STATE OF MICHIGAN

STATE OFFICE OF ADMINISTRATIVE HEARINGS AND RULES

In the matter of:	File Nos.:	GW1810162 and MP 01 2007
The Petitions of the Keweenaw Bay Indian Community, Huron Mountain Club, National Wildlife Federation, and Yellow Dog Watershed Environmental Preserve, Inc., on permits issued to Kennecott Eagle Minerals Company. _____/	Part:	31, Groundwater Discharge 632, Nonferrous Metallic Mineral Mining
	Agency:	Department of Environmental Quality
	Case Type:	Water Bureau and Office of Geological Survey

D R A F T T R A N S C R I P T

HEARING - VOLUME NO. XIV

BEFORE RICHARD A. PATTERSON, ADMINISTRATIVE LAW JUDGE

Constitution Hall, 525 West Allegan, Lansing, Michigan

Thursday, May 15, 2008, 8:30 a.m.

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Lansing, Michigan

Thursday, May 15, 2008 - 8:31 a.m.

JUDGE PATTERSON: You ready?

MS. HALLEY: We are. We're continuing on with Dr. Coleman.

MR. LEWIS: I have one matter, your Honor. We've given to the court the PowerPoint slide of Mr. Donohue that we discussed the other day. I believe it's offered as a demonstrative exhibit marked as Intervenor 611.

JUDGE PATTERSON: Okay.

MS. HALLEY: Ready?

JUDGE PATTERSON: Ready.

JOHN COLEMAN, PH.D.

having been called by the Petitioners and previously sworn:

DIRECT EXAMINATION

BY MS. HALLEY: (continued)

Q Dr. Coleman, we were talking about water quality in the re-flooded mine. And we ended at a shift in topic. So I'm wondering if you are familiar with the storm water control plan at the Eagle site?

A Yes, I am.

Q Okay. Have you reviewed the relevant parts of the permit application?

A Yes. I've reviewed the storm water management plan in the permit application and the operations monitoring plan, the

appendices related to storm water and the permit conditions -- DEQ permit conditions related to storm water.

Q Okay. Do you believe the storm water management plan is adequate to protect natural resources?

A No, I do not. There's a couple reasons why I have some concerns about it. One is that there's no monitoring of non-contact storm water or non-contact runoff. The other issue is that there is inadequate accounting for the large quantity of snow at the site in the Yellow Dog Plains, and therefore the basins are undersized. And the third concern I have is that there's virtually no information about storm water management and monitoring along the transportation route and at the rail head.

Q All right. This is DEQ Exhibit 25, Figure 4-2. First we're going to talk about where these various water holding basins are. So could you just point out where the contact basins are and the non-contact basins?

A Well, sort of a central component of the storm water management plan is the concept of contact water versus non-contact water. And the site is divided into two categories, this green being the contact area. And precipitation that falls in this area would be contact water. In this purple area here along the access road and also in the backfill area, in purple, those are considered non-contact areas for precipitation.

Q Okay. Could you explain -- you're using these terms contact and non-contact. Could you just explain what those two terms mean?
A Well, the idea is that, in this area of contact -- the contact area, precipitation would potentially be exposed to mine materials. In the non-contact areas, the concept is that the precipitation wouldn't be exposed to mine materials that might contribute contaminants.
Q So the only distinction between contact and non-contact water is where it falls?
A Yes. It's a characterization based on where the precipitation falls. So rain or snow falling in this area by definition is contact water. Rain falling in these purple areas -- and snow -- is non-contact precipitation.
Q Now, Dr. Coleman, do you believe that it's possible to fully segregate contact and non-contact water?
A I think that's a good concept but very difficult to implement for a number of reasons. Unfortunately mine materials do not always stay in these areas. There is frequently transport of mine materials particularly fine dust particles or fines of either ore or development rock can get moved from the contact areas into the non-contact areas. And that can occur in a number of ways, either dust that might be carried by wind. Dust are very fine particulates that could be tracked by vehicles or sift out

of trucks that are transporting materials, spillage by trucks. And by "spillage," I don't mean a truck tipping over. I mean just material that falls off either through the bottom of the truck or that is clinging to the outside of the truck or conceivably by the movement of contaminated snow from a contact area into a non-contact area.

Q All right. Now, how -- we're going to focus mostly at this point on the non-contact water infiltration basins, which are the purple spots. What are those basins like? How is the water stored in the non-contact water infiltration basins?

A Well, I'll point out that these purple areas are the non-contact areas. And the basins themselves are these squares within those areas. So there's a non-contact basin here (indicating) by the backfill plant. There's a non-contact basin for non-contract runoff here. There's one here along the haul entrance route and then one at the end of the haul entrance route. So those basins -- runoff would be directed to those basins. Those are basins -- unlined basins where the water would percolate into the ground.

Q And would all of the water always percolate into the ground?

A Well, the concept is that these basins would receive the non-contact storm water. The water would then percolate into the ground. However the concept is that at periods of high flow, high precipitation and snow melt, those basins

would overflow and discharge onto the ground.

Q What do you mean by "discharge"?

A Well, these basins have a certain capacity. If that capacity is exceeded, they would have an outlet that that the water would then flow out onto the ground and flow down slope. That would be either into the watershed of the Salmon Trout River for some of these basins or the watershed for these basins of the Yellow Dog River.

Q All right. We're going to come back to that in a minute. What happens to the water that percolates out as those basins are planned to operate?

A Well, the water that percolates down through the bottom of the basin goes into the surficial aquifer and joins the water -- the existing water in the surficial aquifer.

Q All right. Now, is it possible that water in those basins would be contaminated?

A There's a distinct possibility that that might occur. The plan is for that not to occur. But unfortunately plans go arye. And, in fact, it has occurred at other mine sites. As I mentioned, mine materials can get either moved into these non-contact areas and therefore contaminate non-contact storm water. For example, this area where you have a non-contact area immediately adjacent to a contact area, it's relatively easy for very fine mine materials to migrate either through tracking or blowing in materials from

the contact area into the non-contact area. And therefore the non-contact water, the water that's classified as non-contact, could conceivably be contaminated by mine materials. And as I mentioned, that frequently occurs at other mine sites.

Q Okay. I think you have an exhibit that illustrates this point. We'll come back to that exhibit. So, Dr. Coleman, does the company plan to monitor the quality of the water in those basins?

A The current plan is that there would be no monitoring of the water in the non-contact basins prior to discharge.

Q Okay. But didn't you just testify that part of the functioning of those basins is that overflow from them would go out and -- onto the land surface and into whatever surface water receives from that surface? Is that what you just said?

A That is correct.

Q So water is going to be planned to discharge from those basins and nobody will know what the quality of that water is before it leaves the basin?

A Well, that's --

MR. LEWIS: Object as to form, your Honor. I don't think there's any evidence that water is planned to discharge from those basins. It sounds like she's assuming that there's going to be some overflow of this material onto

the surface. That's my objection.

Q Dr. Coleman, are you familiar with the permit that relates to the storm water provisions?

A The mine permit that --

Q The mining permit.

A Yes, I am.

Q Does it reference discharges and where they might go from these basins?

A Yes. The permit -- materials and the permit conditions both identify discharge that would be -- these basins would have discharge points from them, overflow channels from the basins. And the permit materials identify discharge during periods of high slow, as I mentioned, from the basins onto the surface -- ground surface.

Q Thank you.

MS. HALLEY: For the record, that is permit condition H, number 8. That references discharges from the non-contact water infiltration basins.

Q Now, do you know if the company has any kind of permit to regulate that discharge?

A Well, both the permit application and the permit conditions identify or specify that a industrial storm water permit for operations would be necessary for discharge from those non-contact storm water basins. However at this point, to my knowledge, there is no such permit. I contacted the

DNR -- the DEQ repeatedly as to whether there had been a permit applied for or issued for the industrial storm water discharges, and no such permit has been applied for or granted as of last week, at least, when I last checked.

Q All right. So just so this is perfectly clear, at this point, discharge is contemplated from those non-contact water infiltration basins; is that correct?

A Yes.

Q And there's no monitoring of that water before it discharges?

A There's currently nothing specifying any monitoring of that water prior to discharge either to the ground or to the surface.

Q All right. And it's at this point a completely unregulated discharge?

A That is my understanding, yes.

Q Okay. Now, have you observed contamination from non-contact water at other mine sites?

A Yes, I have, particularly at the Flambeau Mine site there were non-contact areas that ended up being contaminated by flying mine materials, primarily fines from ore that escaped onto the rail spur at the Flambeau Mine site, which was part of the non-contact storm water area.

Q All right.

A And I can --

MS. HALLEY: This is Petitioner's Exhibit 75, slide 321.

Q What are we looking at here, Dr. Coleman?

A Yeah. This is the Flambeau River here. It's frozen, I think, in December. And so there's snow on the ground. This is the pit of the Flambeau Mine. The facilities for -- well, the wastewater treatment plant here, this is the ore loading facility. There's some waste rock storage areas here. There's some development -- or non-acid generating waste materials stored over here. The rail spur is this line right here (indicating). It goes off site hauling the ore off site. I apologize. It'd be easier to see if the slide was a little bit bigger, but that was not possible. So the railcars were loaded here where there's a pile of ore that's been hauled out of the pit. And then the railcars sat on this rail spur prior to being hauled to Canada. Unfortunately that rail spur became contaminated. There are drainage ditches on both sides of that rail spur that drained into the adjacent stream, Stream C that was mentioned -- has been mentioned previously. So the contamination by ore fines along that rail spur ended up causing contamination of non-contact storm water that flowed into Stream C. There are other areas. There's a parking lot here where haul trucks were trucked. There were plug-in locations for keeping the trucks warm in winter. This

parking lot was -- unfortunately the snow from this parking lot was plowed into the same drainage ditch that then flowed into Stream C. That snow in photographs -- it's hard to see in this photo. But in other photographs, you can see that that snow is mixed with mud from the parking lot. That mud is some of which -- well, this is the area that was later remediated because of contamination of the parking lot. So at this site, there were a number of causes for transfer of mine materials into non-contact areas that then were exposed -- non-contact storm water to mining materials.

Q Okay.

MS. HALLEY: I'll move to admit Petitioner's 75, slide 321.

MR. LEWIS: Is that slide identified on your exhibit on the judge's copy of that exhibit, Ms. Halley?

MR. HAYNES: Yes. 75 has the number of individually documents and it indices 321.

MR. LEWIS: On the judge's copy of that, will he be able to find that slide by number?

MS. HALLEY: Yes.

MR. LEWIS: What's the number again? 75?

MS. HALLEY: 75, slide 321.

MR. LEWIS: No objection, your Honor.

MR. REICHEL: No objection.

JUDGE PATTERSON: No objection, it will be

entered.

(Petitioner's Exhibit 632-75-slide 321 received)

Q Okay. Dr. Coleman, you also talk about the transportation route. And it sounds like you have some concerns about that. How will the transportation route be impacted by these fines from ore as you are describing them?

A Well, you know, there's very left information in either the mine permit application or the EIA about the transportation route and potential impacts there. But from other sites, it's clear that hauling of ore can cause contamination of haul routes through the loss of fine materials onto the mine route. So one of the most likely ways that that would occur is fines sifting out of a haul vehicle that would then be deposited on the haul road. And the haul road is the 65 miles between the mine site and the rail loading area. And because the ore in particular -- we're not talking about development rock, which does have a significant sulfur content. But the ore itself is very high in sulfur. You can see these are the ore components. The semi-massive sulfide and the massive sulfide have anywhere between 13 and 36 percent sulfur. They're also very high in minerals obviously, otherwise they would be mined. So these materials, if they escape onto the haul road particularly if they're fine materials as I mentioned yesterday -- the fine materials have a large surface area compared to their volume

-- would readily react with air and water to leach materials along the haul route.

Now, unfortunately there's so little information in the permit materials that it's unclear what types of trucks would be used, whether those trucks would be capable of retaining that fine material or not. So it's a little hard to know what the impacts actually would be and evaluate what those impacts would be.

Q Now, you reviewed the EIA; right?

A Yes.

Q Does the EIA address this concern at all?

A No, it does not. It does not talk about impacts along the haul route other than there's some discussion of a truck rollover and how that might be cleaned up. But that is probably the least likely method of contamination of the haul route. These other methods of leaking fine materials onto the road from my experience at other sites is probably more likely.

Q All right.

A Unfortunately the EIA really doesn't talk about that.

Q Now, you talked a little bit about the truck -- potential for this material to escape from trucks. What other types of transportation is supposed to be used and what are the problems related to these fines?

A Well, once the ore is hauled by truck to the rail head, it

would loaded onto the railcars. Unfortunately again in the permit materials there's very little information about how that would be loaded. There's a little bit of information about the rail head but no information about what types of railcars. Railcars for hauling ore come in a wide variety of types. This is a picture from the inside of a ore car and the iron ring. And you can see some ore cars -- I would certainly assume that this is not the type that would be used, I would hope, for ore from the Eagle site. But this is about a 1-inch gap down the side of the ore railcar. And that gap extends along the whole bottom. So fines would easily spill out of this railcar. Unfortunately the permit materials and the EIA don't discuss what type of railcar might be used.

MS. HALLEY: Just a minute. I move to admit Petitioner's Exhibit 74-B.

MR. LEWIS: Is that this one (indicating)?

MS. HALLEY: Yes.

MR. LEWIS: Objection. Relevance, your Honor.

MS. HALLEY: Your Honor, we're talking about possible pathways for these materials to get into the environment. The EIA, the application, has not address this issue of what type of railcar would be used. This is an illustration of the type that is possible and, in fact, is used in the mining industry currently. It's relevant. We

don't know.

MR. REICHEL: I'll join in the objection, your Honor, if I may.

MR. HAYNES: Oh, okay.

MR. REICHEL: First of all, as a legal matter, it is not at all -- in fact, I don't believe it's true that the off-site rail transportation of this ore is mining activity regulated by Part 632.

MS. HALLEY: Could you repeat that, Mr. Reichel?

MR. REICHEL: It is not at all clear that the off-site rail transportation of material of product produced from this mine is regulated by Part 632.

MS. HALLEY: Well, the definition of a mining activity in the Rules 425.103(1)(a)(6) includes, "Transportation of overburden, waste rock, ore and tailing." And the mining plan, which the requirements of what has to be in the mining plan, that's found at Rule 425.203(c)(13). And it includes that:

> "Information shall be included depicting roads, railroads and other transportation infrastructure and provisions to prevent release of contamination to the environment from ore or waste rock during transportation."

MR. REICHEL: Furthermore, I don't believe there's any foundation that these particular railcars have any

relevance to what is being proposed here.

MS. HALLEY: Okay. I think I just established that the transportation route including railways is regulated under Part 632. It's in the plain language of the Rules. Now, that particular exhibit relates to the efficacy of the provisions to prevent the releases to prevent contamination along the haul route. It's very relevant.

JUDGE PATTERSON: I'll overrule the objection.

(Petitioner's Exhibit 632-74-B received)

Q All right. This is Petitioner's Exhibit 74-E. Dr. Coleman, what are we looking at here?

A Well, this is another type of ore hauling car. This is taconite ore being hauled in the U.P. actually between Ishpeming and Marquette. And so these are taconite ore cars. Again I would hope that the highly reactive Eagle project did not use this type of railcar, but we have no idea. You can see this -- what should be rail ballast down here is actually all taconite pellets that have been spilled. How those spilled is not clear, but they've spilled from those railcars. So I would certainly hope that these are not the type of railcars that would be used for the highly reactive Eagle ore. But again the EIA does not discuss the rail -- what types of railcars in any way. It does mention that railcars would be covered. Now, whether they will be covered with tarps or an enclosed-type car is

totally unspecified. So we're left to speculate as to what type of railcar would be used. And therefore it's very difficult to get a handle on what types of impacts might occur both at the -- well, at the rail loading area where these cars would sit until hauled off for processing.

Q Okay.

MS. HALLEY: I move to admit Petitioner's Exhibit 74-E.

MR. LEWIS: Same objection. Relevance, your Honor. And I have no -- the testimony as established is not relevant because the witness has established he has no idea what's going to be used for this operation but just for the record.

JUDGE PATTERSON: I'll allow it.

Q Dr. Coleman, is it your understanding that the EIA should have described transportation, ways to minimize contamination along the transportation route including roadways and railroad?

MR. LEWIS: That's no my objection, Ms. Halley. I don't care if you admit that exhibit.

JUDGE PATTERSON: Okay. I will admit. It's Petitioner's 74-E; right?

MS. HALLEY: Yes, your Honor.

JUDGE PATTERSON: That will be admitted.

(Petitioner's Exhibit 632-74-E received)

Q This is a demonstrative exhibit only. Dr. Coleman, what is this?

A This is that same rail line near Marquette. This is actually Highway 550 that the Eagle project would use for hauling. But this is demonstration again of the type of spillage that can occur along rail lines depending on the railcars used. And so that contamination along rail lines does occur depending on the type of railcar used. And so the type of railcar is very important to evaluating the impacts of transportation.

This is the same site, and this is 550 crossing that rail track. And you can see the taconite, the iron ore, has stained the soil on both sides of the tracks here. If this was sulfide ore, this would be an environmental disaster. The level of contamination at the Flambeau site that caused runoff that exceeded standards into Stream C along that rail spur was very small compared to this level of spillage. In fact, the sulfide ores -- it was almost imperceivably -- imperceivable visually that that ore had spilled. However there were clues at the Flambeau site about spillage along that rail spur because some of the rail track had started to be affected by the acid generation of the fines of the ore dust at that site.

But this kind of spillage would -- as I said, with sulfide ores would be absolutely a disaster. And it would

be very important to use railcars that prevented any kind of spillage of that type.

Q The paved road here, what paved road is that, Dr. Coleman?

A That again is 550 that apparently is the proposed haul route going into -- just north of Marquette.

Q Okay. Thank you. Now, do you know of any other mine sites where ore dust and fines have escaped during transportation?

A Well, actually I know two sites where relatively small ore particles have escaped. One is a site up -- it's called the LTV iron mine site. There's a rail line up there that has taconite ore spilled all along that rail site. I don't have an exhibit for that. The site that I'm most familiar with is the Flambeau Mine where, as I mentioned earlier, there was spillage of very fine materials along the rail spur. There was also tracking and spilling of fine ore materials in the parking lot at that site and contaminated runoff at that site.

Q Now, these releases from the -- in the vicinity of the rail yard presumably from the railcars, did that cause exceedance of water quality standards at the Flambeau site?

A Yes, it did. The runoff from the site starting with measurements in 1999 after the site had closed, all these yellow numbers are exceedances of the standard for -- well, storm water is kind of strange in some ways, because for storm water --

Q Okay. Just a minute. Let's back up for a minute. Can you describe what this table is, Dr. Coleman?
A Okay. This is a table of sampling from discharging from a basin that held the storm water temporarily and then discharged. So these are copper levels in micrograms per liter discharging from this pond that received storm water from the site.
Q So would that pond be somewhat of a corollary to the non-contract water infiltration basins at the Eagle site that serve the same function?
A Somewhat. I wouldn't want to make too close a relationship. Temporarily held storm water in a similar way to the -- to the storm water ponds at Eagle.
Q Okay.
A The hope with this pond is that -- the influx going into this pond were also measured, and they're much, much higher. So the idea of this pond was that some of the contaminants would either be bound up by organic matter in that pond or settle out -- the fine materials would settle out. But even with this pond, the levels of copper in the discharge were fairly high at least compared to the standard for the receiving water. The receiving water had a hardness of approximately 50 parts per million. And the copper standard, acute and chronic standard for a water of that hardness is 9 micrograms per liter and 7 micrograms per

liter. So these discharges into the stream all exceeded those standards for the receiving water.

As I said, these are storm water discharges, so there's not numeric limits on that as a storm water discharge. What I view as a failing of many storm water regulations is the lack of numeric standards. But these also exceed -- the DNR identified a level of concern for discharge from that point of 24 micrograms per liter for this discharge. And these all exceed that level of concern also for discharge from the point -- from the pond.

Q Down here?

A Now, down here, there's data from the receiving water, Stream C, collected in many cases at the same time. Some of the sampling from the discharge -- of the discharge started earlier when the discharge levels of metals were fairly high. And there was some sampling initiated on Stream C. And those levels in Stream C were also well above the water quality standard for -- of water body hardness of approximately 50 parts per million.

Q Now, does -- we can't see it on this page. But the acute and chronic values were what?

A For this are 9 and 7 -- for this stream here.

Q 9 and 7. Okay.

A And so those were consistently above those standards for that stream and exceeded those standards. There were

occasional -- you know, zinc occasionally exceeded the standard, too, but it was really copper that was the -- being used as an indicator of some level of contamination and stimulated the Wisconsin DNR to ask for some remediation at that site. And that's what caused the -- well, initiated the remediation of the rail spur, removal of the rail spur and the ballast from that rail spur because it had been contaminated. And then a couple years later in 2006, the removal of a parking lot that I've mentioned earlier that had been contaminated by fine -- very fine materials that, again, couldn't be seen. It wasn't like there were rocks on the ground that you could see. But it was a very fine material that had sifted into the gravel parking lot and the runoff was contaminated to thousands of parts micrograms per liter of copper coming off of this parking lot.

So these numbers here from the discharge from that pond are different from the raw runoff numbers, which were much higher. Because that pond was having some effect but not nearly enough to bring the discharges down below the level of concern identified by the DNR.

Q So you've described some remediation work that's gone on at the site. Now, has the remediation successfully reduced the copper levels in Stream C so that they are in compliance with water quality standards?

A No, it has not.

Q Still today as far as you know?
A As far as I know, the latest data I've seen, the levels in Stream C are still above the applicable water quality standards.
Q All right. Now, we're going to look at another exhibit here.
MS. HALLEY: I move to admit -- let's see -- Petitioner's Exhibit 75. It's a slide titled Steam C Table.
MR. LEWIS: That's what we just looked at?
MS. HALLEY: Yes.
MR. LEWIS: No objection.
MR. REICHEL: Counsel, 75, what sub designation?
MS. HALLEY: Stream C Table. It's the very last one in that series.
MR. LEWIS: How is it designated for the court?
MS. HALLEY: Yes.
MR. LEWIS: How is it designated for the court?
MS. HALLEY: The same way, Exhibit 75. The slide is titled Stream C Table.
MR. LEWIS: So the court would have to look through all those slides and find that title?
MS. HALLEY: Yes.
MR. LEWIS: If it works for you, your Honor --
JUDGE PATTERSON: How many slides are there? 300-some?

MS. HALLEY: I also don't mind -- I'm purposely willing to pull out the pieces of 75 that we actually use and admit today for you.

JUDGE PATTERSON: Okay. All right. If we could do that, it'd be helpful.

MR. LEWIS: So that would apply to the previous slides then, too, your Honor, and we'll submit that as a new exhibit tomorrow.

MS. HALLEY: Uh-huh (affirmative).

MR. REICHEL: No objection.

JUDGE PATTERSON: No objection, it will be entered.

(Petitioner's Exhibit 632-75 received)

Q Okay. Dr. Coleman, what does the photograph -- did you take this photograph?

A Yes, I did. This was immediately after the remediation that removed the rail spur. The rail spur -- this is the Flambeau Mine site. Some of the buildings have been removed. But the ore loading area was back in this grassy area, what's currently grassy. The rail spur ran here up in this direction. This -- the rail spur and the ballast have been removed. You can see the soil level is lower here where the rail spur and ballast have been removed.

The contaminated parking lots were these gravel parking lots over here to the left. It's not a very good

picture of that. But that -- those were the parking lots where there trucks shed ore materials onto the ground and later had to be remediated. So this was in 2004 after the rail spur was taken out. And it was in 2006 that the parking lot was remediated.

Q All right. What has been the result of this Stream C situation with the elevated copper levels, Dr. Coleman?

A The result? Can you clarify the question?

Q What's been the impact to Stream C?

A Well, Stream C currently is biologically very poor. It has very little biota in it. And --

MR. LEWIS: Just a minute, your Honor. I have foundation objection to his objection. The witness apparently is testifying about the quality of this Stream C. But there's been no foundation that this mining operation has anything to do with that quality. So that's the basis of my objection. Nor that this witness has the qualifications to do that kind of analysis.

MS. HALLEY: I'll lay the foundation, your Honor.

JUDGE PATTERSON: All right.

Q Dr. Coleman, have you been to Stream C?

