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. VII

BEFORE RICHARD A. PATTERSON, ADMINISTRATIVE LAW JUDGE

Constitution Hall, 525 West Allegan, Lansing, Michigan

Tuesday, May 6, 2008, 8:30 a.m.

APPEARANCES:

For the Petitioner Keweenaw Bay Indian Community:

MR. ERIC J. EGGAN (P32368)
Honigman Miller Schwartz and Cohn LLP
222 North Washington Square, Suite 400
Lansing, Michigan 48933-1800
(517) 377-0726

For the Petitioner Huron Mountain Club:	MR. BRUCE T. WALLACE (P24148) WILLIAM J. STAPLETON (P38339) Hooper Hathaway Price Beuche & Wallace 126 S. Main Street Ann Arbor, Michigan 48104-1945 (734) 662-4426 and PETER K. DYKEMA (P37352) Winston & Strawn 1700 K St. NW Washington, DC 20006 (202) 282-5773
For the Petitioners Yellow Dog Watershed Preserve and National Wildlife Federation:	F. MICHELLE HALLEY (P62637) National Wildlife Federation PO Box 914 Marquette, Michigan 49855 (906) 361-0520
For the Respondent Michigan Department of Environmental Quality:	S. PETER MANNING (P45719) Assistant Attorney General Environment, Natural Resources and Agriculture Division 6th Floor, Williams Building 525 West Ottawa Street, PO Box 30755 Lansing, Michigan 48909 (517) 373-7540
For the Intervenor Kennecott Eagle Minerals Company:	SARAH CATHERINE LINDSEY (P68544) STEVEN C. KOHL (P28179) Warner Norcross & Judd LLP 2000 Town Center, Suite 2700 Southfield, Michigan 48075 (248) 784-5000
RECORDED BY:	Marcy A. Klingshirn, CER 6924 Certified Electronic Recorder Network Reporting Corporation 1-800-632-2720

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NOTE: Page numbers may change on final transcript.

EXHIBIT INDEX

NOTE: Page numbers may change on final transcript. Full exhibit list for today will be included in the final transcript.

1 Lansing, Michigan
2 Tuesday, May 6, 2008 - 8:33 a.m.
3 MR. STAPLETON: Judge, we're prepared to continue
4 the deposition of -- the testimony of Mr. Vel.
5 JUDGE PATTERSON: Okay.
6 MR. STAPLETON: Your Honor, I neglected yesterday
7 to provide the Court with copies of the core deposition maps
8 that we were using yesterday.
9 JUDGE PATTERSON: Oh, good. Okay. Thank you.
10 MR. STAPLETON: Copies have been provided to
11 counsel.
12 JUDGE PATTERSON: Okay.
13 SUBE VEL
14 having been recalled as a witness by the Petitioners:
15 DIRECT EXAMINATION
16 BY MR. STAPLETON: (continued)
17 Q Mr. Vel, I'd like to start today by returning to an exhibit
18 that you were discussing yesterday.
19 MR. STAPLETON: And this is, for the record,
20 Petitioner's Exhibit 77O entitled "Vent Raise Summary."
21 Q And just to refresh us all, can you just briefly describe
22 what this exhibit depicts?
23 A This is the vent raise summary from all the previous
24 calculations that we discussed yesterday, and we went over
25 this slide too. This talks about different sources in the

1 underground mining area, and this gives us uncontrolled PM
2 emissions, and this (indicating) column provides us with a
3 controlled PM emissions in pounds per hour. And based on
4 that, we calculated -- based on the concentrations in copper
5 and nickel, emission rate in grams per second.
6 Q Now, you testified yesterday that the deposition of -- the
7 emission of uncontrolled PM in pounds per year would be
8 approximately 56,000 pounds; is that correct?
9 A Yeah, 56,000 pounds; yes.
10 Q Okay. Could you step to the easel there and just do that
11 calculation for us since it's not on the exhibit here?
12 A Yeah. This is a straight conversion here. See, when I said
13 56,000 -- I have to get my calculator out.
14 MR. KOHL: Your Honor, I will object to this line
15 of questioning with regard to uncontrolled emissions since
16 the emissions are required by permit to be controlled.
17 JUDGE PATTERSON: I think you objected before.
18 MR. KOHL: Yeah, I'll just have a continuing
19 objection to uncontrolled emissions.
20 JUDGE PATTERSON: Okay. That's fine.
21 A It's a straight conversion here, you can look at that as
22 being 6.5 pounds per hour.
23 Q All right.
24 A So the uncontrolled PM 6.5 pounds per hour and 8,760 hours
25 in year -- I think there's a simple multiplication here.

1 (Witness calculating)
2 A Uncontrolled.
3 Q So if you'd just explain to us what you did there on the
4 calculation --
5 A Based on the 6.5 pounds per hour and year -- we have 8,760
6 hours in a year. So I multiplied 6.5 times the 8,760, is
7 56,940 pounds a year.
8 Q And that's in uncontrolled PM emissions from the vent raise;
9 correct?
10 A Yes.
11 Q And we talked yesterday about the uncontrolled and the
12 controlled captions. What would you do so the 56,940 number
13 in order to obtain the controlled PM emissions from the
14 mine?
15 A We know that there is a control -- there's a -- Kennecott is
16 proposing a control which would control the PM emissions to
17 have a control of 85 percent. So if you -- so whatever
18 emissions that'll happen in control -- so it would be 15
19 percent of that, which is 56,940 times 0.15, should give
20 me 8,541 pounds controlled. This is PM emissions.
21 Q Now --
22 JUDGE PATTERSON: I'm sorry. What was that
23 figure?
24 THE WITNESS: 8,541.
25 JUDGE PATTERSON: Okay. Thank you.

1 Q And we testified -- you testified about this a little bit
2 yesterday, but what is the basis for the 85 percent control
3 that you are using there?
4 A This is based on the response to the comments received by
5 MDEQ -- received -- I mean, response to comments by MDEQ. I
6 had information that stated that Kennecott is proposing *
7 8:39:31 control, that will have a control efficiency of 85
8 percent.
9 Q Now, were there any specifications for this filter anywhere
10 in the air permit application?
11 A No, because this control was proposed after the permit
12 application was put together.
13 Q So, Mr. Vel, do you have any way of knowing what particle
14 sizes will be filtered out by this proposed filter?
15 A You mean that it will filter out coarse particles versus
16 fine particles?
17 Q Correct.
18 A I have no idea.
19 Q And if the filter proposed only filtered out -- if the
20 proposed filter only filtered out, for example, coarser
21 particles rather than finer particles, what impact would
22 that have on your deposition analysis?
23 A So finer particles will travel farther, so it could have an
24 impact on the long -- not the near field but the farther
25 field far away from the mean property. That could be an

1 impact. But without knowing any specifications, I can't be
2 more specific about it.
3 Q And is the efficiency of a filter such as this in terms of
4 being able to filter out coarser versus finer particles an
5 important specification to know for this type of filter?
6 A I think so, yeah.
7 Q Now, returning to your calculations, Mr. Vel, you've
8 calculated 56,940 pounds per year of uncontrolled PM
9 emissions from the vent raise. How would we take that
10 number and determine the amount of copper and nickel that
11 would come out of the vent raise uncontrolled?
12 A We can take the concentrations.
13 THE WITNESS: If you go down -- if you'll scroll
14 down a little bit here, I can --
15 A These concentrations are based on the air permit application
16 Appendix C, and my -- vent raise may have ore and
17 development rock. And so if you consider -- we have to
18 exactly look at what -- which of these sources have
19 development rock emissions -- particulate emissions from
20 development rock versus ore, and then we can estimate the
21 concentrations of copper and nickel. Right now, if I do --
22 if I take it and multiply by 3.11 percent, that will be an
23 approximation, because it has a mix of ore and development
24 rock.
25 Q Okay. Could you just perform that calculation there

1 underneath your -- under the easel -- your writing on the
2 easel?
3 A Yeah, I could, but it is going to be an approximation. I
4 don't know exactly what the numbers are. You're talking
5 about from the uncontrolled emissions?
6 Q From the uncontrolled. So what amount of copper would come
7 from the uncontrolled emissions?
8 A Yeah.
9 (Witness calculating)
10 A It is 56,940. And I'm assuming the copper percentage to be
11 3.11, and this is an assumption because from the mine vent
12 there is going to be both development rock and ore. I don't
13 know what the distribution of that is. This is just to show
14 a calculation here. 0.0311 -- just a second. I'll convert
15 percentage to fraction.
16 (Witness calculating)
17 A So it'll be 1,770.84 pounds of copper uncontrolled. I'm
18 going to add it assuming that copper percentage from the MVR
19 is 3.11 percent.
20 Q And the 3.11 percent is taken directly from the air permit
21 application?
22 A Yeah. It is from page A-10 of Appendix C of the air permit
23 application, yes.
24 Q And for -- how about the uncontrolled emissions for nickel?
25 Would you perform a similar calculation for nickel?

A Yes. Except for multiplying it by 0.0311, I have to multiply times 0.0315, which will be pretty close. Do you want me to do that?

Q Sure.

A Okay.

(Witness calculating)

A Uncontrolled again, the assumption that nickel percentage is 3.15.

Q So what is the uncontrolled nickel coming out of the vent raise?

MR. KOHL: I'll object, your Honor. There's no foundation for that question. He's just taken the copper percentage of ore and applied it to all the particulate, and now the question is, what's coming out of the vent raise when he's already testified that the vent raise emissions are going to be ore, development rock, backfill, et cetera, et cetera. Lack of foundation.

MR. STAPLETON: Well, your Honor, Mr. Vel is taking the nickel percentage directly from the air permit application and calculating what percentage of the particulate matter would be nickel if the emissions were uncontrolled, and he's -- you know, he's just performing a mathematical calculation based on data in the MDEQ air permit application.

MR. KOHL: Well, if they were uncontrolled, if

1 they were all from the orebody, which has not been the
2 testimony, nor is there any foundation for that. Now, we
3 could spend the next six hours dealing with hypotheticals,
4 but I don't see what the point is.
5 JUDGE PATTERSON: I think, Counselor, you can
6 argue that or pursue it on cross-examination, but so far
7 it's a calculation. I'll overrule the objection.
8 Q Mr. Vel, again, can you just take us through your nickel
9 calculation for uncontrolled emissions?
10 A The uncontrolled PM emissions of 56,940 pounds per hour, and
11 we -- the assumption is that the nickel percentage is 3.15
12 percent coming out of the mine vent raise, and we got
13 1,793.61 pounds of nickel.
14 Q Okay. Now, Mr. Vel, I'd like to take a look -- return
15 briefly to the copper deposition map that was generated by
16 your deposition model.
17 MR. STAPLETON: And for the record, we're putting
18 on the screen Petitioner's Exhibit 83.
19 Q And once again, Mr. Vel, can you just refresh our
20 recollection a little bit and tell us what this map depicts?
21 A The red line indicates the grid size that CRA used, and the
22 green is -- the green line depicts the grid size that MDEQ
23 utilized for their deposition modeling. And the yellow
24 lines depict the deposition contours.
25 Q Okay. And this map depicts the deposition contours for 155

1 pounds of copper, which you calculated would be coming from
2 the mine on an annual basis; is that correct?
3 A That is correct.
4 Q And have you calculated the -- of that 155 pounds, how --
5 what percentage of that would be deposited in the mining
6 area property boundary versus outside the mining area?
7 A I did. I don't know the percentage, but I can tell you it's
8 about -- out of 155 pounds, we took the 80 of it, then the
9 Kennecott's fenced property, and then we estimated the
10 deposition, and that came to about 8 pounds -- 8 pounds.
11 And the remaining was deposited about -- 147 pounds was -- 8
12 pounds inside the property.
13 Q Inside the property, and the balance, about 14- --
14 A -- -7 --
15 Q -- -7 pounds of copper is deposited outside of the mining
16 area?
17 A Outside of the mining area where we're talking, yes.
18 Q Just for illustration purposes, what were some of the
19 components of that calculation that you performed, based on
20 your deposition model?
21 A It is similar to what I testified yesterday how we looked at
22 each of the grid sizes, looked at the nodal points and then
23 calculated the concentrations times the area, and we got the
24 numbers. It was just a calculation for every grid and
25 looking at it and trying to find out what's the average

1 concentration surrounding that area. And the calculation is
2 pretty similar to of we did the copper deposition and nickel
3 deposition.
4 Q Okay. And I was going to ask about the nickel deposition.
5 Did you do a similar calculation for the -- I think
6 yesterday the testimony was that there would be 157 pounds
7 of nickel coming from the mine that would be deposited over
8 this 40-by-40-kilometer area; is that correct?
9 A That is correct.
10 Q And did you a similar calculation for the nickel in terms of
11 how much would be deposited within the mining boundary and
12 outside the mining boundary?
13 A Pretty close; 8 pounds. It was 147 pounds, yeah.
14 Q Now, looking at the map again, Mr. Vel, can you explain just
15 once again what the yellow contour lines depict on the map?
16 A These are deposition contours. That's the line joining the
17 points of same concentration.
18 Q And this depicts an area of concentration of copper coming
19 from the mine; is that correct?
20 A That is correct.
21 Q And do these deposition contours change from year to year
22 based on actual weather patterns?
23 A Yes, they do.
24 Q And could you give us an idea of how they might change based
25 on actual weather patterns?

1 A Depending upon the weather, wind direction, wind velocity,
2 the deposition may be different for different years.
3 They're significantly different, but I can say, in certain
4 areas certain years -- it could be higher in certain areas
5 or -- in other years, depending upon the conditions. It
6 could be lower in certain points so --
7 Q And those greater concentrations, could they be --
8 MR. KOHL: Objection; lack of foundation. He
9 didn't testify that there would be greater concentrations.
10 He said they would be different.
11 MR. STAPLETON: I'll rephrase, Judge.
12 JUDGE PATTERSON: Okay.
13 Q The variants, the greater or lesser concentrations that you
14 talked about, Mr. Vel, could they appear at any point on
15 your 40-by-40 grid depending on weather patterns?
16 A It could; yeah, it could; yeah.
17 Q All right, Mr. Vel, I'd like to return to what we were
18 discussing at the end of the day yesterday, and that had to
19 do with the deposition impact analysis performed by MDEQ.
20 MR. STAPLETON: And for the record, this is
21 Intervenor Exhibit 507.
22 A Okay.
23 MR. STAPLETON: And we're showing on the screen
24 the first page of this exhibit.
25 Q And once again, can you describe -- first of all, had you

1 reviewed the deposition impact analysis performed by MDEQ
2 for this site?
3 A Yeah. There were four different deposition modeling files
4 that were provided to us. We did look at all of them, yes.
5 Q And can you describe for us the methodology employed by MDEQ
6 for performing this deposition analysis?
7 A There are two sources that are considered, mine vent raise
8 and crushing building bag house. Total suspended
9 particulates was considered for mine vent raise emissions,
10 and PM10, which is particulate matter less than 10 microns
11 in size, was considered for crusher building bag house. And
12 the analysis was conducted based on the unit emission rate
13 and then prorated it for different metals and sulfide.
14 Q Can you show us what is depicted in Table 1 there on the
15 first page of this exhibit?
16 A This shows the emission rate of particulate matter. For
17 example, in the mine vent raise, you are looking at 0.0867
18 grams per second. And based on the concentration of 25.8
19 percent of sulfide, they come up with a concentration of
20 sulfide to be 0.0224 grams per second and similarly for
21 other metals here.
22 Q And the MDEQ deposition analysis reflects consideration of
23 just two sources from the mine; is that correct?
24 A That is correct.
25 Q And what percentage of the copper and nickel emissions from

1 the mine do these two sources constitute?
2 A Based on our -- based on CRA's emission rate -- it's the
3 emission estimation where we -- I think it is about 70
4 percent.
5 Q And did you see any reference in the materials that you
6 reviewed as to why MDEQ only considered two sources rather
7 than six sources?
8 A There is a memo that talked about considering all the
9 sources with plume depletion would result in months of
10 computer time, which is really true. It's not possible to
11 do it. And that is the reason why they considered. But
12 there is no other reason. I couldn't see any other reason
13 for it.
14 Q But you -- I mean, you ran the deposition model with six
15 sources, and it didn't take months, did it?
16 A No, it did not.
17 Q How long did it to you to run the deposition model?
18 A I don't remember, but it could be about 48 to 72 hours,
19 something like that, yeah.
20 Q And looking back at the exhibit, Table 2, can you describe
21 what's depicted in Table 2?
22 A This gives the emission rate of sulphur dioxide from
23 different sources; mine air heater, generator 1 and 3 and
24 the mine vent air raise, which was taken from -- in grams
25 per second of sulfur dioxide.

1 Q Okay. Did CRA perform any sulfur deposition analysis?
2 A No, we did not.
3 Q Did you attempt to for this site?
4 A We tried to. We didn't have enough information regarding
5 the sulfide concentration. We couldn't clearly figure out
6 what the sulfur concentrations for different sources. We
7 reviewed a lot of records. We couldn't locate it. We
8 couldn't find an exact concentration, so we couldn't do it.
9 Q Did you request that information in a FOIA from MDEQ?
10 A Not specifically. We got the FOIA from Air Quality
11 Department. We got the information, but we couldn't locate
12 it.
13 MR. STAPLETON: Let's scroll to the next page.
14 Q Now, the deposition analysis performed by MDEQ used the same
15 deposition model that CRA used; is that correct?
16 A You are talking about the software?
17 Q Yeah, the software.
18 A Yes.
19 Q Yes. And similar to CRA, MDEQ concluded a maximum
20 deposition impact for various metals; correct?
21 A That is correct.
22 Q Is that information depicted in Tables 4 and 5?
23 A This is -- this talks about annual soil impacts from air
24 deposition model. I am not familiar with the soil impact
25 analysis. But it does depict taking from the deposition

1 rate in grams per milligrams per meter squared per year
2 using a -- it's a simple calculation. It's the density of
3 soil being 1.6 grams per centimeters cubed. They have come
4 up with concentrations for different metals here.
5 Q Let's focus on the copper in Table 4.
6 A Okay.
7 Q Do you have your pointer, Mr. Vel?
8 A Yes, I do.
9 Q The copper in Table 4, what did MDEQ determine to be the
10 maximum annual soil impact for copper?
11 A I'm going to look at this table and tell you it's just going
12 to be 1.88 times 10 power negative 3 for a 1-centimeter soil
13 depth and --
14 Q But we're talking about copper; right?
15 A Yeah. I'm sorry.
16 Q Yeah.
17 A It's 6.99 times 10 power negative 2 for copper.
18 Q And you testified yesterday as to your calculation of the
19 maximum deposition rate for copper based on the model run by
20 MDEQ. Do you recall that?
21 A Yes.
22 Q And what did you conclude was the maximum deposition rate
23 from the modeling done by MDEQ for copper?
24 A We did a reverse calculation on 6.99 times 10 power negative
25 2, and we came up with 1.12 milligrams per square meter per

1 year.
2 Q Could you step to the easel again, Mr. Vel?
3 A Yeah. Okay.
4 Q And maybe -- yeah, maybe turn that sheet over. And if you
5 could, try to write, Mr. Vel, your numbers a little larger
6 just so that we can see them on the easel a little better.
7 A Okay.
8 Q Can you take us through your calculation of the maximum
9 deposition rate from the information in the DEQ deposition
10 analysis? So --
11 A So the maximum copper concentration is 6.99 times 10 power
12 negative 2 ppm. In mass fraction that will be -- and this
13 is parts per million, so I'm going to just convert that into
14 a mass fraction, which is 6.99 times 10 power negative 8.
15 And based on the density of the soil, which is -- for mass
16 of soil in 1 centimeter cube is -- equals 1.6 grams. So
17 mass of copper in 1 centimeter cube should be a mass
18 fraction 1.6 times 6.99 times 10 power negative 8, which
19 should be 1.1- -- let's see. Let's round it off -- 1.12
20 times 10 power negative 7. This is in 1 centimeter cube.
21 This is grams in 1 centimeter cube. And if I convert this
22 into grams -- milligrams per centimeter squared, assuming
23 that's going to be 1-centimeter thick of soil, it'll come to
24 1.12 milligrams per meter squared per year, because this is
25 an annual emissions. So --

1 Q Okay. And when you ran -- and this is for copper; correct?
2 A That is correct.
3 Q And when you ran the deposition model using six sources, you
4 also concluded what the maximum deposition rate for copper
5 was; correct?
6 A Yeah. I -- yeah. Maximum CU dep rate, going off my memory,
7 could be 71.72 milligrams per meter squared per year.
8 Q Okay. And can you -- so the maximum deposition rate as
9 calculated by CRA using six sources, is 71.72 milligrams per
10 meter squared per year; is that correct?
11 A That's correct.
12 Q And the two sources that MDEQ used, the maximum deposition
13 rate for copper is 1.12?
14 A Yeah.
15 Q And can you perform the calculation for the difference in
16 those numbers?
17 A You're trying to find the ratio?
18 Q Yes.
19 (Witness calculating)
20 A It's about 64 -- 64 times.
21 Q And this ratio results exclusively from the use of six
22 sources versus two sources of copper; correct?
23 A That's right; six sources versus two sources, and this is in
24 the near field, very closer to the property boundary; yeah,
25 at the property; within the property.

1 Q And that's maximum deposition rate for copper?
2 A Based on what CRA calculated. This 1.12 could be -- the one
3 that MDEQ calculated could be somewhere else. We don't
4 know. But this is based on the maximum impact analysis,
5 yes.
6 Q Okay. All right. Mr. Vel, returning to the exhibit for a
7 moment, Table 5, can you describe what that summarizes?
8 A This is a ten-year soil impact. If you look at it, that
9 is -- the numbers from Table 4 has been multiplied by ten
10 times to get the worst-case impact, I'm assuming. It is --
11 for example, in copper it is 0.0699 times ten; got it up to
12 0.699 ppm, so it's a ten-year impact; one-year impact
13 straight multiplication ten times for ten years.
14 Q And that's what's depicted in Table 5?
15 A Yeah.
16 Q And if you performed that same math that DEQ performed based
17 on your maximum deposition rate for copper, what number
18 would you come up with?
19 A I have to convert again milligrams per meter squared to ppm.
20 You want me to do that? Just looking at that number, if my
21 number would have been -- gone there, if you look at -- if
22 the ratio and proportion -- the ratio is going to be the
23 same. It'll be 64 times that .0699 for one year and 0.699
24 for ten-year impact. The number will be 64 times that
25 number, but that is considering this is the maximum annual

1 soil impact you're talking about, yes.
2 Q And what is 64 times that number? Have you done the
3 calculation?
4 A I can do it right now. I haven't done it before but -- you
5 want for one year or for ten years?
6 Q Well, why don't you do it for both?
7 A Okay.
8 (Witness calculating)
9 A About 4.47 ppm for one year and 44.7 for ppm for ten years.
10 Q And when you say "ppm," just for clarification, can you --
11 A It's parts per million.
12 Q It's parts per million of copper in soil; correct?
13 A Yeah; yeah, based on this; yeah.
14 Q Okay. Let's --
15 MR. STAPLETON: Maybe we can move to the next
16 page.
17 Q Mr. Vel, I've put on the screen what is Table 6 from the
18 MDEQ deposition analysis. Can you describe for us what is
19 depicted in Table 6?
20 A This is about soil concentration. I'm not an expert in it,
21 so I'm going to read it and let you -- and I'm going to
22 just --
23 Q Sure. That's fine.
24 A -- whatever I can tell you about it. This (indicating) is
25 one-year average maximum soil concentration from previous

1 table, and this is the ten-year average concentration from
2 previous table. I think they -- this number was compared
3 against applicable part 201 soil cleanup criteria and BLM
4 RMC for metals and soils criteria and ppm and --
5 Q Okay. Let's focus on the copper number in this table.
6 A Okay.
7 Q And once again take us through what the one-year maximum
8 soil impact and the ten year was for copper as calculated by
9 MDEQ.
10 A 0.0699 for one year and 0.699 for ten years.
11 Q And based on this data, if -- using the six sources that
12 were modeled by CRA for copper, what impact does that have
13 on the ten-year maximum soil concentration for copper?
14 A That will be 44.74 ppm.
15 Q I'm sorry. Can you say that again?
16 A 44.74.
17 Q Parts per million.
18 A Parts per million, yes.
19 Q Of copper in the soil?
20 A Yeah, maximum; yeah.
21 Q And does that 44.7 exceed any of the criteria that is listed
22 here in Table 6?
23 A It does not exceed the soil cleanup criteria of 5800;
24 however, it exceeds the BLM RMC for metals in soils. I
25 don't know if this is one of the criteria, but it exceeds

1 this number 7 here (indicating).
2 Q And do you have any familiarity with the Bureau of Land
3 Management criteria for metals and soils?
4 A No, not really; no.
5 Q Mr. Vel, I'd like to talk a little bit about the analysis
6 performed by MDEQ for sulfur deposition. Can you describe
7 for us what is depicted in Table 7 of this exhibit?
8 A I just want to start off by saying CRA did not conduct a
9 sulfur deposition impact, so I'm going to just read off this
10 table here. Sulfur deposition impact, this talks about
11 Minnesota sulfur background values in kilograms per hectare
12 per year. And they have a standard for wet deposition,
13 which would result from acid rain. And these (indicating)
14 are the background sulfur concentration in the area, and
15 this is the maximum sulfur impact in kilograms per hectare
16 per year for wet, dry and total. And this is the percentage
17 of the background; how much percentage is .2 to the
18 background sulfur value that constituted 11 percent here and
19 calculated the maximum impact plus background, which would
20 be a sum of 1.8 per .2 and then try to find out what is the
21 percentage of this standard. So --
22 Q And you mentioned hectare?
23 A Hectare, yeah.
24 Q Yeah. Can you describe for us what that measurement is?
25 A Hectare is the unit of area.

1 Q And what approximately is the size of it in acres?
2 A I don't remember. I don't remember.
3 Q I mean just roughly.
4 A I'm sorry. I should.
5 Q Do you have a --
6 A I don't have memory. My --
7 Q Okay. That's fine.
8 A I used to remember. Now I don't.
9 Q But this depicts the amount of sulfur in kilograms deposited
10 per hectare per year; correct?
11 A Yeah; yes.
12 Q Mr. Vel, from the information in this analysis about sulfur,
13 are you able to calculate the emission in pounds per year of
14 sulfur from the mine?
15 A I don't know the conversion of hectare, but I -- we can go
16 back to the emission rate table, and I can do a simple
17 conversion from there. From Table 1 it had the emission
18 rate in grams per second. I've --
19 Q Okay. Why don't we do that?
20 A Okay. Do you want me to do that?
21 Q We'll go back to Table 1. Okay?
22 A Okay.
23 Q And could you do the calculation for us again on the easel,
24 please?
25 A Okay.

1 (Witness calculating)
2 A From the source, the MAVR --
3 Q And once again, what is the MAVR?
4 A It's a mine air vent raise -- mine vent raise here.
5 Q That's the vent raise?
6 A Yeah.
7 Q Okay. Sulfide is 0.0224. That is in grams per second.
8 This is a straight conversion I'm going to do. Grams, I'm
9 going to convert that into pounds. 2.2 kilograms is 1
10 pound, so 0.0224 times 0.0022, that is grams per sec times
11 pounds per gram. Seconds, I need to convert that into year,
12 which is 3,600; 60 seconds, 60 minute, one hour times the
13 8,760, that'll give me 0.0224 times .0022 times 3600 times
14 8,760 should give me 1,554.1 pounds from the mine vent
15 raise. And doing the same calculation for crusher building
16 bag house, which would be 0.00378, doing the same
17 calculation here --
18 (Witness calculating)
19 A I'm sorry. This is not the number. Sulfide is 0.00098.
20 I'm sorry. I took the PM --
21 Q And, Mr. Vel, can you remind us again, "CBH," what does that
22 stand for?
23 A Crusher building bag house.
24 Q Crusher building bag house?
25 A Yeah.

1 Q And that's the second source considered by MDEQ?
2 A Yeah; that is correct. And the emission rate is 0.00098 --
3 -98 times --
4 (Witness calculating)
5 A Give you approximately 68 pounds. Then I add both; 1,622.1
6 pounds --
7 Q And that's --
8 A -- sulfide per year, and this doesn't include mine heater.
9 This is just from mine vent air raise and crusher building
10 bag house.
11 Q Okay. And are these controlled rates, assuming the 85
12 percent control?
13 A I don't know. That is said particulate matter control. I
14 can't really talk about it, because there are some gaseous
15 sulfurs and --
16 Q Okay. So this number would include gaseous sulfurs?
17 A Yeah. This is just a straight conversion from there. I --
18 some of them could include that. I don't know. I haven't
19 done the analysis, so I can't really give you opinion on
20 that.
21 Q Okay. And once again, based on MDEQ's data, there would be
22 1622 pounds of sulfides --
23 A Sulfide, yeah.
24 Q -- emitted per year from the mine?
25 A Yeah.

1 Q And, Mr. Vel, can you give us some idea how sulfides travel
2 from the mine in particulate matter?
3 A This is a copper and nickel sulfide mine, so wherever there
4 is going to be particulate metal concentrations, you
5 would -- it's conceivable you would see some sulfur in
6 there, you know, wherever there is a deposition of -- from
7 the deposition perspective, because it's a sulfide mine.
8 The particulate matter carries all these compounds, so
9 wherever there is -- you will see deposition of PM or any of
10 these compounds, you will also see some sulfide in there.
11 Q So wherever you would see deposition of copper, you would
12 also see deposition of sulfide?
13 A It is conceivable. I haven't done the analysis.
14 Q But it's likely?
15 A It's likely.
16 Q Because they travel together? I mean, they travel in the
17 same --
18 A Yeah, it could; yeah.
19 Q -- particulate matter?
20 A Yeah, it's a particulate matter.
21 Q And would the same be true for nickel?
22 A Yes.
23 Q And so would you be able to predict that sulfides would
24 follow similar deposition contours for copper and nickel as
25 depicted in your contour maps?

1 A I haven't done the analysis. I haven't done the contour
2 maps for them, so I can't really say but --
3 Q But just in terms of area covered?
4 MR. KOHL: Objection. He's already testified that
5 some of the sulfides would be in gaseous form, not
6 particulate form; lack of foundation.
7 MR. STAPLETON: Well, your Honor, he's testified,
8 I believe, that they would be in both forms and that,
9 wherever copper would be deposited or nickel would
10 deposited, you'd also see sulfides deposited. And so that's
11 the basis of my question.
12 JUDGE PATTERSON: The question again was what?
13 I --
14 MR. STAPLETON: Is what -- would you expect
15 sulfides to be deposited similarly to copper and nickel as
16 depicted in the deposition contour maps?
17 JUDGE PATTERSON: I'll overrule the objection.
18 A If I look at the particulate sulfide, yeah, that is -- that
19 could be true. But there is also gaseous form of sulfur, so
20 I can't really come out and say it, because I don't know
21 what -- this gaseous form, how they travel. I haven't done
22 the analysis.
23 Q Oh, I understand.
24 A Yeah.
25 Q And I'm really just talking about particulate matter.

1 A Yeah.
2 MR. KOHL: Continuing objection on the lack of
3 foundation since he hasn't done the analysis. We're now
4 just speculating.
5 Q But I'm -- restricting yourself to the particulate matter
6 aspect of the sulfides?
7 A From a particulate standpoint, yes, it could be; yeah.
8 MR. STAPLETON: All right. Thank you, Mr. Vel. I
9 don't have any further questions at this time. At this
10 time, your Honor, Petitioners would move for the admission
11 of Exhibits 77A through E, 77G and H, 77J through O and 77Q
12 and 78B and C and Exhibits 81, 83, 86 and 84 and would also
13 propose that the calculations performed on the easel by Mr.
14 Vel be admitted as Petitioner's Exhibit 77R.
15 MR. KOHL: I have an objection, at least at this
16 point, of admitting them until I complete my cross, your
17 Honor.
18 JUDGE PATTERSON: I think you stated that before.
19 MR. KOHL: Okay.
20 JUDGE PATTERSON: All right. We'll reserve that,
21 then.
22 MR. KOHL: Thank you. Good morning, Mr. Vel. How
23 are you?
24 THE WITNESS: Good morning. Good. How are you?
25 MR. KOHL: Good; good.

1 CROSS-EXAMINATION
2 BY MR. KOHL:
3 Q Do you know who retained CRA for this project?
4 A Huron Mountain Club retained for this particular project.
5 Q Were you the direct contact with -- for CRA with Huron
6 Mountain Club?
7 A Ryan Shepard was the original contact. And from a
8 technical -- from the accounting standpoint, I was retained
9 and Gordon Reusing, our shareholder in charge in Waterloo,
10 also had a contact with Huron Mountain Club.
11 Q So did you have any direct contact with Huron Mountain Club
12 or its counsel until you testified?
13 A Direct contact, yes; yes. We did all this calculation at
14 permitting review and things like that.
15 Q And you worked with Huron Mountain Club's counsel, I assume?
16 A Yes; yes.
17 Q Or did you? I -- you know, I'm not trying to put words in
18 your mouth.
19 A Yes, I worked with Bill, and I worked with people. I don't
20 know who the counsel really for Huron Mountain Club is. I'm
21 just --
22 Q All right. I understand.
23 A Yeah.
24 Q When you talked about what you were going to do on this
25 project, who was involved in those discussions within CRA?

1 A I was involved in the discussion, but the scope was very
2 clear from this project forward. It was to take the
3 emissions, do the deposition model and provide the maximum
4 deposition rate and total deposition for copper and nickel
5 and sulfide, but sulfide we couldn't do.
6 Q So would it be fair to say the scope of your assignment as
7 you understood it was to take the information that was
8 available to you through FOIAs and develop the maximum
9 amount of deposition that you could possibly develop? Is
10 that correct?
11 A Not the maximum amount. First we had to check the
12 calculation and, if there are any issues with the
13 calculation, fix it and find out what the maximum deposition
14 rate is. I mean, not really -- we were not trying to find
15 what the maximum that we could find. That's why you could
16 see in my calculations that there were areas that were
17 significantly lower emissions and higher emissions, so it
18 was not trying to use the data. It was trying to make sure
19 that that is correct.
20 Q And who decided that you would model the deposition of
21 nickel and copper?
22 A It was a part of the scope that we were provided to look for
23 the deposition of nickel --
24 Q You were assigned to look for the deposition on those two
25 metals?

