JOINT REVIEW PANEL PUBLIC HEARING

IN THE MATTER OF Application Nos. 1844520, 1902073, 001-00403427, 001-00403428, 001-00403429, 001-00403430, 001-00403431, MSL160757, MSL160758, and LOC160842 to the Alberta Energy Regulator

---

GRASSY MOUNTAIN COAL PROJECT - BENGA MINING LIMITED

VOLUME 17

VIA REMOTE VIDEO

November 17, 2020

TABLE OF CONTENTS

EXHIBITS

Proceedings Taken via Remote Video

November 17, 2020	Morning Session
A. Bolton	The Chair
D. O'Gorman	Hearing Commissioner
H. Matthews	Hearing Commissioner
M. LaCasse	AER Counsel
B. Kapel Holden	AER Counsel
K. Lambrecht, QC	Joint Review Panel Secretariat Counsel
T. Utting	IAAC Staff
E. Arruda	AER Staff
D. Campbell	AER Staff
T. Turner	AER Staff
T. Wheaton	AER Staff
A. Shukalkina	AER Staff
M. Ignasiak	For Benga Mining Limited
C. Brinker	
R. Warden	For Ktunaxa Nation
T. Howard	

K. Poitras	For Métis Nation of Alberta Region 3
Chief B. Cote	For Shuswap Indian Band
B. Snow	For Stoney Nakoda Nations
R. Drummond S. McHugh	For Government of Canada
A. Gulamhusein	For Municipality of Crowsnest Pass
M. Niven, QC R. Barata J. Nijjer (Student-at-Law)	For MD of Ranchland No. 66
B. McGillivray	For Town of Pincher Creek
D. Yewchuk	For Canadian Parks and Wilderness Society, Southern Alberta Chapter
R. Secord I. Okoye	For Coalition of Alberta Wilderness Association, Grassy Mountain Group, Berdina Farms

	Ltd., Donkersgoed Feeder Limited, Sun Cured Alfalfa Cubes Inc., and Vern Emard
R. Cooke	For Crowsnest Conservation Society
G. Fitch, QC C. Agudelo	For Livingstone Landowners Group
M. Sawyer	For Timberwolf Wilderness Society and Mike Judd
(No Counsel)	For Barbara Janusz
(No Counsel)	For Jim Rennie
S. Elmeligi A. Morehouse S. Milligan M. Boyce	For Alberta Chapter of the Wildlife Society and the Canadian Section of the Wilderness Society
J. Gourlay-Vallance	For Eco-Elders for Climate Action
L. Peterson	For Trout Unlimited Canada

R. Campbell For Coal Association of Canada

(No Counsel) For Alistair Des Moulins

(No Counsel) For David McIntyre

(No Counsel) For Fred Bradley

(No Counsel) For Gail Des Moulins

(No Counsel) For Ken Allred
(Not Present)

(No Counsel) For Monica Field

S. Frank For Oldman Watershed Council
A. Hurly

C. Longacre CSR(A) Official Court Reporter

(PROCEEDINGS COMMENCED AT 9:04 AM)

THE CHAIR: Okay. Good morning, everyone.

Just a reminder that live audio and video -- oh, just making sure I'm not muted. Yeah.

Just a reminder that live audio and video streams and video recordings of this proceeding are available to the public through the AER's website and YouTube. Anyone in the virtual hearing room with their camera or microphone turned on will be captured, and images and recordings of you and your surroundings will be broadcast to a publicly available YouTube video.

If you have concerns about this, please contact counsel well in advance of the time you're scheduled to participate to explain your concerns. We will try to accommodate your concerns considering the need for an open and transparent public process.

Is there any -- are there any preliminary matters before we return to cross-examination?

Hearing none, Mr. Secord, you can continue your cross-examination of the Benga panel.

MR. SECORD: Good morning. Thank you, sir.

GARY HOUSTON, DANE MCCOY, MIKE YOUL, MIKE BARTLETT, CORY BETTLES, DAVID DEFOREST, SOREN JENSEN, MARTIN DAVIES, LEIF BURGE, DAN BEWLEY, Previously Affirmed

STEPHEN DAY, NANCY GRAINGER, Previously Sworn

(Water, including surface and groundwater management, quantity and quality, selenium management and aquatic resources, including fish and fish habitat and fish species at risk)

Mr. Secord Cross-examines Benga Mining Limited

Q MR. SECORD: Ms. Grainger, I'd like to just circle back on some of our discussion yesterday. And just to refresh your memory, I had drawn your attention to the "Model Assumptions", Bullet Point 5, which says -- and -- and I don't think we need to turn this up, but it says: (as read)

Apart from preferential flow parallel to fault strike, there is no major fault acting as a significant conduit and no major regional deep-flow influence.

I then referred you to Bullet Point 2 on PDF page 209, the CR Number 3 in CIAR 42, which states in part: (as read)

The north-south thrust fault systems are modelled to impede flows in the east-west direction.

I then asked you yesterday: Do you agree that this configuration will have a profound effect on how much drawdown will propagate outward to the west and east of the mine pit? We have your answer on the record from yesterday.

I then asked you, Please explain why the model has been configured this way when we know there is evidence of active west-east faults based on the trellis-style drainage pattern. And we have your answer on the record from yesterday.

And then I asked you, Do you agree that the trellis-style drainage pattern is a fault drainage system and that this is typical in the mountains? And we have your answer from yesterday.

MR. SECORD: So I would now like to have the Zoom host turn up CR Number 3 in CIAR 42 at PDF page 193.

And, again, this is in the -- if you could scroll down to the bottom of the -- of the Section 2.2.2.4, "Fernie Group".

Q MR. SECORD: And this is dealing with the SRK model. It states there: (as read)

No testing data were obtained for the sales of the Fernie group, which underlie the Kootenay group rocks.

I take it that statement is correct, Ms. Grainger?

A MS. GRAINGER: Yes, that's correct.

Q And under Section 2.2.2.5, under "Thrust Faults", it says: (as read)

While no testing data exists for the thrust faults in the area of the project, it is likely that these faults which strike parallel to the Hog's Back Ridge likely present a flow -- a hydraulic barrier to flow perpendicular to them given the cataclastic nature of these faults and the tendency to form low permeability fault gouge.

Now, I would like to have the Zoom host pull up Aid to Cross AQ Number 5, "Coalition", and it's described as "coulee veins AAPG". And this is a paper entitled, "Stable-Isotope Geochemistry of Syntectonic Veins in Paleozoic Carbonate Rocks in the Livingstone Range Anticlinorium and Their Significance to the Thermal and Fluid Evolution of the Southern Canadian Foreland Thrust and Fold Belt", by Michael A. Cooley, Raymond A. Price, T. Kurtis Kyser, and John M. Dixon, published in AAPG Bulletin, Volume 95, Number 11, November 2011, pages 1851 to 1882.

Do you agree, Ms. Grainger, that the Morin Creek tear fault is shown on Figure 2 on PDF page 4?

A Yes, I see that there.

Q And do you see that it is also shown on Figure 3 on PDF page 6?

A Yes, I see that on page 6 as well.

Q And do you agree that the Morin Creek tear fault is immediately east of Gold Creek and has significant displacement along it?

A It's located on the range to the east of the project. I didn't review the information regarding the displacement, but that's not substantial, I don't think.

Q Do you agree -- if we turn to PDF page 1, do you agree that in Figure 10 on PDF page 12 the Mike Cooley paper

shows many of these east-west transverse faults?
A It appears to.
Q Right. And we see, in fact, Caudron Creek, which actually runs through Ms. Gilmar's property; correct?
A I'll take your word for that.
Q Okay. Have you been to the mine site, Ms. Grainger?
A I personally have not, but my team has.
Q Okay. Do you agree that these faults don't have a large displacement along them, but they are fractures which allow fluids to move along them?
A I'm afraid, Mr. Secord, I've had limited time to review the paper, so I'm not familiar with how much displacement has occurred upon -- on these features.
Q Do you agree that these features can be seen in all outcrops of competent sandstone layers on Grassy Mountain?
A I would disagree with that. I think it might be helpful if we can go to CIAR 42, Consultant Report Number 3, page 85. So there's several cross-sections that are shown here, and the East-West 3, in particular, is quite helpful. It shows the purple outline of the bottom of the pit, and you can see Blairmore Creek and Gold Creek are illustrated there, and the rocks that are described in this paper, Mr. Secord, are shown in the brown and sort of hatched pattern, so occur on the range to the east. So it's

clear from this cross-section that they are at significant depth underneath the project site.
Q Okay. I asked you if you agree that these fractures can be seen in all outcrops of competent sandstone layers on Grassy Mountain. You said you disagree, but, in fact, you have never been to Grassy Mountain and have not looked at these outcrops; is that correct?
A I'm saying that there's no evidence for these east-west features on Grassy Mountain, and that's because the geology is fundamentally different between Grassy Mountain and the Livingstone Range to the east.
Q Okay. But my question was that: Do you agree that these fractures can be seen in all outcrops of competent sandstone layers on Grassy Mountain? That was the question. And you say you disagree, but, in fact, you have never been to Grassy Mountain and looked at these outcrops. Do I have that correct?
A MR. HOUSTON: Mr. Chair, I -- what I heard Ms. Grainger say is that her team has been on Grassy Mountain and has done extensive work there. What I've heard her say is that -- and she pointed out in this cross-section that the formations that Mr. Secord is talking about are well below the bottom of the mine. So that -- that's the evidence that I heard Ms. Grainger provide.
Q Okay. If we could turn to PDF page 12 of CIAR

Number 5. So, Ms. Grainger, do you have --
MR. SECORD: Do we have that up, Zoom Host?
A CIR -- it's not Registered Document 5. It's Aid to Cross 5; right?
Q MR. SECORD: AQ Number 5.
A Yeah.
Q And if we go to PDF page 11 and scroll down. So at the bottom of the first column, it states: (as read)

Regularly spaced, approximately 150 metre, approximately 492 feet, east-west striking deeply dipping zones of intense fracturing and minor faulting transect. The north-south striking limbs and hinge stones of chevron-style folds in the vicinity of Green Creek, Warren Creek, and Caudron Creek, Figure 10. The fracture zones which commonly contain one or more discrete but discontinuous fault services are commonly marked by gullies that form conspicuous erosion features in the steeper slopes and cliffs, Figure 10A and B.

Ms. Grainger, do you agree that the trellis-style drainage is a direct indicator of this type of fault influence?
A MS. GRAINGER: I do not.
Q If the faults are in the deep formation, then why are

they visible at surface?
A Well, as I understand it, Mr. Secord, they are visible at surface on the Livingstone Range, but they don't occur on the Grassy Mountain.
Q So you're saying that they are not visible at the surface on Grassy Mountain?
A Yes. If we go to page 23 of the PDF, at the bottom of that page, there's a note -- or a sentence there that reads: (as read)

> The Morin Creek tear fault, Figure 3; the Daisy Creek tear fault, Figure 5; and the smaller transverse faults in the limbs of the anticlines, Figure 10A, all terminate upward within the lower part of Mount Head Formation, which indicates these fractures were formed in the late Mississippian during deposition of the Mount Head Formation.

And then speaks of reactivation of those faults, but also in the same time frame, these rocks are substantially older than the rocks on Grassy Mountain.
Q So what you're saying -- so what I understand you to be saying, Ms. Grainger, is that we have evidence of east-west faults in the Daisy Creek area directly north of the project, we have evidence of east-west faults adjacent to the project essentially to the east of the project area, but magically, the model has been

constructed in such a way to eliminate the presence of any east-west faults in the project area?
A MR. HOUSTON: Mr. Secord, I think what --
Q Mr. Houston, my question is for Ms. Grainger --
A Was --
Q -- and under the rules of practice, I am entitled to ask a particular witness a question. Rule 23 of the AER Rules of Practice. Now, if she is incapable of answering the question, then the Chair can have another of your witness panel answer it. But she's supposed to be a geologist; she should be the one answering these questions.
A Well, Mr. Secord, I think --
MR. SECORD: I'd like a -- I'd like a ruling, Mr. Chair.
A I -- Mr. Secord, I'd like to be able to --
MR. IGNASIAK: Mr. Chair --
MR. SECORD: I'd like a ruling.
MR. IGNASIAK: Mr. Chair, I think the panel is allowed to determine how the question's answered. Certainly there's nothing inappropriate with Mr. Houston providing an overview, and to the extent Ms. Grainger needs to expand on it, she can.
THE CHAIR: I would suggest that Mr. Secord is entitled to ask Ms. Grainger the question, and if she's unable to respond or Mr. Houston

wants to supplement the response, I think that is fine.
A MR. HOUSTON: Mr. Chair -- Mr. Chair, what I was going to say and what I was going to object to is the characterization of us magically creating a model that ignores information. I -- I didn't think that was an appropriate comment, and -- and perhaps Mr. Secord could rephrase his question, and then Ms. Grainger can answer it.
THE CHAIR: Okay. Go ahead, Mr. Secord.
Q MR. SECORD: So, Ms. Grainger, if I understand your evidence, there are -- there is evidence of east-west faults in Daisy Creek immediately north of the project area; correct?
A MS. GRAINGER: I am sorry. I hadn't reviewed where the Daisy Creek tear fault is located.
Q Do you know where Daisy Creek is in the project area?
A Yes, I certainly know where Daisy Creek is located.
Q And you agree that there's east-west faults adjacent to the project area in Caudron Creek, the Morin tear fault?
A There, clearly from this paper, are east-west tear faults that are located on the Livingstone Range to the east of the project site.
Q Okay. And to be clear, the model has been constructed in such a way that there are no east-west faults in the actual project area. Do I have that correct?

A Correct. The -- the model does not include east-west faults because there's no evidence of them on Grassy Mountain. The fact that they are, you know -- that they do occur on the Livingstone Range to the east in different rocks than occur on Grassy Mountain, that was taken into account when we constructed the model. So there's no evidence for these features also occurring on Grassy Mountain.

Q And if I look at your CV -- which I don't know if we need to turn it up, but it's at CIAR page 571, PDF page 205 -- am I correct that you have degrees in earth -- in the University of Waterloo earth science program?

A Yes. I have a bachelor of science from the University of Waterloo in earth sciences, which was a specialization in hydrogeology.

Q Right. And you are a registered as a professional geologist?

A That's correct.

Q And if we then go back to -- if we could go back, then, to some questions I asked yesterday where we had -- didn't make much progress, and maybe I can just refresh your memory on those. This is dealing with adding -- basically the proposition is that SRK added too much recharge to the model domain. So I referred you to -- and, basically, how will this affect the extent of the drawdown in those portions of the model domain.

And I referred you to -- I referred you to PDF page 183 of CR Number 3. I don't think we need to turn it up. But I drew your attention to -- the MAP for the entire Blairmore catchment is estimated at 719 millimetres and Gold Creek, 777 millimetres.

I then indicated that SRK used the average number of 28 percent for recharge in its model. You seemed to have some difficulty with that even though it is clearly stated in the application that 28 -- the 28 percent number was used for recharge. So, basically, we -- I said, The model will -- the model, then, is saying that 28 percent of the Gold Creek MAPA -- MAP will end up as recharge, and then do you agree that in some areas of the model, the recharge is as high as 50 percent? And then we have your answers.

And then I said, Do you agree that the model underestimates how bad the recharge can get in some parts of the mine site? And that's where we kind of left off yesterday.

So I assume you've had a chance to look at the modelling that SRK did, and so I'd like to continue with that line of questioning. Do you agree, Ms. Grainger, that by adding more recharge to certain parts of the model domain, it will effectively reduce the spatial extent in magnitude of drawdown simulated

for those areas?
You're on mute.
A Sorry.
I was going to ask your permission, Mr. Secord, to provide you the information that you'd requested yesterday.
Q Sure.
A So I wanted to provide one clarification first. On CIAR 42, Consultant Report Number 3, PDF page 179, we reference -- and we don't need to bring this up. I'll just reference it. But we do reference that the mean annual precipitation at the property was determined to range from 611 to 992 millimetres. The model then used -- actually tested a series of equations to relate precipitation relative to elevation because that description also talks about how there is a positive correlation between precipitation and elevation. So the precipitation increases with elevation.
And the information you were requesting yesterday is on PDF page 215 of that same document.
Q Let's pull that up, then.
A Yes. So on the left-hand side, it shows --
Q Maybe just wait till it's up.
A Sure.
So on the left-hand side, it shows some of the areas which were increased. So, for example, there was

a clearcut area -- we talked about that yesterday -- where precipitation was increased by a factor of 2 to represent the lower evapotranspiration.

On the right-hand side are two maps that show the distribution of recharge that was applied to the model. And as I said, there was a series of -- of relationships that were tested between recharge and elevation, two that were selected as best producing or matching the base flows that are observed at the site, and these are the linear and the exponential functions. So the map on the top shows the distribution of linear recharge or the -- the distribution of recharge from the linear equation that was applied to the model, and then on the bottom is the exponential equation, the recharge distribution that was applied as a result of that so that it's -- as I was trying to explain yesterday, it's not a simplistic 28 percent. The 28 percent represent, essentially, the average across the site of the recharge -- excuse me -- that was applied, but you can see that it's lower in some areas and higher in some areas.

Q Right. Okay. So I think we will come back to that figure in a moment or two.

Do you agree, Ms. Grainger, that these high recharge values will certainly work to reduce the magnitude of base-flow reductions reported in

Gold Creek?

A I think it's important to understand that the model actually is calibrated to the base flow. So the observed base flow that was inputted into the model -- the recharge was actually calibrated or modified in order to reproduce the base flow that was observed, and those were some of the -- we looked at the groundwater plots yesterday that show the measured and model output, but that's how those are generated.

So the intent is: There's a series of assumptions that are built into the model as we best can represent the physical characteristics of the site, and then through a process of calibration, we modify those assumptions in order to match the observations at the site. So that would be specifically with respect to the base flow and then the hydraulic head that is observed at multiple locations throughout the site.

Q So I would like to get your answer, though, under oath to this question: Do you agree that these high recharge values will certainly work to reduce the magnitude of base-flow reductions reported in Gold Creek as a result of this mining project being approved? So, in other words --

A I guess --

Q -- if it -- if it goes ahead based on this model and these results, do you agree that these high recharge values will work to reduce the magnitude of base-flow reductions reported in Gold Creek?

A I do not agree, and the reason is because the recharge that was utilized matches, within a statistical accepted range, the observed base flow on the site. And so I don't believe that the recharge that was used is over -- is too high.

Q Okay. Let's turn up PDF page 228 of CR Number 3 in CIAR 42, Figure 5-14, "Monthly Base-Flow Variability". And you'll see in the legend on the left-hand side of Figure 314 the blue line is the observed Blairmore Creek base flow, and the dotted line is the calculated Blairmore Creek base flow, and then we have a similar legend for Gold Creek.

How do you explain, Ms. Grainger, the considerable difference between the models calculated versus observed base-flow variability?

A Well, there are differences. I think the intent is that, on the whole, we've got a reasonable match. I agree that some don't show as good a match, and we have discussed in the model report that there are specific areas where the model doesn't fit as well, but on the whole, we believe it is representative.

Q Do you agree that the model appears to consistently overpredict monthly base flow in Blairmore Creek? So if we look at, for instance, BC -- sorry, BLO3, BC07,

BL02, BC03, BL01, in every instance, we have the calculated -- model calculated Blairmore Creek base flow above the observed Blairmore Creek flow for most of the period 2013 to 2016; correct?
A I think what's observed here on these plots is that, likely on a mean annual basis, the base flow is similar. What we're not seeing is the model representing the -- the peaks of recharge -- of base-flow recharge.
Q In fact, would you agree that the scale of the graph at GC13 hides the base-flow variability so you can't even see what it is?
A I think the intent was to include a consistent scale on all of the figures, not hide the information, Mr. Secord.
MR. SECORD: Please turn up CIAR 42, Section E, PDF page 103, Figure 5.1-1, "Overview of the Mine Plan, Selenium Management Plan, and Surface Water Management Plan". And this should be Figure 103. Do we have -- is this Section E?
MS. ARRUDA: Mr. Secord, do you have a page number?
MR. SECORD: Yeah. I had this as Figure 5.1.1 [sic] in Section E. Let me just take a look here.
Sorry. I must have typed in -- it was actually

CR Number 3. My apologies.
Thank you very much.
Q MR. SECORD: So, Ms. Grainger, in this legend, it shows the -- basically the end-pit lake; the northeast sediment pond, or NESP; the east sediment pond, ESP; and the southeast surge pond, the SESP; as well as the saturated fill zones. In the legend, they're shown as -- shown in blue; correct?
A MS. GRAINGER: Yes, that's correct.
Q Okay. And I was just curious, Mr. Houston. Yesterday, I believe you -- when you were answering Mr. Yewchuk's questions, you indicated to him that the entire mine site was going to end up as a selenium SBZ landfill. Do you recall saying that?
A MR. HOUSTON: Yes, I do.
Q And so do I understand, then, that -- that -- is this -- is this actually changed, then? These areas that are shaded blue, the saturated fill zones, are they -- have they been superseded?
A No, Mr. Secord. Essentially the -- the -- the SBZ zones that you see there are the main volumes where -- where water would accumulate, but the water physically decants from the two zones in the north through -- through the rock fill to the -- the zone in the south.
Q But should the entire area shaded or covered by the black project area line -- should that really -- should

the entire area be shaded in blue, then, to be -- to be -- to depict this saturated fill zone?