A Yes, I have a number of times including one biological assessment conducted by Kennecott in which Stream C was observed by myself and biologists hired by Kennecott to evaluate the biota in Stream C.

Q And what did you find?
A There was very little in Stream C.
MR. LEWIS: Same objection, your Honor. Relevance. Unless there's some foundation which I haven't heard yet that, number one, this witness has the qualifications to analyze whatever -- assuming there's some condition in Stream C that he has the qualifications to analyze the cause and sources of that condition and, two, that he lays the foundation that he has, in fact, done that if he has such qualifications. This is not relevant.
MS. HALLEY: I'll ask a different question, your Honor.
JUDGE PATTERSON: All right.
Q Dr. Coleman, did the company conduct any pre-mining baseline on Stream C?
A No. There was no baseline data collected on Stream C.
Q So we know that the copper levels in Stream C are very elevated; is that correct?
MR. LEWIS: Objection to form of the question, your Honor.
Q Are the copper levels in Stream C elevated?
A They are elevated above standard and above levels frequently toxic to some species of fish.
Q Now, does Stream C intersect the mining site at the Flambeau Mine?

A Yes, it does. It runs through the southeast corner of the mine and recedes right off from the mine site. During mining it did and post mining time still does it.

Q Okay. Now, based on your visits to Stream C, what did you observe from a biological standpoint?/

A Well, you know, I observed very little biota. But --

MR. LEWIS: Same objection, your Honor, relevance and foundation. What this witness observed at this stream is -- there's been no foundation for any relevance whatsoever to the mining operations.

MS. HALLEY: Your Honor, this is a stream that intersects this mine site that we've been talking about for two days now. It's clearly relevant. The Wisconsin DNR has issued memos about it, and we're about to look at one. The company has acknowledged that there is a problem with copper levels at Stream C.

MR. LEWIS: That's not true either, your Honor. The prior testimony is that there have been no violations of any permit conditions. This line --

MS. HALLEY: I haven't said that there is a violation.

MR. LEWIS: This line of examination is once again about some groundwater quality standards which do not apply. And that's already been established. And now finally there's the presumption that the Petitioners wish to make

here is that whatever the quality is in Stream C, that the cause of it is necessarily this mining operation. And there's absolutely no foundation for that. This witness does not have the qualifications to do that analysis. And secondly, we just assume that this stream has other inputs to it, other sources of water coming into it. And this is an improper line of questioning with no foundation and no qualification.

JUDGE PATTERSON: I have another concern with it. Apparently there was no baseline study of the stream previous.

MS. HALLEY: Your Honor, I am not making the case that there was a baseline study or necessarily that these impacts from the Flambeau Mine. The witness has laid the foundation that this stream intersects and receives runoff from the mine. But I agree with you. There is a problem here. And the problem is that the company didn't collect the baseline data pre-mining.

MR. LEWIS: That's already been established. And it's part of the reason there's no foundation, there's no relevance for this testimony.

MS. HALLEY: Okay. I'll ask a different question, your Honor.

JUDGE PATTERSON: All right.

Q Dr. Coleman, this is Petitioner's Exhibit 75, slide 318.

Could you tell us what this exhibit is?

A This is a memo from the DNR when questions were raised about discharges from the Flambeau Mine site into Stream C. Water quality specialists at the DNR looked at what might be a level of concern in a discharge from the site into Stream C. So I won't go through all the text here. But towards the bottom --

Q No. Just a minute.

A Okay.

Q Could you read the subject line?

A "Flambeau Mine site copper concentrations in runoff."

Q Thank you. Can we scroll down to the bottom?

A And so the conclusion here was that the 24 micrograms per liter would be a reasonable estimate for setting a level of concern for copper at discharge from the mine site. Now, this was partly stimulated by the issue that the biological survey of that stream by the company concluded there was virtually no biota in that stream. So the DNR was trying to figure out were the levels being discharged high enough that there was some reason to be concerned about those. And so that's where this memo derived from was an internal memo between DNR staff trying to get a handle on what levels of copper would be likely to be of concern. And so that's how that 24 micrograms per liter was identified.

Q Thank you.

MS. HALLEY: I move to admit Petitioner's Exhibit 75 titled -- the slide is titled "Contamination of storm water."

MR. LEWIS: I'll place a relevance objection on the record, your Honor. Apparently this memo refers to whatever the witness say was a, quote, "estimate," end quote, for a limit of concern. There's been no foundation laid that it has any relevance to any Eagle permit requirements applicable to this mine.

MR. REICHEL: I would join in that objection and it seems entirely -- whatever -- I don't see how this discussion among Wisconsin DNR staff about their regulatory program or standards, the levels of concern they might establish are relevant to the regulation of the -- any activity regulated here under Part 632 or 31 of Michigan law.

MR. WALLACE: Your Honor, all of this evidence is directly responsive and relevant to the prior witness. I mean, they lead with Flambeau Mine. Their first witness came here and tried to persuade us and the court that Flambeau raised no issues with the DNR in Wisconsin and was a pristine site when they were finished with it. They spent half an hour, 45 minutes or an hour on this, offered exhibits which are now in evidence on the environmental pristine quality of Flambeau after they finished with it.

We're just responding to that. If it wasn't relevant, they shouldn't have presented that evidence in the first place. It's highly relevant. This is responsive evidence.

MR. LEWIS: First of all, your Honor, just to correct the record, it should be apparent that Petitioners fully intended to have this witness go through this testimony regarding the Flambeau Mine before Mr. Donohue testified as evidenced in the various slide exhibits that you've now seen that were submitted with their exhibits some time ago. And secondly I believe Mr. Wallace's response does not go to the nature of the objections lodged by myself and Mr. Reichel. And again there's no foundation that any of this -- even this so-called estimate for level of concern was ever adopted by the Wisconsin DNR.

MS. HALLEY: Your Honor, maybe we could have the witness testify about that?

JUDGE PATTERSON: Yeah.

MS. HALLEY: We'll lay some more foundation for this exhibit.

Q Dr. Coleman, where did you get this memo?

A This was -- a DNR staffer gave me this memo. They're very open with sharing their records. And they seemed very open with discussing the project with me. And, in fact, a number of times we talked about runoff from the Flambeau Mine site starting, I think -- I had correspondence with them starting

in 2002. Larry Lynch -- well, Ken Marquart (phonetic) here that the memo is to is the mining specialist in the northern region of the DNR. And I worked mostly with Larry Lynch, who was the mining specialist in the Madison office. But we discussed this project extensively. And -- well, that's how I got the document.

Q Okay. Could you read the last paragraph of this document out loud?

A Okay.

"Runoff should only occur during wet weather so concern for chronic toxicity long term dry weather exposure is diminished especially if dilution in the Flambeau River is considered. However acute toxicity concern increases in soft water locations and very stringent criteria are applied to WPDS discharges."

Q What does WPDS --

A That's Wisconsin Pollution Control Permit. It's like a NEPES permit. It's their Wisconsin equivalent. So WPDS discharges.

"The acute toxicity criteria for copper is at a hardness of level 30 in 6 micrograms per liter. Acute criteria are doubled to set a threshold value but can also be translated to account for the dissolved portion of the metal. For this discussion, a TR/DIS copper ratio of 2 was assumed. In this case, a concentration

of 24 micrograms per liter was a reasonable estimate for setting a level of concern for copper."

Q Did the DNR actually set this level of concern for that -- for that water body?

A Well, we're talking storm water.

Q I understand.

A As I mentioned earlier, storm water has no numeric limits. So that's why this memo was generated, because there had been no numeric limits established for storm water. And the DNR wanted to know what was a level, although there was not a permit limit, because there was no numeric permit limits for that storm water discharge, they wanted to get a handle on what would likely be a level that should be of concern. So they used this number here to help them understand the levels that they saw discharging from the mine site.

Q And did the DNR ever, to your knowledge, come to any conclusion about the levels in the Stream C?

A Well, they concluded that the site needed to be remediated.

Q And you received a copy of this document when?

A I have to look at the -- obviously the April 2007.

Q All right.

A I actually talked to the original author of it and he sent me a copy.

Q So this memo is based on your personal communication with DNR staff, which was -- well, and somewhere along the line

their concern about the copper in Stream C got memorialized in this memorandum?

A Well, in this memorandum. Also -- I mean, there were a number of other memorandums that expressed a need to address the copper levels in Stream C. Those were --

Q Do you have more of those here with you, Dr. Coleman?

A I do. It'll take me a minute to dig them out and find them.

Q All right.

MS. HALLEY: Well, your Honor, I'm going to move again to admit Exhibit 75, "Contamination of storm water."

MR. LEWIS: Same objections already placed on the record, your Honor. And note that, despite the additional foundation, there's still no evidence that even as a, quote, "estimate" for level of concern that any such numbers were applied by the DNR to this project.

MR. REICHEL: And I would reiterate my earlier objection that it's not relevant to the issue in this case.

JUDGE PATTERSON: I think Dr. Coleman can certainly testify to, you know, his experience and what he did at the Flambeau. But even with the additional questioning, I don't see how this particular memorandum is relevant under the circumstances. I will sustain the objection.

MS. HALLEY: Could I have just a moment, your Honor?

JUDGE PATTERSON: Sure.

MS. HALLEY: Thank you, your Honor.

Q Dr. Coleman, how does the size of Stream C compare to the size of the Salmon Trout River?

A Well, Stream C, as has been documented in a number of cases, is an intermittent stream that flows part of the year; it doesn't flow part of the year. But during a significant portion of the year, it has flows well over 1 CFS, I think, up to close to 4 or 5 CFS. The Salmon Trout River near the orebody, it's been gauged at Triple A has a flow of 1 to 2 CFS. So when Stream C has water in it, which is fairly frequently -- I know it does at times -- that it never totally dries up but at times the flow ceases and it turns into a series of pools. But when there is flow in it, it has similar types of a level of flow to the Salmon Trout River.

Q Dr. Coleman, do you have an opinion about the impact of this level of copper that is being released into Stream C -- if that same level were released into the Salmon Trout River, what the impacts of that might be?

MR. LEWIS: Objection; foundation and qualifications, your Honor.

MS. HALLEY: I'll ask the witness a few questions and see if we can get there. Okay?

JUDGE PATTERSON: Yeah. Okay.

Q Dr. Coleman, what is your Ph.D. in?
A It's in -- my Ph.D. is in wildlife ecology with a minor in statistics.
Q And with that degree, do you have a basic understanding of metals impacts to animals?
A Yes, I do. But, you know, my master's degree was in wildlife and fisheries science. So I was exposed to more fisheries science during my master's degree. So that probably is more relevant.
Q And during the course of that degree, did you study the impacts or read about the impacts of metals on fish?
A Yes. And probably more of that since I began work for Blithwick (phonetic) since our program in the environmental section is looking at toxics particularly metals in fish. We've done a lot of sampling relating to metals in fish as I testified yesterday.
Q And in the course of your professional work since that time, do you routinely review metals -- release of metals in wastewater and whatnot and the potential impacts on flora and fauna?
A Well, I do not do toxicology studies. But I use toxicology studies on a regular basis. On a weekly basis we look at the levels of contaminants or constituents that we find in water and look at that in relation to established toxicology studies. We reference EPA work frequently and don't feel

like we need to redo EPA's toxicological work since that's been well established.

Q Of course not. Okay. Well, let's look at this exhibit, Dr. Coleman.

A This is -- this was data that's available on the web of levels of --

Q Where is this data from?

A This is an EPA database of toxicological studies for aquatic organisms. And part of what I wanted to see -- I mean, the EPA has established these levels of chronic and acute toxicity for a variety of species. And these list and identify the studies many of those species. So this was recently a document that I used to look at the toxicity of copper, in particular, to aquatic species.

Q Okay. Could you direct us to the relevant part of this document?

A You're asking quite a bit. Well, you can see -- here's rainbow trout. There is a huge listing of different species here; rainbow trout. You know, in this particular study, a toxic dose was 28 micrograms per liter.

Q Okay. So this table is for copper?

A Yes.

Q This is copper? Okay. So in this --

A Right here -- we've got copper information here. You know, there are other studies that show different values.

Q All right. So based on the literature and your education, experience and knowledge, what do you believe would be the impact of the levels of copper that have been released into Stream C if those or similar levels were released into the Salmon Trout River?

MR. LEWIS: Objection; foundation, Your Honor, and qualifications. Number one, qualifications, this witness is not a toxicologist. As far as his experience relating to this area, all I've heard is he is a sampler. He does sampling. Number two, there's no foundation again in terms of any level of copper -- actually number one, caused to be in this Stream C at the Flambeau Mine as a result of the mining operations versus other sources. As the court has already heard, there were no background studies or at least none that this witness has talked about. And number three, this question further presumes without any foundation that some level of copper may report to the Salmon Trout River from this mining operation. And there's no foundation whatsoever for this witness to assume any such level. And he's got no qualifications to do it I guess beyond that. All we've got here is he can read an EPA table of toxicity studies on fish.

MS. HALLEY: Your Honor, Dr. Coleman has postgraduate degrees in wildlife.

Q Refresh my memory. Wildlife what?

A Wildlife science, wildlife ecology, fishery science.

Q Thank you.

MS. HALLEY: And his understanding goes far beyond reading an EPA table. And he has been doing this work, applying this type of work for his whole career. He is very qualified to make this judgment.

JUDGE PATTERSON: Are you asking him relative to Stream C or asking him to assume the same level would go in the Salmon Trout?

MS. HALLEY: I'm not asking him to assume anything. What I'm asking him to think about is the copper levels in Stream C that have been discharged, we already looked at the tables. We could pull them back up again if we need to do that. I'd like the witness to think about what the impacts to the Salmon Trout River would be if a similar level of copper was released there. He just testified that the streams at many points in the year are comparable in size. I'd like to know what he thinks.

JUDGE PATTERSON: So essentially what you're asking is a hypothetical assuming similar --

MS. HALLEY: Yes; yes, I am.

JUDGE PATTERSON: I think in that context it's -- you can ask him to assume a hypothetical situation, a similar level --

MS. HALLEY: Okay. That's exactly what I'm

asking.

JUDGE PATTERSON: -- is induced into the Salmon Trout River.

MS. HALLEY: Thank you.

Q Dr. Coleman?

A Well, what I'd like to answer is that if there were trout in Stream C there would be a serious problem. If there are trout in the Salmon Trout River, you know, the overall impact to the Salmon Trout River I would not want to comment on. But trout in Stream C would have a serious problem with the level of discharges that has been observed from the mine site.

Q Would you care to opine on the Salmon Trout River above the Triple A Road, just the headwater region of the Salmon Trout River?

A Well, it's, you know, a similar size stream. It has trout in it. I think there would be serious concern about those levels of copper in that stream.

Q Thank you. All right. We've been talking a lot about the railway transportation. Let's just for a minute go back to the roadway transportation issue. Could you describe the haul route between the potential mine site and the railroad loading facility as you understand it from the application?

A Well, describe it? I mean, the haul route goes down the Triple A eventually -- which is a gravel road, eventually

picks up Highway 550, goes down to Marquette and then from Marquette goes out to Champion where the rail loading area would be. That is a curvy road. Between Marquette and the mine site, the first half of that haul route there are multiple stream crossings. In fact, using GIS modeling, we identified 19 significant stream crossings along the haul route between the mine site and Marquette.

Q Now, you've read the application and the EIA. Has the application ruled out in your opinion that storm water -- I'm sorry -- surface water along in those stream crossings that cross that transportation route could be impacted by escaped fines, ore fines?

A No. As I mentioned, the permitting materials that permit application and the EIA say very little about that type of contamination, virtually nothing about that type of contamination along the haul route or what the impacts might be to streams that the haul route crosses.

Q Is there -- you've read the materials in the permit. Is there any mention of monitoring of surface waters --

A No, there is not.

Q -- along the haul route?

A No.

Q Okay. How about the soil along the roadways?

A No, there is not.

Q Any monitoring at all along the haul route?

A No, there is not.
Q Okay. Dr. Coleman, one of the other issues you raised is snow. Now, what are your -- what's your primary concern about snow at the site?
A Well, the permit materials are almost totally silent about snow. They do mention it in a couple of cases. But there are really two issues; one is the capacity of the basins to handle the amount of snow melt that might occur in spring, but also a significant concern that I have is how the store -- the snow is stored during the winter. There is really no information about that other than in multiple diagrams of the mine site there's an area identified here (indicating) for contact snow storage and another area over here identified for noncontact snow storage.
Q Just so we're clear, do the terms "contact snow" and "noncontact snow" correlate with "contact water" and "noncontact water," as you described it before?
A Yes, they would. So contact snow would be snow that was potentially exposed to mine materials. Noncontact snow is snow that theoretically would not be exposed to mine materials.
Q And how are each of those types of snow to be segregated?
A Okay. The noncontact snow, which would be plowed off of the roads that are in purple here, and the parking lots would be stored in this pile here. In the springtime that would melt

and the melt water would run off into either this basin or this basin over here, the noncontact storm water basins. The contact snow is proposed to be stored within the temporary development rock storage area on top of the development rock right here. In the spring when that melted, it would percolate through the development rock and report to these basins here.

Q All right. Just so we are clear, now, the separation process of contact snow and noncontact snow, how does that segregation process actually work? Is the person running the snowplow going to be out there testing the snow, or how are they going to decide what pile to put it in?

A Well, as I said, the permit materials have virtually no information about snow management. I think it's reasonable to assume that any snow that was being plowed in this green area would end up being hauled into the temporary development rock storage area. That's what you would hope. And any snow plowed in this area would be hauled to the noncontact snow storage area. However, there is significant potential, as we saw at the Flambeau, of snow moving across this line between the contact and noncontact areas. There are some gates here and some restriction, however, there's a road -- a perimeter road here that apparently has no restriction for movement. And that would be a clear potential for movement of snow being plowed from one area to

the other. So contaminated snow from the contact area could conceivably end up in the noncontact area. Hopefully that wouldn't occur, but mistakes happen sometimes.

Q How much snow are we talking about?

A Well, the Yellow Dog Plains has quite the reputation for snow. Probably somewhere between 15 and 20 feet of total snowfall. That's not 15 or 20 feet on the ground, thank goodness. But Marquette has about 185 inches of snow annually and Houghton, which is probably more similar to the Yellow Dog Plains, I think that's a number of people's assumption has about 203 inches of snow annually. On the ground as far as I know there are very few measurements. We've taken some measurements of snow depth up there and found that in the open when we were there in April -- this last April, snow depths were between 29 and 36 inches in the open. That's snow on the ground that has melted repeatedly over the -- and compacted. And in drifts such as up against Eagle Rock, there were drifts 48 inches deep.

Q Four feet deep?

A Four feet deep on the ground.

Q All right. Now, do you know what the company used for their calculations when they were figuring out the sizing of these facilities to handle snow?

A Well, yes, I do. There was for sizing the basins and to account for snow melt there was an effort to use a 50-year

storm and snow event. Unfortunately, the snow levels during part of that calculation -- well, none of the snow levels that were used in those calculations came from the Yellow Dog Plains because there were none. And some of the calculations used snow depths of 26 inches for snow melt from Champion, whereas other locations in the area had more snow. The 26 inches of snow on the ground used in the calculation is significantly less than what we've observed at the Yellow Dog Plains and I think would be reasonable to assume typically occur at the Yellow Dog Plains given the snowfall up there.

Q So do you believe it's likely that the basins are not appropriately sized to handle this snow melt?

A Well, I think the calculations need to be redone using more realistic snow depths. Using a 26-inch snow depth for spring snow melt is I think a significant under representation of the amount of snow at the site, particularly given that we just recently measured depths that were deeper than that.

Q All right. Now, you said that -- you pointed out an area I believe on the TDRSA that designates that that's where the contact snow will be stored?

A Yeah. This area right here (indicating) is identified as the contact snow storage area. It's a rectangle on top of the development rock. There are other diagrams that show

that also.

Q Now, is it your understanding that the size of the TDRSA took into account snow?

A No. My understanding from the permit materials is the TDRSA is sized for the development rock with some excess capacity to account for the limestone that is planned to be added to the development rock. There seems to be no accounting for the volume of the snow in that capacity. That raises some concerns for me that either there at some points during the mine operation there would be not enough capacity in the TDRSA for the development rock or else not enough capacity for storage of snow on top of that development rock.

Q I see. Now, my understanding of the TDRSA design includes that the company has put some thought into trying to keep that pile somewhat dry, as I guess, you know -- as dry as they can in an environment where it's raining and snowing and whatnot. Now, putting the snow on the TDRSA, does that sort of seem to mesh with that plan?

A Well, yeah. The plan is to cover the pile incrementally and as quickly as possible as the pile fills up so that I think it's at the in year four the idea would be to have this pile covered to prevent infiltration of precipitation. Having the snow pile on top of the development rock seems to be in direct conflict with that concept of excluding water from the development rock and would undercut the --

Q Because sooner or later --
A -- functioning of the --
Q -- is that snow going to melt and become water?
A Please, could you repeat?
Q I said, because sooner or later that snow is going to melt?
A Yes. In the spring that snow's going to melt. And as I said, it would percolate down into the development rock. And given the large amount of snow, that would probably be a significant amount of water. The amount of water content of the snow of snow on the ground is typically -- well, the company used .28 or 28 percent. So out of 100 inches of snow, you'd have 28 inches of water. So, you know, if you have about 28 to 30 percent -- other studies have identified 30 percent of packed snow is water. So with a big snow pile there, you would have about 30 percent of that volume would be water, which could be a large quantity of water.
Q Now, the permit that was issued includes, I believe, a limit to the amount of head that can be on the TDRSA, the amount of water that can be sitting on the TDRSA? Is that your understanding?
A That is correct. One foot of head is my understanding is the limit on that.
Q And do you know if the company took into account the snow melt, the volume of water from the snow melt, when they were considering the TDRSA and particularly that permit limit of

one foot?

A I haven't seen no calculations that include the snow melt and how that would affect water levels or head on the liner. It seems like the amount of water melting out of that snow pile could very well put significant head on the liner. Unfortunately, as far as I know, no calculations have been done to see whether the drain system could handle that amount of water.

Q Okay. Dr. Coleman, you can sit down, if you want to. But if you're more comfortable standing, I think that's all right, too.

A I think I'm good here.

Q Okay. Just a couple of more, just a couple questions here. Now, you testified yesterday that you routinely work with other state agencies and federal agencies reviewing and participating in various mining -- reviewing mining projects and assessing them and being very involved in those processes; is that correct?

A Yes. I think I mentioned I work with other agencies in Minnesota, with Army Corps of Engineers, forest service, state DNR and the state pollution control agency. We're cooperating on an EIS for a mine project out there. In Wisconsin I work closely with the state DNR on mine projects. We did a --

Q Just a minute. What do you mean by "work closely"? Do you

mean -- what does that mean?

A Well, during the -- I mean, right now there's not a whole lot of mining in Wisconsin, so we don't meet very often. But during permitting for the Crandon project we had meetings probably monthly. They weren't scheduled monthly but, you know, as issues came up there would be meetings to discuss issues related to the permitting process. That was meetings with the agency staff and the applicant in many, many cases to discuss the project and discuss approaches to evaluating potential impacts.

Q Now, you said you are cooperating on an EIS for a proposed mine up in Minnesota. Could you briefly describe what that entails, who you work with and what you're doing generally?

A Well, lots of work, lots of reading technical documents. The EIS is in draft. Now draft chapters are being written. It's a joint EIS, state, federal EIS. So we're reviewing chapters -- draft chapters for that EIS, contributing language to chapters. We also cooperated on the Crandon EIS with the Army Corps of Engineers and wrote some draft chapters of that.

Q So you work with those agencies writing portions of the EIS's?

A That is correct; yes.

Q Now, when you started working on this project in Michigan, did you assume that there would be perhaps a similar type of

arrangement with the DEQ?
A I assumed that there would be fairly frequent and close communication with the DEQ, yes, and the DNR.
Q In fact, did you ever attend a DEQ mining team meeting?
A Yes, I did attend one DEQ mining team meeting early on in the process. I think there was a presentation by Kennecott about the mine or mine proposal, and there was discussion of the proposal at that mining team meeting.
Q Can you remember who was there, generally?
A Well, there was DEQ staff, I think some DNR staff. There was I think a township representative and there was myself and Todd Warner from KBIC.
Q All right. And a company rep you said gave a presentation?
A And Jon Cherry was there.
Q Okay. Now, did you continue on with the mining team?
A No. There were other mining team meetings. And I inquired about attending additional mining team meetings, and my understanding was those meetings became closed meetings later. And so was told that if they were available for -- if it was possible for me to attend, I'd be notified, and never heard anything about it.
Q So you were never notified again?
A Of a mining team meeting, no; no.
Q All right. And that process to you seems very different than what goes on in other states and at the federal level?

