From: John Hamrick [mailto:John.Hamrick@cotterusa.com]
Sent: Monday, June 25, 2012 5:11 PM
To: Kaldenbach, Tom
Cc: Amory Quinn; swyman@whetstone-associates.com
Subject: Cotter Response to TR-20 Review

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Whetstone Associates

Technical Memorandum

To:	John Hamrick, Amory Quinn (Cotter Corporation, N.S.L.)	**4109C**
From:	Susan Wyman, P.E., P.G. (Whetstone)	
Date:	June 25, 2012	
Subject:	Response to DRMS Preliminary Adequacy Review of Technical Revision 20 (TR-20) for Grouting at the Schwartzwalder Mine (M1977-300)	

Cotter Corporation (N.S.L.) (Cotter) submitted a Technical Revision to the Colorado Division of Reclamation, Mining and Safety (DRMS) on June 18, 2012, for installation of a grout curtain at the Schwartzwalder Mine. DRMS provided a preliminary adequacy review in a letter to Cotter dated June 25, 2012. The purpose of this technical memorandum is to respond to issues raised by DRMS in the preliminary adequacy review.

1. Please provide a map showing the outline of the grout curtain area.

A map showing the outline of grout curtain area is attached. The contour lines shown on the figure are approximate because earthwork was performed after the site was surveyed in May 2011.

2. What will be the elevations at the tops of the grout holes?

The collar elevations of the grout holes will range from approximately 6,565 to 6,585 feet amsl. The holes will be surveyed after the grouting program is complete, and the elevation data will be included in the grouting as-built report.

3. Will the holes be entirely filled with grout?

Yes, the holes that are drilled for the grouting program will be fully filled with grout to ground surface.

4. Please identify the "grouting cutoff criteria" that are noted on page 3 of the Hayward Baker Budget Proposal dated June 15, 2012 (Budget Proposal).

The general criteria for the grouting program is to reduce the hydraulic conductivity within the grout zone to $1x10^{-5}$ cm/sec or less. Lower hydraulic conductivities may be achieved, as a result of the primary, secondary, and tertiary grouting programs. Further, all visible flow will grouted off, and a QC program will be implemented as described in response to Item #6 below.

5. Please submit to DRMS within 30-days of their completion a copy of the grout monitoring data and plots that are mentioned in item 9 of on page 3 of the Budget Proposal.

The grout monitoring data and plots will be included in the grouting as-built report, which will be submitted within 30 days after completion of the program.

6. Please describe how "the verification of the grout curtain" will be accomplished (mentioned in item 10 on page 3 of the Budget Proposal).

Verification of the grout curtain will occur during the water testing (packer testing) phase of the project. The grouting will occur in a primary, secondary, and tertiary pass at a minimum. Each pass includes drilling the hole, water testing (packer testing) the hole, and grouting the hole. Verification of the effectiveness of the grout curtain will be shown in the packer tests conducted in each hole in the secondary, tertiary, and potentially quaternary passes. In the last pass of the grouting program, newly drilled holes will accept little or no water because all fractures will have been grouted.

The numeric criteria for grout testing is measured in *lugeons*, where a *lugeon* is defined as the loss of water in litres per minute and per meter borehole at an over-pressure of 1 MPa. Water testing will be performed in the packed off hole in 10-ft stages, starting from the bottom up. The water pressure testing will be performed with a maximum of three (3) 5 minute hold periods. If water take is less than 3 lugeons, the contractor will retract the packer to the next stage without grouting. At the top of the hole (final stage), the entire hole will be pressure grouted to refusal regardless of the permeability of the test section.

A progressive decrease in the measured permeability (i.e., water take or grout take) is expected from the primary to secondary to tertiary pass of grouting. Eventually, when grouting is completed, new holes drilled within the grouted zone will not yield or take water. The testing phase will indicate a water take of less than 1 lugeon, and grouting in that area will be considered complete.

7. Will an underground injection control permit be sought for this grout injection project?

It is our understanding that an underground injection control (UIC) permit is not required for this project.

8. Will the grout injection wells be reported to either the U.S. Environmental Protection Agency or Colorado Department of Public Health and Environment?

