EXHIBIT U GEOTECHNICAL STABILITY EXHIBIT

Damage waiver agreements were sent to all owners structures within 200 feet of the permit boundary. Evidence of this is in Exhibit S. These agreements have not yet been returned; therefore the engineering demonstration of the mine not affecting these structures is enclosed in this section. Based on this, no structures should be damaged. Rocky Mountain Aggregates still commits to repairing any structure outside the permit area in the case that a structure is damaged as the result of mine-related activities for this permit.

The possibility of damage for the engineering demonstration is divided into 2 areas, which are discussed below:

1) <u>The mine access road to the pit</u>

The access road will utilize T Road for the eastern portion until immediately west of the office/shop area, when the road will turn south and then west, approximately 100 feet south of T Road, in order to provide nuisance mitigation to the Alexanders' and Janice Wheeler, who live immediately north of T Road. Map C-2 shows the mine access road in relation to the houses. These residences have fences, driveways, culverts and other items which are within 200 feet of the permit boundary. The access road on the subject property will be paved and will be 24 feet in width. From the northern edge of the access road to the southern edge of T Road is a length of 100 feet, which is primarily the irrigated field of the subject property. It is 120 feet from the northern edge of the access road to the southern fence of the residences and much further to the residences themselves. Although it is not impossible, it is extremely unlikely that a truck or other vehicle related to the mine will cross this large distance and damage the structures on the properties. No engineering demonstration can guarantee that this will not happen but the road cannot be used at night for material haulage according to the Montrose County permit, thus limiting the night risk. Also, large signs will be placed on T Road so that all mine traffic will know to turn south onto the mine access road.

A permanent berm of 6 feet height, with slight undulations immediately north of the access road to protect the residences from noise, dust and visual impact from the truck traffic on the road. The berm will be topsoiled with at least 8-12 inches of topsoil and seeded and mulched using the dryland range mix described in this reclamation plan. The berm will be 2,240 feet in length and provide a substantial protective barrier for the structures located to the north of the new access road. The berm will have approximate slopes of 3.0H:1.0V. The berm satisfies MSHA safety berm requirements: 30 CFR 56.9300. For this MSHA requirement, berms shall be at least mid-axle height of the largest self-propelled mobile equipment which usually travels the roadway. The visual berm will not be located on banks of roadways where a drop-off exists. The berm will also not require openings for roadway drainage since the road is relatively flat and drainage will flow to the east on both sides of the berm as it does currently in the irrigated field.

Concerning the Ouray Ditch and Montrose West Canal, the structures shall not be damaged by proposed construction materials excavation operations. The mining operation will not adversely affect the stability of the ditches. First, the subject property is the last property served by the Ouray Ditch and the Ditch Company does not care what happens here since their responsibility ends at the entrance to the subject property. The Ditch has also not been used for years and the owner does not have plans to use it. Regardless, the Ouray Ditch will only be crossed with a culvert from the access road that has been designed for its maximum flow. The disturbances to both ditches will be limited to road crossings. The stability and function of neither ditch will not be impacted.

The crossing of the Montrose West Canal will have a new bridge designed and approved by Montrose County. This design has not yet been approved by the Engineering Department in the County but the designs presented in the Appendix form the basis of the design. The bridge will be wider and stronger than the current T Road crossing of the Montrose West Canal and will be designed to handle the maximum load of any truck used on the property with an additional safety factor. This crossing is subject to the overall agreement with Montrose County.

2) The mine area

There are no buildings or any structures outside the permit area which could be affected by the excavation. A minimum twenty foot buffer will be maintained from the permit boundary line to all excavations. There will be no excavation within 30 feet of the property line. All reclaimed areas will be restored to relatively flat (<3.5%) slopes since the terrace will simply be lowered. The initial incision of the pit into the natural berm will be done at an angle of 3H:1V, which is more than stable for any in-situ gravel deposit.