A Yeah. No. I -- I understand your question. The -- but in order to calculate the volumes and the -- and the residence time in -- in the SBZ, we've -- we've focused on those three areas. But the water does physically flow through the rock from the two larger pools in the north to the one in the south.

Q I noticed yesterday you were mentioning -- Mr. Houston, you were talking about Gold Creek and how some areas of it have dried up in the past. You recall that discussion?

A It's not in the past, Mr. Secord. That's -- that's happening in the current time.

Q Sure. But I take it you -- you pulled up a photograph of an area of Gold Creek that had dried out. You recall?

A Yes, a couple of them, actually.

Q At what time of year were those photographs taken?

A I believe one was taken in August, and the other may have been taken earlier in the year.

Q Okay. So August of -- do you recall what year?

A 2019, I believe.

Q Okay.

A Just a minute, Mr. Secord. We just want to --

Q No.

A Oh, sorry?
Q No. That's fine.
A Okay.
Q I -- if you miss -- if you think it's important and you want to change your answers, I'm not sure that it's critical, but -- but come back to me if you -- if you've got different information. I --
A Okay. Just -- just -- just I've got somebody waving at me, so I might have misspoke. I just want to confirm what that was.
So, Mr. Secord, the photos were taken in September of 2016. I was mistaken.
Q Yeah. Not a problem.
So you mentioned that -- that Benga is going to be in a position where it can remedy these low flows that occurred in, for instance, these low-flow months of, like, August and September. So looking at -- looking at the project map here that we have in front of us, how is -- where is the water going to come from that you're going to put into Gold Creek to augment the flow so that we no longer see those dry areas that you pointed out?
A Yeah. So that's a really good question, Mr. Secord. Thank you. And -- and I'm -- I'm happy to have the opportunity to explain a bit more clearly.
What's happened at those sections of the creek is

that the creek has physically jumped out of its historical channel, and that was probably caused during the -- the flooding that occurred; I believe it's around 2013. And what happens in those areas is that water actually spreads out and flows through the treed area, but through many, many channels. So it's flowing cross-country, if you will, not in a defined channel. And because of that and because there is a gravel kind of surface in those areas, the water actually is still there, but it's below the surface in those areas. So it's not a matter of creating more water; it's a matter of diverting the water back to the main channel, having it concentrated in that channel, and -- and that will ensure that there's water above the surface even during the dry seasons.

Q Okay. So if I understand it correctly, then, Benga has no intention of augmenting the flow of Gold Creek by pumping water into the creek at some point, such as GC10, for instance, or GC13? You're not going to run a -- you're not going to run a hose from the end-pit lake and start pumping water into Gold Creek or taking water from Blairmore Creek, for instance, and shifting it over?

A No. We -- we did a -- we did an instream flow needs assessment in -- in 2016, and that was fully reported in -- I believe it's addendum -- it's -- it's Registry

Document 44, in any case. And we did an instream flow needs assessment and determined that the amount of water in Gold Creek is sufficient. What -- what's going on at these sites is -- is not about the amount of water; it's about the fact that the channel has been damaged by -- by flooding and -- and the water is going subsurface --
Q Okay.
A -- in specific areas.
Q So just to be clear, you're -- Benga's proposal, then, to save the westslope cutthroat trout is -- has nothing to do with augmenting the flow of water in Gold Creek but to do some channelling work in some of those areas where you took those photographs and try and improve the channel? That's really what you're talking about?
A That -- that is what is contained within our fisheries offsetting plan, yes.
Q Okay. If we could turn up CR Number 3, PDF page 242. This figure is entitled "Figure 3-22, Predicted Drawdown EOM", end of mine; correct?
A MS. GRAINGER: Correct.
Q And if we could just discuss the legend. If we could just discuss the legend for a minute. You have "drawdown in metre iso lines" and then "drawdown in metres fringes". What does that depict, Ms. Grainger?
A Well, the colouring just indicates the range of

drawdowns shown within that area. So the very light blue shows the area where drawdown is predicted to be between 5 and 30 metres, as an example.
Q So what -- what are -- what are the iso lines?
A I think it just refer -- well, the iso line, I'm assuming that refers to the outermost line which is where drawdown is predicted to be 5 metres.
Q And the fringes?
A Well, I think the fringes is the coloured portion which just indicates that in that coloured area, it varies, but it's obviously going from the 5-metre iso line on the light-blue pattern towards the 30-metre drawdown outline.
Q So this Figure 3-22 shows the mine area as a sink; correct?
A Correct. It's representing the drawdown that's occurring as a result of the mining.
Q And the drawdown is, what, 300 to -- 300 to 430 metres?
A Yes. The maximum drawdown is 430 metres at the very deepest part of the pit.
Q And then you recall we looked at that previous figure, and I note that we have these areas that are -- basically step out towards the bottom. You'll notice how in the area of the northeast -- or the northeast sedimentation pond, or the NESP, it looks like there is a drawdown area of 5 to 30 metres. Do I have that

right?
A Sorry. I'm just quickly comparing the two maps. I mean, I -- I think that's correct, but I'd have to -- it doesn't -- because the two maps don't overlay the features, it's --
Q Is there --
A -- harder to compare the areas.
Q Is there any doubt in your mind that the area where we see this 5- to 30-metre drawdown is in the area of the northeast sedimentation pond, Ms. Grainger? Do you want to go back to the previous document and take a look at it?
A MR. HOUSTON: Mr. Chair, we'll just take --
A MS. GRAINGER: No.
A MR. HOUSTON: Sorry. We'll just take a minute to -- to consult here, if you don't mind.
MR. SECORD: Maybe, Zoom Host, we can just put back for -- flip back for a moment to the Figure 5.1.1.
A MS. GRAINGER: Mr. Secord, yes, I've confirmed that that area in the northeast does coincide with the northeast sediment pond location. Apologies for my delay.
Q MR. SECORD: Right. And then I'm assuming you can confirm that the ESP -- let's go back to Figure 3.1.1 -- sorry, 3-22 on PDF 242. Yeah.

I take it you can confirm, Ms. Grainger, that --
A Yes, that --
Q -- that that -- that that second area where it steps out in Section 30 is the east sedimentation pond?
A That's correct.
Q All right. And that's the -- that's the area that is directly in the -- in the northwest quarter of 30, which is directly to the north of Fran Gilmar's property in the southwest of 30? You're familiar with where my client Ms. Gilmar lives?
A I'm afraid I'm not, so I will take your word for that.
A MR. HOUSTON: I -- I can confirm that for you, Mr. Secord. I agree with that.
Q All right. And then I'm less certain about this, Mr. Houston, but the area of the southeast surge pond, is that -- would that be in the area sort of towards the south -- I guess this would be south and west -- or I guess the north is going -- yeah. So it would be essentially --
A South.
Q -- south of --
A Southeast.
Q Yeah. South --
A Southeast surge pond, yeah.
Q Yeah. Yeah. Is that sort of in the vicinity of that other drawdown area that we see on the --

A Yeah.
Q -- bottom left-hand side?
A Yeah. Mr. Secord, this -- this model is obviously assuming that those ponds are all empty, and so that would be roughly the depth of pond that we're looking at on this model.
Q Okay. Can you tell me: What is the model actually showing in the -- near the northeast sedimentation pond and the east sedimentation pond?
A As I just mentioned, Mr. Secord, the model's showing -- yeah. So you want Nancy to -- Ms. Grainger to answer this question?
Q Well, maybe you -- maybe you have some expertise in modelling. Are these edge effects?
A These -- these are ponds that are empty, and -- and in the immediate vicinity of the pond, it's going to create a drawdown on the groundwater table.
Q Okay. And, Ms. Grainger, do you know what "edge effects" are in modelling?
A MS. GRAINGER: Sorry. I was on mute.
Sorry. That is not a term I'm familiar with, with respect to modelling.
Q Mr. Jensen, are you familiar with the term "edge effects" in modelling -- in SRK's modelling?
A MR. JENSEN: I did not -- I'm not a hydrogeologist, and I did not model this sort of thing,

so in the context of hydrogeological models, no, I am not.
Q So, Ms. Grainger, do you know if SRK have numerical instability in their model which may be producing these edge effects on --
A MS. GRAINGER: No.
Q -- on -- in Figure 3-22?
A My understanding, Mr. Secord, is that these are not edge effects; they are a result of the inputs that were entered into the -- the model with regards to the mine activities.
Q Okay. So do I understand, then, that as a result of this SRK figure, 3-22, there is going to be drawdown of up to 5 to 30 metres, very close to the Gold Creek, and that it is going to pull water from Gold Creek?
A This is identifying that there's drawdown in those areas. It doesn't necessarily -- and, in fact, I can find the references, but there was an exchange of IR responses that looked specifically -- I know there's no drawback from the creeks towards the mine.
Q You know that Gold Creek flows essentially through Fran Gilmar's property and then through the northeast quarter of 30 and is essentially almost adjacent to the east sedimentation pond? I take it you're familiar with how the creek flows through the --
A I --

Q -- through Section 30?
A Well, I can see it on the map, and I'm -- I've now been made aware that that's where Fran Gilmar's property is.
Q Right. And the creek itself would be -- would be less than 100 metres from -- would be approximately, what, 100 metres from the east sedimentation pond?
A It is quite close.
Q And the creek is also within 100 metres of the southeast surge pond?
A MR. HOUSTON: I -- I can confirm that, Mr. Secord.
Q And the creek would also be within a hundred metres or so of the northeast surge pond? This is Gold Creek.
A Yes. I can confirm that as well.
Q Okay. Why are you getting drawdown under a pond which will likely be recharging the groundwater?
A Mr. Secord, am I allowed to answer this question? Because my response would be: The pond is sometimes empty.
Q So what's happening, then, the empty pond is drawing down --
A As --
Q -- groundwater?
A As Ms. Grainger pointed out, we have input operating parameters from the project into the groundwater model, and -- and at times, those ponds will be empty, and so

that -- that would affect the -- the groundwater in the
immediate vicinity of the ponds.
Q Yeah. Near the -- near Gold Creek?
A We've -- we've established that those ponds are near
Gold Creek, yes.
Q Right. Okay.
If we could turn up CR Number 3, PDF page 246, in
Exhibit 42. And this figure is entitled "Predicted
Drawdown LTC" or "long-term closure"; correct?
A MS. GRAINGER: Sorry. I was on mute.
Correct.
Q So what is the -- what is the time frame for --
represented by Figure 3-22, "Predicted Drawdown End of
Mine"? What period is that covering?
A Well, "end of mine" is a snapshot immediately at the
end of maximum mining. I can get you the exact year.
Q Okay. And then Figure 3-25 that we have up now, this
would be what -- this is at the end of the --
A This --
Q Sorry. Go ahead.
A Yes. This represents the -- essentially the new
equilibrium, so it's long-term closure; it was a
steady-state model run. So it -- it represents the new
equilibrium at the project site.
Q So if we study Figure 3-22 and Figure 3-25, the model
projects that the drawdown will be limited to

400 metres out for the mine pit area in all directions; correct?
A Correct. Yes. I mean, this figure doesn't show the edge of the -- the mine, so -- but it's -- it's quite -- it's close, certainly, to the pit.
Q So if you, one, limit the conductivity in an east-west direction -- which, Ms. Grainger, you said you have done in the model -- and, two, if you put more recharge into the 1,500-hectare mine area that is realistic, do you agree that you will get less drawdown of base flow in Blairmore Creek and Gold Creek?
A I guess I -- sorry. I'll just restate. I guess if one was to apply too much recharge and reduce the conductivity, then obviously it would impact the distribution of the drawdown.
Q Do you agree that this scenario had something to do with how hydraulic conductivity values were selected for the SRK model layers; i.e., the lower k-value in the west-east direction as opposed to the north-south, leading to more drawdown in a north-south direction?
A I disagree with that statement. The sensitivity analysis specifically looked at that condition, so the conductivities in the north-south direction were about half an order of magnitude higher than in the east-west direction. And that was tested in the sensitivity analysis. So I'll just see if I can find a page number

for you.
Q We are going to --
A So --
Q We are going to look at some of those tables.
A Right. So PDF page 256, if I can. So under the "'K' Anisotropy", the last case, so anisotropic basically removes that influence of the thrust faults which reduce the 'K' in XY -- or in the east-west direction, and you can see that that had no measurable effect or --
Q Right.
A -- on -- on the heads or on the base-flow predictions.
Q So do you agree that it is better for the Benga project to have drawdown in a north-south direction rather than an east-west direction?
A What I'm saying is that the way the model was constructed with that assumption doesn't actually significantly affect the outcome. Had we not included a reduced conductivity in the east-west direction, we would've had a similar outcome of the model.
MR. SECORD: If we could turn up CIAR 793, PDF page 150, and this is Transcript Volume 8 at page 1896.
Q MR. SECORD: And just while we're waiting for that, Ms. Grainger, in relation to your last answer, I would put it to you that the reason for the

model not showing greater impacts by removing the east-west direction or faults is because SRK has been putting and is putting too much recharge into the project area. Would you agree with that proposition?
A MR. HOUSTON: I don't think we agree with that proposition, Mr. Secord.
Q Yeah. But --
A And -- and we've -- we've been discussing this for quite some time, and we haven't created a model based on what we want to occur. We're -- we're creating a model based on the physical conditions at site. We've calibrated it to site. The -- you know, the mean annual precipitation and the care that we've taken in distributing that across the -- the site -- this is not a grand design to create an outcome, Mr. Chair. This -- this is a -- a scientific and objective modelling exercise that has resulted in outputs that we've discussed here.
Q Okay. Well, Mr. Houston, we'll continue to explore how this model was put together, but first of all, let's look -- we now have this transcript page up. And at the top of -- at the bottom of page -- PDF page 150. So it says here: (as read)

> A shift in the intensity, duration, and frequency, or IDF, of precipitation events is anticipated according to Kuo.

And then if we go over the page to PDF 151, it says: (as read)

How -- [so this is line 5.] How has the anticipated change in the shift -- how has the anticipated change to the IDF been considered regarding the impacts to westslope cutthroat trout habitat once the Blairmore and Gold Creek watersheds are significantly altered permanently by mining operation?

[And then]

A Exactly as I've just mentioned, Mr. Chairman, as once the mine is in place, if there is an extremely dry period -- and, again, thinking about the westslope cutthroat trout, a drought in Gold Creek under current conditions would result in a number of places in Gold Creek where the creek literally dries up -- it doesn't dry up, but it goes -- it recedes into the surficial layer and becomes impassable for fish.

So, Mr. Houston, do you recall giving that evidence on November the 5th to my questions on that day?
A Yes, I do.
Q And so if Gold Creek could literally dry up, as you

said on November 5th, and run below the surface, what if the SRK model is wrong and your mining operations are capturing more than 20 percent of the base flow of Gold Creek? Do you agree that fish, such as the westslope cutthroat trout, are then going to be even more threatened than they are now?
A So, Mr. Chair, I -- I -- I think what's important here is to understand the difference between base flow and total flow in the creek. When we capture water in the mine, in -- in fact, it's a big sump, and we're pumping water out of the mine, that does draw down the groundwater table in the vicinity of the mine, and Ms. Grainger and Mr. Secord have been discussing what those drawdowns look like.
But what we need to keep in mind is that when we pump the water out of the mine, it's got to go somewhere. It doesn't disappear. Where does it go? It goes into the sedimentation ponds, it gets cleaned up, and then it's put back into the creek. So although the base flow, which is the flow in the creek that comes from the groundwater, will reduce, that water is still put into the creek. So it just goes through a different pathway through -- through the pumps and the -- the pipes and the sedimentation ponds to come back into Gold Creek.
Q So, Mr. Houston, if your mining operations are

capturing more than 20 percent of the base flow of Gold Creek, will that result in more areas of the creek drying up when they would normally be flowing?
A So as I've just explained, Mr. Secord, the water will continue to go into Gold Creek, albeit through a different pathway. I've also explained that the creek is not actually drying up; it is going subsurface. So the water is still in the creek. The problem is the -- the channel has been destroyed in certain areas, and the water's being allowed to go subsurface. And of course, the fish can't swim underneath the surface of the ground. They -- they have difficulty there.
So we're going to do two things. First of all, we're going to fix the -- the flow regime in the channel by reconstructing the channel and putting the water back where it has been historically. That's going to give a contiguous path for the fish to follow.
And secondly, as we pump down the -- the groundwater table, as we pump out of the mine pit, we're going to be returning that water that we're pumping through the sedimentation ponds, and that will end up back in Gold Creek as well.
So there is no decrease in water. The water doesn't disappear, is what I'm saying, as a result of the mine.
Q Do you agree, Mr. Houston, that base flow is really

important for the fish and that if the model is wrong, it could be catastrophic for the fish in Gold -- in west -- in Gold Creek?

A Well, base flow has -- is -- is important for two reasons: Number 1, the -- the quantity of water that's in the creek. And -- and I've just explained how the quantity doesn't -- except for a -- a minor shift of water from Gold Creek to Blairmore Creek, which we've talked about extensively. But the water doesn't disappear. So it -- it still arrives back in the creek.

But the other -- the other important aspect to base flow is in keeping some of the overwintering pools open and -- and -- so that -- that is another factor. We're well aware of that, and -- and -- and that's why we're addressing overwintering pools, and that's why we're monitoring groundwater around Gold Creek as part of this project.

Q Mr. Houston, I thought you said earlier that no water was going to go to Gold Creek from the mine site?

A No contact water, Mr. Secord. So "contact water" is water that contains an elevated level of selenium. That -- that occurs primarily in the ex-pit dumps where we have the leaching of selenium, and that water would be directed through the SBZ, which -- which will eventually end up in -- in Blairmore Creek after the

water's been treated and tested.
Q So do I understand it, then, that -- that -- that water from the northeast sedimentation pond, water from the east sedimentation pond, and water from the southeast surge pond will be going to Gold Creek? Is that what you're saying?
A Two -- two out of three, Mr. Secord. Two out of three.
So the -- the -- the ones that are labelled as "sedimentation ponds" are ponds that are treating water that does not contain elevated levels of selenium. It may contain sediment, which we would settle out in those ponds. The one that you call the "surge pond" -- the "southeast surge pond", that water is directed towards the saturated backfill zone and is treated for removal of selenium and eventually ends up in Blairmore Creek.
Q Okay. So how does the water from -- how long does it take the water from the northeast sedimentation pond to get into Gold Creek?
A After it's been tested for sediment and -- and cleared for return to the environment, hours, days. It's a short time period.
Q So how does it get there? Is it pumped into the creek?
A It'll likely fault -- flow through a -- a -- a channel that we'll -- we'll create down to the creek.
Q 'Cause when I looked at your mine plan, it looked to me

like the northeast sedimentation pond and the east sedimentation pond both were dam -- they had dam structures around them; correct?
A Yes. Absolutely. They're -- they're containment structures. They're made to hold water, but there will be a -- a -- a mechanism, probably, pumping into a -- a channel to discharge that water to Gold Creek.
Q So you've got a spillway?
A Something like that, yes.
Q And so how much -- and -- and will this then -- this will then flow through overland, will it?
A Yes, likely.
Q Okay. And so when will -- it does seem very different to the answer you gave me earlier about no water being pumped into Gold Creek. Now you're telling me that you will be pumping water from the northeast sedimentation pond and the east sedimentation pond into Gold Creek at some point?
A So I -- I apologize if my previous answers weren't clear. So let me be perfectly clear. Any water that contains elevated levels of selenium will eventually end up in the saturated backfill zone, and that water will be treated, and when it is tested and determined to be suitable for return to the environment, that water will go into Blairmore Creek.
Water that is -- is not containing elevated

selenium or other metals which only has, potentially, a sediment problem will go to the sedimentation ponds. That sediment will settle out in the ponds, and then that water, which doesn't have selenium or -- or other elevated metals, will return to Gold Creek.

Q And if it does -- if it does have selenium or elevated levels of metals or other contaminants, then I take it that that water would remain in the pond until it is either treated or put into the saturated backfill zone?

A That's right. We would divert that water to the -- to the saturated backfill zone.

Q All right. So if we could turn up Bullet Point Number 7, PDF page 207 of CR Number 3. Bullet Point Number 7 says: (as read)

> Water-level data and creek-flow data collected between late 2013 and early 2016 are representative of the pre-mining steady-state conditions and long-term trends.

And this is -- again, this is the "Model Assumptions", Bullet Point 7.