1 A Cooper, nickel and sulfide, and sulfide we couldn't do it.
2 We didn't have enough data to do that.
3 Q You weren't asked to model nox emissions from the source?
4 A Not really, no.
5 Q You weren't asked to model SO2 emissions from the source?
6 A No.
7 Q CO emissions?
8 A No.
9 Q Do you know why you were asked to model nickel and copper?
10 A They're the largest source of heavy metals. And it's a
11 copper and nickel mine. This is again speculation. We were
12 given a scope, and we executed that scope of work.
13 Q Okay. So you're not testifying today that you consider the
14 nickel and the copper values that you modeled to be
15 significant or not significant in any broader sense?
16 A I'm just a numbers guy. I'm -- my job was to do the
17 deposition; to check the emissions, do the numbers and
18 provide the contours, and that's what we did.
19 Q Now, the modeling results that you've testified to today and
20 yesterday, when did you complete that work?
21 A We completed it probably -- this was done -- this
22 calculations was done in March after we received the
23 response to the comments. This scope of work started in the
24 end of November, December. We previously did some modeling,
25 but that was dispersion mostly and just do a quick run on

1 deposition. But this one was done based on the comments
2 received by MDEQ -- got -- received from MDEQ, and we did
3 the revised modeling.
4 Q So you had these values generated in March of this year; is
5 that correct?
6 A We had generated it long time before, but we checked it,
7 made sure everything is fine, and we did the revised
8 emission calculations, double-check, triple-check it, made
9 sure it's all okay, and then we ran the model, yes.
10 Q And so it was in March?
11 A Yeah.
12 Q All right. And I assume you communicated the results of the
13 modeling to Huron Mountain Club's counsel?
14 A Yes, we did.
15 Q And I just want -- I want broadly round numbers, because I
16 can't deal with numbers out to the 27th digit.
17 A Yeah; yeah.
18 Q In rough terms, you've modeled -- you've come up with the
19 calculations of about 150 pounds per year of copper and 150
20 pounds per year of nickel?
21 A That is correct.
22 Q All right. Which would then equate over an eight-year
23 period to what would be something like 1200 pounds of copper
24 and 1200 pounds of nickel; is that correct?
25 A That is correct.

1 Q Okay. And that was communicated to counsel in March?
2 A Yeah. We had provided all of our results to counsel, yes.
3 Q All right. So if HMC had a motion pending where a claim
4 that deposition modeling results indicate that more than 430
5 tons of particulate will be deposited within 1.6 miles of
6 the site, more than 959 tons of particulate matter including
7 more than 7,000 pounds of copper and 7136 pounds of nickel
8 would be deposited, as of March, that wasn't true based on
9 your modeling work; is that correct?
10 A I can only talk about what I have done. I don't know what
11 the motion pending is. But based on my results, 150 pounds
12 approximately of copper, 150 pounds of nickel gets deposited
13 in one year based on our modeling. And --
14 Q Okay. Thank you, sir.
15 A Yeah.
16 Q Have you ever done an air permit for an underground mine?
17 A Not really. This is my first. I didn't do the mining
18 permit. I just checked the numbers. Methodology did not
19 change. And just I checked the emission calculations, ran
20 the deposition model.
21 Q But again you've personally never worked in the mining
22 industry?
23 A No, not really.
24 Q Have you been to the site?
25 A No.

1 Q Have you ever been to the U.P.?
2 A Yes.
3 Q Have you been to Marquette?
4 A No.
5 Q Okay.
6 A Because for doing this calculation, I was not looking for
7 any specific things as nothing existed. But I was to look
8 at the emission sources. So there was no reason for me to
9 go there.
10 Q Now, did you do the actual modeling work?
11 A No. I had my modelers do the work, but I did do the
12 checking on it. I did do -- double-check the --
13 Q Okay. But the model outputs were done by somebody else?
14 A Yes.
15 Q And the model inputs were doing by someone else?
16 A Model inputs -- the calculation was verified, and I did make
17 sure that the numbers are correct. And then I had the
18 modelers run the model, yes.
19 Q Run the model. Okay.
20 A Yeah.
21 Q And did you -- were you the one who set up the parameters
22 for the model?
23 A For the emission rates and data, all the parameters other
24 than the emission rate and the grid sizes, which was
25 directly taken from MDEQ's modeling because it was accurate.

1 Q What about plume depletion? Did you have how the MDEQ dealt
2 with plume depletion in the --
3 A Yes. We used the plume depletion that the MDEQ used based
4 on the FOIA that we received.
5 Q All right. You testified today -- and we don't have an
6 exhibit supporting this -- about -- that you did run a model
7 where you tried to determine how much would be deposited on
8 the mine site?
9 A Right.
10 Q As opposed to deposited as a whole?
11 A Uh-huh (affirmative).
12 Q You didn't do that modeling?
13 A No. It was the calculation. I did the calculation. I have
14 the calculation right here. That is the one thing that I
15 have not -- they have not probably given it to you.
16 Q No. I haven't seen one.
17 A Yeah; yeah.
18 MR. KOHL: Could I get a copy of that, Counsel?
19 Thank you.
20 A Make sure I give you the right one here.
21 Q Now, I've looked at your CV. And based upon -- and I
22 understand that you've done some air permitting for major
23 sources?
24 A Yes.
25 Q And you referred to that yesterday?

1 A Yes.
2 Q Okay. With all due respect to Judge Patterson, contested
3 cases are typically not -- don't arise on air permitting
4 matters in Michigan. So I think it's useful to maybe put
5 some context to what we're talking about when we're talking
6 about a major source. What's a major source, as you used
7 the term yesterday?
8 A A major source is any stationary source that has a certain
9 quantity of air pollutants or contaminants.
10 Q And is the mine a major source?
11 A Mine is not a major source. This mine is not a major
12 source, no.
13 Q Now, is there also a category of major sources for hazardous
14 air pollutants?
15 A Yes. It's about 25 tons of aggregate HAPS and single tons
16 of -- 10 tons of single HAP.
17 Q And is the mine a major source, as far as you can tell for
18 hazardous air pollutants?
19 A No, it is not.
20 Q So the mine is in nomenclature you used yesterday a minor
21 source?
22 A It's a non-major source.
23 Q Well, you used the term yesterday "minor source."
24 A Minor source. I'm sorry.
25 Q I just want to stay with your nomenclature. The mine is a

1 minor source; correct?
2 A Yeah.
3 Q Now, have you ever done any work permitting or
4 compliancewise or in any context with coal fire sources?
5 A Coal fire boilers I've worked on.
6 Q And they emit particulate; correct?
7 A Yes, they do.
8 Q They emit heavy amounts; correct?
9 A Yes, they do.
10 Q And it's because the metals are in the coal?
11 A That's correct.
12 Q All right. And you testified yesterday about a MAERS
13 report. What's a MAERS report?
14 A It's a Michigan Air Emissions Reporting System that is --
15 that companies are required to produce March 15th of every
16 year.
17 Q And for regulatory purposes, companies -- certain sources in
18 the state including large major sources have to report to
19 the state their air emissions; correct?
20 A That is correct.
21 Q And, in fact, they pay fees based upon what they report;
22 correct?
23 A Yes.
24 Q So would sources like a power plant in the U.P. -- would
25 they have to file a MAERS report?

1 A Yes, they do.
2 Q And are you aware that there are two coal-fire power plants
3 in Marquette?
4 A No, I am not. I didn't do that research.
5 Q And you're not aware of the fact that the Marquette Board of
6 Power and Light has a power plant?
7 A They might have. I don't know. I haven't looked at those
8 information.
9 Q How about Wisconsin Electric? Are you aware they have a
10 power plant in the Marquette area?
11 A No, not really.
12 Q Are you aware of any of the major sources in the U.P.,
13 existing major sources?
14 A Nothing comes to my mind. I haven't looked at it so --
15 Q Okay.
16 A There must be major sources in the U.P.
17 Q Now, will this mine need a renewable operating permit?
18 A It's not a major source. No, it wouldn't.
19 Q And why don't -- you and I both know, but I'm not sure Judge
20 Patterson knows. Renewable operating permits are mandated
21 under federal law for major sources; correct?
22 A Yeah. It's a Title 5 of the Clear Air Act, yes.
23 Q Okay. But since this a minor source, we wouldn't need one
24 in your judgment?
25 A Yes, it wouldn't.

1 Q Who is Gordon -- is it Reusing?
2 A Yeah, Reusing (pronouncing).
3 Q Who is he?
4 A He's a shareholder in charge of air quality for CRA.
5 Q Was he involved in this project?
6 A Initially, yes. And he did some peer review on things that
7 we did, reports and --
8 Q And who is Peter Romzick?
9 A Peter Romzick is one of my colleagues. He works in my
10 group.
11 Q Okay. What did he do on this project?
12 A He did help us with calculations, the emission calculations,
13 checked the emission calculations, make sure it's all
14 correct; mostly limited to permit review -- permit
15 application review.
16 Q And who did the modeling?
17 A Amit Joshi and Steven Koo. They are two modelers.
18 Q And are they with you at CRA's office in -- you're in
19 Plymouth; correct?
20 A Yeah. Amit is in CRA's office implement and Steven Koo is
21 in Waterloo. All the modeling that was done by Amit was
22 peer reviewed by Steven Koo. So it was reviewed both sides.
23 Q Now, are you a modeler?
24 A I used to model. Now I'm just working on reviewing the
25 models.

1 Q Okay. Was there any discussion about doing a sensitivity
2 analysis for the modeling results seeing which sources
3 affected ambient or depositional impacts the most?
4 A We did not do that, no. There was no discussion on it. No,
5 we did not do it.
6 Q Now, you testified that -- you walked through the steps of
7 what you do in air permitting and what you consider to be
8 best practice. The starting point for that would be to, as
9 I understood your testimony -- to develop, in essence, an
10 estimate of the emissions you can expect from the various
11 sources that you're trying to permit; is that correct?
12 A That's correct.
13 Q And would I be correct that sometimes you can get those
14 values from, let's say, a boiler manufacturer; correct?
15 A Yeah. Manufacturer's specifications, yes; exactly.
16 Q And other times you have to use engineering judgment to
17 envelope emission estimates; correct?
18 A That is correct.
19 Q And for a site like this, there has to be engineering
20 judgment employed; correct?
21 A Yes.
22 Q Now, as part of your job or any consultant's job in
23 developing an air permit application, you would want
24 those -- to develop emission estimates that were at the
25 upper bound of what you anticipated to be reasonably

1 expected from a source, would you not?
2 A Yes. That will give us a most reasonable analysis and a
3 worst case analysis, yes.
4 Q And your problem if you're a consultant and you dramatically
5 underestimate your emissions or potential emissions is that
6 you would wind up with permit conditions that you couldn't
7 comply with; correct?
8 A That is correct.
9 Q And would you have any reason to believe that the
10 consultants for Kennecott had any different motivation in
11 this case but than to try to estimate emissions which they
12 viewed to be at the upper end of what they reasonably
13 expected?
14 A I wouldn't doubt that that they would have done the same
15 thing as we -- anybody would have done it. And if you're
16 talking about the gravity settling chamber issue, we just
17 did that particulate matter. That's the only issue we
18 identified and we fixed that based on what we identified it.
19 Q But from your review of the air application, other than --
20 leaving aside the settling chamber issue, everything else
21 was done more or less the way you would have done them;
22 correct?
23 A Yes. But there are certain issues which we have identified
24 in the public comments like silt content issues and road
25 traffic control issues and other things. For the focus of

1 the deposition modeling, only two issues that we identified
2 was particle settling efficiency calculation and silt
3 content.
4 Q When we're talking silt content, we're talking about
5 basically the roadway inside the mine?
6 A Yes; that is correct.
7 Q Now, with regard to permitting a source here in Michigan,
8 you would -- you typically would do air dispersion modeling
9 for -- unless it was a very minor source; is that correct?
10 A That's correct.
11 Q And that was done in this case; is that correct?
12 A That is correct.
13 Q And that air dispersion modeling looks at -- you're looking
14 at the concentrations that you model into the ambient air;
15 correct?
16 A That's correct.
17 Q What's ambient air?
18 A Outside air, for example.
19 Q Okay. When you do an air permit modeling demonstration,
20 you're modeling not within the site but outside the site;
21 correct?
22 A Yes. If there is a fenced boundary, then we would look at
23 modeling that would be outside and not inside for the
24 dispersion modeling purposes, yes.
25 Q And when you model -- when you do dispersion modeling,

1 you're looking for the highest level of concentration or
2 impact in air concentration -- correct? -- of a given
3 pollutant? Correct?
4 A That's correct. Ground level concentrations.
5 Q But when you do that, you're looking at outside the fence
6 line; correct?
7 A Outside the fence line, yes; at the fence line and outside.
8 Q Say that again.
9 A It's at the perimeter, at the fence line, and outside.
10 Q From the fence line out?
11 A Yeah, out; yeah.
12 Q So you wouldn't pay attention typically when you're doing an
13 air dispersion model to values that you generate inside a
14 facility?
15 A No; no. Unless it is -- if it is fenced, then we wouldn't
16 pay attention to what the ground level concentration inside
17 the property.
18 Q Nor does the MDEQ?
19 A MDEQ wouldn't do that.
20 Q Nor does EPA; correct?
21 A EPA wouldn't do it.
22 Q All right. Now, do you typically have to do deposition
23 modeling for an air permit in this state?
24 A No; no. Deposition modeling is typically not connected as a
25 part of the air permit application.

1 Q Is what?
2 A It is not a part of it.
3 Q Is not. Have you done deposition modeling in support of any
4 air application in Michigan?
5 A No; no.
6 Q Have you done air deposition modeling for any air permit
7 application?
8 A No, not for air permit applications. For different
9 circumstances, we have done it but not for air permit
10 application.
11 Q Now, here you did not model ambient deposition. You modeled
12 total deposition?
13 A That is correct.
14 Q So all the values that you've generated were values that
15 were of deposition where we're looking at deposition both
16 within the mine site and outside the mine site?
17 A Yeah. We were looking at the total deposition. Whatever
18 gets emitted, we were trying to capture it. And that was
19 the purpose it. We didn't exclude the property. We
20 included the property also.
21 Q Okay. Now, yesterday you testified a little bit about
22 Michigan air toxics rules. And I got the impression from
23 your testimony that the Michigan air toxics rules are sort
24 of a unique animal; is that correct?
25 A Yeah.

1 Q Do other states have air toxics rules like Michigan?
2 A Not really, no.
3 Q Michigan air toxics rules from your experience some of the
4 most stringent in the country?
5 A Based on my limited experience, yes, it is one of the
6 stringent in the country.
7 Q And from your review of the air application, did the mine
8 pass with regard to Michigan air toxics rules?
9 A From that air permit application, yes, it did.
10 Q Now, in the air toxics rules, one of the things that you
11 look at, as I understand -- and recognizing I'm a lawyer and
12 not an engineer -- is that you have to model -- for certain
13 air toxics, you have to model what the ambient
14 concentrations are; is that correct?
15 A Right. Ground level concentrations of toxics and you
16 compare it against initial threshold screening level or
17 initial risk screening level if they are **9:4646.
18 Q And you're looking at impacts outside the fence line?
19 A That is correct.
20 Q Okay. And there are screening levels established by rule?
21 A Screening levels are established by rules, yes.
22 Q Which are deemed protective by the MDEQ?
23 A That is correct.
24 Q And this site had no problem passing those screening levels;
25 correct?

1 A Not based on the emission calculation that was done, no.
2 And that is based on the emission calculations performed by
3 Kennecott.
4 Q Now, as I understand your testimony, the mine -- MVAR, I'll
5 call it -- it's easier for me to say.
6 A Correct.
7 Q I guess we could say Mine Ventilation Air Rise or something.
8 A Yeah, MVAR.
9 Q Okay.
10 A That's fine.
11 Q That's the largest single source at this mine of particulate
12 and, in turn, the largest single source of copper and
13 nickel; is that correct?
14 A Yes, that is correct. That constitutes about 63 percent in
15 our calculations, yes. That is the single largest source.
16 Q And do you recall what the controlled annual emissions are
17 from the MVAR in total particulate?
18 A Yes, I do. The controlled emissions about 8,000 pounds, I'm
19 thinking.
20 Q 8,000 pounds?
21 A Yeah.
22 Q So that's --
23 A I'm just telling you based on my memory.
24 Q And that's -- 8,000 pounds is what? Four tons?
25 A Four tons.

1 Q Which is a very minor source of particulate, is it not, in
2 your experience?
3 A For a controlled emissions -- when you look at a major
4 source and a minor source, you look at the facility-wide
5 emissions. This is just -- we are talking about the mine --
6 one of the sources. Yeah. This MVAR is not a major
7 emitter.
8 Q I mean, to be a major source as used in the air control
9 laws, the Clean Air Act and the state laws, the major source
10 for particulate would have to emit 250 tons of particulate;
11 correct?
12 A With respect to the Clean Air Act, yes.
13 Q Now, do you recall the height of the MVAR? I think you did
14 yesterday. Let me just help you. 65 feet?
15 A 65 feet, yes.
16 Q Okay. And what is the function of the MVAR?
17 A It's to take the air from inside the mine and release it out
18 along with all the pollutants. And it has got -- brings in
19 fresh air and recirculate it. It's got a total of 427,000
20 cfm of air that is being moved through there.
21 Q This is the HVAC for the mine basically; correct?
22 A Yes; that's right. HVAC for the mine.
23 Q All right. So the MVAR is exhausting the air that people
24 are working in and breathing in within the mine; correct?
25 A That is correct.

1 Q And the MVAR -- from your review of the permit
2 application -- the mine or the air permit application, would
3 it be your belief that the MVAR's flow velocity, volume of
4 air that it's moving, was designed to assure that the air
5 within the mine was safe?
6 A I can't answer that question. I'm not an expert in
7 HVAC-type system. Our scope was limited to air permit
8 review looking at the calculations making sure it's all done
9 correctly. So --
10 Q All right. But I guess my point is -- and I don't want to
11 lose sight of this, --
12 A Right.
13 Q -- the air that we're talking about where this copper and
14 this nickel are coming from, that's the air that people are
15 working in in the mine environment?
16 A That is correct.
17 Q All right. Now, since you've never worked on a mine, do you
18 know if there will be OSHA or MIOSHA or Bureau of Mine
19 standards that will apply to the air within the mine?
20 A For every source, every -- YEMSHAW**9:5100 requirements
21 apply to mines.
22 Q Okay. Do you ever work with those in your work?
23 A Not, not really. I'm not an indoor air quality guy. My
24 group deals with air quality.
25 MR. KOHL: Why don't we bring up -- can we bring

1 up Exhibit 77?
2 Q You're familiar with this exhibit? You testified about it
3 today?
4 A Yes, I did. Correct.
5 Q Okay. As I understand, this is the exhibit where you more
6 or less developed the -- or derived the amount of copper and
7 nickel to be emitted?
8 A Yes; yes.
9 Q From the MVAR; is that correct?
10 A Yes; that is correct.
11 Q Okay. And I guess I wasn't clear. Let's back up. This
12 morning you did some math which frankly I didn't understand.
13 You calculated the total uncontrolled particulate this
14 morning. And then you took the copper percentage from the
15 orebody and you multiplied the total particulate by that
16 copper percentage?
17 A Yes.
18 Q Is that the exercise you did this morning?
19 A Yeah, that's what I did. Yeah.
20 Q Do you know what the point of that was?
21 A I'm trying to estimate the copper percentage. But that's
22 why I put an assumption in there that I don't know. Because
23 mine ore -- mine vent raise consists of ore, development
24 rock, flyash and native soils at different proportions here.
25 So if I have to really do the calculation, I have to go back

1 and look at the pounds per hour for each of these -- pounds
2 per hour and try to find out what the percentage from each
3 of these area based on the ore and development rock.
4 Q I don't want to be argumentative about this. But do you see
5 any relevance to doing that calculation to your modeling
6 effort?
7 A Not to my modeling effort, no.
8 Q Do you see any relevance at all to that calculation?
9 A Just to have an estimate of the copper coming out of the
10 mine. But it just an estimate and nothing else.
11 Q Is it a reasonable estimate of the amount of copper that
12 would come out of the MVAR?
13 A That could be an overestimation if you look at it. The ore
14 is about 3.11 percent and the rest of them have a lower
15 percentage rate. So that could be a little overestimation.
16 Q But not all the particulate coming out of the mine -- of the
17 MVAR is derived from the orebody; correct?
18 A That is correct; that is correct.
19 Q So does it have any relation to the anticipated expected
20 exhaust characteristics of the MVAR, in your mind, that
21 calculation?
22 A The calculation that we did is based on the particulate
23 matter -- that I did was based on the particulate matter,
24 total particulate matter from the mine vent raise. And all
25 I did was, assuming that the copper percentage is about 3

1 percent, and I found out what every particulate --
2 assumption is that every particulate has 3.11 percent, which
3 is -- which if you look at it is not an accurate way of
4 estimating it.
5 Q Thank you. Same for nickel; correct?
6 A Yeah.
7 Q Okay. Did you know you were going to be asked that?
8 A Not -- there are so many things that --
9 Q Now, on this exhibit, it's my understanding that what you
10 attempt to do is you attempt to develop an estimate of how
11 much copper and how much nickel based upon all the
12 assumptions that you testified to about today and yesterday
13 will come out of the MVAR; correct?
14 A That is correct.
15 Q Okay. Here's what I don't -- and I'm looking now down at
16 the bottom right-hand corner of this. And you have -- down
17 there you have the percentage of copper and nickel for the
18 ore.
19 A Okay. Yeah.
20 Q Correct? Okay.
21 A Yeah.
22 Q Now, those values are derived from the air application,
23 Appendix G; is that correct?
24 A Appendix C, page 8-10; 8-10.
25 Q Did you look at Appendix G, which is where the data for the

1 concentrations of copper or nickel might be in individually
2 materials was derived from?
3 A I would have looked at it. But when I -- when we did the
4 calculation, we relied on that permit application. Because
5 initially we started our calculation to check the air
6 permit.
7 Q Do you know how these percentages were derived, I guess, is
8 my question?
9 A How these percentages were derived, I don't remember. At
10 the time when I looked at it, I would have understood it.
11 Now I don't remember.
12 Q Okay. What if I suggested to you that the percentages were
13 derived by taking a sample set and developing to a 95
14 percent confidence interval a value? Does that refresh your
15 recollection at all?
16 A Yes.
17 Q Huh?
18 A Yes, it does.
19 Q It does? Okay. So these -- when you use a 95 percent
20 confidence interval, that's a conservative assumption, is it
21 not?
22 A Yes, it is.
23 Q Okay.
24 A From a statistical point of view, yes.
25 Q And so it tends to overstate what, on average, you might

1 expect to be the actual concentration?
2 A We have to look at it from a statistical point of view. I
3 can't really testify to that. I don't remember, to be
4 honest with you.
5 Q Okay. But it's a conservative value?
6 A If you take a 95 percent confidence level and try to do an
7 analysis, it is conservative.
8 Q Okay. And then simply for the development of rock, the
9 samples?
10 A If they have taken a 95 percent confidence level and did
11 that, yes.
12 Q All right. Now, down here you have listed values for ore,
13 for development rock, for flyash and for native soils?
14 A Right.
15 Q Okay. Are there any other materials that are going to be
16 handled or dealt with within the mine that are going to
17 result in potential particulate emissions through the MVAR?
18 A I don't recall any other sources that are significant.
19 Q How about cement?
20 A Cement, flyash, aggregates. We have just included the
21 flyash here and not the cement and aggregate.
22 Q Do you know how much -- in the cement aggregate is a
23 backfill material; correct?
24 A Right.
25 Q Do you know how much of the particulate generated within the

1 mine is attributable to those operations?
2 A I might have looked at it. I don't remember those numbers
3 now.
4 Q Did you account for that in your calculations for the copper
5 and the nickel? Because I can't tell in this exhibit that
6 you did.
7 A From the backfill operations, I would have counted the total
8 particulates and then taken the flyash concentrations and
9 figured out what the copper percentage is, which was
10 probably -- what? -- the methodology then when we did the
11 calculations would be very similar to what Foth and VanDyke
12 did in their calculations.
13 Q But you used -- what? You used the flyash value as the
14 default value then for all backfill particulate?
15 A Yes; yes.
16 Q You didn't take into account cement value?
17 A We didn't separate between cement and aggregates and flyash.
18 We would have looked at it, and we would made a decision
19 based on the conservation estimate what the flyash -- we
20 would have used that number, yes. I don't remember exactly
21 what -- the rational way we did it. But it would be very
22 similar to what air permit application did. We wanted to
23 make sure that the methodology that we used exactly
24 replicates the methodology that the permit application
25 states.

1 Q Now, you didn't do a sensitivity modeling analysis to see
2 what sources affected what; correct?
3 A We did not. That was not a part of the scope. We looked at
4 all of the sources, took six major sources, conducted a
5 deposition modeling analysis.
6 Q Now, we have the MVAR. And that's a fan. So you have
7 exhaust coming up a 65-foot stack of material being
8 exhausted; correct?
9 A That is correct.
10 Q So when you deal with a source like that that has a vertical
11 velocity, you have to account for that in your modeling;
12 correct?
13 A We did account for it, yes.
14 Q Okay. I'm not suggesting that you didn't. Of course you
15 did. And then you also have to account for the height at
16 which the gas stream is being released into the
17 atmosphere -- correct? -- when you do the modeling?
18 A Yes.
19 Q Okay. Now, the crusher building, tell me what you know
20 about that source.
21 A It's an enclosed building that has its own controls. And
22 overall the emissions coming out of the crusher building has
23 a bag house, which has a control efficiency. I don't
24 exactly remember how -- what the control efficiency of that
25 is.

1 Q All right. If the permit application indicated it would
2 have a control efficiency of 99 percent, would you disagree
3 with that for the crusher building?
4 A No; no. If the permit application states that is the
5 number.
6 Q And this would be, in essence, an exhaust port from the
7 building? That's how I would view it.
8 A That is correct.
9 Q Okay. With a filter on it?
10 A With a filter on it, yes.
11 Q And do you recall the height of that?
12 A You know, I used to -- I forgot. I remember 65 feet,
13 because that was -- went from 40 to 65 feet for this. And I
14 just -- it doesn't come to my mind right now.
15 Q Let me suggest that it's lower than the MVAR.
16 A It would be lower.
17 Q And also based on your experience, is 99 percent a
18 reasonable control factor to apply to that kind of source?
19 A 99 percent for that smaller sources like crusher building
20 bag houses is a reasonable number, yes.
21 Q No problem getting an off-the-shelf bag house with filtering
22 that will achieve 99 percent; correct
23 A The one that I've dealt with has 99 percent, yes.
24 Q Okay. That's sort of industry standard; correct?
25 A Yeah, for bag houses.

1 Q Okay. So would there be a fan, then, for pulling this air
2 out?
3 A Yeah, in the bag house, from there. It just goes --
4 Q Now, the four other sources that you included that the MDEQ
5 didn't are the ore bins?
6 A Right.
7 Q Correct?
8 A Right.
9 Q The fine and the coarse.
10 A Right.
11 Q What kind of emission do bins have?
12 A Mainly particulate emissions. That was calculated in the
13 permit application for both PM and PM10. And we took that
14 because it is a ore bin. We thought it is prudent for us to
15 consider that and make sure that we we've accounted for
16 emissions from those sources. Those are volume sources.
17 Q What do you mean by "volume sources"?
18 A It's a bin, so it doesn't have a point source emissions like
19 stacks we have.
20 Q Okay.
21 A So it is a --
22 Q The bins don't have any vertical velocity to them; correct?
23 A It doesn't. Most of the impact would be from the near field
24 and not from the far away from the property boundary.
25 Q In other words, if I'm standing out underneath the MVAR, I'm

1 probably not going to have a piece of dust fall on me
2 through the MVAR?
3 A You could or you could not. I don't know.
4 Q Okay. But if I'm standing next to the ore bin, I might;
5 correct?
6 A Possibility you might, yeah.
7 Q All right.
8 A Yeah.
9 Q I guess where I'm going here is, of these six sources, the
10 ones that -- that one that would have the greatest
11 dispersion, the widest field of impact, if you will, would
12 be the MVAR; correct?
13 A Yeah. Here we're talking about the deposition modeling.
14 And the reason we considered all the six sources is we are
15 trying to figure out what is the maximum deposition and the
16 deposition concentration of copper and nickel from the
17 source. Unfortunately we couldn't include all of the
18 sources because it would not be possible for us to do it
19 because of the computer time.
20 Q I understand. But you were trying to determine the maximum
21 deposition impact anywhere?
22 A Anywhere.
23 Q And as it turns out, the maximum deposition impact you got
24 was on the mine site?
25 A Yes; on the mine site, yes.

1 Q Not in the ambient environment outside the mine site?
2 A Yeah. We are talking about deposition on the ground level.
3 We found it at the property -- within the property.
4 Q And, in fact, as I understood your testimony, you found the
5 maximum points of deposition right near these ore bins?
6 A That is correct, because they are volume sources.
7 Q They're volume sources. So the ore bins have, in relative
8 terms -- and I recognize you didn't do the sensitivity
9 analysis. But wouldn't you agree with me that the ore bins,
10 in relative terms, have very low impact once you start going
11 out from the mine site?
12 A Yeah, that I testified to yesterday, too. Most of the ore
13 bins will have a near field impact and not a far field.
14 Q You know, it was mentioned, but it wasn't focused on. And I
15 want to focus on it.
16 A Okay.
17 Q Okay. So if you back out the ore bins -- okay -- are you
18 going to have -- see significant changes in the deposition
19 values that you might project out 500 meters, 1,000 meters,
20 4,000 meters from the mine site?
21 A I can't answer the question. But I can tell you it would be
22 significantly -- it will be different, because you are
23 taking out a volume source out of that deposition model.
24 Q I recognize you're taking out a volume source. It would be
25 different, but would it be significantly different? Or do

1 you think the MVAR really dominates the farther out
2 deposition analysis?
3 A That's the major -- these are stack emissions and point
4 source emissions. And MVAR and crusher building and bag
5 house will have more impact -- will have significantly more
6 impact farther away, as we talk about it, than from volume
7 sources which are located nearby. What we were trying to
8 establish is what is the maximum deposition of copper on
9 the --
10 Q I understand. Anywhere. And in this case, you established
11 it was on the mine site, which is --
12 A That is correct.
13 Q -- no offense to you -- but you probably got paid a lot of
14 money to determine what was empirically obvious, that the
15 mine site would have the highest rate of deposition of
16 particulate from mine operations given the sources?
17 A I don't know how to answer that question. But I'm just
18 going to say that most of the -- we wanted to account for --
19 it was not an afterthought that we have to include it to get
20 a maximum deposition. I can tell you we wanted to account
21 for most of the emissions that is coming out of the mine.
22 And one way we did the calculation was trying to find out
23 what is -- how many pounds per hour gets emitted. If I look
24 at it -- if I look at grams per second per meter squared of
25 the emissions, the grams per second emissions, it doesn't

1 look like a whole lot from a orebody -- from ore bins. But
2 when we looked at it and we wanted to account for sources,
3 when we wanted to figure out at what point we can run the
4 model safely without compromising the time and the quality,
5 we figured the top six sources, if you take it, that would
6 account for 98 percent of the emissions. And that was the
7 rationale behind it.
8 Q Sure. And I'm not disagreeing with that all.
9 A Yeah.
10 Q I've looked at your data and your charts, and you've got
11 this 98, 99 percent of the nickel and copper are from those
12 six sources.
13 A Yeah. Now, what I want to tell you is money did not play
14 into a factor --
15 Q No. I'm not saying that. I'm not saying that.
16 A -- in this whole analysis.
17 Q I'm just saying, as a lawyer looking at this mine site and
18 looking at the sources, I would assume that the most
19 particulate -- the most dust containing nickel and copper
20 would wind up being dumped on the mine site?
21 A Yeah. From an engineer looking at a point of view, I would
22 look at 98 percent being -- representing more of the
23 emissions. And that was the reason why. I am trying to
24 explain to you what is rationale that went behind taking the
25 six mines versus four.

1 Q Sure. But to come back to the point that I'm trying --
2 since you didn't do the sensitivity analysis, the point I'm
3 trying to understand is, when we start looking out from the
4 mine, the MVAR starts to have a greater influence on the
5 depositional impact model results than, let's say, the ore
6 bins?
7 A That's correct.
8 Q Thank you. Now, we've talking about this will be the
9 deposition, that will be the deposition, this is the amount
10 of copper, this is the amount of nickel. We're really
11 talking about something known as potential to emit, are we
12 not?
13 A If you look at the calculations that was done by Kennecott
14 and later by MDEQ -- I hope I get it right -- blasting
15 emissions, drilling emissions, all these emissions they
16 considered average numbers where there is no permit
17 conditions that would restrict the amount of blast and
18 amount of drilling. Certain sources like crusher building,
19 bag houses, fine ore bins and coarse ore bins, that is based
20 on the maximum ore processed per year. So it is a mix and
21 match of both. That's what I am trying to get at. It is
22 neither this way that one would be considered average and
23 one would be considered maximum.
24 Q But many of these sources that you're looking at are
25 predicated upon being at a full production level; correct?

