Introduction

Alabama Power Company (APC) owns and operates the Coosa River Hydroelectric Project (FERC No. 2146) which, includes the Weiss, Neely Henry, Logan Martin, Lay and Bouldin developments. The federal operating license for this Project expires in 2007. In order for APC to continue operating the Project, they must obtain a new operating license from the Federal Energy Regulatory Commission (FERC).

APC is currently involved in a cooperative multi-year relicensing process for the Coosa Project and other hydroelectric projects on the Coosa River. As part of this relicensing process, APC must file a license application with FERC by July 31, 2005. This license application will evaluate and address project impacts upon existing aquatic resources and describe any protection, mitigation, or enhancement measures that will be implemented during the term of the new license. APC has developed issue specific relicensing teams (Issue Action Groups) comprised of Federal and State regulatory agencies as well as other interested stakeholders to assess the effects of project operations on particular project resources.

Erosion Processes

Before evaluating specific erosion sites occurring within in the study area, it is important to identify and understand the different potential causes of erosion. Some sources of erosion are derived from natural factors while others are related to man's interaction with the environment. Natural erosion processes without the influence of anthropogenic effects are considered to be typical or background levels of erosion. Man-made erosion often accelerates erosion processes creating significant and/or atypical erosion. The following discussion describes natural and man-made causes of erosion directly and indirectly influencing significant and/or atypical erosion.

Natural Erosion

Erosion along rivers is a natural, dynamic process whereby sediments are constantly being redistributed. For example, outer bends of rivers and shorelines that are exposed to wind and waves, naturally experience erosion, and inner bends of rivers often experience deposition. Natural or background levels of erosion can be important ecological processes (e.g., actively eroding shorelines can provide a habitat niche for certain plant and wildlife species), but accelerated or atypical erosion can negatively impact water quality and fish and wildlife habitat. The primary natural erosive forces are wave action from wind, gravity, natural water level fluctuations, direct scour from river flows, and runoff (both surface and subsurface) from the contributing watershed. The degree of natural erosion and deposition in a riverine system depends on these factors as well as flood frequency and severity, topography, and soil types. Rivers located in flashy watersheds, and those in relatively flat gradient areas with non-cohesive soils tend to undergo more severe natural erosion. Shorelines that are naturally armored (e.g., with well-vegetated, cohesive soils, exposed bedrock, or rocky substrate) are far less susceptible to erosion.

Direct scour and wind waves are two primary mechanisms of natural erosion involving the physical removal of soil particles by the energy of moving water. Daily and seasonal water

level fluctuations (whether natural or anthropogenic) can increase the total area of erosion since wind waves or river scour act over a greater vertical range.

In addition to direct scour of bank materials, and wind waves, another erosion mechanism, called piping, may occur when water levels fluctuate (whether by natural or anthropogenic causes or both). This type of erosion occurs when water enters into noncohesive (*e.g.*, silty or sandy) soils during water level increases and reverses direction flowing back toward the waterbody when water levels subside, taking particles of the bank with it. Fluctuations resulting from natural cycles (*e.g.*, wet weather inundation) can cause piping. Subsurface runoff from the contributing watershed that emerges as groundwater seepage at the river or lake bank can also result in piping.

The effects of wind waves are more important than direct scour from water flows as erosion mechanisms on lakes. The effect of wind is greatest on lakes of greater width/fetch (not protected from winds). Erosion associated with natural high flow events involving direct scour of riverbank material is often the most important natural erosion force on rivers. Areas of loose or noncohesive river bank or lakeshore soils are more susceptible to erosion than are soils with cohesive properties or naturally armored shorelines. Where relatively steep banks are found, scouring or piping of bank materials often also result in sloughing of the upper bank which is no longer supported from below.

Man-Made Erosion

Natural erosion forces, such as wind waves or scour, are exacerbated where anthropogenic factors compromise root systems and aboveground vegetation components. Land use practices such as deforestation, removal of naturally vegetated buffers, and the addition of impervious surfaces are all examples of activities that can exacerbate erosion by creating more concentrated runoff patterns, exposing soils to the direct impact of erosive forces, or compromising root systems.

