6 Assessment Implementation

6.1 Evaluation of Data

The goals and objectives of data evaluation will be to assess the near-term cleanup and restoration effectiveness on the Big Sandy River watershed. These objectives will be structured to determine the overall impact and long-term effects on the health and sustainability of the Big Sandy River watershed. Spatial and temporal trends for parameters selected as critical to evaluating overall restoration efforts will be evaluated. Based on the predicted lack of bioavailability and insignificant health risks posed by the toxicological properties of the organic and inorganic constituents in the slurry (see Section 2.3.3), it is presumed that most of the data evaluation effort will be directed toward those parameters that potentially represent a physical hazard to biological communities within the watershed. The water quality parameters addressed will most likely include assessment of entrained slurry/sediment measured in the form of total suspended solids (TSS) and turbidity. An evaluation of the slurry data will consider spatial distribution of slurry based on depth profiles and particle size.

The final objective of the data evaluation process will be to revise the present sampling program in order to fill any potential data gaps and provide the information needed to effectively evaluate any impacts.

6.2 Sampling Plan Development

Based on the foregoing data evaluation, a Sampling Plan (SP) will be developed to address the objectives specified above. The SP will be designed to address baseline conditions, and to identify other unrelated or pre-existing sources of contamination or physical stress. The overall study design will be based on goals, data quality objectives, and methods developed within the context of the SP.

6.3 Field Assessment

6.3.1 Field Assessment Rationale

Assessment methods prescribed for the various stream segments in large part will be determined by the magnitude of prior cleanup and restoration activities that have been approved by the SACS Team, and implemented by MCCC for other stream reaches. In general, physical, hydrological, and biological components within each stream segment will be the critical variables considered by the SACS Team in determining appropriate assessment methodologies and proposed removal options. The ultimate goal of the assessment will be to develop a solid understanding of the overall stream segment dynamics and any areas of special concern. Because restoration and removal efforts are presently underway in Coldwater Fork and Upper Wolf Creek, no further assessment activity will be, developed for these water bodies, other than those required for evaluating restoration effectiveness as outlined in Section 7.1. To the extent possible, MCCC will continue to use a phased approach for implementing this field assessment activity by focusing initially on habitats where slurry impacts are likely to be the greatest.

6.3.2 Rockcastle Creek

The strategy and assessment rationale for physical and hydrological variables within Rockcastle Creek will focus on the field delineation, such as: spatial accumulations and volumes of slurry along banks; the identification of in-stream depositional areas; and the determination of slurry depth profiles, streambed configuration, grain size distribution, stream cross-sectional depth profiles, flow rates and volume, erosional potential, and other temporal and spatial particle transport mechanisms. A specific focus of the field assessment will be to determine those portions of the creek where biological components are most vulnerable in terms of slurry/sediment movement or accumulation. This process will also include a determination of a segment's habitat quality or potential based on physical and hydrological attributes of the stream at baseline conditions. Due to its size, it is anticipated that water intake issues will not be a concern in Rockcastle Creek.

6.3.3 Tug Fork

Like Rockcastle Creek, the strategy and assessment rationale for physical and hydrological variables within the Tug Fork will focus on field delineation, such as: spatial accumulations and volumes of slurry at in-stream depositional areas; and the determination of slurry depth profiles, streambed configuration, gram size distribution, stream cross-sectional depth profiles, flow rates and volume, erosional potential, and other temporal and spatial particle transport mechanisms. A specific focus of the field assessment will be to determine those portion of the river where biological components are most vulnerable in terms of slurry movement or accumulation. This process will most likely include a determination of a segment's habitat quality or potential based on physical and hydrological attributes of the stream at baseline conditions.

6.3.4 Big Sandy

The strategy and assessment rationale for physical and hydrological variables within the Big Sandy River may be similar to that described for Rockcastle Creek and the Tug, with the emphasis on slurry impacts primarily directed toward determination of the in-stream depositional characteristics. Bottom deposition may be a variable that will also be considered more carefully based on the number of other input sources into the Big Sandy River. Due to historic and ongoing dredging and channel maintenance, biological components within the Big Sandy River are likely to be continuously disturbed and less critical than those in the Tug.