MR. REICHEL: Objection; leading.

Q Does it seem different to you, Dr. Coleman?

A In my experience in Minnesota and Wisconsin, it -- the relationship with the DEQ is very different than my experience in Wisconsin and Minnesota, yes.

Q Okay. Thank you. Dr. Coleman, you and I prepared these slides together. These are two conclusory slides meant to summarize your testimony from yesterday and today. Could you read the slide, please?

A Yes, I'd be glad to. I assume I don't have to read the title. So number one,

"Kennecott's own model, when corrected for input errors, predicts that water quality in the reflooded mine would be far worse than predicted in the application." Number two, "Well data indicate the contaminated water in the mine could move upward into the surficial aquifer." Number three, "The compliance wells are not as close as practicable to the facility." Number four, "There are no compliance wells for water quality in the lower bedrock aquifer."

Q Just a minute. Do those four points summarize your testimony from yesterday?

A I believe they do, yes.

Q And they're accurate?

A Yes.

Q Now, this slide goes to what you testified about today, storm water and snow, those primary concerns. Could we do the same thing here?

A Number one,

"The storm water management plan does not include monitoring of 'noncontact' water for contaminants prior to discharge." Number two, "The storm water management plan does not address monitoring or control of contaminated storm water along the transportation route." Number three, "The storm water management plan does not provide adequate storage for the large amount of snow occurring at the site." And number four, "The plan to store snow in the temporary development rock storage area on top of the development rock compromises the effectiveness of the TDRSA."

Q Does this summarize accurately your testimony and your belief?

A Yes, it does.

MS. HALLEY: Thank you, Dr. Coleman. I have no further questions at this time.

JUDGE PATTERSON: Do you want to take a break before you start your cross?

MR. LEWIS: Yes, Your Honor.

(Off the record)

MS. HALLEY: Your Honor, I need do a little

housekeeping with exhibits here.

JUDGE PATTERSON: Okay.

MS. HALLEY: Mr. Reichel, what's now labeled as Petitioner's Exhibit 157 is on your desk. And it looks like this (indicating).

MR. REICHEL: Yes.

MS. HALLEY: It's the same report that we discussed yesterday as from Petitioner's Exhibit 3, Appendix 10. And I attached also just for convenience Appendix D-5 from the mine permit application. And I'm moving to admit it as Petitioner's Exhibit 157.

MR. LEWIS: I have no objection, Your Honor.

MR. REICHEL: No objection.

MS. HALLEY: Your Honor, may I bring the court a copy?

JUDGE PATTERSON: Sure.

MR. REICHEL: Counsel, that's 157; is that correct?

MS. HALLEY: 157.

JUDGE PATTERSON: Thank you.

(Petitioner's Exhibit 632-157 received)

MS. HALLEY: And I'd also like to admit Dr. Coleman's conclusory slides for demonstrative purposes only. And those would be 158 and 159. And I will provide a hard copy of those tomorrow.

MR. LEWIS: No objection on that basis, Your Honor.

MR. REICHEL: No objection.

JUDGE PATTERSON: Okay. And no objection. Those two will be entered as demonstrative.

(Petitioner's Exhibits 632-158 and 632-159 received)

JUDGE PATTERSON: That's all housekeepingwise?

MS. HALLEY: That's all.

JUDGE PATTERSON: Okay.

MR. LEWIS: Hello. Dr. Coleman, I'm Rod Lewis. I represent Kennecott Eagle Minerals Company in this matter.

CROSS-EXAMINATION

BY MR. LEWIS:

Q Dr. Coleman, your CV we talked about earlier. Your degrees are in wildlife ecology, fisheries and wildlife science, wildlife management, and you note a minor in statistics; right?

A That is correct.

Q In reference to some of the issues you discussed earlier, one of them was geochemistry calculations. And I think you acknowledged, sir, that you're not a geochemical engineer?

A I have no formal academic training in geochemistry; that is correct.

Q And you also talked about groundwater hydrology. And it's

also true, is it not, that you are not a hydrologist by education?

A I'm not a certified hydrologist.

Q Nor are you a mining engineering?

A That is correct.

Q Nor are you a civil engineer?

A That is correct.

Q And nor are you a toxicologist?

A That is correct.

Q Now, I looked at your list of papers and your CV as well, Dr. Coleman. And I think I'll characterize this fairly, but if you don't think so, please feel free to look at your CV or ask me to clarify my questions. All right? I counted some 20 papers listed. Does that sound right?

A Yes.

Q As to the ones that seem to have some relevance to mining, it appears to me that those were all related to the Crandon project; is that correct?

A Published papers; that would be correct.

Q And that all relates to the mine that was never mined; isn't that also true?

A Correct.

Q You have -- other than that, you have one paper on free-ranging domestic cats?

A Spatial analysis of those cats, yes.

Q And by my count, you have some nine papers in this list of 20 having to do with black vultures and turkey vultures?
A Resource used by those birds, yes.
Q Now, in these -- you referred earlier to what you called I think being a cooperator on a project in Minnesota; is that right?
A Yes.
Q Now, in this role, whatever it is, as a cooperator, it's true, is it not, that you represent GLIFWC?
A That is correct.
Q And for the record, the acronym is GLIFWC?
A Correct.
Q And tell me again what those letters stand for.
A Great Lakes Indian Fish and Wildlife Commission.
Q And it's true, is it not, that, Dr. Coleman, in connection with your activities on behalf of GLIFWC that you have taken positions in favor of and actively sought enactment of anti-mining resolutions?
A Can you be more specific?
Q Yes. Were you involved in a group of Dane County citizens opposed to mining?
A What group would that be?
Q I'm trying to find out here. What I've got here is a press release titled "Board Support Astounds Mine Foes Diverse Support Shocks County Mining Opponents" dated April 12th,

1994, Capital Times, Madison, Wisconsin. And I wanted to ask you whether it says in this article, Dr. Coleman, quoting you,

"I was surprised at the type of support," end quote, "said John Coleman of Madison who was elected as a delegate at last year's meeting and was among those pushing for adoption of the anti-mining resolutions."

Do you recall that article?

A I don't recall the article. I now understand what you're talking about.

Q All right. And that's the group I was referring to. You understand the group I was referring to?

A That is not an anti-mining group.

MS. HALLEY: Your Honor, if Counsel wants to cross-examine Dr. Coleman on a press release from 14 years ago, I think Dr. Coleman ought to be able to take a look at that document where he's quoted. He didn't write it.

MR. LEWIS: If he tells me that he disagrees with something --

JUDGE PATTERSON: I was going to say, if he wants to see it, that's fine. Would you like to look at it, Doctor?

THE WITNESS: I guess I wouldn't mind seeing it, yeah. I don't know what else is in there.

Q Tell me when you've looked at it enough, and I'd like to ask

you questions about it. All right?

(Witness reviews document)

Q Now, the quote I wanted to ask you about, Dr. Coleman, is right here where it says, quote,

"I was surprised at the type of support," end quote, "said John Coleman of Madison, who was elected as a delegate at last year's meeting and was among those pushing for adoption of the anti-mining resolutions."

Now, do you dispute the truth of what's stated here?

A That resolution is 14 years ago. And I don't recall the exact wording of that resolution, but my best recollection is that I would not characterize that as an anti-mining resolution. I would -- there was a resolution expressing concern about the Wolf River and environmental impacts to the Wolf River. That group is an elected statewide group of citizens that represent their counties on hunting, fishing and occasionally environmental issues. It primarily deals with fishing and hunting regulation. And my best recollection of that resolution was it was expressing concern about potential environmental impacts of mining in the headwaters of the Wolf River. That reporter apparently -- and I had not previously seen that article, to my recollection -- seemed to have characterized it as anti-mining. But as I said, my best recollection is that it

was expressing concern about environmental impacts of mining, not anti-mining. I think that also was prior to my employment with GLIFWC.

Q And as to your employment with GLIFWC, you spent some 13 years now -- is that right? -- employed by GLIFWC?

A Approximately, yes.

Q And your roughly ten years of that time at least were work related -- was work related to the proposed Crandon mining project?

A The Crandon mining project and the Flambeau Mine.

Q And you and your group, GLIFWC, as to your work relative to the Crandon Mine, it was work seeking to make sure that mine was never permitted and never allowed to operate; isn't that correct?

A That is incorrect.

Q Earlier, Dr. Coleman, you showed a photograph you apparently took where you showed a rock in one photograph and then you showed the rock after you had crushed it with a hammer; do you recall that?

A Yes, I do.

Q You are aware, aren't you, sir, that there is no crushing of the development rock planned for this mining operation?

A I am aware of that fact. That is why I looked at stockpiles from other mine sites.

Q Now, you testified earlier about what you called your

recalculation of Kennecott's prediction of post-mining in-mine water quality. And in fact, your report on that subject has now been admitted as Petitioner's Exhibit Number 157. I wanted to ask you a couple questions about your conclusions there, as soon as Elmo warms up. Now, with the understanding that, as you indicated earlier, Dr. Coleman, you're not a geochemist. And I understood your testimony earlier, you spent some time explaining that you didn't have to be a geochemist for what you did here because, after all, you just used the spreadsheet and adjusted some of the assumptions used in that spreadsheet. But if I ask you something for which you do not have sufficient background or knowledge to answer the question, please don't hesitate to tell me. All right? I wanted to ask you about this table. This is what you call your corrected Table 2 of Appendix D-5 of the Kennecott mine permit application materials, which should be on page five of this new Petitioner's Exhibit 157, if I don't have things mixed up. At any rate, you recognize that table, do you not?

A Yes, I do.

Q And this table, what you're showing is various parameters listed on the left-hand column and then you showed the Appendix D-5 value in the second column, which is the report by Geochemica submitted with the mine permit application materials; is that right?

A That is correct.
Q And then in the next column you show what you called a corrected value; right?
A Yes.
Q And again, you've got the last column being Part 201 standards. And you do understand, sir, do you not, that that standard is not being applied to the water in the mine for this mining operation?
A I do not understand that.
Q Now, I wanted to ask you about the first parameter up there, pH. I noticed that you include a pH value for Mr. Logdston's calculations from his results, but you do not include a pH value in your results; is that right?
A That is correct.
Q And you in fact did not calculate a pH value for the scenario that you have calculated here; is that also true?
A That is correct.
Q And again, this may be one of those areas where you have to tell me where you may not have the background necessary. But are you familiar with the concept of solubility controls in this type of geochemical calculations?
A I am.
Q And do you generally have an understanding, sir, that as concentrations like you have reflected here, as we get up to those kinds of numbers, that solubility controls may become

important?
A I certainly do.
Q And are you also aware, sir, that it is in fact generally accepted practice in this discipline to adjust for solubility controls based on pH?
A I certainly understand that. Can I add that I understand that and it was not conducted by the original model and, therefore, I did not conduct that solubility modeling.
Q You did see the pH value reported by Mr. Logdston, though?
A And I did. That was not -- that was not calculated by the spreadsheet model either. The numbers I report were strictly numbers developed from that model.
Q I understand. And that's one of the limitations of what you did, I believe, is that you did not calculate a separate pH and you did not, therefore, see whether solubility controls or adjustments were necessary? You did not do that?
A I would assume they would be necessary given those high numbers.
Q Thank you.
A They were not -- that was not conducted by Dr. Logdston either in his results. And, therefore, I did not feel it was appropriate to branch off and do different modeling than what Dr. Logdston did.
Q I understand. Now, in your characterize of the Flambeau project, I have in here in my notes -- and I don't recall

which particular point we were talking about, but you used the term "disaster." Do you recall that?

A I was talking about the rail line photos at the crossing of the rail line and 550 I think was the occasion.

Q And you characterized that as a disaster?

A No, I did not. Iron taconite is relatively unreactive in the environment, particularly compared to sulfide ore.

Q And you may recall again in a press release dated March 20, 2007, Mr. Coleman, that you were quoted to the effect, quote, "'In some circles the Flambeau Mine is being promoted as the future of mining, the best mine in the country, and an example of how sulfide mining can be done without harming the environment.' He said it is hard to be hypercritical because so many sulfide mine projects have been an environmental disaster. Coleman said, 'This one wasn't. They are getting better.'" That's what you said, isn't it?

A That is correct.

MR. LEWIS: That's all I have. Thank you.

MR. REICHEL: Dr. Coleman, my name is Bob Reichel. I represent the DEQ. I just want to clarify a few points in your prior testimony.

THE WITNESS: Sure.

CROSS-EXAMINATION

BY MR. REICHEL:

Q You indicated, in your discussion of your work over a period

of years on -- I believe this was on the Crandon Mine Project -- among other things that you had, quote, "worked with the USGS," US Geological Survey modeling effort?

A That is correct.

Q Just so the record is clear, you're not saying that the USGS retained you or that you were a consultant to them? You're not saying that, are you, sir?

A No. GLIFWC employees are not consultants for other people. We were a sister agency that worked together. We had a joint project, jointly funded, that we worked on together. It was an equal partnership. I was not an employee of the USGS.

Q So would it would be fair to say that you or your colleagues at GLIFWC offered comments or input to USGS?

A On that project? No, that would not be correct. This was a joint research project that we worked on, that we developed together. So commenting on their project would not be an accurate description of that work.

Q I think with respect to Crandon -- the Crandon Mine you also said that you had some interaction with the US Environmental Protection Agency; is that correct?

A That is correct.

Q And again, you weren't working for the USEPA, were you?

A No. EPA and the Great Lakes Indian Fish & Wildlife Commission have a close relationship on many projects. We

work jointly on some projects. We get grants from the EPA. But on that particular project there was an effort to model surface water, stream modeling. We worked with the EPA closely in providing them with inputs for that model. We did provide comments on the development of that model. We sat with their programmers, their modelers at the EPA offices and worked on modifying those models. So it was not strictly a commenting relationship. There was no -- we had no funding for that project, so it was not an inherently funded project. It was an EPA-funded project. But we -- there were a number of data sets that we provided at EPA's request for that project. And as I said, we worked very closely with the modelers.

MR. REICHEL: Nothing further.

MS. HALLEY: I have just a couple of questions, your Honor.

JUDGE PATTERSON: Okay.

REDIRECT EXAMINATION

BY MS. HALLEY:

Q What is GLIFWC's policy relating to mining, Dr. Coleman?

A Our policy related to mining as in all development within the Ceded Territories is that development should only proceed if the environment is adequately protected. And our efforts have always been to ensure that the environment is protected when projects move forward.

Q Does GLIFWC oppose all mining?
A GLIFWC is -- does not oppose mining. It opposes certain aspects of projects that would damage the environment. We have worked closely, as I tried to explain, with regulatory agencies to make sure that problematic aspects of projects were modified so that the environment was adequately protected. Member tribes, their big concern is the protection of the environment. And so that -- they have a very high standard for that protection of the environment, and we make an effort that any project that moves forward through the permitting process meets very strict and rigid, vigorous standards of environmental protection.
Q Do you expect mining projects that move forward to meet the standards of the law?
A We certainly do.
Q Now, I just have one more question. There seems, perhaps, to be a little confusion that this Table that you testified about yesterday somehow relates to rock that has been intentionally crushed. Could you just clarify what this distribution table represents?
A Well, I think I went through it maybe in too much detail yesterday, but maybe not. But the pictures of the crushed rock was purely illustration of what crushing does to surface area. The real inputs to the model were derived from these studies that were studies of wasterock at other

mine sites, which should have been -- they were uncrushed; they were just hauled out of a mine, piled into piles, and then a sieve analysis was done on these wasterock piles. So this is uncrushed. As far as I can tell it would be similar to the rock types that would occur at the Eagle Project. I mean, "uncrushed" is sort of a -- you know, there's -- when very large rocks are -- the rocks have to fit into a truck, so to some degree the rocks have to be broken to a size that can fit into a truck. Any breaking of the rock will generate small particles. So that's why you see a certain percentage of small particles in these rock piles, is because breaking of rocks, even large pieces so that they can be hauled by truck, will generate some small particles. In particular, certain types of deposits where the rock can be -- where it's been weathered can be very fragile, and handling of that rock can fracture it.

Q So to the best of your understanding, this particle-size distribution represents rock that has been treated in the way that the application describes that the development rock at this site would be treated?

A Well, very few -- virtually nobody describes in detail exactly how they're going to handle their wasterock. But these are wasterock piles at other mines that it is, I think, very reasonable to expect would be handled in a way similar to Eagle. There's no reason to crush rock at any

mine site unless you're going to be using it for other purposes. These are not rock piles that have been crushed for some other purpose.

Q Thank you.

MS. HALLEY: No further questions, your Honor.

RECROSS-EXAMINATION

BY MR. LEWIS:

Q Dr. Coleman, one of those lines on that chart says Foth & VanDyke. Do you see that?

A Yes.

Q Do you know what mine that is?

A That's the Crandon Mine. There was material taken from the Crandon Mine.

Q Just one question at a time if we could, please?

A Yes.

Q Okay. Do you know what rock type was mined -- well, let me back up. Do you know what rock type would have been mined at the Crandon Project?

A What rock type?

Q Yes, sir.

A Well, it was a sulfide mine.

Q Do you know week kind of rock it was, what mineralized kind of rock it was?

A Off the top of my head I don't immediately recall, no.

Q Do you know what kind of rock we're going to be mining at

the Eagle Mine?

A Well, there's a peridotite; there's massive sulfide and semi-massive sulfide will be mined. We're not talking about the ore, though, here; we're talking about the development rock, which is the surrounding host rock.

Q Right. And all you know and all you can say about this chart is -- well, as to this one mine, that it was what you call a sulfide mine. As to the Eagle Mine it's what you call a sulfide mine. But as to further characterizing the type of development rock that will be removed or the type of ore that will be removed in terms of its hardness, characteristics and so forth, you don't have information to do that?

A Can you repeat the question? I sort of got lost towards the end there.

Q That's all right. Let's move on. I wanted to ask you, in reference to what you said earlier about not necessarily having -- or not having an anti-mining agenda. And specifically you were asked questions on redirect about that and -- in reference to the Crandon Mine. Do you have your laptop with you here today?

A I do.

Q And do you have various stickers and decals on that laptop?

A Probably.

MS. HALLEY: I object, your Honor. This is

irrelevant.

Q And do in fact you have stickers and decals on your laptop which are anti-mining stickers and decals?

A My laptop is probably four years old. The Crandon Project ended in 2003.

Q Is the answer "yes"?

A I have stickers that were put on after that project terminated. And the people I worked for bought that project and had a whole host of materials. It also has a Nicolet Minerals Mining Company sticker on it, right next to all the other stickers.

Q Can you tell us what the anti-mining stickers say? Can you do that without looking at them?

A I have no idea.

MR. LEWIS: Could the witness retrieve his laptop and show us those, your Honor?

MS. HALLEY: Your Honor, this is irrelevant. The stickers on his laptop have nothing to do with his testimony about this particular mine.

MR. LEWIS: It's always to bias, your Honor, and probably would not have hadn't there but for the redirect which tried to establish that he does not have such bias. And I think it's more readily apparent by the fact that he walks around with anti-mining stickers on his laptop. So with the court's permission I'd like the witness to show us

the stickers on his laptop.

JUDGE PATTERSON: If you would, sir.

THE WITNESS: To be honest, I don't even remember at this point, so it will be a surprise for all of us.

MR. LEWIS: May I approach the witness, your Honor?

JUDGE PATTERSON: Sure.

Q You've got one on here that says, "Save the Wolf River. No Crandon Mine"; right? Is that what it says, Dr. Coleman?

A Yes, that is what it says.

Q You've got more on the bottom, don't you? Oh, you've got another one here that says, "Save the Wolf River from an Exxon Disaster." That's what that one says?

A That is what that one says.

Q And that's also a reference to the Crandon Mine?

A I believe it probably is, yes.

Q Okay. Thank you.

A One of those stickers is one I obtained from a DNR employee who collects stickers from the projects he works on.

MR. LEWIS: That's all I have, your Honor.

MS. HALLEY: No further questions.

MR. REICHEL: Nothing further.

JUDGE PATTERSON: Thank you, Doctor.

MR. LEWIS: Could we take 15 minutes so I can get some exhibits to get in the right order if I could?

JUDGE PATTERSON: Yeah, sure.

(Off the record)

MR. LEWIS: Your Honor, Intervenor Kennecott Eagle Minerals Company calls Andrew Ware.

REPORTER: Do you solemnly swear or affirm the testimony you're about to give will be the whole truth?

MR. WARE: I do.

ANDREW WARE

having been called by the Intervenor and sworn:

DIRECT EXAMINATION

BY MR. LEWIS:

Q Could you state your name and spell it for the record, please?

A My name is Andrew Ware. That's A-n-d-r-e-w W-a-r-e.

Q And who are you employed by, Mr. Ware?

A I currently work for Kennecott Eagle Minerals Company.

Q And what is your title there?

A My title is site operation and exploration manager for the Eagle Project.

Q Could you tell us about your educational background, Mr. Ware?

A My degree was an honors degree in applied geology from the University of New South Wales in Australia. That was completed in 1987, I believe. After 1987 I joined CRA, which was a subsidiary of Rio Tinto. From there I joined

Kennecott, and from then for the last approximately 20 years I've been working with Kennecott.

Q And during that period of time with Kennecott, could you describe your various job activities?

A I actually started off working for Kennecott in Papua New Guinea. We had a project up there called Lihir. It's one of the world's largest gold deposits. My position there for the first three years was actually managing the geotechnical database that was being developed for an open-pit mine.

Q What years was that?

A That was starting approximately in mid '88 through to '91, I believe that was.

Q And when you refer to "geotechnical program," is that something you also do for Kennecott in relation to this mine project, the Eagle Project?

A Yes.

Q Would you please continue with the review of your history with the company and what you've done?

A In 19- -- late 1992 I transferred from Australia to Mexico. I was employed by Kennecott Exploration in Mexico, basically starting off as a project geologist, reviewing various projects in that country including exploration. The aim was to define targets of interest to the company. And that involved project reviews, advanced exploration and geotechnical data-gathering associated with drilling

programs. One of the bigger projects I worked on was the Salaverna-Tiela-Penasquito Complex located in Zacatecas in Mexico. After that I transferred around within Mexico. Actually during those ten years I moved three times. I finally wound up in Tucson in 2001, I believe. In 2001 I was employed as an exploration geologist, again looking for prolific coppers in southeast USA, Mexico and a little bit of Central America. And early 200- -- or late 2001 I started working on the nickel exploration program with Kennecott Exploration. That office was based out of Vancouver, Canada. I remained in Tucson. But during that time I was basically commuting to and from Minnesota. And in October 2002 I actually took up a position as project manager for the Eagle Project, where I've remained.

Q Where do you live, Mr. Ware?

A I live in Negaunee, in the Upper Peninsula of Michigan.

Q How far is that from the Eagle Mine site?

A That's approximately 18, 20 miles by straight line.

Q Do you have family there with you?

A I do. Wife and three children.

Q How long have you lived there?

A We actually moved up there June 2003.

Q Could you explain your duties generally as the exploration and site operation manager for the Eagle Project?

A The site operation manager is charged with the collection

and documentation of data. When I say "data," that would include geological data, geotechnical data, geophysical data, petro physical data, metallurgical data. In addition I also oversee the acquisition and/or release of mineral title and/or land surface as it pertains to exploration within the Baraga Basin. The project -- the position actually involves looking after and issuing contracts for drilling and geophysical data collection as well.

Q And are you personally involved with that geophysical data collection?

A Yeah. I do design the surveys in conjunction with internal groups within Kennecott Exploration.

Q Can you tell me, from the period since roughly 2001 to present, how many drill holes have been drilled in and around the Eagle deposit to define that deposit?

A In and around the Eagle deposit itself -- and include that as a project area -- I believe we're getting up to number 200 as we speak.

Q And can you put that roughly in general terms as to how many meters of core that might represent?

A In terms of meters of core, that would be close to 45,000 meters. Or multiply that by 3, 120-, 135,000 feet of core in the close-on area to the Eagle Project.