1 A Yes.
2 Q Based on the application review?
3 A Yes; that's correct.
4 Q So that when we start talking about taking those values and
5 extrapolating them out to a year, then we have to assume
6 full production level for a year?
7 A Full production level for a year, yeah. That's a reasonable
8 estimate.
9 Q And do you know if full production ever is contemplated as
10 being at the rate of 8760, 24/7? Because you did a
11 calculation this morning of 8760.
12 A I'm not too familiar with it. I was doing a simple
13 conversion here from a pounds per -- grams per second to
14 pounds per year. I don't exactly remember to answer your
15 question. Most of the air permit applications that we
16 reviewed in this Kennecott had 8760 as a PTE calculation --
17 potential **10:1354.
18 Q But that again would be potential. You don't know whether
19 it's contemplated that this mine will run 24/7?
20 A No, I don't. But most of the dispersion modeling
21 calculations also sometimes were run for certain sources
22 based on the potential.
23 Q And that's an industry standard; correct?
24 A That is correct.
25 Q You want it at 8760 to develop the potential to emit. If I

1 assume I'm running at maximum production for a year, this is
2 how much I might emit; correct?
3 A That's correct.
4 Q That's the calculus?
5 A Yeah, that's the calculus.
6 Q Okay. And you were doing that in these values? You were
7 assuming maximum production across a year. And then this is
8 the number I generate?
9 A Yes. It's a straight conversion. That's what I did here
10 today.
11 Q And then when we start going on to what it is for eight
12 years, then we have to extend that assumption over eight
13 years?
14 A That is correct.
15 Q So the extent the mine doesn't operate 8760 over eight
16 years, then these deposition values that you talked about
17 will be less?
18 A If the amount -- yeah, of course. Yeah; that is correct.
19 Q I state the obvious?
20 A Yeah. That's fine. Yeah.
21 Q Now, in my experience in doing air permit work -- and I do
22 do some as a lawyer -- sometimes there's a circumstance
23 where because of a regulatory restraint or without, you do
24 your potential to emit calculation and guess what? You
25 can't meet a regulatory standard. Have you had that

1 experience?
2 A Yes, many times.
3 Q Okay. And is there a device sometimes that is employed to
4 address that?
5 A Yeah; yeah. We put operational restrictions either by a
6 bottleneck which could be an hourly restriction.
7 Q So maybe you take an emission rate limitation; correct?
8 A That is right.
9 Q Okay. And if you take an emission rate limitation, that is
10 recognized as a means of limiting your potential to emit;
11 correct?
12 A That is right. That is a federally enforceable limitation.
13 Q Okay. Now, in all of your testimony today and yesterday, I
14 never heard you talk about any of the permit limits.
15 A Because most of them were -- this is not an air permit
16 deposition -- air permit type of testimony. This is based
17 on totally a deposition. All I did was state the emissions
18 from the air permit and then applied it here. So it was
19 never meant to be a discussion of the air permit conditions.
20 So I did not do it.
21 Q Okay. But it's recognized, isn't it -- you can -- the
22 permit to emit can be limited by permit conditions; correct?
23 A Yes; that is correct.
24 Q But you didn't take any permit conditions into account and
25 determine what the potential to emit and the resulting

1 deposition was in all of what you testified to?
2 A If I -- I'm just stating the obvious.
3 Q I'm not criticizing you. I'm just asking you.
4 A No. I understand. And that's what I'm trying to
5 understand, how this -- how I can answer this. Most of the
6 permit conditions that we have -- that has been formulated
7 is based on the permit application. Is that right? Permit
8 application and then the restrictions. We have exactly how
9 the dispersion modeling emission rate was done. We have
10 done it in the same way. So not directly I haven't
11 mentioned every way. This is the permit limit. That's why
12 we have done it. But in certain cases we mentioned that
13 drilling emissions we are taking an average versus maximum
14 was the reason for it.
15 Q I understand that. But there is a permit limit on the MVAR;
16 correct?
17 A There is a permit limit on the MVAR, yes.
18 Q Did you use that permit limit at all in any of these
19 calculations?
20 A No; no. No. The reason being we were trying to estimate
21 the deposition model. And we did not consider it when we
22 did the modeling part of it. And I don't think MDEQ really
23 considered the emission rate. We checked the emission rates
24 and we used exactly the emission rate with a minor
25 modification, the settling emission factors.

1 Q Well, let's look at this exhibit that we have up.
2 A Sure.
3 Q In the lower left-hand corner of this document, --
4 A Somewhere in here? Oh, here.
5 Q No. Up above that. I'm sorry.
6 A Okay. Here.
7 Q You have the vent raise fan?
8 A Yes; yes.
9 Q Do you see that?
10 A Yes; yes. I can see that. Yes.
11 Q Okay. And you have two values there. You have 6.543 pounds
12 per hour. Do you see that?
13 A Yes.
14 Q And you have .0032 pounds per thousand pound. Do you see
15 that?
16 A Yes.
17 Q All right. Now, what is this set of calculations? What are
18 you doing here?
19 A This is the air flow rate in cubic feet per minute. And
20 this consists of 3**10:1922 55 cubic feet per pound ** 40
21 degrees. And the molecular rate is 29 pounds per pound
22 10:1932**. And I'm trying to estimate what is the total
23 pounds per hour that is coming out of the mine. But I
24 don't -- doing so many numbers, I don't even remember what
25 was the purpose of this calculation here. 33.94 pounds per

1 minute of air and -- I believe I'm trying to estimate the
2 pounds per hour. But I don't know if it's right. But I
3 can't answer that question. I don't remember this
4 calculation specifically.
5 Q Well, it looks to me like pounds per hour, and then you're
6 also trying to come up and generate a say pounds per
7 thousand pounds of exhaust gas; is that correct?
8 A Yes; that is correct.
9 Q And that's a standard way of expressing an emission rate or
10 emission limit of particulate; correct?
11 A That is correct.
12 Q Expressed as pounds per thousand pounds?
13 A Yes.
14 Q All right. So am I correct in understanding that the
15 uncontrolled rate -- because I think that's what this is?
16 A This would be uncontrolled, yes.
17 Q Okay. The uncontrolled rate as you assessed it for the MVAR
18 was .0032 pounds per thousand pounds?
19 A Yes.
20 Q Now, if you apply the 85 percent control efficiency, which
21 is, I understand, what has been applied, --
22 A Yes.
23 Q -- do you know what number you would get? Can you do that?
24 A Yeah. Let me check. Yeah. It would be 0.00048.
25 Q So that would be --

A Three zeros.
Q -- 0.00048 pounds per thousand pounds of exhaust gas?
A Per thousand pounds of exhaust gas, correct.
Q Do you know what the emission limit is for the MVAR as far as pounds per thousand pounds of exhaust gas?
A Is it .1? I don't recall. It should be -- .1 is it? I don't --
Q How about if I suggest to you it was .00036?
A 0.00036?
Q Yes.
A Yeah. It could be right, yeah.
Q So the controlled rate of emission of particulate that you used the model for the MVAR expressed as pounds per thousand pounds of gas is .00048?
A Right.
Q And the permit limit is .00036?
A That is correct. And let's go back up and see -- we used a calculation not based on thousand per thousand pounds. We must have used the total calculations based on the first table.
Q Yeah. But I'm just trying to equate your numbers with the permit limit.
A Correct. Okay.
Q I've done that; right?
A Yeah, you have done that. Right.

1 Q Okay. So your modeling assumptions are that the MVAR would
2 be emitting a rate 33 percent above its emission limit?
3 A That is correct if that is the way that was done by all
4 consultants and MDEQ too in this project.
5 Q If what was done?
6 A Dispersion modeling and deposition modeling.
7 Q Well, that's what you modeled. That's what you modeled?
8 A Yeah; that's right. That's right. That's correct.
9 Q Okay. So your modeling results are predicated upon the
10 assumption that the MVAR will be running at a third over its
11 emission limit a full year?
12 A That's correct, if I remember it correctly. I got to check
13 the calculations that we did before to really come back with
14 it.
15 Q Well, do whatever you need to do, because I want -- I want
16 to be certain about this.
17 A Right. Can we go -- can we zoom out here a little bit so I
18 can check it -- check this.
19 Q Take your time.
20 MR. KOHL: And if you want to take a break, your
21 Honor, at this point so we can -- I don't know how long this
22 is going to take.
23 A No; no. This will take ten minutes. I'll look at this one
24 really quickly.
25 Q Okay.

1 A We did the calculation here based on the uncontrolled
2 long-term emissions which we find -- what is the --
3 uncontrolled in pounds per year. We looked at 6.5 pounds a
4 year, which would convert to 0.0032 pounds per thousand
5 pounds. And permit limit was 0.0048. Yeah. We did
6 consider the worst case scenario then what was specified in
7 the permit limit. That's correct. The permit limit is what
8 you're seeing.
9 Q Okay. So you didn't model the permit limit. You used a
10 different value?
11 A Yes. We did use a different value.
12 Q Okay. So in your potential to emit calculations, which then
13 result in your potential deposition modeling, it's all on
14 the assumption that the MVAR will be operating a third over
15 its permitted limited constantly for a year?
16 A That is correct. That is correct. And that's exactly how
17 MDEQ modeled, and that's how Foth and VanDyke in their
18 dispersion modeling modeled it. So we might have used the
19 same methodology.
20 Q What would allow you to check what the rate was that the
21 MDEQ used for the MVAR?
22 A From the input and output data.
23 Q And do you have that available?
24 A No, I don't have it available.
25 MR. STAPLETON: Your Honor, may I just approach

1 and give Mr. Vel paper copies of the exhibits just for ease
2 of reference perhaps?
3 JUDGE PATTERSON: Sure.
4 A Maybe we did overestimate the emissions here in this case.
5 We didn't check against the permit limit for the mine
6 vent -- mine air vent raise now I think about it.
7 Q Okay. Thank you. So you overestimated by a third?
8 A Possible. I got to check this number. But looking at it
9 right now --
10 Q Well, do whatever you need to do to check the numbers. You
11 know, I don't want you to be uncertain.
12 A Right.
13 Q But I want you to take your time.
14 A Right. Okay.
15 (Witness calculating)
16 MR. STAPLETON: Your Honor, would this be a good
17 time --
18 A No, we didn't consider the permit limit.
19 JUDGE PATTERSON: Would this be a good time for a
20 break?
21 JUDGE PATTERSON: I was just going to say that. I
22 think it's --
23 MR. KOHL: I'd suggest we --
24 JUDGE PATTERSON: It's 10:30.
25 (Off the record)

1 A See, when we did the overall emission --
2 MR. KOHL: Was there a question pending?
3 A Pardon me?
4 Q I don't think there was a question pending.
5 JUDGE PATTERSON: Not that I remember.
6 A Oh, I'm sorry. I'm sorry. I was trying to --
7 Q See, I get to ask the questions.
8 A Yeah, yeah, yeah. I understand. I'm sorry. I'm extremely
9 sorry.
10 Q Let's look at Exhibit 5 of 7. You already looked at this
11 today?
12 A Yeah.
13 Q This is the emissions rates that the MDEQ to do their
14 deposition modeling; correct?
15 A Yes.
16 Q Do you see that rate for the MVAR?
17 A Yeah, 0.0 -- for PM you mean?
18 Q Yeah.
19 A Yes, **??0.08687??10:42:41?? grams per second?
20 Q Hm?
21 A Yeah.
22 Q Yes. And then when I looked at -- where were we just
23 looking at? Exhibit --
24 A 0.109 was our rate.
25 Q So you didn't -- I'm just trying to clarify, you did not use

1 the MDEQ parameters.
2 A No, not for the calculation. The methodology was the same,
3 but the emission rate varied because of the settling
4 emission factor -- settling emission factor that we
5 calculated on individual calculations.
6 Q But this value here, the grams per second, that equates to
7 the permitted limits, does it not?
8 A It could, yeah.
9 Q So when you testified that you did everything the same as
10 the MDEQ, you made one slight change, which was you ignored
11 the permitted limits?
12 A I didn't consider the permit limit when I did it. I looked
13 at individual sources as maximum emission rates and -- not
14 the maximum emission rate as provided in the application,
15 and then what we did was we cumulatively added them up and
16 used that for our calculation, yes.
17 Q Why don't we go to Exhibit 83 -- or Exhibit 83. Now, this
18 is the model generated plotting of the deposition for copper
19 on an annualized basis on a 5 kilometer grid; is that
20 correct?
21 A Yeah.
22 Q So from top to bottom or from --
23 A No, from left to right it's 5 kilometers; right.
24 Q From left to right is 5 kilometers?
25 A It's 5 kilometers, yeah.

1 Q Do you know where the KBIC property is that's most proximate
2 to a mine?
3 A There is a slight -- the Kennecott property?
4 Q Yeah.
5 A This is the processing area I can see that is now -- and
6 this (indicating) is the second area here, and this is the
7 processing area here. I don't have the --
8 Q Let me try to rephrase it and direct you. Can you locate
9 where the KBIC property is?
10 A Yes, I can.
11 Q Okay. Where would it be?
12 A The Kennecott property is right here (indicating).
13 Q No, the KBIC tribe property.
14 A No, I don't know.
15 Q You don't know.
16 A I don't know about that.
17 Q Okay. If I told you that the KBIC property, which I think
18 is 40 acres, is about one and a half miles north and
19 slightly east of the mine site, could you approximate where
20 that would be on this model -- on this printout?
21 A So north and east, so right in here (indicating)?
22 Q Yeah, approximately -- well, basically north.
23 A Okay. I don't know the scale of it, so you have to point
24 that out to me if you --
25 Q Well, I thought you just said it's 5 kilometers across.

1 A Yeah, that's right. So 1.6 kilometers is one mile, so right
2 in here (indicating).
3 Q So if we went one and a half miles north, that would be
4 roughly two kilometers?
5 A Yeah; yeah.
6 Q Can you tell me what your --
7 A Concentration?
8 Q -- deposition concentration was two miles north of the line
9 or a mile and a half north of the line?
10 A I wish I could. I can't. My eyes are really bad so I can't
11 see.
12 MR. STAPLETON: Your Honor, if could approach,
13 maybe I could help out; give out copies of the maps.
14 A This is bad color. I can't even see. Can you zoom that
15 (indicating) area, please?
16 Q I'm trying.
17 A About 1 -- between 1 and .75 milligrams per meter squared
18 per area.
19 Q How much is 1 milligram? Can you put that in any sort of
20 qualitative sense -- qualitative sense? Is that like a
21 fleck of ground pepper?
22 A I don't know. I don't know. It's 1 milligram is one
23 thousandth of a gram. It could be a --
24 Q Now, on this plot do you know where Huron Mountain Club's
25 property is?

1 A There is not Huron Mountain Club property here because it is
2 farther away. This is just a five kilometer by five
3 kilometer area.
4 Q Okay. So Huron Mountain Club is up off this map?
5 A Yes; yes.
6 Q Do you know what the top --
7 A Concentration is?
8 Q Yeah.
9 A I can't see that, but if you go down, one of these areas
10 should have that number for the same line. If you follow to
11 that line, somewhere in there there is a --
12 Q I think it's a .25.
13 A .5. I can't see it.
14 Q .25?
15 A .25. There's a .5 number that I can see, but this line, I'm
16 following it, and it should be .25.
17 Q Okay. It's going to be even harder to work with the other
18 one, but this is now, as I understand it, Exhibit 83. This
19 would be the 40 kilometer grid?
20 A Yeah; yeah.
21 Q Does this help you at all?
22 A Yeah, it does, it does to a certain extent I think.
23 Q Would it be fair to say as I read these that the output of
24 your model with the annual deposition of copper based on the
25 emission -- potential to emit that you used at something

1 less than .25 across Huron Mountain property -- Club
2 property?
3 A I think that's fair, yeah.
4 Q Now, if we correct it -- your potential to emit that you
5 used for the modeling from the MVAR to bring it down to what
6 is the permitted limit, do you have any idea how these
7 values would change?
8 A I have not idea, but we have to check the calculation. This
9 is based on five minutes of reviewing it. I considered so
10 many sources -- for example, in a mine heater -- within the
11 mine ??10:51:48**; right?
12 Q Yeah.
13 A When we are looking at four propane heaters, that has a
14 limit; that has an individual limit. So we have considered
15 many sources within there. So it could go down if you
16 reduce or lower emission rate. That would be a fair
17 statement to say, "If I lower my emission rate in the
18 calculations, it would lower these numbers."
19 Q Okay. So if I --
20 A Right. But I don't know. I have not done the calculations.
21 Q I understand.
22 A Right.
23 Q But by conforming the potential to emit to the permitted
24 limits, the numbers would all go down -- correct? -- for
25 copper and nickel?

1 A You're free to use the limit, yes. We have to make sure
2 that is the appropriate way to do. Then, yes, it will go
3 down.
4 Q Well, you told me already that having a permit limit is a
5 way of limiting the potential to emit.
6 A That is correct for the dispersion model; that's correct.
7 Q It's recognized by state and federal authorities; correct?
8 A That's correct.
9 Q So you really don't know what the potential deposition is if
10 you operate with the permitted limits?
11 A If I have to consider permitted limit as being the actual
12 emission rate, then I have not done the calculations for
13 that.
14 Q All right. Now, with regard to the models you use, the ISC
15 model, --
16 A Yes.
17 Q -- can you go beyond 40 kilometers per grid?
18 A I think there has been documentation that says beyond 50
19 kilometers there will be an -- there will be an error. So
20 we're limited to 40 kilometers. That will -- we can't
21 beyond 50 kilometers in --
22 Q That's a limitation of a mile; correct?
23 A Yes, limitations of the model.
24 Q Are there models that you can use to go beyond 50
25 kilometers?

1 A Yes, some of them, like a ??10:53:34* for any of the
2 model -- long-range models are available.
3 Q And can they be adopted to do deposition modeling?
4 A Yes, they can be.
5 Q I guess wh I'm going with this is you can take, for
6 instance, Wisconsin Electric in Marquette -- and Marquette's
7 maybe within 20 miles of this location -- and you could
8 model a deposition from the Wisconsin Electric Power Plant;
9 correct?
10 A Yeah. The scope of our project was limited just to look at
11 the source; right.
12 Q I understand that. I'm just talking about the capability is
13 of the modeling tools.
14 A We can look at surrounding sources, yes, and we can model it
15 to see what is -- the cumulative impact of the sources are.
16 Q And these are known as isopleths, these lines?
17 A Isopleths, yes.
18 Q So you could take any source in the UP that's within 50
19 kilometers and use the ISC model you did and you generate
20 some value for deposition of nickel or copper at that source
21 emitting nickel and copper; correct?
22 A That's correct. I can do it as MDEQ as done it. They can
23 do it. Anybody can do it. It's the same methodology.
24 Q And theoretically, if I could take the model to 50
25 kilometers, I'd generate -- the model would generate values

1 at 50 kilometers; correct?
2 A Yeah. It would be a lot lower, but it will generate
3 numbers, yes.
4 Q And it will plot a number; correct?
5 A It will generate a value.
6 Q Exactly.
7 A Right.
8 Q All models do that?
9 A Yeah, all models do that.
10 Q I could take a long-range model, and I could probably
11 generate a value for deposition in Duluth from this model;
12 correct?
13 A Possibly. It could be a much lower number, but, yeah;
14 possible, yeah.
15 Q The point is, the model will generate a value.
16 A Yeah. The model is going to be -- generate the value
17 wherever you are going to place the grid in there --
18 right? -- because that is the way the models are designed to
19 run.
20 Q And by running these models, your only intent was to
21 generate a value. That's all these models do?
22 A My project is to develop a deposition -- correct deposition
23 modeling and produce the results, yes. And that's all we
24 did. And we were not asked for the disc analysis or
25 anything like that. So it was limited to generating

1 deposition modeling numbers.
2 Q And you wouldn't sit here today and be in any sort of
3 position to opine that any of the values that your model
4 generated represent what in your judgment might be the
5 actual deposition for mine operation?
6 A It is a potential deposition from the mine operation, yes,
7 based on the maximum production numbers.
8 Q Assuming your running for a year?
9 A Not really. Many sources -- you have to go through
10 individual sources and look at it. But when you look at
11 certain sources we have considered average emissions and
12 this is the same number, same methodology of calculation
13 that the MDEQ used or Kennecott used except for emission
14 rate numbers.
15 Q I'm just trying to distinguish --
16 A Yes.
17 Q I'm not arguing with you; I'm just trying to distinguish
18 between numbers predicated upon potential to emit and
19 numbers predicated upon, let's say, history of actual
20 operation. They can be different.
21 A Right. It would differ. But maximum deposition rate
22 estimation conducted in the December 2007 by MDEQ also
23 considered maximum deposition concentration.
24 Q Of course it did.
25 A Yeah. So this is one way of looking at it.

1 Q I'm not disputing it.
2 A Right.
3 Q But again, all your numbers reflect the MVAR running and
4 emitting on a annualized basis much higher than its
5 permitted limit.
6 A I have to check this to look at it. But I'm telling you,
7 based on the permit limits, we didn't do it based on the
8 permit limit. We did it based -- we did it based on the
9 maximum numbers.
10 Q What do you need to look at to answer my question as to
11 whether or not your values are predicated upon running
12 higher than the permitted limit?
13 A I have to look at every individual sources, number one. And
14 number two --
15 Q No, I'm just talking with regard to the MVAR.
16 A With regards to the MVAR, it is based on -- not based on the
17 permit limits but based on the maximum operating
18 *??10:58:07processed -- were processed?? per year
19 calculations.
20 MR. KOHL: I don't have any additional questions,
21 your Honor.
22 MR. MANNING: I don't have any questions.
23 JUDGE PATTERSON: Redirect?
24 MR. STAPLETON: Could we take just a couple minute
25 break?

1 JUDGE PATTERSON: Sure.
2 (Off the record)
3 JUDGE PATTERSON: Mr. Stapleton, did you need more
4 time? I didn't mean to rush you. I just --
5 MR. STAPLETON: Oh, no. No, your Honor. We are
6 all set.
7 JUDGE PATTERSON: Okay.
8 MR. STAPLETON: Yeah, I've just got a few follow-
9 up questions.
10 JUDGE PATTERSON: All right.
11 REDIRECT EXAMINATION
12 BY MR. STAPLETON:
13 Q Mr. Vel, I want to turn to what you were -- what Mr. Kohl
14 was asking you about in terms of the permit limits for the
15 MVAR stack. And you recall he was asking you some questions
16 about that?
17 A Yes.
18 Q Let me ask you this: Based on your calculations, does it
19 matter that the permit number that Mr. Kohl was talking
20 about is below the emission rate that you have calculated?
21 A That is correct.
22 Q And does that matter -- is that a substantive issue for you
23 in terms of what you were asked to do in this case?
24 A No. I was trying to predict the worst-case emission rate.
25 We looked at the overall worst-case production for each of

1 these sources, and cumulatively we looked at it. So this --
2 the model that I did predicted the worst case over the life
3 of one year. In the production it's maximum. I think it's
4 2012 or something like that.
5 Q Okay. And that's also what was predicted by the model run
6 by MDEQ; correct?
7 A MDEQ used a lower emission rate, and then their predictions
8 are based on their emission rates. And my emission
9 calculations had a little higher emission rates, so --
10 Q Okay. But you're both trying to determine, you and MDEQ,
11 maximum deposition rates; correct?
12 A Yes, that's what we're trying to do.
13 Q That's what you're trying to do --
14 A Yeah.
15 Q -- over the course of a year?
16 A For a course of a year, yes; same year.
17 Q And whatever numbers -- whatever number is in the permit
18 doesn't play into the calculation that you performed or MDEQ
19 performed?
20 A I did not use the number. I did not use the number. I
21 can't talk about MDEQ, but I did not use that number. I
22 used the worst-case emission, worst-case production from
23 each of these sources. And the methodology and other
24 factors are the same, but the emission rates are different.
25 And I was trying to predict the worst-case deposition

1 rate -- worst-case deposition rate. And that was what the
2 intent of -- that was my scope, yeah.
3 Q Okay. And, Mr. Vel, we've talked about, you know, various
4 periods for the life of the mine. There was eight years
5 mentioned, ten years mentioned. Let's just step back a
6 second and let me ask you this: Regardless of what the time
7 period is, eight years, ten years, twelve years, if you
8 assume that all of the ore is going to be removed from the
9 mine, can we assume that all of the copper and nickel will
10 be deposited over the life span of the mine --
11 A That's obvious.
12 Q -- across the grid that you explained in your deposition
13 model?
14 A If you take all the -- if all the ore is going to be
15 extracted out of the ground what were the emissions; that
16 is, what were the emissions that comes out of the mine vent
17 trays and other sources will be deposited in the ground,
18 yes.
19 Q It will all be deposited on the ground over the life of the
20 mine, whatever that period may be; --
21 A Yeah.
22 Q -- is that correct?
23 A Yeah, that is correct.
24 MR. STAPLETON: Thank you, Mr. Vel. I don't have
25 any further questions. And, your Honor, once again I would

1 just move for the admission of exhibits that I identified.
2 MR. KOHL: Just a quick recross.
3 RECROSS-EXAMINATION
4 BY MR. KOHL:
5 Q Again, as far as you know, the MDEQ used the permitted limit
6 to do its model?
7 A The MDEQ, I don't know how they used it. I didn't check
8 their calculation, but they used a number based on -- what
9 you told me it is, based on that permitted number, then I
10 agree.
11 Q What I'm just trying to get at is, that would, in part,
12 explain the difference between your model of maximum impact
13 and the MDEQ's model of maximum impact; correct?
14 A That's one of the reasons. Other reasons is number of
15 sources that we considered, and there are many other reasons
16 too, you know. Pressure built in bag houses, MDEQ
17 considered particulate matter under 10 microns and we
18 considered total particulate matter. That accounts for some
19 of the differences. And then change in the calculations
20 because of -- emission calculations were done like we talked
21 about. I'm just recapping here. Particulate matter --
22 Q There's no need to recap. Okay? Let me just ask you one
23 further question. When you said somebody else did this
24 modeling where you tried to subtract out the mass that would
25 be deposited on the mine site -- is that correct? --

1 A That is correct.
2 Q -- you didn't do that?
3 A No. One of the *??juniors 11:15:19?? did.
4 Q And you don't have those outputs? 'Cause I never got them.
5 A You didn't? Okay. I'm sorry. It's here. I should have
6 it.
7 THE WITNESS: Did I give that to you guys?
8 Q Let me just -- while they're looking for it, let me just ask
9 you this: When you say a "mine site," are you talking about
10 within the fenced line?
11 A Yes, sir, that's what we did.
12 Q We're not talking about taking out the property Kennecott
13 would occupy; we're talking about just --
14 A No, I just looked at the fenced area. That's all the
15 information I had.
16 Q Fenced area of the mine site itself or the portal entry?
17 A Both areas. And there will be two sets of calculations for
18 it.
19 MR. KOHL: Nothing further.
20 MR. STAPLETON: Just briefly, Mr. Vel.
21 FURTHER DIRECT EXAMINATION
22 BY MR. STAPLETON:
23 Q When Mr. Kohl was asking you on cross-examination about most
24 of the dust from the emissions settling on the mine
25 property, do you recall that question?

1 A Yes, I do.
2 Q But that isn't true, is it, for the copper and nickel
3 emissions from the mine.
4 A See the concentration gradients are deceiving. You are
5 looking at a maximum concentration over a smaller area
6 versus larger area, --
7 Q Right.
8 A -- so it is little -- only eight pounds got deposited within
9 the fenced area that I could look at.
10 Q And that's only eight pounds of the 153 pounds?
11 A That's correct.
12 Q And the rest is spread out outside of the mining area;
13 correct?
14 A That is correct.
15 MR. STAPLETON: All right. I don't have any
16 further questions.
17 MR. KOHL: Well, I'll object to their offer of
18 their exhibits. Based upon his testimony, it's essentially
19 a hypothetical demonstration that I don't think is relevant
20 to these proceedings, because in developing his -- as
21 testified, in developing his potential to emit, which is the
22 basis for the modeling outputs, he ignored the permit limits
23 that are in place. And, you know, we might as well -- you
24 know, we could assume uncontrolled MVAR emissions and model
25 that. That wouldn't be relevant. We could assume that this

1 mine was twice the size that it is and run models. We can
2 generate any number we want. The question is whether or not
3 the numbers are relevant. And in this case, since he's
4 ignored the lawful limits that are in place, the numbers
5 that he's generated are completely irrelevant to these
6 proceedings.
7 MR. STAPLETON: Your Honor, I think it's important
8 for the court to keep in mind that the deposition model and
9 software used by Mr. Vel was exactly the same as the
10 deposition model software used by MDEQ. They ran the exact
11 same model with virtually the identical data. And Mr. Vel
12 has described in detail his involvement in all of the
13 calculations that form the underpinnings for that model, so
14 I would once again move for the admission of the exhibits.
15 MR. KOHL: His testimony quite clearly was he
16 didn't model exactly what the MDEQ did. His testimony is
17 that MDEQ followed the permit limits and he didn't.
18 JUDGE PATTERSON: Well, he used the same modeling
19 technique with different input.
20 MR. KOHL: He used the same model. He used the
21 same model and I don't dispute that at all. It's just --
22 JUDGE PATTERSON: And I think certainly you've got
23 an argument to that effect. But I'm going to overrule the
24 objection and admit the exhibits. And again those were --
25 can you recite them again just for the record?

1 MR. STAPLETON: Yeah, I sure can, your Honor.
2 They were Exhibits -- Petitioner's Exhibits 77A through E,
3 77G through H, 77J through O, 77Q, 78B, 78C, 81, 83, 86 and
4 84. And I would also proposed that the calculations that
5 Mr. Vel did on the easel be included as Petitioner's Exhibit
6 77R.
7 MR. KOHL: There I have an additional objection
8 which is ??very11:19:48*?? calculations of uncontrolled
9 emissions assuming all of it was particulate derived from
10 orebody. I don't see the relevance of that at all nor did
11 his testimony support any relevance.
12 JUDGE PATTERSON: You have had a continuing
13 objection to the relevance of the uncontrolled --
14 MR. KOHL: Yeah.
15 JUDGE PATTERSON: I'll admit that. Has that been
16 marked?
17 MR. STAPLETON: No, your Honor. I'll --
18 JUDGE PATTERSON: We can do that at the break.
19 MR. STAPLETON: Okay. I'll be sure and mark it.
20 JUDGE PATTERSON: Okay. Thank you, sir.
21 (Petitioner's Exhibits 632-77A through 77E;
22 632-77G through 77H; 632-77J through 77O; 632-77Q;
23 632-78B; 632-78C; 632-81; 632-83; 632-84; 632-86
24 received)
25 MR. DYKEMA: Your Honor, Petitioners call Dr.

1 David Flaspohler.
2 REPORTER: Do you solemnly swear or affirm the
3 testimony you're about to give will be the whole truth?
4 DR. FLASPOHLER: Yes, I do.
5 DAVID FLASPOHLER, Ph.D.
6 having been called by the Petitioners and sworn:
7 DIRECT EXAMINATION
8 BY MR. DYKEMA:
9 Q Dr. Flaspohler, please state your name for the record and
10 spell your last name.
11 A David Flaspohler, and that's spelled, F-, as in Frank,
12 -l-a-s-p-o-h-l-e-r.
13 Q And where do you live, Dr. Flaspohler?
14 A 328 Harris Avenue in Hancock, Michigan.
15 Q And where are you currently employed?
16 A At Michigan Technological University.
17 Q In what position?
18 A I'm a associate professor in the School of Forest Resources
19 and Environmental Science.
20 Q Can you please review briefly for the court your
21 post-secondary education?
22 A Okay. I have a bachelor's degree from the University of
23 Michigan in architecture and urban planning. I have a
24 master's degree in conservation biology fm the University of
25 Wisconsin in Madison. And I have a Ph.D. in wildlife

1 ecology from the University of Wisconsin in Madison.
2 Q And what was the subject matter of your dissertation?
3 A My Ph.D. was looking at the effect of forest openings in
4 northern Wisconsin in migratory songbirds that were breeding
5 in adjoining undisturbed forests.
6 Q Since receiving your dissertation, what have you been doing?
7 A After I got my Ph.D., I was hired by Michigan Tech into an
8 assistant professor position and received tenure about three
9 or four years ago. So that's where I've been for the last
10 ten years.
11 Q And can you review for the court the courses and subjects
12 that you've were taught during your tenures as a professor
13 at Michigan Tech?
14 A Sure. At Michigan Tech I regularly teach ornithology, field
15 conservation biology. I give a number of guest lectures in
16 classes in wetlands, in restoration ecology. I regularly
17 also teach in a US Forest Service silvacultural training
18 course that's taught at Michigan Tech most every summer.
19 When I was a graduate student at Wisconsin I taught a class
20 in wildlife ecology and management, and I was a teaching
21 assistant in a number of other classes as a graduate
22 student.
23 Q You mentioned conservation biology. What is that?
24 A Conservation biology is a discipline that shares a lot in
25 common with biology and ecology, but it focuses particularly

1 on species whose populations are low and processes that tend
2 to affect population -- small populations. And also it
3 focuses on anthropogenic effects in the environment or
4 human-caused environmental change and the way that
5 biodiversity species at -- genetic diversity, biodiversity
6 at many levels responds to those kinds of perturbations.
7 Q You also mentioned wildlife ecology. What is that?
8 A Wildlife ecology is an older discipline that dates back to
9 perhaps the 1930's, and that's the study of animal
10 populations in the wild and their demography, genetics,
11 species interactions, interactions between animals in their
12 environment and interactions between animals and each other
13 and plants as well.
14 Q What other professional activities have you had in recent
15 years other than the teaching?
16 A Well, about half my job is teaching and half is research.
17 And then there's another ten percent of service on top of
18 that, so I conduct research and supervise graduate students
19 that do research in those areas of ornithology, wildlife
20 ecology and conservation biology. So I've had a number of
21 research projects over the last ten years. I also served
22 professionally. I've been an associate editor of the
23 Journal of Wildlife Management. I'm on a number of state
24 and national committees. I review proposals for a variety
25 of agencies, National Science Foundation, Fish and Wildlife

1 Service, review manuscripts regularly for peer reviewed
2 journals.
3 Q Have you received any awards or honors from Michigan Tech?
4 A Yeah. In 2001 I was nominated for the excellence in
5 teaching award, and in 2002 I was nominated and I won that
6 award.
7 Q How many total publications do you have in the fields of
8 wildlife ecology, ornithology and conservation biology?
9 A About 40.
10 Q How many of those are peer reviewed?
11 A A little over half of those are peer reviewed.
12 Q On how many occasions have you given speeches or addresses
13 on the subjects of wildlife ecology, ornithology and
14 conservation biology?
15 A Oh, several dozen I would say, probably 40 or 50 times.
16 MR. DYKEMA: Your Honor, I ask that Dr. Flaspohler
17 be permitted to testify as an expert in the fields of
18 wildlife ecology, conservation biology and ornithology.
19 MR. PREDKO: Just again, your Honor, that Michigan
20 law does not require that counsel or the court express that
21 a particular expert qualified to testify on a certain issue,
22 and we reserve foundational objections.
23 JUDGE PATTERSON: Okay.
24 MR. MANNING: Could I ask a couple, please?
25 JUDGE PATTERSON: Sure. Voir dire?