So if we could turn up PDF page 66 in CR 4 of CIAR 42, Figure 28. And you will note, if we look at the figure in the top left corner, it shows "Monthly Time Series at Gold Creek Near Frank" running from September 1975 to January 2012. And then underneath that, we have "Annual Time Series at Gold Creek Near

Frank", again, running from 1975 to 2011. Those are the numbers depicted there.

So I don't know, Mr. Jensen, whether this is a question for you, the hydrologist, but you will note that in the top left-hand corner, the flow over many of those years is less than 1 metre -- 1 cubic metre per second per month; correct?

A MR. JENSEN: That's correct.

Q And if we look at the bottom of -- the bottom -- bottom graph, we have flow of less than 0.4 cubic metres per second per year in many of the -- in many of those time periods or in several of those time periods; correct?

A Yes, that's correct.

Q So can you tell me: How is this 2013-to-2016 flow data representative when we have data from the Gold Creek Near Frank Water Survey of Canada Gauging Station that provides historical information on a flow variability from 1975 to 2012?

A I -- I apologize, Mr. Secord. Would you mind repeating the question?

Q So I drew your attention to "Model Assumptions", Bullet Point 7 --

A M-hm.

Q -- (as read)

Water-level data and creek-flow data collected between late 2013 and early 2016

are representative of the pre-mining
steady-state conditions and long-term trends.
So my question to you is: How is this 2013-2016 flow data used by SRK in its model representative when we have data from the Gold Creek Near Frank Water Survey of Canada Gauging Station that provides historical information on flow variability from 1975 to 2012?
A So in -- in conducting the hydrological analysis for this project, we looked at not just the Gold Creek station near Frank but all the regional stations to, you know, do our best to characterize the hydrological regime in the -- in the entire study area. And what -- what's quite apparent from the flows in -- measured at Gold Creek is that they systemically -- flows measured at that station are systemically lower in general than at -- even at stations upstream on Gold Creek, which means that there's evidence that whatever's measured at that station isn't representative exactly of the flows in Gold Creek.
So, in fact, we were -- we were asked in -- in a number of -- of rounds of information requests -- or it was requested of us to rely more heavily on that information, and time -- you know, through a number of rounds of information requests, we had to push back and -- and decline to do that 'cause we -- we understand -- and we can -- we can demonstrate

positively that the flow rates measured at that Gold Creek station, that they're not -- there's something else going on that -- that -- there's some measurements -- a portion of the flow that's not accurately measured at that station.

So -- so that -- that's what -- I -- I don't know if I'm answering the question --

Q No --

A -- correctly here.

Q So I think you are. I think what you're saying is: Despite the fact that there are many years between 1975 and 2011 where the flow is less than 1 cubic metres per second per month, you're saying that this multiyear -- these -- this multiyear low-flow condition has not been accommodated in SRK's model -- in SRK's model base-flow calculations? Is that fair?

A MR. HOUSTON: Could we -- could we just have a minute, Mr. Chair, to discuss this? One minute.

A MR. JENSEN: Mr. Secord, thank you for your patience.

I -- it appears that I may have been referring to a different -- it -- it appears that I may have misunderstood your question. I'm being corrected by my colleagues here. So I'll defer, if I may, to my colleague Dr. Dan Bewley. Yeah. So he'll take -- he'll take it from here.

A DR. BEWLEY: Hello, Mr. Secord. This is Dan Bewley. Can you hear me?
Q Loud and clear. Where are you located?
A Hi. I'm in Calgary as well right now.
Q Okay. Okay.
A So -- yeah.
Q I like your accent.
A I -- I don't, but I appreciate the compliment.
So just to add some context. I was working with Mr. Bettles here in formulating the instream flow assessment. And as I'm sure you're aware, the instream flow assessment uses streamflow data as one of its key inputs. Okay?
So in the instream flow assessment, we go into depth around how stream flows specifically in the channel because that's what we care about in terms of modelling fish habitat in the channel itself. How -- we characterize how conditions have changed spatially along each creek and temporally over the record period.
So to answer your question directly, if we could turn to CIAR 44, please, Addendum 1, CR 6, Appendix A3, and then if we can go to PDF page 37. Okay. So what we're looking at here is essentially the same plot. It's from Gold Creek since records began in 1975, and I've highlighted two areas here.
One is in yellow, and one is in blue. The area in

yellow is essentially when our hydrometric monitoring in the area began. It was at the very end of 2013 into 2014. It's a higher flow year.

In the blue area, which is essentially when a lot of our instream flow work was conducted, you can see it's obviously a dry year. So between those two periods, we have quite a high year and quite a low year captured in the data. And that kind of puts it into context over the longer term since those records began in the mid-1970s.

Does that answer your question, or would you like me to expand?

Q No. That's -- thank you.

Now, I don't know whether this is for you, Mr. Bewley [sic], or for Mr. Jensen. Do you agree that the importance of springs to the flow in Blairmore and Gold Creeks has not been addressed very well in Benga's application?

A MS. GRAINGER: Mr. Secord, it's Nancy Grainger. We did review springs in the hydrogeology report, so we completed a field investigation and sampling program. All of the springs that were identified on the project site were related to historical mining activities. And we reviewed as well any published data regarding springs in the area. So that's the information that was available regarding springs on the project site, if that's helpful.

Q Do you agree that numerous small springs are known to exist in the area, and the discharge of groundwater at surface forms wet area habitat as well as flow down the flanks of Grassy Mountain down to the valley bottoms?

A I don't know if it's helpful. We can pull up a map that shows the wetlands that are mapped within the project area. There are a very limited number of wetlands that mapped, but we can look at that if that's helpful, Mr. Secord.

Q Not -- not really. The question was: Do you agree that numerous small springs are known to exist in the area, and the discharge of groundwater at surface forms wet area habitat as well as flow down the flanks of the Grassy Mountain down to the valley bottoms?

A MR. HOUSTON: Mr. Secord, is there -- are you reading from a specific passage in our application or --

Q No, I'm not, Mr. Houston. I'm asking a question. If I was asking -- if I was referring to your application, I'd have it up in front of you. Trust me.

A Okay.

Q I'm not -- this isn't -- this isn't a test on your -- what is it, 20,000 documents is it, or pages? I don't think we're doing that. So it's just a very simple question. I would've thought Ms. Grainger could've

asked -- answered that.
A Let -- let us just have a little discussion here, and then we'll give you an answer.
Q Maybe -- maybe -- maybe this question too: Every headwater tributary starts at a spring; is that correct?
THE CHAIR: Apologies. We appeared to have lost the Zoom connection for a moment or two. I'm not sure if everybody's able to rejoin now or not.
MR. SECORD: Mr. Chair, should we take our mid-morning break --
THE CHAIR: Yes. I think that's a --
MR. SECORD: -- while we're --
THE CHAIR: I think that's a good idea. So let's take 15 minutes. It's 10:28. We'll resume at 10:45.
MR. SECORD: Thank you, sir.
(ADJOURNMENT)
THE CHAIR: So, Mr. Secord, before we start, there was some kind of a disturbance in the force just before that break. I lost my Zoom connection, as did Mr. O'Gorman and a couple of AER staff. It wasn't for very long. And the last thing we recall before we lost our connection was you asking a question, and the question was along the lines of: Do you agree that -- do you agree that numerous small

springs are known to exist in the area and the discharge and groundwater surface forms wet area habitat? And then that was kind of the end of what we heard.

So if we could maybe just back up, and if there was a response provided to that question, if it could be repeated.

MR. SECORD: Yeah. I think where we were was they wanted to break and discuss it.

THE CHAIR: Okay.

MR. SECORD: So it looks like you didn't miss anything at all.

THE CHAIR: Okay. Thank you.

A MR. HOUSTON: So -- so, Mr. Chair, we'll -- we'll provide an answer to that question now, just to make sure everybody's on the same page.

But before we do that, Mr. Secord, you and I had a discussion about whether the sedimentation ponds were within 100 metres, and we've -- we've confirmed over the break that they're more than 100 metres but close to 100 metres away from Gold Creek. Just -- just to be clear, they're not closer than 100 metres; they're -- they're approximately 100 metres away.

Q MR. SECORD: Okay. So, Ms. Grainger.

A MS. GRAINGER: Thank you.

We don't need to turn to it, but in CIRA --

CIAR 42, Consultant Report Number 3, PDF page 34, there is a discussion and a review of natural springs within the project area as part of the hydrogeology assessment report. So that reviews known information about springs in the area. In short, there are only a small number of springs that were identified within the project area itself, and they are all related to historic mining activities.

So within the upper portion -- not talking about the creeks themselves or along those -- the creek valleys, but within the upper portion of the project, there's a very limited number of springs that have been identified in the project area.

And I'd like to ask my colleague Mr. Bettles to add to this response.

A MR. BETTLES: Hi, Mr. Secord. Apologies. I was on mute for a second there.

To follow up to Ms. Grainger's response, we've -- through our field surveys along Gold Creek, we have noted base flow that daylights and enters into Gold Creek itself, but we have not documented any habitat that you could construe as being off channel or what have you that would provide that extra habitat for westslope cutthroat trout.

Q Okay. I think probably for Ms. Grainger. Do you agree that the flow from these features adds directly to the

creeks via tributary drainage and provides base-flow contributions to the streams?
A Mr. Secord, I can -- I'll try to answer your question for you. The -- the tributaries along the west side of Gold Creek are, for the most part, ephemeral, so at times, they may offer some -- some contribution, but it would be very little that they are contributing. I will point out that the Caudron Creek from the east is a major contributor to Gold Creek.
Q Do you agree that very few springs -- only six were assessed during the preparation of Benga's application?
A MR. HOUSTON: So, Mr. Chair, if I could sum up a little bit what we've heard here, that -- that there are -- there are very few springs high up in the project, but if you look right along the banks of Gold Creek, there are a number of places where -- we classify it as "base flow" is visible coming from the side of the creek, and -- and I understand that those are the features that Mr. Secord is describing here, and -- and so we -- we would've evaluated those as part of the base-flow contribution to Gold Creek.
Q So, Mr. Jensen, given their importance, why were so few springs assessed, and how does this speak to the accuracy of the SRK groundwater modelling?
A MR. JENSEN: Mr. Secord, I'm afraid I have to defer that question to my colleagues. Again, I did

not do the groundwater model --
Q But --
A -- assessment.
Q Okay. Well, is it -- would springs be part of hydrology or hydrogeology?
A MS. GRAINGER: Mr. Secord, I can answer.
So the springs were reviewed and examined both from published information and part of -- field surveys as part of the hydrogeology portion of the baseline and the assessment. And that's in the section that I referred to just earlier. We reviewed all the springs that were on record and that we could identify within the project area on the project site, so those are described. And there's a very limited number of springs that were identified in the project site.
Q So how does this speak to the accuracy of the groundwater modelling?
A I -- I don't think it has any impact on the groundwater modelling. The -- the model does talk about the springs that were monitored, as they're considered in the model itself, but it means that all information that we understand and know about the site was considered in the development of the groundwater numerical model.
Q Okay. Just --
A MR. HOUSTON: If -- if I could just add to

that.
Q Just before that, Mr. Houston.
Do you agree, Ms. Grainger, that there have to be more than just six springs, because all headwaters -- streams originated at a spring area; correct?
A So, Mr. Secord, that's precisely the point I was going to just clarify, if I could. We have -- we have included base flow in Gold Creek in -- in our modelling, and we have -- and -- and I think a lot of the features that you're referring to as "springs" may, in fact, be a base flow that happens to be coming out from -- from the bank or a little bit -- you know, at the -- adjacent to -- to the creek. So we -- we've included those in our modelling as -- as base flow. I -- I'm just not sure if that was clear.
Q Okay.
A Base flow doesn't all come up from the bottom of the creek. It -- it sometimes comes in from the side.
Q Okay. So, Mr. Bewley, could you pull up that figure again that you had us look at for instream flow needs?
A DR. BEWLEY: Certainly. So can we go back to CIAR 44, Addendum 1, CR 6. There we go. Thank you.
Q Okay. So just to refresh your memory, are you familiar with the SRK model?
A At a basic level, yes.
Q Okay. So we've already had this up on the screen -- we

don't need to pull it up -- Bullet Point 7 from PDF page 207 of CR Number 3, which says, as part of the model setup: (as read)

Water-level data and creek-flow data collected between 2013 and early 2016 are representative of the pre-mining steady-state conditions and long-term trends.

So that's what SRK wrote in their model design.

I then had Mr. Jensen look at Figure 28. I think that's right. Yes, Figure 28 -- we don't need to pull that up -- from, basically, the flow records for Gold Creek at Frank Regional Station and the low flows that were shown there.

And then, Mr. Bewley, you came -- you came into the picture, and you pulled up Figure 3.5 from Section E -- this is from Section E of Exhibit 42; correct? This is from the EIA?

A MR. HOUSTON: That -- that's correct, Mr. --
Q Okay. So --
A -- Secord.
Q So as I understand it, you -- the modellers used 2013 and 2016 to capture some variability. So in that period of time, you had those extremely high flows, which are marked with the yellow line, and you had some extremely low flows marked by the turquoise line; correct? That's what you said, Mr. -- I'm talking to

Mr. Bewley now.
A Yeah. I -- I -- I understand that, Mr. Secord, but I -- I think what you're asking is a question that integrates across a number of fields. So it might be more helpful if I provide a -- an integrated answer here.
Q I don't think so, but I think you're going to do it anyway, Mr. Houston.
A You -- you understand me very well, Mr. Secord.
So what we have on this graph is -- the black line is the -- is the hydrometric station near Frank, and, of course, the data goes back from 1975 up to 2017.
Since 2013, '14, we've had other hydrometric information from Gold Creek based on other measuring stations, monitoring stations, and that helps us to understand where the water's coming in in a more detailed way.
And -- and so what this graph shows quite nicely is that -- that detailed information that we've used for the -- the modelling of the subsurface flows is based on the detailed information from 2013 to 2017. And what this shows is that that detailed information is truly representative of the range of flows that we could see in Gold Creek. And that -- that's shown because in 2014, we had a -- a high-flow year, and in 2016, we had a low-flow year. So by -- by capturing

the detailed information over that time range, we have, in fact, captured the range of variability on -- on that stream.

Q Okay. So -- so, Mr. -- I don't know. Mr. Bewley or Ms. Grainger, do you agree that you have used two -- and I think you misspoke, Mr. Houston, already, because the modellers didn't use 2017. So --

A Yeah. You're right. Two thousand -- 2016.

Q And so -- whatever.

Ms. Grainger, do you believe -- do you -- do you agree that you have -- that basically SRK have used 2013 to 2016 to capture some variability in flow conditions, but have failed to capture the multiple years of low flow in the 1975-to-2012 record, and that if base flow is reduced by drawdown and low flow occurs over multiple years, what happens to the fish?

A DR. BEWLEY: Can I -- Mr. Secord, this is Mr. Bewley again. Can I add some context to the series of low flows that you see on the graph in front of us? Primarily, you know, the 1980s.

So let's -- let's add some context when we discuss variability at a certain location. It's important that we discuss the period in question, so here from 1970. We've shown in other documents and maps -- and I can guide you to one if you'd like -- Gold Creek has been subject to a lot of anthropogenic disturbance, and by that we mean forestry and agricultural activity as well. And this was, we think, going on during this kind of, you know, first half of the period in which we see here.

So what that means is Gold Creek was more heavily forested in this early section. As those disturbances have escalated over time, then that would essentially explain why we're trending slightly upwards over the long-term period at Gold Creek.

If you -- do you want to see a map of disturbance? I can direct you there if you'd like.

Q What is the long-term MAD?
A It's around .66 --
Q And what does MA --
A -- depending on -- sorry.
Q What does it stand for? What does "MAD" stand for?
A "Mean annual discharge."

So .66 means 660 litres per second coming, on average, through the year.

Q Okay. All right. I think -- I think that's enough. Given the list of -- length of questions I have, Mr. Bewley, I'm -- I think I better press on if I'm going to ask them all.

So I think, Mr. Houston, this is -- you'll be happy to know this question's probably for you. The saturated backfill zones, SBZs or SBZs; rock dumps and

water management ponds; sedimentation and surge ponds; and the end-pit lake, or EPL, they will all be established on top of bedrock; is that correct?
A MR. HOUSTON: So all of the features are obviously on the site. We haven't done exhaustive geotechnical investigation at all of the sites. So some of the features we're going to want to go in before we do our detailed engineering and gather more information about the -- the subsurface conditions.
Q Sure. And in relation to -- I'm thinking in relation to the northeast sedimentation pond, the south -- sorry, the east sedimentation pond near some of my clients' properties, they would be established on residual soils basically covering the areas outside of the mine pit?
A Yeah. So I -- those are areas where we -- we need to do a -- a little bit more geotechnical investigation to determine just how -- how deep that goes. Those features will be something like 10 metres deep at their deepest point, and so we're -- we're going to have to do additional drilling to understand, you know, where is the bedrock in these areas.
Q And do you agree there is a lack of information regarding the physical and chemical nature of the bedrock below the mine footprint?
A I'm -- I'm not -- for what purpose, I -- I guess is the

question I --

Q Well, let's just take it one at a time. Let's say the east settling pond. Do you agree that there is a lack of information regarding the physical and chemical nature of the bedrock below the east settling -- the east sedimentation pond near Fran Gilmar's property?

A So it -- it depends on what you need the information for, Mr. Secord. If -- if it's for designing the pond and the dam, absolutely we need to gather more information to ensure that we build a safe structure, and that would be part of the dam design.

Is that the direction of your question?

Q I'm correct? There is a lack of information regarding the physical and chemical nature of these water management ponds that you're going to establish on the east side of the project area?

A Less chemical, more physical, but, yeah, we -- we would need more information to do a detailed design.

Q And -- and why -- why haven't you got that information?

A Well, many reasons. One, it's a disturbance on the landscape. Secondly, it's not required at this point in time. We're confident that understanding the general nature of the -- the terrain and the -- the geological setting, that a design can be achieved. But absolutely once -- once we get the go-ahead to go ahead with the project, we'll have to gather more information

to do the detailed design for those -- for those dams.
Q Do you agree that there is potential for trace elements to be mobilized from the underlying soil and bedrock -- for instance, the Fernie Group materials -- once the water management ponds are in place near Fran Gilmar's property and north of her property, the northeast sedimentation pond?
A By -- by virtue of having dug the ponds?
Q So do you --
A Is that what you're --
Q Exactly. Do you --
A No.
Q -- agree that there is a potential for trace elements to be mobilized from the underlying soil and bedrock materials once these water management ponds are in place?
A No. No, I wouldn't think so, Mr. Secord.
Q Yeah. But you already said, We don't know anything about the underlying soil and bedrock. So how can you say that?
A Well, because the interface between the -- the -- the base of the pond and -- and the water is a -- a finite area. It's -- it's not like the -- the -- the rock spoil pile, for example, where you've got millions of tonnes or thousands of tonnes of fractured rock.
What we're talking about is a -- a discrete pond,

and -- and if -- if we were to determine that there was a potential, we could always go to something like a pond liner or a clay base to the pond to -- to minimize any effects. Those -- those things are all things that we will analyze when we do the additional geotechnical work, and -- and they'll -- they'll inform the design of the ponds.

Q   Yeah. So I think you were already asked whether there were plans to prepare the grounds beneath these water management ponds, and I think you said that you would not be lining the structures. I think you --

A   Again, that -- that's -- that's our -- that's our preliminary assumptions based on what we understand about the geology of the area. We -- we believe these ponds are going to be sitting on bedrock, that it won't be highly fractured or -- or, you know, it's not going to be a really permeable base, and -- and so for the purpose of a sedimentation pond, that -- that doesn't seem to require a liner.

Q   But at this point, you don't know whether the bedrock contains fractured shale or sandstone in the areas of the ESP or NESP or SESP?