Q And is that drilling and core retrieval and characterization and data collection continuing?

A To this date, yes.
Q And will it continue if the mine is allowed to proceed? Will that drilling and coring and data collection continue as the mining progresses?
A Yes. That's fairly typical of an underground mining operation, and it's also about permit conditions.
Q One of your areas of responsibility I believe you mentioned earlier is mineral title and surface title database management; is that correct?
A That's correct.
Q And in connection with those job duties, are you familiar with the property ownership interests of Kennecott in the Marquette County area?
A Intimately.
Q And Mr. Ware, prior to today, do you recall that I asked you to obtain plat maps for other areas around the mine site, and we put them in our exhibit list?
A I do recall that.
MR. LEWIS: And for the record, those plat maps are in Intervenor Exhibit Number 397.
Q And then, Mr. Ware, I also asked you, I believe, to then show and depict on a map of the area where Kennecott's property is in relation to other properties owned by some of the Petitioners or members of the Petitioners. And did you prepare that --

A I did prepare that map.
Q -- exhibit as well? Okay. Is that the exhibit we just referred to, Exhibit 610, Mr. Ware?
A That's correct.
Q And you have depicted there the Kennecott property. What color is that? Use the pointer, please.
A The Kennecott property is this sort of olivey-green box here. That's Kennecott surface title.
Q And then what is the blue color around those green areas?
A The blue color? Are you referring to these (indicating)?
Q Yes.
A That is state surface title.
Q And then you have some orange coloring to the north of there, up near the top of the map?
A That is the southern limits of the Huron Mountain Club as we understand it.
Q And before we go further with the pointer there, could you give us a reference to where the mine orebody is located on that in the green area?
A That's small red mark on the map is the proposed ventilation shaft. That would be the borehole. So the actual orebody sits under the "E" and the "R" and possibly the "A" of the word "minerals" there in the title.
Q And the surface facilities are located where?
A Surface facilities are depicted by this accumulation of red

lines.

Q And you also show the property ownership of Mr. Torreano on this map?

A I do. I believe it is that (indicating) one.

Q And KBIC's parcel that they referred to earlier?

A Again, according to documents that I've seen, it's that (indicating) one.

Q And you also show the relative location of the Yellow Dog group on this map?

A That would be the yellow block at the bottom here.

Q I forget the term.

MR. LEWIS: What is the term of that group, Mr. Wallace?

MR. HAYNES: It's the Yellow Dog Watershed Preserve.

Q And the intersecting black lines on this map are section lines?

A Yes. These small squares here are sections. And as we go out to these large lines, they're townships and ranges.

Q So the intersecting lines are a distance of one mile?

A Correct.

MR. LEWIS: Offer Intervenor's 397 and 610, your Honor.

MR. HAYNES: I don't have an objection to 610. But for 397 can we just perhaps walk through that, rather

than just have the witness say that he prepared it? Just so we're clear what it is in the record.

MR. WALLACE: And I've got a question about 610 when we get to it.

Q What are these materials, Mr. Ware?

JUDGE PATTERSON: Is this 397?

MR. LEWIS: 397, yes, your Honor.

A This is one of the front pages out of the Marquette County Plat Map. This is actually an index map showing various townships. And I believe there's sections and ranges. Township north and range west, so each one of these blocks is a separate township and range.

Q And what do the subsequent pages show?

A The subsequent pages are simply copies of maps up in this area here (indicating) that actually show 40 boundaries and title information as to who owns those 40's or smaller blocks.

Q And is that plat map information the information that you used to locate the property ownership information on Exhibit 610?

A That's correct.

MR. LEWIS: Offer 397, your Honor.

MR. HAYNES: Your Honor, could I have a bit of voir dire?

JUDGE PATTERSON: Sure.

MR. HAYNES: Mr. Ware, I'm Jeff Haynes. I represent the National Wildlife Federation and the Yellow Dog Watershed Preserve.

VOIR DIRE EXAMINATION

BY MR. HAYNES:

Q For proposed Exhibit 397, what's the date of the plat map that you used?

A This was the latest edition of the publicly available plat book. I believe it's 2006.

MR. HAYNES: I don't object to 397. I want to amend my statement as to 610. Could we go to that, please? Because I want to voir dire the witness on that.

MR. LEWIS: We'll bring it up.

MR. HAYNES: Thank you.

Q Mr. Ware, on proposed Exhibit -- Kennecott Exhibit 610, you've shown -- you compiled this exhibit, did you not?

A That's correct.

Q From the plat maps; correct?

A Correct.

Q And then you superimposed on this the areas for the surface facilities for the proposed mine; correct?

A That's correct.

Q And that's shown in the red squiggles --

A Uh-huh (affirmative), that's correct.

Q -- next to the writing "State of Michigan"; correct?

A That's correct.
Q And we see the -- I guess it's a 160-acre area that you've put on this map that is shown for the Yellow Dog Watershed Preserve. Do you see that?
A That's correct.
Q And there appears to be -- I think it's a red line that trends sort of east to west, that goes through the Yellow Dog property. What is that red line supposed to represent?
A That red line was a depiction of a -- I believe it was either a surface or a groundwater boundary.
Q And what is that derived from?
A That would probably be better directed to Mr. Wozniewicz one of our further witnesses.
Q Oh, I see. You didn't put the red line on it?
A I didn't put the red line. I put the land information on the map.
Q All right.

MR. HAYNES: I don't have an objection to proposed Kennecott Exhibit 610, except for the red line, through this witness. Because he testified he didn't put it on there; he has no idea what it's there -- how it got there. Well, I'm sorry. He drew it, but he doesn't understand the basis for that red line being there.

JUDGE PATTERSON: Okay.

MR. WALLACE: And that's Huron Club's position as

well.

MR. REICHEL: No objection.

JUDGE PATTERSON: With that caveat both 397 and 610 will be admitted.

(Intervenor Exhibits 397 and 610 received)

DIRECT EXAMINATION

BY MR. LEWIS: (continued)

Q Mr. Ware, before we move on to more view of technical issues, again, in your capacity as mineral title and surface title database management -- or with that job duty, are you also aware that some of the Kennecott-owned property that you just described has been in the Commercial Forest Act?

A Yes.

Q And is some of that property -- or can you -- have you -- are you aware as to portions of the property which are no longer in the Commercial Forest Act?

A Yes, I am.

Q And do you have knowledge as to property that will be removed from the Commercial Forest Act?

A There are pending applications, yes, for removal.

Q And in terms of this Commercial Forest Act, can you tell us what that means when that's applied to property ownership?

A The Commercial Forest Act is essentially a tax break for landowners, surface title owners, that allows public access to their title.

Q Public access for what purposes?
A Recreational purposes, hunting, fishing.
Q And have you also prepared a map depicting -- as to the Kennecott-owned property that we talked about in Exhibit 10, have you prepared another figure illustrating the portions of the Kennecott surface-owned property which either has been or is in the process of being removed from Commercial Forest Act?
A I have.
Q And does the illustration you prepared accurately depict that property?
A It does.
MR. LEWIS: I'd like to show Exhibit -- Intervenor Exhibit 13, please.
Q Could you explain what this exhibit shows in relation to Kennecott's total surface property ownership here and show us the area that either has been or is in the process of being removed from the Commercial Forest Act?
MR. HAYNES: I'm sorry to interrupt. Maybe I misheard. This is Intervenor -- Kennecott proposed 613?
MR. LEWIS: Yes.
MR. HAYNES: I heard "13." I apologize.
MR. LEWIS: I probably said that.
JUDGE PATTERSON: I did too.
MR. LEWIS: 613. Thank you.

Q Again the question is, Mr. Ware, could you tell us how you depicted on this map, in relation to the Kennecott surface-owned property, that portion of the Kennecott property which either has been or is in the process of being removed from the Commercial Forest Act?

A The property that has been or is in the process of being removed from the Commercial Forest Act is included within this polygon, this black-line polygon. And each 40 has a black dot on it. So it's this (indicating) area here. The surface owned by Kennecott outside of it is still in CFA.

Q And could you show us on this map -- locate us again as to where the orebody is?

A The orebody sits right in there (indicating).

Q And the surface facilities?

A Again, the accumulation of red lines on this diagram is the main infrastructure. And this (indicating) is the vent shaft.

Q And it's hard to see on this illustration, but could you -- there is a blue line on here depicting the Salmon Trout River?

A It is very hard to see. Trace of the Salmon trap and associated wetlands basically goes up through here (indicating).

MR. LEWIS: I want to offer this exhibit. I'll say it has another red-line problem like Mr. Haynes pointed

out as to the earlier exhibit. And we're not offering it as to any relevance to the red line. And we would offer it subject to any accuracy or relevance of the red squiggly line at the bottom. And I offer Intervenor Exhibit 613 on that basis.

MR. HAYNES: No objection on that basis.

MR. WALLACE: I'm probably the only one in the room that doesn't understand this, but what is the relevance of coming out of the CFA?

MR. LEWIS: There will be no rights of public access to any of that property outlined in the heavy dark line.

MR. WALLACE: With that explanation I have no objection.

MR. REICHEL: No objection.

MR. EGGAN: No objection on the Part 31 matter, either, your Honor.

JUDGE PATTERSON: There being no objections, Intervenor 613 will be admitted.

(Intervenor'S Exhibit 613 received)

Q Mr. Ware, I want to turn to the discussion about the data that you collect as part of your responsibilities in relation to the Eagle Project. And earlier I think you referred to the following categories of data collection: geological, geotechnical geochemical, metallurgical,

geophysical, petro physical data collection. So I want to ask you now, to whom is this data disseminated, Mr. Ware, and for what purposes?

A Well, that list of data that you just outlined is disseminated to various consultants. For example, Golder will obtain geotechnical and geological data in their analysis of the ground pillar. Golder will also obtain the data for their analysis of groundwater modeling. Data is sent to McIntosh who do the mine design. Data is distributed to people who are doing ARD kinetic static testing. Data is distributed to internal groups within Kennecott for ore deposit modeling resource and reserves, geophysical modeling centers. Data is distributed to people who are doing the baseline environmental work, just in terms of geochemistry. It's a wide-ranging list.

Q And is that data that you just summarized referenced in the various reports that are included in the mine application permit materials?

A Yes, it is.

Q And does that include the Golder Reports that have been discussed earlier, which are in Intervenor Exhibit Number 2 and we've referred to earlier as Appendices C-2 and C-3?

A The data is in there.

Q And does it also -- does that data -- is that data also used for subsequent reporting by Golder as to the Eagle crown

pillar stability?

A That's correct.

Q This is what's marked as Intervenor Exhibit 269, Mr. Ware. Can you explain what this data is?

A That is a section of a geotechnical database that probably would have been forwarded to Golder on the groundwater modeling.

Q Is that was their purposes in their groundwater modeling?

A That form, part of it, definitely.

Q And is this information an accurate representation of the drilling information that you collected?

A That is an accurate representation of part of the drilling information, yes.

Q And Intervenor Exhibits 269 through, Mr. Ware, is that also drill hole data that was provided to Golder Associates in connection with their hydrogeology studies?

A It is.

Q And can you vouch for the accuracy of the data that's reflected in those Intervenor Exhibits 269 through 302?

A I can.

MR. LEWIS: We offer Intervenor Exhibits 269 through 302.

MR. HAYNES: May I voir dire the witness on the exhibits?

JUDGE PATTERSON: Yeah, sure.

VOIR DIRE EXAMINATION

BY MR. HAYNES:

Q Mr. Ware, looking at 269, this exhibit appears to relate to hole 47; is that correct?

A That is correct.

Q And I'm not a really technical kind of guy, but isn't this data presented in a comma delimited form?

A That is correct; a CSV file.

Q When you say a CSV file, what do you mean by that?

A That's a standard format for dumping data in a very small file.

Q I see. And I take it that the legend across the top here are abbreviations of the various types of data that are collected in this document; is that correct?

A That's correct.

Q And those all mean something, don't they?

A They do.

MR. HAYNES: Your Honor, we just had an offer of about, by my count, 33 or 34 exhibits, and I believe not all of them look like this (indicating). Perhaps, if we could, go through them one at a time so that we can have an explanation as to what they are and what they stand for and what the abbreviations are 'cause I'm not willing to admit -- I'll object to those exhibits to the extent that they're different than this (indicating) one and they

portray different information. I mean, I've looked at those, and they deal with five different holes. They have about six or seven different types of data in them. And some of them are -- some of them look like this (indicating) page. Some have one line. Some six lines of data in them. And rather than having a group exhibit, I think we need to go through them one at a time.

MR. LEWIS: I'm not opposed to that in principle, but I think there's been a foundation laid that, number one, they accurately -- they accurately reflect the drill core information, and, number two, that this is information sent to and used by Golder for various of their reporting. And think that's sufficient foundation to offer these exhibits now. As Mr. Haynes indicated, he has, in fact, looked at these various exhibits. He knows that they represent a series of data. And it strikes me that if he has other questions such as the ones he's posing, that could be reserved for cross-exam and --

MR. HAYNES: Well, I guess I can reserve my objection 'til cross-examination, but I'm not going to stipulate to their admission now.

JUDGE PATTERSON: I can understand that, stipulation to what --

MR. HAYNES: Like I said, we've got 30-some exhibits.

JUDGE PATTERSON: Right.

MR. HAYNES: And they are in different formats and different labels, and they are not all the same as this, so --

MR. LEWIS: We can go through them, your Honor.

JUDGE PATTERSON: Okay. I really don't know what that depicts, if somebody can explain that to me.

MR. HAYNES: I'm sorry, your Honor. I didn't --

JUDGE PATTERSON: It's apparently core data, but I'm not sure what it -- what it shows, if somebody can explain that.

MR. LEWIS: We'll go through it.

JUDGE PATTERSON: Okay.

DIRECT EXAMINATION

BY MR. LEWIS: (continued)

Q Can you explain the kind of data shown in this Exhibit 269, Mr. Ware?

A Yes. That is cemented joint data from hole 47.

Q And briefly, what is cemented joint hole data?

A These are records generated on cemented joints observed within drill hole 47. A cemented joint is one of the variables that we use to define certain features within drill core.

Q And is that data that Golder used in its analysis?

A I dump the entire data for hole 47 as per Golder's request.

Q We'll look at --

MR. LEWIS: Well, offer Exhibit 269.

MR. WALLACE: Well, I don't care when we do this, but at some point before I decide whether to object or not I want to know, you know, what's being shown here. I have no idea.

JUDGE PATTERSON: Yeah, I don't either. That's what I was --

MR. WALLACE: And so I can do it later, but I'd like this witness to go across the lines and tell us what each entry means for a line or two.

MR. LEWIS: Well, that's fine.

Q Would you do that, Mr. Ware? Read the line -- couple lines and explain what the data is?

A The header on the file is a series of variables. Starting from left obviously is a hole ID, project code. "Geological From" and "Geological To" is just the distance down the hole of a start of an interval and the end of an interval.

MR. HAYNES: I'm sorry to interrupt. I think it would be helpful if the witness, when he is describing the headings, to describe the number, perhaps, on the first line that the heading relates to.

A "Hole ID" refers to the hole number. "Project Code" refers to the project. In this case it's Eagle. "Geological From/To (sic)," in this case it's 16.46 meters. "Geological

To" is 18.29 meters. "Priority" is a number that's generated by the computer. It's just a count in that interval. "Cardinal" is a feature relating to orientated core, the orientation of that joint in space. "Add Date" is the date of recording. "Closed Joint Alpha" -- and these are measures here (indicating) -- is again a measure of the angle of the fracture to the core axis. So we're actually measuring alpha there. "Closed Joint Beta," that's a measurement you make when the core is orientated. You're actually measuring the bottom of the fracture ellipse, so if you have a piece of core and it's got angle, you've got an ellipse on it. So you're measuring the angle between the bottom of the ellipse and the orientation line on the core. "Closed Joint Modify," that's a modifier that we use to -- variously we describe features that we observe on the closed joint. That could be alteration or infill. "Closed Joint Upbound," that's just a way of orientating your measured fractures. "Closed Joint J," I don't know. I'd have to look at a picklist. "Closed Joint I," that's intensity. "NC" -- and I'm sort of skipping across these -- "Joint ID," I *(11:40:00) the picklist. And "Closed Joint Roughness" and "Closed Joint Estimate," that would be another one I'd have to get off the picklist. This is basically a table describing closed joints and their attributes.

BY MR. WALLACE:

Q And what are closed joints?

A Closed joints is when you retrieve core and you notice a feature in the core that's not broken. That's classified as a closed joint. If the material in that joint actually goes all the way around the core or penetrates the entire core, it's classified as a closed joint.

Q So each one of these describes the piece of core that was taken out of that length?

A Each one of those describes each -- I just use the word "closed joint." I should have used "cemented joint." Each one of these measurements -- each single line would describe a single point, a single feature within the core.

Q Okay. So taking our first line, what do we learn about where this came from? The 1646 is meters, is it?

A Yeah. That's from, to, and this (indicating) is joint depth.

Q And what does that -- 1646 tells us what? From what where?

A That's the start of the run. It would be a depth of 16.46 meters down the hole.

Q Okay. That's the distance below the surface?

A That's correct.

Q Okay. It doesn't relate to elevation?

A Yeah, it does not relate to elevation.

Q So we don't know the elevation of this from looking at this. We only know that it was 16 meters -- is it meters?
A Yeah. This is downhole data.
Q Okay. Downhole data. Okay. And so you went from 16.46 meters below the surface of the earth wherever the drillers were standing, --
A Depending on what the --
Q -- okay -- to 18.29 meters below --
A That's correct.
Q -- for not quite 2 meters worth of core?
A That's correct.
Q Okay. And then can we tell what the orientation is, the CJ Alpha and CJ Beta? Can you tell?
A From that geological date --
(Witness reviews document)
Q I mean, in terms of east to west or --
A Well, this is the actual data down the hole. The hole as an azimuth --
Q Right.
A -- and a dip. That information is kept in a separate table. So when you want to calculate true location in 3-dimensional space, you need that other table to recalculate these. Once you recalculate that, you know the true orientation of the cemented joint.
Q But this is -- CJ Alpha and CJ Beta is part of that

information; right?

A Correct.

Q And which part of it is it? What's it telling us?

A Alpha is typically a measure of the angle of the fracture to the axis of the core. Now, an orientated core, you try to orientate all your core. If you can't orientate it, you can only get CJ Alpha. Okay? If you can orientate it, you can start measuring CJ Beta which is a measure of the bottom of the ellipse of the cemented joint around to the orientation line on the core. And using that data and a separate table with the drill hole location and azimuth and dip, you can locate the true orientation of that feature in space.

Q So do you know what feature in this first core that we're talking about is being described here? Is it a --

A First line, the feature is at 16.62 meters depth. It has a -- it's classified as a SRP fracture which is serpentinite. And the -- all I can tell because the core wasn't orientated is what the alpha angle was and that would be 10 degrees.

Q Okay. So at an angle of 10 degrees to something, there's a serpentine fracture --

A That's correct.

Q -- running through this piece?

A Uh-huh (affirmative).

Q And then the modifier, what's that?

A The modifier in this case -- I'll have to go back to --

(Witness reviews exhibit)

A They don't have a modifier in that particular case. They're just classifying it as serpentinite. The modifier will typically relate to other features in a picklist.

Q And what are the 1's and 0's at the last number? What's the 1?

A Closed joint strength I believe that one is.

Q Strength?

A Yeah. Again --

Q Measured on what kind of scale?

A That's a measurement of if the core will break if you drop it; how many times you have to drop it to break it.

Q And does -- is there a name for this scale? Can we go look it up and they'll have 1's strong or weak or what?

A I believe we have that in an exhibit. I think time goes 1, 2, 3 -- 0, 1, 2, 3.

Q Okay. 0 being the weakest?

A That would be correct.

MR. LEWIS: Your Honor, I think we're abusing the voir dire process.

MR. WALLACE: I've got about two more questions and then --

MR. LEWIS: All right.

MR. WALLACE: Okay.

MR. HAYNES: And then I have some follow-up after that.

JUDGE PATTERSON: I was hoping you'd figure out what's going on, so --

Q Are we going to be provided with a key so we'll know what kind of fracture is shown in each one of these. The serpentine you explained, but what about CC and -- I guess they're all either serpentine or CC. What's CC?

A Calcite.

Q Hm?

A Calcite.

Q Calcite?

A Uh-huh (affirmative).

Q And is that -- that's what the fracture consists of? It's a kind of material; right?

A It's in the cemented joint, yes.

Q It's in the cemented joint. And it's a weak -- would this calcite -- is it out -- where there's calcite, that's the reason for the weakness then?

A It would be measured. Each joint is different.

MR. WALLACE: Okay. Well subject to being provided with the key to the description of the fractures, serpentine, CC or whatever other codes are used and the strength scale, what the unit measurement of that is and so forth, I don't have an objection.

MR. HAYNES: Your Honor, I have some follow-up voir dire.

VOIR DIRE EXAMINATION

BY MR. HAYNES:

Q Mr. Ware, did you prepare this table?

A The data was collected by geologists. I requested a data dump.

Q Okay. So you didn't actually collect the data that's shown on this exhibit, did you?

A That's correct.

Q Other people did?

A That's correct.

Q From the data, did you take that data and put it in some sort of a -- in a chart or a piece of paper or in a computer somewhere, or did someone else do that?

A This came out of the computer.

Q That wasn't my question. The data that was collected by the geologists which apparently is shown on this table, did you take that data and physically do something with it? Did you enter it into a computer? Did you write it down on something? Did you do anything with the data?

A That's a download of the data from that table from our database. That's it.

Q Let me ask the question again because you answered it the same way both times that I asked the question. The data

that was collected by the geologists that is asserted to be shown on this table, you didn't take the data that they collected and put it into some system or some piece of paper somewhere, did you?

A No.

Q All you did, then, was take the data collected by others and entered or input by others and then print it or to dump it to either Golder or Kennecott in -- where? -- Vancouver; is that correct?

A Calgary, I believe it would have been.

Q Calgary. All right. So you actually can't vouch for the data that's shown here, can you, that it's accurate?

A We have quality control procedures to ensure accuracy as best as possible.

Q I understand that. But you don't know whether or not the data that's shown on this exhibit is, in fact, accurate, that it was accurate transcribed by the geologist, that it was accurately input by someone else. You can't testify to that, can you?

A I'll repeat that we have QC procedures for that.

Q Okay. But, again, I'm going to ask the question again: You cannot testify whether or not this data collected by others and input by others is accurate.

A In the absence of checking 350,000 data points personally, no, I can't.

MR. HAYNES: Your Honor, I object. I don't think there's been a proper foundation laid for this witness to testify to this data. We don't have the geologists. We don't have the people who input the data. We don't even have the -- if there were any sort of procedures that were used to input the data, we don't know what those are. And as Mr. Wallace pointed out, we don't know -- we have a series of numbers and abbreviations and we don't have an index for any of that. So the series of comma delimited entries is incomprehensible without that back up, so there's been no foundation laid.

MR. LEWIS: The level of personal participation of Mr. Ware apparently required by Mr. Haynes is certainly required for sufficiency of the foundation for this data. This witness I believe has laid a very sufficient foundation for both the authenticity and accuracy of this data, your Honor, and the relevance. And I think it ought to be admitted.

JUDGE PATTERSON: I assume somewhere during your case the geologists are going to --

MR. LEWIS: Mr. Ware is our geologist.

JUDGE PATTERSON: Oh.

MR. LEWIS: And we will talk further in the case about his roles and responsibilities in the collection of this data. Now, I've already done that to some extent, but

we can defer some of this until later too. That might be appropriate, come back to this data exhibit anticipating that I'm going to have three or four attorneys asking -- spending a long time with questions under the auspices of conducting voir dire beyond what is necessary for foundation to offer this data, but if it would -- we can defer that pending further description of Mr. Ware's description of his responsibilities and his -- what he does in reference to collection of this data.

JUDGE PATTERSON: Okay. Why don't we do that?

MR. LEWIS: All right.

JUDGE PATTERSON: Would this be a good time to break for lunch? It's almost noon.

(Off the record)

JUDGE PATTERSON: Okay.

MR. LEWIS: Your Honor, I'm going to -- the exhibits we were just talking about at some length, I'm going to -- before I come back to those, I'm going to go to a description -- more detailed description of the core logging procedures used, and then I'll come back later to those exhibits, is I don't neglect to do so.

JUDGE PATTERSON: All right.

