1. For each point source emitting particulate matter (PM), please provide a calculation showing whether or not the emission point will be in compliance with the Rule 331 emission limit of 0.10 pound of PM per 1,000 pounds of exhaust gas, on a dry gas basis. Note that emission limits may be set lower than the Rule 331 limit as a result of other applicable requirements.

See the attached report from AECOM – Copperwood Mine Air Dispersion Modeling (CW Modeling 2012-01-26 AECOM.pdf).

2. For the concentrate truck loading operation, will the exterior doors be closed while a truck is being loaded? If not, the emission estimate must be revised to reflect the capture efficiency of the building with one or more doors open.

Work procedures will be established to require exterior doors on the concentrate loading and truck washing facility at the process plant be closed during truck loading.

3. For the concentrate truck loading operation, is the 9% moisture content of the concentrate an assumed value or a process specification?

The 9% moisture content is a process specification in the Copperwood Prefeasibility Study for concentrate filter cake.

4. Will the haul roads at the facility be paved?

The main access road to the processing plant and mine site will be paved as will the main travel ways and parking lots at the plant site location.

5. Please provide toxic air contaminant and hazardous air pollutant emission rates for the emergency generators. Also, please provide an analysis demonstrating whether or not the toxic air contaminant emissions from the generators will comply with Rule 225.

See the attached reports from AECOM – Copperwood Mine Air Dispersion Modeling (CW Modeling 2012-01-26 AECOM.pdf) and Copperwood Toxic Air Contaminants (CW TAC_Spreadsheets_Rule_227_2012-01-26.pdf AECOM).

6. Please provide further details on how the data in Table 3 of the Air Quality Impact Assessment was obtained, including how the emission rates were calculated. Using the weighted average Parting shale composition from Table 203.3.4-2 of the Part 632 application may underestimate emissions of some pollutants. Please provide a justification for using the weighted average or revise the calculations to use the highest composition for each pollutant.

The highest composition for each pollutant has been used in revised calculations.
7. Please verify that the ore will be conveyed to the mill feed surge bin from the reclaim feeders.

The reclaim feeders will withdraw ore from the bottom of the mill feed surge bin (also referred to as the mill feed stockpile) for delivery to the grinding circuit in the mill. Ore delivery to the feed surge bin/mill stockpile is by tripper conveyor into the bin.

8. Are the dry bin vents used for dust control in the surge bin area accounted for as emission points in the modeling and emission calculations? If not, please revise the application to account for these additional emission points.

There are four dust collector exhausts included as emission points in the calculations: One each for the underground conveyor and mill stockpile conveyor transfers and two collectors for the reclaim feeder area.

9. At what point in the milling process is water added to the ore?

Process water addition is started at the feed chute before the primary grinding circuit (SAG mill) for the milling process.

10. Will the ore in the grinding circuit/mill be more like a wet solid or more like a solid in water? If it is only a wet solid, what steps will be taken to ensure that it is adequately wet so that there will be no particulate emissions from ore grinding and handling?

Once the ore enters the grinding circuit in the mill, enough water is added so that it becomes a slurry (solid in water). It remains as a slurry until the concentrate filtering step begins to de-water the slurry into a filter cake specified to be 9% moisture. The concentrate storage and loading building has two cartridge type dust collectors for particulate emission control at this point in the mill process.

For reference, the mass balance from the Copperwood Prefeasibility Study (Figure 00-F-00 Mass Balance) is included as an attachment to show typical percent solids at various stages in the mill processing circuit, e.g. 70% solids in SAG mill discharge, 46.7% in the cyclone feed.

11. Is the ore feeding into the classification cyclones more like a wet solid or more like a solid in water?

The ore feeding the cyclones is a solid in water as referenced in the response to number 10 above.

12. Please provide a description and a process flow diagram of the floatation circuit. How does it work? What equipment is involved? What chemicals are used? What is the potential for air emissions?

The following excerpts from the Copperwood PFS report describe the grinding and flotation circuits in the mill. Flow sheets are included for review: 10-FS-01 SAG Mill Grinding, 20-FS-02

17.2 SAG Mill Grinding
The primary grinding circuit will consist of a semi-autogenous (SAG) mill equipped with grate discharge and a trommel screen to size the mill discharge. Water will be added to the SAG mill to produce slurry and the ore will be ground. The SAG mill discharges through a trommel screen with 3/8 inch openings. Oversize will be recycled to the SAG feed system by a series of conveyors. Preliminary tests indicate that crushing of the SAG mill trammel oversize is not needed; however, space will be provided for a recycle crusher so a recycle crusher can be added in the future if it is demonstrated that a crusher is required. Weigh scales will be installed so that the weight of material recycled can be monitored. The future crusher will be able to be bypassed for maintenance purposes or when not needed. SAG mill trommel screen undersize will flow by gravity to the ball mill discharge pumpbox where it will join the ball mill discharge.