A   Yeah. So to be clear, the sedimentation ponds, Mr. Secord, are -- are going to contain water that is -- is not contaminated with any metals. It will be -- have a high sediment load. If some of that water

seeps into the groundwater, it's -- it's -- it's not something that would have an impact.
Q So yesterday you indicated that you would install liner -- liners for the gravel bed reactors; correct?
A Again, that's part of a gravel bed reactor design. That's -- that's a typical design for a gravel bed reactor, to have liners above and below the -- the -- the part that's filled with gravel. So that's a specific structure that would be designed to treat water.
Q So if you can do that for the gravel bed reactors, why can't you do it for the NESP, the ESP, and the SESP?
A We can do a lot of things, Mr. Secord. The question is whether it's required or not, needed to be protective of the environment, and -- and that's an assessment that -- our preliminary assessment is it's not required. But that will be reviewed when we get more geotechnical information in those areas.
Q So once the -- once the NESP, ESP, and SESP are in place, will water leach out picking up metals and taking them off to Gold Creek?
A Mr. Secord --
Q Maybe just do maybe one at a time.
A Okay.
Q Yeah.
A So the sedimentation ponds have clean water. It's --

it's no different than water falling on the ground today. It -- it's going to go -- move through the groundwater system, and -- and as you can plainly see, there's -- there's no leaching effect that happens naturally today. The --
Q Sorry. I don't understand that. I'm sorry.
A Okay. If a -- if a raindrop falls on the ground today --
Q Right.
A -- some of the -- the water goes into the groundwater. We agree on that --
Q Right.
A -- right?
Q Right. Right.
A Okay.
Q But -- so now you're -- now you're create -- now you're creating a structure on top of --
A Yeah.
Q -- on top of the ground at the NESP and ESP, for example? You're going --
A Yes.
Q -- to, then, impound water into that --
A Yes.
Q -- structure?
A Yes.
Q You're not going to line these structures. The

question, then, is: Is there potential for trace elements to be mobilized from the underlying soil and bedrock and to actually then pick -- you know, for this water to pick up metals and take them off to Gold Creek as it infiltrates through these unlined ponds? That's the question. I don't know whether it --
A Okay.
Q -- may be -- maybe a geochemist we might want to answer that for you. I don't know. Or maybe that's your expertise as well. I don't know.
A I'm -- I'm by no means an expert, but there is groundwater there. We've been talking about drawdown of the groundwater this morning. So today there is groundwater. That means there's water in contact with the rock beneath the areas where we'll put these ponds today, and Mother Nature doesn't seem to have a problem with that, so we're not doing -- we're not creating a new circumstance. There will be -- there is water there today; there will be water there when these structures are built.
Q But there's nothing like the amount of water that you're going to put in place. Now you're creating these artificial ponds at the NESP and ESP, and presumably this water is going to then slowly -- what is slowly -- basically is slowly going to leach out of these ponds into the underlying hydrological regime.

Is that what you're saying?
A It -- so the base of the pond -- the base of the ponds is within the groundwater zone, Mr. -- Mr. Secord. So the water's already there. Today the water is there.
Q Right?
A And -- and there's no leaching happening, at least none that Mother Nature can't manage.
Q You're going to be putting, though, a lot more water in place in those ponds, correct --
A It's not --
Q -- (INDISCERNIBLE - OVERLAPPING SPEAKERS) is there?
A It's not about the quantity. It's the fact that the rock is wet today, and so leaching is happening today, and -- and the rock will be wet tomorrow. So it -- it -- I don't know how else to explain it, Mr. Secord.
Q Am I not correct that the GoldSim model says the water in the ponds will be impacted by trace elements?
A Again, the -- the -- the sedimentation ponds -- no, you're not correct. That water is water that is not contact water. It doesn't have trace elements.
If you're talking about the surge pond, the specific function of the surge pond is a collection point for water that has been in contact with the waste rock dump and will have picked up trace elements like selenium in the waste rock dump.
Q And you would agree that Mother Nature is already

showing some trace elements in the groundwater based on Benga's baseline monitoring?

A Mr. Chair, in our baseline monitoring, we have detected some trace elements. That's not unusual in -- in topography like this.

Q How does the deficiency of information regarding the soil and bedrock beneath the mine pit, rock dumps, water management ponds, the NESP, ESP, and SESP, and the EPL provide the Joint Review Panel with any confidence that we actually know what will happen once everything is in place?

A Mr. Chair, I -- I think it's important to understand the difference between the decision in front of the Joint Review Panel today and the ongoing regulatory process that governs the -- the design and construction in particular of -- of ponds and -- and dams and other structures on -- on this mine.

Regulation doesn't end with the JRP decision. Regulation continues, and we will expect ongoing monitoring. We're going to expect to submit detailed design drawings to -- to the regulators for review and approval prior to construction. So the -- the regulation doesn't end with this decision, and we're not expecting this JRP to evaluate the design of a -- of our -- our water management structures.

MR. SECORD: Zoom Host, if you could please

turn up "Model Properties", Bullet Point 3, PDF 209 of CR 3 in CA -- CIAR Number 42.
A I missed the PDF page, Mr. Secord.
Q MR. SECORD: 22 -- 209. And it reads in part: (as read)

'K' decreases with depth due to increases in the lithostatic stress.

And am I correct, Ms. Grainger, that, put another way, the model assumes that 'K' decreases with depth as a result of the increase in lithostatic stress or pressure from the weight of the overlying rock?
A MS. GRAINGER: Yes, that's correct.
Q So you and I can agree that up to 430 metres of Grassy Mountain will be removed to gain access to the coal with waste rock being redistributed in dedicated dump areas?
A That's correct.
Q And you will agree that the removal of this overlying weight of material will cause k-values in underlying and adjacent formations to increase and, in some cases -- to increase in some cases and decrease in others; correct?
A I think it's -- it's probably debatable. This is -- relationship is not just based on the weight of the rock, but also the fact that shallower rocks are subjected to freeze-thaw cycles and develop joints

which increases the conductivity; right?
So just because we unload the rock and expose it and it's now at a shallowing depth doesn't necessarily mean that the 'K' would immediately increase according to its -- its new depth.
Q But it certainly could happen?
A It could. I think, you know, in terms of the numerical model, had we altered the conductivity, it would've affected a very small number of cells essentially in the shell of the mine, so -- because once you get far enough from the pit, they're still at -- at depth; right? So it would really only affect cells immediately adjacent to the mine pit.
And the net effect of that would be, I think, insignificant on the model results because it -- those -- that small rim, if you will, of higher conductivity values, if that occurred, would still be surrounded by a host rock of a lower conductivity that's ultimately going to determine groundwater flow conditions within the mine site.
Q So I think you answered my next question. This transient change in k-values -- this transient change in k-values has not been accommodated in the SRK model simulation?
A That's correct. It was not included in the model.
Q And then my understanding is that you've also answered

my next question based on your position as answering the questions on the model for SRK. Given that it has not been accommodated in the model simulation, your view is that this will not affect the model results regarding groundwater drawdown extent? That's your evidence?
A MR. HOUSTON: Mr. Secord, I think I heard the opposite, that it wasn't included because it wasn't considered to be a significant factor, not -- not that it wasn't included --
Q Okay. I think, Mr. Houston --
A So -- so --
Q Mr. Houston --
A Yeah.
Q -- you know, unfortunately, your interjections are delaying my cross-examination and taking up time that probably doesn't need to be taken up.
So I think it's pretty clear what Ms. Grainger's evidence is: The transient change in k-values has not been accommodated in the SRK model simulation. My question to her was very specific, really didn't need your interjection, and so I just want to get Ms. Grainger's answers.
Ms. Grainger, given that it has not been accommodated in the model simulation, I take it it's your evidence that it will not have any effect on the

SRK model results regarding groundwater drawdown extent?
A MS. GRAINGER: My evidence was that it would not have a significant influence on the predictions of the model.
Q Okay. So -- so it's not -- so thank you, Mr. Houston. You were right.
So it's the case of not -- so you're not saying it won't have any effect, but it -- the effect will not be significant. Do I have that right?
A That's correct. As I described, it would affect a -- a small rim -- you know, a narrow margin of rocks in the vicinity of the mine pit shell. The rock beyond would remain at the original conductivity values, and so, therefore, those lower conductivity host rocks, if you will, would ultimately determine the behaviour of groundwater and the drawdown predictions.
Q Okay. Thank you for that.
And my apologies, Mr. Houston, but that's not an invitation to jump in. Okay?
If we can turn into -- turn up Figure 3-4 on PDF page 214 of CR Number 3.
So here we have the SRK Figure 3-4, "Boundary Conditions"; correct, Ms. Grainger?
A Correct. I don't know if you want to bring up CIAR 70, PDF page 110. There was a revised version of this

figure provided.
Q I don't think we need to because I know that obviously the definition of -- and I'm familiar that they did change it 'cause you -- it's hard to read these constant headnotes and --
A Correct.
Q -- seepage notes.
But I'm more interested in the -- I -- the figure that really didn't change, which is in the bottom left-hand corner. That's what I'm really wanting you to focus on.
A Sure.
Q So in the lower left corner of Figure 3-4, the model configuration shows that the area of the mine pit is dealt with using inactive cells and does not show the presence of an excavation?
A That's correct.
Q And this is the SRK model's boundary conditions. Red cells are inactive from a flow perspective, but you still see "Topography" there; correct?
A Correct. But it -- it removes them from the influence of the model.
Q How does this model configuration impact the drawdown simulation results given that it is not reflecting the anticipated increase to local k-values beneath and adjacent to the mine pit once the weight of Grassy

Mountain has been removed?
A I believe we've discussed that already, Mr. Secord, that were we to accommodate a -- a change in conductivity in the model, it would affect, really, just the cells, as you can see, adjacent to the inactive ones, so a very small number of cells with respect to the entire model.
Q Okay.
A Did that answer your question?
Q I take it that's your view, and we've -- and we've discussed that earlier; correct?
A Correct. We've discussed that earlier.
Q If we could turn up PDF page 210, Figure 3-2 of CR Number 3. And this is the "Model Mesh"?
A Correct.
Q And if we look at the figure on the right-hand side, we -- it shows the 40-metre vertical meshing; correct?
A Yes, that's what's labelled there.
Q And the ground -- the SRK groundwater numerical model comprises nine layers that appear to be oriented in a horizontal manner, yet the formation in the area is tilted heavily toward the southwest; correct?
A Correct. So the layers are orientated in a relatively horizontal manner, but that was addressed through essentially applying -- and there's a figure -- if I can just find it. But applying the conductivities at

angles relative -- so on PDF page 212, and there are several diagrams that show -- sorry. I'll wait till it pulls up.

Yeah. So you can see there the orientations of the conductivity tensors that are shown. So although the units are -- appear to be flat-lying, the conductivity is orientated in such a way as to be representative of the structure of the -- the geological units.

Q How does the horizontal orientation of the SRK model layers affect the model outcomes?

A I think what's important is that the conductivities are orientated in such a way that -- that that's what's driving the flow in the model.

Q How does the draping of the model layers affect the model outcomes?

A Well, there was a structure superimposed. We can also look to a description of the geological model that was utilized and input into this and then, in fact, informed the orientation of these conductivity tensors throughout the model. So the geological model was used to represent Coal Seam 1 that was then applied throughout the model, and that orientation of Coal Seam 1 was, in fact, used to determine the orientation of the conductivity tensors. So although the model might appear simplistic with just horizontal layers, in

fact, the structure is -- is -- is reproduced within this model in that method.
Q If we could turn up the first full paragraph, PDF page 74 of CIAR 533 from Dr. Fennell's report.
And while we're -- while we're looking for that --
A MR. HOUSTON: Should that be 553, Mr. Secord?
Q It probably should. Yes. Thank you.
So, Ms. Grainger, in relation to your last answer, what about faults? I thought this was a fault-dominated model.
A MS. GRAINGER: Sorry. Mr. Secord, what would you -- with respect to faults, what would you like to -- me to explain?
Q I thought the area was fault-dominated.
A So there are -- sorry. I'm just going to find a figure. In CIAR 42, Consultant Report 3, PDF 257, there's a map that shows the distribution of the thrust faults that was -- that were mapped within the project site. These were considered in a separate sensitivity analysis of the model, so they were assessed by both increasing and decreasing the conductivity along these zones by two-and-a-half orders of magnitude. So this was a separate analysis to look at the impact of these significant or, you know, these known features and whether they have an effect on the model predictions.

So those are just the page up on 256, I believe. Geological structure at the bottom of the sensitivity table describes the results of both increasing and decreasing the conductivity along those structures and the effect that that had on the hydraulic head and the base flow. So it had a low effect by increasing the conductivity and -- on hydraulic head, but in all other cases, it was seen to be less than 5 percent difference to the model predictions.

Does that answer your question, Mr. Secord?

Q Yes. Thanks.

MR. SECORD: If we could turn up, Zoom Host, CIAR 553, PDF page 74. This is the Coalition submissions.

Q MR. SECORD: And just while we're waiting for that, Ms. Grainger, you would agree with me that the north-south faults were mapped to basically impede flow in an east-west direction? In the SRK model.

A MS. GRAINGER: They were considered in two different ways, as we've discussed. So the one way we've just reviewed, which was they were specifically evaluated as both a barrier and a conduit. So the effect of that was reviewed through the sensitivity analysis.

Q Okay.

MR. SECORD: Now, Zoom Host, are you able

to pull up 553, CIAR 553?
THE CHAIR: This appears to be 553. Is it not?
MR. SECORD: Oh, it is. I'm sorry. Thank you.
Q MR. SECORD: So in the first full paragraph, Dr. Fennell writes: (as read)
Similarly, the assumption of an average twenty -- of a 28 percent of mean annual precipitation map as a -- as the recharge input to the model is high given documented mountain front-block recharge estimates, i.e., a range of less than 1 percent to 38 percent with an average of around 11 percent and a geometric mean of around 6 percent.
And then he footnotes to a paper by Wilson and Guan. And if we could pull up Aid to Cross AQ Number 3. This is a paper by Wilson J. and Alan [sic] Guan, "Age 2004 Mountain-Block Hydrology and Mountain-Front Recharge". And, Ms. Grainger, have you reviewed this paper?
A MS. GRAINGER: I have reviewed this paper.
Q And do you take -- do you have any issue with Dr. Fennell's statement: (as read)
Similarly, the assumption of an average of 28 percent of mean annual precipitation MAP

as the recharge input to the model is high given documented mountain front block recharge estimates, i.e., range of less than 1 percent to 38 percent with an average of around 11 percent and a geometric mean of around 6 percent.

A I have concerns with the applicability of this paper to the project site. I note that the precipitation that's identified for the sites that are reviewed in this paper are generally considerably lower than we see at Grassy. I also note the geology is substantially different. These are typically volcanic and igneous rocks as opposed to sedimentary. So I have concerns about the applicability of this paper. And the -- the statistics that you quote, I haven't recalculated those.

Q So do you disagree that the values reported in the literature for mountain-front recharge are generally less than 28 percent, with an average of 11 percent and a geometric mean of 6 percent?

A I think what's relevant is: Despite my concerns, the -- the -- this paper identifies a range of percent recharge, which is in -- within the range that we have used in the numerical model.

Furthermore, I think what's important is that recharge was part of the calibration process in order

to reproduce, within a statistical range, the base
flows that are observed at Grassy Mountain. Recharge
was modified, and so the model is internally consistent
in terms of predicting base flow with the recharge that
was applied.
Q   Well, in fact, SRK have used recharge of in excess of
55 percent of the MAP in certain areas of the mine
site; correct?
A   Well, as we've reviewed this morning, it -- it varies
considerably across the model area.
Q   Okay. All right. Well, let's turn up PDF 21 --
page 213 of CR Number 3 and CIAR 42.
     So under the heading "Recharge", it states:
(as read)
     Recharge for precipitation and snow melt is
     applied on the top slice and is assumed to
     follow a similar relationship to that
     observed between MAP and elevation. Recharge
     rates were calibrated to the base and
     alternative calibration models that matched
     the base-flow estimates for Gold Creek,
     Blairmore Creek, and Daisy Creek for both
     steady-state and transient conditions. The
     two recharge distributions, linear and
     exponential, corresponding to the base and
     alternative calibration models are shown in

Figure 3-5. The base-case calibrated average recharge over the model domain is equivalent to 28 percent of MAP in both scenarios and is generally consistent with observed base flow in Blairmore and Gold Creeks.

What are "steady-state conditions", Ms. Grainger?
A "Steady-state conditions" are basically one set of conditions and then allowing the model to run to steady state, if that -- hopefully that answers your question.
Q And what are "transient conditions"?
A Well, the "transient conditions" are inputting changes during the model run. So those would be, for example, the variation in base flow that's seen seasonally.
Q Well, let's look again to the figure that you drew my attention to earlier, Figure 5 -- 3-5 at PDF page 215 of CR Number 3. This is the "Groundwater Recharge Distributions", Figure 3-5.
Now, which is the base-case calibration model and which is the alternate calibration model?
A I believe the base case is the linear model -- or linear recharge distribution, and then the alternative is the exponential.
Q And both the base-case calibration model and the alternative -- alternate calibration model used an average recharge of 28 percent of MAP; correct?
A Yes. That's what's stated in the report.

Q So let's just look at the recharge applied in the middle reaches of Gold Creek.
MR. SECORD: And is it possible, Zoom Master, to rotate the Figure 3-5 to the left? And can we expand it a little bit? Beautiful.
Q MR. SECORD: So if we look at the figure on the left, is that the base-case calibration, Ms. Grainger.
A MS. GRAINGER: I believe so, yes. That's linear distribution.
Q Right. And if we look at the area which comprises Gold Creek, do you agree that the recharge that the model is applying to that area is 450 to 550 millimetres of recharge or, put another way, greater than 55 percent of the mean annual precipitation for that catchment?
A Sorry. Can you remind me of the range that you were specifying?
Q The yellow.
A Well, that's a portion of the area, but not the entire catchment.
Q I'm just looking where Gold Creek -- where Gold Creek runs through the base-case calibration model area. I see that that area is covered, for the most part, with yellow.
So do you agree that in -- certainly in the middle

reaches of Gold Creek, the recharge applied is between 450 and 500 millimetres or greater than 55 percent of the mean annual precipitation?

A MR. HOUSTON: Can we just take a minute to consult, Mr. Chair?

A MS. GRAINGER: Mr. Secord, I think we spoke yesterday, but there's an area -- and I think that's the -- the area that is particularly high -- that was a clear-cut area. So recharge was increased by a factor of 2 within that area because of the lower evapotranspiration.

Q So the answer, then, Ms. Grainger, to my question is that in the base-case calibration model, the recharge applied to the middle reaches of Gold Creek is much higher than 28 percent; it is in the range of 450 to 550 millilitres [sic] or greater than 55 percent of the mean annual precipitation; is that correct?

A It is certainly higher in that area where it was deemed appropriate to increase the recharge because of the physical features, yes.

Q And certainly much higher than the numbers that are listed in the Guan article that we looked at a moment ago?

A Well, as I --

Q Well above the 38 percent number that was in the Guan article; is that fair?

A Sorry. Which number in the Guan article?
Q Well, you said -- you said a moment ago, Well, we're not doing too bad here, Benga; we -- we're within the range. I mean, we're 28 percent. The range is less than 1 to 38 percent.
So I'm just saying to you that in relation to the base-case model used by SRK, they are using a recharge of greater than 55 percent of the mean annual precipitation. That's even outside the range that you were noting earlier in my -- in response to that question about the Guan article; correct?
A So the 28 percent is on average across the site. That means there's areas that are lower and areas that are higher. I'm not familiar enough with the Wilson and Guan article to identify whether the ranges which are a maximum of 38 percent in that article, whether that's on the same basis of mean across an area or whether that was actually the maximum applied. But as I -- I noted previously, there are some concerns with the applicability of that paper to the site.
Q Okay. Would you agree that SRK have applied -- SRK, in its base-case calibration model, have applied too much recharge that will lower the effects of -- on the creek, specifically Gold Creek?
A So there's actually a sensitivity analysis with respect to changes in recharge, and I think what's significant

about the sensitivity analysis is, yes, the model is sensitive to recharge as a whole; however, the change is the same. The effect of the project on recharge is consistent percentage-wise regardless of the amount of -- of recharge. So if you increase recharge overall, there's still the same percentage change produced by the project, and I think that's significant.

Q Yeah.

MR. SECORD: Let's turn up that sensitivity analysis. Table C-20 at PDF 295 of CR Number 3. And it's at the bottom. And if you can maybe -- that's -- that's great. Maybe just a little less. There we go.

Q MR. SECORD: So this Table C-20 says, "Relative Difference Percentage Long-Term Closure Sensitivity Models to the Long-Term Closure Base-Case Model"; correct? That's the title of the Table 2 dash --

A Yes, I think that's the title. Yeah.

Q Yeah. And do you agree that recharge is driving everything in Table C-20?

A Well, I don't think it drives everything. I think that's inaccurate. But we agree that recharge is -- is significant in terms of base-flow outputs.

Q Can you please explain what the KR -- K/R ratio is in Table C-20 and what purpose it serves?