DIRECT EXAMINATION

BY MR. LEWIS: (continued)

Q Mr. Ware, is there, in fact, a standard protocol used by

Kennecott for logging of the core and for acquiring the data that we were looking at in the Exhibit 269 earlier?

A Yes, there is a standard protocol that was developed with help from an outside consulting agency, SRK. That was back in 2001, 2002. Essentially the program was put together for the expressed purpose of standardizing the collection of geotechnical and geological data. In fact, the protocol document covers all aspects of data collection aside from geophysics.

Q I'm showing you what's been marked as Intervenor Exhibit 303, Mr. Ware. Is that the protocol you just referred to?

A That's correct.

Q And what's depicted on the front of that document, the photograph?

A Top left actually is a drill rig located just to the north of the Salmon Trout. That was actually hole 202, radio 202, which was the discovery hole. The top right was first loading facility. This was when the program was still considered an exploration program or project. You can see fairly rudimentary logging facilities. Bottom left we decided at that point around 2002, 2003 that we needed a much better facility, so we moved back into Negaunee and set up a logging facility which allowed for much greater through put. We increased the staff and computerized all the data entry. That's actually showing two gentlemen logging core.

You can see that they're entering the data into a tablet. Within that tablet there are access database tables in which the geologist has the ability to describe features as they pertain geology, geotech, et cetera, et cetera. You can see the core laid out on the table. And they will move down that core logging the data as they go. If the core is iron tighted -- you can see a Vrail right here, which is simply a piece of angle iron. That's stretches the length of these tables both sides and there's another table over there and there's two more tables on the other side of the building. If the cores are in tighted, the geologist will physically pull the core out of the boxes and load that core onto the V rail piecing it back together. And if there's an orientation line from core, they will orient it. Once that's done, they can begin logging. That pretty much describes that picture.

Q Okay. Could you get back to the reduced page? If you would, Mr. Ware, take us through some of this protocol document and with particular reference to how the data is collected that's reflected in the Intervenor Exhibits 269 through 302 and highlight in this document where the various fields that are shown in those data exhibits are discussed and where the discussion is as to how that data is to be entered in those fields.

MR. HAYNES: Your Honor, before the witness begins

this exploration of this document, I note that proposed Kennecott Exhibit 303 says on its face page prepared by Steven Coombes. Mr. Coombes has not been listed as a witness in this case. Apparently -- if you look at this exhibit, each page has a box on the bottom of the page indicating that Mr. Coombes prepared -- or wrote this exhibit. And so for this witness to then take a document prepared by Mr. Coombes and then describe what's in the document is improper. And I object to its use for that purpose.

MR. LEWIS: This document -- Mr. Ware has identified this document as a protocol followed by Eagle during the core logging. I submit that the author of the document is not relevant to the necessary foundation.

MR. HAYNES: Well, it's entirely relevant, your Honor. Because it was prepared someone who actually was listed -- is listed as a witness but not in the current witness lest -- Ms. Coombes -- who also prepared one of the appendices to the application. And the document itself is 51 pages long. It contains charts, data, explanations and so on. And I think, if we're going to have someone explain the document, it ought to be the author of the document.

JUDGE PATTERSON: Well, if Mr. Ware utilizes this procedure in the normal course of business, I don't know why he couldn't testify to it. But I'm not sure we have a full

foundation for that yet. I'm assuming he used it. But, Mr. Lewis, if you could pursue that.

MR. LEWIS: Sure.

Q Is this, in fact, the protocol followed by you and your engineers in collecting and reporting the data?

A This is the protocol used by us.

MR. LEWIS: Offer Intervenor Exhibit 303, your Honor.

MR. HAYNES: Your Honor, I'll object for the reasons previously stated.

JUDGE PATTERSON: I am going to admit it based on the fact that Mr. Ware, as a project manager, utilized this procedure.

(Intervenor's Exhibit 303 received)

Q And again could you walk us through this, Mr. Ware, in light of the objections made earlier to the exhibits with the data with particular reference to those sections of this report which addressed how that data is reported in various fields that we were talking about earlier in reference to Exhibit 269?

A Exhibit 269 contains data for five drill holes. Each of those drill holes has a separate subset of data. And we were to turn to page 15 of this particular document, there is a summary as to what each of those tables contains in terms of data. So in this -- bullets on the bottom of that

page, we can see some of it starts up with -- it says, "Geotech Table (tbl Geotech)." That is one of the databases that is found in Exhibit 269 as it pertains to five different drill holes. That is the main geotech recording table. Under that you can see the individual fields which the geologists are required to fill out for each interval of the dill hole. We can move down that and go into that more detail. But as you move down that list, you can see Open Joints Table (tblOpen Joints). That described open joints within the core. It's a separate table. If we flip to page 16, you'll see the title "Cemented Joint Table (tblCemented Joints)." And again that there's one, two, three, four, five, six separate data entry points in that table before you get to the "Major Structures Table," which is (tblMajor Structures. Moving down the list there's a table Point Load Test, and that's another separate database. So essentially that's a summary. The question was as to the significance of the abbreviations on top of one of the common delimited data sets. If we move to page 17, our back table there is an actual description of the significance of each one of those abbreviations in the geotechnical logging field, which would be Table Geotech. I can run through them one by one if required.

Q Are all the abbreviations used or referred to in the prior Exhibit 269 that we were looking at? Are those referenced

in this data?

A They will pop up on that data table from 269.

Q And again a description for the various headings we were looking at earlier in the exhibit, there's a corresponding explanation for what those terms are?

A That's correct. For a geotechnical logging form, you can see there's approximately 20-plus fields. And I will run through this one. In the left-hand column you have the field name, data type and on the right-hand side it is a brief description of what that field pertains to. ID, as we discussed earlier -- ID is just a record number. That is consistent throughout the entire database. It assigns a number to each interval logged. Then the "Hole ID" which is the hole number, we were previously looking at 04EA047, I believe. That would be typed in there. "Rock Type ID" is a number. "Rock Type" is a text. "From" again that's the top of the interval as it's drilled down the hole. And "To" is the bottom of the interval on that particular section. That's a from/to. "Run" is the actual drilled run as according to the blocks in the box. That's -- there's blocks in the box inserted by the driller on the drill rig as they retrieve the core. They will record how far they drilled forward. They know what the last run was or where it stopped. And at the end of the next one, they'll put a block in as to how far they drilled. "TRC" is total core

recovery. We get back to the comment I made earlier regards piecing the core back together. And you physically measure how much core was recovered from that run. "NONSRC" (sic), there's two entry points here. You can see NONSRC and NONRQD and SRC in between them. They refer to the RQD data that we collect. NONSRC, you can measure it two ways. You can measure the pieces greater than 10 centimeters or you can measure all the pieces of intervals less than 10 centimeters. So you've got an option to do that. RQD, length greater than 10 centimeters, you're actually adding it all up there. "MAGSUS" is a petrophysical measurement on the core. That tells you how magnetic the core is. We use that in -- for some of our modeling forward or if we're trying to determine if there's additional resources. We'll have a pretty good idea of how magnetic that material is. And that pops up in the geophysical interpretation of the area. Intact rock strength, that's the estimate of the intact rock strength obviously. Open joints is a count of the number of open joints. CJ is the number of cemented joints. OJN is open joint set count. If you have multiple joints with similar orientations, those orientations, if you have two joints like that and two joints like that, then you'd say you have two joint sets in there. They have to have different orientations. Then you do exactly the same thing for the cemented joint depending on if there's one

like that in the cemented and there's one like in the cemented, then you have two cemented joint sets. Open fracture is a count of open fractures in the rock. Open joints and open fractures are different. Open fractures, you have to be very careful to try and count only natural open fractures. And to count that -- well, to make sure we're getting that right, the drillers on the rig, when they retrieve the core from the core barrel, sometimes have ave to have to push it or tap it and will physically break the core to fit in the box. So each time they do that -- each time they physically break the core, they'll mark it with a red cross so, when it comes back to the loading facility, we know that that's an induced break and not a natural fracture. Micro defect intensity, that's an estimate of very fine fissures which aren't broken. They may not go all the way across the core. Micro defect strength, that's again an estimate of the strength or those fissures. So 27 disseminated core pieces, that's the sum of core grade in 27 meters, 30 meters and some are corrugated in 30 centimeters. Longest piece is simply the longest piece in that run. And then in memo, that's a text field where you can general comments as you see fit concerning pieces of the core. You may include your comments to the long runs or you may include comments as to a broken end on one of the runs which may induce -- may signify that the driller had a problem

getting the core out of the core barrel and the core was broken. Log date is a date and time. Logger name, the name of the person logging the core. And logger ID, that's again basically a repetition of the other one, logger name. That's the geotechnical logging form. That was one of the tables brought up in Exhibit 269.

I can move on to open joint data. At this point it's worthwhile going to page 18. And we can see the format in which this data is entered. If you just blow up that little table on the bottom. You can see that -- on this screen shot, you have an open joint data set which is shown on -- signified by the tab on the top. So when the geologist is actually entering the data, the computer is forcing him to enter -- or enter each of those boxes and write something. And if there's no applicable data to that, they still have to enter that box before they can move on to the next one. As you can see, cemented joints is just behind that and major structures sits behind that. So we'll go on to the next page.

And if you can blow up the top part. This is the open joint pit essentially. Record ID, that is tied into the interval where it's drilled. So your record ID for your open joint database or your geotech database or your cemented joint or open joint, that ID is going to ensure that the data from all these tables can be joined together.

So you have cemented joints, open joints, geotech all relating to that individual ID. Hole ID obviously is hole again. From/to, I think that's fairly well explained. It's the distance down the hole. Open joint roughness, that is a measure of what the joint actually looks like from extremely rough with a very sharp angular surfaces to -- the ultimate would be zero, which would be plane or smooth. Again these are picklists. The geologist can't make up his own interpretation of that. The computer tells him it has to be a selection of one of these numbers. OJA is wall alteration. If you note in the alteration around the open fracture you write that down. That requires the use of a hand lens generally, a scratcher to see what sort of hardness that material has. OJI is infill. Sometimes joints will have a little bit of infill and maybe a little bit of calcite, could be a little bit of clay. Again there's a picklist from which you can select data that describes that infill and enter it in there. Temp is just a temporary fill. Cardinal is just a number filled. Number of open joints in a set, so we go back to that concept of having multiple joint sets. So here you're actually saying, "I have a joint set with this orientation down the core. How many joints have that orientation?" And that number is recorded. Open joint depth, that's a point down the core. You measure from the block to that open joint. And it's not

a from/to. It's an actual depth. Beta angle, we've discussed that before. That's the measure of the distance from the lowest point on the ellipse of the core around to the orientation line. Ellipse end UD, again that's measured down the hole. Oriented, yes or no. Open joint date, that's open joint modify date. They're just time stamps on the recording date of that data.

Moving on to cemented joints, again we can blow up that top part there.

Q What page, Mr. Ware?

A The next page, page 20. Cemented joint data that you can record, again hole ID we've mentioned. ID is the exact record number. Depth from, depth to. Cemented joint ID, you're actually recording an alphanumeric in that field. It's a joint qualifying number. CJ alpha, that's very similar to the -- well, it's exactly same as the alpha number. It's the angle between the axis of the core and the joint itself. CJR joint infill, there's a picklist for that. CJS is an estimate of joint strength. CJR is an estimate of joint roughness. Number of cemented joints at depth is CJN. That's at a particular point. Depth of cemented joint. Beta angle, that's and oriented core. Obviously you have a cemented joint, and you're measuring from the bottom part of the ellipse on the core around to the orientation line. Is the ellipse up or down? And that

depends how far away you are from the line. That's just an up/down measure. So if you're on one side of the orientation line within 180 degrees it's up. On the other side, you're down. Is the core oriented? And the last two are time and date stamps.

Moving on the major structure table, it's the next page, page 21. Major structure table is used when there's significance structural disruption within the core. Typically the geologist will move through this table when he identifies something that he considers is a major structure. Generally is a feature that is greater than 1 meter in width down the core. Going through the fields again, hole ID, again that's the same unique identifying number for that particular interval. Hole ID is the hole number, hole name. Depth meters, length meters, that would be to the midpoint of the feature. Quality of structure, there's a picklist to that. If you have a large joint of loose rock that just came out of the core and you have no chance of putting it back together, that would be a poor quality. If you have -- a significant could also be a large calcite cemented joint. That would be good. And it may be intact. So level intact all goes into that quality of the structure. Fractures per meter, again if you're in a broken zone, you will count those and that will give you some indication of the intensity of the structure. Date, time is the stamp again,

the logger and the geologist here can actually put in some commentary on that structure.

I think the last one is the point load table, if we can blow that up. Again those are your data entry screen as it would pop up. And below that you have the point load abbreviations and text fields in which you can enter data. ID, we've mentioned that, hole ID, hole number, depth. Pressure is the number that you read off the digital gauge that comes out in kilonewtons. That's recorded. The rock type, as you log it, that's the rock type you put in there. Orientation to plane of weakness, that's any plane of weakness when you point load it. They will break hopefully across the core. You can measure that orientation. If it's fair area, if the core doesn't break completely or only partially, then the logger has to note that. Sample width is the length of the sample. We do axial and diametral tests. Date of test, obvious. Logger, name of the person. And additional comments in that field there. I believe that covers the five tables that were presented in 269 for those holes.

JUDGE PATTERSON: Can you explain to me what an open and cemented joint is or are?

THE WITNESS: A cemented joint is intact. When you drill a hole, the core will come out and it's cemented. It's a fracture that has an infill that's different from the

rock around it.

JUDGE PATTERSON: Okay. An open joint is?

THE WITNESS: An open joint can be a completely clean break. Sometimes it's a break with no infill, so there's differences in the way you want to characterize the --

JUDGE PATTERSON: So a joint refers to an interface between different types of rock?

THE WITNESS: No, not necessarily. You can have a joint within one type of rock. It could be a vein, it could be a structure. It could be something 1 millimeter thick. It could be 5 millimeters thick. It's basically something that has infill in it, a cemented joint, cement being the material that's inside the fracture.

JUDGE PATTERSON: Okay.

THE WITNESS: Or the feature, I should say.

Q Is an open joint that same as a cemented joint?

A No. We classify them differently. We have two tables for that. An open joint truly is a break within the core. Open fracture -- you have open fracture -- that's one set. And you have open joints and cemented joints. The cemented joints are intact. But open joints are cemented joints that have been broken in the process of drilling. So you still log those as separate features.

Q Mr. Ware, in addition to the descriptions you've just gone

through for the various data in these Exhibits 269 through 302, is there additional test discussion and explanation about this data in Exhibit 303?

A Indeed there is.

Q Okay. I'm not asking you to go through that. I just wanted to explain that. And if we go back to -- before we do that, could you explain how the procedures for collecting this data and inputting this data that you've just talked about are standardized?

A The geologist logging onto the tablet, they have an option of picking data from a picklist. Now, if they consider a joint roughness, there is some interpretation of that. But the geologist still has to pick a number from a list. And that list is common to every geologist logging the core. We definitely try to run through core together. And that's part of our QA/QC program. We'll have two people logging the same core for one side of those tables. So that is an attempt to make sure that the geologists are actually recording data that is comparable between the two geologists. So say a joint has a roughness of 5, hopefully they'll both say 5. If one says 5, one says 6, then that's pretty good. If one says 0 and one says 10, then that's not going to work. So that's an ongoing attempt to ensure consistency within the data collection procedures. Once the data is collected, typically the data will go through a --

we call it a wash. You go through, you check all the from/to's. You make sure that all the data is consistent between the tables. The computer actually does most of that, but there's still some things that will sneak through. And we have to correct those post data recording. But that's done on every hole. That's just standard practice.

Q Could you characterize the -- or explain the training that is required to do that?

A We had a group of people come through typically from associate university professors, Ph.D. geologist to tech graduates. One thing we do -- and we always start out the same way -- is we have one of those people logging with the most experienced person. And then get through with them, and they log the core together. Typically someone starting out will just be measuring one feature, let's call it open joints. And they'll go through and they'll open joints with an experienced person. And that way that experience is transferred down. And more importantly -- just importantly the consistency is transferred down to the new hire. We don't throw a new hire in here to do all of this. They'll do it step by step making sure they get each one of those for each one of those tables fully understood and they can differentiate between the different features of how to classify a cemented joint, how to classify an open joint. So it's a training program essentially to ensure consistency

as the program advances.

Q And what are the quality control elements of the procedures?

A Well, the quality control elements truly do revolve around duplicating logging data. So we'll log a whole table side. That would typically be 200 feet. Then we'll have someone else do it 200 feet. Then we compare the databases. And that's just a test as to see -- to see how close the two are getting. And again some of the data is subjective. But we try and remove that just by using picklists. Again how to classify roughness of a joint, there is some -- there is some room there for people to make a decision by themselves. The computer can't do it all.

Q And would you explain again your involvement with this geotechnical logging program?

A My involvement is actually contracting people to conduct this work. We have a group of people that we use often. They're a company out of Tucson and Iron Mountain actually. They're experienced geotechnical loggers. One of their main programs is go to around to all mine sites, review databases and log them geotechnically and geologically to produce an updated new interpretation. We use those guys extensively. Typically we'll bring them in, and I'll go through with them down the core holes. And we'll re-log it. We'll do that with a new hire. We'll do that with somebody who has got two to three years experience. Typically I want to see them

log the core. And I want to see that they're making the right decisions based on the features that they're seeing and recording.

Q And do you have ongoing continuing responsibilities for that geotechnical logging program?

A I do to this day.

Q Now, I wanted to turn back to the exhibits that we were talking about earlier, Intervenor 2609 to 302. For the court's reference and I think as Mr. Haynes knows, those exhibits are a series of repeating sets of data for various holes. So, for instance, Intervenor 269 is represented as Hole 047. And then there's a series of headings; cemented joints, density, geology, geotech and open joints, which are the subsequent exhibits under 269. Then that series repeats for the next hole, the next hole and so forth in that grouping of exhibits. So I believe we've now talked, have we not, Mr. Ware, in reference to Exhibit 303 how the data is collected, how the data is input to the database and how the data is represented on the exhibits for the cemented joints, density, geology, geotech and open joints?

A That's correct.

Q Oh, NPTLD, which is the joint load?

A NPTLD, yeah.

Q Okay. And in addition to Exhibits 269 through 302, Mr. Ware, you have Intervenor Exhibit 598, which was also

provided to Petitioner's counsel. And I believe that's the same kind of data for yet another hole; is that correct?

A I believe that's the geotech title for Hole 84.

Q Okay.

MR. LEWIS: And we would offer those exhibits, your Honor. That would be Intervenor 269 through 302 and Intervenor 598.

MR. HAYNES: Your Honor, I have a somewhat similar objection as before to a couple of these groups of exhibits. And let me just point out for the record before I get to the objection -- the substance of objection that I'm talking about. Kennecott Exhibit 269 through 275 relates to Hole 47. Kennecott Exhibit 276 to 282 relates to Hole 54. Kennecott Exhibit 283 to 289 relate to Hole 73. Kennecott Exhibit 290 to 296 relate to Hole 77. Kennecott 297 through 302 relate to Hole 83. The types of tables in these groups are not the same for each hole. And there are several of this exhibits that have tables that have not been explained in proposed Exhibit 303 -- Kennecott Exhibit 303. And before, I think, you can rule on their admissibility, we have to lay some further foundation as to what those tables represent. And in particular, I don't think in Exhibit 303 we have pointed out what the density table is. That's Kennecott 270 for Hole 47. Nor did we have pointed out the structure table, which is Kennecott Exhibit 275. I

understand the other ones. But I think, before we can have a ruling on those types of tables, we need to have them put up on the screen and explained what they are. Because those particular tables aren't represented, as far as I could find, in Exhibit 303. So that's a foundational objection. And once we get done with that, I may have other objections. But I think we need to start with that first.

JUDGE PATTERSON: One was the structure table and what was the other one?

MR. HAYNES: Well, one was the density table. That's Exhibit 270.

JUDGE PATTERSON: Density.

MR. HAYNES: And then structure, which is 275. And I note just for the record that for Hole 83 we don't have a structure table. And maybe there's a reason for that. But just for those two types of tables, we haven't had an explanation as to what the headings are, what the tables represent, where they were found and so on.

MR. WALLACE: If we're going to lay more foundation, can I add my items to the list here so we can deal with all the points?

JUDGE PATTERSON: Sure.

MR. WALLACE: And I had sort of narrowed my concerns earlier to some abbreviations that were used and asked if there'd be a key for the abbreviations, number one.

And number two, whether there would be an explanation or scale for the rock strength. Because I think this is, you know, really what this information is being offered for ultimately. It has to do with strength as much as anything. And the abbreviations that I was looking for have never showed up here. So I don't know where they are. And they were CC for calcite, it was explained to us. And SRP may be for serpentine. So apparently this protocol book does not have a key to the -- all the abbreviations. And, in fact, the only ones that I thought were particularly of concern and I never saw any scale or explanation for this rock strength starting with 0, 1, 2, 3. That doesn't seem to be in there. So we are still at a loss to be able to understand the contents of these exhibits and what they're going to be argued to me. It's certainly not apparent on the face of them.

My other two points are -- and we're looking right at this. The point load test -- apparently point load test data is going to be here. And there's been extensive evidence already that they didn't follow ASTM protocols for the point load testing. And I don't think that that should go into evidence without a further foundation of propriety. Because the Sainsbury and Wilson Blake testimony was that it was improperly done. And finally all of these holes, I think, are different from the only ones we've ever seen. So

we are now having to take at face value what somebody who has seen these cores says without being able to cross-examine them, because I don't think this gentleman is prepared to talk about the specific cores that are issue here. He says other people will be. So I don't think we'll ever have a foundation to this gentleman for introducing these exhibits for the purpose that I think they're being offered, which is to indicate something about the subsurface integrity.

MR. LEWIS: Well, I thought I might be starting with a discrete list. I could identify from what Mr. Haynes said and we could perhaps, if necessary, talk about those things. Mr. Wallace started out identifying a couple variables. But then it seems to me it went on into arguing about who is right and who is wrong, getting into cross-examination topics, I believe, your Honor, not having to do with the foundational requirements of these exhibits. I would submit, first of all, that I believe we have now explained what these tables are. We've explained what these variables mean. We've explained what the data in these exhibits is. And I believe we've laid sufficient foundation both to authenticate the data and to explain what it is and thirdly that we have explained the relevance of this data to the court. So I would like to -- I think there's sufficient information to admit the exhibits now. If there is not and

there is some specific things we can deal with as far as additional foundation, if required, I would be happy to do so. But I can't deal with a far ranging objection such as Mr. Wallace just put -- just suggested, which again the latter part of that, as I understand it, dealt with cross-examination topics, not -- it does not go to the foundational requirements for the admissibility of these exhibits.

JUDGE PATTERSON: I think we need to address the -- I don't want to use deficiency -- address codes or tables so counsel know what they're dealing with at this point.

MR. LEWIS: All right.

Q Let's start, Mr. Ware, with, Mr. Haynes asked about references to the density table, the discussion of that in Exhibit 303.

A Density measurements, page 31 of that exhibit.

Q And without reading it all, can you explain or summarize the various parts of this portion of the document and what they say about the heading density measurement?

A Under density measurements, we have a system whereby we measure densities in house for KEMC, and we also have a laboratory density measurement. So it's essentially a double-check. The KEMC method uses a specific length of core. The density is calculated through emersion in water

and weight in air. Without reading it all, the less chemics method is weight of sample in air over weight sample in air minus weight of sample in water. It gives SG. We collect density measurements essentially on 10-meter intervals within the mineralized zone. The density measurements go towards the calculation of the ore results and ore reserve.

Q Does that description continue on the next page, Mr. Ware?

A That's a summary of it.

Q Okay. And is that the information -- the density information that's included in the exhibits that we were discussing in the sections labeled "density"?

A That's correct.

Q As to the structure table that Mr. Haynes referred to, is that information referenced in Exhibit 303?

A That is the major structure table. It's just an abbreviation within that exhibit list, I believe. Page 21, major structure data.

Q And would you explain a little bit more how that data is input into the database?

A I can read that again. Again the geologist while logging the core will note certain major structure features. There's major structure features that are able to be recorded in the major structure table. In the exhibit list, it's just a -- it's referred to as hyphen structure, which is an abbreviation. I've previously gone through this.