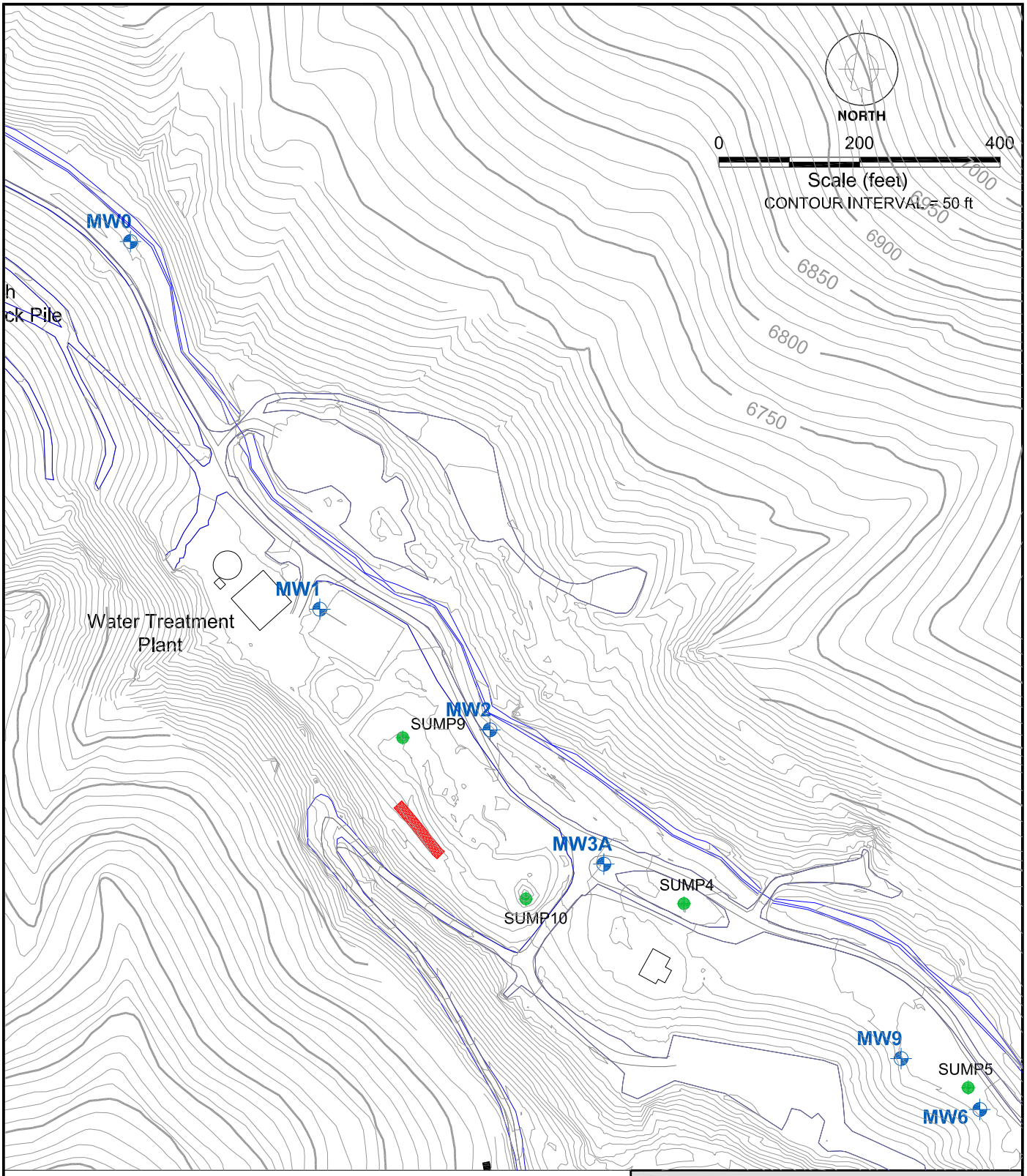
Grout will be injected through bore holes, not wells. A copy of the grouting as-built report will be provided to EPA, CDPHE, or other parties upon request.

9. Please notify DRMS ahead of the start of grouting so that DRMS staff may have the opportunity to inspect the grouting project when it begins.

The drilling, testing, and grouting program is scheduled to begin as soon as approval is received from DRMS.

10. The reclamation cost estimate for the TR-20 is $277,380.

Cotter submitted the check for the reclamation bond on June 25, 2012.



EXPLANATION

- CREEK
- ROAD
- PROPOSED GROUTING AREA
- MW1 MONITORING WELL
- SUMP9 SUMP
- BUILDING

Schwartzwalder Mine

FIGURE 1
PROPOSED GROUTING AREA

File: SCHWARTZ_120601.dwg	Date: 6/25/2012
Whetstone Associates	Scale: 1" = 200' 1:2,400
	Drawn/Checked By: SW/SW