MWH

BUILDING A BETTER WORLD

MEMORANDUM

TO: Roy Blickwedel, GE **DATE:** 2/3/09
FROM: Toby Leeson and Robert Young **CC:** Larry Bush, UNC

SUBJECT: SOIL LOSS ANALYSIS FOR REGRADE & COVER SECTIONS SECTION 27 MINE CLOSEOUT PLAN

INTRODUCTION

This soil loss analysis was prepared to estimate long term soil loss from the soil covers over the Non-Economic Storage Areas (NESA) at the Section 27 Mine. This analysis was performed in response to questions from THE New mexic Mining and Minerals Division (MMD) regarding the Closeout Plan (MWH, 2008), Supplement to the Closeout Plan (MWH, 2008), and Financial Assurance Cost Estimate (included in the Closeout Plan) for the United Nuclear Corporation (UNC) Section 27 Mine (MMD letter dated January 8, 2009).

METHODS

Soil loss was estimated using the Revised Universal Soil Loss Equation 2 (RUSLE2) version 1.26.6.4. (Foster and Yoder, 2006) RUSLE2 software is the primary tool used in erosion modeling by federal agencies (e.g., Office of Surface Mines and U.S. Forest Service) to assess soil loss for mine reclamation applications. RUSLE2 technology uses several factors in determining erosional extent including climate, soil properties, base management, slope length, shape, and gradient. The RUSLE2 soil loss equation is:

$$a=(r)(k)(l)(s)(c)(p);$$

where:

a = daily soil loss
r = rainfall/runoff
k = soil erodibility
l = slope length
s = slope steepness
c = cover management
p = supporting practices

To obtain average annual soil loss, RUSLE2 sums all daily soil loss values (a) provided by the above equation. Site-specific parameters were entered in a soil loss model in order to obtain average annual soil loss for each NESA at the Section 27 Mine. These parameters were:

1. r-factor of 15 (NRCS, 1999)

2. Time variant k factor based on site specific soil type – Tintero Complex fine sandy loam (40%) (USDA, 2009)
3. 4:1 gradient, 80 ft slope length for NESA1 (MWH, 2008)
4. 6:1 gradient, 125 ft slope length for NESA2 (MWH, 2008)
5. Revegetation beginning with new growth of cool season, non-harvested, poor stand grasses
6. No mechanical disturbances following establishment of vegetation
7. Perfect contouring, no row grade
8. Normal residue burial

Regional climate and soil data were input into RUSLE2 directly from the U.S. Department of Agriculture, Natural Resource Conservation Service. This database provided specific time-variant annual rainfall data as well as provided the soil type that would be used in the simulation of soil loss. Soil type data used in the simulation is consistent with the borrow source data presented in the *Materials Characterization Report*. (MWH, 2007). Other slope characteristics were obtained from the Section 27 Mine Closeout Plan (MWH, 2008).

SOIL LOSS ANALYSIS

Using the climate and soil data from the NRCS database and the slope design from the Section 27 Mine *Closeout Plan (MWH, 2008)*, RUSLE2 simulations estimate an average annual soil loss of 1.4 and 1.1 tons/acre/year for NESA1 and NESA2, respectively. Results are shown below in Table 1.

TABLE 1
SOIL LOSS ANALYSIS RESULTS

	Horizontal Slope Length (ft)	Slope Gradient	Annual Soil Loss (t/ac/yr)
Non-Economic Storage Area 1	80	4:1	1.4
Non-Economic Storage Area 2	125	6:1	1.1

Using the greatest annual soil loss estimation of 1.4 t/ac/yr provided by the RUSLE2 model and an assumed density of the cover material of 110 lbs/ft^2, it will take 143 years for one inch of cover material to erode off the slope of NESA1.

REFERENCES

"Area of Interest Interactive Map." Map. Web Soil Survey. USDA - NRCS. 2 Feb. 2009 <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>.

Foster, George, Daniel Yoder, Jim Lyon, and Joel Lown. RUSLE2. Computer software. Vers. 1.26.6.4. Revised Universal Soil Loss Equation Version 2. 2 Feb. 2009 <http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm>.

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