It's a similar tab within the database. You're recording -- you will recall ID is a specific identifier to each individual core logged. Hole ID is the number of the hole. Hole name, E30 -- E3EA28, for example. Depth in meters, again that's the depth down hole. Length, that is the length of the structure at the level. We talked about quality of the structure previously. Again it could be an intact zone of calcite or serpentinite or whatever filling or it could be a zone of very broken angular core. And they'll knock that down in quality of structure. Fractures per meter within the zone, they're identified as a major range of structure. Date, that's the date of the logging, the logger, the person who logged it. And the comment field with general comments on what they're doing and what they're recording or other observations about that structure. Date and time recording. If there's a modification to that, they'll come up in the MS modify date if they happen to go back to that structure at a later time.

MR. LEWIS: Would you go to the top of that please, please? And pull up just the top paragraph.

Q And that's the introductory paragraph to the table you were just looking at, Mr. Ware?

A That's correct.

Q And it is talking about the major structures data?

A Uh-huh (affirmative).

Q "Yes"?
A Yes.
Q Okay. And I think Mr. Wallace asked about two abbreviations. One was CC. Do you recall that?
A Yes.
Q What does that mean?
A It stands for Calcite.
Q Calcite?
A Uh-huh (affirmative).
Q We need the "yes" or "no," Mr. Ware.
A Yes.
Q And the other one, I think, was PSRP?
A SRP.
Q SRP. What does that mean?
A Serpentinite.
Q And why do you input that data into these databases?
A They're descriptives. They're characterizations of joints or joint infill with cement. So as I was alluding to earlier, each one of these features can be described as to what's in it. It could be chlorate, it could be calcite, it could be serpentinite, it could be clay, it could be clean. It may be chloride. There's a whole list of options that the geologist has to describe that.
Q So the calcite or the SRP could be one of those materials they can input to that?

A Yeah; yeah. That comes from the picklist.
Q Okay.
MR. LEWIS: I believe that covered the discrete items I could identify, your Honor.
MR. HAYNES: Your Honor, could I have a brief voir dire of the witness on these exhibits --
JUDGE PATTERSON: Sure.
MR. HAYNES: -- just so that -- to clear up some questions?
JUDGE PATTERSON: Yeah.
VOIR DIRE EXAMINATION
BY MR. HAYNES:
Q Mr. Ware --
MR. HAYNES: Mr. Lewis, I may have to call on your tech staff to put up some exhibits, if that's all right. Because they've got the -- they've got the screen.
MR. LEWIS: I hope it's not too many.
MR. HAYNES: No. One or two, not all 852. One or two.
MR. LEWIS: All right.
MR. HAYNES: If we could go to Kennecott Exhibit 275, which is one of the exhibits you want to introduce.
MR. LEWIS: We should have it available.
MR. HAYNES: All right. Thank you.
Q Now, Mr. Ware, what's on the screen now is what's in

Kennecott Exhibit 275, which is the structure table for hole 47; correct?

A Uh-huh; that's correct.

Q "Yes"? Looking at the labels on this table, the headings, those headings don't seem to be the same headings as the items in the major structures table in Exhibit 303, the logging procedures, do they?

A No, they are not.

Q Okay. So the explanation you just went through for the major structures table is not an explanation of the categories or the data that appear in the structure table, which is Exhibit 275; correct?

A That's correct.

Q Okay. In Exhibit 303, is there anything that explains the headings in the structure table, Exhibit 275?

A I believe there is. Could I have ten seconds to find that?

Q Of course. Take your time. We're just trying to straighten this out so we can all understand what you're talking about here.

(Witness reviews documents)

A The database structures that I am presenting in this Exhibit 303?

Q Yes. You mean the major structures?

A No. The database structures of the picklists in the tables.

Q Yes.

A Okay. This data was entered under what we were calling our Access database system. Access is a computer program through Microsoft.
Q Yes.
A We have just recently swapped over to Acquire. Acquire is a very -- it's a similar program to Access. It just happens to be a lot more functional in the way ore reserve modeling programming. What you're seeing there is a modification from our Access database structures. What's in Exhibit 303 is a same data, different format dumped from Acquire.
Q I see. So Exhibits 269 through --
A Yeah.
Q -- 302, which are the data dumps -- right? --
A Yes.
Q -- for the five holes that we're talking about, --
A Yes.
Q -- are from an Acquire database rather than an Access database?
A They're from the Acquire database; correct.
Q And in Exhibit 303 we have an explanation based upon Access databases; --
A Access databases.
Q -- correct?
A Yes.
Q Are the field names in Exhibit 303 the same field names that

are used in Exhibits 269 through 302?

A For the most part, they are.

Q And I'm now going to ask a question that Mr. Wallace would probably like to ask, and that is, is there a key somewhere in your files so that we can read the key and understand the abbreviations in these exhibits?

A We do not have the picklists.

Q That's what you're calling the picklists?

A You're calling it a key. I'm calling it a picklist.

Q That's fine.

A Okay. The picklists are not in the exhibit.

MR. HAYNES: Your Honor, I renew my objection to Exhibits 269 through 302 so long as we don't have the picklists so that we can understand what the headings are on these exhibits and so that we can -- and understand what the data then stand for. In addition, without the key to the various abbreviations, the ones that Mr. Wallace talked about, cc and so on, we have a series of letters that are meaningless without some sort of a key. So without those documents, it is impossible to understand what all these letters and symbols and commas mean. And, therefore, I object. I mean, the foundation hasn't been laid as to what these things -- what these things represent. And so we're all laboring in the dark here with a bunch of numbers and letters and symbols on pieces of paper that are meaningless

without the key.

MR. LEWIS: We'll offer subject to production of the so-called picklist, Your Honor. We can make that available at some time.

JUDGE PATTERSON: Well, does that --

MR. HAYNES: Well, if and have --

JUDGE PATTERSON: -- solve your problem or --

MR. HAYNES: -- the picklist --

JUDGE PATTERSON: -- do you want that before --

MR. HAYNES: Well, I would really like to have a chance to cross-examine this witness on the picklist so that we can have a chance to study it. It's not in an exhibit any where here. Or if the stuff goes in and we then have witnesses next week talking about this data, we're not going to -- and we don't have this list to figure out and have our folks tell us what it means, we're really at a disadvantage and prejudiced.

MR. LEWIS: I think the witness has explained what these terms mean quite thoroughly, Your Honor. I'm not sure there's a distinction here to be made versus one computer program or the other. He's explained what the abbreviations mean. He's explained the density table and the structures table. So I think there's sufficient foundation to admit these exhibits now. If the Court things otherwise, we will get the key and if necessary bring Mr. Ware back to discuss

that issue.

JUDGE PATTERSON: I think for no other reason than my benefit --

MR. HAYNES: I'm sorry?

JUDGE PATTERSON: I think for no other reason than my benefit, I think you're right, Mr. Haynes. We're dealing -- I don't fully understand this without -- and for my benefit, I think it would be important to have those keys, and whatever they are, picklists. Is Mr. Ware going to get into the substance of this as if you had --

MR. LEWIS: No; no. This is foundation. Again, as he explained earlier on, this was data and information used by Golder and other consultants for the technical reporting that they did.

JUDGE PATTERSON: So how much farther is Mr. Ware going to go with this?

MR. LEWIS: No further on this particular point.

JUDGE PATTERSON: I think we need to get those, that material, before we get into the substance of these.

MR. LEWIS: No. I didn't intend to do that with this witness.

JUDGE PATTERSON: Okay. That's what I was asking.

MR. LEWIS: No; no. Again, he was just talking about this data, laying a foundation for this data as it was used by other consultants in their reporting as a person who

was involved in collecting the data, Your Honor.

JUDGE PATTERSON: Okay. How soon could you make these other things available?

MR. LEWIS: I have no idea.

MR. HAYNES: And just so the record's clear, we need the picklist that we can translate to both the Access database in Exhibit 303, if that's going to be offered, and also these other 30 exhibits, and also the abbreviations table for the items -- r the data items. So there's two sets of --

JUDGE PATTERSON: Right.

MR. HAYNES: -- things -- two sets of keys or picklists that we need.

MR. WALLACE: This 0, 1, 2, 3 scale, whatever this strength scale is and so forth.

JUDGE PATTERSON: And we're going to need to have those before we get into any substance of what these figures are.

MR. HAYNES: I think so, Your Honor.

JUDGE PATTERSON: I don't know when that's going to occur.

MR. LEWIS: Well, it's not going to occur tomorrow.

JUDGE PATTERSON: Okay. So if somehow we can get that information before we get into the substance of what

these mean,--

MR. LEWIS: Yeah. Okay.

JUDGE PATTERSON: -- if Mr. Ware's not going to get into that, then I don't think we're in any trouble right now. But I think we're going to need that before we get into the substance of the underlying data. Mr. Haynes, does that satisfy your angst?

MR. HAYNES: That's satisfactory, yes, Your Honor.

JUDGE PATTERSON: And mine. We all need to know what we're dealing with is the bottom line with this.

DIRECT EXAMINATION

BY MR. LEWIS: (continued)

Q Mr. Ware, I'd like to go back into the process itself, if we may. And would you start with an explanation of how the drill core is actually obtained?

A On the Eagle project we use diamond core drilling. The diamond drilling process essentially revolves around placing a diamond studded bit in the shape of an annulus on the end of a pipe which is rotated at speed and pressure is applied to that pipe. And that is forced through the ground. What that does is it cuts a ring of rock and leaves a solid piece of core in the middle. That piece of core is being pushed up continuing to what we call a core barrel. And typically that core barrel is ten feet in length.

So the drill will start a run. You'll have a

series of rods all tied together, strung together, screwed together. And he'll push that down. He will start cutting the rock at a certain known depth. The core is forced up inside of the core barrel, which is a removal tube inside what we call the drill string. When he's finished drilling ten feet and he thinks he has his core barrel full, he sends a wire line with a latch on it which will actually grab that tube and pull it out. So within that tube, depending on how far he drilled, he might have anywhere from ten feet or some smaller amount in there. When he's removing the core -- or he actually has to physically break it at the bottom of the hole, and that's done with what's called a lifter spring. And a case comes down and pushes that spring on there. It's actually pushed down around the rock and he pulls back on the rock and breaks it. So he's got a clean break on the end of the thing and he then retrieves it. What's the core comes to the surface, the driller's helper will actually retrieve the core barrel off the wire line. He will unscrew the connection to the core barrel and he will lay the core barrel down and he'll put a new core barrel on, send it down the hole and they'll keep drilling.

In the meantime, the helper has to then retrieve the solid piece of core from inside the core barrel. And to do that, what he will typically is lift up the core barrel. And if the core has the ability to slide out by itself, it

will gently slide out and he'll be placing it into a box with a number of cardboard divisions in it. Once he gets approximately two feet of core in one of these divisions in the box, he actually has to physically break the core to get in the box. So where he breaks it he marks that break with a red X with a crayon pencil. He continues doing that, putting in the division, breaking it, marking it, breaking it. In the meantime, if he happens to induce a break in the middle of that two foot or somewhere in between the ends of that two feet run, he'll mark that as well. So eventually he empties out the core barrel. He marks up the block typically in feet, because it's a ten-foot barrel. And if the box is complete or filled up, he will shelve it. If it's not filled up, sometimes you'll have varying lengths of remaining space in the box. So he will put the block in and wait until the next run then fill up that one-foot, one-and-a-half-foot gap with the next part of the run and then next a new box and start the process all over again.

So on a typical day we could drill anywhere from a hundred to -- or a typical shift, which is 12 hours, we could drill anywhere from a hundred to up to 300 feet of core, which will result in I think between ten and 30 boxes. Sometimes I do more, sometimes I do less.

Once the core is stacked, we'll typically go out to the project site in a truck and retrieve that core.

We'll stack it in the back of the truck. And that core will be brought back to the logging facility, which was shown on the front of Exhibit 303, I believe it was. Once the core arrives at the logging facility, we will physically unload the boxes. Depending on what's on the table, we may lay them out straight away or we may stack them. But what we typically do is check the box numb to make sure they have that right. If they don't have that right, then we've got to go through and check the blocks and make sure the boxes are numbered correctly.

If we start laying the core out on the table, we'll do a quick run from the very top of the hole, checking the blocks that the driller's put in. They have to match with the driller's logs, as we call them. They mark how far they drilled, a start and end depth; make sure those match. If there's any change that needs to be made, we'll physically renumber the block to match the driller's log sheets.

The core's laid out. The geologist will do a very quick run over it, and that's when we produce what is called a quick geological log. And that's just indicating intrusive massive, semi-massive, disseminated mineralization, under mineralized intrusion and sediments. that quick log is stored in a database. Once the core gets onto the table, then starts the process. And that process

is pretty well described on page seven of 303.

Q And what does this show, Mr. Ware?

A This is a summary flow chart for handling and logging core that we use at Eagle.

JUDGE PATTERSON: What page is that again?

THE WITNESS: This is number seven.

MR. LEWIS: Page seven, Intervenor 303.

A So I've essentially just described the drill site up here. In addition to information, now going back to the drill site, around Eagle we'll typically try to have the cores orientated. And we'll use an orientation device that sits on the top of the barrel. We use the fact that hole is inclined, so the tool actually has a set of balls floating in a very viscus fluid. And when they line up, there's a series of pins that press down onto the top of the core. And if there's a fracture, that will scribe a mark on that fracture. Once that core breaks, that particular mechanism activates and those balls are snapped into place and essentially won't rotate when they're being pulled out. The helper will pull the core out. Then he has a separate device out there where he marks the core. And he can orientate that core to a certain point so that the mark is down. Then he'll scribe a line on the core that says this is the bottom of the core. So once he's done that, we actually have the core orientated essentially in

three-dimensional space. That's what we call orientated core. And as you will see up there (indicating), there's a step there where it's actually asked if the core was orientated or not. So I missed that part on the drill site.

So typically we brought the core into the logging facility. We're checking the footage. We change footage to meterage. All our calculations are done the metric system. We've done the quick log there. As I mentioned, when I check the core, sometimes the core will slide out with a little bit of velocity and the helper will actually see a piece go in the box then break and maybe fall onto the floor. Sometimes he'll -- well, he always picks it up and puts it in the box. But sometimes he gets it ran the wrong way. So we have to reorientate the core, and that physically means pulling the core out and rejoining it together. You can do that generally most of the time because there's fractures or features on these fractures that match features on these fractures and they fit pretty nicely together.

So we're down to here (indicating). If the core is orientated, we'll physically remove all of the core from the box and place it on that V-rail system that was shown in the photo on the front of the report there. So what we'll do is we know that there's a mark on the core where it's orientated from the driller's helper. And he will load --

we will load all the core on the V-rail rotating it to make sure when the pieces fit together they truly do fit together. We do that down the side of the table. And typically when all the cores are pieced back together, we'll run a marker down the side of the V-rail on the line indicating which side that hole is down. And once we get that line down there, then we essentially orientated most of the core, all of core in some cases.

So once we've orientated, we can go down this step here, drill on the reference line. And that's where we sort of move into measuring total core recovery, solid core recovery, RQD, intact rock strength ** and access, recurred ** open joints, cemented joints, log the large scale fractures and rock samples for point load test.

So up until this point in time we've actually done no destructive testing on the core. So they'll log the core geologically and they'll mark the core for sawing. The point load testing is a destructive test on the core, so you have to do that after you've rearranged all the orientated core. Then you actually physically break the core with a point load tester and that goes in the point load database. We photograph the core. I sort of jumped around a bit there. We mark the core for sawing. We photograph the core. All the core that we've ever drilled at Eagle is photographed. Then we perform the point load test and then

we actually physically split the core in half for all the areas that we want geochemical information on. We'll split it in half. If we're doing a duplicate sample for the lab, we'll split one half in half again, so you've got two quarters and one half. And the most difficult place if you're doing -- if you're taking a metallurgical sample and a duplicate sample, you'll saw the last half in half again so you wind up with four quarters, one of which goes to assay, one of which is stored for metallurgical sample, one of which goes to assay again as a duplicate on that, and the last quarter goes into storage as a witness core to the hole itself.

Typically once you cut it you have a much cleaner surface on which to review sulfide content or other features of the core as it pertains to particularly geology. If you've got a clean surface, you can make a pretty good determination on rock types, sulfide contents, that sort of thing. Once we've done all that and we've gone through the geological logging, the geotechnical logging, the core is restacked in the boxes and then transported to storage.

MR. LEWIS: I'm going to turn to a new subject, Your Honor. Do you want to break now or break later?

JUDGE PATTERSON: Yeah.

(Off the record)

Q Mr. Ware, I wanted to turn next to a discussion about how

data is collected for purposes of the RMR calculations that we heard quite a lot about in the prior weeks. And you've talked through the flow chart in Exhibit 303. You've walked us through how the -- from how the core is collected and then through what's done with it and how it's characterized and the data is logged. I'd like you to now turn to a discussion about the RMR parameters. And first of all, are you familiar with those parameters, Mr. Ware?

A I'm familiar with A-1 through A-5 and --

MR. HAYNES: I'm sorry. I didn't hear the answer.

THE WITNESS: I'm familiar with the parameters.

MR. HAYNES: Thank you.

Q Is the data that you collect in the field from these cores in fact used for the RMR calculations?

A That data goes into the RMR calculations.

Q And A-1 is what, Mr. Ware?

A A-1 --

THE WITNESS: Could we turn to the Exhibit Number --

Q Which one is that?

A I can explain it without the exhibit. Do we need to do it?

Q Well, if they find it, we'll look at it. We looked at a chart earlier, had the various A RMR A-1 through A-5 parameters on it. Is that what you wanted to refer to?

A Yeah.

Q Okay. And could you just briefly review what those parameters are and what they mean?
A A-1 is intact rock strength. It's a measure which can be obtained through uniaxial compression strength tests. A comparative measure is through the collection of point load data. We collect both on the project.
Q And A-2?
A A-2 is RQD. That's a measure we derive from the length of core greater than ten centimeter over the length of the core drilled.
Q Okay. And what's the coverage from the drilling program at Eagle as to RQD and the drill core?
A At Eagle RQD is approximately 96 percent coverage on all drill core.
Q And then A-3?
A A-3 is the spacing of discontinuities in the core.
Q And A-4?
A Is the condition of the those discontinuities.
Q Now, are those parameters that you log as part of the logging program?
A That's correct. The logging program is designed to fulfill that data requirement in RMR calculations.
Q Okay. And as to A-5, the moisture condition of the discontinuity that we heard about earlier, is that something that --

A That's not something we tried to determine at Negaunee.
Q Okay. And now, Mr. Ware --

MR. LEWIS: And I'm sorry, Your Honor. I meant to set this up during the break. And I don't think it'll take to long.

JUDGE PATTERSON: Okay.

Q You brought a box of some core samples?
A That's correct.
Q And that's a V-rail that you were talking about earlier.

MR. LEWIS: And I'd like Mr. Ware to demonstrate how this is done and how these A-1 through A-4 parameters are actually logged by them at the facility.

Q So could you set that up, Mr. Ware?
A What we have here is a box of drill core. What I'd like to explain is just some of the logging protocol that goes into generate that A-1 through 4 data. So this is an interesting piece of core. It's actually a contact zone between the intrusions and the sediments. The top of the box or the top of the run is at this (indicating). It's marked with a red cross where the driller broke it. That was from the previous run. This is a block or a marker that he put in there. And this is the start of the next run.
Q What do you mean by a run, Mr. Ware?
A The run is the length of core that the driller can retrieve from his core barrel.

Q And what is that length?
A Typically ten feet.
MR. HAYNES: Just for the record, perhaps I didn't hear this. Are these samples from an actual core at the Kennecott Eagle site?
THE WITNESS: That's correct.
MR. HAYNES: And which hole?
THE WITNESS: I believe this is hole 62.
MR. HAYNES: 62. And what's the run?
THE WITNESS: The run? The description of the run?
MR. HAYNES: The length of the run.
THE WITNESS: The from-to?
MR. HAYNES: Yes.
THE WITNESS: Okay. Well, I have a block here that says 148.43 meters. And the box actually covers the run 148.34 meters to 151.05 meters.
MR. HAYNES: Thank you.
MR. EGGAN: I didn't hear what core number this is.
THE WITNESS: This is hole 62.
MR. EGGAN: Hole 62. Thank you.
A So this box of core has gone through the geotechnical logging process. It's also had a point load test completed on it. And we've also taken a density sample. What we

haven't done is split the core for assay, because it appears to be particularly low grade. So what I'm going to try and do here is build a very small V-rail. And I want to do it without everything falling off. So I may not fill this up, because it's going to be unbalanced. But typically what we'll do when the core comes in -- just before we get into it, is an unoriented hole with a fairly steep dip. Our orientation tool doesn't work at angles steeper than minus 85.

So what the geologist will typically do once the core comes in and we're assuming it's an oriented hole, they will systematically piece the core back together. And you can see when we're talking about putting the core back together, most of the time it's a pretty easy fit. I can put that together. And it's very difficult to see the nature of the fracture in there, 'cause it's a fairly clean break. So we'll start here. We'll mark the block, and then we'll try and put all this core back together on the V-rail. So this (indicating) being the portion of the hole up, and we're heading down the hole here. So you can see it requires a little bit of patience and skill to make sure all that gets put back together. Okay. So here's the block. We know where the run is. The geologist will mark "end of run" on there. And we'll fit that together. And typically if the rock is very broken, they will glue it back together

with SuperGlue prior to logging it.

So we're piecing the core together. And I don't think I have to do it all, but I think you get the idea of the purpose of this. When you pull the core out of the blocks, you're getting a true -- number one true length when you can put all the core and pieces back together so you can actually measure the actual meterage drilled. So according to our RMR parameters, one of the first things we do is collect RQD data. So the geologist will go through here. They'll note all the fractures that were induced by the driller, mark those red X's. And I'll find one. There's (indicating) a red X. So that's an induced fracture and it won't be counted as a natural fracture in the RQD measurement. It's induced because you have to break it to fit it in the box. So the geologist will physically go through and measure with a tape measure. He can do it either way. He can measure pieces of core bigger at ten centimeters. If it's a particularly solid run, that's easy. He can measure it greater than ten centimeters or less than ten centimeters. In either case, what you wind up with is a measurement of core that is smaller than ten centimeters. So that goes into our RQD field up there.

MR. LEWIS: We did find the RMR chart. It's --

A Yeah. There it is.

MR. LEWIS: -- from Intervenor Exhibit 2, Appendix

B, Bates stamp 102524.

A Okay. So we've collected our RMR data, and that falls into A-2 up there. So what we have to do is we have to do it in sequence. You can't do destructive testing on the core until you do all the physically logging on the core. Otherwise you're inducing fractures and you're biasing your data. So we'll go through and log all the core. We'll characterize open joints, closed joints, fractures and cemented joints. And each one of those is assigned a particular chalk color. We're generating that data, and that's going to go into A-3, which is -- I can just probably read that -- condition of joints is A-4. Sorry. A-3 is spacing of joints. So once the core's all put back together you can actually start measuring spacing the joints. You go to the particular table that depends -- that records these individual items. You go to the open joint table or you go to the cemented joint table or you'll go to the geotechnical table and you can log those pieces of information in. The most important thing to remember here is, when you're classifying these sorts of things, you physically need to pull the core out to physically touch it as to make a roughness. In this case it looks like about a four or five. And you want to get your hand lens out. And you're physically going to inspect each one of these to check for alteration around these joints. You're checking for

alteration around it, possibly weathering. You're looking for in-fill, determine the type of in-fill. You may drop a little drop of acid on it. You may scratch it. So you're classifying each joint by physically holding the core in your hand.

Once we've got through those calculations and measurements, you can start conducting the physical testing of the core. One thing we do up there is a point load test. The geologist will mark -- on the sample itself it says point load ** at 149.21 meters. And this particular rock was placed under the point load machine in I think we saw on the front page of that Exhibit 303. So the point load machine is essentially they call them platens, but they're two very extremely strong steel cones that will come down on either side of the rock, apply pressure until it breaks. Okay? You can record that pressure in the point load table. That point load table also records the sort of break that you've got there. Once that's done, that core is replaced.