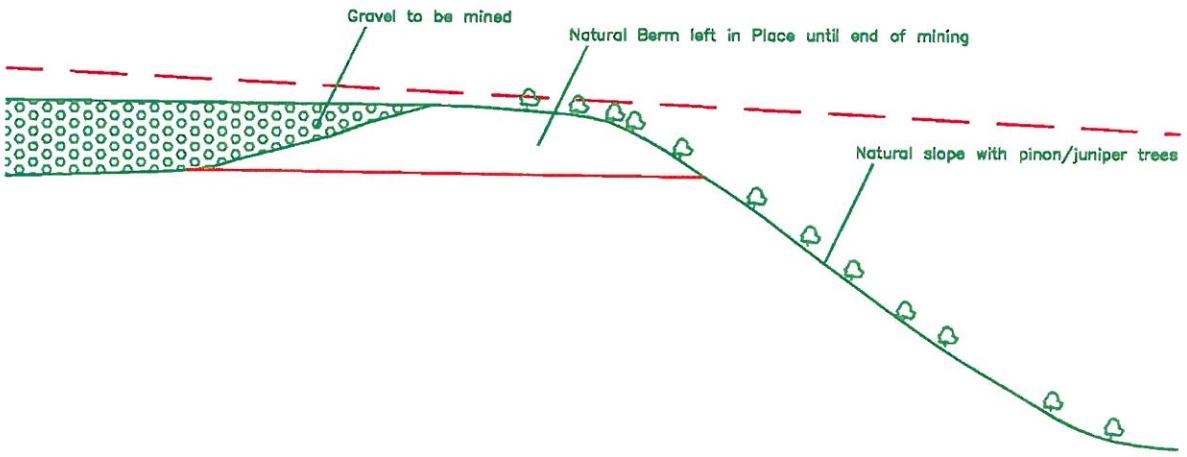

Figure U-1, from Huang, shows typical internal angles of friction for various materials. Assuming that the gravel is classified as GC (clayey gravels, poorly graded gravel-sand-clay), this material has an internal angle of friction of approximately 34 degrees.

The Factor of Safety (FOS) for gravel with a 3H:1V slope, which is 18.26 degrees in GC classified material with an assumed internal angle of friction of 34 degrees can be approximated by ignoring the cohesion component of the stability, and simply evaluating the internal angle of friction as follows:

$$FOS = \frac{\text{Tangent of Internal Angle of Friction}}{\text{Tangent of Actual Angle of Failure Surface}}$$

$$FOS = \frac{\text{Tan } 34^\circ}{\text{Tan } 18.3^\circ} = \frac{.6745}{.333} = 2.04$$

This factor of safety far exceeds the normal long term safety factor of 1.3, therefore the plan of extraction as presented is acceptable.

I, Greg Lewicki, P.E., with over 28 years of experience in mine slope safety analysis in Colorado, certify that the mine plan and reclamation plan presented in this application will lead to stable slopes during and after mining and that there is no realistic threat of failure or to the stability of any structures outside of the permit area.

Greg Lewicki

Greg Lewicki, P.E.

P.E.# 20335

Date: July 17, 2013

Table 3.1 Average Effective Shear Strength of Compacted Soils.

UNIFIED CLASSIFICATION	SOIL TYPE	PROCTOR COMPACTION: MAXIMUM DRY DENSITY pcf	PROCTOR COMPACTION: OPTIMUM MOISTURE CONTENT %	AS COMPACTED COHESION c_o tsf	SATURATED COHESION c_{sat} tsf	FRICTION ANGLE ϕ deg
GW	well graded clean gravels, gravel-sand mixture	>119	<13.3	*	*	>38
GP	poorly graded clean gravels, gravel sand mixture	>110	<12.4	*	*	>37
GM	silty gravels, poorly graded gravel-sand-silt	>114	<14.5	*	*	>34
GC	clayey gravels, poorly graded gravel-sand-clay	>115	<14.7	*	*	>31
SW	well graded clean sands, gravelly sands	119±5	13.3±2.5	0.41±0.04	*	38±1
SP	poorly graded clean sands, sand-gravel mixture	110±2	12.4±1.0	0.24±0.06	*	37±1
SM	silty sands, poorly graded sand-silt mixture	114±1	14.5±0.4	0.53±0.06	0.21±0.07	34±1
SM-SC	sand-silt-clay with slightly plastic fines	119±1	12.8±0.5	0.21±0.07	0.15±0.06	33±3
SC	clayey sands, poorly graded sand-clay mixture	115±1	14.7±0.4	0.78±0.16	0.12±0.06	31±3
ML	inorganic silts and clayed silts	103±1	19.2±0.7	0.70±0.10	0.09±*	32±2
ML-CL	mixtures of inorganic silts and clays	109±2	16.8±0.7	0.66±0.18	0.23±*	32±2
CL	inorganic clays of low to medium plasticity	108±1	17.3±3	0.91±0.11	0.14±0.02	28±2
OL	organic silts and silty clays of low plasticity	*	*	*	*	*
MH	inorganic clayey silts, elastic silts	82±4	36.3±3.2	0.76±0.31	0.21±0.09	25±3
CH	inorganic clays of high plasticity	94±2	25.5±1.2	1.07±0.35	0.12±0.06	19±5
OH	organic clays and silty clays	*	*	*	*	*

