REVERSE SITE VISIT QUESTIONS AND RESPONSES
DUSEL-CASCADES

CaI: The information item below from the Code of Federal Regulations describes an MSHA standard on underground escapeways in operating mines. Please discuss it in the context of your proposed site.

30 CFR 57.11050. Escapeways and refuges.

ESCAPEWAYS–(Metal/nonmetal) UNDERGROUND ONLY

(a) Every mine shall have two or more separate, properly maintained escapeways to the surface from the lowest levels which are so positioned that damage to one shall not lessen the effectiveness of the others. A method of refuge shall be provided while a second opening to the surface is being developed. A second escapeway is recommended, but not required, during the exploration or development of an ore body.

(b) In addition to separate escapeways, a method of refuge shall be provided for every employee who cannot reach the surface from his working place through at least two separate escapeways within a time limit of one hour when using the normal exit method. These refuges must be positioned so that the employee can reach one of them within 30 minutes from the time he leaves his workplace.

The Project Office that would oversee design and construction would be staffed by safety professionals with experience in both in underground construction and lab operations. They would play an integral part in the design and review process. They would also monitor Project Office protocols for identifying and monitoring contractors that will adhere to best-in-industry standards in ES&H. Pending the availability of such people to the project, our current understanding of the safety issues raised by **CaI** comes from discussions with members of our Constructibility Advisory Committee.

We divide the question into two parts, post-construction and during construction.

Post-construction: Our laboratory plan for Stage I provides:

- An entrance tunnel, the normal entrance/exit for laboratory personnel.
- A parallel escape tunnel, the Cascade Tunnel, which would be connected to the Pioneer Tunnel by a series of cross cuts that would be outfitted by double fire doors. The interiors of the crosscuts would be designed as refuges.
- Stage I also includes an isolation refuge in the interior of the clean area.

This design provides two means of escape and a refuge in the laboratory interior. The proposal discusses emergency operations, including cooperation with BNSF on rescue protocols. This design – both facilities and operations – would be examined by industry professionals during the design phase, to assess its overall soundness, as well as parameters such the resistance of fire doors to fires of a given intensity, duration, and maximum temperature, and the separation of cross cuts. Preliminary design was based on the recommendations of project engineers, but the need for further examinations including compliance with local codes was stressed.

Our laboratory plan for Stage II provides:

- A main hoist and an emergency/mining hoist position at the diagonal corners of Stage II. Thus personnel can exit quickly via the dirty-side or clean-side hallways in either direction, to make their escape.

- A laboratory refuge, which would be outfitted to allow personnel to wait out emergencies in isolation.

However, we stress that this level of safety design reflects only a starting point, and that we envision more provisions being made for safety as we begin to finalize what is going on in the laboratory – the hazards associated with the liquids and gases that might require special handling, venting, reroutings, etc. Our starting point has been to include a ventilation system that has substantial capability to isolate and direct special processes flows, a dedicated exhaust shaft, etc. However, as we begin to site potential experiments, we would anticipate that a great deal of safety engineering would need to be invested in fixing the relative position of experiments, rerouting air, resizing exhaust ducts, and examining he consequences of leaks. We also would examine the positioning and numbers of refuges, including the possibility of mobile refuges that might be very important to some of the geoscience outposts we envision. Even when we have a lot of safety expertise built into the Project Office, we think the safety engineering will take a lot of thought and iteration, before it is right.

We do feel that the DUSEL-Cascades site offers good potential for safety – the site's physical layout allows a very capable ventilation system, and our plans for all electric operations, a dedicated exhaust shaft, dedicated access with activities separated from those of the host, an alternative safe site for an underground experience, tracked transportation within the site and easy rail access to the site, a low-elevation portal, the potential of a snow-free surface campus site within reasonable distance of the portal .... all help in ensuring a safer facility.

Construction: The proposal notes that the Project Manager and other industry professionals in the Project Office would be responsible for ensuring that all contractors and subcontractors adhere to best-in-industry standards for ES&H during construction. This includes careful examination of all proposed construction procedures for safety compliance and for evaluation of associated risks.

Pioneer Tunnel enlargement would occur from the Scenic portal, with contractor-supplied ventilation, along the Pioneer/Cascade alignment. While the tunnels are currently connected by cross cuts, they are of poor quality and several are bolted closed. Thus we anticipate that contractors would be required to upgrade cross cuts as the enlargement proceeds, to ensure that the Cascade Tunnel could serve as an adequate escape route in the developed portion of the tunnel. The cross cuts are designed to allow escape and to provide refuge.

The initial phase of Stage II development is the mining of the main shaft. This is the step in construction where workers would be most exposed, in case of an accident – the normal secondary escape route (the emergency/mining shaft) would be bored only after access to Stage II is established. We have discussed this phase with Frontier Kemper engineers. Their standard practice in such cases is to provide a second means of egress, in the shaft being bored, typically via a temporary hoist and cage module.

However, pending advice from Project Office safety specialists, it strikes us that greater levels of safety should be introduced. We believe the cage module mentioned above should be a mobile refuge – something that, depending on the nature of the emergency, would either allow workers to hunker down in a separate, sustained atmosphere (e.g., 36 hours), or hoisted to safety, out of the way of

a fire, again with isolation from the environment. We think an inventory of materials at the base of the shaft is critically important: there should be no large fuel source. As Stage II is excavated, before the permanent refuge is in place and before the secondary hoist is operational, we again see a role for mobile refuges. We think such refuges could also be important in Stage I tunnel and room development. As our development plan includes establishing geoscience "outposts" at various elevations along the main shaft, some thought should be given to how those areas might be used to enhance safety, as mining proceeds.

MSHA vs. OSHA: Constructibility Advisory Committee members suggest that DUSEL-Cascades may fall under OSHA regulations, depending on details of rock disposal, etc. This may be advantageous in increasing the number of contractors interested in the project. Excavation for NuMI was conducted under OSHA.