this proposal to do this model because it does represent a state of the art at this time. It was developed under a grant with the EPA's Office of Research and Development. So it's rather a new thing and we were very happy to see it done here.

What it helped us to do was to target those areas of the river for further sampling. And I'll go on with that.

The next step in our field work was to look at 25 locations along the river and I have a map of that coming up. We did subsurface testing along portions of the river where we thought the sediment had deposited historically. And we also took transect locations for field screening across all of those 25 areas of the river. And then based on results of the field screening, we focused in on eight transects for full analytical sampling which included sediment, surface water, and fish tissue.

Again, these maps are up here if you can't see it. These are the 25 areas and you can see we started upstream and worked all the way down and then down through the French Broad River. And these are the areas which were based on the WARSSS model looked like they were the highest areas of historic deposition. And what we did was went in and cored along the banks there and took deeper samples because we thought maybe historically that it had been buried and there had been sediment laid down over time. So that was the focus of that investigation.

And then the eight transect areas, you can see Site A is our background going down, Site B which is -- is on this side of the south ditch, Site F is on that side. And I said add one there, so we added another, that's why F is up from B and we worked our way downstream all the way down, just below where the outfall. See where the area of stabilization basin is up there, where the Davidson comes into the French Broad and then downstream on the French Broad River itself.

The results of the analysis on the

sediment and the surface water showed low levels of dioxins, mercury, and methyl mercury in the sediment throughout the investigation area. We compared those levels with national and regional background, they were very similar. In fact, for the dioxins that we found, the highest level was the upstream or background sample and we theorized that the dioxin can be generated as a result of fires. And the types of dioxins that we found out there are very similar to the type of congeners that you'll find following a fire. So we theorized that that may be where that is coming from.

We did identify some evidence of historical releases of mercury from the former mill through the process ditches, the ditches that discharged to the river directly. Again, those levels were pretty comparable to the background levels.

I have the results table here. As you can see, some formatting issues, and then, again -- I have all of this in print if you'd like to look at it a little more closely -- for the dioxins in the sediment, the maximum we found was 6.6 times ten to the minus seven. Now, those are pretty low numbers. The background was the same. That was our highest detection was in the background.

From mercury in the sediments, the highest we found was .19 milligrams. Our background was quite a bit lower, a couple of orders of magnitude lower. The EPA screening level for mercury and sediments is .12. So what that means is we had to put these results and -- we did it anyway. We did for all of the compounds, even though all of them fell below our screening levels with the exception of the one mercury result, we went ahead and put them through the formal risk assessment process. And I'll talk about that in just a minute.

Methyl mercury, we test for methyl mercury because it's more bio-available to an ecological system and those results again were very similar to background levels, surface water all very low.

And then in the fish tissue, what we did with fish tissue was we compared to our backgrounds for the site, the .4 and the .11 being the background. But we also compared it to regional and national typical mercury levels in fish tissue because we do have a problem with that in this country. And compared to regional and national background levels, we ranged anywhere from a .98 to a 4.2. And those are regional and national testing stations. So you can see that our fish tissue was quite a bit lower than those levels.

I'm going to talk about the site specific risk assessment in just a minute. This is a side that talks about the different areas of regional and national databases that we looked at for mercury in fish tissue. United States, northwest Canada, we also looked at regional levels in Georgia and in Florida.

And then the bottom is what we found here at the Davidson and French Broad. It's good news. The fish seem very robust and very healthy and they don't seem to be accumulating mercury from this site.

For the human health risk assessment, we took and modeled three potential exposure scenarios for that part of the river, the Davidson and French Broad. The recreational fisherman, as you know that area is owned by the Davidson River Village and leased out to an outfitter in town, so he controls the access to that part of the river. He controls a catch and release program and takes recreational fishermen out there. So our first human receptor that went through the risk assessment process was the recreational fisherman and may be potentially exposed to any contamination in surface water, any contamination of sediment in the river, and then potentially ingesting fish. And there are certain EPA standards that are used for how many fish a person might consume in a year's time and that all goes into a risk assessment model.

We looked at the adolescent trespasser, the kid that walks across the street with his fishing pole and get into the river and splash around, play in the river, possibly ingest surface water and sediment and potentially catch some fish and take them home and eat them.

And of course, the aquatic scientist, those of us that go out there and actually go into the river and do the testing of the water and sediment. And we had a certain amount of input criteria that goes into that model.

This is a schematic of the conceptual model. What that does is it takes us through historic operations into the discharge, constituents that might go into the river, surface water, and the solid phase of the sediments, and then into fish. And you can see how each person, how much of each they are going to take in. That's just a summary chart of what I just said.

