Chapter 5

Modeling Guidelines

5.1 General

Training Document No. 13, entitled "Guidelines for the Calibration and Application of Computer Program HEC-6," (HEC 1992) describes methods and procedures for calibrating and applying computer program HEC-6. Other useful documents for sediment transport modeling are Thomas (1977), Gee (1984), Vanoni (1975), USACE (1989), and USACE (1993). Data requirements for river geometry, sediment characteristics and hydrology are discussed in these documents. Sensitivity of computed water surface profiles to data uncertainties is presented by HEC (1986).

5.2 Establishing Geometry

With the study reach located on a topographic map, mark the upstream boundary, the downstream boundary, the lateral limits and the location of each cross section. Assign an identification number to each cross section; river miles are recommended. Subdivide the floodplain into channel and overbank portions. These can be considered as subsections having similar hydraulic properties in the direction of flow. Within a subsection, flow conditions (depth, velocity, roughness) should be similar and, therefore, representative *n* values and reach lengths can be selected.

Plot each cross section as it appears at the starting time of the simulation (time zero) and divide each into two parts; the movable bed part in the main channel and the fixed part. Mark the elevations of geologic controls such as bedrock and clay layers on each cross section. If none are present, the program will arbitrarily assign ten feet below channel bottom to provide some finite depth of sediment material in the model. If more than ten feet of scour is expected, assign a lower bottom elevation.

It is necessary to locate the downstream end of the reach where there is a stable rating curve or known water surface elevation. For analysis of potential degradation this may be many miles downstream from the dam at a rock outcrop or concrete weir. For studies of reservoirs, the operating policy will define the reservoir level for the water surface profile computations and the program will adjust the bed according to calculated results.

5.3 Sediment Data

5.3.1   Sediment Particle Characteristics

Only inorganic sediments are addressed by the HEC-6 transport functions. Therefore, the amount of organic sediments in samples should be measured, expressed as a percentage, and removed before testing for the inorganic properties presented below. If a significant quantity of organic particles is present, such as on the Big Sandy River where coal amounted to 40% of the sample by weight, a suitable procedure for correcting the calculations must be developed. In the Big Sandy River case, the coal was represented by an equivalent sand size and treated as inorganic sediment having a specific gravity of 2.65.

5.3.2   Inflowing Sediment Load Synthesis

If the inflowing sediment load is not available, HEC-6 can calculate it from gradation curves for the bed material. This procedure is less desirable than obtaining measured inflowing sediment load data because of the difficulty of obtaining representative sediment samples for the entire bed. However, simulating conditions along a segment of the river permits the use of