



Milind Diwan &lt;milind.diwan@gmail.com&gt;

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## Re: 6 Day Schedule & Costs]

5 messages

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**Chris Laughton** <laughton@fnal.gov>

Wed, Feb 20, 2008 at 6:02 PM

To: Milind Diwan &lt;diwan@bnl.gov&gt;

Hi Milind..

Just got back from Rapid City.. starting to plan-out a site investigation program.

To give you detailed commentary I'd need to take a look at the new scheme (I note your comment "larger than before".. which sets off my panic button!). Based on discussions at the geo-meeting there are some important properties that need to be investigated before we can site/design with any confidence so numbers below are contingent upon finding a good host rock mass and sanity checking unit costs...

Excavation Cost.. For budget/ball-parking purposes here are some numbers for a drive-in LAr detector hall at the Homestake 300-Level. Costs (update of Diablo Canyon/Theta 13 estimate.. assumes use of an independent contractor including numbers for design, CM, haulage/disposal, modicums of decommissioning work, profit, mobilization/demobilization and contingency) are coming-out at between 500 and 1000 \$/cubic meter for a stabilized shell that is ready for permanent electrical/mechanical/technical installation. Note contingency numbers of over 100% are placed on some of the ideas we're looking at. I think the base numbers (excluding contingency) are pretty close to what we'd see at a drive-in Homestake site. Keep in mind that unit costs (cubic meters) for underground excavations at depth (shaft accessed) might be a bit higher, given the gnerally smaller size of equipment (constraints of shaft and drift dimensions), travel times of the contractor's personnel and the potential need to hoist and double-handle waste rock.

Excavation Duration.. A long while back I also looked at a timeframe for an UNO-sized/shaped excavation (> 500,000 cubic meters.. assuming long-term stability was achievable without recourse to an extraordinary level of reinforcing effort.. not a trivial assumption!) and came-up with a duration (from site investigation to the start of technical installation) of ~ 5 years.. As an old contractor I'd assume that the multiple domed shaped caverns will have significantly lower average productivities (cubic meters/day) than the single horseshoe cavern, but the duration you show is probably still do-able. However, as Gina pointed-out, by the time we add potential delays associated with critical decisions such as C-0 though CD-3b, this duration could increase markedly!

Site Investigation.. Note that in the geo-meeting at Rapid City we

focused on site investigation plans for the next four months. When we start looking at 4850, I'm sure we will make an investigation of the Yates Formation a top priority (Bill Pariseau already made a great outline of required tasks). However, we were all a little disappointed with the small amount of money currently budgeted for site investigation.. suggestion here is to put site investigation funding within the S-4 proposals (LAR or Water Cherenkov).. if we put a proposal in that is definitely what I plan on doing.

Hope this gives you an idea of where we are out here... I've been looking at costs a bit more since we started developing cavern concepts for Ash River, Soudan, and Homestake (shallow/deep) sites.

cheers, chris

Caveat Emptor.. I really don't like using any unit costs for underground work.. too many variables! Ideally an inclusive bottoms-up cost estimates and contingency analysis should be prepared in a manner consistent with the proposed contracting framework by an experienced estimator with access to an up to date cost data base... like we did for Diablo Canyon and Braidwood!

----- Original Message -----

From: "Milind Diwan" <[diwan@bnl.gov](mailto:diwan@bnl.gov)>

To: "Chris Laughton" <[laughton@fnal.gov](mailto:laughton@fnal.gov)>

Sent: Friday, February 15, 2008 9:35 AM

Subject: [Fwd: 6 Day Schedule & Costs]

> Chris:

>

> Please have a look at this schedule for a single cavity.

> It is larger than before, and we have a made a few other changes.

>

> The rock disposal costs will be added separately.

>

> I also have your earlier list of items to add, but we cannot add

> them

> yet since we don't know how DUSEL will function (i.e. who pays for

> the

> hoist and power).

>

> We understand that it is aggressive and intend to add some more

> time to the early phases.