EPA standards for determining whether there is an adverse risk effect from a site are one times ten to the minus six or one in 1 million excess cancer risk or a hazard quotient of one, which is a non-cancer indice (sic). So what we do is we put all of that information, all of the modeling parameters in, and we plug and we jug. We come up with a site specific risk number and we compare that to our acceptable risk levels.

And for this site, for the aquatic scientist, we came in with a 2.2 times ten to the minus nine. So if we're looking at 1 times ten to the minus six, ten minus nine is three orders of magnitude less than that. So no adverse cancer risk and for the hazards indices, compared to a one, you know, it's like 5 zeros, 5, 6. So very low.

The same with the recreational fisherman. We came up with a 5.8 times ten to the minus nine. Again, compared to 1 times ten to the minus six, quite a bit lower than that. And a hazard indice of .65 times nine, non-cancer hazard compared to one. So it is below our threshold as well.

And then the adolescent trespasser came in at 7.2 times ten to the minus nine, a little bit higher than the fisherman because it's children and they're a little bit more sensitive, but still well below our risk levels. And also on the hazard indices for non-cancer was well below our standards. So that's good. People aren't at risk.

The next thing we looked at is, is there a risk to our ecological environment out there, the things that are living and eating in the area of the river. The primary exposure pathways that we looked at were exposure to the surface water and sediment and also for the higher levels, do they eat the fish. So we looked at is the community, the bugs and smaller crayfish type of organisms that live in that river system, are they healthy.

The second thing that we looked at is the fish. Are the fish healthy? Are they accumulating any of the contaminants from this site? And then we looked at what else that lives in the area could eat those fish if the fish were accumulating the contaminants. So we modeled sensitive species, the mink and the great blue heron. They're primary fish eating animals, so those were the assessment endpoints that went into our ecological assessment.

And here's a picture. It's better than the human health one, I think. As you can see, we looked at what was living down in the sediment and were they healthy, the crayfish and other organisms that live in the river, the fish themselves, and then what eats them.

The summary of the results are the macro-invertebrate population is robust. It's a very healthy stream system. Everyone seems to be living a good life out there.

The fish tissue samples that we took were very comparable to national and regional background levels and also well below our effects benchmarks if we're looking at just the effects on the fish, not just the effects on people, but also the effects on the fish themselves. We have standards that we compare those to.

The great blue heron, the acronym, NOAEL, no adverse effects level. And it's the very lowest standard that we look at for an ecological assessment. And we compare that to a standard of one. It's similar to the human health calculation. And so we were well below the orders of magnitude below for the mink and for the great blue heron.

The next step is we come to you with our proposed plan, based on this site specific risk assessment, the analytical testing that we did. The EPA is going to propose no further action for the river. We feel that there isn't any reason that any type of clean-up needs to be done or any additional monitoring needs to be done. We feel it was a very good investigation, very comprehensive work that's been done over the last year and a half to investigate any effects of the plant on the river system. Our testing seemed to indicate it was very similar to any type of stream you would see in North Carolina and other parts of the country. And our site specific risk modeling concluded that there were no adverse effects to human health or ecological receptors. So compared to other streams like this, it seems healthy. And when we did our site specific risk assessment calculations and modeling, we came up with numbers that were below our actionable levels.

As Linda said, our public comment period starts today and it goes through August 19. The administrative record is housed here at the library. It was shipped today. It was supposed to be here this morning. I'm going to be making sure tomorrow morning that everything is there in terms of documents if you'd like to review them.

We take comments from the public tonight and it's included in our official record that is appended to our record of decision. So we have a court reporter that takes down everything. And we respond to those comments formally as part of our record of decision process.

I'll be writing the record of decision. It's about a 50-page document that basically memorializes everything that we've done to date in terms of the investigating the river system. And it summarizes as I did tonight in a much deeper level what we found in our risk assessment. And then that is the official record of decision for the agency on this part of the site. And I have a completion due date of that of September 30 of this year.

Here's our contact information and it's also out at the table and it's on the back of the proposed plan fact sheet. If you didn't get one and you want an extra copy, they're out on the table.

At this point, I'll just turn it over. If you have questions for me, I'd be happy to try to answer them. I know this was a lot of information. I went through it in a rather rapid fashion. It's difficult to understand some of the science that was behind it. So if you have a specific question that I can address, please let me know.

MR. CARNEY: Richard Carney, Brevard. Did the EPA sample at the beginning of this project?