A Sorry. Just a second. What -- K-and-R ratio is increased. So that's both the conductivity and recharge are changed proportionally.
Q And what purpose does it serve?
A Well, conductivity and recharge are related. It often makes sense to test them in a related way because as you increase recharge, in order to maintain flow -- or heads within the groundwater table, usually you need to modify conductivity as well.
Q Do you agree that 'K' is not really that dominant in Table C-20 and that recharge is really the driving factor?
A I've indicated that, yes, we're well aware that the model sensitivity does identify that recharge is significant in terms of the model outputs with respect to base flow.
Q Now, I'm sure you or Mr. Jensen is aware that the SRK model is already predicting a 10 to 20 percent reduction in the base-flow contributions in seven out of ten reaches assessed for Blairmore Creek and Gold Creek? So you're aware of that? I mean, we can turn up Table 3-6, if you want, but you're aware of that?
A Yes, I'm aware.
Q Okay. So using this sensitivity analysis, using -- so if we go to reduction -- reducing the -- the recharge by 50 percent -- so this is the third-last line of

Table C-20, sensitivity 'R' reduced by 50 percent, it takes -- using 50 percent less recharge takes that 10 to 20 percent reduction down another 33 percent, correct, for the Gold Creek reaches?
A No. That's -- that's incorrect. So this is a relative percent difference that's identified in this table.
Q So what does that do -- so, for instance, on GC13, it's 36 percent; GC09, 33 percent; GC04, 34 percent; what does that mean in terms of -- what effect, then, does it have on the base flow contributions in seven out of the ten reaches assessed?
A Well, as I said, I think what's significant about this information is it shows a -- the similar effect if recharge -- sorry. I'm not stating that very clearly, but ...
The percent reduction base flow from pre-mining levels doesn't change significantly in the sense that we see the same change -- if recharge is increased across the board and then we apply the -- the effect of the project, we see a same change in base flow as we do in -- in the base case -- or our -- our -- the simulation that we've presented here.
Q So we've looked at the MAP for the entire Blairmore catchment is estimated at 179 millimetres, and Gold Creek is estimated at 77 -- 777 millimetres. And the model, as we know, has used this average of 28 percent.

We see -- we've looked at that Figure 3-5, which shows that in some -- in the middle reaches of Gold Creek, the -- the recharge is greater than 55 percent of the MAP. Can you tell me: How will this excess recharge along the Gold Creek Valley influence the drawdown extent calculated for the mine development?
A Sorry. I'm -- I'm unclear in your reference to "excess recharge".
Q Yeah. So how will this excess recharge along the Gold Creek Valley -- so the model isn't using an average of 28 percent; it's -- it's actually showing something like 50 -- 55 percent of the MAP. How will this excess recharge along the Gold Creek Valley influence the drawdown extent calculated for the mine development?
A Sorry. I'm not -- I'm still not understanding your question. I mean, the -- the --
Q Maybe -- maybe --
A Are you saying --
Q Maybe this question will be easier for you. Do you agree that this excess recharge along the Gold Creek Valley will make the drawdown extent calculated for the mine development smaller?
A Yeah. I'm afraid I'm unclear about what you're referring to with "excess recharge". So you're saying that the -- the re -- you're implying the recharge used in the model was too large? Is that --

Q Well, the SRK model, as I understand it, used an average of 28 percent; correct?
A Correct, across the entire model area.
Q Right. So we know looking at the Figure 3-5 that, in fact, in the middle reaches of Gold Creek the model is, in fact, using recharge of 55 percent of the MAP; correct? Or didn't you understand that from --
A Well, we haven't calculated what the average percent MAP is for just the Gold Creek catchment.
Q Right.
A I think that's what you're referring to; right? And you're suggesting that it would appear that it's probably larger than 28 percent.
Q Well, we know it is, Ms. Grainger. There's no question about that, is there?
A Well, I -- without having done the calculations, I'm -- I would reserve my opinion on that.
Q Well, how -- how --
A As I said, there are other areas where it's -- it's lower, so if we look at the entire catchment --
Q But that's not my -- that's not my question, Ms. Grainger. I'm talking about the Gold Creek Valley. And I wouldn't think you'd have to do too much in the way of calculation. You just have to look at the shading and the colours, all of which are over 28 percent, all of which are over the average. So how

would this excess recharge along the Gold Creek Valley influence the drawdown extent calculated for the mine development?
A And I guess the issue I have is the reference to "excess recharge". The reality is the -- the recharge that was applied was used to calibrate the model or the -- you know, the model was calibrated on recharge to produce the base flow that it observed on Gold Creek.
Q Do you agree that the 55 percent recharge applied to the -- of the MAP applied to the middle reaches of the Gold Creek Valley will make the drawdown extent calculated for the mine development smaller?
A Well, the -- the recharge was increased in certain areas in order that the model was able to reproduce within an acceptable range the base flow that is observed along Gold Creek.
Q Okay. Let's turn up table -- just before we break for lunch, let's turn up Table 3-6 at PDF page 250 of CR Number 3.
So this is the -- this is the monthly base-flow reduction baseline to LTC.
And, first of all, Ms. Grainger, perhaps you can help me with this. What is the significance of the shading on Table 3-6?
A Sure. The shading was applied, in my understanding,

just to highlight for each location the highest period of change.

Q So dark blue is the lowest change, and dark red is the highest change?

A Sorry. That -- that's correct.

Q Okay. And so if we look, for instance, at --

MR. SECORD: Maybe we can just pull up very briefly, Zoom Master, PDF page 80 and hydrology CR 4, Figure 42. That's -- yeah.

Q MR. SECORD: So we'll just -- we're just going to touch on this very briefly, but this is Figure 42, the water quality prediction model, and this shows stations GC13, GC10, GC4, and GC2 on Gold Creek; correct?

A Correct, I see those there.

Q And do you know where GC09 is located?

A MR. HOUSTON: Sorry?

Q GC09.

A MS. GRAINGER: Mr. Secord, I'm just trying to find another figure that would show those locations for you.

Q Sure.

A So on CIAR 42, Consultant Report Number 3, PDF 184, there's a figure, and it shows the Gold Creek stations there. So you were looking for, I believe, GC09?

Q Yeah, GC09.

A Yeah. So it's at the top of the page there.
Q Just below GC -- GC -- just below GC --
A 13.
Q 13; right?
A Correct.
Q So if we could go back, then, to PDF 250.
So in this table, we see, for instance, for Gold -- for Gold Creek, GC02, we see a 20 percent reduction in May, a 19.3 reduction in June, an 18.6 reduction in July, a 17.9 reduction in August, and a 17.4 reduction in September for that reach; correct?
A Yes, that's what's included in that table.
Q And this is basic -- this is, again, what the model has generated for essentially the reductions to the base flow or Gold Creek as a result of the mining operation; correct?
A Correct, at the time of long-term closure, yes.
Q Right. And we've already heard from Mr. Houston that in the months of September and October some reaches of Gold Creek have run dry on the surface. You heard him say that earlier today and yesterday; correct?
A Correct.
Q And then so if we look at September, if we look at the reaches, GC13, 9, 4, 2, and 1, we see reductions of 11 percent -- 11.1, 11.5, 8.6, 17.4, and 6 point -- 6.0 percent during those times of low flow; correct?

A That's the base-flow reduction at that time; correct.
Q Right. So then looking at your Table D-20, if you reduce recharge by 50 percent, do you agree that it will take these monthly base-flow numbers -- it will reduce them down another 33 percent?
So maybe I can help you. Putting it another way, SRK is already using 28 percent of the mean annual precipitation for annual recharge. If you take the 28 percent down by 50 percent to a 14 percent annual recharge, that then would result in a 36 percent to 33 percent reduction in the base flow in Gold Creek.
A So, Mr. Secord, my understanding of the data is that if recharge was reduced by 50 percent, that across the board -- and I -- it results in a reduction of 30 percent to these numbers or 35 as stated in the table.
Q Okay. Well, let's go back to the table. This is C-20 at PDF 295 at the bottom. And what are you referring to?
You're on mute. You're on mute.
A Sorry. If you change only recharge and reduce it by 50 percent, then you're applying those numbers, yes.
Q What numbers?
A The 30 -- the -- the numbers for GC13 of 36 percent, 33 percent, and so on.
Q Okay.

MR. SECORD: Mr. Chair, this would be a good time to break for our lunch if that's agreeable.

THE CHAIR: Yeah. That's fine. So it's a little after 12. We'll resume at 1 PM.

MR. SECORD: Thank you.

THE CHAIR: Thank you.

PROCEEDINGS ADJOURNED UNTIL 1:00 PM

Proceedings Taken via Remote Video

November 17, 2020	Afternoon Session
A. Bolton	The Chair
D. O'Gorman	Hearing Commissioner
H. Matthews	Hearing Commissioner
M. LaCasse	AER Counsel
B. Kapel Holden	AER Counsel
K. Lambrecht, QC	Joint Review Panel Secretariat Counsel
T. Utting	IAAC Staff
E. Arruda	AER Staff
D. Campbell	AER Staff
T. Turner	AER Staff
T. Wheaton	AER Staff
A. Shukalkina	AER Staff
M. Ignasiak	For Benga Mining Limited
C. Brinker	
R. Warden	For Ktunaxa Nation
T. Howard	

K. Poitras	For Métis Nation of Alberta Region 3
Chief B. Cote	For Shuswap Indian Band
B. Snow	For Stoney Nakoda Nations
R. Drummond S. McHugh	For Government of Canada
A. Gulamhusein	For Municipality of Crowsnest Pass
M. Niven, QC R. Barata J. Nijjer (Student-at-Law)	For MD of Ranchland No. 66
B. McGillivray	For Town of Pincher Creek
D. Yewchuk	For Canadian Parks and Wilderness Society, Southern Alberta Chapter
R. Secord I. Okoye	For Coalition of Alberta Wilderness Association, Grassy Mountain Group, Berdina Farms

	Ltd., Donkersgoed Feeder Limited, Sun Cured Alfalfa Cubes Inc., and Vern Emard
R. Cooke	For Crowsnest Conservation Society
G. Fitch, QC C. Agudelo	For Livingstone Landowners Group
M. Sawyer	For Timberwolf Wilderness Society and Mike Judd
(No Counsel)	For Barbara Janusz
(No Counsel)	For Jim Rennie
S. Elmeligi A. Morehouse S. Milligan M. Boyce	For Alberta Chapter of the Wildlife Society and the Canadian Section of the Wilderness Society
J. Gourlay-Vallance	For Eco-Elders for Climate Action
L. Peterson	For Trout Unlimited Canada

R. Campbell For Coal Association of Canada

(No Counsel) For Alistair Des Moulins

(No Counsel) For David McIntyre

(No Counsel) For Fred Bradley

(No Counsel) For Gail Des Moulins

(No Counsel) For Ken Allred
(Not Present)

(No Counsel) For Monica Field

S. Frank For Oldman Watershed Council
A. Hurly

C. Longacre CSR(A) Official Court Reporter

(PROCEEDINGS COMMENCED AT 12:59 PM)

THE CHAIR: Okay. Welcome back, everyone.
Mr. Secord, whenever you're ready, you can resume.

MR. IGNASIAK: He's just taking his dogs out, Mr. Chair.

THE CHAIR: I see that.

MR. SECORD: I had to get rid of the dogs. Sorry, sir.
THE CHAIR: No worries.
MR. SECORD: I have to say it's one of the beauties of doing a Zoom hearing. You know, I -- I have to say, I'm becoming a fan. I never thought I would say that, but ...
GARY HOUSTON, DANE MCCOY, MIKE YOUL, MIKE BARTLETT, CORY BETTLES, DAVID DEFOREST, SOREN JENSEN, MARTIN DAVIES, LEIF BURGE, DAN BEWLEY, Previously Affirmed
STEPHEN DAY, NANCY GRAINGER, Previously Sworn
Mr. Secord Cross-examines Benga Mining Limited
Q MR. SECORD: In any event, panel, if I -- if we could go to Mr. Houston's evidence about -- I guess maybe we could pull up Exhibit CR 3, PDF page 250.
MR. SECORD: Zoom Host, are you with us?
Thank you so much.
Q MR. SECORD: So, Mr. Houston, you mentioned earlier that one of the reaches of Gold Creek had essentially completely dried out in September of 2016. And with reference to what the model predicts to be the monthly base-flow reduction baseline to LTC, can you tell me, in relation to what of these river reaches or stations, that dry stretch was located nearest to, if

you could?
A MR. BETTLES: Mr. Secord, it's Cory Bettles. I'll respond to your -- your question.
The -- the -- the -- there's two locations near the town of -- the old historic town of Lille. The one that's documented is kind of right in the vicinity of the -- of the historic coal waste pile, kind of just upstream of Morin Creek tributary. And then there's a second one that is about -- about a kilometre just upstream of that as well that goes -- that -- that does go subsurface as well. And then more recently, as of this -- the last -- I don't know -- several months, we've actually documented a third location that does go to ground and is fully disconnected up near the -- the Gold Creek tributary GCT10 and 11.
Q Okay. So would that be -- so would that be between GC9 and C10?
A Mr. Chair, are you -- sorry. Mr. Secord, are you referring to near the town of Lille, the -- the first two examples I -- I shared?
Q So basically, Mr. Bettles, what I wanted to know is these reaches that Mr. Houston had indicated that had already dried up, which would -- which would be the nearest GC stations that we see on Table 3-6?
A Okay. Let me just -- I'm trying to find a map to go with that that --

Q Yeah. We --
A -- can be pulled up at the same time.
Q Yeah. We had that map.
A Can we -- can you -- can you share the map, and I can tell you which ones? That would be better to show you off -- I can point on the map exactly which -- that has the -- I just don't have that up in here.
Q Ms. Grainger, I think, had the page number.
A MS. GRAINGER: Yes. It's PDF page 184.
A MR. BETTLES: Yes, please. Can we go to 184, please? And can we scroll down a little bit, please? Thank you.
So if you -- if you look at the map, if you see there is a -- a "GC2".
Q Yeah. That would be Lille.
A Yeah. That is -- that is --
Q That would be near Lille.
A Yeah, exactly.
So the -- the first example I provided you, that is -- that is the documented location where we've identified it going to ground.
Q And is -- is -- is that the -- is that the one you just found this year?
A No, not -- that is not. This is the one we -- that represents the photos from September of 2016.
Q Okay.

A And then there is another location about a kilometre
upstream of GC02, so quite close in proximity, but just
upstream of GC02 in that -- in that -- in that area
that does go to ground as well.
And then the one from this year that we have
located is upstream above Caudron Creek near -- it's in
the vicinity of GC09, but it'll be a little bit further
upstream, I believe, of GC09.
Q Okay. So back to -- back to Table 3-6. So if we look
at -- if we look at GC02, in September of -- in
September, the model -- the monthly base-flow reduction
baseline to long-term closure shows a 17.4 percent
reduction in the base flow at Gold Creek at that
station; correct, Ms. Grainger?
A MS. GRAINGER: Yes, that's correct.
Q And this, of course, as we know, is based on SRK using
an average of 28 percent of the MAP for recharge. And
so based on our discussion just before lunch, using the
sensitivity analysis, if you apply a 33 percent
decrease on top of that, then you would see a --
basically a reduced flow of 24 percent at GC02 based on
the Table G- -- C-20, "Sensitivity Analysis"; correct?
A I think it is important to understand that the model is
developed and calibrated, and then the sensitivity
analysis is completed. And the sensitivity analysis is
completed by just changing one or two parameters as

have been described in the modelling report. So the model is technically not calibrated at that point to fully represent the system with that kind of recharge. So it's a guide. It gives us -- the value of the sensitivity analysis is it helps us to understand which parameters do have a significant influence on the model output. So certainly recharge, we understand, definitely has an effect on the model predictions.

However, we can't strictly take those numbers and then just apply them because to recalibrate the model and have it represent the hydraulic heads and the base-flow measurements that were observed within the project area, we would have to change other parameters as well in the model.

Q Well, I think you're -- I don't think you're right, Ms. Grainger. If we could go back to Table C-20, PDF page 295. And I think you've already given this evidence. Let's just go to the bottom.

So we have there GC02, which -- where we know -- where we already know that in 2016, that stretch of the Gold Creek had run dry, as we've seen in the photographs. So what this table shows that by -- by changing the model, which SRK used a 28 percent average annual recharge number, by reducing that to 14 percent, which Dr. Fennell says may still be too high, we see that for GC02, there will be a 33 percent reduction in the flow at GC02. That's what it's -- that's what it states in the third line from the bottom in Table C-20; correct?

A MR. HOUSTON: Mr. Secord, Mr. Chair, Ms. Grainger has been pretty clear here as the expert --

Q I -- I --

A -- related to these tables.

MR. SECORD: You know, I think, Mr. Chair, I'm going to ask for a ruling that Ms. Grainger answer the -- answer the question.

A MR. HOUSTON: And I'm just going to point out she --

MR. SECORD: I'm --

A MR. HOUSTON: -- already has, Mr. --

THE CHAIR: Mr. Houston.

A MR. HOUSTON: Yes. Okay.

THE CHAIR: Let Ms. Grainger answer, and if you want to supplement, you may.

A MS. GRAINGER: I believe your question, Mr. Secord, was that the -- the reduction of recharge by 50 percent when we only change that value in the model results in a 33 percent reduction of base flow at GC02.

Q MR. SECORD: So --

A My caution on applying that directly was that -- just to highlight that you are only changing one characteristic of a calibrated model which then renders the model no longer calibrated.

Q Sure. And I guess we can talk about whether the model was properly calibrated, and that's, you know, something obviously that Dr. Fennell will speak to.

But in terms of the actual reduction when we look -- turn to Table 3-6 for GC02, you would agree with me that by reducing the annual recharge from 28 percent to 14 percent, that would result, then, in a reduced flow at GC02, in September, of 24 percent; correct?

A That's -- that's not the intention of -- I think we're extending this analysis beyond its -- its useful purpose. So it highlights that certainly recharge is a -- a significant parameter in the model and does result in changes to base flow. I think to take this number and apply it to that table is incorrect.

Q That's what Table D-20 is doing, is it not? It's applying the -- it's applying that sensitivity analysis to all of the stations in the Gold Creek -- along Gold Creek that are listed there, correct, such as GC02?

A It's comparing the model output at each of these locations and calculating a relative percent difference in order that we can understand what the effect is of changing these parameters by the amounts indicated. That is the intent of this table.

Q Right. All right.

MR. SECORD: So if we could then turn up Dr. Fennell's errata sheet, CIAR Number 844. And if you could scroll down to Point Number 3.

Q MR. SECORD: So, Ms. Grainger, Dr. Fennell wrote in his report -- and I'm just going to read the first sentence so we don't have to jump back and forth, but this is at PDF page 78 of the Coalition evidence. And he writes: (as read)

> The SRK groundwater numerical model projects that drawdown effects will be limited to within 400 metres of the mine pit extent, Figure 3, left image.

And then this is the errata. He goes on to say: (as read)

> This is a difficult conclusion to align with, considering the concerns related to the model configuration and results of empirical formula calculations indicating impact distances anywhere from about 860 metres up to 1,880 metres over a 50-year time span using a k-value consistent with the geometric mean readings reported for the Mist Mountain Formation; i.e., 1.1 times 10-7M/S.

So he then says: (as read)

To correct for the expected increase in hydraulic conductivity following the removal of 430 metres of overlying mountain, a value of 3.1 times 10-7M/S was calculated using the depth relationship employed by SRK at page 38, along with an effective porosity of 5 percent to emulate fracture porosity and 40 metres of sustained drawdown from the mine pit.

So Dr. Fennell estimates -- estimates of the extent of the drawdown from the pit boundary using analytical equations indicate a much larger area of influence up to 1,880 metres over 50 years. How do you explain this discrepancy from the 400 metres projected by the SRK groundwater model?

A MR. HOUSTON: Mr. Chair, it seems to me that Dr. Fennell should be speaking to his work. I -- I don't -- I don't understand why we're being asked to speak to Dr. Fennell's evidence here.

Q I guess my question, Ms. Grainger, is: Why is only 400 metres being projected by the SRK groundwater model, whereas Dr. Fennell suggests that the impact distances could be anywhere from 860 to 1,880 metres? And I guess as a further question: Have you looked at this issue? I think in his initial report -- in his

initial report, I think he used the figure 1,500 metres, and I'm just wondering whether you've examined this at all?
A Again, Mr. Chairman, I don't think it's up to us to discuss Dr. Fennell's findings. That -- that should be something he defends when he's giving his own direct evidence. It's difficult for us to understand exactly what he's done and why he's done it.
Q Yeah. Well, Mr. Houston, are you a hydrogeologist?
A No. I'm -- I'm -- I'm the policy --
Q So -- so --
A -- witness. Yeah. So I'm -- I'm --
Q So I -- so I --
A I'm saying --
Q So I --
A I don't think we should be -- yeah. I don't think we should be defending Dr. Fennell's calculations. That's all.
Q No. No.
MR. IGNASIAK: Mr. Chair, I think the question can be rephrased to ask Ms. Grainger about her work in this area, but I would agree that asking her to interpret why Dr. Fennell's done something is -- it's not something she should be expected to testify to.
THE CHAIR: Okay. Mr. Secord?
MR. SECORD: Right.

Q MR. SECORD: Well, in Mr. -- in Dr. Fennell's initial report, he indicated that he thought there would be an impact distance of anywhere -- of up to 1,500 metres. He's since suggested that.

Ms. Grainger, have you done any work in this area to determine whether this 400 metres projected by SRK in its model may be understated?

A MS. GRAINGER: Well, I don't -- excuse me. I don't believe it's understated. I -- I believe it's the right order of magnitude, and the -- the reason that I think some interpretations might expect a larger area drawdown is a -- a simple calculation which looks at, essentially, a flat-line structure. And so drawdown propagates that outwards, kind of like a dish or a bowl, if you will, in a very simplistic way.