*denotes insufficient data, > is greater than, < is less than
(After Bureau of Reclamation, 1973; 1 pcf=157.1 N/m³, 1 tsf=95.8 kPa)

Figure U-1 (from Huang)

Berms or Guardrails

30 CFR 56.9300 and 57. 9300
30 CFR 77.1605(k)

56/57.9300

(a) Berms or guardrails shall be provided and maintained on the banks of roadways where a drop-off exists of sufficient grade or depth to cause a vehicle to overturn or endanger persons in equipment.

(b) Berms or guardrails shall be at least mid-axle height of the largest self-propelled mobile equipment which usually travels the roadway.

(c) Berms may have openings to the extent necessary for roadway drainage.

(d) Where elevated roadways are infrequently traveled and used only by service or maintenance vehicles, berms or guardrails are not required when all of the following are met:

(1) Locked gates are installed at the entrance points to the roadway.

(2) Signs are posted warning that the roadway is not bermed.

(3) Delineators are installed along the perimeter of the elevated roadway so that, for both directions of travel, the reflective surfaces of at least three delineators along each elevated shoulder are always visible to the driver and spaced at intervals sufficient to indicate the edges and attitude of the roadway.

(4) A maximum speed limit is posted and observed for the elevated unbermed portions of the roadway. Factors to consider when establishing the maximum speed limit shall include the width, slope and alignment of the road, the type of equipment using the road, the road material, and any hazardous conditions which may exist.

(5) Road surface traction is not impaired by weather conditions, such as sleet and snow, unless corrective measures are taken to improve traction.

(e) This standard is not applicable to rail beds.

There is no MSHA policy for this standard.

77.1605(k)

Berms or guards shall be provided on the outer bank of elevated roadways.

MSHA policy can be found here: 77.1605(k)

These standards require that adequate berms or guardrails be installed on roadways where a drop-off exists of sufficient grade or depth to cause a vehicle to overturn or endanger persons in equipment. It also establishes requirements for the height and construction of berms and guardrails (metal and nonmetal). Alternative measures, other than berms, may be utilized for roadways that are infrequently traveled or used only by service or maintenance vehicles (metal and nonmetal).

Issues to Consider in Determining Compliance:

- □ If the drop-off is of sufficient grade or depth to cause a vehicle to overturn or endanger persons in the equipment:
  - ≈ Is a berm or guardrail installed?
  - ≈ Is the berm or guardrail mid-axle height to the largest vehicle that usually travels the road (metal and nonmetal)?
- □ If there are openings in the berms for water drainage:
  - ≈ Are the openings small enough to impede self-propelled vehicles using the road (metal and nonmetal)?
- □ If the roadway is infrequently traveled or used only by service or maintenance vehicles (metal and nonmetal)?
  - ≈ If berms or guardrails are not installed on roads traveled by service or maintenance vehicles, does the roadway have locked gates at all entry points?
  - ≈ Are signs posted at appropriate locations to indicate that berms or guardrails are not present?
  - ≈ Are delineators installed and visible along the perimeter of the elevated roadway in both directions of travel?
  - ≈ Are reflective surfaces of at least three delineators along each elevated shoulder always visible to the driver and spaced at intervals sufficient to indicate the edge and height of the roadway?
  - ≈ Is a maximum speed limit posted and observed for any elevated, unbermed portions of the roadway?
    - ❖ Is the speed limit being observed?
      (77.1607(c) - prudent operation of loading and haulage equipment)
  - ≈ Have measures been taken to provide traction in inclement weather?

Other issues covered by related standards:

- □ Was a berm, bumper block, safety hook, or similar impeding device provided at dumping locations where there was a hazard of overtravel or overturning?
  (56.9301 or 57.9301 - dump site restraints)
  (77.1605(l) - dump site restrain