6.4 Assessment of the Mechanisms of Mobilization and Depositions

An assessment of the mechanisms for mobilization and deposition of slurry will be conducted (Order, §VII, 12(c)). The assessment will be based on extant field measurement data as well as data collected as part of the work detailed herein. The analysis will involve statistical regression and the generation of rating curves relating slurry conditions (TSS, turbidity, depth, etc.) to various flow and channel parameters. The analysis will also include an examination of temporal changes in slurry parameters, beginning with pre-release data (as available) to develop baseline conditions.

6.5 Screening-level Ecological Risk Assessment

The general approach that will be used for the screening-level ecological risk assessment (SERA) within the Tug and Big Sandy Rivers will follow EPA (1998) guidance (Order, @VII, 12(c)). The SERA process is divided into three phases: problem formulation, analysis, and risk characterization. In the problem formulation phase, sensitive receptors, exposure pathways, and stressors of concern will be identified, and potential adverse ecological effects from coal slurry exposure described. The analysis phase includes two major elements: characterization of effects and characterization of exposure. Finally, an overall risk characterization will present a discussion of risk potentials to identified critical receptors based on complete exposure pathways to slurry concentrations (water-borne or sedimentiank-deposited) in the system.

Sources of ecological screening benchmarks for the assessment may include: EPA ambient water quality criteria; water quality standards for the State of West Virginia and Commonwealth of Kentucky; EPA (1996) Ecotox Thresholds; consensus-based freshwater sediment quality guidelines (Ingersoll et *al. 2000);* toxicological benchmarks compiled by personnel at Oak Ridge National Laboratory (Sample *et al.* 1996, Suter and Tsao 1996, Jones et *al.* 1997, Efroymson *et* al. 1997), or other literature sources, as appropriate, based on the identified stressors and affected media.

The SERA process will initially focus on an assessment of risk based on previously collected data (see Section 3.2) and predicted in situ concentrations resulting from the application of the various proposed removal alternatives (see Section 5.5). Secondary data sources may include post-spill information collected by KY and WV, and/or data from the EPA-STORET program for the Tug Fork and Big Sandy Rivers. The primary goal of the SERA process will be to predict the level of removal (if any) required to protect biological communities within the Big Sandy River Basin. A SERA for each stream segment will be performed to the extent necessary to assess mitigative removal alternatives within these segments. In addition, SERA results will be used to better define data needs and monitoring requirements for the long-term monitoring program to be described in the site SP.

6.6 Removal/Restoration Alternative Evaluation

In conjunction with the SACS Team, MCCC will develop and evaluate removal/restoration alternatives for Rockcastle Creek, Tug Fork, and the Big Sandy River, to assess what, if any, additional removal and/or restoration may be required. It is assumed that successful implementation of the restoration plan in Coldwater Fork and Wolf Creek, under the direction of the SACS Team, will achieve the prescribed removal/restoration objectives for these segments.

Slurry that was released to Rockcastle Creek, Tug Fork, and the Big Sandy River was confined to the main channel; thus, removal actions to be considered will be limited to the main channel. Restoration activities will similarly be limited to the main channel, with the exception of locations that may be disturbed by gaining access to the main channel. If required, removal/restoration in these areas will be conducted in a manner consistent with methodologies described in Section 4.1 and 7.1.1 of this Work Plan and in the Restoration Plan for Coldwater and Wolf Creeks (February 27, 2001).

6.6.1 General Removal/Restoration Actions

General removal/restoration actions include the following classes of techniques:

- Natural Attenuation – involves little or no active removal or restoration of the channel bottom. Natural slurry resuspension processes, dilution, and bottom armoring allow the bottom to stabilize, returning substrate to the baseline conditions:
- Dredging-involves mechanical, hydraulic, or pneumatic means of removing slurry from the channel bottom.
- Transport and Disposal -includes a combination of dredging and handling, transportation and disposal of removed slurry.
- Slurry Turbidity Controls -includes technologies that reduce the potential for slurry migration. Slurry turbidity controls may be used as the corrective action or as a temporary measure to reduce impacts of intrusive activities such as dredging.

For each of the general removal/restoration actions identified, commonly employed technologies will be identified. Information on removal options for specific stream reaches will be evaluated based on effectiveness, implementability, risk and cost. MCCC will present removal and restoration recommendations to the SACS Team.