MS. WENDELL: We did sample the river back in 2004 as part of our preliminary work, what we call our site assessment process. Yes, we did sample in the Davidson River.

MR. CARNEY: Wouldn't that be instructive for the public if that is another column in which you have a baseline for what it was before any work was performed.

MS. WENDELL: Actually, this investigation was done before any of the demolition activity was started on the site.

MR. CARNEY: No, but there was already work had been done by Glatfelter before you did this work. In your introductory comments, you commented that they did this under a grant from the EPA.

MS. WENDELL: No, it was an administrative order. They conducted this work under a Superfund order with us with our oversight. They paid for it.

MR. CARNEY: But they did that before Lenovo got involved in the project.

MS. WENDELL: It was done last summer before the demolition started.

MR. CARNEY: Okay. Did the EPA test before that?

MS. WENDELL: We did some very light testing on the river, yes.

MR. CARNEY: And what was the result of that?

MS. WENDELL: It was very similar to these. We didn't find anything different. We found a few hints of mercury when we first came out to sample in 2004 right adjacent to the site. But when we retested those same locations, we found very similar results.

MR. CARNEY: So Glatfelter didn't have to do any remediation. Is that what you're saying?

MS. WENDELL: No, we required a full remedial investigation be conducted on the whole river system. What EPA had done was just a very few sample locations. We did not do anything that resembled a full-blown remedial investigation of the river system. We just did a very compulsory sampling of that.

MR. CARNEY: I guess it's not clear to me, maybe it is to others that the remediation that Glatfelter did was even worthwhile.

MS. WENDELL: They didn't do any actual remediation. They did investigation testing and it was very worthwhile. We had a number of questions. And there is a history, a legacy of contamination in the river systems associated with paper mills. And we didn't have the resources, EPA didn't have the resources to do the full investigation.

As part of our Superfund process, we typically try to get into an enforcement position where we'll go back to a previous owner or operator and ask them to conduct the work that we would normally do. And that's what we negotiated with Glatfelter to do under our administrative order. You do the work and pay for it and we'll oversee it and we use our Superfund law to compel that work to be done.

MR. CARNEY: So what I'm hearing you say is they did the investigation very similar to what you did.

MS. WENDELL: What we would do. They did a much more extensive investigation. EPA, at this point in the Superfund process, would have done a very similar investigations that was conducted by Glatfelter if we were not able to find a responsible party to pay for the work and that would be funded with taxpayer dollars. In this case, using our Superfund law, we were able to go back to Glatfelter and as a liable or responsible party and compel them, under -- negotiated in an administrative agreement with them, whereby they would do the investigation work.

MR. CARNEY: So you're reporting on what they found.

MS. WENDELL: Correct.

MR. CARNEY: That even raises another question of the independents of the EPA versus what Glatfelter did.

MS. WENDELL: What we do when we work and we do this is it's more common than EPA fund the investigations. EPA always takes an enforcement first approach when it comes to Superfund sites.

If we can find a liable party that we can compel by our law as responsible for potential contamination, we take an enforcement approach. And we bring them in and they are required to pay for the investigation work. We do all full-time oversight. They'll do a work plan.

And you can read the administrative order in the repository; I want make sure it's there. It lays out the specific steps that they have to go through to complete the investigation, including submitting a work plan for our review, revision. We come out, we do full-time oversight of the field work, and then they submit the results to us.

We review, we comment on those, on the first draft of the investigation report, and then they revise it and resubmit it to us. And then EPA comes forward and presents the results of the investigation work. It's all requirements of your Superfund statute.

But like I said, if we can find someone to pay for it, EPA does not pay for it using taxpayer dollars.

MR. CARNEY: I don't have any problems with that. What I have a problem with is the independence of this type of work.

MS. WENDELL: It's all approved and reviewed by the agency. The type of analysis they do, the sampling that they do, we receive the sampling, we approve the laboratory they use, we approve the environmental contractors they use, we approve the work plan that they use, we approve the results, we approve the investigation report itself. We comment on it.

MR. CARNEY: And all these independent steps are monitored by EPA.

MS. WENDELL: Correct.

MR. CARNEY: Including the laboratory.

MS. WENDELL: Yes. As part of our administrative agreement with Glatfelter, we get to approve the lab that they use and the environmental contract.

MR. CARNEY: So the summation of your points of more extensive testing, was that a mutually agreed or was that dictated by the EPA or who made those decisions?

MS. WENDELL: I did. They presented the work plan to me and we reviewed it. We met a couple times, we scoped it out, they presented a first draft, I reviewed it, and Jim Bateson with the state of North Carolina reviewed it. We made extensive comments and changes to what they wanted to do.