What we have to remember is that the structure of the units that we have has essentially tilted that on an angle at the project site, and therefore, the drawdown extends over a much smaller area than it would if it was in a -- a flatter setting, let's say.

And I have seen this in my experience working at prairie coal mines as compared to mountain coal mines. So we do see larger drawdown cones associated with prairie coal mines, where they have flatter structure of the geology. In mountain coal mines, the drawdown

is usually much tighter and doesn't extend as far.
Q And why does the tilt cause the area of impact to be less?
A Because of the contrast in conductivities. You've got different units one on top of another, and they all have different conductivities. Some are higher, and some are lower. But the net result is that it's difficult for the -- or for the drawdown to transmit from one unit to the next. As soon as it encounters a unit of lower permeability, it transmits much more slowly.
So the result is that the drawdown extends laterally within a unit, and because of the structure, as I've indicated, that's tilted on an angle that extends within the bed that is on an angle, and so in a map view, that's a very small distance.
Q And what angle is it tilted at in this case?
A I'll have to look up that number, if you require that. But we've shown it on our cross-sections in Consultant Report Number 3. I can refer to those.
Q And what about the faults of the fractures? How do they affect the projected distance in this tilted environment?
A Yeah. So CIAR 42, Consultant Report Number 3, there's a series of cross-sections starting on PDF 79.
Yeah. Sorry. We may have -- I don't know if we

can rotate it. But that shows -- I believe there's a vertical exaggeration applied to the figure so the dip of the units can't be directly measured, but it does illustrate the dipping nature of the bedrock units, and then there's a fault also illustrated on this feature, on this cross-section.
Q And where is the fault indicated?
A So you can see -- if you follow the Seam Number 4 shown in red, and you can actually see the displacement on Seam Number 4. If you follow it from the left-hand side, you can see that it -- it -- it goes up towards a fault; it terminates because the fault has then displaced both sides of the -- the fault block. So the side -- the rocks on the left-hand side have been moved upwards relative to the rocks on the left-hand side -- or the right-hand side, sorry, to the east.
Q All right. Let's turn to PDF page 194, Table 2-5 of CR 3. And we'll take a look at some of these hydro -- hydraulic conductivity values that you were talking about a moment ago.
Just could we go back to that figure that you were just looking at for a minute?
Ms. Grainger, does that show west-to-east faults?
A Those faults would -- the strike of the fault is north-south.
Q Okay. All right. Back to PDF page 194. So would you

agree that most of the hydraulic conductivity k-values used to constrain the groundwater model have focused on coal-bearing rocks?

A Yes, that's correct. We've stated that most of our testing focused on the coal-bearing rocks.

Q And this leaves many of the other formations, including those below the mine footprint, as unknown or unassessed?

A They're not completely unassessed, but there's limited data for the other units. Part of the reason we focused on the coal-bearing -- or the coal seams themselves is 'cause frequently they are the more permeable units within the sequence.

Q And what is a "slug test type"?

A A "slug test" is a test that's completed in a monitoring well where you create an instantaneous displacement of the water level, and then you measure the water level as it responds within that well, and then there are analyses that you conduct to -- you analyze that data to give you an assessment of the conductivity. So it's measuring horizontal conductivity.

Q All right. So if we go to page PDF 209, the first bullet of CR 3. And this is under "Model Properties" at the bottom -- sorry. The first bullet on page -- yeah, the first bullet on page 209. So it talks about:

(as read)

Hydraulic conductivities 'K' in bedrock parallel to bedding range between 6 times 10 to the 10 to 1.7 times 10 to the -- to the minus 7.

Table 3-1. K-values are constant within a given layer. This hydraulic testing generally targeted coal seams. The 'K' of the host rock is not completely characterized.

So does that go back to that earlier -- your earlier remark that basically many of the other formations, including those below the mine footprint, are basically unknown or unassessed for the most part?

A We have less data on them. The table that we were looking at just before -- I don't know if we can return to that, but there are packer tests in that table also, and the packer tests are completed over larger intervals within the core holes. So I believe the longest interval was 116 metres.

Q Yeah.

A And the nature of --

MR. SECORD: So we could scroll down, and, Zoom Host, maybe you could just maybe reduce it to -- there we go.

Q MR. SECORD: So we see the packer tests in

RGSC-004, for instance?
A MS. GRAINGER: Correct, and then -- and then further down.
So they just show the interval that was essentially used for the test, so the top and the bottom. And so they're over larger intervals. So although they reference the coal seam, they also include significant portions of the other units. So it's not perfect, but it does mean that substantially larger portions of the material were tested than just the coal seams themselves.
And the nature of these tests is that we get a response from the most conductive unit that is tested. So the lower permeability units would not essentially respond because they're too slow within the scale of the test. So these tend to give us a higher rather than a lower bound on the conductivity of the material that's tested.
Q Looking at that first bullet from PDF page 209. What is the host rock? What does it consist of in the project area?
A So the Mist Mountain Formation, which is the main unit, it's a -- a sequence of sandstone, mudstone, siltstone, shale, and then coal.
Q Okay. So regardless, k-values are given to the various nine layers of the groundwater model.

So if we could turn to PDF page 211 of CR Number 3.

So you'll see here you've got the linear recharge that would be the baseline model conditions; is that right?

A These are the calibrated conductivity values that were used in the model. So they reflect, after calibration, what the conductivities are in each of the units.

Q And the one below is the exponential recharge; correct?

A That's correct.

Q So regardless, as I say, k-values are given to the various nine layers in the SRK groundwater model. How can the JRP be confident that the model is accurately reflecting the transmissive capabilities of the rocks when there is little local information to describe the host rocks?

A Well, as I've indicated, the conductivity not -- test results not only come from discrete testing of the coal seams themselves but also from these longer intervals of testing. Conductivities would've been entered into the model, and then it was calibrated such that the model matches the hydraulic head observations that we have in the monitoring wells and the vibrating wire piezometers as well as the base-flow measurements.

Q So can you -- let's just take a look at Table 3-1, the "Calibrated Hydraulic Conductivity Value by Model

Layer". How were these first three numbers selected for K1, K2, and K3?

A So there's a process of calibration, which is described in the model report. So there's a systematic way in which the values are modified. So there would've been some values close to these, presumably, that was input into the model initially, and then they would do a series of iterations of runs. So if we go to page 216 in the PDF, it describes the model calibration process.

Q Let's go to --

A Does that answer your question?

Q No.

MR. SECORD: Let's go to page 209. And if we -- can you -- can you make it -- there we go. Keep going. Yes. This is the -- at the bottom of the page.

Q MR. SECORD: It says here: (as read)

> Table 3-1 and Figure 3.3 present the site 'K' data together with calibrated model k-values. Note that the values for the fractured bedrock incorporate the hydraulic barrier effects of the thrust faults in the K2 value which otherwise would be similar to K1.

So if we go back to Table 3-1 on PDF -- on PDF 211, is this saying, then, that for the first layer, the K2 value would be similar to K1 but for the hydraulic barrier effects of the thrust faults? Is that -- is

that correct?
A MS. GRAINGER: Yes. There's a -- generally about a half order of magnitude difference between K1 and K2; the lower one being in the east-west direction; the higher conductivity being in the north-south direction.
Q Okay. And so if we go back to Table -- to Table 2-5 at PDF page 194, we see the -- we see various k-values calculated for various monitoring wells; correct?
A Correct. These are the site data that was determined, yes, from the slug tests and the packer tests.
Q Right. So are numbers from the actual summary of the 'K' tests -- do they find themselves -- do -- are they allocated in some fashion to the figure on PDF page 211?
A So -- yes. As -- so there's several -- that's -- essentially what's described on 209 is there's a -- a set of assumptions that were used to order the variations in -- in conductivity. So one of them was -- as we've talked about, the K1 and K2 vary by about a half order of magnitude, and those are both higher than K3, so that's consistent within each layer. You can see that there's -- typically K3 is two orders of magnitude lower than K2, and then there's a half order of magnitude difference between K1 and K2.
In addition, as was outlined on page 209, it talks about conductivity decreasing, and there's an -- an

equation that was used to reduce it by depth.

Q Okay.

A So we go from Layer 1 to Layer 2. Layer 2 has lower conductivity overall than Layer 1.

Q Okay. So can you tell me: What was the justification for selecting 2.7E-07 for Layer 1 for K1? I'd like to just go over that first row and just understand what was the rationale and -- you know, given the limited number of 'K' tests that we see, you know, in that summary of 'K' tests -- and there really aren't very many monitoring well tests. Most of them are in coal. I'm just wondering: What was the -- you know, why was that number selected? What was the rationale? What's the backup? Is there averaging? I'm just trying to understand how you -- obviously you didn't do this, but how did SRK pick these first three numbers for Layer 1?

A So these are not the numbers they would've picked. So, for example, they would've, as I described, set up initial values on that basis of using the relationships between K1 and K2 and K3 and the different layers. They would've input those into the model and run the model, and then they would've began a systematic process through calibration of varying certain parameters at a time in order to replicate the hydraulic head measurements at all of the -- the monitoring wells and the vibrating wire piezometers,

and then also to replicate, as best as they could have the model do, the base-flow observations.
So it's -- it's an iterative and lengthy process, and the values that we see here is the final calibrated model -- in this case for the linear recharge scenario -- that best fits all of the data that we have, the hydraulic heads and the base-flow measurements.
Q So the first layer is 40 metres, correct --
A That's correct.
Q -- each of these --
And if we look at Table 2-5, the summary of 'K' tests that's on page -- there we go. So if we look here at the screened intervals, would I -- would it be correct that Monitoring Well 15-12-7 would be in that first layer?
A So these are not applied in that manner. We can talk about surficial deposits, the first one, because the surficial deposits are not explicitly included into the model. But it's not a matter of taking by depth the physical measurements and then applying them to the layer that corresponds to that depth. The full data set was looked at on a -- a -- a conductivity-versus-depth basis, and that was the relationship that was then applied to the model.
Q Well, Table 2-5 is the full data set. This is the

summary of 'K' tests that were conducted for the model; correct?
A This is the conductivity tests that were completed as part of the study.
Q This is all of them? This is all of the 'K' tests that were performed for the purpose of SRK constructing its model?
A Well, that were -- yes, it's all of the available conductivity data.
Q Right. And so for the first layer, as I look at this, the only data that you have for the first layer of the model would be the first four well ID numbers here? Once you get into the Mist Mountain Formation, you're below -- 40 metres below ground surface; correct?
A Sorry. It -- it varies depending on location. We can see -- oh, sorry. MW1406-32, for example, is in the Mist Mountain Formation and is at a depth that's shallower than 40 metres.
Q Sure. But there's not a lot in that first 40-metre -- that first 40-metre interval. So, again, I'm just trying to understand. When I look at these 'K' numbers in Table 2-5, I just don't see how you get from those numbers to Table 3-1 and these calibrated hydraulic conductivity values for the first layer. That's, I guess -- just wondering whether you can help me with that, if there's any correlation between what was

actually recorded and what SRK used in its model?
A Well, I would say that all of this information was used, and it was pooled. It's just not used directly as in, We measured this value, at this depth, at this location, and so, therefore, it's directly applied into the model in -- in the same manner. It's -- it's pooled -- there was a -- an interpretation made of depth relationship to conductivity, and that's what was applied into the model. So the -- resulting -- I think if you review these conductivity results with those that were applied in the model, the ranges are consistent.
Q If we could turn up, please, PDF page 55 of CR 3.
Just while we're pulling that up, Ms. Grainger, just one question about the model. Benga's removing the coal, so how are the k-values in the coal relevant to the model?
A Would you like me to answer that question right away, Mr. Secord?
Q Sure. Sure.
A Sure. So the -- I mean, the pit is being advanced into the coal, and so, therefore, those units are the ones that we are most interested in because that is where the pit is being developed and -- and where drawdown is being propagated from.
Q Okay. If we could scroll down, please, to the second

paragraph under "Assessment Results". So this paragraph starts: (as read)

Groundwater residence time, travel time to the creeks from the LTC scenario is predicted to be mostly greater than ten years.

Then the part that I'm interested is in the next sentence: (as read)

The groundwater modelled with the longest residence time, greater than 50 years, is close to the topographic highs, and the shortest, less than 20 years, are close to the topographic lows.

And in terms of the -- you understand what the "LTC" definition is, Ms. Grainger?

A "Long-term closure", yes.

Q Right. It's representing the completed open pit with in-pit backfilling, saturated rock fill, and open-pit lake, and a reclaimed surface water management system?

A Correct.

Q That's the -- yeah.

If we could please turn up PDF page 112 of CR Number 3. And this is the Table 5.3-9, "Predicted Groundwater Travel Time to Creek Discharge for LTC". And if we go to the legend below, there is a heading "Mean Lifetime Expectancy Per Year"; correct, Ms. Grainger?

A That's correct.
Q And the green is the 50 to 100, and then we have a lime green at 20 to 50, and yellow from 10 to 20?
A That's correct.
Q Could you please explain what is meant -- what is meant by "mean life expectancy" using your terminology or Millennium's terminology?
A Well, the travel time represents the time it would take for water at the location that's shown -- groundwater at the location that it's shown to migrate to the nearest creek following the groundwater flow pathways. So obviously closer to the creeks, travel time is short, and as we get more distant from the creeks, then travel time is much longer.
Q Okay. So the residence time or mean life expectancy, to use your terminology, that's one and the same?
A Yeah. I just -- you referred to it as the "travel time", but ...
Q Okay. So maybe I'll just use that, then. The travel time of groundwater is stated as being in excess of 50 years over most of the model domain represented by the turquoise colour?
MR. SECORD: So we go -- maybe we can reduce that to -- maybe to 50 percent. Let's reduce it to 50 percent. There we go. Maybe even 20 -- yeah. Perfect.

Q MR. SECORD: So would you agree that the travel time of groundwater is stated as being in excess of 50 years over most of the model domain represented by the turquoise colour?
A I believe that's what we read just before in the -- in the paragraph previously, correct.
Q And with values of less than 20 years in the valley bottoms?
A Yeah, the --
Q That would be -- that -- that would be represented by the yellow colour?
A Yes, the yellow colour would represent 10- to 20-year travel time.
Q Right. So less than 20 would be the yellow; right?
A Or red, yes.
Q Right. Okay.
Now, the ponds on the east side of the mine footprint, the NESP and the ESP near Fran Gilmar and the SESP located south of Fran Gilmar and, I guess, to the west of the Donkersgoeds, are located in some of the areas where transit times are listed as zero to ten years; is that correct?
A Yes, I think that's correct.
Q And so is it going to be -- are we talking zero years or one year or nine years or ...
A Well, it's -- it's a range. So obviously if it's, you

know, in the red zone but close to the yellow boundary, then it would be closer to ten years. And if it's closer to the creek, then it's -- it's some number less than that, but it's a range within that area, and it -- it varies linearly; right? So ...

Q So where the travel times are listed as zero to ten years, does that lead to concerns that seepage of contaminants to Gold Creek will occur?

A Well, I believe we were talking about the sedimentation ponds which we've talked about this morning in that there aren't any concerns with respect to the water quality from the sedimentation ponds.

Q But these red areas encompass more than the NESP, ESPs, and SESPs; correct? These red areas are far more -- cover far more territory than those structures?

A MR. HOUSTON: Mr. Chair, can we just take a minute to have a discussion here?

Apologies, Mr. Secord. Could you repeat the question -- the last question?

Q Okay. We can see in the -- in this figure the areas where the travel times are zero to ten years. The areas that are sitting in red, let's say in the area where the ESP and SESP were located, is the -- is the travel time zero years, or is it ten years?

A MS. GRAINGER: It's somewhere between those two values. So, I mean, the -- this map is not intended to show precisely at every location what the travel time is. It's intended to give an indication of the areas where it is short, as you pointed out, and -- and other areas where it is much longer under the long-term closure conditions.

Q Okay. And where you have these travel times listed as zero to ten years, does that lead to concerns that seepage of contaminants to Gold Creek will occur from the mine site area shaded with these short travel time [sic]?

A Well, it was part of the evaluation, so our assessment looked specifically at where there could be sources. So, for example, the rock disposal areas, which is the section that we were reading from previously that you quoted, that was specifically looking at concerns related to the rock disposal areas and where those are located and what the travel time is from those areas towards the creek. With respect to the sedimentation ponds, there isn't a concern with respect to contamination, particularly under the long-term closure scenario, so ...

Q And this is the -- this is the long-term disposal -- the long-term closure scenario here in Figure 5.3-9; correct?

A Yes.

Q This is showing -- this is showing what the travel

times will be at long-term closure?
A Correct. I think we should understand too -- and I -- I just looked, and I can't see it in the modelling report, but we've only produced this map for long-term closure, not under baseline conditions. But I would expect quite a large portion of the areas, in fact, unchanged between current conditions and the long-term closure.
Q Okay. Now, do you agree that hydraulic conductivity testing of monitoring wells only provides an idea of the transmissive properties of the soil or rock in a very small area around the monitoring well?
A Yes, that's accurate.
Q Do you agree that the accuracy of k-values is very important when modelling the effects of drawdown and residence or travel times?
A Conductivity is certainly an important parameter in a numerical model.
Q Do you agree that when longer term pumping tests are conducted, the k-values obtained are often higher, sometimes by an order of magnitude?
A Yes. That presumes that you were able to conduct pumping tests. As we've seen, a lot of the conductivities in the rocks here at the site are -- are -- and low, and therefore, pumping tests would just be impractical, unfortunately.

Q Is it correct that Benga did not do any pumping tests to better constrain the k-values used in the SRK groundwater numerical model?
A There was one pumping test that was completed from a flowing core hole that gave us some information, but as I've indicated in general, it was -- it was just not simply possible to do pumping tests in lower permeability rocks.
Q Was it attempted? Did Millennium attempt to do any pump -- any other -- any other pumping tests other than the one that was done?
A Since the application was submitted, we have undertaken some limited pumping tests, which don't change our -- our understanding of the conductivity of the materials on the property in any substantive way.
Q Okay. And was that data given to SRK?
A No. This was work that was undertaken subsequent to the model being completed, but as I said, it -- it doesn't change our interpretation of the conductivity of the materials on the site.
Q Okay. So going back to PDF page 55 of CR Number 3, I had read you the passage about travel times being greater than 50 years and less than 50 years. It's the next sentence I want to focus on: (as read)

Therefore, most basal leakage from the waste rock dumps would reside in the groundwater

system for a duration that substantially
exceeds the critical residence time to
attenuate any selenium.
A Yes. I see that there.
Q What is the justification for this statement given that no transport and fate modelling was done?
A The justification was based on observations from the site. We collected data at water that was emanating from historical mining, like old rock piles and so on, which did not contain elevated concentrations of selenium, and from information from other sites. So that's summarized in the preceding text.
Q And how does this statement in this sentence apply to other constituents, such as arsenic, chromium, mercury, or cobalt that might be mobilized?
A Well, in general, I mean, fundamentally, those weren't specifically looked at within the assessment, as there weren't concerns identified with those parameters specifically, but metals frequently do absorb -- absorb to particles during transport and can be attenuated in a very general sense.
Q Now, Benga indicates that the dominant pathways for groundwater flow in the project area are faults and fractures in the rock; correct?
A Correct. That is our understanding.
Q What work did Benga do to map or better understand

these important features in the area of the proposed
mine as well as areas beneath the solid and liquid
waste management areas?
A So we looked this morning at the significant thrust
faults that have been mapped at the project site.
We've also talked this morning in regards to additional
work that would be done in specific areas as needed in
order to better characterize the underlying rock.
Q Did Benga do any lineament mapping, fracture
orientation assessments, or borehole televiewer
surveys?
A MR. HOUSTON: Just give us a minute,
Mr. Chair. We'll -- we'll ...
A MS. GRAINGER: Mr. Secord, to the best of my
knowledge, those analyses were not completed at this
time.
Q Did Benga do any pumping tests and monitoring of
bedrock wells to determine if there was evidence of
hydraulic connectivity between the areas where the
waste solids and liquids will be stored, and local
water features?
A So as I mentioned just previously, there was one
pumping test that was completed; however, it was not
for that purpose.
Q So why not, then?
A Well, I think, as we've talked about also, the

conductivities are generally low, and pumping tests are -- are not practical in rocks that have these lower conductivities.

Q Okay. So Benga indicates that if faults are encountered that present a risk as acting as pathways for groundwater flow and contaminant movement, the mitigation will be to seal them off. Do you agree that visual identification of faults in the mine workings will not likely be possible due to the obscuring by residual fines and rock fragments?

A Mr. Secord, I'd have to look up the reference, but there is a -- a response to a -- an information request where we did provide some additional information that discussed geophysical techniques and overhead imaging techniques and other approaches to identify and map the orientations of fractures at the site in -- in areas such as the mine specifically and also at the rock disposal areas.