The other thing we do, we mentioned density measurements prior to that. The box is physically marked with a piece of paper here that says the depth from-to. They've cut a 15 centimeter piece of rock here and they've cut the ends flat or perpendicular to the axis of the core. I mean, we can calculate the actual volume of that piece of rock. If we know the volume, we know the weight. Then we

can do the calculations immersed in water and what it weighs in there and actually come up with a density for that rock. So that's pretty important. That goes into figuring out how much the rock weighs and then how much it weighs per cubic meter. And that goes into your ore reserve calculations and so on and so forth.

The main point I want to make about this, you physically need to pull the core out to log it. If you were to try and log it in the box itself, you're missing a whole lot of data as it refers to in the condition of the joints. If you can't see it, you really can't log it. Well, once the core is logged, I think we've gone through two destructive tests. And if this was mineralized, what we typically do is the loggers will mark a line on the core where they would like to see that core cut in half. That's important where you put that line. Sometimes you get a lineation of mineralization or structures, so you want to make sure the core is cut in half so each side is fairly representative of what's in the core. And then the core is shipped out for cutting in the core saw room. It comes back in and the core is dried. And then we move into the sampling procedure for geochemical sampling.

Q Mr. Ware, as to the point load testing, that goes to the A-1 parameter, the intact rock strength?

A That's correct.

Q And there was some discussion by the Petitioner's witnesses earlier I think to the effect that you all should have used a standard uniaxial compressive strength test instead. Have you reviewed that testimony?

A I have reviewed that testimony. At the core logging facility we have -- we collect point load data. We also ship samples out for uniaxial compression strength testing. That data is used by Golder to produce a recalculated value for your point load data. So point load we've got I think it's 8400 point load data points on separate breaks on all that core. So we have a pretty good coverage of the core, a very good coverage of the core. And we can correlate that -- and this is very common throughout the industry -- with our uniaxial compressive strength data, which is essentially a big press that will squash that rock until breakage. And that gives you an MPA or megapascal value. Then you back calculate your point load data to come up with an MPA value.

Q And was your use of the point load testing conservative?

A It was extremely conservative. I believe there was some indication that we had overstated A-1 based on two comments in the previous days. And one was that the rock appeared to be altered at the Eagle outcrop. Indeed it is, but you can't quantify that just based on alteration. And number two I think was a comment -- a nice graph by Mr. Sainsbury

in one of his reports for the DEQ where it clearly shows that our recalculation of point load data is extremely conservative.

Q And I'm going to ask you to stay up her just a minute, because I'm going to ask you to use the cores again in a moment. But before I get to that, the RQD coverage you said was 96 percent on all the core?

A That's 96 percent that includes what we call the till portion of the drill hole. And that would be the overburden above the bedrock. So I simply calculate how many of these will be drilled, how many intervals are there, then I calculate how many intervals have got RQD data.

Q And some of the Petitioner's witnesses also indicated that they thought you may have used an eight centimeter scale rather than a ten centimeter scale for the A-2 RQD parameter. Are they correct about that?

A They're incorrect. Our logging protocol booklet clearly indicates that we've used ten since the initiation of this program. It just happens there was an eight centimeter long scale on the photograph board, and that's just a misunderstanding.

Q And now, Mr. Ware, if you would while you're still up there, would you characterize as opposed to the logging that you've described by going through the procedures manual and also as you've now demonstrated, would you characterize the logging

completed by Mr. Vitton and Bjornerud as compared to the logging that have done on all this core?

A They were attempting to quantify parameters in the RMR system -- 86 system, I believe it was. For, number one, to get an A value, which is intact rock strength, you really need to do uniaxial compressive strengths and with point load data, which is fine. I don't believe that have access to our core to conduct those particular tests. So I suggest that they were sort of critical of that. In the end, they accepted our A-1 calculations. A-2, that got back to the point where they were suggesting that our RQD was based on an eight centimeter core length as opposed to a ten centimeter core length. In the end, they were critical of that, but -- and they accepted that the RQD that we presented was correct.

Q And as to the A-3, the discontinuity spacing, can you compare the way Mr. Vitton and Mr. Bjornerud logged that parameter versus the way you actually do it?

A I just -- I would suggest -- in fact, I know it's extremely difficult just trying to characterize fractures from photos in a core box. If I'm looking at this core box here, I cannot accurately determine the nature of the fracture, its roughness or its *infill. If it's cemented joint, I cannot determine what the cemented joint is. It's very difficult to do. You can only really see one side of the core. You

can't actually see the fractures. And that's particularly important when you're trying to determine the condition of the discontinuities; extremely difficult to do, I would suggest.

Q What about the A-3 parameter, the discontinuity spacing? Can that effectively be done via photograph?

A You would need to completely understand how Kennecott marks up the core. There are some various comments in a couple of those reports that talk about single chalk lines, multiple chalk lines.

Q What reports are you referring to?

A I'm talking about Vitton, Parker et al, 2000.

Q Did you also review their testimony on that subject?

A I did.

Q And what -- go on with your explanation.

A You need to fully understand the Kennecott logging protocol as it pertains to marking the core. We have a system whereby you mark fractures that are induced by the drilling process or by handling and those that are natural fractures. And they're single chalk lines -- okay? -- but they just happen to be a different color. So I think one of the assumptions was that any single chalk line marked on the core was not counted, which was indeed not the case within our protocol. In addition, their calculation of discontinuity spacing again gets back to the fact that

you're only seeing one side of the core. So if I have driller-induced fractures on the core that happens to reside on the other side of it in the photo, then I suggest you're starting to overestimate some of those features in the core. It's hard to do from core photos.

Q All right. I think you can take your seat again, Mr. Ware. And is there anything else you wanted to say about that? If you've completed that, you can take your seat.

A I believe we touched the high points.

Q Mr. Ware, based on your review of the testimony of Ms. Bjornerud, how long did it take her to log eight holes from the photograph?

A I believe she reviewed the eight drill holes in approximately 30 hours.

Q And can you tell me for the geotechnical, geological logging that you do, Mr. Ware, how many people it takes and for how long to log a single hole?

A If we just -- if you consider a single hole 200 meters long, it's going to take a minimum of two days to fully complete the logging on that hole, geotechnical, geological, point load, density. If you have an oriented hole, that's -- add another two days to that. That's four days per 200 meters, essentially.

Q And how many people are doing that?

A It ranges between three and five people.

Q And how would you characterize the validity of the recalculations of RMR's by Ms. Bjornerud and Mr. Vitton, based on their use of photographs of these eight holes?

MR. WALLACE: Object; lack of foundation. Now he's recharacterizing. We don't know what he's done with that analysis. No foundation for that. All he's saying, you know, she didn't have the cores because Kennecott wouldn't give them to her. It's not enough of a foundation to go ahead and recharacterize her analysis.

MR. LEWIS: It's based on Mr. Ware's discussion just now, pointing out the problems with trying to do the A-3 through -- A-2 through A-3 -- A-2 through A-4 parameters without actually physically inspecting the core and doing the kind of things you just talked about. My question is as to the validity of the recalculations, given that they weren't able to do that and that their opinions were based solely on photographs. And I think there's sufficient foundation for him to offer that characterization.

JUDGE PATTERSON: I'll overrule.

Q Because they weren't able to do these things you just talked about and only based their opinions on photographs, Mr. Ware, what's your opinion as to the validity, then, of their recalculated RMR?

A I would have severe reservations about using any of that data as it would pertain to the planning of a mine. I think

they were including features that were induced, thereby biasing the final RMR calculations lower than what they truly are.

Q Now, can you characterize the representativeness of the eight drill holes for which Ms. Bjornerud and Mr. Vitton had access to the entire database that you have on the drill holes at the Eagle Project?

A The eight drill holes were originally identified by Golder from Kennecott data indicating that there were major structures in those drill holes. Golder identified them as holes with major structures; therefore, the DNR requested photographs of those eight drill holes with RQD data. So we subsequently sent them that data. So what you've essentially wound up with is a subset of drill holes from the Eagle database that show some of the more -- some of the lower quality rock if you were to consider it on an average for all the drill holes. So essentially the RMR calculations that they came up with and subsequently reduced based on the logging off photos were then extrapolated to the calculation of effect on safety on crown pillars, for example.

Q And were those holes that were reflected in those eight photographs representative of the crown pillar itself, Mr. Ware?

A The original selection of holes by Golder was based on an

area of influence around the crown pillar. The holes that were noted as having major structures from the major structure table physically lie outside the crown pillar as we currently have it located at level 327, with the exception of Hole 55, which they did have access to. And I may note that that Hole 55, according to their report, was one of the better holes in that Dataset. The holes that they got, the actual holes are located up to 25 meters away from the crown pillar. In some cases the end of hole is up to possibly 60, 70, 80 meters away from the crown pillar.

Q And how many drill holes has Kennecott made through the crown pillar?

A We were working on a Dataset of 26 drill holes with the last Golder Report.

Q As reflected in the Appendix 3-C, Golder Report?

A That's correct.

MR. LEWIS: Which for the record is Intervenor Exhibit Number 2, starting with Bates stamp 102527 through 102576.

Q And can you characterize the RQD values of the eight drill holes for which the Petitioners obtained photographs to the RQD set of the drill holes through the crown pillar at Eagle?

MR. WALLACE: I'm going to -- excuse me -- object to the lack of foundation. The foundation that is -- the

evidence that would have to be laid for a proper foundation for this gentleman to make that characterization would be the cores themselves and photographs of the cores. And there's no foundation for that; that he's done that. He's talking generally. I don't know where he's getting his information from. He's getting it from third parties. And we haven't had access to the cores themselves.

MR. HAYNES: Join in the objection.

MR. LEWIS: I think that goes back to their discovery motion, your Honor, which has been ruled on. And I think the court has already ruled on their discovery motion for the proposition that there was certain data required by law to be submitted in the reporting and the calculations by Kennecott for the mine permit. And now I'm asking Mr. Ware about information that he has personal knowledge about, as a person who was involved with collecting all this core, and as he described earlier, calculating all these RQD values for this core. So I believe there's sufficient foundation. And secondly, that the objection goes to the discovery motion that we've already dealt with.

MR. WALLACE: I just have two responses, your Honor, and then I'll be quiet about this. First of all, this entire two and a half weeks has been an evidentiary hearing in support of our discovery motion. Over and over

and over again they've tried to pound us over the head with what we haven't gotten in discovery, and they're doing it again today. And I think it's objectionable, and I think for that reason this gentleman shouldn't be allowed to testify on the basis of evidence of which we've been deprived. Second of all, there's no foundation that this gentleman has personally conducted the necessary inspection or gone through the protocols himself to characterize RQD. We lack that foundation. He's shown us some core from someplace, talked about it for a few minutes. And now he's going to talk about what took Dr. Bjornerud 30 hours to look at. And there's no evidence that he's put in 30 hours or four days, not him. So he's the wrong witness for this.

MR. LEWIS: I think I've laid sufficient foundation, your Honor. He's the man who was involved with collecting all this information and the RQD values and testified he's familiar with that database.

JUDGE PATTERSON: What was the question again?

MR. LEWIS: I asked him to compare the RQD of the eight holes for which the Petitioners had photographs to the RQD values of the rest of the core sampling with the crown pillar.

JUDGE PATTERSON: I'll overrule the objection.

A In a summary table provided in Golder C-3, I believe it is, you can calculate -- or Golder has calculated the average

RQD values. And --

Q Did you prepare a summary comparing Golder information?

A I did; I did.

MR. LEWIS: Could we show Exhibit 612, please?

MR. HAYNES: Well, then I'm going to move to strike, because it's now become clear this is not his information at all; it's Golder's.

MR. LEWIS: We can talk about that, yeah.

JUDGE PATTERSON: Okay.

Q In the table you've prepared, Mr. Ware, the DEQ information is from the -- or what information do you show on here? Let's start with that.

A The table shows essentially four pieces of information per Dataset. Now, we can see -- are considering the Vitton Bjornerud, slash, DNR Dataset as a subset of the one above. So we look at average run length, which is essentially drillability of the core; if you're having problems drilling. You can see the average run length from the Golder C-2 to -- Table 2-C2, page * (3:15:37) is 2.52 meters per run, as opposed to the data included in the Vitton Bjornerud subset of data, which is 2.26. You can see some of the core recovery greater than ten centimeters is 2.44 for the Golder data and 1.9 for the Vitton Bjornerud data. And * (3:16:01) is 90 for the Golder data versus 84 for the Vitton Bjornerud data. And that's the way it should be,

because they had a subset of the eight worst holes as identified by Golder. They exhibit major structures.

Q And is the source of your information there in the first line, the average run length including the average RCD from Table 2 of Appendix C-2, the Golder Report that we've been discussing at some length in these proceedings, identified as Intervenor Exhibit Number 2, Mr. Ware?

A The RQD value is, yes.

Q And the RQD values for the Vitton Bjornerud, what's the source of that?

A They accepted that RQD values. I just averaged those.

Q And the Eagle database covers -- do you have something about that on there? -- covers how many data points?

A We have approximately 7600 data intervals. And by that I mean run lengths. With the Vitton Bjornerud database had less than ten percent of that, approximately 718 -- well, actually 718 intervals. So they're dealing with less than ten percent of the entire database.

Q And is the data reflected in the Golder Report, Appendix C-2, data provided by you to Golder?

A That is correct.

Q And is it accurate and reliable?

A It is accurate and reliable, collected to industry standards.

MR. LEWIS: Offer Intervenor Exhibit 612, your

Honor.

MR. WALLACE: Object, your Honor.

MR. HAYNES: I object. Go ahead.

MR. WALLACE: I mean, we've now got hearsay layered upon hearsay layered upon hearsay and contained in a document from some other party. This is Golder information. We have no idea how it was gathered. We have none of the Golder people here to explain that to us. It was then given to him. He's testified that he's comparing this to eight of the worst cores, which is -- we don't know how many layers of hearsay this gentleman is relying upon to say these are eight of the worst cores, or what the MDEQ decided or wanted to know about them. And this gentleman hasn't given us an iota of testimony that he's personally familiar with the development of any of the information that leads to this document.

MR. HAYNES: I join in the objection and have some additional reasons to object to the admission of this proposed Kennecott Exhibit 612. I'm looking right now at Appendix C-2 of the mining permit application which is entitled "Eagle Project Geotechnical Study." I'm looking at Table 2 which is on page 6, and it says, "ISRM Rock Strength Chart." So the exhibit apparently is -- that chart has nothing to do with RQD's or SCR's or average run length. So the exhibit completely lacks foundation, and we can't -- I

mean, there's no way to compare what's on the exhibit with what it refers to.

Secondly, this is extremely prejudicial, your Honor, to admit this kind of testimony and this kind of a chart when, as Mr. Wallace has said -- and I join in his objection -- we have been beat over the head for the last two and a half or three weeks about how our experts didn't have the right data. And they didn't have the data because it was never provided to us after we requested it. So we now have a witness who has access to the data, or he says he has. He has access to all of the cores; he has access to the core photos. He can go out to the core shed and take a look at the cores and testify about what he saw or what the folks who work for him saw. Our experts couldn't. And now we have him expressing an opinion saying -- or attempting to express an opinion saying, "Well, we have -- our side has 7600 data points. The other side has only seven percent of those. We win." Even if it's probative, under Rule 403, your Honor, it is highly prejudicial and ought not to be admitted because of the basic unfairness of how this is proceeding. So to admit this kind of exhibit, your Honor, it just shows they're playing hide the ball. We don't get to look at the ball and then compare what it is he's testifying about. So it's a secret game that he has here, to have all of this data, have all of the cores, have access

to the cores. They get to use that and we don't. How is that fair? Under Rule 403 it cannot be admitted.

JUDGE PATTERSON: Mr. Lewis, any response?

MR. LEWIS: Well, again, they filed their motion for discovery. It went up on appeal. And it's the nature of this forum that discovery is not generally -- has not been allowed here. We are also entitled to produce additional information via our exhibit list, which we have done. In our exhibit list is the Golder Report that we've been referring to. And by the way, it's Golder Report C-3, and we can go to the Table if necessary. That has been in fact offered and admitted at least on a limited basis, with the stipulation on the record that you know about.

And next, Mr. Ware has already testified about his involvement in collecting this very data; that Kennecott collected the RQD data and transferred it to Golder, so that the RQD data represented in the table -- summary table in the Golder Report is RQD data collected by Mr. Ware and the group who did the core logging. Mr. Ware has verified the accuracy of that data. The data summary that Mr. Ware referred to is actually in Intervenor Exhibit 2. It's the Appendix C-3 Report that various persons have spoken about earlier in these proceedings. And if we go to page 5 -- right there (indicating), I think. Blow up that bottom table, please.

Q Is that the table you were referring to, Mr. Ware?
A That's the table I was referring to.
Q And is that the source of the number 90 in the --
A That's correct.
Q -- Exhibit 612 under "Average RQD"?
A That's correct.

MR. LEWIS: Again I offer Intervenor's Exhibit 612, your Honor.

MR. HAYNES: Well now, your Honor, there's a significant foundation objection. First of all, we haven't admitted Appendix C-3 for the truth. It's been admitted to show that some documents were filed with the DEQ. Secondly, we have no way of knowing, since we've been denied discovery and we don't have in Appendix C-3 any of the work shown as to how the figures in this table got there, for this witness to then take these numbers, the foundation for which is unknown at this point, and then use those numbers to compare those to the work that Dr. Bjornerud and Dr. Vitton did painstakingly -- and they showed their work -- is prejudicial. I mean, it lacks foundation first of all, and it's prejudicial second of all.

MR. LEWIS: I just would add that neither Mr. Vitton or Ms. Bjornerud did their own calculations of RQD. They worked with the numbers that were available, including, as I recall the testimony, the numbers from these same

Golder Reports, Appendices C-2 and C-3. And once again, this witness has verified the accuracy of this data, as he is -- he was the source of this data, your Honor.

JUDGE PATTERSON: Are there going to be people from Golder testifying later on?

MR. LEWIS: Yes, there are.

JUDGE PATTERSON: Well, I think we have a couple of layers of foundational problems as Mr. Haynes has pointed out. I think probably it's better left to the Golder people to make that comparison. With this particular witness, he's obviously relying on information that was provided by -- compiled by somebody else. And I'm going to sustain the objection.

Q Mr. Ware, we've also heard testimony earlier in this case about geophysics, and we've seen various exhibits by the Petitioners portraying geophysical mapping in this area. And I wanted to ask you first of all, can you describe how geophysics and geophysical information plays a role in mine planning?

A We use geophysics essentially as a first pass in exploring an area that we may be interested in looking for mineral deposits. Geophysics is done because you can characterize sub-surface rocks based on their *picture (3:27:15) physical properties. That may be conductivity, resistivity, magnetic susceptibility and density. So as a first pass it's a good

broad-brush approach as to defining the character of the sub-surface rock in a particular area. In terms of validating that data, it is required that you have extensive surface outcrops so that you can drill holes in area where you have no outcrop to fully characterize the sub-surface geology. You set up an inferred geological map, essentially, with your geophysics; then you test it by drilling.

Q And are you familiar with the Klasner Report that we've seen earlier in these proceedings and the mapping of these inferred features?

A Yes, I am familiar with that.

Q How did that compare, Mr. Ware, to the geophysical data later collected by Kennecott?

A The conclusions drawn by Klasner et al, based on their geophysical database, differs somewhat from our conclusions based on our geophysical database. We have to remember that was -- I believe it was almost 30 years ago that that data was collected. Certainly technology and data acquisition methodology has improved substantially during that 30 years.

Q Have you prepared an exhibit to illustrate the drilling you've done in relation to these inferred faults that were shown in the Klasner map that we saw earlier?

A Indeed I have.

Q And are the two lines drawn here -- are they from the

Klasner map?

A They are from the Klasner map.

Q What else do you show on this figure?

MR. HAYNES: Just for the record, which exhibit is this?

MR. LEWIS: I'm sorry. 596. Intervenor 596.

MR. EGGAN: Is there a page number at all among that?

MR. LEWIS: No. You have to look at a collection of figures, Mr. Eggan. And this is the figure we're looking at here.

MR. EGGAN: All right.

Q Would you describe what's depicted on this figure, please?

A This map shows drill holes that are being completed on the Eagle Project. Those red dots, color locations; the black lines are what we call the trace of the hole. So essentially what you're doing is looking down on the drill plan. And if the hole's at an angle, that black line indicates where that hole went in relation to the color. These two black lines (indicating), the Klasner outline of his CP interpreted fault zone. Within that fault zone we have 14 drill holes drilled at varying angles that to date don't indicate either the existence of an approximately 500-yard-wide fault zone or indeed the existence of discrete features that could be represented by these black lines.

Q And did you prepare another figure to help illustrate that point?
A I did. There should be a figure showing the magnetics that we flew over the area.
Q Is that (indicating) the figure?
A That is the figure.
Q What does this show?
A Again, it shows the drill holes as distributed at Eagle and Eagle East. It shows the Klasner-interpreted fault zone. It also shows very clearly this feature here, which is a dike; it's a magnetic dike. That's a magnetic high. It shows -- it's got another dike to the south of it. That's a magnetic low. And these are responses from *peritite-rich (3:32:51) sediments. Peritite is a magnetic mineral that is commonly found in sedimentary rocks. The point of this is that these sediments dip at an angle. There's two lines of evidence that those faults don't exist. There's no offset on this dike.
Q What does that mean?
A It indicates that there's no movement such as this on a dike -- I'm sorry -- on a fault that it could be like that. If there was, you would see this (indicating) piece of rock either moved up or down in relation to these fault zones in addition to that. The other piece of evidence that there's no vertical movement on that fault is that you see no

displacement on this bed here, which is dipping. So when you push the dipping back down, you're going to start developing a notch in that magnetic feature there that indicates that there would be movement related to these postulated structures here.

Q Now, as you know, some of the Petitioners' witnesses have characterized these faults as meaning that the crown pillar cannot be stable. Does the information you're showing here in this figure address that claim, Mr. Ware?

A In part it does address that claim. It indicates that those faults don't exist. Those particular faults don't exist.

Q I want to turn next, Mr. Ware, to the Petitioners' assertion that we should not or could not safely proceed with this mining without what's been called in situ stress testing. Are you familiar with that testimony?

A I'm familiar with in situ stress testing, yes.

Q Have there been any in situ stress testing conducted at the Eagle deposit?

A There has been none conducted to date.

Q Now, we also heard, Mr. Ware, from -- I think it was Mr. Vitton; it may have been Mr. Parker -- that as a result of drilling and extracting the core, there are some indicators of the potential for horizontal stresses, I think was the issue, to exist. And are you familiar with certain indicators that can be observed in the core samples that

have some relevance to the existence of these so-called horizontal stresses?

A * (3:35:56) Yes. In drill core drilling areas of high horizontal stress, you'll sometimes observe what's called a disking of the core, where the core will break into very fine, essentially, little plates. It's due to a combination of the drilling, the stresses imposed on the rock and the high horizontal stress --. The disking can take many forms. It can be just perfectly flat discs, in really high stress areas actually turning to what looks like a Pringle shaped -- it's sort of fractured along -- a Pringle-shaped fracture.

Q And I think one of the Petitioners' witnesses testified earlier about this core disking and perhaps something to the effect that he would have liked to have known whether there was much of that present. And I wanted to ask you, was there any significant core disking in the cores drilled at the Eagle deposit?

MR. WALLACE: Excuse me. I just want to interpose my objection on this, your Honor. Now this gentleman is testifying as to -- apparently what he's seen in cores that we have never been able to see. It's not in evidence; there's no photographs of them; there's no foundation for him to just throw away one of the serious concerns about this mine which might be reflected in disking.

MR. HAYNES: Join in the objection.

MR. LEWIS: I think it's their motion-for-discovery objection again, your Honor.

MR. WALLACE: Well, you know, it's a slightly different point. I mean, we sought discovery; we didn't get that. Now we're asking that evidence be precluded because of the unfairness of introducing it. It's a double whammy. We didn't get the discovery; that's one thing. That's decided. But it's also a reasonable basis to preclude somebody else from testifying without foundation as to evidence that we've not had access to.

MR. LEWIS: And that motion has already been ruled on as well, your Honor.

JUDGE PATTERSON: I'll overrule the objection.

Q So what, if any, evidence of disking did you see in all of the coring from the Eagle deposit that you testified about earlier?

A I've seen no evidence of disking.

Q Now, as to the lack of actual in situ stress testing, in your experience is that done before actual mining begins?

A I would say it's typically done in underground workings.

Q In underground?

A Underground workings.

Q And is that the plan at Eagle?

A That is the plan at Eagle.