Anther anthropogenic factor that can exacerbate erosion is hydropower peaking operations. Water level fluctuations related to hydropower operations have the greatest chance of creating atypical erosion (i.e., beyond natural or background rates) where the fluctuations are relatively high magnitude (i.e., several feet) and high frequency (i.e., hourly or daily rather than seasonal). Water level management involving seasonal fluctuations (e.g., storage) are more analogous to natural seasonal fluctuations, and therefore pose less potential for atypical erosion than daily fluctuations. Where hydropower operations involve daily water level fluctuations (especially where these are several feet or more), waves and scour act on a greater vertical range, thus making a greater volume of soil potentially susceptible to erosion. Further, piping can result from water entering and exiting the soil profile as the levels go up and down.

Boat waves act much the same as wind waves as a cause of erosion. On waterbodies where large motorized craft are present, boat waves can be a substantial contributor to erosion, sometimes creating waves as large or larger than typical wind waves.

Historic Erosion

Historic erosion might include areas where slumping and uprooted trees have accumulated at the base of an eroding bank and provided a new stable equilibrium where vegetation is firmly established at the base of the historic area of erosion. Or, an area where removal of fine substrates by historic erosion has exposed bedrock or rocky substrate, thereby creating a new stable equilibrium. Such areas are no longer sources of sedimentation.

Issue Statement

In cooperation with relicensing stakeholders and as the result of several scoping meetings the following issue statement was agreed upon to help address and resolve erosion within the Warrior and Coosa Basins:

WE2 & CE2 Erosion and Siltation – Effects of the existing (and estimated future) levels of erosion and siltation within the Warrior and Coosa Basins on the public uses and water quality of the lakes and rivers in the project study area.

Study Objectives

This study is intended only to provide the necessary baseline data on the extent of areas with significant erosion in the Study Area and the relative causes.

This Study Plan has two goals:

- Identify the locations and characteristics of atypical or significant erosion areas and unstable streambank sections.

- Qualitatively evaluate the potential causes of the erosion for the sites identified, particularly with respect to project operations.

Since erosion in some form and to some extent can be expected in association with all lakes and rivers, the terms atypical and significant as they apply to this study refer to erosion areas that appear appreciably different than typical conditions observed within the project boundary or that are potentially significant with respect to water quality or fish and wildlife habitat due to large extent/magnitude. Data sheets will be completed for areas of active, atypical erosion only.

Geographic Scope/Study Area

The Study Area for this investigation includes the immediate shoreline perimeter of the Warrior and Coosa projects landward to the normal maximum extent of water level influence (i.e., to the normal high water mark or typical annual flood elevation – not up to the 100-year elevation). Also, the geographic scope shall focus primarily on undeveloped sections of shoreline. Undeveloped sections are the most apt to exhibit erosion that is attributable to natural causes (e.g., wind waves, natural fluctuations) and project operations (e.g., fluctuations attributable to operations). Since land use influences (e.g., riparian vegetation alteration,

stormwater runoff changes, impervious surfaces) often contribute to erosion processes, it is more difficult to isolate the potential effects of project operations in these locations.

At the January and March 2002 meetings, the IAG identified several areas within the Warrior and Coosa projects that should be examined for atypical project related erosion. These sites are:

- Smith tailrace
- Bouldin canal
- Clear Creek (Smith reservoir)
- Weiss tailrace
- Neely Henry tailrace
- Shoreline erosion on storage reservoirs
- Tributary erosion associated with lake level changes

Data Collection

Field data sheets documenting erosion extent and processes, based on visual observations at each identified atypical erosion site will be completed (See Attachments). This form will include fields for: the water body, field personnel, photo identifier, erosion area location (Lat-Lon); potential causes of erosion; position in landscape; physical properties of the area; potential erosion processes; adjacent land use and vegetative cover; hydrologic impact information; description of exposed soils; and general comments. Information collected as a result of this study will be added to any project related GIS overlays.

