

# **Appendix A**

## **Bank Erosion Study**

## **Decision Point Paper**

**UPPER MISSISSIPPI RIVER/ILLINOIS WATERWAY  
BANK EROSION STUDY  
DECISION POINT INFORMATION PAPER**

FIELD SURVEY REPORT

The Final Draft Bank Erosion Field Survey Report will be distributed for concurrent review by the previously established Bank Erosion Study Technical Review Group and the Navigation Environmental Coordinating Committee (NECC) in the November/December 1996 time frame. This report will present the results of the field reconnaissance survey conducted by a multi-disciplined study team during the Summer and Fall of 1995. It will document existing bank conditions along the entire Upper Mississippi River and Illinois Waterway and provide detailed information at 72 erosion sites which were determined to be representative erosion sites by the study team. These 72 sites will be classified following a system of classification attributes which can be used in combination with the Aquatic Areas Classification system being developed at WES to extrapolate knowledge gained at the 72 sites to the rest of the UMR/IWW system. Opinions as to the relative significance of bank erosion due to various factors such as hydraulics of flow, floods, waves generated by commercial and/or recreational traffic, mooring and fleeting activities, wind and geotechnical factors will be provided.

DECISION POINT

a. IPMP The decision point as described in the Initial Project Management Plan (IPMP) reads as follows:

**“Decision Points:** The first two tasks of the bank erosion study are to: (1) search the literature and (2) conduct site inspections of identified erosion sites. The follow-up task then would combine these efforts in determining whether the effects of navigation can be separated from other causative factors of bank erosion and, if so, whether the effects are significant. If the effects of navigation cannot be separated from other causative factors, or if they are concluded to be insignificant, the bank erosion studies will be terminated. Otherwise, the study will continue on to Tasks 4, 5, and 6 as described below.”

**“Task 4: Predict the Without-Project Future.** This task will involve extensive computer modeling of generalized sites along the waterways. Other studies involving physical forces, both physical and numerical sites will represent various configurations typical of the waterways, such as straight reaches and inside and outside of bendways, with navigation close to or far from the bankline. Based on available data, including that accessible through the EMTC database, predictive regression type models will be developed for the various forces causing bank erosion. The predictive equation related to navigation will be a function of the amount of various types of traffic patterns.

This task will quantitatively predict future erosion at generalized sites. These models will be used to simulate conditions anticipated without the navigation improvement projects and to predict the total erosion along the waterways as well as the ranges of site-specific erosion.”

**“Task 5: Predict With-Project Future.** This task is identical to Task 4 with the exception that the study of bank erosion due to navigation will be computed with the traffic patterns which are predicted with the navigation project in place.”

b. Discussion

*Preliminary results from the 1995 field survey and literature review indicate that it may be possible to conduct field experiments at individual sites which would result in an equation or set of equations which could be applied to that individual site or at an identical site to estimate erosion rates caused by passing navigation traffic. A great deal of field monitoring of each site would be required to determine how navigation induced erosion rates vary with varying antecedent conditions. Secondary effects cannot be properly evaluated unless monitoring is conducted for a sufficient period to include periodic events. This would include making erosion rate measurements over a period of several years at each site so that the varying antecedent conditions could be captured in the equations. Development of a set of equations which could be systematically applied to the entire Upper Mississippi River and Illinois Waterway would require field experiments to be conducted at a large number of sites so that the wide variety of bank conditions which exist on these two rivers are represented in the equations. Variables which would effect the predictability of these empirically derived equations include flood flows, stages, durations, antecedent and subsequent conditions, wetter or dryer than average weather, variation in soil types, variations in soil profiles, back of bank conditions, geologic parameters and ground water conditions at each erosion site. The execution of such a set of field experiments is well beyond the scope of this study. It is estimated that it would take approximately 5 years to conduct such a set of experiments and the cost would be in the millions of dollars.*

In the Bank Erosion Field Survey Report, the study team will provide estimates as to the relative significance of navigation use effects in the context of bank erosion processes on the UMR and IWW. Navigation traffic, in a context may be separated from other causative processes. The study team has determined that bank erosion caused by navigation could be significant in mooring and fleeting areas and in narrow channel reaches. Since in some locations it has been proposed that the impacts of navigation traffic may be separated from other causative factors and that in locations where navigation induced bank erosion could be identified it may be significant, the study must proceed to Tasks 4 and 5.

Tasks 4 and 5 of the IPMP discuss development of regression equations which will be used to predict navigation induced erosion for the without- and with- project conditions. Development of such equations has been determined by the field survey report study team to be infeasible for application to large river systems such as the UMR and IWW. Therefore the approach discussed in Tasks 4 and 5 of the IPMP is inappropriate and the correlative approach described in the next section of this information paper is proposed.

## PROPOSED STUDY - (Bank Erosion Impacts Assessment Study)

### a. Study Summary

1. Task 1 - Assess bank erosion impacts on environmental and cultural resources using the results of the Field Survey Report in combination with the Aquatic Areas Classification Mapping, available data on environmental and cultural resources, and GIS mapping techniques.

2. Task 2 - Develop correlations between apparent navigation induced erosion and physical parameters such as proximity to narrow channel reaches, locks, and mooring/fleeting activities, soil and sediment characteristics, land uses, etc. These correlations will be developed from data collected at the 72 detailed study sites during the 1995 field survey.

3. Task 3 - Using these correlations along with 1995 erosion mapping of both rivers, the Aquatic Areas Classification Mapping and existing resource mapping; predict areas of adverse impacts where measurable increase in navigation induced erosion will likely occur with increases in navigation traffic levels. Bank reaches will be classified as low, medium or high risk areas for naturally occurring and navigation induced erosion.

4. Task 4 - Risk and uncertainty techniques will be applied to the resulting low, medium and high risk areas to develop an impact assessment.

5. Task 5 - To help understand the relative significance of navigation induced waves, a wave study will be performed at approximately 10 sites where storm and flood events and wave effects were observed during the field survey. Wave energies associated with wind will be calculated from existing wind data and predictive equations and compared to wave energies produced by recreation and commercial navigation. Navigation induced waves will be calculated based on present traffic observations and future forecasted traffic volumes using the wave equations developed at WES (Martin).

6. Task 6 - Write a final report which combines the results of the Bank Erosion Field Survey Report and the Bank Erosion Impacts Assessment Study.

b. Study Schedule The study would commence immediately utilizing primarily in-house labor resources and be completed by July, 1997. The final report combining the Bank Erosion Field Survey Report and the Bank Erosion Impacts Assessment Study would be completed by October, 1997.