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MEMORANDUM

TO: Technical Review Staff

FROM: Larry D. Adams, Director
Division of Permits

DATE: August 7,2002

SUBJECT: Sediment/ Flood Control Design Considerations

Mining disturbances have the potential to alter watershed characteristics and increase peak **flows** due to changes in topography **and** vegetation. Whether or not flooding occurs **is** a site specific circumstance based on the degree **of** flow alteration caused **by** the mining activities and the downstream channel capacity and geometry, **as** well as the influence of other manmade alterations to channels and flood plains (e.g., roads, culverts, stream **crossings,** bridges, residential or business fills encroaching on stream beds, and other obstructions).

A Joint Special **Study** was conducted **by OSM and** DSMRE on drainage control at ten **mine** sites in Kentucky. **Site** selection **was** based on citizen complaints alleging life threatening "wash-outs" were caused by mining or mining otherwise significantly contributed to downstream flooding. Of the ten sites investigated, three were determined *to* have increased flood potential based on the operators failure to follow the approved drainage plan. The report concluded that compliance with the approved regulatory program effectively minimized flooding potential.

Recommendations of the Joint **OSM –** DSMRE Special Study Report on Drainage Control are summarized **as** follows:

- Permitted worst case models must reflect on anticipated ground site conditions to insure the adequacy of sediment / flood control measures, To assist in site inspections, the method of operation should be expanded to include drainage information.

- Reclamation timing that is pertinent to the proposed mining plan. For example, if end-dumped durable rock hollow fills are modeled with the lower lifts aged, the hollow fill narrative must address the timing of reclamation. Alternatively, if the applicant proposes to breakdown an end-dumped fill at the conclusion of mining within the subject watershed, the worst case model should reflect the fill fully disturbed, bare.

- Pre-mining, during mining hydrologic analyses must be modeled using the same methodology to insure comparable peak run-off values. Pre-mining hydrologic analyses should not typically be modeled with an instantaneous time of concentration (Tc). When an instantaneous time of concentration is modeled with SEDCAD, the model immediately projects all rainfall within the subject watershed to the outlet resulting in an elevated pre-mining run-off estimate. While the use of an instantaneous time of concentration is appropriate in some during mining models, it may artificially increase pre-mining peak flow and would not provide an appropriate base for comparison of post-mining discharge.

- Energy dissipaters / erosion control devices should be required at pond outlets. To the extent possible, on bench dugout structures should be located so as to discharge into preexisting natural drains.

In addition to the study report recommendations, the following sediment / flood control design considerations are to be implemented.

Hollow Fill Design and Modeling

1. In light of common end-dump hollow fill construction practices observed in the mining industry, it is prudent, in assessing the projected hydrologic Ioad on sediment structures, *to* assume a **default modeling configuration** comprised of;

   a) Fill at full capacity/size,
   b) Surface condition of entire fill is bare spoil, no seeding/mulching, no final grading, no terraces,
   c) Slope and, more importantly, slope lengths used in T_c, Muskingum k, and sedirnentology inputs should reflect absence of terraces, considering the full lengths *of* the downstream face.
   d) The remainder of the mining activity within the watershed should be modeled for an acceptable worst-case estimation, and the pond performance assessed accordingly.

2. The applicant/engineer may substitute a **design modeling configuration** for the default scenario to only such degree that is supported by specific construction practices and sequence as are delineated within the **plans,** specifications, and drawings. Those specifications should address the following areas;

   a) an estimation of the time to required for completion of the fill, from initial clearing through final grading and establishment of vegetation,
   b) Maximum height of fill/volume of fill to *be* exposed **at** arty time before initiation of grading/vegetation,
   c) Hollow fill aging (in the modeling) should reflect the reclamation pattern described in the specifications, including variable cover conditions **(based** on history) **and including the maximum allowable height of the exposed fill face.**

3. If there is more than one hollow fill within **a** drainage area, the narrative should specifically address the relative reclamation status of the fills, either accounting for or precluding multiple fill sites active at any time.

4. The specifications should clearly stipulate placement of the rock check structure (below the toe of the fill) at the beginning of fill operations, and drainage **structures** (perimeter diversions) **as** soon as practicable.

Contemporaneous Reclamation Variance

1. For applications containing a request for a contemporaneous reclamation variance, additional information relating to potential storm flow increases **and** sediment discharge should be considered. This information should address;

   a) Consideration of sedimentology / hydrology impacts of extensive open pits or un-vegetated area, along with **any** appropriate controls. Additional modeling scenarios may be necessary to analyze during mining conditions versus reclamation condition for worst case impacts.
   b) Consideration of the worst case hollow fill status during development of the open highwall.

   Likewise, the applicant may choose ***to*** utilize a design modeling configuration taking into account specific reclamation timing / sequence factors similar to that addressed in hollow fill design and modeling considerations.

Ponds in Series

1. Where ponds are proposed in series, extra diligence should be employed in assessing the worst case sediment and storm load. This is particularly true for instances where multiple on-bench dugout structures are proposed in support of a downstream impoundment. Additional modeling scenarios may be necessary for fully assess the projected load on the lowest downstream discharge point.

2. In no case should the watershed plan be approved based solely on a demonstration showing all active disturbances above an upper level structure. Consideration must be given to the predicted storm performance, sediment accumulation, and effluent for the lowest structure in the watershed under the maximum predicted load for that structure.

Proximitv of Downstream Development

1. For watersheds with a higher risk of negative impacts due to flooding or inadequate sediment controls (highly populated or developed areas, particularly if the natural or constructed drainage course is only marginally adequate before mining), additional precautions should be taken. These precautions should include;

   a) Because of the potential impacts from high rainfall rates, particular care should be employed in considering the watershed routing to, and through, the impoundment.
   b) Recommendation should be made as to appropriate additional control measures, such as on-bench rock checks, more aggressive reclamation provisions, and/or additional sediment control measures.