1 MR. MANNING: Yes. Good morning, Dr. Flaspohler.
2 I'm Peter Manning from the Attorney General's office. I'm
3 substituting for normal counsel today.
4 VOIR DIRE EXAMINATION
5 BY MR. MANNING:
6 Q Conservation biology is a recognized field of study?
7 A Sure. It has journals associated with it, professional
8 societies, annual meetings, just as any science discipline
9 or engineering discipline has.
10 Q Looking at your CV, I see most of your work -- is it fair to
11 say that most of your work involves birds?
12 A Yeah, that's fair to say. Yeah.
13 Q I don't see anything involving fish limnology.
14 A Right.
15 Q Have you done any work in that?
16 A I've collaborated with fisheries scientists and published a
17 couple papers with some colleagues at Michigan Tech who are
18 aquatic ecologists and fishery scientists, but I'm not one
19 of those. So that's something I have some knowledge of, but
20 it's not a -- it's not something I work in as frequently as
21 with other groups.
22 MR. MANNING: All right. Thank you, your Honor.
23 I don't want to belabor this. We have the same reservations
24 regarding whether or not we're going to agree with this,
25 but --

1 JUDGE PATTERSON: All right.
2 MR. MANNING: -- proceed at this point.
3 DIRECT EXAMINATION
4 BY MR. DYKEMA: (continued)
5 Q Dr. Flaspohler, I'd like to start by asking you to describe
6 for the court the natural resources surrounding the Eagle
7 Mine site, and to help that, you can put up slide number
8 1 -- 2. Sorry. We're looking at Petitioner's Exhibit 32 in
9 the Part 632 case. Can you please describe for the court
10 the environment surrounding the mine site and the points
11 regarding that environment that are significant to wildlife
12 ecologists or conservation biologists?
13 A Sure. Well, the mine site is right here (indicating), so in
14 terms of --
15 Q And that's in the Escanaba River State Forest?
16 A Yes, right here in red. To the north is the Huron Mountain
17 Club, which is -- I would say a continentally significant
18 protected landscape in terms of the -- both the vegetation
19 and the rarity of the successional stage to which that
20 vegetation is in, which is a large amount of old growth
21 forest.
22 Q Are there any stands of old growth forest comparable to the
23 Huron Mountain Club in the Northern Great Lakes Region?
24 A There are a couple others: the Porcupine Mountains
25 Wilderness State Park and Sylvania Wilderness, so one is

1 state and one is federal forest service. And so within the
2 Western Upper Peninsula is one of the only places other than
3 Northern Minnesota where you can find this kind of forest,
4 mature native forest.
5 Q Southwest of the mine site is McCormick Wilderness Area;
6 what's that?
7 A This is also -- this is a forest service land that's
8 designated for research and preservation because of the same
9 values that you find in the Huron Mountain Club, mature
10 forests. So these are two nearby landscapes that are both
11 significant and unusual in the Great Lakes in general, but
12 even within the Upper Peninsula.
13 Q And what's in between them?
14 A The Yellow Dog Plains is right here (indicating) in between
15 the two, and also the Salmon Trout River to the north and
16 the Yellow Dog River to the south are also within the center
17 of this map.
18 Q I'd like to look at each of these -- discuss each of these
19 areas a little bit. What is it that makes the property, the
20 Huron Mountain Club, extraordinary from a biological point
21 of view?
22 A Okay. Well, part of it is that it was set aside over a
23 hundred years ago as a protected area and before the cutting
24 of the forests reached those areas and has been preserved or
25 a large percentage of it is preserved in a virtually

1 untouched condition. The other part that makes that
2 significant -- that would be significant alone, but on top
3 of that you have a whole body of research that's gone on
4 there for the last -- since the 1930's, 1940's that provides
5 a lot of additional insight into the composition and
6 functional attributes of those old forests.
7 Q And we have --
8 A It's very valuable because of the breadth of it and because
9 it goes back so far.
10 Q Dr. Flaspohler, we're now looking at a slide that is the
11 first page of Petitioner's Exhibit 29 in the 632 case,
12 article entitled, "Planning for Wildness," Aldo Leopold's
13 report on Huron Mountain Club. Are you a co-author of this
14 article?
15 A Yes, I am.
16 Q What's the significance of Aldo Leopold's report?
17 A Okay. Well, Aldo Leopold was contacted by the club back in
18 1938 to do a research assessment for the club lands and at
19 the time Aldo Leopold -- is a common name today; I think
20 familiar to a lot of people -- was sort of at the height of
21 his career. He was -- he founded the Department of Wildlife
22 Ecology where I got my PhD and was -- spent some time with
23 the club, published this report that sort of assessed what
24 resources they had and with management recommendations. And
25 it was really that -- partly that experience in the club

1 that gave him some insights and some new understandings of
2 what a fully functioning ecosystem can look like. That was
3 one contribution that his visit to the club and that report
4 made.
5 The second one has to do with the contents of that
6 original report, and the reason we wrote this paper partly
7 because -- was because that report was privately published
8 and it wasn't published in the peer reviewed source; it
9 was -- people didn't really appreciate the significance of
10 this. And in the content of his report he points out a
11 couple important things that in 1938 were very novel
12 insights into how to manage a protected area or a park;
13 today they're very commonly used. And one of those is this
14 idea of using kind of a zoning approach to managing
15 protected areas where you set aside the most valuable
16 resources in a core preserved area and then around that you
17 perhaps allow somewhat more -- some extractive land use but
18 you use a buffer to try to mitigate external impacts on that
19 core protected area.
20 Q Is that concept used today in conservation management?
21 A It's a widely used -- throughout the world it's used. Down
22 the road at Pictured Rocks National Lakeshore they have
23 buffer areas and core areas so the federal government and
24 any protected area -- new protected area in the world today
25 typically uses that same approach. But it was very novel in

1938.

Q What other lessons did Aldo Leopold give to the Huron Mountain Club in 1938?

A Well, the other thing that he really emphasized for the club was the importance of considering external impacts that can impact the resources that the club valued from quite a long way away.

MR. DYKEMA: Can we have slide number 4, please?

Q What are we looking at, Dr. Flaspohler?

A This is a picture of Aldo Leopold on the club about ten years before he died, but during one of his visits to the club.

Q What kind of tree is he standing beside?

A It's either a white pine or a hemlock.

Q Are trees of that size uncommon on the Huron Mountain Club property?

A They're very common.

Q Are they common elsewhere in Michigan?

A Very uncommon.

Q There's a quote here which is a quote from your paper on Aldo Leopold in which you have quoted Aldo Leopold. And what's the significance of that to you?

A Well, what he's saying with this quote is that even owners of large properties -- and this was thousands of acres, the club -- cannot ignore forces and processes operating outside

1 the club. And at the time he was talking about road
2 building, he was talking about logging, things going on on
3 the margins of the club and he was trying to convince them
4 that even when you a large protected area there are
5 processes and mechanisms by which even large areas can be
6 affected. And that was, I think, not an necessarily
7 intuitive thing to understand particularly for -- when you
8 have thousands of acres it might seem that insulated from
9 almost anything.
10 MR. DYKEMA: Can we have the next slide?
11 Q Was it Aldo Leopold's view that things going on even miles
12 away from the Huron Mountain Club property could have
13 profound affects on the ecological integrity of that
14 property?
15 A Sure; definitely.
16 Q We're now looking at some other quotes from your paper, one
17 from -- again from Aldo Leopold where he wrote,
18 "All earth sciences must in the long run learn how
19 to use land by referring to unused land as a baseline
20 or starting point. Whoever owns such land will one day
21 find it in demand for scientific investigations."
22 Do you agree with the first point?
23 A Definitely.
24 Q Dr. Woods of the Wildlife Foundation was here and described
25 the value of a resource of a reference ecosystem. Is that

1 what he's talking about?
2 A Right. And there's a lot of values to that, but certainly
3 one of them is an understanding -- if you have a reference
4 ecosystem it gives you a baseline from which to measure
5 change in more heavily impacted ecosystems. And also for
6 the sake of restoration of disturbed ecosystems it gives you
7 some template to measure progress.
8 Q The point is that "whoever owns such land will one day find
9 it in demand for scientific investigations." Is that
10 prophecy borne true?
11 A Definitely. Yeah, the Huron Mountain Club has facilitated
12 and supported financially research by hundreds of scientists
13 over the many decades on the club lands.
14 Q He concludes this segment by saying, "The club has not only
15 a unique property, but a large opportunity for public
16 service and science and conservation." In your opinion has
17 the club fulfilled that opportunity?
18 A Yeah, I would say it has through their support for research
19 and allowing scientists to come and study that system.
20 Q Where do scientists come from to look at this resource
21 ecosystem?
22 A From all over the -- at least the United States certainly.
23 Q Let me go back to number 2. You mentioned the McCormick
24 Wilderness Area. Is a piece of that area set aside for
25 research?

1 A Yes, it is.
2 Q Do you know how big that -- the old growth research station
3 is there?
4 A I think it's a couple thousand acres, if I'm --
5 Q And how big is the Huron Mountain research area?
6 A The Huron Mountain Club is about 15- to 18,000 acres and
7 the -- I don't know if any of it is considered a research
8 area or a core preserved area, but the entire thing is --
9 has been used for research by various scientists.
10 Q Are there rare and unusual species or organisms on the Huron
11 Mountain Club property?
12 A Yes, there are. There are unusual fish populations, rare
13 dragonfly species, fungi, some unusual birds, some state
14 listed species of birds. So where scientists have looked
15 for rare species in detail they've often found them there.
16 Q And in the McCormick Tract area there rare and unusual
17 species there?
18 A The McCormick Tract isn't as well surveyed. It doesn't have
19 the facilities or resources to support research as well, but
20 the research that has been done there, that I've seen,
21 has -- they've found certainly rare plants.
22 Q Now, in between these two is the Yellow Dog Plains. How
23 does the Environmental Impact Assessment prepared by
24 Kennecott in support of its mine application characterize
25 the Yellow Dog plains from an ecological point of view?

1 A Well, they don't look at the entire Yellow Dog Plains, but
2 the part of the Environmental Impact Assessment, spatial
3 portion of the plains that they do examine they characterize
4 different habitat types, different forest types and open
5 land types some of which they characterize as cut over --
6 and they are; some of it cut over; some of it is not, so --
7 Q Does the Environmental Impact Assessment characterize the
8 area as having very poor ecological value?
9 A There's some content in there that suggests that there are
10 portions of -- there are portions of it that aren't -- that
11 don't have a lot of value for wildlife.
12 Q Is that true?
13 A Not in my opinion; no.
14 Q Please explain.
15 A Well, there's -- there are some lines in there suggesting
16 that -- in the Environmental Impact Assessment suggesting
17 that areas of forest where the jack pine, for example, have
18 been cut in some years past don't have much value for
19 wildlife. Now, jack pine is a -- the jack pine forest is a
20 forest type that is prone naturally to fire and so that type
21 goes through a successional process after the trees are lost
22 either to fire or to logging where the trees regenerate, a
23 whole community of plants comes back and often there's sort
24 of a flush of growth after a cutting like that that supports
25 a whole range of wildlife species from deer to grouse to

1 songbirds.
2 Q What do you call a forest that is in this process of
3 regeneration?
4 A It's called an early-successional or early-serial stage
5 forest.
6 Q And is early-successional forest a preferred habitat of game
7 species?
8 A Particularly game species like deer and grouse, woodcock;
9 that's all -- that's precisely the kind of forest that they
10 prefer for different parts of their life history.
11 Q Is early-successional forest a valuable habitat for any
12 species of particular regional or national conservation
13 concern?
14 A Sure. Well, the most obvious one would be Kirtland's
15 Warbler, a state endemic federally endangered species that
16 depends young jack pine forests of a particular age class to
17 breed, so they depend on that. And there are other --
18 Golden Wing Warblers; there's a whole range of songbirds
19 that depend on early-successional forests.
20 Q And are they -- do they use the -- the birds you've just
21 mentioned are they found in the Yellow Dog Plains?
22 A The Yellow Dog Plains have a number of the early-
23 successional bird species. The Golden Wing Warbler I don't
24 think was picked up on the bird surveys that were conducted;
25 it may or may not be there in some low density.

1 Q Has it been seen in the area?
2 A Yes.
3 Q You mentioned the Kirtland's Warbler. What sightings have
4 there been in the Yellow Dog Plains?
5 A Well, I know of one perhaps two years ago. I haven't
6 followed it real closely, but I know there was a singing
7 male at least seen in that area. There are Kirtland's that
8 breed to the east and to the west in the Baraga Plains and
9 Gwinn south of Marquette. So there are Kirtland breeding
10 pairs.
11 Q Dr. Flaspohler, when I was a kid Kirtland's were limited to
12 a particular forest area in the Lower Peninsula. Has that
13 that been changing?
14 A Yeah, over the last ten years or so the Kirtland's Warbler
15 has shown up in young jack pine habitat in the Upper
16 Peninsula in -- regularly and in increasing numbers. So
17 they've been expanding their range a little bit into the
18 Upper Peninsula.
19 Q As an expert in conservation biology do you have an opinion
20 as to whether early-successional jack pine forests in the
21 Upper Peninsula are or may be important for the survival of
22 the Kirtland Warbler?
23 A Yeah. It would be my opinion that any species -- any rare
24 species that's confine to a fairly small geographic area is
25 going to be vulnerable to environmental change in that area

1 or catastrophic events. In our area it might be something
2 like a tornado or a wildfire that could destroy all the
3 habitat in one event. By spreading out that species
4 geographically you sort of are buying an insurance policy
5 against those kinds of events which would be sort of
6 spatially restricted and could not wipe the -- or have a
7 dramatic effect on the population through one single event.
8 That's sort of fundamental conservation biology for almost
9 any species.
10 Q Generally speaking, are the Yellow Dog Plains a natural
11 habitat?
12 A Yeah, I would say so.
13 Q How would you characterize the bird diversity of the area?
14 A It's quite high. I think they had 53 or 56 birds detected
15 in that and similar numbers in other surveys that I've seen.
16 Q When you say "they" who do --
17 A Kennecott's contractors that did the bird surveys.
18 Q And over how much time did they do the survey?
19 A They did it in one season, 2004, with a -- a May, a June,
20 and an October visit with probably most of the -- in terms
21 of the breeding community it was that June -- that single
22 June visit that was the best characterization of that.
23 Q In North America is there a category of songbirds that are
24 typically associated with early-successional forests?
25 A Sure; there are a lot of them, songbirds that prefer that.

1 Sometimes we call that a "guild," a group of organisms that
2 are sort of unified in a single -- with a single habitat
3 preference, food preference.
4 Q What's the status of that guild, the early-successional
5 forest songbirds in North America?
6 A In general that's a group that has had a lot of species
7 declining in the last 20 years or so in Eastern North
8 America.
9 Q The Environmental Impact Statement I think you said
10 identified different habitat types. Approximately how many?
11 A I think there were 13 that were identified in the -- in that
12 wildlife report that I saw.
13 Q Does that reflect a piece of geography with relatively high
14 habitat diversity?
15 A Yeah, I would say so, in a relatively small area.
16 Q Do you recall what Habitat Type D was?
17 A No, I can't say which one D was. I think that they sort of
18 arbitrarily assigned habitat types to letters, letter codes
19 and I don't have those all memorized.
20 Q The Environmental Impact Statement states that the current
21 clear-cut areas provide very little wildlife habitat. Is
22 that true?
23 A No. As I was saying earlier, that -- those kinds of areas
24 they can look very disturbed and they can look like there
25 isn't much habitat, but for many species the removal of the

1 trees facilitates their use of that habitat following the
2 removal of the trees; for many species of birds, some
3 species of mammals.
4 Q Did the Environmental Impact Assessment identify in addition
5 to different habitat types habitat types in different
6 successional stages?
7 A Yes, it did.
8 Q Is that also of significance in assessing the ability of a
9 landscape to support biodiversity?
10 A Sure, because just as you have wildlife species that prefer
11 early-successional forests there are species that prefer
12 sort of middle-aged forests and mature forests. So the more
13 habitat diversity and the more successional-staged diversity
14 you have within a landscape all else being equal, you're
15 going to have more biodiversity than a more homogenous
16 landscape.
17 Q Do the Yellow Dog Plains in any sense function as a corridor
18 between the Huron Mountain Club Preserve and the McCormick
19 Wilderness Preserve?
20 A Certainly in all likelihood for mobile fauna that move
21 across the landscape in that -- at that spatial scale deer,
22 moose, wolves, coyote, bobcat, things like that they
23 certainly would pass through that as they disburse or cover
24 a territory.
25 Q Are there bobcats in this area?

1 A Sure.
2 Q Are they rare?
3 A That's a good question. Bobcats are -- they can be
4 harvested, so presumably that -- based on the DNR monitoring
5 they're -- I don't think they're terribly rare. They're not
6 easy to see though. They're furtive; they're nocturnal
7 largely. So there's species that through rarity can be
8 difficult to document because they're difficult to monitor.
9 Q Have you seen one?
10 A Yeah, I saw one one time on the Huron Mountain Club.
11 Q If the Yellow Dog Plains function as a corridor for
12 megafauna that exploit both the Huron Mountain Preserve an
13 the McCormick Preserve, what significance does that have for
14 conservation biology?
15 A Well, a lot of research in conservation biology in the last
16 ten or fifteen years has gone into trying to understand how
17 corridors function or how they don't function, and that's
18 become important because as landscapes become more
19 fragmented and habitat patches become more isolated
20 populations in those patches tend to be smaller than they
21 were in the original contiguous habitat. So where you have
22 a network of patches a lot of the problems small populations
23 can have: genetic, demographic problems can be mitigated by
24 linking those patches together with corridors so that
25 there's genetic gene flow, so that there's sort of

1 demographic rescue; there's a lot of things that can
2 facilitate it when you have a corridor that is useful to the
3 species of interest.
4 Q In your expert opinion do you think it is likely that the
5 Yellow Dog Plains serve those functions for megafauna that
6 exploit the older growth forests in this part of the state?
7 A I think that's very likely.
8 Q You also mentioned two rivers in this area, the Salmon Trout
9 River and the Yellow Dog River. What's the ecological
10 importance of the Salmon Trout River?
11 A Well, the Salmon Trout River -- a good share of its lower
12 stretches is protected within the Huron Mountain Club, so
13 that gives it some significance. It is largely undisturbed
14 in the uplands at this point as well, so that makes it quite
15 valuable. Probably the most significant thing, the thing
16 that -- if you ask somebody out of this state what the
17 significance of that river would be they would think of
18 Coaster Brook trout, because that's a species or at least a
19 population of brook trout that has unique behavioral and
20 morphological traits that lives and breeds -- the only place
21 that it breeds is in the Salmon Trout -- on the south shore
22 of Lake Superior the only place is in the Salmon Trout
23 River. A small population in Isle Royale too, but --
24 Q What makes the Coaster Brook trout unique?
25 MR. PREDKO: Objection; no foundation. The

1 witness has already testified that he's an expert in
2 aquatics or fisheries.
3 MR. DYKEMA: I'll lay a foundation.
4 Q Is Professor Casey Huckins a colleague of yours?
5 A Yes, he is.
6 Q And is Professor Casey Huckins among the world's leading
7 experts on Coaster Brook trout?
8 A Yes.
9 Q And have you studied the Salmon Trout River with Casey
10 Huckins?
11 A Yes.
12 Q Are you knowledgeable of the work he has done and the
13 existing research on Coaster Brook trout?
14 A Yes.
15 Q Dr. Flaspohler, what makes the Coaster Brook trout unique?
16 MR. PREDKO: Same objection, your Honor. He's not
17 the expert; this Casey Huckins is. If Casey Huckins is --
18 comes to testify that's fine. Same objection.
19 MR. DYKEMA: Your Honor, he has studies the river,
20 he is familiar with the relevant research. He is a
21 conservation biologist. The Coaster Brook trout is one of
22 the most pressing conservation biology issues in the Upper
23 Peninsula today. I think he's fully qualified to answer
24 that question. And the question is a very general one.
25 JUDGE PATTERSON: I'll allow him to answer.

1 A Okay. Well, the Coaster Brook trout is a -- it's a
2 population of brook trout that has some unusual habits in
3 its spatial use of its habitat. Most brook trout are
4 confined to streams and rivers; this Coaster Brook trout
5 spends -- although it breeds largely in rivers, it spends a
6 good share of its life out in the open Lake Superior. It's
7 an unusual habit for a brook trout to have. They also get
8 to be very large. I'm not sure what the biggest one is, but
9 I would guess it's in the four or five pound range. It's a
10 very big brook trout. And there aren't very many of them
11 left.
12 Q Do you know what recent studies have indicated the current
13 breeding population in the Salmon Trout is?
14 A I understand it's --
15 MR. PREDKO: Objection; --
16 A -- somewhere around --
17 MR. PREDKO: I'm sorry, Doctor. Same objection,
18 your Honor. The first question was a very general question;
19 now we're getting into results of specific studies.
20 MR. DYKEMA: I've asked him if he knows.
21 MR. PREDKO: About results of specific studies; I
22 understand that, Counsel. And same foundational objection.
23 He is not a fish or aquatic biologist.
24 MR. DYKEMA: My question is if he knows what the
25 population is and then I'll ask him what the basis for that

1 knowledge is, and if the basis is adequate I'll him what the
2 answer is.
3 Q Do you know what the recent research in the Salmon Trout has
4 indicated the current breeding population of Coasters is in
5 the Salmon Trout?
6 A Yes.
7 Q And what's the basis for that knowledge?
8 A It's talking with my colleague, Dr. Huckins.
9 Q And --
10 MR. PREDKO: I'm going to object; it's hearsay,
11 your Honor.
12 MR. DYKEMA: Your Honor, it is absolutely
13 customary for expert witnesses to rely upon personal
14 communications as a basis for opinions.
15 JUDGE PATTERSON: And I'll allow it.
16 MR. MANNING: Your Honor, that's only within their
17 expertise. They can't just talk to anybody and then testify
18 about hearsay. He can't talk to an engineer and start
19 telling us what -- you know, about the engineering of the
20 mine.
21 JUDGE PATTERSON: Is Dr. Huckins going to testify?
22 MR. DYKEMA: He cannot, your Honor. Well, your
23 Honor, I'll withdraw the question; it's in the record.
24 JUDGE PATTERSON: All right.
25 Q Do you know if the U.S. Fish and Wildlife Service has listed

1 the Coaster as a species of concern?
2 A It is listed on their website.
3 Q Does the Salmon Trout River support -- apart from the
4 Coaster Brook trout how would you characterize the wildlife
5 that the Salmon Trout River supports?
6 A It's a pretty complete fauna: river otters, beaver, several
7 other species of fish. And associated is riparian-loving
8 birds; there are some species that are associated with those
9 in the riparian corridors. So it's quite intact.
10 Q The other river you mentioned is the Yellow Dog. Where
11 does -- relative --
12 JUDGE PATTERSON: It's noon and I have to break
13 right now. Stop now. Back at 1:00?
14 (Off the record)
15 Q Dr. Flaspohler, when we broke for lunch, we were wrapping up
16 your discussion of the ecological resources in the area
17 surrounding the proposed mine site. And one of the
18 resources you mentioned is the Yellow Dog River. Is that a
19 wild and scenic river?
20 A Yes, it is.
21 Q And it's so designated by the federal government?
22 A Uh-huh (affirmative).
23 Q And what is the outflow of the Yellow Dog?
24 A It goes into Lake Independence near Big Bay, and then that
25 flows out into Lake Superior.

1 Q And what's the outflow of the Salmon Trout?
2 A Lake Superior directly.
3 Q I'd like to talk some more about endangered species in the
4 area. And am I right that the federal government and the
5 state government both recognize three categories of at-risk
6 species?
7 A Right.
8 Q And what are those categories?
9 A From sort of the most critical level, those are endangered,
10 and then there are threatened below that, and then there
11 special-concern species which are below threatened.
12 Q Are there many federal or state endangered, threatened or
13 special-concern species in the Upper Peninsula of Michigan?
14 A Yeah, there are many plants and animals.
15 Q What sorts of animals?
16 A Many species of birds, some species of reptiles, many
17 species of invertebrates, mammals, plants.
18 Q And what resources are available to someone who wanted to
19 determine what endangered species, either state or federal,
20 might be present in the area of the proposed mine site?
21 A Well, one of the places to start would be to go to the
22 Michigan Natural Features Inventory, and that's a
23 state-level database of occurrences of lots of species but
24 in particular of rare species, and those exist in every
25 state, all 50 states, and Michigan has its own.

1 Q How exhaustive are the Michigan Natural Features Inventory
2 Listings of endangered, threatened and at-risk species in
3 the central Upper Peninsula?
4 MR. PREDKO: Objection; no foundation.
5 MR. DYKEMA: Your Honor, the man is an expert in
6 conservation biology, the focus of which is at-risk species
7 and species with limited population numbers. I can lay a
8 foundation that he's familiar with the MNFI list. He's
9 familiar with endangered species lists. He's familiar with
10 endangered species in the region. But frankly, I would have
11 thought that was a waste of time.
12 JUDGE PATTERSON: I agree. I'll him to answer.
13 Q How rich is the database that MNFI has to work with for
14 endangered species' appearances in the central U.P.?
15 A It's not very rich.
16 Q What's the geographical demarcation of the MNFI listings?
17 A Well, they present them in a variety of spacial scales.
18 They have point locations for some species, but they're
19 presented also at the county level.
20 Q If you were asked to identify those threatened, rare of
21 special -- threatened, endangered or special-concern species
22 that might be present in the area of the proposed mine, what
23 aspect of the MNFI inventory would you look at as an expert
24 in conservation biology?
25 A Well, I think it'd be important to understand that the data

1 in the Natural Features Inventory is not the result of an
2 exhaustive search for species across the state and then that
3 data goes into MNFI. That's never been done. So what does
4 go into there are historic accounts, occasions when
5 biologists report finding particular species in a particular
6 location. So that's one reason why the coverage of the data
7 in Kalamazoo County or Wayne County, for example, would be
8 better than it would be in the western U.P., because there's
9 just simply fewer biologists in that area to survey those
10 kinds of areas. So consequently, if I were curious about
11 what rare, endangered or threatened species might occur in
12 any area in the western U.P., you would need to consider the
13 fact that whatever's in the Natural Features Inventory is a
14 small sample of what's actually out there, in all
15 likelihood. So as a result, what I would do is look at
16 county-level data, at least, or county and
17 adjoining-county-level data, compile a -- sort of a master
18 list of occurrences of threatened and rare and
19 special-concern species at that spacial scale, then take
20 that list and look where my area of interest is and what
21 kind of habitats occur in that area and which one of those
22 species -- how many of those species have affinities for
23 those kinds of habitats that are in the area of interest.
24 Q And have you gone through that process in this case with
25 respect to the area of the proposed mine?

1 A Yes, I have.
2 Q And did you look at just Marquette County or Marquette and
3 adjoining counties?
4 A I looked at Marquette and adjoining counties for the reason
5 that I mentioned.
6 Q And how many threatened, endangered or special-concern
7 species are on the MNFI inventory for Marquette and
8 adjoining counties?
9 A For -- there are about 40 species.
10 Q And can you give us an idea of what kinds of animals are in
11 that list?
12 A It's a diverse list from conspicuous, familiar mammals like
13 moose and wolves to also conspicuous birds like peregrine
14 falcons, Merlin Northern Goshawk, to less-conspicuous
15 species of some species of songbirds and other birds. King
16 Rail is on there. So those are some birds -- and then on
17 down to number of species of invertebrates, several species
18 of land snails, dragonflies, butterflies.
19 Q Any reptiles?
20 A Reptiles as well, yeah; two species of turtle -- three
21 species -- sorry -- of turtle.
22 Q Dr. Flaspohler, I would now like to switch to the subject of
23 the potential ecological harms that the proposed mine may
24 cause. And first I'd like to get a broad understanding of
25 your concept as a conservation biologist of how best to

1 categorize the ways in which a large human presence can
2 affect area wildlife. And let me start at the very bottom.
3 What does an organism need to survive?
4 A Okay. Well, organisms need habitat, and "habitat" is sort
5 of a catchall phrase for a variety of physical and
6 biological parameters or characteristics in the environment.
7 So habitat would include things like the vegetation and
8 associated soils. It would also include the community that
9 the species lives within, so you're talking about trees,
10 plants and other plants, fungi. Habitat also includes
11 certain sort of climatological ranges that a species can
12 occupy, certain sort of chemical environment that a species
13 can tolerate. So all those sort of go into what would be
14 considered habitat for a species, whether a plant, animal
15 fungi; any life form.
16 Q How would you classify the fundamental ways in which the
17 proposed mine could impact wildlife habitat in the
18 surrounding areas?
19 A Okay. Well, I would say there are certain -- you could
20 think of them as changes to the physical environment,
21 potential changes to the chemical environment, changes to --
22 in terms of the species composition, the community of
23 organisms in that area, and then, related to that last one,
24 changes in the sort of interrelationships among that newly
25 ordered community following disturbance.

1 Q The changes in the community and the resulting relationships
2 in that community, can you agree with me to refer to that as
3 biological impact or biological change?
4 A Sure.
5 Q So you've said that the three basic categories are physical
6 changes, chemical changes and what we're going to call
7 biological changes.
8 A Okay.
9 Q Is that fair?
10 A Sure.
11 Q Let's first talk about the physical changes, the potential
12 physical impacts of this mine. Is the creation of the mine
13 site itself, the clearing of 90-some acres and construction
14 of facilities, is that a physical change that is likely to
15 have effects on wildlife in the area?
16 A Well, certainly wildlife that were living on those 90 acres
17 are going to find a different habitat physically changed
18 once the facilities are in place.
19 Q Will the impact of that physical facility extend beyond the
20 property lines or the facility boundary lines?
21 A Yeah, I believe it will.
22 Q How?
23 A Well, as I understand it, there are a variety of things that
24 will be going on at the mine facility. The noise
25 environment will certainly change from what it is today.

1 The light environment will also change. The -- it's my
2 understanding that there'll be a volume of dust produced
3 from the activities related to the mine. And also it's my
4 understanding that there'll be some potential for water
5 related to the mine activities to get off site or off the
6 facility site.
7 Q How about the truck traffic? A number of ore trucks will be
8 going to and from the mine every day if the mine is built
9 and is operated. Is that, in your mind, a -- will that
10 constitute a physical change to the local habitat that will
11 have an impact on area wildlife?
12 A Sure, it definitely will, from things as obvious as greater
13 road mortality from increased amount of traffic to changes
14 in the dust produced from the road getting into the
15 environment downwind of the road to runoff from the road
16 surface into the surrounding -- water runoff into the
17 surrounding landscape. The noise environment obviously is
18 going to be different along that road than it is today.
19 Q Does road traffic facilitate the spread of exotic species?
20 A Yeah. There are many studies that have documented that
21 right here in the Great Lakes for roads with far less
22 traffic than I understand this one is proposed to have.
23 Logging roads, for example, there are studies that show
24 increased density of nonnative species and basic species
25 along roads compared to the forest interior.

1 Q Are the Yellow Dog Plains characterized by a large density
2 of exotic plants?
3 A No, in general they aren't. It's a pretty intact flora in
4 terms of the native species with -- there are some that I
5 think showed up on some of the plant surveys nonnative
6 species, but in general they're not invasive exotics that
7 tend to have dramatic effects on native flora.
8 Q Does road dust generated by heavy traffic on an unpaved road
9 have an effect on snow in the spring?
10 A Yeah, it can. There have been some studies that have shown
11 that dust that settles on the snow will, by changing the
12 albedo or the reflectance of the snow, making the snow
13 absorb -- darkening it essentially, making it absorb light
14 faster than areas distant from the road will melt that snow
15 more quickly in the spring 'cause of solar radiation and --
16 so that's a physical change in terms of the speed of snow
17 melt related to dust.
18 Q Was that shown to have any effect on -- well, what effect
19 could that have on wildlife around there?
20 A Well, early in the spring when the first snow melts, there
21 are a lot of wildlife species that are drawn to that water
22 for drinking. There's also species that can be drawn for
23 breeding such as pond-breeding salamanders. And so
24 potentially, at least, you could have species concentrating
25 themselves along the roadside during the spring at a time

1 when they're looking for open water and there isn't a lot of
2 open water and that's the first water to melt -- the first
3 snow to melt.
4 Q And if the operation of the mine facilitates the
5 introduction of exotic plants, what is the potential spatial
6 impact of those introductions?
7 A Well, the way it could happen -- it's likely to happen is
8 bringing seeds on tires, employees' boats. There's a lot of
9 ways that seeds of plants can move into an area. Once
10 they're established in a particular location, I would expect
11 that would be the area of greatest activity. Seeds spread
12 from plants from seed dispersal by wind, by animals, and so
13 those seeds can move offsite within a generation or two from
14 where they were first established.
15 Q Did Kennecott's environmental impact statement analyze the
16 potential impact of the introduction of the exotic plants
17 beyond their own property line?
18 A No.
19 Q Did Kennecott's environmental impact study -- assessment
20 analyze the potential adverse impacts on wildlife resulting
21 from road dust created by their truck traffic?
22 A No.
23 Q Those impacts, I assume, will extend far beyond the
24 company's property line?
25 A Yeah, in all likelihood.