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> --

> Regards

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**Milind Diwan <diwan@bnl.gov>**

**Wed, Feb 20, 2008 at 6:28 PM**

Reply-To: diwan@bnl.gov

To: Kevin Lesko <ktlesko@lbl.gov>, Kenneth Lande <klande@physics.upenn.edu>

Kevin:

This is the latest from Chris.  
It is unclear to me why he is so dismissive of Mark's numbers.

I have the Diablo Canyon costs. I don't recall them being this high.  
I don't have the papers with me, but you can get them from Richard Kadel.

Why does he claim working on multiple cavities at once will be lower  
in productivity than a single cavity? This cannot be correct.

\$500 to \$1000 per m<sup>3</sup> will kill this project. It couldn't be correct because  
they would have lost money mining gold at that rate. I don't think there is that much  
gold in the rock even at today's prices.

regards,  
Milind  
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regards,  
Milind Diwan, Ph.D.

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**Milind Diwan <diwan@bnl.gov>**

**Wed, Feb 20, 2008 at 6:50 PM**

Reply-To: diwan@bnl.gov

To: Kevin Lesko <ktlesko@lbl.gov>, Kenneth Lande <klande@physics.upenn.edu>

I will leave to you to engage Laughton.

I have the Diablo Canyon numbers (not currently with me since I am in CA),  
but don't recall such a high number.

If the cavern will cost \$1000/m<sup>3</sup> then this project is not doable. We  
should just forget about it and also forget about Homestake; it simply  
will not happen.

The question is why Laughton does not have confidence in Laurenti's  
estimates. They seem very detailed. I am willing to accept a high  
contingency, but his number is  
a factor of 5 beyond his. It more or less means Laurenti has no  
credibility, and neither does RESPEC, or Lombardi, who gave me the

indication that our numbers were more or less in line with the numbers for Frejus except for the rock disposal.

It means there is no credibility to the Homestake DUSEL plan also which was put together by Laurenti and others.

regards,  
milind

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**Kevin Lesko <KTLesko@lbl.gov>**

**Wed, Feb 20, 2008 at 8:03 PM**

To: diwan@bnl.gov

Cc: Kevin Lesko <KTLesko@lbl.gov>, Kenneth Lande <klande@physics.upenn.edu>

Milind,

looked up the Diablo Cyn numbers \$29M including 30% contingency for 42,000m<sup>3</sup> or \$687/m<sup>3</sup>  
The problem is this number includes tunneling, ground support, rock disposal, shotcrete, conduit, adit supports, bulkheads, rail tracks, mob and demob costs, mine rescue training, safety huts, rock bolts, rock bolt nuts, QA/QC surveys, etc. etc.

If I take Mark's numbers \$28M + \$8M contingency + \$10M capital costs + 1M design + \$4.5M access + 2.6M contingency = \$54M  
Cavity volume = 130,000m<sup>3</sup>  
So you are at \$415/m<sup>3</sup>

If we add rock disposal \$10M, mob and demob \$2M, \$4M power we get to \$538/m<sup>3</sup> or \$70M for the first cavity.

I think the path here would be to define what we want (cavity, shotcrete liner, painted, doors top and bottom, etc.) get Mark to estimate the excavation and finishing costs, and get an independent to review the costs and add items in. We can even have Chris do the review, he already has.

If this becomes an ISE, then it will be reviewed to death.

It might be stressed that the 2nd cavity would be \$28 + 8 + 2.6 + 4 + ... probably closer to \$50M or \$400/m<sup>3</sup>.

So the average might well be \$450 or \$500/m<sup>3</sup> for two finished cavities.

Kevin

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**Milind Diwan <diwan@bnl.gov>**

**Wed, Feb 20, 2008 at 8:50 PM**

Reply-To: diwan@bnl.gov

To: Kevin Lesko <KTLesko@lbl.gov>

Cc: Kenneth Lande <klande@physics.upenn.edu>

Kevin:

Can you bring that Diablo Canyon thing with you tomorrow ?

One single person has to be prepared to handle this because  
Gina will show her number and I am going to show mine.  
Someone on the committee will go for blood.

regards,

Milind

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