Create a New Cavern for NOvA Near Detector

NOTE
1. DIMENSIONS OF NEAR DETECTOR FOR REFERENCE ONLY.
2. NEAR DETECTOR, SERIES, PLANTING, DRAINAGE, AND RELATED INFRASTRUCTURE TO BE DETERMINED BY OTHERS.
3. PRECASTER CUTOUTS ALONG ALL WALLS AND PROPRIETARY NOT SHOWN FOR CLARITY.
4. LOCATION OF POWER FULL BOX AND FIRE ALARM JACK ARE APPROXIMATE.
5. LOCATION OF DUST CONTROL BARRIER IS APPROXIMATE, FINAL LOCATION AND DESIGN TO BE DETERMINED BY OTHERS.
6. UTILITY OR WEST WALL BETWEEN STA 38+00 TO DUST CONTROL GATEWAY.

PRELIMINARY
NOT FOR CONSTRUCTION
Upstream and Downstream Partition Locations

FLOOR PLAN EXISTING HVAC - ABSORBER & MINOS ACCESS TUNNEL

PRELIMINARY
NOT FOR CONSTRUCTION

HVAC CRITERIA

NOTES
1. AIR DUCT SIZE VARIES UPON MINOS ELEVATION CHART.
2. DUCT CONTROL BARRIERS TO BE DESIGNED BY OTHERS.
3. EXISTING HVAC PROBABLY ADAPTED TO MINOS ENVIRONMENT AS REQUIRED.
4. HVAC CRITERIA FROM ABOVE OUTLINING AIR DUCTS DRAINED AS.
There are two design efforts in progress:

1) **Site Preparation** by Hanson Engineering
   - Locate and identify all impacted utilities
   - Relocate all impacted utilities
   - Make all relocated utilities functional
   - Locate protection partitions – upstream and downstream
   - Design adequate partitions to protect upstream and downstream areas from construction activities
   - Create work specifications
   - Cost and schedule estimation

2) **Tunnels and Halls** by MWH
   - Specify new excavation
   - Do geotechnical investigation
   - Design rock support
   - Specify excavation methodology
   - Create work specifications
   - Cost and schedule estimation
A third design effort is required but has not started:

3) **Outfitting (Not yet assigned)**

Waiting for further detailed design of the first two phases
Status of Cavern Excavation Design and Engineering

Status:

1) Hanson Engineering (Site Prep)
   30% design package delivered 4/8/2010 (Posted in FESS ftp)
   After in-house review, a meeting on 5/11/2010 to respond
   95% design due September 2010
   100% package due November 2010

2) MWH (Tunnels and Halls)
   Final PDR July 16, 2010 (Posted in FESS ftp)
   50% Review September 2010
   95% Review January 2011
   Bid Package ready March 2011

3) Not assigned (Outfitting)

Our Assessment: Progress Satisfactory
Status of Hanson Site Prep Design and Engineering

This is the title sheet for Hanson’s 30% Review Drawings

NOvA Near Detector Hall
SITE PREPARATION AND UTILITY RELOCATION
PROJECT NUMBER 6-7-14

* INDICATES SHEETS INCLUDED IN THIS SUBMITTAL

GENERAL
  - G-1 LOCATION PLAN AND DRAWING LIST
  - G-2 GENERAL NOTES AND STANDARD SYMBOLS
  - G-3 PHASING PLAN

ARCHITECTURAL
  - A-10 ARCHITECTURAL SITE & DET. - SHT 11
  - A-20 ARCHITECTURAL SITE & DET. - SHT 12

STRUCTURAL
  - S-44 TEMERARY TENT BARRIER WALL, SECTIONS & DETAILS
  - S-45 UTILITY SUPPORTS

DEMOLITION
  - D-40 MINOS WALL - PROCESS SYS. DEMO
  - M-110 MINOS ACCESS TUNNEL HVAC DEMO
  - M-120 MINOS ACCESS TUNNEL DEMO
  - P-120 B.A. ACCESS TUNNEL FIRE DET. DEMO
  - P-130 MINOS ACCESS + FIRE DETECTION DEMO
  - E-160 ACCESS TUNNEL - LGT & RECEPT DEMO
  - E-170 MINOS ACCESS - LGT & RECEPT DEMO

ELECTRICAL
  - E-10 ACCESS TUNNEL - LGT & RECEPT
  - E-14A ACCESS TUNNEL - PHOTOS
  - E-20 MINOS ACCESS TUNNEL - COND LAYOUT
  - E-20A MINOS ACCESS TUNNEL - PHOTOS
  - E-21 MINOS ACCESS - LGT & RECEPT
  - E-21A MINOS ACCESS - PHOTOS
  - E-22 MINOS ACCESS TUNNEL
  - F-4 MINOS ACCESS TUNNEL FIRE DET.
  - F-5 MINOS ACCESS - FIRE DETECTION
Status of Hanson Site Prep Design and Engineering

These are examples of Title Blocks from some of Hanson’s drawings for the relocation and demolition of utilities in the way of the new cavern excavation.
Status of Hanson Site Prep Design and Engineering

This is an example of a utility relocation section from one of Hanson’s drawings for the relocation and demolition of utilities in the way of the new cavern excavation.
Status of Hanson Site Prep Design and Engineering

Hanson’s 30% Design included a discussion of the construction of the large temporary wall needed to isolate the MINOS Cavern and the experiments located in the MINOS cavern.
Discussion of Methodology and Impacts

1. Electrical Utilities located on the west wall of the access passage will re-routed and relocated from a point just downstream of the shaft “up and over” to the east wall on top of the egress passage existing utilities. They will then run downstream to the MINOS Hall where they will again go “up and back over” to the panels currently serviced. New conduit will be installed, and in all probability whole new wiring runs will be pulled, all during operations prior to shutdown. Then in a relatively quick operation the existing wiring will be cut upstream and downstream, the new wiring connected, and service restored. This probably will be a very few days interruption at most.