1 Q If, instead of using a Triple A Road, Kennecott built a new
2 road to access the mine site, how would the environmental
3 impact of that compare with the environmental impact of
4 increasing traffic on an existing road?
5 MR. PREDKO: Objection, your Honor, to relevance.
6 This is a hypothetical. There is no new road in this
7 permit.
8 MR. DYKEMA: Is there no plan to build a new road?
9 MR. PREDKO: There is no new road in this permit
10 that is subject to this proceeding.
11 MR. DYKEMA: I'll withdraw the question, your
12 Honor.
13 Q Another aspect of the physical changes to be caused by the
14 Eagle Mine is noise. Are wildlife species sensitive to
15 noise?
16 A Yeah, definitely. In fact, fruit growers and orchard
17 growers use noise to discourage pest species like redwing
18 blackbirds, for example, in southern Michigan from taking
19 fruit. So clearly, wildlife respond to noise. More subtly
20 it's been shown in the last decade or so that some species
21 can be -- songbirds nesting near consistent noise such as
22 road noise and highway noise experience more subtle effects
23 to their biology. For example, males nesting close to
24 highways have a more difficult time attracting a female
25 partner to mate with, so they experience reduced what is

1 called pairing success. So that's an area that's only been
2 looked at carefully for perhaps the last seven -- five to
3 seven years -- the effect of noise. But certainly it's
4 going to have an effect on some species.
5 Q Will some species of birds simply flee an area that was
6 formerly quiet but now has loud, continuous noise?
7 A Probably some certainly will, and some won't use the habitat
8 because it's just been so altered -- physically altered.
9 Q Will the impacts of the noise stop at the company's property
10 line?
11 A No; no. They'll penetrate into the forest. Certainly
12 you'll be able to hear some of those activities away from
13 the road for some distance, perhaps a kilometer, depending
14 on how loud it is.
15 Q Did Kennecott's environmental impact assessment consider at
16 all the impacts on area wildlife from the increased noise
17 levels outside their own property?
18 A No.
19 Q Do we have an understanding as to why it is that continuous
20 noise impairs bird breeding success?
21 A Well, there's been a little insight into that, and it came
22 from a study where they actually looked at the song
23 frequencies that males were singing at away from noisy areas
24 and near noisy areas, and they found that males appeared to
25 be adjusting the frequency of their song over time, at

1 least, so that it didn't compete directly with the
2 background noise. And that might -- that could be the
3 mechanism by which females are not choosing to mate with
4 males, because they just -- they can't hear them or they're
5 not hearing the proper song because of the drowned-out
6 background noise. But again, this is very new recent
7 research, and so it'll be some time before we understand the
8 mechanisms behind some of those patterns.
9 Q Are the Yellow Dog Plains today a very noisy place?
10 A No; very quiet.
11 Q Is there any industrial activity out there?
12 A Not that I've ever seen.
13 Q You mentioned that you had categorized the forms of habitat
14 alteration as physical changes, chemical changes and
15 biological changes. I'd now like to talk about chemical
16 changes. And first, what is your understanding of the
17 pathways by which the wildlife habitat in the area of the
18 mine site will be chemically altered?
19 A Okay. Well, it's my understanding that there -- there are
20 airborne particulate vectors through which chemical change
21 through deposition of dust into the landscape onto waters
22 and soils downwind of the mine --
23 Q Have you seen the deposition modeling down by
24 Conestoga-Rovers Associates?
25 A Yes, I have.

1 Q And were you here yesterday to hear some of the testimony of
2 Mr. Vel?
3 A Yes.
4 Q Please continue.
5 A So that's the sort of atmospheric vector. And then, again,
6 it's my understanding that there'll be -- there's the
7 potential for water -- sort of a water-based pathway for
8 water related to the mine and the mine processing and water
9 treatment to get off of the mine site into the landscape as
10 well outside of the --
11 Q Over how large an area did CRA's deposition modeling show
12 the deposition of heavy metals?
13 A It was tens of kilometers.
14 Q Will that particulate deposition fall on both lands and
15 waters?
16 A Sure, I would expect so; yeah.
17 Q Will the particulates transport from the land into the
18 surface water?
19 MR. PREDKO: Objection; no foundation. Again, the
20 objection is that I'm not sure that this witness is
21 qualified to testify on the transport of metal particulates.
22 MR. DYKEMA: I'll lay a foundation, your Honor.
23 JUDGE PATTERSON: All right.
24 Q Dr. Flaspohler, is the transport of land materials and
25 sediments into water bodies an issue that is of concern to

1 conservation science on a regular basis?
2 A Sure; definitely.
3 Q Is it likely that materials, dusts that deposit on lands
4 will be carried by rainwater into rivers?
5 A It's very likely.
6 Q Will that happen on a steady basis all year long?
7 A No, because, of course, we get a lot of snow up there, and a
8 lot of that dust that falls -- that is generated during the
9 winter will accumulate on the snow pack and then be released
10 in a fairly short amount of time during the spring melt.
11 Q How much snow does this part of the state get each winter?
12 A We get about 250 inches in Houghton where I live --
13 Houghton, Hancock and similar amounts I think in the
14 Marquette area in between.
15 Q And for how many months in a typical winter is the snow pack
16 intact?
17 A Typically from, I'd say, mid November to -- well, there was
18 still snow on the ground when I left Houghton a few days ago
19 in patches, so usually by mid April it's largely gone, so
20 November to April.
21 Q So is it your understanding that the particulates emitted
22 from this mine site will accumulate on the snow for five
23 months in the winter?
24 A That's what I would expect.
25 Q And then what will happen to them in the spring?

1 MR. PREDKO: Objection; same foundational
2 objection, your Honor.
3 MR. DYKEMA: Your Honor, I think the Court can
4 take judicial notice of the fact that in the spring snow
5 melts and rivers flood, because all of the water flows into
6 the rivers. I can lay a foundation with the witness, but I
7 don't think this even requires expert testimony.
8 MR. PREDKO: Your Honor, just a little
9 clarification. I understand the snow melting and going into
10 the river; however, there's a component here where expert
11 testimony is needed as far as what concentrations will melt
12 and go into the river, what concentrations will be held back
13 by organic material or what concentrations will soak into
14 the soil. If you don't venture into that area, then, you
15 know, I think that's fine. But if you do, I don't think
16 that Dr. Flaspohler is qualified to testify to that.
17 MR. DYKEMA: Well, it's sufficient for my
18 purposes, Chris, if you'll agree with me, that a very large
19 percentage of what sits on top of the snow is going to get
20 washed away in the spring. If there are some traces that
21 actually stay where they originally fell, I don't care
22 but --
23 MR. PREDKO: I think that that's an area where we
24 need expert testimony, and it's not something the Court can
25 take judicial notice of.

1 Q Dr. Flaspohler, do you have a basis for opining as to
2 whether dust that accumulates on the snow pack -- most of
3 the dust that accumulates on the snow pack washes into
4 surface water with the spring floods?
5 A Some of it certainly does. I couldn't say what percentage,
6 and it would depend on the soil conditions, and it would
7 depend on a number of things. But certainly some of it
8 would end up in water nearby -- surface water bodies.
9 Q Then let me ask you to make an assumption with me, and the
10 assumption is that half or more than half of the
11 metal-bearing particulates emitted by the mine that are
12 accumulated on the snow pack over a five-month period wash
13 into surface water when the snow melts in the spring.
14 MR. PREDKO: Objection; assumes facts not in
15 evidence. I assume that you're going to bring foundation to
16 that through another witness?
17 MR. DYKEMA: May I take a moment, your Honor?
18 JUDGE PATTERSON: Sure.
19 MR. DYKEMA: Yes, I believe we will.
20 Q On that assumption, if that is true, does that raise a
21 particular concern about toxins accumulating in rivers in
22 the spring?
23 A Sure. If that were true, then that would be -- that could
24 be a concern.
25 Q What other vectors are there by which the operation of this

1 mine could alter the chemical habitat or the chemistry of
2 the wildlife habitat in the surrounding area?
3 A Other than --
4 Q Other than the dust.
5 A Well, water that however escaped from the -- either runs off
6 the roads or runs off of the facility site would -- could
7 likely contain sulfide or sulfur-bearing rock, which would
8 turn to sulfuric acid and could acidify along with whatever
9 metals might happen to be in there. So that's an aquatic
10 mechanism.
11 Q Are you familiar with a phenomenon known as acid mine
12 drainage?
13 A Yes.
14 Q Is it your understanding that that is another vector by
15 which the operation of this mine could chemically alter
16 wildlife habitat in the area?
17 A Yes.
18 Q What are the key chemical agents of interest to you as a
19 conservation biologist and an ecologist that are -- that
20 will be created by this mine?
21 A Well, as I understand, there's a large -- fairly large
22 amounts of nickel and copper. Both of those metals are --
23 depending on the taxa 1:35:13* you're talking about, can be
24 either very toxic or moderately toxic. In addition, any
25 acidification to either soils or waters can affect wildlife

1 directly that live in the soil or it can affect species that
2 live in the soil and affect other species that -- for which
3 those may be their prey or -- so acidification and heavy
4 metals would be my main concern.
5 Q Has it been demonstrated that nickel is toxic to plants?
6 A Yes.
7 MR. PREDKO: Objection. I'm going to object this
8 whole line of questioning, your Honor. This witness has not
9 been established to be an ecotoxicologist, and we're getting
10 into the effects that certain metals and toxins had on
11 certain species, so I don't believe he's qualified.
12 Q Dr. Flaspohler, is the analysis of pollution and toxins in
13 the environment an important subject for ecological science
14 and conservation science?
15 A Sure; yes.
16 Q Is it a subject that you have studied?
17 A Yes.
18 Q Is it a subject that comes up routinely in your field?
19 A Through my field, yes.
20 MR. DYKEMA: Your Honor, I think he's eminently
21 qualified to address these questions. We are not going to
22 delve into how many parts per trillion particular toxic
23 effects are shown. I would agree that he doesn't have the
24 expertise for that. But that nickel and copper are toxic to
25 a variety of organisms and in a variety of ways, that's a

1 big part of his business.
2 MR. PREDKO: It's dangerous to let an expert who's
3 not qualified just talk generally about, for instance, how
4 heavy metals or toxins are going to affect species. Without
5 this level of knowledge where they know what concentrations
6 affect certain species and what concentrations don't, it's
7 dangerous to let that testimony in, because he's not
8 qualified to do that, and we have the same objection, your
9 Honor.
10 MR. DYKEMA: I would just say he is qualified to
11 say that nickel is toxic to certain kinds of organisms.
12 That testimony only goes as far as it goes. I don't think
13 there's anything misleading or --
14 JUDGE PATTERSON: If that's as far as it's going,
15 I think it's okay. You can --
16 Q Does the literature demonstrate that nickel is toxic to
17 plants?
18 A Yes.
19 Q Including trees?
20 A Uh-huh (affirmative).
21 Q Does it affect algo* 1:38:12 growth rates?
22 A Yes.
23 Q Does nickel accumulate in plant tissues?
24 A It can, yes.
25 Q Does that result in biocumulation when plants are consumed

1 by animals?
2 A Can, sure.
3 Q Is nickel toxic to amphibians?
4 A It can be, yes.
5 Q Fish?
6 A Yes.
7 Q Birds?
8 A Yes.
9 Q Mammals?
10 A Can be.
11 Q Are you familiar with a New Zealand study that compared the
12 levels of dissolved metals in a river with the diversity of
13 invertebrate species?
14 A Generally, yes.
15 Q What relationship was disclosed by that study?
16 MR. PREDKO: Same objection, your Honor. Now
17 we're getting into concentrations and other areas that
18 affect certain species, and I do not believe that Dr.
19 Flaspohler, with all due respect to him, that he is
20 qualified. He's not a toxicologist.
21 MR. DYKEMA: The extent of the testimony, your
22 Honor, is that the study with which Dr. Flaspohler is aware
23 showed that the more metals you have, the fewer insects you
24 have, so that there is an inverse relationship. He cannot
25 testify as to the mechanisms of the toxicology. That's the

1 limit of the testimony.
2 JUDGE PATTERSON: All right. With that limit I'll
3 allow him to --
4 Q What relationship did the New Zealand study show between the
5 levels of heavy metals in the water and insect diversity?
6 A Right. It simply showed that rivers that had higher
7 concentrations of metals have lower abundances of aquatic
8 invertebrates.
9 Q You also mentioned that -- you said that there were two main
10 chemical agents of concern to you as an ecologist. One is
11 the heavy metals, and the second you mentioned was
12 acidification. Can you explain to the Court your
13 understanding of how the operation of this mine would have
14 caused acidification?
15 A Right. Well, it's related to this acid mine drainage to
16 some extent as an aquatic avenue for getting -- potentially
17 getting acidifying agents into surface and groundwater.
18 It's also related to the airborne deposition of dust, which
19 has the same ore composition and would be expected to also
20 acidify the soils and waters in which it falls and settles
21 and becomes entrained.
22 Q When you say water is acidified, what does that mean?
23 MR. PREDKO: Just another objection, your Honor.
24 And if your Honor is inclined to let this go forward, if I
25 could have a continuing objection so I don't keep

1 interrupting -- but we're now delving into again chemical
2 reactions where it would be not only useful and helpful but
3 necessary to have an expert who's qualified to talk about
4 those things. And there has been no foundation whatsoever
5 to show that Dr. Flaspohler is an ecotoxicologist, a
6 toxicologist or even a biochemist, and so we don't think
7 he's qualified.
8 MR. DYKEMA: Your Honor, the testimony I will
9 elicit is that acidification causes a change in pH, and that
10 changes in pH have an effect on aquatic organisms. Again,
11 I'm not sure that even requires expert testimony, but
12 certainly a conservation biologist and an ecologist who is
13 familiar with and has published studies on aquatic organisms
14 is about as familiar with pH as I am of putting on my shoes.
15 This is pretty basic.
16 MR. PREDKO: I don't believe that it's that basic,
17 your Honor, and there are numerous factors that affect the
18 amount of the pH that Dr. Flaspohler is not qualified to
19 talk about. It's very dangerous to let an expert testify in
20 an area where he's not qualified.
21 MR. DYKEMA: Your Honor, would you like me to lay
22 a foundation? I'll be happy to.
23 JUDGE PATTERSON: If you could, yeah.
24 MR. DYKEMA: Sure.
25 Q Dr. Flaspohler, when did you first learn about pH as a

1 variable of water quality?
2 A Oh, I suppose high school.
3 Q And how frequently in the course of your career as an expert
4 ecologist have you found the pH of water to be relevant to
5 work you were doing?
6 A Well, it's not a central part of research on a regular
7 basis, but there are studies. For example, the Otter River,
8 a study that I've worked on with colleagues that I published
9 several papers on pH was an important variable for looking
10 at water quality changes with forest management.
11 Q And in the course of your studies and in the course of your
12 work as a teacher and a researcher, have you frequently
13 undertaken to understand how changes in pH affect aquatic
14 organisms?
15 A It comes up from time to time. But, you know, my
16 understanding, as I think I would concede, is not as an
17 environmental toxicologist. But I think pH is one of
18 those -- one of the very fundamental level trait of habitat
19 that, even if you wanted to avoid environmental toxicology
20 as a field, would be hard to avoid, because it's --
21 Q Is pH one of the fundamental attributes of water as a
22 habitat for living organisms?
23 A Sure.
24 Q Is it possible to understand water habitat for an organism
25 without knowing what the pH is?

1 A That would be difficult.

2 MR. DYKEMA: Your Honor, I think he's eminently

3 qualified to talk about the basics of pH and what affect it

4 and how it affects creatures that live in water.

5 MR. PREDKO: I agree he may be able to talk about

6 the basics, but once you start getting into specific

7 species, especially aquatic species, your Honor -- he's

8 already earlier testified that he's not an aquatic biologist

9 and that any studies which are infrequent he's done with

10 other folks who actually are experts in that field. And he

11 just said again that he relied on those other people for

12 some of the understanding that he has, so same objection.

13 JUDGE PATTERSON: Do you intend ask him about

14 specific species and --

15 MR. DYKEMA: I will ask him whether --

16 JUDGE PATTERSON: Or just a proposition that --

17 MR. DYKEMA: I will ask --

18 JUDGE PATTERSON: -- adding acid to water will

19 lower the pH?

20 MR. DYKEMA: That, and I will ask him about the

21 sensitivity of organisms as classes, taxa* to changes in pH;

22 that the extent to which insects and fish can be affected

23 negatively by pH or require certain pH levels in order to

24 live. That's -- I think that's as far as I'm going to go.

25 JUDGE PATTERSON: All right. Thank you.

1 Q How do mines cause changes in pH? I think you were talking
2 about acid mine drainage. Was there more you wanted to say?
3 A Then the only other thing I mentioned was the potential for
4 acidifying dust to get into soils. And so it's not just a
5 question of water but also soils that can have their pH
6 altered by acidic or basic inputs.
7 Q Does acidity -- is there a relationship between these two
8 things, the heavy metals and acidity? Does the acidity of
9 soil or water affect the way it -- with that environment
10 response to have the presence of heavy metals?
11 A More acid conditions typically make heavy metals more
12 mobile, meaning they're -- they can be more easily moved
13 through an ecosystem both physically and biologically
14 through creatures or physical movement.
15 Q I'd now like to talk with you broadly about the effects of
16 these two chemical habitat alterations, the introduction of
17 heavy metals and acidification.
18 MR. DYKEMA: Can we have slide 6, please?
19 Q Dr. Flaspohler, we are now looking at a letter that was
20 written by a Dr. Dana Richter of Michigan Tech to Mr. Steven
21 Wilson of the DEQ. Have you seen this letter before?
22 A Yes, I have.
23 Q Is this one of a large number of letters that biologists
24 submitted as comments on the proposed mine?
25 A Yes, it is.

1 Q And can you summarize for the Court the point that Dr.
2 Richter tried to make in this letter?
3 MR. PREDKO: Your Honor, I'm just going to object.
4 Again, this involves trying to get in through this witness
5 other expert testimony in other fields. He's not a
6 toxicologist. I don't believe that he's a botanist, which I
7 believe this letter has to do with. I don't think he's
8 qualified to talk about it. This letter is clearly hearsay.
9 MR. DYKEMA: Your Honor, the letter will not be
10 offered for the truth. It's here as a foundation for me to
11 ask Dr. Flaspohler. But also, my -- the issue I take with
12 the objection is a broader one. Dr. Flaspohler is an
13 ecologist and a conservation biologist and, in acquiring
14 expertise in those fields, he is called upon to understand
15 all of the components of a forest. That's what ecology is.
16 And, yes, he does have a particular interest in birds, but
17 he's published on other subjects as well. And I don't think
18 it's fair to say that he can't talk about trees because he's
19 not here as a tree expert. He's here as a forest ecology
20 expert -- or wildlife ecology expert. That requires an
21 understanding of ecological systems. So I think it's unfair
22 to object every time I ask him about a different -- either a
23 different type of organism or a different environmental
24 impact, because his expertise is in natural organism and
25 environmental impact, so there's a broad expertise. But

1 this is not going to be offered for the truth. It's
2 offered -- we are going to use this letter as a foundation
3 for Dr. Flaspohler's own understanding of what the
4 literature shows.
5 JUDGE PATTERSON: I think the question, the way it
6 was phrased, was --
7 MR. DYKEMA: My colleague, your Honor, reminds me
8 of another point, which is perhaps the most important of
9 all, which is that the statute that we're operating under
10 specifically requires that the environmental impact
11 assessment consider cumulative impacts of all of the
12 different forces, all of the different effects that the mine
13 can have and that, as Dr. Flaspohler has indicated in his
14 field, that includes physical impacts and chemical impacts
15 and biological impacts, I can't think of a better person,
16 your Honor, to address that issue, cumulative impacts, than
17 a community ecologist and a conservation biologist whose
18 expertise is in looking at all the different ways in which a
19 biological system or a biological population or a biological
20 species can be affected.
21 MR. PREDKO: Your Honor, while the statute
22 regulation may require examination of cumulative impacts,
23 here we're looking at a specific area of expertise in this
24 letter, and that's the way that certain chemicals affect
25 certain types of fungi and plants. And the objection is not

1 necessarily that Dr. Flaspohler is not an expert in fungi,
2 although I don't believe he is. It's, again, that he's not
3 a toxicologist.
4 JUDGE PATTERSON: The problem I have with the
5 question, at least my interpretation of it, was asking him
6 to characterize or interpret Dr. Richter's opinion. I
7 think, if he reads it and is asked if he agrees with that,
8 that's a different matter but -- so if you can, rephrase
9 that.
10 MR. DYKEMA: Certainly, your Honor. Thank you.
11 Q Skipping over the literature citations in the interest of
12 time, can you please read what Dr. Richter said to Mr.
13 Wilson at the DEQ?
14 A Okay.
15 "It has come to my attention that considerable
16 airborne particulate matter of mineral and metal
17 content will result from the mining operations during
18 the life of the mine. There is abundant documentation
19 that metal and particulate deposition to forests at
20 these levels is harmful to the mycorrhizal fungi and
21 the trees with which they are in symbiosis. Several
22 pertinent research papers demonstrating this phenomenon
23 are" --
24 Q And then he cites several papers, and then what does he say?
25 A "In essence, these papers demonstrate the

1 detrimental effects on root colonizing fungi due to
2 increased metal concentrations. Anything that harms a
3 mycorrhizal fungi will harm the forest since trees are
4 intimately dependent on their mycorrhizal fungi for
5 nutrient and water uptake."
6 Q For the benefit of the reporter, can you spell the word
7 "mycorrhizal"?
8 A Yeah. I sometimes have trouble with that myself;
9 m-y-c-o-r-r-h-i-z-a-l.
10 Q What are mycorrhizal fungi?
11 A Those are fungi that live in association with the fine roots
12 of a variety of plants but -- and particularly in this case
13 with trees, and they aid in water and nutrient uptake for
14 the tree, and they benefit from their association with the
15 tree as well by providing habitat for the mycorrhizal fungi
16 to exist.
17 Q Are you familiar with studies showing the impact of
18 impairment on mycorrhizal fungi on their symbiotic trees?
19 A Studies showing that things can impair mycorrhizal fungi and
20 then affect tree growth and tree survival, yes.
21 Q Do you agree with Dr. Richter's concern here?
22 A Yes.
23 Q Are heavy metals toxic to mosses, lichens and liverworts?
24 A Yes, they can be in high-enough concentrations.
25 Q How do mosses, lichens and liverworts get their nutrients?

1 A Because they're growing on -- many of them -- not all, but
2 some are growing on the surfaces of trees, they get their
3 water from rainfall. Those on the ground can get it from
4 rainfall and surface flow. So that's where they get their
5 water.
6 Q Are mosses, lichens and liverworts actually used as -- in
7 order to monitor levels of atmospheric pollution?
8 A Yes, they are. Commonly throughout the world they're very
9 sensitive to air pollution and will often decline -- will be
10 some of the first groups to decline if you have lowered air
11 quality.
12 Q How will the chemical alteration of the habitat as a result
13 of the operation of this mine potentially affect aquatic
14 organisms?
15 MR. PREDKO: Same objection, your Honor. Now this
16 is -- how will certain chemicals emitted by the mine affect
17 the environment? That's a question for an ecotoxicologist.
18 MR. DYKEMA: I will take it one small step at a
19 time, your Honor.
20 JUDGE PATTERSON: Go ahead.
21 Q Are heavy metals toxic to fish?
22 A They can be.
23 Q Are heavy metals toxic to aquatic invertebrates?
24 A Sure, they can be.
25 Q And do heavy metals biocumulate when predators eat

1 invertebrates that have absorbed heavy metals?
2 A Sure; yeah, many of them do.
3 Q In your opinion, is the potential dispersion of heavy metals
4 of concern regarding the aquatic organisms and the habitat
5 surrounding this proposed mine?
6 MR. PREDKO: Same objection, your Honor.
7 JUDGE PATTERSON: I'll overrule.
8 A Yeah, that would be a concern of mine.
9 Q And did Kennecott's environmental impact assessment make any
10 effort to assess the likely or potential damage to aquatic
11 organisms by chemical agents outside its own property line?
12 A No, not that I ever saw.
13 Q Did the environmental impact assessment acknowledge the
14 possibility of acid mine drainage at all?
15 A No.
16 Q Did the environmental impact assessment address in any way
17 the deposition of metal-bearing particulates?
18 A Not that I saw, no.
19 Q For purposes of putting these chemical alterations into
20 context, what are the relevant characteristics of the
21 existing landscape on the Yellow Dog Plains?
22 A They have a bearing on some of the chemical change and the
23 habitat.
24 Q The effect of the pollution by water and air with heavy
25 metals and acids?

1 A Well, at one level it's a -- it's -- certainly there's been
2 logging. But in general, in terms of invasive species and
3 in terms of the communities that are there, it's pretty
4 intact. So anything that you're proposing to do would
5 change that would be a concern. In terms of metals and any
6 sort of acidifying inputs, the soils and the waters -- not
7 all the waters but many of the waters in that area are
8 already pretty acid, so they're -- and there aren't a lot of
9 buffering agents within the soils of this area. There's a
10 lot of sand. So they would tend to -- the landscape and the
11 soils and the waters would be, in my opinion, quite
12 sensitive to relatively small changes in pH as a result of
13 that.
14 Q Going back to the mycorrhizal fungi, if the deposition of
15 heavy metals -- the atmospheric deposition of heavy metals
16 as a result of the operation of this mine has a detrimental
17 effect on mycorrhizal fungi, if I understand what you said,
18 that will in turn hurt the trees. Did I understand that
19 right?
20 A If the -- many trees have -- are very dependent on their
21 mycorrhizal associations to the point where they can't live
22 without them. Some of them can live, but they just grow
23 much slower.
24 Q And what's the potential geographical or spatial extent of
25 that impact?

1 A Well, that would be hard to predict, because it would depend
2 a little bit -- it would depend on the volume of deposition.
3 It would depend on the -- sort of the buffering that may or
4 may not occur. But certainly the models that I've seen of
5 airborne deposition worst case scenario would be quite far
6 from the mine.
7 Q Did Kennecott's environmental impact assessment pay any
8 attention at all to potential impacts on mycorrhizal fungi
9 and trees?
10 A No.
11 Q You indicated at the outset that you categorized the impacts
12 at this mine in terms of physical changes, chemical changes
13 and biological changes. And I'd now like to get you to say
14 a little bit more about the biological changes. And what
15 you mentioned, I believe, was changes in the community. Can
16 you say more about that?
17 A Okay. Well, the habitat change -- the physical habitat
18 change and the presence of people and human activities are
19 going to change the physical characteristics of the habitat.
20 And one of the ways that wildlife is going to respond to
21 that is certain species will be harmed by that and will
22 either be destroyed or will leave that area depending on
23 their mobility. Some species will actually be attracted to
24 that sorts -- those sorts of changes. So --
25 Q What sorts

1 A Well, there are a group of species called human commensals.
2 And if you just walk outside the building here, that's just
3 about all you'll see in terms of wildlife. These are things
4 like house sparrows, European starling, pigeons, seagulls,
5 house finches. So these are species whose habitat
6 preference is very much like our own. And so when humans go
7 in and alter a landscape that tends to improve it for some
8 of these human commensals. And some human commensals are
9 native species. Many of them are not native.
10 Q Are there commensal families?
11 A Sure. There are native commensal mammals like racoons,
12 skunks, coyotes to some extent. These are animals who tend
13 to be a benefit not from every human land use change but
14 from certain kinds.
15 Q And what are the potential effects on the native wildlife of
16 the increased presence of commensal species at or around the
17 mine site?
18 A Well, for the most part, as a conservation biologist, we
19 don't worry about human commensals in the sense that they
20 tend to be very abundant. We worry their effects on less
21 abundant species of native species. So a lot of those human
22 commensals are generalists in terms of their habitat and in
23 terms of their diet. So, for example, coyotes, racoons,
24 skunks are all -- at least during the breeding season of
25 songbirds are pretty effective nest predators. Many of the

1 species that -- of songbirds that breed in this area and
2 other ones too -- other kinds of birds in here breed on the
3 ground. And so by increasing the abundance of human
4 commensals within the disturbed area, there's the potential
5 for birds breeding quite a ways outside of the disturbed
6 area to experience effects such as reduced breeding success,
7 nesting success, if their eggs are destroyed.
8 Q Did Kennecott's environmental impact assessment pay any
9 attention at all or even --
10 A No.
11 Q -- recognize the possibility of this impact?
12 A No.
13 Q Are cowbirds a commensal?
14 A Yeah. Brown-headed cowbirds are a commensal species and
15 native to North America but have moved into parts of North
16 America following European settlement and agriculture,
17 because they like short vegetation, pasture ideally. But
18 any kind of open -- large openings tend to attract
19 brown-headed cowbirds. And that's significant because
20 brown-headed cowbirds are what is called a brood parasite.
21 So they don't lay their own, they don't build nests and they
22 don't lay eggs in their own nests. They find other host
23 species in which to lay their eggs. Those host species then
24 raise the cowbird chicks to the detriment of them own
25 reproductive effort.

1 Q Did cowbirds have an effect on the Kirkland's warbler?
2 A Yeah. The Kirkland's warbler declined partly as a result of
3 really very highly rates of cowbirds parasitism during the
4 50's, 60's, 70's. So they parasitized them very heavily.
5 Q I don't know if I asked you this before. Is the Kirkland
6 federally listed?
7 A Yeah. It's federally endangered.
8 Q You spoke earlier about the possibility of exotic species
9 being introduced to the property as a result of truck
10 traffic. If exotic plant species are introduced, what are
11 the likely effects?
12 A Well, some non-native species such as dandelion could get in
13 there. And they really aren't -- they don't represent a
14 great threat outside of the disturbed area, because they
15 don't really have the capacity to move into, let's say, a
16 closed canopy forest and compete with native plants. On the
17 other hand, there are species -- wetland species like purple
18 loosestrife and forest species like garlic mustard that are
19 very aggressive and successful colonizers and can compete
20 for light and space with native plants and crowd out native
21 plants.
22 Q Can the introduction of exotic plants such as you've
23 identified have an effect on the plant biodiversity of the
24 region?
25 A Yeah; definitely. And you can go to many places and see

1 this within Michigan where, say, garlic mustard has gotten
2 established. In fact, a couple of days ago I took a walk
3 along the river, and there's garlic mustard all through the
4 forests that are the little patches within right here in
5 Lansing. And once it gets in there, two things happen. The
6 deer don't tend to like to eat it, so they'll eat everything
7 but the garlic mustard favoring the garlic mustard to some
8 extent. And then also garlic mustard just produces lots of
9 seeds. And those seeds become adult plants. And those
10 adult plants grow and shade native plants growing near them.
11 Q Can the appearance of exotic plants actually produce a
12 monoculture?
13 A Sure.
14 Q And what is a monoculture?
15 A Or something close to a monoculture. Where polyculture is a
16 -- typically when you talk about polyculture or monoculture,
17 you're talking about cultivated -- a cultivated plant
18 community. But they can simplify a complicated, diverse
19 plant community from many species down to just a very few.
20 Q Does that have impact on animal diversity?
21 A Yeah, it does. I mean, one of the sort of central tenants
22 in wildlife habitat relationship tends to be you have a
23 strong tendency in many communities for greater plant
24 diversity is usually associated with greater animal
25 diversity in that same community. So to the extent that you

1 simplify a community, a wetland goes from diverse plants to
2 a monoculture of purple loosestrife, you would expect bird
3 diversity, arthropod diversity, the diversity of many other
4 groups to decline.
5 Q Returning for a moment to the effect of commensals, have you
6 yourself studied the effect of commensals and of very low
7 impact human activity in bird communities?
8 A Well, I can give you a couple examples. In my research,
9 we've looked at whitetail deer can be considered a common
10 commensal in that, when you take a landscape and you take it
11 from forest to a wood lot type of agriculture landscape,
12 that deer densities go up. And I've had graduate and I have
13 done work on the effect of deer on understory plants. So
14 deer can be kind of a result of land use change that can
15 then impact plant communities. We've looked at more subtle
16 forest management effects on birds and insects and fish
17 communities in the Ottawa River for a couple of years. So
18 that's where the forest management is not clearcut but
19 rather selectively cutting individual trees out of the
20 forest, so pretty low-intensity forest management. And for
21 my Ph.D., we didn't find a lot of cowbirds. But in terms of
22 we did look at cowbird parasitism as another factor
23 affecting bird reproductive success in that study. And then
24 a more recent study and another one I have ongoing is
25 looking at the effect of lakeshore development in northern

1 Wisconsin and in the Keweenaw Peninsula on the bird
2 community that tend to characterize developed shoreline
3 versus undeveloped shoreline.
4 Q And what has that study shown?
5 A And generally what you see there is, when you have a
6 pristine shoreline and cottages come in, you see a different
7 community that is made up of more -- fewer ground nesting
8 birds once the cottages are in place and more seed-eating
9 birds versus insect-eating birds was another change. And
10 one of the -- part of that study is still ongoing in
11 Wisconsin.
12 Q And is it your understanding that the relative loss of
13 ground nesting birds is a result of the commensals following
14 the cabin owners?
15 A We weren't -- we didn't get at the mechanism for that -- for
16 that loss of ground nesting species, but certainly that
17 would be a reasonable hypothesis to test.
18 Q Dr. Flaspohler, is it appropriate in trying to understand
19 the impact that this mine might have on area wildlife to
20 look at each of these causal factors one at a time and in
21 isolation?
22 A Well, often it's done out of convenience and in order to
23 simplify a system. But clearly, in reality, wildlife --
24 when habitats change whether it's physically, chemically or
25 the composition of the community changes, the animals

1 experience those things collectively, not as individual
2 sequential disruptions. So what that argues for -- and this
3 has been reflected in more and more ecological research --
4 is trying to look at not just individual effects but
5 cumulative effects, because that is -- better reflects the
6 reality of how species' ecological systems work.
7 MR. DYKEMA: Can we have slide 9, please?
8 Q Doctor, we're now looking at a demonstrative exhibit, your
9 slide 9. Did you prepare this?
10 A Yes.
11 Q In your opinion, must a scientifically valid assessment of
12 the likely ecological consequences of the Eagle Mine view
13 potential impacts cumulatively?
14 A Well, I would say, if that sort of an approach isn't taken,
15 then you're apt to miss and perhaps fail to completely
16 understand the way wildlife is fully experiencing that
17 totality of change.
18 Q Is an assessment of the impact of the mine that looks at one
19 causal factor -- each causal factor in isolation likely to
20 produce an accurate prediction of actual impact?
21 A No. I think it's likely to miss impacts that would be the
22 result of the accumulation of multiple stressors on an
23 ecosystem or on a species.
24 MR. DYKEMA: Can we have the next slide?
25 Q Now, Doctor, is slide 10 a demonstrative that you have

1 prepared to illustrate how cumulative impact analysis can
2 and should be done?
3 A Yeah. It's partly to illustrate that, yes.
4 Q Please explain what you're trying to communicate here.
5 A Well, this gets back a little bit to what we've already
6 talked about. And this is somewhat of a simplification.
7 But it's looking at for one taxonomic group birds. What
8 I've pulled out or tried to simplify are some of the key
9 habitat characteristics that are most germane to birds. And
10 then -- so these would include the terms in bold in each of
11 those surrounding circles. And then underneath those are
12 what I would expect to be potential likely changes that
13 could result from almost any land use change but, in this
14 case, in particular, some of the activities related to the
15 proposed mine.
16 Q And how do you anticipate all of these factors will
17 influence the bird habitat?
18 A Well, they're going to interact obviously because a bird
19 lives in one place and those -- at least during the breeding
20 season for those species that breed in this area, if they're
21 on a territory, they're going to experience for several
22 months the interaction of all of these changes. So, for
23 example, a species may be capable of dealing with one or it
24 may not have a dramatic effect on the bird's reproductive
25 success, mortality rate, whatever. But when you start --