The field investigation will include a qualitative assessment of the potential cause(s) (*e.g.*, project operations, natural factors, land use, etc.) and characteristics (*e.g.*, soils, position in landscape, physical properties, etc.) of each area identified. Data sheets will be completed for each identified area of atypical erosion as well as for other miscellaneous features of interest (*e.g.*, bridge abutments).

A shoreline reconnaissance will be conducted prior to completion of individual data forms/identification of atypical erosion sites. In observing shorelines during the reconnaissance, the first step will be to make general observations regarding the overall condition of the banks and to determine what the typical or normal condition is. Then this condition will be compared qualitatively with what would be expected to be found on similar lakes or streams. Atypical erosion areas will be assessed based on their exhibiting significantly different characteristics than the majority of the observed sites. Whereas areas of atypical or significant erosion will be assessed individually, the prevailing or normal, background conditions will be described qualitatively in the report as a whole but will not require individual data sheets.

Photographs of typical or background erosion conditions for each water body, of other noteworthy features such as bridge abutments, public access areas, and examples of construction or development related activities will be taken. Pictures of all significant or atypical erosion locations will be taken as well.

Reporting

The collected study information will be analyzed and summarized into a report (or series of reports) for review and use by the E2 Erosion IAG. The IAG will use this report (or series of reports) as a basis for their recommendations to the EcoRAT and WCRT. The report will include introduction/background, methods, results and conclusion sections. The results section will include a description of existing conditions including both atypical and typical erosion sites, a description of the various relative causes of erosion, and documentation (including representative photos, and data sheets). The report should provide sufficient data that users are able to understand the baseline condition as a basis for making future decisions about the magnitude of environmental impacts from project-related erosion and the need for potential mitigation measures.

EROSION & BANK STABILITY STUDY

Water Body: _____ Date: _____

Field Personnel: _____ Photo No.: _____

1. Erosion Area Location:
   ID: _____ Lat: _____ Long: _____ Time: _____

2. Potential Causes (check all that apply):
   - ☐ Project operations (water level fluctuations)
   - ☐ Natural factor independent of operations (e.g., seasonal flooding, wind, riverine processes, etc.
   - ☐ Land use (e.g., farming, ranching, mining, development, etc.)
   - ☐ Anthropogenic (Foot/bike paths, vehicle traffic, waves from boats, etc.)
   - ☐ Other: _____

3. Position in Landscape (check all that apply):
   - ☐ Levee/Embankment
   - ☐ Steep bank
   - ☐ Floodplain Terrace
   - ☐ Protected from dominant wind waves
   - ☐ Subject to dominant wind waves
   - ☐ Main Channel/Main Body of Lake
   - ☐ Cove
   - ☐ Other: _____

4. Physical Properties:
   Length: _____
   Width: _____
   Shape: _____
   Slope:
   - ☐ Steep (> 20%)
   - ☐ Moderate (8% to 20%)
   - ☐ Gentle (< 8%)

5. Erosion Processes (check all that apply):
   - ☐ Direct scour from river or tributary flows
   - ☐ Piping
   - ☐ Slumping due to scoured toe of bank
   - ☐ Gully or rill erosion from overland flows towards lake
   - ☐ Wind or boat waves
   - ☐ Other: _____

6. Adjacent Land Use / Vegetative Cover:
   - ☐ Agricultural
   - ☐ Undeveloped, Grassy
   - ☐ Undeveloped, Wooded
   - ☐ Road Crossing/Bridge
   - ☐ Roadway, Gravel
   - ☐ Roadway, Paved
   - ☐ Unvegetated
   - ☐ Early successional vegetation
   - ☐ Exposed roots or root undercutting
   - ☐ Leaning or fallen trees
   - ☐ Park
   - ☐ Other: _____

7. Hydrologic Impact Information (Erosion area affected during or by):
   - ☐ Extreme Floods
   - ☐ Above normal high water level
   - ☐ Within range of normal water level fluctuations

8. Description of Exposed Soils:
   _____
   _____

9. General Comments:
   _____
   _____
   _____