17.3 Ball Mill Grinding
The secondary grinding circuit will consist of a ball mill in closed circuit with cyclones. For Phase I, one large ball mill is required. For Phase II, a second identical ball mill will be added. Water will be added to the ball mill to control the mill density. Ball mill discharge will join SAG mill discharge and will be pumped to the cyclones for classification. Cyclone underflow will return to the ball mill. Cyclone overflow at approximately 80 percent minus 74 microns will overflow by gravity to the flotation feed sampler. Flotation reagents may be added to either the SAG mill or the ball mill.

17.4 Flotation
The bulk flotation circuit will process the ground pulp through a conditioning and flotation circuit to produce silver bearing copper concentrate. Flotation feed sampler discharge will flow to the rougher conditioning tank with five minutes of retention time at design flow. Pulp will flow from rougher conditioning to first rougher flotation by gravity. The first rougher stage is followed by de-sliming, second rougher and three stages of cleaning. First Rougher tailing and first cleaner tailing are both processed through scavenger cells. Mechanically-agitated flotation tank cells have been selected for first rougher flotation, rougher scavenger flotation, second rougher flotation, first cleaner and first cleaner scavenger flotation. The retention time for the Phase I operation has been increased. Flotation stage residence times selected are approximately two times the laboratory test program retention times.

17.9 Flotation Reagents
Reagents required for the operation will be stored, prepared as required and distributed to the process. Reagents which require storage and distribution include:

- Sodium hydrosulfide (NaSH)
- Sodium Isobutyl Xanthate (C-3430)
- Methyl Isobutyl Carbinol (A-249)
- Dowfroth 250 (D-250)
- Alkylaryl Dithiophosphate (A-249)
- n-Dodecyl Mercaptan (NDM)

Individual storage tanks and distribution pumps will be installed for the NaSH, SIBX and A-259. The frothers, A-249 and D-250, will share a common storage tank. The NDM will be delivered to site in 55-gallon drums and metered directly from these drums into the process. Note:
Flocculent dosage was estimated but exact brand name not selected during the PFS study. Final determination of type will be determined during the Bankable Feasibility Study that is currently ongoing.

Reagent usage in the mill at dosages from the Copperwood PFS Report are included as an attachment. Reagent delivery in the PFS report is planned to be in liquid form except for the flocculent that will be delivered as a bulk solid for mixing with water in a storage tank. MSDS sheets are included as an attachment for review. Emission estimates of tank working loss are provided for the sodium hydrosulfide and methyl isobutyl carbinol as they exhibit vapor pressure in storage. The sodium isobutyl xanthate, Dowfroth 250, alkylaryl dithiophosphate and n-dodecyl mercaptan have negligible vapor pressures. A particulate matter emission estimate for indoor handling of super sack containers of dry flocculent was based on AP-42 emission factors for low moisture mineral processing materials.

See attached spreadsheet with reagent dosage and emission estimates. Reagent MSDS sheets are also included for review.

13. **Is the material going into the rougher floatation concentrate cyclone cluster more like a wet solid or more like a solid in water?**

The material is like a solid in water. See response number 10 above.

14. **Please provide descriptions of the thickener and filter and describe the potential for air emissions from this equipment.**

The concentrate and tailings are in slurry form as they enter the concentrate filter and tailings thickening equipment. The concentrate is de-watered in a pressure filter to approximately 9% moisture as a process specification. The tailings slurry will be de-watered to approximately 50% solids for pumping to the tailings disposal facility. After de-watering, the concentrate has the potential to generate particulate emissions and is handled in an enclosed building with dust collectors provided.

The following excerpts from the Copperwood PFS report describe the thickening and filtering circuits in the mill. Flow sheets are included for review: 50-FS-05 Cu Conc Handling Flow Sheet and 60-FS-06 Tails Thickening Flow Sheet.