Q Based on your experience -- and we reviewed that earlier --

Mr. Ware, in several different countries and for several years, is the amount of data collected by Kennecott for purposes of characterizing the crown pillar adequate?

A Yes.

Q And do the data collection procedures that you described earlier with reference to Exhibit 303 comply with industry standards?

A They do comply with industry standards.

Q And is the quantity and quality of the data sufficient to rely on for the development of the mine, pending the additional drilling, data collection and characterization that was both recommended in the Golder Reports and required in the permit conditions?

A The additional data to be collected from underground is a very important part of characterizing the conditions at Eagle, as in any mine. It's an ongoing process. You generate your technical data from development openings, which in this case will essentially be 15 by 15 feet wide. So you generate a lot of geotechnical data underground. In addition to development work you develop it from drill-hole data. Essentially when you're underground you have very few restrictions on where you can place a drill hole * (3:39:48) a particular feature you want to test.

MR. LEWIS: That's going to complete my direct, pending -- as you know, we may call Mr. Ware back to address

the question of the -- I forget the term, but the checklist or the description of the variables that were used in the geotechnical logging that related to the exhibits that we talked about earlier.

JUDGE PATTERSON: Do you want some time before you start your cross-examination?

MR. WALLACE: I wasn't sure it was quite our turn yet.

MR. REICHEL: Mr. Ware, my name is Bob Reichel. I represent the DEQ. Just a couple of brief questions to clarify something that struck me as maybe being confused on the record.

CROSS-EXAMINATION

BY MR. REICHEL:

Q You were asked a series of questions about some RQD or rock quality -- RQD data that appeared in Table 2 from Appendix C-3 to the mining permit application. Do you recall that?

A I do.

Q Just so the record is clear, is it your understanding, sir, that the data tabulated there -- was that data generated -- I mean, Golder prepared -- who prepared that document?

A Golder.

Q But based upon your involvement in this project, sir --

A Based on KEMC data.

Q Well, that was what I'm -- so in other words, who gave the

data to whom?

A We gave the data to Golder. KEMC gave the -- KEMC gave the data to Golder.

Q And what was your role with respect to -- was this the data that you talked about earlier as part of the -- your work as the site operations and exploration manager for Kennecott's project?

A That's correct.

Q The data collection that you were --

A The data collection.

MR. REICHEL: No further questions.

MR. HAYNES: Your Honor, now might be a good time to take a break before we start cross.

JUDGE PATTERSON: Okay.

(Off the record)

JUDGE PATTERSON: Just so you know, I'm going to have to leave about a quarter to 5:00 today.

MR. HAYNES: All right, your Honor. Thank you. Mr. Ware, again for the record, my name is Jeff Haynes. I represent the National Wildlife Federation and the Yellow Dog Watershed Preserve.

CROSS-EXAMINATION

BY MR. HAYNES:

Q We've had put on the screen Kennecott Exhibit 613 which you testified about earlier. Do you recall that testimony?

A I do.
Q You pointed out on Exhibit 613 a fairly indistinct blue line which is where the Salmon Trout River runs through the Kennecott -- let me back up. You testified that the portion of this exhibit that's in green that has the black dots in the middle of the sections is the commercial forest land that's going to be withdrawn; is that right?
A It's either withdrawn now or has an application pending for withdrawal or is planned to be withdrawn.
Q Right. I mean, at some point that area on this exhibit will be withdrawn from the CFA program; correct?
A That's correct.
Q And the Salmon Trout River runs in a portion of that -- let's call it the withdrawn land, if we can just for our present purposes. Right? The Salmon Trout River runs through; correct?
A That's correct.
Q Or a portion of the Salmon Trout. Does this map or this exhibit show the Triple A Road? Can you identify that on this exhibit? You've been at the site, haven't you?
A Yes.
Q You've driven up and down the Triple A Road more than one time?
A More than one time. That's the Triple A Road there (indicating). And it essentially comes up over here and

crosses the Salmon Trout -- I'm going to get a closer to the screen. Okay?

Q Oh, of course. Go ahead. Get as close as you like.

A Can't get much closer. That's (indicating) the Salmon Trout there. That's the trace of it.

Q Now, you're tracing the blue line --

A Yeah.

Q -- that trends sort of northwest and then to the north; correct?

A That's correct. And the Triple A basically comes up here (indicating), and it's pretty indistinct, but I believe the crossing is right there.

Q Okay. And I just want to make sure the record is clear on this. The Triple A goes to the north of the orebody; correct?

A That's correct.

Q And then it trends west, and the crossing of the Triple A and the Salmon Trout is about one section north of the word "Kennecott" in the withdrawn area -- correct? -- before the "Kennecott"?

A One 40 north.

Q About one section north --

A One 40 north. A section is a mile square.

Q Right. Oh, those are -- oh, these are 40's. I'm sorry. One 40 north, yes.

A Approximately from what I can see there.
Q Now, you testified that when the withdrawn area is, in fact, completely withdrawn, then there will be no access by the public to those lands; correct?
A I only indicated that it was withdrawn from the CFA.
Q Okay. And you understand that when that happens, the public will no longer have access to those lands under the CFA program; correct?
A Correct.
Q Now, you're not suggesting, are you, that the public would no longer be able to travel along the Triple A Road through those things. You're not suggesting that, are you?
A No. That's a county road easement.
Q All right. And you aren't suggesting, are you, that the public won't have access to the Salmon Trout River if they can get access to it legally, are you, the portion of the Salmon Trout that runs through the withdrawn lands?
A That's not a decision I'd be making.
Q Okay. So that's not something that you understand; correct?
A That's correct.
Q Mr. Ware, you're aware of the outcrop of Eagle Rock?
A I'm aware of the outcrop, yes.
Q You've been on it?
A I've been on it.
Q You've been around it? "Yes"?

A I've been around it.
Q Eagle Rock is on state land, is it not?
A That's correct.
Q Mr. Ware, I want to make sure I understand your work history. My notes say that in late 2001 you were in Vancouver; is that right?
A No. I was working for the Nickel Group that is based in Vancouver, but I was actually living Tucson at that time.
Q Oh, living in Tucson. All right. And when did you move to Negaunee?
A Physically moved the family June 2003.
Q When did you start working for Kennecott at the proposed Eagle Project?
A I was commuting from October 2002 from Tucson to Marquette essentially.
Q That's a rough commute, isn't it?
A It's not too bad.
Q And in October 2002, that's when you took over as project manager -- project site operation and exploration manager; is that correct?
A Essentially, yes.
Q How is it not correct? You said "essentially."
A That's correct.
Q You testified on direct examination that Kennecott has drilled about 200 holes for the Eagle Project; is that

right?
A That's correct.
Q Now, we've seen in various reports -- and I'm referring specifically to Appendices C-1, C-2 and C-3 of the mining permit application. You've read those reports, haven't you?
A I have.
Q In fact, you helped prepare C-1, didn't you, the geology report?
A I would have had some input into that report, yes.
Q So you helped prepare it?
A Correct.
Q Did you help write the text?
A Yes.
Q How much of the text did you assist in? You know, 100 percent? 50 percent? 2 percent?
A 20 percent.
Q Those reports, as I recall, indicate that as of the date of those reports -- for the C-3 report I think it was 2006 -- there were 109 drill holes.
A Uh-huh (affirmative).
Q Does that sound about right?
A That sounds -- sorry. Can you just repeat the date? The C-3 report?
Q April 2006. This isn't a memory test. I mean, we can all agree on the date of it. It's -- the date is February 2006.

A February 2006. February 2006. I believe we would have been drilling the 130, 140 series holes at that point in time.
Q Okay. And since that time you've drilled another 60 to 70 holes?
A 60 holes, yeah.
Q For the Eagle Project.
A That's correct; Eagle and surrounds, yeah.
Q Eagle and?
A Eagle and the surrounding area -- project area.
Q What is the surrounding project area?
A That would include Eagle East or the area to the east of the outcrop.
Q And what is the purpose of drilling the holes in the surrounding project area?
A It's a combination of geotechnical data for the decline and exploration.
Q I see. How many of those 60 holes were drilled around the crown pillar for the proposed Eagle Mine?
A I'm just counting here. An additional 15 holes were drilled at the Eagle deposit amongst that number.
Q And were those 15 holes -- again I don't mean to make this a memory test, but looking at not only Appendices C-1, C-2 and C-3, but also the Attachment 7, which is the Golder Geotechnical memorandum dated July 7, 2006. That memorandum talks about 109 holes as of July 7, 2006. Does that sound

about right?

A I believe that's right if that's in the report, yes. That's right.

Q Not 130 but 109, or were there holes that were drilled that weren't reported by Golder?

A Golder selects their drill holes very specifically. When I'm referring to the number of holes drilled at Eagle, I'm referring to the number of holes actually testing the mineralization at Eagle or close to it or underneath it.

Q Oh, I see. So for Golder's reports; that is, C-2 which is the geotechnical study and Appendix C-3 which is the subsidence report and the July 7 memorandum, are you saying that Golder didn't use all of the holes that were drilled around the Eagle deposit but just selected some of them?

A They would have selected holes that a) had mineralization within them or, b) were of a distance considered to be significant to be relevant to the crown pillar design.

Q I see. Did you have any part in selecting those holes?

A I did not.

Q Is there someplace we could look in the documentation that was filed with the application here? And you don't have to limit your answer to C-1, C-2 or C-3 or the Golder July 7, 2006 memorandum. Is there someplace in the documentation we can look to find out how Golder selected those holes?

A I believe there is.

Q And where would that be?
A I believe it's in C-2, and it's a table describing a polygon, a set of xy points.
Q Did you help prepare that work at all?
A I didn't select the polygon there.
Q So we'd have to talk to the Golder folks about that?
A That would be appropriate.
Q Now, Mr. Ware, we've had some discussion about Kennecott's Exhibit 269, and I want to explore some things with you for this exhibit so that we can understand it when you provide the -- what did you call it? It's not the key. The --
A The picklist.
Q -- the picklist. Thank you. All right. Mr. Ware, just a brief -- my brief review of this exhibit I have a couple of questions. If you could look at -- pointing out a line here, this is hole 47 Eagle, and it's the run from 109.73 to 112.78. Do you see that?
A Yes.
Q Okay. If you go to the next line on this table, it starts at 115.82. Do you see that?
A Yes.
Q There seems to be about a 3 meter gap there. Can you explain why that 3 meter gap would appear on this table?
A There's a possibility that there was no -- we're looking at cemented joints in that interval. So you wouldn't record

cemented joint data if there were none.

Q So this cemented joint table doesn't represent the entire length of the core necessarily?

A It represents all the cemented joints.

Q And then if we go to the next series of lines we have 115.82 to 118.87, and we seem to have 1, 2, 3, 4 lines with that run.

A Yup. Uh-huh (affirmative).

Q Why would there be four lines there?

A Each one of those is an individual point within that run.

Q So each line of this table then represents the single cemented joint?

A That's correct.

Q Is there a database that you have access to that contains all of the data from the drill cores that were logged by the Kennecott geologists?

A Do I have access to that data right now?

Q No, not right now. Is there such a table that exists?

A Just to be very clear, as I tried to explain it, there's various tables which the geologists log into. Okay?

Q Right. And is there any -- let me back up. The geologists log information into the various tables on their touch -- their pads; right?

A Correct.

Q Right? And the information -- how does the information then

get from their pads to this kind of a table?

A At this stage -- we call them Fujitsu tablets, have the program loaded on there. So as the geologist was logging -- if he's logging open joints, he would select the open joint table and fill out the data for the area he was logging. So at the end of the day, the data is transferred from the tablet computer onto the main database.

Q So there's a main database that has the information from the core log; correct?

A That's correct.

Q And it has the information for open joints, closed joints, density, geology, structures; correct?

A Uh-huh (affirmative). That's correct.

Q And this is a database that has all of this information from all of the cores?

A That's correct.

Q And so working with the database, you can then query the database to pull out information as you need it; correct?

A That's correct.

Q Where is that database housed?

A That database is housed in Negaunee.

Q And you have access to it; right?

A I do have access to it.

Q Who else at Kennecott as access to that database?

A The loggers have access to that database, the geologists who

log the core. Salt Lake City data administration staff have access to that database remotely.

Q All right. Have you ever at your office in Negaunee ever sat at your computer and shown how to work the database to people outside of Kennecott?

A Personally I would not have.

Q Presently? Have you in the past?

A Personally.

Q Oh, personally.

A I would not have.

Q Have others at Kennecott?

A Yes. Interested parties have come around and asked to view the geotechnical logging procedure.

Q Who would those interested parties be?

A I believe there was people from Michigan Tech.

Q Who?

A I think maybe an Al Johnson had visited the office one day.

Q I see. And he was shown -- you didn't show him the database?

A I didn't show him, no.

Q But one of your staff did?

A Yeah.

Q Did anyone from the DEQ come around and ask to see the database?

A People from the DEQ did come around and view the logging

procedures, yes.
Q Who from the DEQ?
A Joe Maki.
Q So they viewed the logging procedures; right?
A Uh-huh (affirmative).
Q "Yes"?
A That's correct.
Q Did they look at the cores?
A They looked at the cores.
Q Let's talk about Mr. Maki, not "they." Who else besides Mr. Maki from the DEQ looked at the cores?
A Melanie Humphries has looked at the cores.
Q And what's your understanding of her position with the DEQ.
A She is in charge of the core repository. She's also in charge of reviewing exploration programs in the field to ensure that they're complying with Part 625 Mineral Wells Act.
Q Okay. Who else from the DEQ looked at the cores?
A Off the top of my head, I do not recall anyone else from the DEQ.
Q When did Mr. Maki first come to the -- by the way, the cores are located in the core shed in Negaunee; correct?
A That's correct.
Q And when did Mr. Maki first, to your knowledge, come to the core shed to look at the cores?

A I can't give you an exact date on that one. I'm thinking 2005 possibly.
Q How many times has Mr. Maki been to the core shed, to your knowledge?
A Five, six times, possibly more.
Q Did he ever ask you for a printout of the data?
A No.
Q Did he ever ask you to take a look at the photos that you took of the cores?
A I'm sorry. What was the question again?
Q Did Mr. Maki ever ask you to give him copies of the core photos?
A No.
Q Did you ever offer them to him?
A I did not.
Q Do you know if anybody at Kennecott ever offered the core photos to Mr. Maki?
A That request was never received.
Q Did Mr. Maki ever request that you provide him with the underlying data that you have sent to the other -- to Golder and to the folks at Calgary?
A Not that I recall.
Q To your knowledge did Mr. Maki ever express any interest in looking at the core photos or at the data that you produced?
A Mr. Maki definitely expressed an interest in looking at the

core and the logging procedures.
Q And do you recall when that was?
A If 2005 was the first date, ever since basically. I'm saying the visits would have occurred after 2005, so --
Q So whenever Mr. Maki visited the core shed, he expressed an interest in looking at the cores and the core photos?
A Looking at the cores.
Q At the cores. Did Mr. Maki ever ask you to put together any sort of a booklet or a presentation or a document that contained the data from the cores or the core photos so that he could take that back to his office and study it?
A Not that I recall.
Q Did anyone from the DEQ, to your knowledge, ever express such an interest in having some sort of report showing the core photos and the data from the core work so that they could take it back and look at it?
A Again, not that I recall.
Q You testified that the folks from Michigan Tech came over to look at the cores; is that right?
A Yes, that's correct.
Q And who was that; do you remember?
A I would say Dr. Jim Hwang from the Materials Science has been there. Al Johnson's certainly been there. I believe we've actually had Ted Bornhorst possibly go through there.
Q And when did these visits occur?

A Within the past two years.
Q And do you know why they visited the core shed?
A Out of interest regards the project.
Q Did they ask you or did you ask them to come over and take a look at the cores.
A They asked me if they could come across.
Q And you freely gave them access to look at the cores?
A I gave them access to look at the cores.
Q Are all of the cores from the 200 cores -- excuse me. Are all of the boxes from the 200 cores in the core shed at Negaunee?
A Aside from that (indicating) one, they're all there. Yes, they are.
Q Okay. Thank you. You haven't gotten rid of any of the boxes, have you?
A We're not allowed to.
Q And as part of your core logging process you took photos of each of the boxes, didn't you?
A That's correct.
Q And where are the photos kept?
A On the data server in Negaunee.
Q Has anybody besides Kennecott employees or consultants looked at the photos at the server at Negaunee -- or in the Negaunee offices?
A Could you rephrase that?

Q Sure. Has anyone besides Kennecott or its consultants viewed the photos in the Negaunee offices?
A If I understand you correctly, accessing the photos in the Negaunee office --
Q Yes.
A -- off the server?
Q Yes.
A I'm sorry. Just a minute. I lost track of the first part again. Has anyone aside from Kennecott --
Q And its consultants looked at the photos in the Negaunee office?
A No.
Q Have you sent by e-mail or otherwise copies of the core photos to anyone outside of Kennecott or its consultants?
A I distributed the eight core holes that were requested by the DNR. Those were sent.
Q Okay. Any others?
A There were three core holes that I believe were sent to Wilson Blake.
Q I see. You physically sent those out?
A I believe I copied --
Q By "physically" I mean, did you do the process of extracting them and send them?
A Copied them on the disk and Fed-Ex'd them, yes.
Q I see. You did that?

A I'm not sure about the last three, but the first date I did, yeah.
Q And who at the DNR requested those photos?
A That was a request passed on to me via Jon Cherry.
Q I see. And can you describe for Judge Patterson how that request came -- I mean, who -- what you understand the nature of the request to be and why it was made?
A The request pointedly referred to the eight holes contained in the Golder report on the major structures table. I believe the phrase was "eight holes that contained broken zones," and they quoted the table that contained that data or those hole listings.
Q And what was your turnaround in getting that request processed? Was it a day? A week? A month?
A I think it was within a week.
Q And for the three core photos -- excuse me -- photos of the three cores that were sent to Wilson Blake, who selected those three cores?
A I did.
Q And was there a reason why you selected those particular three as opposed to the 109 or 200?
A Yeah, I wanted a hole that was within the crown pillar. I wanted a hole that was drilled from on the edge of the crown pillar to the north, and I wanted a hole that was drilled to the south.

Q Did Dr. Blake ask you for three cores or just an unknown number of holes?
A I believe he asked for three.
Q He asked for three?
A I believe, sir. I do not recall the request specifically.
Q Okay. And you -- what made you pick those three?
A As I mentioned, one was drilled within the crown pillar, one was drilled to the north from the northern boundary of the crown pillar, and one was drilled to the south, but a vertical hole and two holes drilled like that (indicating). So it gives it coverage of the orebody to the south, the hanging wall to the north and the crown pillar.
Q What's there any reason why you couldn't have sent him four cores or five or ten or 50?
A There was no reason.
Q You just thought three would be enough?
A Yeah, if that's what the request was, I sent the number he requested.
Q Oh, I see. So he -- maybe I missed something. So he requested three core -- photos of three cores?
A I believe so. I'm sorry. I don't remember the specific wording of that request.
Q Mr. Ware, we're looking at Table 4 from Appendix C-3. You're familiar with this table?
A Yes, I am.

Q This is the table that shows the eight cores that the DNR personnel wanted to see; is that correct?
A That's correct.
Q Now, this table apparently -- by the way, did you help put this table together?
A That table was developed from the structure -- major structure table within the geotechnical logging.
Q All right. Did you help compile the information for this table -- for the table that appears in the Golder report?
A Golder received the major structure table. They noted these (indicating) features.
Q Oh, I see. So you didn't actually select the holes that are -- or the cores that are represented by this table?
A I didn't select those cores.
Q You sent then the data and they selected them?
A I sent them the entire structure table. They noted these.
Q All right. And this is from the table major structures that you've already testified on; correct?
A That's correct.
Q And the text here says -- by the way, you've read this text, haven't you?
A I have.
Q As far as you know, it's accurate?
A I believe so, yes.
Q The text says, "The query of this table indicates that 40

individual major structural zones were identified in 22 of the 26 drill holes intersecting the crown pillar area." Do you see that?

A I do.

Q So there are 40 major structural zones that apparently intersect the crown pillar area; correct?

A As that reads, yes.

Q The text; correct?

A As that reads, yes.

Q You don't disbelieve that, do you?

A No. I'm just saying that's stated within that paragraph. That's all.

Q Do you have any reason to disbelieve what's said in the paragraph?

A No, none whatsoever.

Q What is it -- how is "major structural zone" defined as you understand that phrase?

A Major structural zones, features in the core that are -- can either be intact or broken. They're typically areas of breaking core or significant vane shear feature within the rock.

Q So a major structure is something other than intact rock.

A It can be intact. You can have a shear zone or even a fault zone that's intact.

Q I see. But a structure is something that is different

than -- well, strike that. It says in the sentence -- the parenthetical that I didn't read says, "A total 183 were recorded." Do you see that?

A I do.

Q And what does that parenthetical refer to?

A That is referring to the number of major structural features that were recorded in the data set that Golder had at that point in time.

Q So that was of all of the holes?

A That's correct.

Q Not just the 26 drill holes intersecting the crown pillar area?

A No, they're saying that 40 major structural zones were identified in 22 of the 26 drill holes.

Q Right. My question is, what does 183 refer to?

A Most probably structural features below the crown pillar.

Q I see. Skipping down a sentence, the text says, "The majority of the zones (20) were classified as broken with links varying between 0.1 meters and 55 meters in core length." Do you see that?

A I do.

Q So apparently from this, there were 20 core -- 20 zones that had a length from one tenth of a meter to 55 meters length; correct?

A That's correct.

Q And then they identified ten zones with lengths of one meter or greater, and they listed those on the table. So we have ten zones that are a meter or more in length; correct?
A Correct.
Q But there are 20 zones that are major structures of any length; correct?
A There are 20 zones that were classified as broken with varying lengths between .1 and 55 meters.
Q And tell us what that mean by "broken," if you know.
A We have in the major structure table again four categories of structure. There's broken, gouge, fault and --
Q I think it says "gouge, sheared or broken."
A Yeah. Okay.
Q All right? I see. So they're saying -- and how is broken different than sheared or gouged?
A Broken I believe I know more often than not is mainly attributable to the process of drilling the hornfels.
Q And what do you mean by hornfels?
A Hornfels is the baked rock right on the edge of the intrusion that forms Eagle.
Q So the broken zones were broken by what? The drilling process or from the rock itself?
A It's a combination. It's the drilling process, the extremely brittle nature of that rock. When you're drilling forward, you typically get very short runs, and it's very

hard to get out of the core barrel. So to helper has to whale on the core barrel, really bang it hard to get the rock out, so he's inducing fractures. That said, we record them as broken zones up to 55 meters in length.

Q Certainly for the 55 meter broken zone here which is the fourth item on -- this is on hole 62, --

A Uh-huh (affirmative).

Q -- for that length of 55 meters, that's not a situation where the geologist was banging on 55 meters of core, was he?

A The driller.

Q Excuse me. The driller.

A Quite possibly. And the reason was, that hole was drilled straight down the contact with intrusion, so it's very easy to drill 55 meters of poor quality rock hornfels.

Q That is the rock that is between the country rock and the peridotite?

A Country rock on this (indicating) side, hornfels, peridotite, then in that area, mineralization.

Q All right. So the 55 meters you're saying was -- if this was a vertical hole, followed 55 meters of pretty broken rock between the country rock and the intrusion; right?

A That's correct.

Q 55 meters is about 160 feet or so; right?

A Uh-huh; that's correct.

Q That's a pretty long length, isn't it?
A Not when you put it in context on how the hole was drilled. I mean, as I suggested before, if you're drilling --
THE WITNESS: May I stand up?
JUDGE PATTERSON: Sure.
A If this is our very small opening and your drilling right down the side of it, the zone itself may be 2 meters wide of broken rock. But you can drill a hole with 55 meters of broken rock by drilling parallel to the contact.
Q And the broken rock again, just so that the record is clear, is the rock between the country rock and the intrusive -- the intrusive; correct?
A Sometimes it occurs in the contact.
Q And what do you mean by "the contact"?
A Contact between the country rock and the intrusive.
Q And the broken rock would show up in the core photos -- in the cores -- right? -- as broken rather than solid rock?
A That's correct.
MR. HAYNES: Your Honor, I note that it's almost a quarter to and I'm going to move into another area now, so --
JUDGE PATTERSON: Okay. Let's call it a day.
(Proceedings adjourned at 4:41 p.m.)
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