Q So similarly, do you agree that on the outside of the mine footprint, rock dumps and water management ponds will be established in areas covered by soil, also obscuring any faults present?

A MR. HOUSTON: Maybe I could take that one, Mr. Secord --

Q Sure.

A -- if you don't mind.

Q And take -- and take -- take the one before as well, Mr. Houston.
A Sure. Sure. Sure. So before we develop the ex-pit rock dumps, we're going to strip all of the topsoil and the trees, and -- and we will do additional investigation to, as -- as Ms. Grainger pointed out, to more -- more precisely map out any -- any fault structures in -- underneath those areas. So that -- that work will all be done as part of the mine development.
Q So back to Ms. Grainger. Do you agree that the placement of any monitoring well could very well miss these obscured features?
A MS. GRAINGER: Well, that is part of the intent of doing the analysis and it would be considered in the monitoring well placement. We've also talked in some of our IR responses about some of the different approaches we can use during monitoring well installation in order to identify fracture zones within a -- a borehole and target those for monitoring.
Q How will Benga ensure that all faults and fractures are identified and monitored accordingly so that no contaminants bypass the surveillance system and reach Blairmore and Gold Creeks?
A Well, I -- I -- I think it would be impractical to monitor all faults and fractures; however, the intent

would be to monitor downgradient immediately in the area of the rock disposal areas, for example, and to collect information there at a representative number of locations and also to monitor upstream of the receptors. And, again, we've -- we've provided additional detail and description of the monitoring plans.
Q Okay. And in relation to the -- the ESP, what -- what -- what would be downgradient of the ESP? Where would that monitoring well go, Ms. Grainger?
A I might just need a minute or two to pull up a map, if that's all right.
Q I'm thinking of Ms. Gilmar at her property enjoying the water from the springs and Gold Creek.
A MR. HOUSTON: Mr. Secord, just to be clear, the ESP is a settlement -- sedimentation pond, and so --
Q I understand that, but it's going to be aboveground. I'm just wondering what is --
A Yes.
Q -- downgradient -- what is downgradient from the ESP? That's the only question --
A Yeah.
Q -- outstanding. I --
A Yeah, I know.
Q I understand -- I understand you're saying,

Everything's going to be wonderful; nothing's going to be mobilized. But I just want to know what downgradient is, and we'll leave that -- we'll leave the debate over what might be coming Ms. Gilmar's way or the way of the fish for a little later, when I talk to your geochemist.

A Okay. I -- I -- I just wasn't sure that -- that you were clear that that's a sedimentation pond that doesn't have contact water in it. It's got water with high sediment loads.

A MS. GRAINGER: So on CIAR 313, Addendum 11, PDF page 311. I'll just wait till that comes up, but there -- there is a map that was provided, and it illustrates locations of monitoring wells. And there are two, in fact, planned downgradient of the east sediment pond.

Q What page is it? 311?

A Yes, 311.

Q Maybe while the Zoom master is getting Addendum 11, picked out -- oh, he's there already. 311.

A Yeah. If you just scroll down a little bit further, you can see "east sediment pond". Yeah. A little too far. Sorry. Just back up a little bit. Yeah. Now we're right near the top of -- right of the figure.

So there is, in fact, an existing monitoring well in that area, and then there are two additional wells that are proposed.

Q So basically that's -- that is -- let me just -- just bear with me for a second.

So essentially the monitoring wells -- the one MW5 would be essentially directly above Fran Gilmar's property in the southwest of 30, and then MW5-2 would be basically on the north -- basically the northeast corner of her property and the northwest corner of Vern Emard's property; correct?

A I'll have to take your word on that. I -- yes.

A MR. HOUSTON: I -- I can confirm that, Mr. Secord.

Q Okay. Thank you.

All right. So let's go to my next question. I had to scroll up.

So I'm not sure who, Mr. Houston, is best to handle this. Does Benga agree that sealing off faults and fractures is a tricky activity? So that's the -- that's Part 1 of the question. And then the second part is probably over to Ms. Grainger, which is: And if successful, can result in changes to local groundwater flow patterns? I suppose it may be a hydrogeological question in its entirety in terms of, you know, putting in grout curtains, you know, when you think about, you know, some of the efforts that have polluters -- that polluters have gone to to try and prevent contamination from, you know, migrating off of their properties. So maybe it's entirely to Ms. Grainger.

Do you agree that sealing off faults and fractures is a tricky activity and, if successful, can result in changes to local groundwater flow patterns?

A MR. HOUSTON: So maybe I'll start, and Ms. Grainger can add to that, Mr. Secord. We -- we don't expect to find anything dramatic in these areas that we're -- we're talking about the -- the ex-pit rock dumps, I think, are we not?

Q No.

A Okay. Maybe I misunderstood the question, then.

Q Yeah. So the -- the general -- the general question was that: Will Benga ensure that all faults and fractures are identified and monitored accordingly so that no contaminants bypass the surveillance system and reach Blairmore and Gold Creeks? Okay? That was the -- and then we have Ms. Grainger, who showed us where there are a number of monitoring wells. Presumably those monitoring wells, they were -- the two new ones that were put in downgradient from the ESP where -- to the north of where my clients Gilmar and Emard live were put there for a purpose.

So the question was: Will Benga ensure that all faults and fractures are identified and monitored accordingly so that no contaminants bypass the surveillance system and reach Blairmore and Gold Creeks?

So I'm assuming that you're going to look at those monitoring wells, and if there are contaminants in MW5-1 or MW5-2, you're going to do something about that. Or did you put them there just for the -- just because you could? I don't know. Why did you put them there?

A So I -- again, I -- I think the -- the -- the rigour, I guess, that one would invest in sealing or otherwise dealing with faults and fractures would -- would depend on the expected consequences associated with that.

So directly with respect to Ms. Gilmar's property, we're -- we're talking about a sedimentation pond and the -- the opportunity for water in the sedimentation pond to be -- well, it -- it won't be contact water. And -- and so seepage of that water is a fairly benign issue. So -- so I wouldn't expect to invest a lot of time and -- and money in sealing off fractures. Although we would -- we would want to understand that the pond is -- you know, and it's got a solid bottom on it.

Q Why were these two monitoring wells put in downgradient from the ESP? What was the purpose of that, Ms. Grainger?

A MS. GRAINGER: I think they were identified as low risk, but it also demonstrates that there isn't an impact to groundwater quality, so that is the intent of this location. I can reference we have provided a description of the groundwater monitoring program and response plan which would, you know -- in all cases of groundwater monitoring wells, we would be looking at the groundwater quality data, comparing it against thresholds, and in the event of a -- you know, increasing trends or values that exceed certain thresholds, there would be a response plan and actions undertaken. So that's across the board regardless of location, but in this instance, the sedimentation ponds, as have been described, are low risk, but proactively some monitoring was identified in order to demonstrate that there isn't an impact to groundwater quality in those areas.

Q Okay. Back to you, Mr. Houston, then. I think you really thought that the sealing off of faults and fractures would be, I guess, in areas around the rock -- the rock pit areas? Do I understand that? Is that where -- is that where they're really more concerned to seal off faults and fractures?

A MR. HOUSTON: Certainly the more -- more effort is required to investigate the -- the ground underneath the rock dumps and to ensure ourselves, you

know, that all the organic material's stripped off. We're going to construct subdrains. We're going to do a number of things to try to facilitate the extraction of water that seeps through those rock dumps, which would be contact water.
Q So if you are successful in sealing off faults and fractures, can that result in changes to local groundwater flow patterns, Ms. Grainger?
A MS. GRAINGER: I think it would just depend on the significance of the groundwater movement that was occurring along that fault or fracture. I don't know if that answers your question.
Q Do you agree that this could alter contaminant-movement patterns and reduce the effectiveness of monitoring wells positioned to detect releases from mine-related structures and waste management areas?
A So if I understand you, you're asking if by sealing faults and fractures that would reduce the effectiveness of our monitoring program?
Q Yes. That could reduce the effectiveness of monitoring wells positioned to detect releases from mine-related structures and waste management areas?
A Well, my understanding would be that by sealing the faults or fractures, if they were providing a significant pathway for groundwater movement, that that would require the groundwater to then move more through

the matrix of the rock as opposed to through fractures or faults. It would move more slowly, and it would make -- it would slow groundwater movement. It doesn't necessarily affect the effectiveness of the groundwater monitoring program. It's just going to result in some changes and slow the groundwater movement potentially.

Q How will Benga determine the best locations to place monitoring wells to ensure their continued effectiveness once installed?

A MR. HOUSTON: So that's -- I was just going to jump in and add on to Ms. Grainger's response and -- and comment that once we've done our investigation, and -- and I'm talking about the ex-pit rock dumps and -- and done the work that we're required to do there, that -- that would inform the location of the -- final location of the monitoring wells. So the -- the -- the whole thing comes as a package, Mr. Secord, and we -- we would use the best information we have after that detailed investigation to perform the work underneath the ex-pit rock dump and -- and to locate the monitoring wells.

Q Yeah. Monitoring wells typically consist of small diameter PVC pipes installed in 6-inch boreholes. Given the size of the structures to be monitored and the dominant control that faults and fractures are anticipated to have on groundwater flow directions,

what spacing of monitoring wells is Benga proposing to ensure that contaminant plumes are detected?
A MS. GRAINGER: I don't think it's so much a question of spacing. Monitoring wells have been located in all instances downgradient of potential sources, and as we've discussed, they will be located targeting preferential flow pathways once those have been defined.
Q But you would agree that sealing fractures could push groundwater away from installed monitoring wells, Ms. Grainger?
A Well, I think the -- as Mr. Houston has discussed, the intent is to look at this wholistically, so we would investigate, determine the locations of any significant faults or fractures. There would be a determination on which ones were going to be sealed, if any; and then based on that, we would select the locations for the monitoring wells.
Q Now, surge and sedimentation ponds, as well as waste rock dumps, are to be established in upslope locations to provide suitable setback from Blairmore and Gold Creeks; correct?
A MR. HOUSTON: So they'll be located in appropriate locations. All of the structures are a hundred metres or more from Gold Creek and Blairmore Creek.

Q Do you agree that being situated at a higher elevation will result in a driving head of water that will push any mobilized contaminants downward through the base of these structures and into the underlying rock and fracture systems?
A MS. GRAINGER: Mr. Secord, these structures are planned to be lined, so there is a -- the surge ponds.
A MR. HOUSTON: Just a minute, Mr. Chair.
Q I think you're wrong, Ms. Grainger. The sediment ponds are not being lined, at least not as -- as of this morning's evidence.
A MS. GRAINGER: My apologies, Mr. Secord. I thought we were talking about the surge ponds, not the sedimentation ponds.
Q My question is: Surge and sediment ponds as well as waste rock dumps are to be established on -- in upslope locations to provide suitable setback from Blairmore and Gold Creeks. And then -- so that -- I think the answer was yes. And then do you agree that being situated at higher elevation will result in a driving head of water that will push any mobilized contaminants downward through the base of these structures and into the underlying rock and fractures systems?
A MR. HOUSTON: So, Mr. Secord, the sedimentation ponds and the surge ponds will -- will

be, let's say, 10 or more metres indepth, and so I would expect that there -- yes, there -- there could be a -- a hydraulic head created around those ponds, and that would have a -- a limited effect on -- on pushing groundwater downslope.

Q Do you agree that it is unclear how deep contaminants will migrate before moving laterally so there is considerable risk that they will eventually reach Blairmore Creek and Gold Creek undetected?

A MS. GRAINGER: Generally speaking, Mr. Secord, the -- any contaminants would migrate downwards towards the water table and then migrate in the water table following the groundwater flow path, so that would be a combination of downwards and lateral. It's not just down and then straight across. It -- it would move through the unsaturated zone, if there is such an unsaturated zone beneath the structure, such as there is at some of the rock disposal areas, for example, and then once reaching the water table, would move in a combination of downwards and lateral.

Q Do you agree that considerable faith is being placed by Benga on the groundwater monitoring? So how will Benga guarantee nothing is missed and any impacts are mitigated prior to and not after causing an adverse effect?

A MR. HOUSTON: So, Mr. Secord, first of all, the monitoring program that we've proposed is a layered program. As Ms. Grainger pointed out, we'll have monitoring wells adjacent to most of the structures. We'll have additional groundwater monitoring wells adjacent to the receiving environment, i.e., the creeks, and -- and I think what's really important to remember is the slow speed at which change occurs in the groundwater environment. It -- we're talking about changes on the -- on the scale of years, and so we would expect to see at the monitoring wells a very, very slow change in -- if -- if there was seepage and there was a contaminant issue, very, very slow change in concentrations commensurate from the movement of water in that environment.

I guess a third layer, Mr. Secord, will be the monitoring of the water in the creeks itself, and -- and that is another layer of monitoring where we would expect any changes to occur very, very slowly, and certainly giving sufficient time for a change in strategies if required.

Q Okay. If we could turn up CIAR 42, Section E, PDF page 126, and this is Heading E.6.3.1.3.2, "Potential Changes in Water Quality", and the authors write: (as read)

As the mine progresses through operations, there's the potential for changes to sediment and water quality variables that may have chronic or lethal acute effects on aquatic biota if they have the potential to enter the aquatic ecosystem.

And then if we could turn up PDF page 216 of CR 3. And this is under Heading 3.5, "Model Calibration", the last paragraph. It says: (as read)

The overall calibration approach provides an estimate of the regional 'K', storativity, and recharge values; however, although calibration is considered reasonable for larger scale approximations, models may exhibit large uncertainties at the local scale due to localized heterogeneities not recognized or incorporated into the larger model.

How does this caveat provide confidence to the Joint Review Panel that the SRK model is generating accurate and reasonable results that significantly influence ramifications for base-flow reductions and waste assimilation calculations both during mine development and post closure?

A MS. GRAINGER: Mr. Secord, I can just speak to the model and the localized heterogeneities and -- and that specific piece.

So my understanding is your concern is: How do we have confidence in the model given that there are some uncertainties at specific locations? And that's a function of the -- the model. It cannot accurately represent -- it is a -- any model is a simplification of a very complex system. It provides us an overall understanding, and we believe it's representative in terms of the base-flow reductions that are predicted. Could there be variations at a specific location? Potentially. But the overall understanding and -- and predictions, we believe, are informative and do give us confidence in completing the assessment.

Q And does this model factor in climate change?

A Climate change isn't explicitly incorporated into the model. The model was calibrated, and as we've talked significantly about, the sensitivity analyses -- and that would be one manner in which potential changes, such as climate changes and those effects -- could be understood in terms of the model predictions, so specifically recharge, which we've looked at earlier.

So if there's a change in recharge due to climate, how would that affect the model? And the conclusions were that the change resulting from the project itself was consistent regardless of whether there was a change in the overall amount of -- of recharge. So what I mean is if a base-flow reduction of 10 percent was predicted with the recharge that was used, that -- that

10 percent base-flow reduction would be maintained even if recharge was reduced or greater.

MR. SECORD: Mr. Chair, I am going to move on to a new area of questioning. You'll be happy to know my questions on hydrogeology are over. I intend to move into questions on groundwater/surface water interaction and mine water balance, and then I have a further area on geochemistry.

I wonder whether we should give the court reporter a break now before I move into this new area?

THE CHAIR: I think that's a good idea, Mr. Secord. I was about to suggest that.

So it's 2:30. We'll break till 2:45. And just by way of time, depending on how we account for yesterday's head start, if I'm generous, I'm going to say you have probably about an hour and a half left of your allocated time, Mr. Secord. I don't know how well that works for your other questions, but just keep that in mind.

MR. SECORD: Okay. Thank you. I'm hoping you might give me another half hour, but I'll do my best, sir, and obviously I know we -- Mr. Yewchuk was -- he was very efficient yesterday, so it's a difficult process estimating time, and --

THE CHAIR: Yeah. Understood.

MR. SECORD: -- also with, you know, the

responses. So I guess I'll see where I get. I did have those climate-change questions left over. I've got those at the end, so -- but I'll do my best. Hopefully I can get the job done in the time allocated.

THE CHAIR: Okay. Thank you.

MR. SECORD: I will do my best.

THE CHAIR: Okay. Thank you.

We'll see everybody after the break.

(ADJOURNMENT)

THE CHAIR: Okay. Go ahead, Mr. Secord.

MR. SECORD: Thank you, sir.

And just to be clear, you'd like me to be completed by 4:15, if at all possible?

THE CHAIR: Yeah. As I said, Mr. Secord, I'll be flexible. I just want you to try and, you know, continue to be efficient, and, you know, the goal is to wrap you up today and hopefully not go too, too late.

MR. SECORD: Sure. I really appreciate that, sir.

Q MR. SECORD: So these next set of questions are on groundwater/surface water interaction and mine water balance.

I think, Ms. Grainger, do you agree there is no indication of how areas of groundwater contribution to streamflows were identified and quantified in Blairmore

and Gold Creeks?
A MS. GRAINGER: Sorry, Mr. Secord. Can you rephrase the question perhaps. I'm not understanding what you're asking.
Q Do you agree that there is no indication of how the areas of groundwater contribution to streamflows were identified and quantified in Blairmore Creek and Gold Creek?
A From my perspective, there were -- you're correct in that there were not specific -- we didn't map exactly where and how much base-flow recharge was occurring along Blairmore and Gold Creeks. The base flow was estimated by reach.
Q Please turn up PDF page 236 of Appendix 10 of CIAR 42. This is the water and load balance model. Appendix 10B.
A What was the PDF number, Mr. Secord?
Q 236. This is under "Model Description", and then 3.2, "Scenarios", and Item 3, "Worst case for water quality": (as read)

> The "worst case" predictions was run using the upper-limit source terms with average hydrological conditions.

And maybe just to put this in context, maybe, Mr. Jensen, this -- maybe this is you. The model -- under 3.1, the "Model Platform and Time Scale", the water balance and quality model for the Grassy Mountain

Project was developed using the GoldSim software package, Version 11.1, GoldSim Technology Group 2014. So: (as read)

The water balance and load-modelling work done to support this application indicates that the worst case predictions were based on upper-limit source terms and average hydrological conditions.

Mr. Jensen, how is using average hydrological conditions considered "worst case" when extreme or upper-limit conditions would be more appropriate.

A MR. DAY: Mr. Secord, I think I -- I kind -- I think I understand your question, but could you -- which part of it are you -- are you asking about the combination with the average hydrological conditions or which part?

Q Exactly. So the worst-case predictions was run using the upper-limit source terms with average hydrological conditions. So how is using average hydrological conditions considered worst case when extreme or upper-limit conditions would be more appropriate?

A I think we'll need to confer for a moment on who should respond to this question.

A MR. JENSEN: Good to go?

So, Mr. Secord, I will -- I'll answer this question. It's Soren -- Soren Jensen here.

When we talk about the different -- the -- the model scenarios that are listed in Table 3.1, we specifically -- when we talk about a worst-case water quality scenario, what we're looking at there, we're looking at it as opposed to the base-case water quality scenario. And when we look at water quality, what really drives the difference in water quality is the range of possible -- I -- I won't say "likely", but the range of possible water quality conditions, which are driven by the source terms much more so than any -- any sort of hydrological variability we might -- we might encounter.

So, you know, a lot of the times we're looking at sort of an order of magnitude difference in source terms, and we want to -- we want to fixate the -- the assessment of water quality -- the potential water quality outcomes. We want to look at those through the lens of how do -- how do base-case source terms or the expected source terms -- how do they stand up or how do they compare to the worst-case source terms. So what we do is we fix the hydrology, and then we look at that dimension.

So I hope that answers your question. Like, it -- it's an examination of the effect of different source term assumptions.

Q Okay. Let's turn up PDF page 236 of Appendix 10B. So

we're right there. And I read to you from Section 3.1 about the use of the GoldSim software package. So the GoldSim software package is used to predict water quality impacts, yet there is no description of how the model was set up in the application documents.
Why is that?

And do you agree, Mr. Jensen, it is important to communicate how a model is set up so that others can review its efficacy?

A So I would -- I would respond to that by saying that the GoldSim model is really nothing other than a graphical user interface on -- on a spreadsheet model. It's nothing we couldn't do in a spreadsheet that -- that -- or there's nothing you can do in GoldSim that you couldn't do in a spreadsheet. So it really is more a matter of, you know, I -- I -- the -- the assumptions we've stated, the inputs we've used, and the model assumptions we've used to arrive at our model results are stated. You know, so we're happy to -- to discuss them. We didn't prepare the -- the model code itself for distribution, but, you know, an experienced modeller would be able to look at our inputs here and -- and replicate our results.

THE CHAIR: Sorry to interrupt. I just want to check. I think we've lost Mr. Matthews. So I just want to give him an opportunity to reconnect before we continue.

Mr. Matthews is just trying to reconnect. Let's just take a minute.

MS. ARRUDA: Mr. Chair, I believe we have Mr. Matthews on the phone now while he's trying to reconnect his audio and video through Skype.

