COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

November 17, 2022

Bradford Janes
Raptor Materials LLC
8120 Gage Street
Frederick, CO 80516

Re: Two Rivers Sand, Gravel and Reservoir Project, File No. M-2022-013, 112c Permit Application, Additional Item for Second Adequacy Review, Comments on the Berm Failure Analysis

Mr. Janes -

Regarding the 112c permit application for the Two Rivers Sand, Gravel and Reservoir Project, the Division sent a second adequacy letter on 17 October 2022. In that letter, we stated that the Division is still reviewing the report "Riverside Berm Failure Analysis and Flood Control Mitigation Plan" (Flow Technologies LLC, 2020) and related adequacy response memorandum (dated 27 August 2022). We have reviewed those materials, and we have determined that the methodology (utilizing the WinDAM C software by the NRCS) is not sufficient to ensure that the proposed mine will not have significant impacts on the hydrologic balance of the rivers adjacent to the site.

We came to this decision after considerable review, and we appreciate the efforts by Douglas Trieste of Flow Technologies. However, there are some particular reasons that we are not wholly confident in the use of this model for this application:

- The Flow Technologies report states that this model was not created for this application, and, in fact, has likely never been used to assess riverside berms.
- Other hydraulics models have been created to assess scour within floodplains.
- Based on a conversation with Karl Visser (hydraulic engineer with the NRCS), the WinDAM C model was created for an embankment that is assumed to be a homogenous, engineered fill of fine-grained material. It was not designed for erosion of riverbanks into adjacent gravel pits. Native material properties can vary significantly.

- The WinDAM C software does not address lateral scour at river bends that can shorten the width of a riverside berm through erosion and cause lateral migration of the channel.

The Division has determined that additional response is required from Raptor Materials. Please perform one of the following:

1. Revise the extraction and reclamation plans to include a 400-foot setback from the top of the river banks to the top of the pitside slope. This size of setback is based on guidance from the Mile High Flood District (MHFD). The document, "Technical Review Guidelines for Gravel Mining and Water Storage Activities Within or Adjacent to 100-year Floodplains," is available upon request. A smaller setback will be considered by the Division if rationale from this guideline (or similar reference) is given.
2. Design inlet and outlet structures that will allow floodwaters to pass through the site with considerably less risk of destroying the banks (aka, riverside berms). The design should include any necessary analysis to illustrate that the structures will prevent the loss of riverside berms during a 100-year flood.
3. Perform an analysis of the possibility of riverside berm failure using a more-accepted methodology, such as a two-dimensional HEC-RAS model.

One possible path forward: The 400-foot buffer could be adopted for this application, and an analysis (with HEC-RAS, for example) could be performed at a later date, as part of a Technical Revision, to relax this requirement.

If you have any questions, please contact me at rob.zuber@state.co.us or (720) 601-2276.

Sincerely,

Robert D. Zuber, P.E.
Environmental Protection Specialist

Cc: Michael Cunningham, DRMS
Garrett Varra, Raptor Materials
Peter Christianson, RESPEC