### 17.6 Concentrate Sedimentation and Filtration

Copper flotation concentrate will be thickened and filtered prior to transport to the concentrate storage bin and shipping to a smelter. The thickener underflow will be pumped to the filter feed tank and then will be pumped to the filter. The filter cake will be conveyed to concentrate storage bin. The filtrate will be pumped back to the concentrate thickener. Filtered concentrate final moisture content will be approximately 9 percent.

### 17.7 Tailing Sedimentation

Slime tails, second rougher flotation tail and first cleaner scavenger tail will be will report to a tailing thickener for water recovery. The thickener underflow will be pumped to the tailing dam. Other waste streams will also be sent to the thickener for water recovery. The recovered water will be used in milling and bulk flotation. Thickener overflow will be stored in the mill water tank. A tank with 30 minutes of live capacity is specified.
17.8 Plant Water Management
The fresh water distribution system provides fresh water for process requirements such as process water makeup, reagent mixing, gland water, and fire water. The bulk of the process makeup water will be added to the thickener. From the head tank, low pressure process water will flow to the systems that do not require high pressure.

15. Please provide electronic copies of the dispersion modeling files. If changes are needed to the modeling based on the responses to these questions or the responses to the additional information request sent to Orvana for the Part 632 application, Orvana may wait to submit the electronic files until the modeling analysis has been revised.

Modeling files will be submitted after analysis of emissions by MDEQ-AQD.

16. Please provide Green House Gas emission calculations for the facility.

The table GHG Emissions – Rev. 1_December 27 2011.pdf is attached for review based on 500 hours maximum operation of the emergency generators. There are no process heaters or large boilers planned for the Copperwood Project. Space heating requirements are under review as to energy source (electric or propane). There is the possibility of small boiler installations for building heating requirements.

17. Please provide a summary table listing the potential to emit for each criteria air pollutant for the project.

See the attached report from AECOM – Copperwood Mine Air Dispersion Modeling (CW Modeling 2012-01-26 AECOM.pdf). A facility summary of emissions can be found on pages 20 and 21.

18. For the vehicles located in the mine, the AQD considers these to be mobile sources. Therefore, the combustion emissions from vehicles operating within the mine do not have to be included in the potential to emit for the project. Emissions from stationary combustion equipment, such as heaters, must be included.

Noted. Emissions from mobile sources have been removed from the Copperwood Project calculations. Stationary, diesel fired emergency generators are still included. There are no process heaters or boilers in the prefeasibility design study for the project.

Previously revised for the 632 permit review responses.

19. For the PM10 and PM2.5 modeling, the mine vent should be modeled using the scenario (year 2 or years 3-13) that yields the highest ambient impacts.

Noted for revised modeling.

20. Orvana estimated the particulate emissions from mine ventilation by multiplying the air flow rate from the ventilation model by the respirable
particulate level allowed under the MIOSHA rules, as calculated based on the estimated quartz content of the airborne dust.

However, the air flow rate from the ventilation model from the Prefeasibility Study appears to be based on keeping the diesel particulate matter (DPM) to a concentration of 160 μg/m³ in the mine, rather than meeting the level allowed by the MIOSHA rules.

In step 7 of the mine ventilation emission calculations in the Air Quality Impact Assessment, Orvana assumes that the non-diesel particulate matter will be controlled to meet the MIOSHA levels but there is no explanation as to how those levels will be achieved. There is no estimate of the particulate matter generated inside the mine through mining activities and there is no demonstration that the proposed air flow rate will be sufficient to meet the MIOSHA levels.

Please review the mine ventilation emission calculations and provide additional explanation and/or revised calculations as necessary to ensure that the particulate emissions from mine ventilation are adequately addressed.

The MSHA standard for diesel particulate matter (160 μg/m³) is considered to be a difficult standard to meet in underground mine working areas. The mine ventilation plan was designed to meet this standard by dilution with fresh air alone. Non-diesel particulate matter generated by blasting and ore handling operations will be controlled in the working areas of the mine with dust suppression systems, such as water sprays, so that the fresh air flow in the mine will be maintained at or below the workplace respirable dust exposure limit of 0.33 mg/m³. Regular workplace monitoring will be conducted to monitor compliance with these standards and provide information needed to make changes to ventilation and dust suppression systems as needed.

21. In step 7 of the mine vent emission calculations, why is a factor of 0.35 used to convert PM10 to total PM?

This is a particle size multiplier used in AP-42 (Chapter 13 specifically) to convert total suspended particulate to PM-10.