In general, we thought it was robust and -- Jim, you can comment if you'd like -- a good proposal, a good first cut. We made a few changes. They went out and did the field work. We came out and watched them do it. And when they brought the results to us the first time in December, we sat down and met with them and did a quick summary of what they found and gave us the report. And it took us months to go through it. It's 2,578 pages and I reviewed it, Jim reviewed it. I had a hydrogeologist in my office review it. I had a human health risk assessor in my office review and an ecological risk assessment person review it. And those technical people were also involved in the work planning process in the beginning.

MR. CARNEY: And none of the 25 points that I guess you started with, none of those tested above the standard.

MS. WENDELL: No, in fact we were hard pressed to find eight locations that looked good to sample.

MR. CARNEY: Did you think that's sort of atypical to what most paper plants put into rivers?

MS. WENDELL: It depends on the river system. I did the warehouse plants out in Plymouth, North Carolina and it was a completely different river system. Not fast moving, it was a creek, very low flow and a lot of the paper material stayed in place.

The Davidson, as you know, is a fast-moving stream and I don't know -- this is a different type of information. This is flax pulp. That's wood pulp, so it's hard to say.

You can have different legacies with paper mills, but I was very happy and was happy for us and happy for Brevard that we didn't find anything.

Any other questions? If you have more comments, Mr. Carney, certainly call me.

MR. CARNEY: I do have one additional

comment, if I may.

MS. WENDELL: Sure.

MR. CARNEY: You're looking at the risk assessment of the river which is, you know, between the banks of the river. That's all you're looking at.

MS. WENDELL: Correct.

MR. CARNEY: It seems to me that there are more risks beyond the bank that ought to be considered.

MS. WENDELL: Yeah. This is just operable unit two. We broke the site into two operable units, the part that's the plant site, including the area of stabilization basin and all the landfills and then the river system itself.

MR. CARNEY: And when will they be studied?

MS. WENDELL: Mike's going to give us and update.

MR. CARNEY: Thank you.

MS. WENDELL: Any other questions or comments? Okay. Thanks.

(Official Record Concluded at 7:39 p.m.)

CERTIFICATE OF REPORTER

STATE OF NORTH CAROLINA)
COUNTY OF TRANSYLVANIA)

I hereby certify that the foregoing is a true and correct transcript from the record of proceedings in the above-entitled matter.

This, the 27th day of July, 2009.

MEREDITH R. JOHNSON
Notary Public in and for
County of Gaston
State of North Carolina
Notary Number 200814200186

APPENDIX C

State Concurrence Letter

NCDENR
North Carolina Department of Environment and Natural Resources

Dexter Matthews, Director | Division of Waste Management | Beverly Eaves Perdue, Governor
Dee Freeman, Secretary

September 25, 2009

Ms. Jennifer Wendel
Superfund Site Evaluation Section
US EPA Region IV Waste Division
61 Forsyth Street SW, 11th Floor
Atlanta, GA 30303

SUBJECT: Concurrence with Record of Decision
Ecusta Mill Site Operable Unit 2 (River Investigation Area)
Raleigh, Wake County

Dear Ms. Wendel:

The State of North Carolina by and through its Department of Environment and Natural Resources, Division of Waste Management (herein after referred to as "the state"), reviewed the attached Record of Decision (ROD) received by the Division on 25 September 2009 for the Ecusta Mill Site Operable Unit 2 (River Investigation Area) and concurs with the selected remedy, subject to the following conditions:

1. State concurrence on the ROD for this site is based solely on the information contained in the ROD received by the State on 10 September 2009. Should the State receive new or additional information which significantly affects the conclusions or amended remedy contained in the ROD, it may modify or withdraw this concurrence with written notice to EPA Region IV.

2. State concurrence on this ROD in no way binds the State to concur in future decisions or commits the State to participate, financially or otherwise, in the cleanup of the site. The State reserves the right to review, overview comment, and make independent assessment of all future work relating to this site.

1646 Mail Service Center, Raleigh, North Carolina 27699-1646
Phone: 919-508-8400 \ FAX: 919-715-4061 \ Internet: www.wastenotnc.org

The State of North Carolina appreciates the opportunity to comment on the ROD and looks forward to working with EPA on the remedy for the subject site. If you have any questions or comments, please call Mr. Jim Bateson at 919 508-8449.

Sincerely,

Dexter R. Matthews, Director
Division of Waste Management

cc: Jack Butler, Chief, NC Superfund Section
Jim Bateson, NC Superfund