2. At present, MWH intends to require the excavation contractor to have no impact on the existing NuMI MINOS water systems. What water is needed by the construction contractor will be brought down the MINOS shaft, and all construction water will be collected in a NEW sump near the work, and pumped by a mine pump to the surface to a treatment/settling system.
A Road-header
3. MWH intends to specify that excavation will be accomplished using a road-header (previous slide.) The intention is that it should not be necessary to utilize “drill and blast” for the construction of the enlarged cavern. The road-header teeth should chip the shale (rock strata of the MINOS Hall and also the new cavern) relatively easily. There may be some vibration transmitted through the rock from the chewing teeth, but generally no severe shocks or impacts are expected. The road-header teeth will probably be sprayed with water to minimize dust for the miners. This is the water that will be brought down the shaft and collected in the new sump.

4. The new sump will be below floor level, and therefore NOT in the shale. The excavation in the Galena-Platteville dolomite is probably not efficient with the road-header. Drill and “cracker?”
5. Access to the MINOS Hall, and “emergency egress” will be reversed during construction activities. The regular access to the MINOS Hall will be through the existing emergency egress passage, which will not be altered in any respect. There will be “emergency doors” constructed as part of the upstream and downstream partitions. Emergency (secondary) egress will be through the construction area. It should be noted that the emergency route may be dirty, uneven, and perhaps the location of a small mining railroad track from the new cavern entrance to the shaft base. Large equipment delivery down the shaft will be limited, and the doors in the partition wall will not be oversize.

6. The existing air service to the MINOS Hall downshaft will be maintained, and air outflow will continue to be by the downstream shaft (in the middle of Pine Street.)
7. The MINOS shaft crane will be under the control of the contractor, and will be the primary lift and delivery system for the contractor. In the case of emergency service for the existing sump system, the contractor will need to give way. Other use of the shaft crane will usually have to be “off hours”, and the partition door limitations will limit deliveries, as will floor surface conditions.

8. The personnel elevators will be shared with the contractor’s staff.

9. The pre-construction of the partition walls should not impact operations, but door sizes will limit the size of delivered items once built into the walls.

10. The upstream crane stop in the MINOS Hall may need to be relocated slightly downstream until the partition wall is removed.
11. After the cavern excavation is completed, the excavation contractor will demobilize and “Outfitting” will begin. The partitions may then be removed. Outfitting will consist of installing the final lights, electrical, fire suppression (including restoration in the access way,) final HVAC, etc. As each of these systems is completed and brought “on-line” there may be brief interruptions while “tie-in” is accomplished. There will not be particular time urgency, and mutually acceptable times may be selected for utility interruptions for the “tie-in” process.
August 18 2010 NOvA Cavern Construction Impacts

Russ Alber, Dixon Bogert, Jon Hunt

The MWH Final PDR

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Exhibit 1 Vicinity Plan, Location Plan and General Notes
Exhibit 2 Plan
Exhibit 3 Near Detector Hall - Section, Sheet 1 of 2
Exhibit 4 Near Detector Hall - Sections, Sheet 2 of 2
Exhibit 5 Excavation Sequence
Exhibit 6 Existing HVAC Criteria

Appendices
Appendix A Near Detector Parameters
Appendix B Selected Geology and Geotechnical References
Appendix C Opinion of Probable Construction Costs
Appendix D Construction Schedule
Appendix E Review Comments and Responses
Table 3 - Engineer's Opinion of Probable Construction Cost

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
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<tr>
<td>Surface Mobilization/Demobilization</td>
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<tr>
<td>Underground Mobilization/Demobilization</td>
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<td>Contingency 30%</td>
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<td>Escalation to Midpoint of Construction</td>
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<tr>
<td>Two Years at 3.0%</td>
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<tr>
<td><strong>Engineer's Opinion of Probable Construction Cost</strong></td>
<td><strong>$4,590,590</strong></td>
</tr>
</tbody>
</table>

10.3 SCHEDULE

A construction schedule has been developed based on the general scope of work and assumed construction means, methods, and sequence described herein. The schedule is included in Appendix D and indicates a total duration from the time of the contract award through major underground construction of approximately 10-1/2 months. The duration of underground construction activities to complete the Tunnels and Hall is approximately 8 months. The major project milestones include:

- Award of Contract: July 1, 2011
- Begin Site Prep/Mobilization: January 3, 2012
- Begin Underground Excavation: May 7, 2012
- Complete Near Detector Hall: October 22, 2012

The preliminary construction schedule requires a careful sequential construction approach. With this approach the schedule indicates the Tunnels and Hall construction would be complete in October 2012.