1 when it starts to experience more than one -- two or three
2 of these changes at the same time, that's a different --
3 could be a different magnitude of effect on the bird and
4 what its sort of key demographic traits are.
5 MR. DYKEMA: Can we have slide 12?
6 Q Dr. Flaspohler, we're now looking at slide 12, which talks
7 about the wood thrush. Have you prepared this in order to
8 give the Court an illustrative of how cumulative impacts can
9 affect wildlife?
10 A Yes.
11 Q Can you please describe what you're trying to communicate
12 here?
13 A Okay. Well, wood thrushes are a group of migratory
14 songbird. And there's a couple other thrush species also
15 that are found on the mine site, Swainson thrushes and
16 Hermit thrushes. And this is a group of migratory birds
17 that has been shown for 20 or 30 years to be sensitive to
18 forest fragmentation. It's a forest breeding songbird that
19 tens to be more common in large blocks of forest, large
20 contiguous blocks of forest, and become less common as those
21 forests get chopped up into smaller and smaller pieces.
22 Now, that's been known for 30 years -- 20 or 30 years. What
23 some scientists at Cornell couldn't quite explain was why,
24 even in certain blocks that were large enough -- appeared to
25 be large enough for wood thrushes, they would find wood

1 thrushes breeding in some blocks and, in a similarly sized
2 block, they would not find any wood thrushes breeding. So
3 what they did is they went in -- so there's your first
4 effect is the fragmentation of forests and the shrinking of
5 forest area that has been going on for 100 years or more in
6 North America. What they did is they then went in and
7 looked at the soil acid characteristics of these forests.
8 And what they found was that wood thrushes breeding in lower
9 pH, more acid soils or I should say blocks of forest where
10 the soils were more acid did not have any or very man wood
11 thrushes breeding in them. Whereas forests that were less
12 acid of the same size did have wood thrushes within. The
13 mechanism behind that was that they also found that calcium
14 rich invertebrates such as land snails and isopods were less
15 common. And these are foods for these birds during the
16 breeding season, particularly the females who need a lot of
17 calcium to form eggs during the breeding season. So the
18 acidification had suppressed the abundance of a key food
19 resource, a calcium rich food resource. And the wood
20 thrushes were laying fewer and poor quality eggs, which can
21 contribute then to an overall population decline at least
22 within those sort of acidified forests in which some of the
23 wood thrushes found themselves. So what this is trying to
24 illustrate is it was a combination -- it wasn't until the
25 ornithologists looked at both fragmentation and soil

1 acidification that their understanding of what the pattern
2 really was in the landscape began to make sense.
3 Q Dr. Flaspohler, did Kennecott make any effort to assess the
4 cumulative impacts of the various ways in which it would
5 affect the environment on local wildlife habitat?
6 A Acidification? Could you repeat that?
7 Q Yes. Did Kennecott's environmental impact assessment offer
8 a cumulative impact analysis --
9 A No.
10 Q -- of how this mine would affect local wildlife?
11 A No; no.
12 MR. DYKEMA: Can you go to slide 16, please?
13 Well, let's back up to 15.
14 Q What is slide 15?
15 A This is kind of a low-resolution picture. But this is a
16 blue spotted salamander.
17 Q Are they present in the middle Upper Peninsula?
18 A Yes.
19 Q And is it likely that the area of the mine has salamanders?
20 A Yeah, it's very likely.
21 Q Why do you say that?
22 A Well, because these are pretty widespread in -- a widespread
23 species, not only this one but a couple of species of
24 salamander in the --
25 Q And do the Yellow Dog Plains in the area of the mine have

1 good salamander habitat?
2 A There are wetlands that these spotted salamanders needs to
3 breed and there's soils which is where they spend the rest
4 of their life or underneath logs. So I would expect all the
5 habitat components are probably there. Some of the very --
6 they can't breed in very high acid ponds. So they probably
7 are breeding not in certain types of wetlands but more
8 likely in vernal pools that are formed during the spring
9 melt.
10 Q And have you prepared a demonstrative to help you explain
11 how a cumulative an impact analysis would project likely
12 impacts on amphibians in the area of the mine?
13 A Yes.
14 MR. DYKEMA: Can you go to slide 16?
15 Q Dr. Flaspohler, how are the ways in which you anticipate the
16 operation of this mine will affect amphibians in the area of
17 the mine?
18 A Okay. So this is a similar graphic that shows -- for
19 amphibian habitats the considerations are slightly different
20 than birds. You still have physical structure including
21 plant soils and water. But water is a much bigger part of
22 the life cycle of most amphibians or at least the two main
23 pond breeding salamanders in this area. So water quantity
24 and water chemistry and then also soil chemistry to the
25 extent that it affects invertebrate abundance, some of the

1 main foods of these salamanders. So again if you are trying
2 to model potential effects of any land use change on
3 amphibians, these would be the kind of information you would
4 want to gather.
5 Q Now, the water quantity, were you here when Dr. Adamus
6 testified?
7 A Yes.
8 Q And it's your understanding that it is his opinion that
9 there's likely to be a substantial loss of water in area
10 wetlands?
11 A Yeah. That's my understanding.
12 Q And is that what you're alluding when you include water
13 quantity as of the, I'll say, stressors on area amphibians?
14 A Yes.
15 Q Okay.
16 MR. PREDKO: Just object. I don't think that Dr.
17 Adamus testified to that. I believe Dr. Adamus testified he
18 was not a hydrologist and he relied on others. You said a
19 substantial loss of water.
20 MR. DYKEMA: Thank you for the objection.
21 Q And soil chemistry, how is it possible that soil chemistry
22 will impact amphibians as a result of the operation of this
23 mine?
24 A Well, a lot of amphibians have a range of pH's in which they
25 can survive. And if it moves outside of that range either

1 there -- some characteristic, their life history could
2 change; reproductive success or survival or juvenile
3 survival or something like that could change. Also the
4 abundance of some of their main foods, invertebrates being
5 the main food of those two larger salamanders, if that were
6 to change because of soil chemistry, that would indirectly
7 affect salamanders.
8 Q And what's your point about the change with respect to
9 plants and the physical structure?
10 A Well, the plant community whether it's the terrestrial plant
11 community or the aquatic plants are going to affect the
12 physical structure, the amount of light that reaches the
13 water or the soil and consequently the temperature. So
14 changes in those kinds of characteristics are also going to
15 affect certain salamanders perhaps more than others. But
16 certainly those are characteristics that are a key part of
17 any salamander habitat -- understanding of salamander
18 habitat.
19 Q And are those points also largely true for other amphibians?
20 Frogs? Are they also very sensitive to water chemistry and
21 soil chemistry?
22 A Yes; yeah. Frogs and toads.
23 Q Did Kennecott's environment impact analysis -- assessment
24 make any effort to assess the likely impact of the mine on
25 salamanders?

1 A No.
2 Q Did it or any of its supporting documentation acknowledge
3 that salamanders are there?
4 A They did in the environmental -- in one of the studies that
5 was contracted by Kennecott. They did mention that
6 salamander surveys could have been done but they said they
7 could not find the habitat that suggested that salamanders
8 would be there. And so they didn't survey them. They
9 didn't look for them.
10 Q Does that make sense to you?
11 A It doesn't make sense. It's kind of puzzling, because there
12 are plenty of wetlands. They said they couldn't find any
13 vernal pools. But I can't imagine there aren't vernal pools
14 out there. There are vernal pools all over the Upper
15 Peninsula in the spring particularly in the more upland
16 forest area. I would expect to find some.
17 MR. DYKEMA: Next slide, please.
18 Q Dr. Adamus (sic), we're now looking at slide 17, which is a
19 picture of a golden winged warbler. Is that a species of
20 concern?
21 A That's a species that's very high conservation priority
22 lists both in the Great Lakes and eastern North America in
23 general.
24 Q Is it present in the mid Upper Peninsula?
25 A Uh-huh (affirmative).

1 MR. DYKEMA: And next slide, please.
2 Q And have you prepared a demonstrative, slide 18, in order to
3 help you explain the cumulative effects that you expect this
4 mine will have on bird habitat?
5 A Yeah. Yes, I have.
6 Q And what do you expect those impacts to be?
7 A Well, the wood thrush example I gave is one example from a
8 different system. If, say, soil acidification were to
9 happen, you could have similar effects on female birds
10 needing calcium in the spring and finding it more difficult
11 to acquire enough calcium through invertebrates within a
12 system. We've already talked about commensals and potential
13 predation and bird parasitism that could act in concert with
14 that.
15 Q Going back to the chemical dimension, can -- and thinking
16 not about soil acidification but the heavy metals, can
17 toxins biocumulate in birds?
18 A I'm sure they could, yeah.
19 Q And have toxins been shown to biocumulate in birds from
20 their consumption from plants and insects that hold toxins?
21 A Uh-huh (affirmative).
22 Q Okay. Please continue.
23 JUDGE PATTERSON: You have to say "yes" or "no."
24 MR. PREDKO: You have to verbalize the "yes."
25 JUDGE PATTERSON: You have to say "yes" or "no."

1 A Oh, yes; yes. Sorry.
2 Q Now, the physical -- the plant and the community changes you
3 mentioned already, the possibility to reduce densities from
4 noise and -- is that what you're talking about there?
5 A Yeah. In the 90-some acre mine facility site, certainly
6 there will be changes in the plant community. And then any
7 other resulting changes that could result. I wasn't
8 thinking so much of noise in that case, although you can
9 throw that into a physical change in the environment that
10 are going to affect birds. But also to the extent the plant
11 community might change because of changes in the soil
12 characteristics, that's going to also -- would change the
13 habitat structure. And that could have an effect on birds.
14 Q Is -- if acidification or heavy metal pollution results in a
15 loss of invertebrates or a change in the invertebrate
16 community, would that have an indirect effect on birds?
17 A Sure. That's their main food source during the breeding
18 season for almost every species out there, songbirds
19 certainly. there are predatory birds that are eating
20 mammals, amphibians and other birds. But most of them are
21 eating insects.
22 Q How big an effect does soil acidification have on bird
23 population?
24 A Well, in -- there are examples in Europe where birds have
25 disappeared -- certain species have disappeared from forests

1 where acidification has changed the soil characteristics
2 dramatically usually in those cases as a result of acid
3 rain.
4 MR. DYKEMA: Your Honor, would this be a good time
5 for a short break?
6 JUDGE PATTERSON: Okay.
7 (Off the record)
8 MR. DYKEMA: Your Honor, I think we have a forum.
9 JUDGE PATTERSON: Is everybody here?
10 Q Dr. Flaspohler, earlier I asked you about how you would go
11 about trying to identify the endangered, threatened or
12 special concern species that might be in the area. And you
13 referred to the Michigan National Inventory lists. I'd now
14 like to ask you some questions about how you would go about
15 conducting a survey to determine which of those species are
16 actually present in the area. What's the proper way to
17 conduct an endangered species survey?
18 A Well, it really depends on the organism or organisms you're
19 looking for. Often species that are listed as threatened,
20 rare or special concern are not common for obvious reasons.
21 By definition they're not common. So the considerations in
22 devising a survey or a sampling protocol are very different
23 than they would be for surveying common species. And they
24 would be species or taxon specific. For example, you
25 could -- if you're interested in the abundance of white

1 throated sparrows or yellow-rumped warbler, who very common
2 species in this landscape, all you have to do is walk
3 through the landscape along a transect the way they did and
4 count them. If you're interested in finding out whether a
5 rare land snail is in that same landscape or a rare
6 dragonfly, you can't expect to find them using that same
7 protocol. You have to look in the habitat where they're
8 likely to be found, and you often have to do more spatially
9 intensive survey, spatially focused surveys.
10 Q Did Kennecott conduct an endangered species survey on its
11 own property?
12 A Well, they say they did.
13 Q How much of their property did they actually survey for
14 endangered species?
15 A I think there's about 1600 acres that, I believe, they own.
16 And I would say 10 to 15 percent was actually sampled
17 through the bird, mammal and frog points and transects that
18 they had.
19 Q Did Kennecott in conducting -- and when I refer to
20 "Kennecott," I mean Kennecott or its contractors.
21 A Okay.
22 Q Am I right it wasn't Kennecott employees who conducted these
23 wildlife survey?
24 A No; no.
25 Q Okay. In this context when I refer to "Kennecott," I mean

1 Kennecott and its contractors.
2 A Okay.
3 Q In conducting their endangered species survey, did Kennecott
4 tailor the survey to the particular habitats of the
5 potential endangered species on the property?
6 A No. I would say that the surveys that they did were just
7 fine for documenting and characterizing the common species
8 within that landscape. But they weren't -- there was no
9 consideration or adjustment for looking for rare species
10 with the exception perhaps of, I think, the narrow leaf
11 gentian, some species they knew were there and so they
12 perhaps did some intensive surveys to locate the populations
13 of those species.
14 Q Someone had told them that the gentian was there?
15 A I believe so; I believe so.
16 Q Does the Michigan DNR have guidelines for conducting
17 endangered and threatened species surveys?
18 A Yes, they do.
19 Q And do those guidelines request that a survey include the
20 endangered, threatened and special concern species?
21 A Yes, they do.
22 Q Do the DNR guidelines require that the species be -- the
23 surveys be conducted using standard techniques designed to
24 ensure a high probability of locating the species?
25 A Yes.

1 Q Okay. Did Kennecott do that?
2 A No. With the exception -- perhaps if there had been a
3 Kirkland's warbler on their transects, they would have
4 picked that up. There's an endangered species for which
5 that sampling protocol might have been appropriate. But for
6 most of them the protocols that they used most threatened
7 and endangered and special concerns species -- the protocols
8 that they used would be very unlikely to pick up an
9 occurrence.
10 Q Do the DNR guidelines require that endangered, threatened
11 and special concern species surveys be done at appropriate
12 times during the year to adequately survey for all the
13 species?
14 A Yes.
15 Q Did Kennecott do that?
16 A Yes and no. Their surveys -- they had did it for a single
17 year in 2004, May, June and October. And so for, for
18 example, birds, which is a big focus of their survey, and to
19 some extent small mammals, those are appropriate times of
20 the year to sample them for common ones. There are some
21 groups which, if you were interested in sampling blue
22 spotted salamanders or other pond breeding salamanders,
23 about the only time you can reliably sample them is earlier
24 than May 20th, which was the earliest date that they were
25 out there sampling for amphibians and birds or anything. So

1 you have to really catch them in their migration to ponds
2 early in the spring, which happens in April or perhaps
3 early May.
4 Q Forgive me if you've already told me this. How many
5 sampling stations did Kennecott or its contractors use in
6 trying to identify amphibian?
7 A Three.
8 Q Is that adequate?
9 A Not in my opinion. And that was just for calling frogs and
10 toads. And they didn't do it at night like they should have
11 done it either. They did it in the day. So you said
12 amphibians. All they really focused on were frogs and
13 toads. So they weren't looking at all at salamanders. And
14 even the frog and toad surveys were very few points done at
15 dusk rather than at nighttime which is peak calling period.
16 So it'd be like going out and sampling birds in the
17 afternoon. A few things sing then, but most things -- the
18 peak singing is in the morning. And any bird scientist
19 knows that you can't sample songbirds in the afternoon.
20 MR. DYKEMA: Can I have slide 7?
21 Q Dr. Flaspohler, we're looking at slide 7 in the
22 demonstratives that you prepared. What's on this slide?
23 A This on the left column are a list of birds and mammals that
24 are listed as endangered, threatened or special concern in
25 the State of Michigan and also their federal listing status,

1 if they have one, on the right-hand column. So these are
2 mammals and birds that -- at least some of which could have
3 been detected using the methods and the survey methods that
4 they used for sampling birds and mammals. Some of these
5 species such as spruce grouse, they did find. Some of these
6 species you wouldn't really expect to find on a standard
7 variable circular plot that they used because they're not
8 very common. Some of them it would have been impossible to
9 find because -- such as the yellow rail, they're nocturnally
10 active and they sing at night. They don't sing in the day.
11 So if you really wanted to know whether yellow rails are out
12 there, you can't expect to detect them during the daytime.
13 Q Apart from whether Kennecott's survey was designed in such a
14 way as to successfully find these species, did they at least
15 purport to attempt to find these species?
16 A Can you rephase that?
17 Q Yes. Did Kennecott's threatened, endangered and special
18 concern survey attempt to determine whether the species on
19 this slide were present on the property?
20 A A couple of them, they did, in terms of they watched these
21 transects and they found loose skat and they looked to see
22 if they see if they saw any gray wolves while they were out
23 there, which you're not likely see even if they are there,
24 of course, because they're a sort of shy species. But they
25 didn't do any particular focused sort of well designed

1 studies that were focused on -- based on the attributes of
2 the species they were looking for.
3 MR. DYKEMA: The next slide.
4 Q We're now looking at slide number 8. What is this?
5 A These are also species that are listed in the State of
6 Michigan with some listing at the federal level or at least
7 some status at the federal level for some and not for
8 others. So this -- and these are all species that have
9 detections in the Michigan National Features Inventory
10 database in Marquette County or adjoining counties that
11 border on Marquette County.
12 Q Now, was that true of the preceding slide as well --
13 A That was -- yes.
14 Q -- where all those species are listed in Marquette or the
15 adjoining counties?
16 A Right.
17 Q So if you put these two slides together, slides 7 and 8,
18 would this represent the total universe of listed species
19 that you yourself would want to look for if you were
20 conducting a survey in there?
21 A Yea; that's right.
22 Q Because all of these are in the Michigan Natural Features
23 Inventory for Marquette and adjoining counties?
24 A Right.
25 Q Now, what's the difference between the species on slide 8

1 and the species on the preceding slide, slide 7?
2 A Well, in the preceding slide what I was -- one of the points
3 I was making is that they made some effort, if arguably
4 minimal, to try to detect those species. They made
5 absolutely no effort at all to try to establish whether this
6 group of species was present in the survey area or anywhere
7 else around the survey area.
8 Q How do you know that?
9 A Well, there's no mention of any reptile surveys in the
10 wildlife studies that were done. There's no mention of
11 invertebrate surveys. And there's no mention of any methods
12 that were used or considered to sample this group.
13 Q So with respect to the species listed on slide number 8,
14 Kennecott didn't even try?
15 A I'd say it's safe to say that, yeah.
16 Q If a student of yours was assigned a task of doing an
17 endangered, threatened or special concern species survey of
18 a 90-acre tract of land and they didn't even try to find
19 roughly half of the candidate species, what grade would you
20 give them?
21 A Well, I'd probably -- hopefully they would turn it in before
22 the end of the semester and I could just send them back to
23 redo it. But if they turned it in at the end, it would be a
24 very low grade. I don't know. C or a D. I think it was a
25 mis- -- sort of a misuse or a misunderstanding of the

1 Michigan Natural Features Inventory data. It doesn't
2 purport, as I said earlier, to be a comprehensive list of
3 everything that is there. It's a list of the few
4 observations that have been turned in for various locations
5 by professional and amateur biologists and that have gotten
6 around to being entered in the database.
7 Q In addition to their endangered, threatened and special
8 concern species survey, did Kennecott also do a general
9 wildlife survey?
10 A Well, they did the bird transects on which they put traps
11 for mammals. And they did the frog inventory. And as I
12 understand it, it was a wildlife survey from which they
13 gleaned a bit and called it an endangered species survey.
14 Q Forgive me if I've asked you this before. But did they --
15 did Kennecott's reports to the DEQ offer any explanation as
16 to why they didn't survey for amphibians?
17 A Well, they did survey for frogs and toads, even if it was
18 minimal. For salamanders they said that they couldn't find
19 any habitat -- specifically vernal pools that would suggest
20 that salamanders are there. So they didn't think they
21 needed to use the pitfall traps and drift fences which they
22 described as being the appropriate way to do it, which it
23 is. But they didn't do it.
24 Q I'd like to ask you some questions about what was or was not
25 included in Kennecott's environmental impact assessment.

1 And in referring to the assessment, I mean to refer also to
2 the supporting documents, the surveys that underlay that
3 assessment. Did the assessment make any effort to determine
4 the impact on wildlife of the dispersion of ore dust from
5 the site?
6 A No.
7 Q Did the assessment make any effort to determine whether
8 plants and invertebrates were biocumulate heavy metals?
9 A No.
10 Q Did they make -- did the assessment make any effort to
11 determine the effect of the interaction between the melting
12 of a heavy snow pack and the deposition of sulfur, nickel
13 and copper into the snow pack?
14 A No.
15 Q Did the assessment make any effort to determine what effect,
16 if any, would be had by a large spring pulse of acid, nickel
17 and copper into the Salmon Trout and Yellow Dog Rivers?
18 A No.
19 Q If there is, Dr. Flaspohler, a heavy pulse of copper and/or
20 nickel and/or sulfur in the spring into the Salmon Trout
21 River, where will that go?
22 A Well, it'll go into the river, and some of it will, I
23 suppose, settle onto the substrate of the river and some of
24 it will be absorbed by the organisms in that and some of it
25 will make it out into Lake Superior.

1 Q Generally speaking, are juvenile organisms more sensitive to
2 toxins than adults?
3 A Generally, yes.
4 Q In the spring when the Salmon Trout is in flood due to snow
5 melt, are there juvenile fish in the river?
6 A Sure; yes.
7 Q Does that include Coasters?
8 A Sure, there would be Coasters and many other species.
9 Q Did the environmental impact assessment make any effort
10 whatsoever to determine the potential impact of this mine on
11 Coasters, juveniles or adults?
12 A Not that I saw.
13 Q Did the environmental impact assessment make any effort to
14 determine the extent to which deposited copper and nickel
15 will be mobilized in sandy soils and move into the
16 groundwater?
17 A No, not that I've seen.
18 Q Did the environmental impact assessment make any effort to
19 calculate how much in the aggregate of copper, nickel and
20 sulphur will be deposited over the life of the mine on the
21 grounds and waters surrounding the mine site?
22 A Well, I've seen what the last witness had, and I didn't pay
23 as much attention to that in terms of digging into the
24 atmospheric portions of the application.
25 Q Let me put the question a different way. Did the

1 environmental impact assessment -- I realized I asked you
2 the wrong question. Did the environmental impact assessment
3 make any effort to determine the environmental impact of the
4 accumulation of sulphur and heavy metals --
5 A No.
6 Q -- in the lands and waters around the site over the life of
7 the mine?
8 A No.
9 Q Did the environmental impact assessment make any effort to
10 determine the effect of -- the cumulative effect of mine
11 operations on the diversity of the wildlife in the
12 surrounding areas?
13 A No. I would say "no" to that.
14 Q Coming back to the wildlife surveys conducted by Kennecott
15 and its contractors, over how long a period were those
16 surveys conducted?
17 A There were three visits, as I said, May, June and October.
18 I'm not sure if it said how many days they used to conduct
19 those surveys within those three survey periods. I would
20 imagine it was probably, given what I saw, maybe two or
21 three days per visit, perhaps one. You could do a lot of
22 that in one or two days.
23 Q Is it your understanding they were supposed to do a two-year
24 study?
25 A I've heard that. I'm not crystal clear on the necessity of

1 that. That would be more of a sort of an understanding of
2 the legal statutes on that.
3 Q Then let me bring the question into your home field which
4 is, as an ecologist, is it important, and if so, how
5 important is it to do more than a one-year survey to
6 identify wildlife that lives in a region?
7 A Well, you know, one of the things that's important and this
8 bears regularly on my job because I conduct research and
9 supervise graduate students that have to conduct research,
10 sometimes with minimal supervision. And with wildlife
11 species you often see -- you have annual variation that
12 needs to be taken into account. Often as good a study as
13 you can do, whether it's birds or amphibians or other
14 groups, if you try to publish that in the peer reviewed
15 literature with a single year's worth of data, it's very
16 difficult because everyone knows in that field that there's
17 annual variation. And so one year provides a snapshot,
18 glimpse of what's going on in a natural community, but it
19 doesn't give you any sense of the variation, year to year
20 annual variation which can be important. It can also be --
21 there can be species present one year and not present the
22 next year, so there's variation that way. So, for
23 example -- this is sort of a confession maybe, but I've had
24 many graduate students, and I've only had one that relied on
25 a single year's worth of data, and she's the only one who've

1 we've never been able to publish her results even though
2 we've tried at one place. We're still working on that. So
3 the take-home message there is that in ecology in general
4 and animal ecology in particular where you have mobility
5 among species from year to year, you really have to consider
6 annual variation as a big part of what's going on in any
7 community.
8 Q In this part of the state, the Central Upper Peninsula,
9 what's the single most common mammal?
10 A Most common mammal in the Upper Peninsula may be a deer
11 mouse. That's a guess. But, I mean, it would be something
12 small with a small home range that could be a --
13 Q What's the easiest kind of mammal to find?
14 A Easiest mammal to find? Probably a squirrel. They're
15 diurnal. They're conspicuous.
16 Q What's the commonest squirrel?
17 A The red squirrel in conifer dominated areas, which is a lot
18 of what the UP is.
19 Q Did the Kennecott wildlife survey find any red squirrels?
20 A Well, that was one of the sort of puzzling results. They
21 had a list of species, red back bull, deer mice, eastern
22 chipmunk, but they report not observing or hearing red
23 squirrels, but they report that they're likely to be in the
24 study area.
25 Q Is it odd that they didn't hear or see any red squirrels?

1 A It seems kind of odd to me given that they're just
2 ubiquitous in any kind of conifer forest of any kind.
3 Q Dr. Flaspohler, is this a demonstrative that you've prepared
4 to summarize the opinions that you have explained to the
5 court today?
6 A Yes.
7 Q The first opinion states:
8 "Several landscapes of continental significance
9 can be found within the potential affected area of the
10 mine including the United States Forest Service
11 McCormick Tract, the Huron Mountain Club, the Salmon
12 Trout and Yellow Dog Rivers." Have you explained your
13 bases for holding that opinion today?
14 A I think I have, yes.
15 Q The second opinion is,
16 "If implemented, the Kennecott Eagle Project
17 Mine will have a range of effects on the wildlife
18 and ecosystems that may extend for miles from the
19 mine footprint."
20 When you say "a range of effects," do you mean negative
21 effects?
22 A Yes.
23 Q Is it your opinion, Doctor, that the operation of this mine
24 is likely to impair or destroy wildlife in the area of the
25 mine and extending well beyond the property boundaries?

1 A Yes, that's my opinion.
2 Q Did Kennecott make any effort even to determine any
3 potential impacts on wildlife beyond the mine boundaries or
4 beyond property boundaries?
5 A No. I hesitate to say none at all, but very little, and
6 nothing that can -- nothing that comes to mind.
7 Q Your third opinion is that:
8 "Kennecott has largely ignored the potential
9 environmental impacts of the mine and, as envisioned,
10 the mine could do essentially permanent harm to aquatic
11 and terrestrial wildlife in the region."
12 Have you explained your bases for that opinion today?
13 A Have I? I think so, yes.
14 Q Does Kennecott's environmental impact assessment state or
15 assume or imply that there will be no wildlife effects from
16 this mine outside of Kennecott's own property?
17 A Yes. That seems to be sort of the tenor of the
18 environmental impact assessment.
19 Q Do you have any doubt that this mine will, in fact, have
20 detrimental effects on wildlife well beyond the boundaries
21 of the property?
22 A No, I have no doubt it will.
23 MR. DYKEMA: Your Honor, I would like to offer
24 Exhibit 127, Dr. Flaspohler's CV, which is in my
25 stipulation, the map that you showed which is Exhibit 32,

1 Dr. Flaspohler's article "Planning for Wilderness," which is
2 our Exhibit Number 29, and I would like also to offer the
3 demonstratives, again strictly for demonstrative purposes.
4 Although, if counsel will indulge me, I need to go through
5 them and pick out the ones we didn't use, so I'm not
6 offering anything you didn't actually talk about. And if
7 you want to wait until I've done that in order to respond to
8 that proffer, obviously that's fine.
9 MR. PREDKO: Yeah, why don't we wait? I don't
10 have, Judge, any objection to anything other than possibly
11 the demonstrative part. The other ones --
12 JUDGE PATTERSON: Okay. So 127, 32 and 29?
13 MR. DYKEMA: 29, and the demos will be marked as
14 143.
15 JUDGE PATTERSON: Mr. Manning?
16 MR. MANNING: No, no objection.
17 MR. DYKEMA: I tender the witness.
18 (Petitioner's Exhibits 632-29, 632-32 and 632-127
19 received)
20 MR. PREDKO: Good afternoon, Dr. Flaspohler.
21 THE WITNESS: Hello.
22 MR. PREDKO: My name is Chris Predko. I represent
23 Kennecott, and I think you know that. You've been here over
24 the last couple of days watching proceedings; correct?
25 THE WITNESS: Uh-huh; yeah.

BY MR. PREDKO:

Q You talked about Kennecott's wildlife and threatened and endangered species surveys.

A Uh-huh (affirmative).

Q And you discussed use of the Michigan Natural Features Inventory and you're aware that in doing its surveys, Kennecott used the MNFI data for Marquette County; correct?

A They used some data. I'm not clear what they got from Michigan Natural Features Inventory, if it was -- they did get county level data. You're right. They did get county level data.

Q And so they reviewed county level data --

A Right.

Q -- as well as site specific data; correct?

A Right; right.

Q And that's one of the things that you would do in doing a survey. You would take a look at the MNFI data; correct?

A Right.

Q And you spoke earlier about how the MNFI data is not necessarily rich; right?

A Right.

Q But there really is no other database -- comprehensive database out there to do these types of surveys, is there?

A No, there isn't.

1 Q Now, you talked about -- well, strike that. If a particular
2 species is rare, then the state or federal authorities will
3 determine that that species is threatened or endangered;
4 correct?
5 A Yeah. It's done at that state or federal level, sure.
6 Q Okay. And threatened or endangered species means that that
7 particular species is legally protected; right?
8 A Right.
9 Q Now, a species of special concern is something less than
10 that; correct?
11 A Right.
12 Q So a species of special concern is something less than rare;
13 correct?
14 A Not less than rare. Usually it's special concern 'cause it
15 is rare. It's just not rare enough to warrant threatened or
16 endangered status.
17 Q And species of special concern are not legally protected,
18 are they?
19 A Not under the endangered -- not under this sort of same
20 endangered species legislation. They can be protected if
21 they're, say, migratory songbirds which are protected by
22 International Migratory Bird Treaty. But that's a
23 separate -- that's a whole separate legal protection that
24 they get that has nothing to do with their rarity.
25 Q In general, though, species of special concern are not

1 legally protected; correct?
2 A There are many that are not; right.
3 Q Now, did you or anyone else on Petitioner's side that you
4 know of do their own threatened or endangered species survey
5 of the Kennecott site area?
6 A No, not that I know of.
7 Q And so you're not aware of any other species on that site
8 which is not already listed in Kennecott's survey's;
9 correct?
10 A That's correct; yeah.
11 Q Back to the threatened and endangered species survey, you
12 testified that you would also, if you were doing one, go to
13 the MNFI.
14 A Uh-huh (affirmative).
15 Q At least county level, take a look at those species, and I
16 imagine next you would determine what the habitats are for
17 those species that are listed; correct?
18 A Uh-huh (affirmative). That's a good --
19 JUDGE PATTERSON: "Yes" or "no"?
20 THE WITNESS: Yes; yes.
21 Q And Kennecott did that, didn't they?
22 A They looked at the habitats that were present on the --
23 within that ownership area. I don't know that they looked
24 at them in relation to the habitat needs of those listed
25 species. I never saw anything like that.

1 Q Well, I'm going to read to you a section. I'll find it
2 quickly. I'm going to read to you a section of the
3 Threatened and Endangered Species Report which is Appendix
4 F1 of the environmental impact assessment. And it's Section
5 2, paragraph 2.1.
6 "Records and information on threatened and
7 endangered species, species of concern and unique or
8 threatened plant communities within or near the project
9 area were obtained from MNFI. Specific target habitat
10 and species were identified based on information
11 received from MDNR and MNFI and literature reviews
12 conducted by Wetland Coastal Resources," who is
13 Kennecott's --
14 A Right.
15 Q So, now, do you have any reason to disagree with me that
16 that's what this says? I can show it to you if you like.
17 A No, I know what you're talking about there. So they had a
18 list of -- of listed species, and then they had a list of --
19 they inquired and looked for sources of information about
20 the habitat, habitats preferred by those lists species.
21 Many of those listed species are known to use habitats
22 present in the -- anyone can go into the Web site and find
23 that out present in the study area, butterflies for example
24 and some species of dragonflies. But, yet, there were no
25 surveys for those. I guess I see what you're saying, but

1 then the connection in terms of, like, well therefore the
2 survey should be designed for sampling those species which
3 are both rare and for which habitat for them is found within
4 the study area. That's what I would have expected to follow
5 from those two steps.
6 Q Well, you would agree with me, though, that that's what you
7 would do; you would determine target habitats for the
8 threatened and endangered species; correct?
9 A Right; yes.
10 Q And then you would look at those habitats to see if you were
11 able to locate any of species on the list; right?
12 A Yes.
13 Q And that's what Kennecott's consultant did, didn't they?
14 A No, they didn't. They did bird transects and mammal
15 transects and frog calling and toad calling surveys, and
16 they never looked for land snails. They never looked for
17 butterflies, and they never looked for dragonflies. There
18 was no mention of -- they're in -- there are some of those
19 species that are in the list they got from Michigan Natural
20 Features Inventory, but there's no mention of them in terms
21 of their effort, their survey methods.
22 Q Okay. You do know that they recorded all plant and animal
23 species that they saw as they were doing particular surveys;
24 correct?
25 A Right, they did.

