Attachment E
CTA Interview Protocol

Cognitive Task Analysis (CTA) Interview Protocol: At each of the two mines, up to 6 underground miners (for a total of 12) will participate in two CTA interviews. A single CTA interview could require approximately 2 hours of participation per participant, for a total of 4 hours per participant across the two interviews.

Following is the protocol for conducting the CTA interview:

1. Obtain verbal participant consent and document their agreement to participate; provide them with the Informed Consent document
2. Record the names of the researchers conducting the interview
3. Record location of interview
4. Record date of interview
5. Researchers introduce themselves
6. Background on gOE-Aptima-Consultant team
7. Reason for this discussion and purpose of the project
8. Record participant ID coding

Cognitive Task Analysis Interview Protocol

This analysis will focus on tasks, identified in the initial task analysis, that are both critical and have an important cognitive and/or decision-making component. The list below represents the complete list of probes that may be used during knowledge elicitation. A subset of these probes will be during each interview, depending on the goals of the interview, the nature of the experience of the interviewee and the extent of information gathered in prior interviews and focus groups.

- Participant's role during emergency escape (company description).

- Participant's role during emergency escape (study categories).
    - Crewman (working face)
    - Outby worker
    - Escape group leader
    - Responsible person

- Review amount of time available for the interview.

- Review scenarios (Provide printed scenario handout)
    - Scenario 1: Fire in belt drive (hydraulic oil and small coal accumulations).
    - Scenario 2: Explosion (open mandoor along the main beltline; methane accumulation).
    - Scenario 3: Impoundment Failure/Liquid/Gas Inundation: Strike into old gas well; methane gas and water).
    - Scenario 4: Rockburst/Coal Burst/Roof fall (roof failed due to a coal burst of a pillar).

- Explain the information we are seeking (Provide this text in a printed question handout):
    - What stimuli in the mine environment differentiate an emergency situation from both (a) normal and (b) abnormal but not emergency conditions?
    - How would miners first recognize and conclude that an emergency scenario exists?
    - Given the emergency scenario, how does the miner decide to escape?
    - What information would miners immediately provide within and across groups of coworkers in the mine and the responsible person?
    - How do miners know when to ignore cues that might otherwise indicate an emergency?
    - How would miners make decisions about whether to attempt to correct an emergency situation as opposed to escaping from the mine?
    - How do miners determine the need to initially don Self-Contained Self Rescuer (SCSR) equipment?
    - How do miners determine that pre-planned escape routes are feasible for use to escape the danger?
    - What decisions do miners make to evacuate the danger area?
    - What issues do miners anticipate during escape in using multiple types of equipment (such as how to communicate to other miners by speaking, telephone, or radio while using a SCSR)?
    - How do miners plan to deal with injured coworkers during escape?

o How would miners determine an escape route is not usable, and what decisions do miners make to resolve the situation?

o What decisions do miners make concerning whether or how to use a Strata Safety Fresh Air Bay?

o How do miners determine the presence of hazardous gasses or lack of adequate breathable air?

o How would miners make decisions about whether a changing situation had made self-escape more or less difficult?

o How should miners receive updated information about the emergency, and what information would they expect and want?

o How do miners provide information about their own and others' condition (both normal and emergency methods)?

o What decisions must miners make concerning egress from mining equipment or avoiding becoming entrapped by parts of equipment or controls?

o Do miners shut off equipment during an emergency, and depending on what equipment is or is not available, how does this impact escape?

o What decisions must miners make concerning obtaining stocks of food or water to survive extended entrapment?

o What decisions do miners make about emergency sources of light to enable escape?

o What decisions must miners make concerning abnormal temperature (heat or cold) conditions?

o If escape does not appear to be immediately possible, what decisions do miners make about barricading to create a refuge (such as how, when, what materials to use, whether to use what is in immediate area or retrieve materials from further away)?

o What job aids or other sources of information are available for making decisions, signaling, or determining courses of action?

o What job aids may be critical to self-escape, but of reduced value due to loss of power, lack of visibility, or damage to mine systems (such as not being able to read printed instructions due to darkness)?

o What decisions and knowledge do miners use to find their way along escape routes, particularly in conditions of reduced visibility due to darkness or presence of dust or smoke?

o What understanding of the mine physical layout do miners use to locate their way to safety (refuge or escape) during emergencies?

o What support do miners expect, need, or prefer from the responsible person?

o What skills would miners apply within groups of miners to organize escape or survival efforts.

o What information should miners share, to whom, and through what communications method.

o How would miners determine whether to walk out of the mine, or attempt to use the normal motorized transports?

o Other than the emergency itself, what abnormal risks from equipment or the mine itself must miners be able to detect and act to avoid injury (such as a damaged power cable that could cause electrocution)?

o How do miners verify that they are making progress in escaping from the emergency (for example, have not gotten lost and doubled back)?

- o What sources of stress and uncertainty are miners likely to encounter during an emergency situation?
- o What might be potential sources or situations that could lead to cognitive overload during an emergency (simply too much information to process, unable to make decisions or select a course of action)?
- o What information would miners particularly seek to obtain to adjust and coordinate their escape actions?
- o What are the most likely and critical communication and coordination challenges?
- o What workarounds are anticipated when multiple pieces of equipment cannot operate or be used together, of if equipment fails.
- o Please tell us a story about a particularly challenging self-escape experience, either in practice or real life.

- Select one of the scenarios to begin discussion.

- Review time budget for first scenario.

- Review scenario initial conditions.

- Make a first pass through the first scenario.
    - o What does a miner need to know or be able to do?
    - o What decisions does a miner have to make?
    - o What information does a miner need to make decisions?
    - o What tools or technology would a miner want to have available?
    - o What strategies or techniques would miners use for making decisions?
    - o What information would miners monitor or seek during the situation?
    - o What will be demanding, if anything, in terms of thinking or making decisions?
    - o What will be demanding, if anything, in terms of using self-escape technology?

- Recap from discussion about first scenario.
    - o Interviewer recaps the major points heard based on notes. "Let me see if I understand the gist of what you said…So, you…" and misunderstandings are corrected.

- Review timeline for the first scenario, based on discussion. "What did you do first? What was challenging about this? What did you do after that?"

- Continue reviewing through all the events for the first scenario. Review notes about the scenario: The intent is to query the miner for details about:
    - o What does a miner need to know or be able to do?
    - o What decisions does a miner have to make?
    - o What information does a miner need to make decisions?
    - o What tools or technology would a miner want to have available?
    - o What strategies or techniques would miners use for making decisions?
    - o What information would miners monitor or seek during the situation?
    - o What will be demanding, if anything, in terms of thinking or making decisions?

- What will be demanding, if anything, in terms of using self-escape technology?

- Repeat for second scenario, focusing on what is different, missing from responses and actions to earlier scenarios.
- Repeat for third scenario, focusing on what is different, missing from responses and actions to earlier scenarios.
- Repeat for final scenario, focusing on what is different, missing from responses and actions to earlier scenarios.
- Training "what ifs."
    - If you could have used any training or training asset to prepare you better for incidents such as the one you described, what would it be?
    - What exactly would you practice and why?

Thank You

Thank you very much for your time. This was very helpful.

Do you have any questions for us before we wrap up?