1 Q And so if they saw any additional threatened or endangered
2 species that were on the list, those were recorded also.
3 That's what they say in here; right?
4 A Right; that's true.
5 Q Your point is, to be fair, that you think they should have
6 done specific surveys for each particular species?
7 A Right. It would have taken no more time than a bird survey
8 to do a survey for dragonflies or many of those other
9 groups.
10 Q Mr. Dykema asked you some questions which were as -- you
11 beat me to the punch there, but you said it was more of a
12 legal question about what the statute here requires, whether
13 it requires two years of information or something along
14 those lines; right?
15 A Right.
16 Q Okay. Now, you're aware that the MNFI information is based
17 on many years of historical data; correct?
18 A Yeah, if I could qualify that, I would, meaning you might
19 have a record from 1937 and then another record from 1987,
20 and those are the two visits that were made to that site.
21 So that doesn't mean you have 80 years' survey. That means
22 you have -- you know, so it does have many years of data in
23 it, but not from many years of repetitive surveys at the
24 same areas.
25 Q And the report indicates that they also did a literature

1 review; correct?
2 A Right.
3 Q And that would be more years of data; correct?
4 A They could have turned up more information that way, sure.
5 Q And the report that you read was in the original
6 environmental impact assessment; right?
7 A Yeah. I read the one that was in the application, volume 2.
8 And then there was one from that consultant and then another
9 one -- there was a threatened and endangered report, and
10 then there was a wildlife report.
11 Q Okay. And I have the EIA sitting in front of me, and we
12 were working to find it in the exhibits. And for the
13 record, it's Intervenor Exhibit Number 6. But the
14 threatened and endangered species assessment is dated
15 September 2005. Is that consistent with what you remember
16 reviewing?
17 A Yeah, I think so. The surveys were done in 2004, so --
18 Q Are you aware that Kennecott since doing these surveys has
19 subsequently done a threatened and endangered species and
20 wildlife survey in both 2006 and 2007?
21 A I don't think I've seen those.
22 Q You talked about the lack of a specific, I guess, study for
23 salamanders. And the way that you do that is how?
24 A Well, there's a couple different ways depending on the
25 salamander you're looking at. There are terrestrial

1 salamanders that breed on land and don't go into the water
2 like the red-backed salamander. And there you would -- you
3 either systematically turn over logs and look for them
4 there, or you put cover boards out, which is a piece of wood
5 that provides that moist environment that salamanders go
6 under, and then you go around sample those after a time.
7 For pond breeding salamanders that are mostly
8 fossorial or live most of their life underground, they come
9 out in the spring after the last snow melts, and they
10 migrate to ponds to breed. So in that case -- and this is
11 the methods that are mentioned in the study by the
12 contractor. You put fences, which can be just aluminum
13 flashing or plastic flashing, along, buried in the forest
14 floor. And at the end of one of those fences, you put a pan
15 under -- set flush with the surface so that that salamander
16 bumps into that. On its way to the pond, it migrates along
17 and falls into the trap, and then you collect them there and
18 count them or identify them.
19 Q And that's what the Kennecott's consultant called using
20 fencing and pit traps?
21 A Yeah.
22 Q And your understanding in reading this is that they did not
23 do that because there were not vernal ponds on the site.
24 That's what you said; correct?
25 A They said they couldn't find any; yeah.

1 Q Now, have you seen vernal ponds on the site?
2 A I haven't been there in that period in the spring when
3 they'd be present; right. So I've not seen them, no.
4 Q I'm going to put up here, Dr. Flaspohler -- this is actually
5 a portion of the witness list that we received from counsel
6 in this case. And the reason I am asking you about this is
7 because I've read it and it appears to me that it is written
8 in the first person.
9 A Uh-huh (affirmative).
10 Q Did you draft that description?
11 A The whole page here? Is that what you're asking?
12 Q From "If implemented, Kennecott Eagle Mine," that. And I
13 see some similarities between the statements that are made
14 here and the statements that were made in one of the
15 demonstratives. In fact, I think some of the stuff that's
16 in there is verbatim.
17 A Yeah, this looks like mine. This looks like -- this looks
18 like my writing, yeah.
19 Q Okay. And does that represent your opinion regarding the
20 mine in this case?
21 MR. DYKEMA: I'll object to that. It represents
22 our compliance with the requirements of a recitation. I
23 think his opinions have been stated here.
24 MR. PREDKO: Well, okay.
25 Q Dr. Flaspohler, you drafted that; correct?

1 A Yes.
2 Q And do you agree with all of those statements that are made
3 there?
4 MR. DYKEMA: I would suggest, to be fair, you
5 should give I'm a minute to review it.
6 MR. PREDKO: Sure.
7 MR. DYKEMA: Are you asking him for the whole
8 page?
9 A I'll just have a look.
10 (Witness reviews document)
11 A Yeah, I would agree with that.
12 Q I want to ask you about certain portions of this *3:26:59 to
13 3:27:16* audio is missing** and mitigatible with available
14 technology." You're talking about effects of the mine?
15 A Uh-huh (affirmative).
16 Q Now, what effect are you talking about that are predictable,
17 spatially restricted and mitigatible?
18 A Well, I would say there's a variety of things that could be
19 mitigated to some extent. Certainly the light environment,
20 there's things you can do to reduce the amount of lighting
21 that might affect wildlife, the noise environment as well,
22 the air pollution environment based on whether it's from
23 generators or things like that. Those are all -- have
24 effects, and those effects can be mitigated partially or
25 perhaps almost completely. Those are the kind of things I

1 was thinking of in that case.
2 Q And the next sentence you say, "Other effects cannot be
3 wholly anticipated and may extend for miles from the mine
4 footprint." Now, what kinds of other effects that are --
5 cannot be anticipated?
6 A Well, those are thing such as, you know, we've seen debate
7 about the atmospheric modeling of dust, so clearly that
8 can't be perfectly predicted. The effect of that dust on
9 acidification of waters and soils also depends on
10 characteristics of the soils that haven't really been looked
11 at carefully, in my opinion. So that's what I mean by you
12 can't wholly anticipate exactly what's going to follow.
13 Some of the anticipated effects, those are the kind of
14 things I'm talking about.
15 Q Okay. And we had talked about -- well, I had talked about
16 when making objections the fact that I don't believe that
17 you're an ecotoxicologist.
18 A No.
19 Q And you're not; right?
20 A I am not.
21 Q Okay. And so you don't profess to have an expert opinion on
22 the certain concentrations of toxins or metals that may be
23 emitted from this plant and how they may affect anything in
24 the environment, do you?
25 A No, not at sort of the concentration level. That's not

1 where I have much authority.
2 Q And you know that concentration level is very important with
3 respect to determining how chemicals of metals affect
4 species; right?
5 A Sure; yes.
6 Q And so you would be relying wholly on somebody else's
7 opinion with respect to the effect of concentrations of
8 chemicals on species; right?
9 A Well, I would be relying on the opinions of people who are
10 authorities in those areas.
11 Q Toxicologist.
12 A Or atmospheric deposition modelers, whoever; whoever has
13 authority over the effect of concern.
14 Q And that was the next area that I was going to go into, that
15 you don't have any specialization in the deposition analysis
16 or dispersion analysis of particulates coming out of, for
17 instance, an exhaust stack on a mine, do you?
18 A No.
19 Q Okay. And so you would be relying entirely upon the
20 testimony of Sube Vel who testified earlier in this case;
21 correct?
22 A Well, I think it's been acknowledged by the -- by Kennecott
23 that some dust will be produced, so it's not entirely that
24 dust will be produced -- I'm not relying entirely on him,
25 but in terms of the modeling, yes. In terms of actually

1 trying to quantify it, yes.
2 Q So in terms of trying to quantify how much and how far those
3 particulates go, you would be relying wholly on Mr. Vel?
4 A For the Kennecott project, but for other studies looking at
5 the effects of dust from roads or other human activities on
6 wildlife, I can rely on those as well.
7 Q Well, I'm talking about the Kennecott project.
8 A Right; okay.
9 Q In this case in determining the concentration levels of
10 particulates and how far they go from the site, you rely
11 entirely upon Mr. Vel, don't you?
12 A Well, as I said, 95 percent. In terms of actually
13 predicting whether dust is going to move off a site, I think
14 common sense -- or off a road when a truck passes by, common
15 sense would tell you it is. Now, how far it's going to go
16 and the concentrations, I acknowledge I wouldn't have the
17 foggiest idea how to predict those things.
18 Q And were you here during Mr. Vel's testimony this morning
19 when he acknowledged that he over estimated particulates
20 coming out of the stack by at least a third?
21 MR. DYKEMA: Objection. I think that grossly
22 mischaracterizes what happened this morning. I would
23 suggest you put it as a hypothetical which won't be
24 offensive to anybody.
25 MR. PREDKO: Well, I think that's exactly what he

1 testified to. And I think Mr. Kohl gave him time to make
2 those calculations. We took a break to see if he was sure,
3 and he acknowledged that he did over estimate the
4 particulates being emitted from the stack by a third.
5 MR. DYKEMA: I strenuously object to that
6 characterization of the testimony.
7 Q Were you here when he said that?
8 A I wasn't.
9 Q Now, you talked a little bit about this article,
10 Petitioner's Number 29, that you wrote regarding the Huron
11 Mountain Club and Aldo Leopold; correct?
12 A Right.
13 Q And in writing this article, you studied Aldo Leopold's
14 recommendation to the club, that 1938 recommendation that he
15 made to the club; right?
16 A Yes.
17 Q Now, in his report to the club Leopold talks about how the
18 area has been historically logged, doesn't he?
19 A Yes.
20 Q And he uses the term "slashed" in his report.
21 A Not parts of the core of the club, but areas on the margins
22 of the club were logged, sure.
23 Q Sure. And he makes recommendations to have the reserve area
24 in the middle -- correct? --
25 A Right.

1 Q -- of the club, and then he makes recommendations to have a
2 buffer area on the outside edges; correct?
3 A Yes.
4 Q And he even talks about in those buffer edges that it would
5 be appropriate and a good thing to do to selectively log
6 those buffer areas; correct?
7 A Yes; yeah. He does.
8 Q And he talks about the club expanding into new areas,
9 essentially to expand the buffer area, for the club to buy
10 up more land; correct?
11 A For either the buffer area or preserve area.
12 Q While we're waiting for the exhibit, do you recall a portion
13 of that report where he talks about expanding to the
14 headwaters of the Cedar Creek would be a good idea?
15 A I can't remember that reference to Cedar Creek. No, I don't
16 remember that specifically.
17 Q And, Dr. Flaspohler, have you ever seen the original report?
18 A Yes, I have.
19 Q Okay. So you're familiar with it?
20 A Yeah.
21 Q Turn to page 9, please, all the way at the bottom. Now,
22 there he's talking about extension.
23 A Uh-huh (affirmative).
24 Q And at the very bottom he says, "The addition of the entire
25 watershed of the Cedar Creek would be still better." Okay?

1 A Okay. And if we turn to page 10, but with respect to the
2 headwaters of the Salmon Trout area, he had a very different
3 opinion, didn't he?
4 A Well, I think the headwaters of the Salmon Trout had
5 recently been cut over at that time in the 30's.
6 Q Right. And that's what he says there, is that:
7 "The addition of the entire watershed of the
8 Salmon Trout River is out, for its headwaters have
9 already been slashed to such an extent as to destroy
10 its value as a natural area for scientific study."
11 That was his opinion; right?
12 A Yeah, but can I respond to that?
13 Q Well, I asked you a -- I think you did. I said -- it's a
14 "yes" or "no" question, sir.
15 A Okay. Yeah, that is what it says there, yes.
16 Q okay. And that was his opinion at that time; right?
17 A Yes.
18 Q Now, you understand that that area, the headwaters of the
19 Salmon Trout, that's in or around the area where this
20 proposed mine is going to be; correct?
21 A Yes.
22 Q And you understand that that area, including all up and down
23 the Yellow Dog Plains, has been historically used for timber
24 purposes and harvested for timber since that time?
25 A Yes, that's true.

1 Q Have you been out to the site?
2 A I have, yes.
3 Q When was the last time?
4 A It was just this last winter, March.
5 Q Now, you understand that the area of the site is fairly
6 heavily used by humans already; right?
7 A Well, it depends how you define "heavily used."
8 Q Well, here, I'll ask you some specific questions.
9 A Okay.
10 Q You have deer hunters in the fall; right?
11 A A few.
12 Q Bear hunters in the fall?
13 A Perhaps. I don't know.
14 Q You've got some coyote hunters, fur trappers?
15 A Well, by that definition, the entire UP is heavily used
16 because --
17 Q Well, I'm not done with the --
18 A Right? 'Cause they're -- okay.
19 Q I'm not done with the list here, sir.
20 A Okay.
21 Q Okay? I'm just asking you are they specific --
22 A I'm sure those things go on out there.
23 Q Okay. Logging certainly goes on out there, doesn't it?
24 A Oh, yeah.
25 Q Small game hunters; correct?

1 A Sure.
2 Q Trout fishermen; correct?
3 A Yes.
4 Q In the wintertime you've got snowmobilers; right?
5 A Sure; yes.
6 Q That road that runs through the site area, AAA Road, now
7 that's a heavily used thoroughfare that the locals use.
8 It's a well-known shortcut between the County of Baraga and
9 Marquette, isn't it?
10 A It's not well known to me. That's a dirt road that I would
11 never drive on going from Baraga to -- if I had a
12 four-wheeler and I had a lot of time I might take it, but I
13 wouldn't take a normal --
14 Q Are you a local, sir?
15 A I live in Hancock.
16 Q Are you a local to Baraga County?
17 A Not to Baraga County, no, but I go to Marquette frequently.
18 Q Any reason to disagree that the locals know that as a
19 shortcut between Baraga and Marquette and use it frequently?
20 A No, I have no reason to disagree with that.
21 Q You've got four-season recreationalists out there; right?
22 A I imagine.
23 Q And people, as you said, with four-wheelers; correct?
24 Blueberry pickers; right? We've heard testimony in this
25 case about that.

1 A Sure. I bet there are.
2 Q Okay. I'm just going to show you a few pictures of the site
3 area.
4 MR. PREDKO: And for the record, this is
5 Intervenor Exhibit 12 Bates stamped 109 to 105. If we
6 could, zoom in on the picture there.
7 Q Now, is that consistent with what you remember the site to
8 look like?
9 A Uh-huh (affirmative).
10 JUDGE PATTERSON: "Yes" or "no"?
11 THE WITNESS: Yes. Sorry.
12 Q It's a heavily logged area in the forefront; correct?
13 A Yes.
14 Q And in the rear there's a -- it looks like a small stand of
15 conifers?
16 A Yes.
17 Q And there another picture again in the forefront heavily
18 logged area and conifers in the background; correct?
19 A Yes.
20 Q Is that your understanding of the condition of the site
21 where the mine is to be located?
22 A The orebody or the entire area from the facility to the
23 orebody?
24 Q Surface facilities.
25 A I'm not absolutely sure where the surface facilities will be

1 located within that 1600-acre ownership. I mean, I know
2 where they are within it, but I don't know exactly what
3 the -- that patch of landscape looks like that and I need
4 two acres or whatever. It could look like this 'cause
5 there's --
6 Q I'll put up on the screen here -- this is one of the wetland
7 delineation maps that is attached to the EIA, and it's
8 figure 3.4 in the wetland delineation. Now, do you have an
9 understanding, Dr. Flaspohler, of -- and this is an aerial
10 view, of where the mine is to be located? Now, this is not
11 a trick or a test here. There (indicating) is the outcrop,
12 and there is the orebody.
13 A And is the facility to go right there?
14 Q Yeah, the facility is to go right in this area here.
15 A Okay.
16 Q Okay? And from an aerial view, again, you can see that
17 north of the outcrop near this two-track here in this area,
18 that's another recently logged area.
19 A So it probably looks like the photo that you just showed me.
20 I wouldn't doubt that if that's what you're trying to
21 establish.
22 Q Okay. And then on the edge here you see a small stand of
23 what I believe are the conifers that we saw in the other
24 pictures. Any reason to doubt that?
25 A No.

1 Q Now, one of the things that you talked about or you said may
2 happen with the addition of the mine is fragmentation.
3 A Habitat fragmentation?
4 Q Yes.
5 A Yes. Well, let me correct that. I think primarily when I
6 was mentioning fragmentation it was in the context of
7 talking about cumulative effects in the example of the wood
8 thrush.
9 Q Okay. I thought you had mentioned it earlier.
10 A I don't believe I did. Fragmentation -- forest
11 fragmentation is already obviously a big part of this
12 landscape that we see right here at least.
13 Q And that was my point, is that this area -- now, what we've
14 put on the screen is Intervenor 386 which is an aerial
15 photograph of the Yellow Dog Plains. Do you recognize that
16 as being the Yellow Dog Plains as you know it?
17 A Yes.
18 Q And the Yellow Dog Plains to me kind of looks like a
19 patchwork quilt. Does it look like that to you?
20 A Yeah, I can see that.
21 Q I mean, is that kind of the textbook picture of a fragmented
22 area?
23 A That would be a -- it would be a great example of a
24 fragmented area within a contiguous forest. The contrast
25 there is great.

1 Q And fragmented obviously by logging and other human
2 activities. And you can see several miles of roads within
3 the area too; correct?
4 A Correct; yes.
5 Q Okay. All creating these different habitat edges that you
6 had already talked about; right?
7 A Right; yes.
8 Q And, in fact, those other -- the pictures that we had up
9 there where we showed the heavily -- the recently forested
10 site or harvested site and then the stands next to it, that
11 would be a classic picture of an edge; right?
12 A Yeah, it would.
13 Q Now, you talked about the cowbird being a human commensal?
14 A Commensal.
15 Q Commensal (pronouncing). And cowbirds, as I understand it,
16 also are attracted to these edge habitats; correct?
17 A Well, they're attracted to habitats with lots of openings in
18 them.
19 Q Okay. And apparently there are lots of openings on the
20 Yellow Dog Plains; right?
21 A Right.
22 Q Would it surprise you to find cowbirds already on the Yellow
23 Dog Plains?
24 A No, it wouldn't surprise me.
25 Q Now, would you agree with me -- would you agree with the

1 statement that there are no generally accepted set of
2 principals that describe how edges and fragmentation affect
3 birds?
4 A No, I wouldn't agree with that.
5 Q You wouldn't agree with that?
6 A Well, say it again.
7 Q There are no generally accepted set of principals that
8 describe how edges and fragmentations affect birds.
9 A Well, if that's in the context of birds -- different bird
10 species responding differently in different landscapes and
11 different ecosystems to edges, if that statement is meant to
12 suggest that all birds respond the same to edges that are
13 created, then I would say that's probably an accurate
14 statement because, in truth, different birds respond
15 differently to the same habitat edge and an edge in a
16 tropical rain forest is different than an edge in a jack
17 pine forest in the Upper Peninsula, and birds are not going
18 to respond all the same to that physical feature. I'm not
19 sure what the context of this sentence was
20 Q Well, and I'm reading a little bit of Flaspohler here. This
21 is "The Effects of Forest Edges and Fragmentation on Birds,
22 a Wisconsin perspective." That's a paper that you wrote.
23 A That's from the passenger pigeon? That was probably in the
24 late --
25 Q Yes; that's correct.

1 A -- 80's or early 90's or -- maybe it was mid 90's.
2 Q I thought it was dated 2001.
3 A Maybe it was that late.
4 Q And you say, "Our understanding of how landscape patterns
5 affect natural communities has increased dramatically in the
6 last 20 years. Still, there remains no widely accepted set
7 of principals that decisions how edged and fragmentation
8 affect birds."
9 MR. DYKEMA: Your Honor, I take if he's going to
10 question him about a paper that he wrote many years ago,
11 it's only fair that he have a copy of it.
12 MR. PREDKO: I don't have any problem with --
13 A The context there, what that sentence is saying, it starts
14 out talking about landscapes. And what it's saying is that
15 the landscape context has a lot to do with whether -- with
16 how edges behave or how the physical feature of an edge
17 affects species living near that edge. So, for example, an
18 edge in Kalamazoo County where the landscape is dominated by
19 agriculture and forests are represented by small wood lots
20 is different than an edge in the Ottawa National Forest or
21 the Hiawatha National Forest where the landscape is
22 dominated by forest cover and edges are sort of the
23 exception rather than the rule as they are in Southern
24 Michigan. So it's a -- it's a question of sort of, so
25 there's no generally accepted principal that operates in all

1 landscapes.
2 Q And certainly no generally accepted principal that operates
3 with all species of birds either; correct?
4 A No, that's true.
5 Q Different species of birds respond differently to edges.
6 A Definitely.
7 Q As different species of birds respond differently to human
8 presence; correct?
9 A True; yes; yes.
10 Q Taking a look again at this Figure 3.4 as part of the
11 wetland delineation there, now, your understanding, as we
12 discussed, is that the mine was generally going to be in
13 this area; correct?
14 A Yes.
15 Q And I'm pointing with the laser pointer at an area just
16 north of the outcrop.
17 A Uh-huh (affirmative).
18 Q And your understanding is, is that the mine will use the
19 existing AAA Road as the haul road; correct?
20 A Yes.
21 Q They're not going to be making any new roads as you know it;
22 right?
23 A As far as I know, no.
24 Q Now, it's clear that there are already edges here in the
25 area where the mine is going to go; correct?

1 A Yes.
2 Q And so really the mine is not going to create much of a new
3 edge or fragmentation in the area; correct?
4 A Yeah, I would say that's true.
5 Q Now, with respect to -- and we'll keep with the species that
6 you know best, with birds. With respect to birds, if a mine
7 is built, won't just -- won't most birds who are adverse to
8 the mine just go to a different area?
9 A Some will do that. Where there's territory, space
10 available. I mean, when you walk through these forests in
11 the summer, you hear, say, yellow rumped warbler singing
12 just about everywhere you go. You will never be out of
13 earshot of them. So for the yellow rumped warblers that are
14 displaced by the mine, they have to deal with perhaps a
15 saturated habitat -- a habitat saturated by territories of
16 other yellow rumped warblers. This isn't always going to be
17 true. There is space for some species to move out of that
18 area, and they do that typically when a forestry operation
19 comes into, say, a mature jack pine or jack pine burns, as
20 it does regularly. Species will move out of that area until
21 it returns to the state that they prefer.
22 Q Okay. So it's very likely then for that area that's already
23 harvested where the mine is going to go that any species of
24 birds that were using that area have already moved; right?
25 A Birds that were using the standing forest -- there are

1 species that use it as sort of bombed out as it looked in
2 that picture there -- still species of birds that use that
3 kind of habitat and they will have to find other habitat.
4 I'm not saying they couldn't find it, but it's not as though
5 it's empty of wildlife.
6 Q And certainly in the area here you see several other large
7 areas that appear to be recently harvested; correct?
8 A Right.
9 Q And so if they like that type of area, there are several
10 places to go; correct?
11 A Yes.
12 Q And you've done some studies and you made reference to them
13 about nesting success and birds in areas that -- I believe
14 that were recently harvested; is that right?
15 A I've done some studies in areas that were recently
16 harvested, but the -- most of the work on nest success was
17 done in unharvested forests that were adjacent to recently
18 harvested forests. So we didn't actually look for bird
19 nests in the clear-cuts, for example; we looked for them --
20 we talked about that edge -- in the forest that had not been
21 cut.
22 Q Okay. And you compared nesting success on the edge to
23 nesting success in the interior of the forest; correct?
24 A Yeah, exactly; yes.
25 Q And in one of the studies that I read that's entitled,

1 "Species Specific Edge Effects on Nest Success and Breeding
2 Bird Density in a Forested Landscape," you looked at eight
3 different species and six out of the eight there was no
4 effect on nesting success; correct?
5 A True.
6 Q Okay. And the two where there was an effect was the Hermit
7 Thrush and the Oven Bird; right?
8 A Right.
9 Q And then in subsequent study you specifically took a look at
10 the Oven Bird?
11 A Right.
12 Q And there are Oven Birds that are in and around the site
13 area?
14 A Right.
15 Q And the Oven Bird actually adapts to its -- the new habitat,
16 the edge habitat; correct?
17 A How do you mean "adapts"?
18 Q Well, you found -- and tell me if I'm saying it the wrong
19 way because I just might. You found that although Oven
20 Birds near forest edges faced a higher predation pressure --
21 pressure from predators -- they laid more eggs on average
22 than birds in the forest interior; right?
23 A That's true, yes.
24 Q And so this phenomenon that -- I'm not sure that you were
25 able to fully explain or understand -- nor I'm not sure

1 anyone could -- appears to say that Oven Birds when put on
2 edge habitat would compensate for being there and their
3 clutch size or the number of eggs they lay would be more;
4 right?
5 A That's one explanation. An alternative explanation would be
6 that they're attracted to edges -- forest edges for some
7 reason that we don't really understand. It might be greater
8 abundance of insects or something like that. They do lay
9 more eggs and that might related to that resource, but they
10 get hammered by predators when they nest there. So they
11 don't lay enough eggs to compensate for the increased nest
12 failure as a result of nest predators finding their nests
13 and destroying them. So I wouldn't call it adaptation as
14 much as that kind of thing is sometimes called an ecological
15 trap where species are drawn to an area for whatever reason
16 that is not adaptive; it's not a good place to go, but yet
17 they go there. It's like moths flying to a light; it's --
18 and then they die because they're eaten by bats because
19 they're concentrated or something like that. So ecologists
20 call that an ecological trap and that's how we -- one of
21 the -- one of the ways we describe what was going on with
22 the Oven Birds in that system.
23 Q Okay. But the point is, is that all species don't behave
24 the same with respect to edges created by man; right?
25 A Well, that's true, yes.

1 Q Were you here, Dr. Flaspohler, for all of Dr. Adamus's
2 testimony?
3 A I think I heard all of it, yes.
4 Q Okay. And so you heard him say that the wetland areas that
5 are up on the screen here in Exhibit 3.4 there in and around
6 the site area are not threatened or endangered or rare areas
7 either in the state or globally. Did you hear him testify
8 to that?
9 A The blue area here; the large blue area in the middle?
10 Q All of them that are on the site here. We went through all
11 of the various areas and you understand that the features
12 inventory just as they rate plants and animals --
13 A They rate habitats.
14 Q -- they rate habitat too; right?
15 A Right.
16 Q And Dr. Adamus testified that none of the wetland areas are
17 rare types of habitat either statewide or globally; right?
18 MR. DYKEMA: I object to the mischaracterization
19 of his testimony. He specifically testified that one of
20 these wetlands was classified by the Michigan Natural
21 Features Inventory as "extremely rare." So I object to a
22 misleading question.
23 MR. PREDKO: I certainly don't recall that
24 testimony and the record will speak for -- I'm asking the
25 witness what --

1 Q Well, what do you remember, Dr. Flaspohler?
2 A I don't actually remember what -- in that discussion that
3 was an entire day of testimony and I -- or a half a day, I
4 guess it was. I wouldn't doubt that some of the wetlands in
5 that area are not particularly rare statewide. I can't say
6 that there aren't some that may be rare. I don't recall.
7 Q Okay. Well, that leads me to my -- the question for you.
8 How about harvested jack pine stands; is that a habitat
9 that's rated as rare in Michigan?
10 A No; no, it is not.
11 Q How about jack pine stands in general; is that a habitat
12 that's rated as rare?
13 A No.
14 Q Now, this -- again, the area where the surface facilities
15 will be at the mine site -- and I'm pointing to it on
16 Exhibit -- on the wetland delineation aerial map. Now, are
17 you aware of any threatened or endangered species that are
18 habitating there, that are living there in that area?
19 A I'm not aware of any; no.
20 Q You talked a little bit about the Kirtland's Warbler; right?
21 A Uh-huh (affirmative).
22 Q And you said that you were aware that a Kirtland's Warbler
23 was seen at some point in time a couple miles away from the
24 site?
25 A I honestly don't know where the site was. I saw a picture

of it; a couple people have told me that they saw one I think two years ago -- it might have been two or three years ago. But I don't -- I never saw a map of or even a described location of where that male was.

Q Okay. And it was -- to be clear, it was a male that was seen; it was not a breeding pair; right?

A I can't say for sure, but I'm -- that's my recollection was that there was just a male seen.

Q And you know that the Kirtland's Warbler, its preferred habitat is larger homogeneous stands of young jack pine trees; right?

A That's right.

Q Okay. And it prefers, as I understand, the jack pine stands of 80 acres or more that are anywhere from eight to twenty years old in age?

A That sounds right, yes.

Q Okay. And those trees range from about seven foot high to 18 feet high and then once the tree gets any taller than that they don't nest there anymore; correct?

A Right; that's true.

Q Okay. Now, in the area of the mine site here there certainly is not any 80-acre homogeneous stand of jack pine, is there?

A I haven't surveyed that whole -- well, the mine -- the actual facility site?

1 Q Facility site.
2 A No.
3 Q And you're aware that there are several areas of jack pine
4 that are being specifically managed in the Upper Peninsula
5 for Kirtland Warbler habitat; right?
6 A Yeah, I think there are some like that; yes.
7 Q Okay. And those would be the homogeneous stands of 80 acres
8 or more that the Kirtland Warbler prefers; right?
9 A I would expect that's how they're managing them, yes.
10 Q Now, you said that you reviewed the bird survey that was in
11 the Environmental Impact Assessment; right?
12 A Uh-huh; yes.
13 Q And there was no mention of a sighting of a Kirtland's
14 Warbler in that survey; right?
15 A No, there was not.
16 Q Okay. And you said you haven't had a chance to review
17 Kennecott's subsequent surveys; right?
18 A No; I didn't even know they existed.
19 Q Are you aware that petitioners did their own bird survey of
20 the Yellow Dog Plains area?
21 A I know a number of people that have sampled birds out there.
22 Q Did you know someone by the name of Skye Haas?
23 A I know him indirectly as avid birder in the UP.
24 Q Have you had an opportunity to look at the bird survey that
25 was conducted in 2004, the Yellow Dog Plains and was

1 submitted as an exhibit this case?
2 A I did look at that. It was probably a month ago. I didn't
3 look at it particularly closely. Yeah, but I have seen it.
4 Q Do you recall seeing any Kirtland's Warblers on that --
5 A No. I would have remembered that.
6 Q We talked about your area of expertise is conservation
7 biology and wildlife ecology; correct?
8 A Yes.
9 Q Okay. And again, you don't have expertise in toxicology or
10 ecotoxicology; correct?
11 A No.
12 Q No expertise in air deposition of particulates; right?
13 A Correct.
14 Q No particular expertise in wetlands; correct?
15 A Nothing exceptional; just as much as I've needed to know as
16 a wildlife ecologist.
17 Q Okay. You're not a wetland scientist?
18 A No, I'm not.
19 Q And I assume that you're not a hydrologist either?
20 A No.
21 Q And we said today that you are not a fish or aquatic
22 biologist; correct?
23 A Correct.
24 Q Now, you spent a lot of time talking about the cumulative
25 affects of stressors on wildlife; right?

1 A Right.
2 Q Now, would you agree with me that this area of evaluating
3 cumulative effects of stressors on wildlife is a fairly
4 novel and new area to ecology?
5 A I would agree with that, yes.
6 Q Okay. Would you also agree with me that there is no
7 generally accepted scientific method to ascertain the
8 cumulative effects of stressors on wildlife?
9 A I wouldn't agree with that as a blanket statement. There
10 are methods people have employed for looking at multiple
11 effects on amphibians, development of amphibian eggs with
12 looking at ultraviolet in addition to toxins and sort of
13 mixing combinations. I would say there isn't like some
14 universally generally accepted method that works for --
15 certainly not all taxa and even within a taxa it's a
16 developing field.
17 Q And certainly there's no generally accepted method that can
18 be used in all regions either; correct?
19 A That would be true I would --
20 Q Because the stressors in the region --
21 A Are going to be different.
22 Q -- are going to be --
23 A The species will be different, sure.
24 Q Now, in -- as I understand it in reading Petitioner's
25 Exhibit 104 --

1 (Pause in dialogue)
2 MR. PREDKO: I really like using hard copy
3 exhibits, your Honor.
4 Q This is what was submitted as Petitioner's proposed Exhibit
5 104. It's an article "Assessing Risks to Wildlife
6 Populations from Multiple Stressors, Overview of the Problem
7 and Research Needs." And it appears to me it's a 2006
8 article, so it's fairly recent. Have you read that article?
9 A Yes, I have.
10 Q Okay. Is this an article that is an article that you
11 submitted to support your testimony in the case?
12 A Yes, I did.
13 Q Okay. And this article leads me to believe that this is --
14 the methods for assessing risks to wildlife populations from
15 multiple stressors is still a work in progress?
16 A Yeah, I would agree with that.
17 Q Now, would you agree with me that there are definite
18 standards that toxicologists apply to determine what levels
19 of chemicals or metals have on certain species?
20 A Yes.
21 Q Would you agree with me that there have been tests done by
22 other scientists with respect to the effect of water
23 drawndown or dehydration on species?
24 A I'm sure there have; that's not a big area of my research,
25 but I'm sure that's been examined by wetland scientists.

1 Q Okay. And given that this -- the -- strike that. When
2 Kennecott was putting together its Environmental Impact
3 Assessment you agree it's a good idea for Kennecott to
4 assess the site of the mine, don't you?
5 A The facility, surface facility, or the broader?
6 Q Well, the surface facility and the area around it.
7 A Sure; that's a good idea.
8 Q Okay. And they should take a look at the wetlands that are
9 there; right?
10 A Yes.
11 Q And do surveys for threatened and endangered species; right?
12 A Yes.
13 Q Okay. And you'd agree that it'd be a good idea to get the
14 wildlife biologists involved to talk about their specialty;
15 right?
16 A To assist in the sampling and designing of that; is that
17 what you're saying?
18 Q Yeah, to determine the environmental impacts?
19 A Sure.
20 Q Okay. And you'd want to get the wetland scientists involved
21 in the process; right?
22 A Yes.
23 Q The botanists to talk about the plants; right?
24 A Yes.
25 Q Toxicologists?

1 A Yes.
2 Q Aquatic ecologists?
3 A Sure.
4 Q Good idea for all of those folks, whether they're from
5 Kennecott or DEQ to get together and talk about the
6 potential effects of this mine; right?
7 A That would be a good idea, yes.
8 Q Okay. Do you have some understanding that that was not done
9 in this case?
10 A No. I don't really have -- I don't have a clear
11 understanding of the, you know, many years that led up where
12 we are today in terms of who was brought in when and who
13 wasn't brought in. I mean, that's not something that I have
14 tried to reconstruct or understand. I know there are
15 certainly hydrologists and people who -- with wetland
16 expertise, and so I don't have any reason to doubt that
17 those folks have been part of the process.
18 Q Okay. And so it would essentially bring your four circles
19 that you had up on the screen together to one place to talk
20 about the effects each one had and the effects on each
21 other; correct? That would be a good idea to --
22 A Potentially. I mean, potentially if those issues were
23 raised and, you know, openly discussed whenever this process
24 you're describing happened over the course of --
25 Q Now, you did do -- you did do a study regarding the

1 potential of historic mining to affect wildlife in the Upper
2 Peninsula; right?
3 A Yes.
4 Q Okay. And that was a recent study published in 2006;
5 correct?
6 A That sounds about right; it was right in that area. I
7 couldn't tell you for sure if it was '06, but that sounds
8 right.
9 Q Okay. And one of the things that you say in there is that
10 there have been hundreds of years of copper mining in the
11 Upper Peninsula of Michigan; right?
12 A Right.
13 Q And that vast quantities of waste rock with traces of
14 cadmium and large concentrations of copper were deposited by
15 those mining operations throughout the UP; correct?
16 A Certainly in the Copper Country, Baraga, Houghton, the
17 Keweenaw Counties. I don't know how widely Ontonagon
18 County; I don't know how widely that goes, but probably not
19 so much out of that area. But certainly in that many --
20 several counties.
21 Q And there were 150 approximately different mines at that
22 time; correct?
23 A Over a hundred years or so there, yeah.
24 Q Okay. And would you agree with me, if you know, whether
25 mines at that time were regulated as they are today?

1 A They definitely were not.
2 Q And there were stamp mills also in the Upper Peninsula;
3 correct?
4 A Right.
5 Q And can you explain to me what the stamp mills would be
6 doing?
7 A Well, I'm not a mining expert, but I live there so the
8 remnants of them are all over the Keweenaw and Houghton
9 Counties and these are places where, as I understand, the
10 rock was brought out of the ground and physically crushed to
11 extract the copper; to free it up from the basalt that it
12 was within.
13 Q Okay. So kind of a milling operation; I mean, is that --
14 A I think it was almost entirely a physical separation, not a
15 chemical separation process, with the exception of some
16 stuff that happened in the '30's.
17 Q And those stamp mills created a bunch of waste rock; right?
18 A Yes.
19 Q And that waste rock is called "stamp sand"?
20 A Yes.
21 Q And that's spread throughout that area where those
22 facilities were; right?
23 A Yes.
24 Q And you say in your report that 200 million tons of the
25 stamp sand was deposited near the site; right?

1 A In that entire region I think is what is was talking about
2 there.
3 Q Yes.
4 A Yeah.
5 Q And now what you did in that study was you wanted to
6 determine what effect that that 200 million tons deposited
7 near the site would have on birds that lived in the area and
8 fed near or on the stamp sand; you wanted to determine what
9 effect it would have on them; correct?
10 A Well, more specifically we wanted to determine if any of the
11 metals in this that are in traces in the stamp sand were
12 making into the birds' kidneys. So that's the effect you're
13 talking about. There's a lot of other effects those things
14 can have, but we weren't looking at all that; we were just
15 looking specifically at sort of a first level detection of
16 that.
17 Q Okay. And again, you say traces of cadmium in large
18 concentrations of copper in that stamp sand; right?
19 A Right; right.
20 Q And so you compared -- the bird that you used was the Rough
21 Grouse?
22 A Right.
23 Q And you say that that is the sentinel species for birds to
24 monitor concentrations of mining metals in and around sites;
25 right?

1 A It has some characteristics that make it a good sentinel
2 species. It has some that make it less good, but it has
3 quite a few that would make it good.
4 Q Okay. So you would use that bird to determine what effects
5 the same metals may have on other birds; right? Is that
6 what you mean by "sentinel species"?
7 A Sort of. It's more -- it has also to do with the ease of
8 monitoring that particular species as one indicator of the
9 mobility of those metals into more -- other vertebrates,
10 including birds and mammals. So yeah, you're right. A
11 sentinel is a species that is often both easily monitored
12 and a good indicator of more broad patterns.
13 Q Okay. And you compared grouse that were feeding on top of
14 the stamp sand that's left from the mines in Michigan to
15 grouse that were in Wisconsin that did not feed on stamp
16 sand; right?
17 A Yes.
18 Q Okay. And you're --
19 A Or feed on a landscape, because they're not eating stamp
20 sand as a food; they're eating it as -- to deposit in their
21 gizzard. But they're eating plants that are growing on the
22 stamp sand.
23 Q Right. They use the grit?
24 A Right; exactly.
25 Q Okay. And you hypothesized that the grouse living in

1 regions with stamp sand would have higher concentrations of
2 cadmium and copper compared to grouse living in the regions
3 of Wisconsin without the stamp sand; right?
4 A Right.
5 Q And that hypothesis turned out to be wrong, didn't it?
6 A Right.
7 Q Okay. And in fact concentrations of both cadmium and copper
8 were higher in the grouse that were in Wisconsin; right?
9 A They were higher in some locations; they weren't sort of on
10 average significantly -- statistically significantly higher.
11 But there was no -- there was no pattern that was consistent
12 with our hypothesis where the Copper Country grouse had more
13 cadmium, copper.
14 Q Now, you understand here with this facility, the closed
15 facility that there will be no smelter; correct?
16 A Right.
17 Q There will be no dumping of tailings; correct?
18 A Right.
19 Q There will be no milling on site; correct?
20 A Yes.
21 Q And no stamp sand dumped across the environment; right?
22 A Right.
23 Q Okay. Now, you acknowledge that you were wrong about your
24 hypothesis about the historical mining effects regarding a
25 time when there were no regulations on mining. Is it

1 possible, Dr. Flaspohler, that you're wrong about the
2 potential effects of Kennecott's proposed mine?
3 A Well, you know, as a scientist I would say when you test a
4 hypothesis you either support that hypothesis or you fail to
5 support it. To say that it's wrong suggests that any future
6 study of that kind would also find that same conclusion, and
7 this was one study of a fairly small sample size and that --
8 but I would agree we did not find cadmium in the kidneys.
9 Geologically you know and I know it's a completely different
10 system; there's no acid mine drainage; it's basalt and it's
11 not sulfide ore. So the two mines are very different in
12 addition to being different in terms of the regulatory
13 environment that they're operating in. As a scientist in
14 terms of whether I can be right and wrong I would certainly
15 acknowledge that I could be wrong. I don't claim to know
16 what's going to happen, but as a scientist also I would
17 expect that there should be a reasonable effort made to
18 consider the possibilities if other parties involved in this
19 are wrong. Certain estimates of emissions within ranges of
20 error and -- so all I'm saying is I'm acknowledging that I
21 certainly could be wrong about much of what I've said here,
22 but I've given you my opinion to the best that I can and
23 that's that.
24 Q Now, you did talk about acid mine drainage a little bit.
25 (Pause in dialogue)

1 Q Now, I put up on the screen here Petitioner's proposed
2 Exhibit 94 and this is "Acid Mine Drainage Causes Treatment
3 and Case Studies." Is this an article that you are familiar
4 with?
5 A I think is the one that I submitted, yeah.
6 Q Okay. And in this article, at least according to the
7 abstract, the last sentence of it there, says that "its
8 environmental impact" -- and they're talking about AMD, Acid
9 Mine Drainage; right?
10 A Uh-huh (affirmative).
11 Q -- "can be minimized at three basic levels. Number one,
12 through primary prevention of the acid generating process";
13 right?
14 A Yes.
15 Q "Two, secondary control which involves deployment of acid
16 drainage migration prevention measures"; right?
17 A Yeah, it looks like that's what it says.
18 Q And "three, tertiary control for the collection and
19 treatment of effluent"; right?
20 A Right.
21 Q Now, you understand that Kennecott is -- under the permit
22 that has been issued by the DEQ is required to do all of
23 those things; right?
24 A Yes.
25 Q Okay. That Kennecott will be attempting to prevent any acid

1 generating process by containing the rock -- right?
2 A Yeah.
3 Q And covering the rock?
4 A As I understand it, yes.
5 Q Okay. That it will be containing the rock in a lined area
6 to prevent deployment of acid drainage; right?
7 A Yes.
8 Q And it has to monitor for any drainage outside of that area;
9 right?
10 A Yes.
11 Q Okay. And you understand that Kennecott is required to
12 treat all of the effluent that comes out of there to potable
13 water standards; correct?
14 A Yeah, that's what I've heard; yes.
15 Q Now, one of your conclusions in this case was that the mine
16 could do essentially permanent harm to aquatic and
17 terrestrial wildlife in the region; right?
18 A Yes.
19 Q Okay. Now, you do understand that the mine facility is a
20 temporary facility; correct?
21 A Just there for the life of the mine, yes.
22 Q Yes, and that the life of the mine is from construction to
23 tear-down is approximately ten years; right?
24 A Yes.
25 Q Okay. And what do you consider to be a baseline for the

1 area around the mine; baseline condition, or is there one?
2 A You mean a baseline condition for the forest in that area?
3 Q The environmental condition in general. Would you --
4 A Well, if you think back I guess to the -- Leopold's talking
5 about Huron Mountain Club as providing a reference system,
6 you're saying what would be an analogous reference system
7 for the Yellow Dog Plains or the mine site; is that what
8 you're saying? Kind of a --
9 Q Yes.
10 A Okay. Well, the Yellow Dog Plains with red and jack pine
11 forest dominated is -- was a fire prone system and has been
12 for thousands of years, just like all jack pine is. So you
13 don't have sort of -- fire return intervals in that system
14 were probably in pre-European times every 50 to -- it could
15 have been every 30 to 80 years, whereas in the Huron
16 Mountains and the northern hemlock hardwood forest it's very
17 300 to 500 years, something like that. So the baseline in
18 that system would have been probably a pretty -- if you
19 would have gone there 5,000 years ago in the Yellow Dog
20 Plains in all likelihood you would have seen big openings as
21 well as a result of fire; it could have been an antigenic
22 fire, a natural fire. So to get a baseline for jack pine --
23 for a jack pine area like that and the wetlands and
24 everything else around it it's a little trickier, I guess.
25 It would be a disturbed system with sort of those natural

1 disturbances that return on -- in some regular intervals.
2 Q Would you agree with me that the area is dynamic and ever-
3 changing?
4 A Yeah, I would agree with that.
5 Q And that even further back 11,000 years ago the area was in
6 the throes of the last glacier period; right?
7 A Right.
8 Q Okay. And since then Native Americans have used the area
9 and used fire to manage the landscape; right?
10 A Yup.
11 Q And you talked about natural catastrophic events: lightning
12 strikes, natural fires; right?
13 A Sure.
14 Q And certainly we talked enough about all of the logging that
15 has gone on in that area; right?
16 A Yes.
17 Q And also there have been other mining operations throughout
18 the Upper Peninsula where there has been no or little
19 regulation; right?
20 A Yes.
21 Q Okay. And nearby you're aware of large power plants, aren't
22 you?
23 A Sure.
24 Q Marquette's got one, doesn't it?
25 A Yes.

1 Q Are you aware that that large power plant emits particulates
2 and metals?
3 A I'm sure it does, yes.
4 Q Okay. And did -- in spite of all of those changes or in the
5 face of all of those changes the Yellow Dog Plains area
6 still is, according to you, a very biodiverse area, isn't
7 it?
8 A All those historic changes coupled with power plants, you're
9 talking about all that together?
10 Q All of it together.
11 A Sure. It hasn't -- yeah, I would say -- yes.
12 JUDGE PATTERSON: The court reporter needs to take
13 a break. Apparently they're not getting any audio. She
14 needs to reconnect.
15 MR. PREDKO: Okay.
16 (Off the record)
17 JUDGE PATTERSON: I think we're ready to go again.
18 MR. PREDKO: Thank you, Judge. And I don't -- I
19 do not have that much more.
20 Q Dr. Flaspohler, you said that it is possible that wildlife
21 may be using the Yellow Dog Plains area, specifically the
22 site area as a corridor to move from the McCormick Tract to
23 the Huron Mountain Club; right?
24 A Yes.
25 Q Okay. Now, you've never tracked any fauna, any animals of

1 any type from the McCormick Tract to the Huron Mountain
2 Club; right?
3 A No.
4 Q You never tracked any bobcats from the tract to the mountain
5 club; right?
6 A No; no.
7 Q You've never done a study on birds going from the tract to
8 the Huron Mountain Club, have you?
9 A No.
10 Q So you don't have any scientific evidence to support that
11 conclusion, do you?
12 A Well, no observational evidence is what you were talking
13 about. I think scientific evidence would include things
14 like an understanding of animal movement patterns and just
15 personal distances and I have that kind of background
16 knowledge that would suggest it's likely. I couldn't say --
17 I haven't seen it happen, but --
18 Q So certainly there are no studies or surveys that you're
19 aware of that show that, are there?
20 A No.
21 Q I think we had a double negative there. There are no
22 studies, are there?
23 A There are no studies that I know of.
24 Q Thank you. You talked briefly about the Coaster Brook
25 trout?

1 A Yes.
2 Q And you know generally about that because you conducted some
3 studies with Casey Huckins; right?
4 A It's more from correspondence and discussions with Casey
5 Huckins than actual research that I've done in conjunction
6 with him. I've done research with him on other streams with
7 other fish communities, but not Coaster Brook trout research
8 that he and I have co-authored together.
9 Q Now, are you aware that the Coaster Brook trout that are
10 located on the Huron Mountain Club property are not able to
11 get upstream down to the mine area?
12 A Yes, I'm aware of that.
13 Q And you're aware of the falls and other obstructions that
14 prevent them from doing that, aren't you?
15 A Yeah, I've seen those falls.
16 Q As far as light being emitted from the proposed mine, do you
17 know that Kennecott is required and will have shielding on
18 any light that's at the proposed mine?
19 A I wasn't aware of that, but it sounds like a good idea.
20 Q Okay. And as far as noise; are you aware that a berm will
21 be built around the outside of the surface area and that
22 silencers will be put on the exhaust stacks of the
23 generators to quiet the noise?
24 A I wasn't aware of that; no.
25 Q Okay. And as far as -- air pollution was the other item

1 that you mentioned, you are aware from some of Mr. Vel's
2 testimony that a filter is to be put on the stack under the
3 air permit conditions that filters out 85 percent of the
4 particulates; correct?
5 A I've heard that. Yes, I've heard that.
6 Q And as far as dust on the site, you are aware, are you not,
7 of the fugitive dust and erosion control measures that
8 Kennecott must employ while the mine is in operation?
9 A Including this -- the bag house that you just were talking
10 about; that's the kind of thing you're talking about?
11 Q Well, there are several items. Did you have a chance to
12 look at the permits that were issued?
13 A I looked at the portions of the permit that were most
14 germane to wildlife and habitat issues, not in detail on the
15 air emissions issues.
16 Q And I'm not going to go over --
17 A But I understand there are -- they have -- there are
18 measures that they're taking to try to reduce those sources.
19 Q And you understand that currently on that AAA road that runs
20 through there, which is dirt road, that there are no
21 measures being taken to reduce sedimentation or erosion;
22 correct?
23 A Yes.
24 Q And are aware that the streams show evidence of
25 sedimentation already from those roads?

1 A I wasn't aware of it, but I'm not surprised.
2 Q And you're aware that when Kennecott runs the mine that they
3 will employ measures such as watering the roads regularly to
4 avoid some of this dust and erosion that you're talking
5 about; correct?
6 A Yeah, I'm aware of that.
7 Q Now, you're aware that the narrowleaf jensen has been
8 located near the site; correct?
9 A Yes.
10 Q And are you aware of the special permit requirements with
11 respect to the narrowleaf jensen?
12 A Yes. I know there's some measures that have been taken to
13 stay away from it.
14 Q And the MDEQ has required that no major disturbance shall
15 occur to vegetation within 66 feet of the narrowleaf jensen?
16 A Yes, I'm aware of that.
17 Q And Kennecott's required to comply with that?
18 A Yes.
19 Q And with respect to the Coaster Brook trout issue, are you
20 aware that Kennecott is to evaluate the brook trout
21 population regularly?
22 A I was not aware of that.
23 Q You don't have any reason to disagree with that?
24 MR. DYKEMA: I'd like to lodge an objection to the
25 question because I think it's misleading. Maybe I've missed

1 something. I don't think there's anything in the permit
2 that calls about monitoring Coaster Brook trout populations.
3 MR. PREDKO: I said "brook trout" I thought.
4 MR. DYKEMA: Yes, the premise of your question is
5 to lead the -- the predicate for your question was something
6 about Coaster Brook trout though.
7 A Yeah, I understood it to be a question about Coaster Brook
8 trout. But I'm not aware of any trout monitoring program
9 related to the permit.
10 Q So there is no confusion -- and I'm not trying to confuse
11 anybody or mislead anybody. I'm looking at the bottom
12 paragraph.
13 "In response to the health of the aquatic
14 ecosystem, primarily the Coaster Brook trout, special
15 permit condition L-42 is modified to require the
16 permittee to utilize MDEQ G-L-E-A-S, GLEAS procedure 31
17 to evaluate brook trout populations during mining
18 operations and for ten years after closure. In
19 addition, special permit condition L-47 was modified to
20 require the MDEQ to approve biological sampling
21 procedures and augment, if necessary, if there are too
22 few fish to sample."
23 Did I read that correctly?
24 A Yeah. That sounds -- I hadn't seen that before. I don't
25 quite understand the last part of that. They're going to

1 put more fish in the stream if there aren't enough to
2 sample; I guess that's what they're saying there. But
3 that's not my expertise, fish biology. But I recognize that
4 that exists.
5 Q So you understand that Kennecott and MDEQ by virtue of the
6 permit are required to do numerous things to avoid just the
7 kind of harms that you and others have talked about;
8 correct?
9 A To monitor the potential for some of the effects that I've
10 talked about; I would agree with that.
11 Q Now, Dr. Flaspohler, isn't it true that your objections to
12 construction of this mine are not simply based on objective
13 science?
14 A No; I don't think that's true.
15 Q Isn't it true that your reasons for objecting to this mine
16 go beyond science, and in fact they relate to your own
17 philosophical view regarding use of Michigan's environment
18 for nickel sulfide mining?
19 A No; I don't believe that's true.
20 Q You don't believe that's true?
21 A That there would be no way to justify nickel sulfide mining
22 in the state of Michigan; is that what you're suggesting?
23 Q Let me ask you about what we're putting up on the screen
24 here, Doctor.
25 MR. PREDKO: If you can go up to the very top

1 paragraph only.
2 Q I'm showing you -- this is a letter to Governor Granholm
3 dated December 16th, 2007. The first paragraph says,
4 "We the undersigned urge you to reject the
5 proposal to allow Kennecott Mining Company to create a
6 nickel sulfide mine in the Upper Peninsula of Michigan.
7 Many of our colleagues have offered appropriate
8 environmental reasons to reject the mining proposal.
9 We appreciate those reasons. Here we present
10 additional reasoning for rejecting the mining proposal,
11 reasoning that we believe has been under appreciated."
12 Do you recognize that letter?
13 A Yes, I do.
14 Q And did you sign that letter?
15 A I did.
16 Q You signed that letter along with some of the other
17 scientists who will testify in this case. Dr. Alee Lindsay
18 signed that letter; correct?
19 A I believe he did, yes.
20 Q And Dr. Strand signed that letter; right?
21 A I'm not sure actually the whole list.
22 Q Okay.
23 MR. PREDKO: Can you blow that up a little bit
24 more?
25 Q And the letter goes on to state,

1 "First, many appreciate the various environmental
2 costs that scientists tell us will or may occur if this
3 mine were built. Despite well appreciated complexities
4 that that uncertainty brings to a decision-making
5 process, uncertainty about the costs inevitably results
6 in those costs being discounted at least to some
7 extent. Sadly, this accounting overlooks an important
8 dimension of the costs, a dimension that transcends
9 science and economics; namely, many Michiganders very
10 simply and quite reasonably think that the proposed
11 nickel sulfide mine represents an inappropriate
12 relationship with Michigan's natural environment. In
13 the same way that human prostitution is not made right
14 because it would create jobs or because psychologists
15 debate what exactly are its effects on human health,
16 the value of nickel sulfide mining cannot be made right
17 by scientific or economic arguments.
18 In contrast to science and economics of nickel
19 sulfide mining there is no uncertainty that many,
20 perhaps most, Michiganders respect nature in a way that
21 precludes nickle sulfide mining. Manifesting their
22 respect is to manifest our democratic principles."
23 Now, that's the letter that you signed along with other
24 professors and sent to Governor Granholm; correct?
25 A Yeah. I would -- if I could give a little context to that?

1 Q Well, I'll let --
2 A I did sign that.
3 Q I'll let you do that; your attorney can do that. But that's
4 the letter you signed; right?
5 A Yes.
6 Q And you read this letter before you signed it; right?
7 A As a matter of fact that was the context. I edited out
8 almost all of that particular paragraph, particularly the
9 reference to prostitution which I thought was a poor
10 analogy. My colleague who authored the letter sent it
11 without showing me an edited draft; they didn't accept
12 virtually any of my editorials. So unfortunately that was
13 done -- that was sent in its current form without my chance
14 to verify it before they sent it.
15 Q Well, did you ever sign the letter?
16 A My signature I don't believe is on it. I think my name got
17 put on it because they asked me if I would be willing to
18 sign a letter of this type. When they sent me the draft I
19 said, "Yes. Here's a bunch of editorial comments." I
20 probably changed half the letter. I never heard for two
21 months; I asked one of the authors -- main authors of the
22 letter. He said, "Oh, we sent that out a long time ago."
23 So unfortunately it does bear my name and I don't deny
24 responsibility for some of it, but it was an oversight on my
25 colleague's part and some extent my part that it ended up

1 with some of the content that it has, that I would not have
2 concluded.
3 Q Now, you would have taken out the reference to
4 "prostitution"?
5 A Certainly.
6 Q Okay. And how about the line about transcending science;
7 did you take that part out?
8 A I can't remember -- I have a copy of the edited version but
9 I can't remember all the editorial comments that I would
10 have made. I don't think I would have left that in there
11 either.
12 Q Now, do you put yourself within that category of Michigander
13 that respects nature in a way that precludes nickle sulfide
14 mining?
15 A The way I would say -- answer that is that there's a history
16 of nickel sulfide, of sulfide mining in general that has
17 left an environmental legacy on a lot of parts of North
18 America in the past. I think nickle sulfide mining, if it
19 has proven technology could be justified -- I use nickel in
20 things that I use and as a consumer of it I can't justify
21 exporting mining to other parts of the world, so -- but this
22 particular mine and this particular location with the
23 history of sulfide mining seems to me scientifically
24 unjustifiable.
25 Q Well, that history of nickel sulfide mining; that's the

1 history where there was little or no regulation of those
2 sites; correct, sir?
3 A Some of the examples I know were older examples. I don't
4 know how many nickel sulfide minings have gone in in the
5 last ten years or twenty years since current technology and
6 regulation have been in place.
7 Q Are you aware of any nickel or copper sulfide mine that has
8 as many restrictions or permit requirements to avoid
9 environmental harms as this one?
10 A No.
11 MR. PREDKO: Thank you, Doctor.
12 MR. MANNING: I don't have anything.
13 JUDGE PATTERSON: Okay.
14 MR. DYKEMA: Your Honor, may we have one minute to
15 confer?
16 JUDGE PATTERSON: Sure.
17 (Off the record)
18 MR. DYKEMA: Your Honor, just a few questions?
19 JUDGE PATTERSON: Sure.
20 REDIRECT EXAMINATION
21 BY MR. DYKEMA:
22 Q Dr. Flaspohler, we are looking at what I will represent is
23 the current and final version of condition L-42 in the
24 mining permit. Do you see the reference there to -- any
25 reference there to Coaster Brook trout?

1 A Starting on 42 there?
2 Q Yeah.
3 A No. No.
4 Q If indeed -- talking about amphibians on the property, and
5 particularly salamanders?
6 A Okay.
7 Q If in fact there aren't any vernal pools on the limited
8 acreage that Kennecott surveyed in its species survey, does
9 that mean there are no salamanders living there the rest of
10 the year?
11 A No. In fact the salamanders can breed in some wetlands as
12 well, so they don't require vernal pools to breed. That
13 tends to -- those tend to be good places for them that they
14 can use wetlands, particularly fishless wetlands is kind of
15 what they like because fish will eat the larval salamanders,
16 so --
17 Q Counsel drew your attention to the comment by Aldo Leopold
18 70 years ago that the headwaters of the STR had been -- and
19 I'm quoting now -- "slashed to such an extent as to destroy
20 its value as a natural area." In your opinion does the area
21 of the headwaters of the Salmon Trout River have no value as
22 a natural area today?
23 A No. And in fact, you know, Leopold was a smart guy but that
24 might have been one place where he missed the boat, because
25 the headwaters are -- some of the headwaters are the jack

1 pine forests and those forests would naturally through fire
2 disappear and reappear periodically throughout their
3 history. So in that sense there had -- even though there
4 had been cutting we're talking -- we're 70 or 80 years later
5 now and there's been a lot of recovery and there may have
6 been some continued cutting. But there's a lot of value to
7 those headwaters, particularly to maintain water quality
8 alone for fish and other aquatic organisms.
9 Q Counsel showed you some photographs and drew your attention
10 to the fact that the immediate area of the mine is -- looks
11 like heavily fragmented forest. Do you recall that?
12 A Yes.
13 Q Okay. Within the area that this mine will in your opinion
14 impact within the effected area, is that all fragmented?
15 A No, because I believe some of the impacts will penetrate
16 farther out into more contiguous forest.
17 Q Counsel asked you a number of questions about edge effects.
18 I don't recall asking you much about edge effects on direct,
19 but is your opinion regarding the extent to which this mine
20 will impair or destroy wildlife based in significant part on
21 edge effects created by the mine?
22 A It's not really based on that; no.
23 Q Counsel pointed out that Kennecott promises to take measures
24 and the permit has conditions that seek to impose measures
25 to prevent acid mine drainage?

1 A Yes.
2 Q Does Kennecott's Environmental Impact Assessment give one
3 moment's consideration to the possibility that those
4 measures may not be 100 percent effective at all times
5 throughout the entire history of the mine?
6 MR. PREDKO: Objection; no foundation.
7 Q Have you --
8 JUDGE PATTERSON: You can go ahead if you can
9 answer it.
10 A I didn't see any -- I didn't see any consideration for those
11 possibility (sic) of failure.
12 Q Counsel also drew your attention to other requirements in
13 the permit that seek to reduce the risk or to control the
14 possibility of pollution from other sources. Does
15 Kennecott's Environmental Impact Assessment recognize in any
16 way the possibility that those control measures may not be
17 100 percent effective?
18 A I didn't see any recognition of that kind.
19 Q Have you ever met a bobcat tracker?
20 A No.
21 Q One of the measures that counsel drew your attention to was
22 road watering, which is done in order to try to control the
23 dust from the heavy truck traffic. Do you remember that?
24 A Yes.
25 Q What's your understanding as to how effective that road

1 watering is going to be?
2 A Well, again, that's -- this is my understanding, not my
3 expertise -- that it's difficult to maintain roads with
4 enough moisture, particularly in the summer, to keep that
5 dust from escaping.
6 Q Counsel also drew your attention to the 66-foot setback
7 requirement imposed for the protection of the narrowleaf
8 jensen. Were you familiar with that requirement?
9 A I was, yes.
10 Q Okay. In your opinion is that requirement adequate to
11 insure that the narrowleaf jensen on and surrounding the
12 property will not be impaired or destroyed by the mine and
13 its operations?
14 A Well, I would say that's a step in the right direction. I
15 guess I would want to know more about the sensitivity of
16 that jensen to things other than just physical destruction.
17 Q Does the 66-foot setback requirement protect the jensen from
18 pollution by heavy metals?
19 A That would be hard for me to answer with confidence.
20 Q Well, it's not going to -- the 66-foot setback requirement
21 isn't going to have an effect on the particles that come out
22 of the main band, is it?
23 A Right.
24 Q Is that 66 --
25 A I don't think that that would have much effect in terms of

1 the exposure to those kinds of things.
2 Q Will the 66-foot setback prevent acid mine drainage?
3 A No; I don't think that would have anything to do with it.
4 Q I mean, basically it will guarantee that they don't drive
5 their trucks over the jensen; right?
6 A Probably, yes.
7 Q Counsel asked you about -- some questions about bringing
8 together a team of experts in all different disciplines and
9 asked you whether that would be the appropriate context in
10 order to assess cumulative impacts and I think your answer
11 was yes, that would be an appropriate context depending on
12 what it was they actually did. My question to you is this:
13 If the world's greatest team of biological and hard
14 scientists were gathered into a room in conference and if
15 that team concluded that this mine would have no adverse
16 impact on any wildlife outside Kennecott's property line,
17 would the fact that that conference room was teaming with
18 experts give you any confidence whatsoever in their
19 conclusion?
20 A Well, I mean I'm one scientist and I wouldn't presume to
21 always know more than any other single or group of
22 scientists, so I form my opinions based on my experience and
23 my understanding of the scientific literature, the ecology
24 and behavior of the species that I know. So I would still
25 form my own opinions based on those things regardless of --

1 but if empirical data were presented to me that was
2 convincing -- that was very convincing that could -- for
3 example, just in the case of threatened and endangered
4 species had exhaustive surveys been done for everything that
5 may occur and they didn't find them, I think that would be
6 very convincing to me that that one segment would not be
7 something that I would be concerned about.
8 Q Did Kennecott's experts in -- as reported in their
9 Environmental Impact Assessment make any targeted effort to
10 locate or identify endangered species?
11 A Other than the jensen, other than the Kirtland's Warbler,
12 which they probably would have picked up in their surveys,
13 not much.
14 Q In your opinion, Dr. Flaspohler, will the operation and
15 installation of this mine pollute, impair and destroy
16 natural resources beyond the property line?
17 A Yes, that's my opinion.
18 Q Did Kennecott's Environmental Impact Assessment even ask
19 that question?
20 A No.
21 MR. DYKEMA: Thank you, Doctor.
22 MR. PREDKO: Just a couple, your Honor.
23 RECROSS-EXAMINATION
24 BY MR. PREDKO:
25 Q Did Kennecott's Environmental Impact Assessment ask any

1 questions?
2 A It did; it asked some and some were good questions.
3 Q Now, you did acknowledge that in doing a threatened and
4 endangered survey that Kennecott did that the Kennecott
5 consultants did examine habitats; correct?
6 A Yes.
7 Q Habitats in which the threatened and endangered species were
8 likely to be; correct?
9 A Well, I would say they characterized the habitat; that's
10 different than really surveying the habitat, but they
11 described it and put it into a category.
12 Q Well, and that's how --
13 A Which you can do often from satellite photos, so you can do
14 that very remotely without actually getting your boots wet.
15 Q Well, and that's how they determined where to look for
16 threatened and endangered species, isn't it?
17 A That would be a step to determine that, sure.
18 Q That's what they did, didn't they?
19 A Characterize or describer habitat types?
20 Q And then go look in those habitats --
21 A Not as far --
22 Q -- for those threatened and endangered species?
23 A They may have gone into those habitats; they may not have.
24 They weren't -- the transects that they had didn't -- there
25 was no reference to those being laid out in ways that would

1 do anything other than sample mammals and birds and then
2 frogs and toads.
3 Q Did they not say, Dr. Flaspohler, in their report that those
4 transects were laid out to view representative samples of
5 this 1200-acre piece of property, representative of the
6 habitats that the threatened and endangered species would be
7 in?
8 A I think they tried to cover as many of those 13 as they
9 could.
10 Q Now, with respect to the jensen; are you aware in the mine
11 permit that there is another provision other than the
12 setback provision that requires Kennecott to document on a
13 an annual basis the health of the narrowleaf jensen
14 communities identified along the Salmon Trout River main
15 branch south of AAA Road.
16 "The annual evaluation shall include an assessment
17 of local climatic conditions, drought, insect
18 infestations, precipitation, et cetera, photographic
19 documentation and visual description of the health of
20 the colonies relative to other colonies that have been
21 documented in the area as described in figure 311 of
22 the Environmental Impact Assessment."
23 Do you recall reading that part too?
24 A I have seen that, yeah.
25 Q And so that's some additional monitoring protection for that

species?
A I think that's a good plan.
Q Do you agree that the Yellow Dog Plains area where the mine site will be located is a highly fragmented area; correct?
A Yes.
Q And it's been subjected to heavy and continuous logging over the years; correct?
A Yes.
Q And it's primarily what has caused a lot of fragmentation; right?
A Right.
Q And in terms of the effected area, you're talking about areas outside of the mine site that may be affected by the what's going on at the mine. Now, you're primarily talking about air particulates, number one; correct?
A Yes.
Q And water, number two; that's the other pathway; correct?
A Right. In addition to the noise and the light that -- I think those are relatively minor compared to those other two.
Q Okay. And as far as reaching outside of the mine, I assume that you would agree that -- well, I assume your position is that air and water reaches further than the noise or light conditions; "yes"?
A Yeah, I would say yes.

1 Q And to come to those conclusions about the effects of either
2 air or water, again you're relying on the particulate
3 deposition experts for the air and the toxicologists;
4 correct?
5 A Yeah. And some published studies that I've seen, not of the
6 Kennecott area but of elsewhere.
7 Q Right. But as far as what's happening or what's going to
8 happen or could happen at this proposed site, you rely on
9 other experts; right?
10 A Right; in terms of the dust and water.
11 Q And the same is said for the water; correct?
12 A Yes.
13 Q You rely on those people who may -- talked about how much of
14 the dust may go into the water or what may come out of the
15 water treatment facility and then rely on toxicologists to
16 tell you the effect of that; correct?
17 A Sure. People with more expertise in those disciplines.
18 MR. PREDKO: I don't have anything further. Thank
19 you Doctor.
20 MR. DYKEMA: Thank you, your Honor. Thank you,
21 Doctor.
22 JUDGE PATTERSON: Thank you, Doctor.
23 JUDGE PATTERSON: Okay. 8:30 tomorrow.
24 (Hearing adjourned at 5:26 p.m.)
25 -0-0-0-