THE CHAIR: Okay. Mr. Matthews, can you hear us?

Mr. Matthews, can you hear us?

MR. MATTHEWS: Hello.

THE CHAIR: Okay. Can you hear us okay, Mr. Matthews?

MR. MATTHEWS: Yeah, I can hear you fine. Can you hear me?

THE CHAIR: Yeah. Okay. So we'll proceed while you try and log back in on your video.

MR. MATTHEWS: Okay. I'll just listen on the phone.

THE CHAIR: Thanks.

Sorry, Mr. Secord. Please proceed.

MR. SECORD: Thank you, Mr. Chair.

Welcome back, Mr. Matthews.

Q MR. SECORD: So, Mr. Jensen, are you saying we are using a spreadsheet to understand water quality and the fate of the westslope cutthroat trout?

A MR. JENSEN: Well, in as far as we're using math, I mean, the -- the -- the type of computations that go into this model you could do equally well in the spreadsheet as you -- as you can in a GoldSim model, the mechanics -- the conceptual model and the mechanics of the computations are all the same, whether --

Q Do you agree?

A Irrespective of -- of if you calculate it by hand or in a spreadsheet or -- or in GoldSim. It -- it doesn't make a difference.

Q Do you agree that the GoldSim model used in this report also identifies some constituents in Blairmore and Gold Creeks approaching or exceeding chronic guidelines for the protection of freshwater aquatic life? These include aluminum, ammonium, cobalt, selenium, and mercury.

A Mr. Secord, that would be a question for my -- for my biology colleagues who handled the -- the aquatic toxicity aspects of this project.

Q And who are they?

A That would be Martin Davies.

Q And is he there?

A Yes.

Do you -- do you want to take it, Martin?

A MR. DAVIES: Yeah, I can.

A MR. JENSEN: Okay.

A MR. DAVIES: Hi, Mr. Secord.
I -- I will need to look that up, but from what you've said, it sounds correct.
Q Are you with SRK?
A I am, yes. I'm -- I don't work with SRK. I mean I'm in the same room as SRK, but ...
Q Okay. Okay. This is the SRK water and load balance model.
Are you familiar with the appendices essentially -- they're not bookmarked for some strange reason, but are you familiar that in Appendix 10B there is something called an "Appendix D3", which is the Blairmore Creek water quality projections from PDF 309 to 334, and in Appendix D4 of Appendix DP -- of Appendix 10B of -- of CIAR 42 --
A Yeah.
Q -- whereas the Gold Creek water quality projections from PDF pages 335 to 360, have you taken a look at those?
A MR. HOUSTON: So, Mr. Secord, I -- I think we're -- we're just a little bit confused about what the question is. So in terms of --
Q Well, there's --
A No. Yeah. No.
Q There's no question.
A Yeah. Okay.

Q There's no question yet.
A Yeah. No. So I just want to make sure we have the right person talking with you. If it's with regard to the numbers that were generated and what the values are under various scenarios, that's the person who ran the model, which would be Mr. Jensen, supported by others. If it's with regard to what is the health effect on the fishies [sic] downstream, Mr. Davies could be more appropriate. And -- and so I -- you know, I'm just not sure where you're going with your question.
Q Okay. So what I'm -- what I'm looking at is the SRK data, and I'm particularly interested in some of these water quality projections that are in these appendices. So perhaps what we could do, maybe, is just turn up -- let's take a look at aluminum.
A Do you have a PDF page, Mr. Secord?
Q I do. PDF page 337. And I'm looking at BLO2. Sorry. I'm sorry. I've got -- this is -- this should be GC -- this is -- should be GC10; right? It's so hard to read, but this doesn't look -- this doesn't look right. Are we on 337? We are.
A So this is Gold Creek --
Q Yeah, it is.
A -- values here.
Q I've got to pull up my document 'cause, unfortunately, it's really hard to see on the Zoom screen here. So

I'm going to pull up my document.
MR. SECORD: All right. Okay. So I'm sorry, Zoom Host. So the first document I want to take a look at is PDF page 311. And this is the Blairmore Creek 02 reach, and this is the second graph -- sorry. Yeah. The -- it would be the third -- the third graph here. So BC -- there we go. BL02. My apologies.
Q MR. SECORD: So I'm not sure who's going to answer this question, but as I understand it, the GoldSim modelling is predicting that the aluminum concentration in Blairmore Creek at its peak between 2039 and 2043 will be point -- approaching .045 milligrams per litre; correct?
A Yes, that -- that's correct.
Q And would you agree, subject to check, that the FWAL is point -- 0.05 for aluminum? Do you know what the FWAL is?
A I believe that's correct.
Q Okay. So do I understand, then, that this -- that the GoldSim modelling is projecting that the aluminum levels in Blair [sic] Creek will be essentially approaching the FW -- can we call it the "FWAL" for aluminum?
A MR. HOUSTON: So, Mr. Chair, we -- we have recognized in our reporting that a number of metals approach or even -- even marginally exceed -- and I'm

not talking about selenium, but other metals, like aluminum, zinc, they approach or even exceed allowable guidelines. And what we've proposed in our -- our project is that as -- as we get a better handle on what the final values may be, it's -- it's important to remember that these values are calculated based on conservative assumptions and early data. It's also important to recognize that the buildup occurs over 15 or 20 years. And so as we get a better appreciation based on real-world experience with the mine, we'll possibly need to implement a metal treatment plant, which we've committed to as part of our application, if required.
Q And if we turn up to PDF page 325. And this is the second graph here showing BC07, "Ammonium Concentration Milligrams Per Litre". Can we agree that in this reach of Blairmore Creek, the ammonium level reaches 5 milligrams per litre --
A That's what the --
Q -- Mr. Jensen?
A That's what the modelling shows.
Q Right. Yeah. And then can we agree that this -- the maximum level that -- where it reaches a peak of 5 milligrams per litre in 2039 is well over the 1.5-milligram-per-litre threshold in the 2014 and 2018 Alberta Environment guidelines?

That would be a question for the Hatfield witness.
A We're just confirming that, Mr. Secord. One minute.
MR. SECORD: Maybe while they're conferring, Zoom Master, would you turn up AQ1 AEP environmental quality surface water guidelines from 2014?
Q MR. SECORD: This is the Coalition aid to cross. So it's -- this is described as "AQ Number 1, Coalition AEP Environmental Quality Surface Waters 2014 Water Topics". That's not it.
A MR. HOUSTON: Mr. Secord, we're going to have to get back to you on the question around ammonia. It's going to take a little bit of time for us to look things up. So what I understand you want to know is whether these predictions exceed the water quality parameters for Blairmore Creek.
Q Okay. That's great. I've produced an aid to cross here, which are the AEP environmental quality surface water guidelines for 2014. Those were the guidelines that SRK used in the -- in the GoldSim model; correct?
A MR. JENSEN: Mr. Secord, I'm just reminding myself whether we did put in guidelines 'cause the way the workflow worked in -- in this model assessment is that we -- we did the characterization of site, compiled the inputs, completed the model, and the model results then were handed off to Hatfield for an

assessment of --
Q Okay.
A -- potential aquatic effects. So let me --
Q So the --
A Let me just --
Q So the Hatfield witness can just confirm these are the guidelines that Hatfield used to determine whether some of these metals were above or below the FWAL guidelines; is that correct?
A MR. DAVIES: Yeah, that would be correct, Mr. Secord.
MR. SECORD: Can we mark this as the next exhibit?
THE CHAIR: Any concerns, Mr. Ignasiak?
MR. IGNASIAK: No, sir.
THE CHAIR: Okay. Do we have a number?
MS. ARRUDA: Elaine Arruda here. The next CIAR number is 849.
THE CHAIR: Thank you.
EXHIBIT CIAR 849 - AQ#1 - COALITION - AEP ENVIRONMENTALQUALITYSURFACEWATERS - 2014 - WATER TOPICS
MR. SECORD: And then can we pull up AQ Number 2, Coalition AEP environmental quality surface water guidelines, March 28, 2018?
Q MR. SECORD: And perhaps I can ask the

Hatfield witness: Have these guidelines superseded the 2014 guidelines?
A   MR. HOUSTON: Mr. Secord, we're -- we're going to have to take an undertaking to get a response on the ammonia question.
Q   I'm not asking that question now.
A   Okay.
Q   Mr. Houston, you're behind.
A   Okay.
Q   So I think the question -- I think we've already got that undertaking.
A   Okay.
Q   But the next question was the -- this aid to cross, the 2018 Alberta government environmental quality guidelines for Alberta surface waters, this document has now superseded the 2014 guidelines that have been marked as CIAR 849; correct? That would be a question for Hatfield.
A   MR. DAVIES: Yes, that's correct.
MR. SECORD: And can we mark this as CIAR -- the next CIAR exhibit?
THE CHAIR: Mr. Ignasiak, no concerns?
MR. IGNASIAK: No concerns.
THE CHAIR: Okay. Can we get a number?
MS. ARRUDA: Mr. Chair, that will be CIAR 850.

THE CHAIR: Thank you.

EXHIBIT CIAR 850 - AQ#2 - COALITION - AEP ENVIRONMENTALQUALITYSURFACEWATERS - MAR28 - 2018 - WATER TOPICS

MR. SECORD: All right. And then if we could turn to PDF page 357 of the GoldSim projections. This is Appendix 10B in CIAR 42. We're at page 357. So can we have the -- the GC02 graph -- you're going to have to scroll down. Right.

Q MR. SECORD: So I believe this is the stretch or the area of Gold Creek that had previously been identified as having dried out in September of 2016. And if we look at this model projection, it shows that starting in 2037, the selenium levels move up to .002 and then remain above .002 up and to the end of 2099. Can you confirm that this -- the selenium FWAL is .001 milligram per litre?

A MR. DAVIES: No. It's .002 milligram -- or, yeah, 002 milligrams per litre, 2 micrograms per litre.

Q Well, I don't think you're right. Let's go to -- let's go to --

A Mr. Secord, it's PDF page 35.

Q No. Let's go to Table B8, "Dissolved Metal Results", page 137 of CR Number 3 of CIR -- CIAR 42. Perhaps you haven't seen this document, Mr. Davies. 137.

All right. So you have identified as Exhibit A49 the 2014 FWAL ESRD aquatic life guidelines. On this table, the FWAL for selenium is .001.
A Yes. That's not exactly correct. There's -- if you look in the 2018 guidelines document that's also an aid to cross there, you'll see that there's two -- there -- there's a guideline of 2 micrograms per litre and there's an alert concentration of 1 microgram per litre, and that 1 microgram per litre value is intended to use in high-risk environments where there's a high risk of selenium accumulation through selenium cycling in the environment.
Q So you're --
A But in this case, that is not the case.
Q So you're saying this Millennium document, this Table B8, "Dissolved Metals Results", the number that's recorded there as the FWAL is incorrect?
A They've used an overly conservative number. The number that they should've used that would apply to this case would be .002.
Q Okay. So back to the previous document. The GC02 selenium is above .002, the level -- the FWAL level from two thousand and -- approximately 2041 through to 2099? It's above the FWAL?
A MR. HOUSTON: This -- Mr. Secord, this -- this graph has been updated. This -- this particular

graph reflects the possibility of having the in-pit lake outflow into Gold Creek which has since been shelved, so we're not -- we're not doing that. So there -- there is a new graph in -- I believe it's Addendum 10. Is it Addendum 10? Yeah. We're just confirming that. But it's in Addendum 10. We redid all of these graphs based on another information request, and Gold Creek remains below .002 micro -- milligrams per litre or 2 micrograms per litre.

Q Do you have that reference?

A We're -- we're looking for it.

Q Maybe I'll just carry on, and you can give that to me.

A We -- we have it, Mr. Secord, so why don't we just close this off?

Q Sure.

A Can you just do it, Mike?

A MR. BARTLETT: Mr. Chair, it's Registry Document 313. PDF page 250 is the relevant information request, and there's a series of figures that speak to these updates.

Q Okay. Thank you.

So given the -- these numbers and the updated numbers, do you agree that there is a likelihood that the contaminant levels could be higher than reported if mitigation techniques are not as effective as -- as -- as hoped for?

A MR. JENSEN: So, Mr. Secord, as we sort of clearly state in the -- in the introduction to this -- this model assessment and -- and, indeed, the purpose of this model assessment is to define what's required in terms of mitigation, that's -- that's -- I would say that's the primary purpose of this model assessment.
So, you know -- and we also clearly state in our -- in our assumption and, indeed, in the conclusions that -- that the design basis that we derived based on these model results need to be met; otherwise -- otherwise, yes, the -- the projections that we include in this model assessment here wouldn't apply. So it's -- it's -- it's a bit of a circular argument in that sense.
Q Now --
A MR. HOUSTON: If I could just add to that, Mr. Secord, just add to that answer a little bit. We -- we have provided Plan B and Plan C. Of course we've talked about the saturated backfill zone as the primary treatment for selenium, for example. But we -- we have -- we have provided other backup plans, including a commitment to install a -- a -- a water treatment plant or a gravel bed reactor, if -- if necessary, to run in parallel or -- or in -- in -- in replacement of the saturated backfill zone.
Q Okay. So given that the GoldSim modelling is showing

that contaminant levels in both the water management structures and creeks will be approaching or exceeding Alberta's chronic guidelines for the protection of aquatic life, you mentioned, I guess -- you indicated that water treatment may be required or will be required?
A So we have to understand that the -- the predictions of the model are based on conservative assumptions that are yet to be realized, and so we have -- we have committed that, for example, if arsenic is -- is a metal of concern and over the early years of operation appears to be exceeding requirements, that we will install a water treatment plant to -- to deal with that issue and the -- and so -- so we have committed to that.
We have --
Q Okay.
A -- also committed to backup plans if the saturated backfill zone, which is treating things like nitrogen, ammonia, and selenium, is -- is not -- not operating as expected.
Q And do you agree that the proposed method is to use lime that will result in a high-density sludge?
A One minute.
A MR. JENSEN: Yeah. I mean, when -- when we looked at the model results generated to date, and,

again, in the spirit of defining mitigation measures, it -- it would appear -- it appeared at the time that some dissolved metals might be of concern. So the use of high-density sludge treatment, lime treatment is -- is -- I would call it the standard. It -- it's a very common approach for -- for treating for -- for removing dissolved metals, so that's what we've proposed.

Q So it is unclear how this treatment sludge will be disposed of. Where does Benga plan on disposing this -- of this sludge, and what will be the risk to groundwater and surface water from the disposal of the sludge?

A MR. HOUSTON: Mr. Chair, using -- using this water treatment process that Mr. Jensen has proposed, this -- this is a standard kind of process that you might find in -- in sewage treatment plants or other industrial applications.

We would -- if and when we need to implement the metals treatment plant, we'll work with -- we'll -- we'll -- we'll develop a plan for properly disposing of the sludge, which -- which would be similar to what you would find in -- in another treatment plant of the -- of the same type.

Q So if we could turn to PDF page 240 of Appendix 10B of CIAR 42. It states here in this first bullet: (as read)

Waste rock hydrology was simplified. Runoff from waste rock disposal areas was assumed to accumulate in the waste rock pile and seep out once the pile had wet up and field capacity of 3 percent had been reached.

After the storage capacity of the waste rock was reached, runoff from the area responds immediately to changes in precipitation.

Why was a field capacity of 3 percent selected, and what is Benga's justification for selecting that value?

A MR. JENSEN: Well, it's -- it's -- first of all, it -- Mr. Secord, I would say that it correctly should've stated a -- an increase in 3 percent is -- is the number that was used to -- and -- and it was -- it was selected as a -- I'd say a very conservative number. Typically, I mean, for this type of waste rock, we might expect to see field capacities -- you know, we might expect to see mine of -- run of mine rock come in at around 3 percent in situ as it is, and then it might increase to somewhere in the neighbourhood of -- of 8 to maybe 11 percent, depending on the -- the material, the characteristics of the material.

In this case, we -- we elected to assign a value of 3 percent sort of above what it comes in with to be conservative 'cause that means that waste rock seepage

would emerge that much earlier --
Q So --
A -- in our modelling. So it's really just a conservative assumption.
Q So what did it come in at? You said it -- you said that it should have read -- you increased it by 3 percent?
A Yeah.
Q What was the number that you increased?
A Well, I mean, typically it comes in at 3 percent already. What we're interested in is how much more water will be retained in the waste rock mass before it starts to drain. So the 3 percent -- the 3 percent is -- is -- is the additional moisture or additional water that needs to be added to the waste rock before it starts to drain freely.
Q If a higher value, like 5 percent or 10 percent, had been selected, how would this have affected model outputs and mine water balances?
A It would just take that much longer before the seepage would start to emerge from the toe of the waste rock dump.
Q Okay.
A So any effect that you see represented in the model would -- would be delayed by, you know, the corresponding amount of time.

Q All right. So I'd like to now move to geochemistry questions.
So Benga chose to only model dissolved concentrations of contaminants and not total concentrations; is that correct? This may be for Mr. Stephen Day, but ...
A MR. DAY: Yeah, I can -- I can answer that, Mr. Secord. Yeah, so the -- the modelling that we do is intended to understand what happens when rock starts to break -- when it kind of weathers and breaks down. And those processes are creating soluble minerals that go into solution, and so that -- or that -- so the -- the water that's inside the waste rock is -- contains dissolved concentrations. It's only when that emerges that you get erosion occurring that adds to the -- the suspended load and makes --
Q Right.
A -- makes up the total. So that's -- that's why we -- when we do the -- what we call a "source term prediction", we focus on the dissolved concentrations.
Q Do you agree that the use of total concentrations would've been more conservative and reflective of the effluent that will discharge from the mine water management structures?
A Soren, I think maybe you -- could you speak to how the -- 'cause, I mean, usually what we do is we add the

load from the dissolved to the -- to the totals from the background areas. Could you speak to that, please?
A MR. JENSEN: Yeah, I can. I just need one minute here to -- actually, I -- no. I -- I'll -- I'll outline that. So what we did from -- with respect to the -- the water management structures, yes, it's -- it's -- we did, indeed, use the dissolved concentrations from those structures, and then we -- in the model, we mixed them in with that dissolved component, in with the -- both dissolved and totals. So we added those dissolved components to the dissolved and total from our assumed background concentrations.
Q Okay.
A So, yes, it -- it would be more conservative to -- to assume some solids load, but what -- what we effectively assumed is that the -- that the sedimentation structures operate as designed.
Q So why did Benga decide to use -- or why did SRK decide to use this less-conservative approach?
A Again, the -- the purpose of the assessment here is to -- is to evaluate what sort of mitigation's required. And given the fact that, you know, we have incorporated the -- the operation of sedimentation ponds into this assessment, it -- you know, it -- it it's consistent, I think, with the fact that our assumptions, as clearly stated in this -- in this model

report, that we assumed that the mitigation measures that are reflected here are effective.

Q So if we could turn up Table B8, "Dissolved Metals Results", page 137 of CR Number 3. And if we scroll down to PDF page forty -- 142, we have, essentially, the values exceeding freshwater aquatic life and drinking water guidelines. That's the brown. Then a sort of salmon colour, value exceeds freshwater aquatic life guidelines, and then the blue, we have values exceed drinking water guidelines.

So over these -- essentially from pages 137 to 142, we have -- we have these various categories -- various metals listed, right, at the top of the document in Table B8, the "Dissolved Metals Results"; correct? Mr. Day?

A MR. DAY: Yeah, that's what the -- the table says, yeah.

Q And has this table been updated as a result of the new work that was done in Addendum Number 10?

A MR. HOUSTON: Um --

A MR. DAY: Sorry. Go ahead, Gary.

A MR. HOUSTON: No. So I -- I was going to say: Mr. Chair, could we just take a minute to -- before we respond? One minute.

Mr. Secord, Mr. Chair, these are -- these are water samples that were taken in our efforts to collect data. Most of these are groundwater samples. And just wondering how you're connecting this to the modelling? These are samples of water in -- from -- from wells from 2015.

Q Okay. So my understanding is that -- that Mr. Day was saying that that FWAL line was inaccurate in terms of some of these model guidelines.

A The -- so Mr. Davies responded to that, and he -- he talked about the selenium number, which, as he pointed out, the -- the 1 microgram per litre for selenium is a conservative guideline used in -- in the most high-risk waters, which means risk in terms of selenium uptake into the -- the -- the aquatic biology. And -- and that one he -- he corrected and said that .002 -- or 2 micrograms per litre -- is a more appropriate number.

Q Yeah, and I appreciate that --

A MR. DAVIES: If I could -- sorry. If I could add to that, just to clarify. The guideline is 2. The alert concentration is not formally considered a guideline.

Q So I'm just -- I mean, you and I were talking about the GoldSim modelling, obviously, and the results done in Addendum 10 and, you know, what they showed, but this particular table obviously is looking at -- at what has been, I take it, measured at various locations, you know, obviously starting on this page with the Bellevue

mine, but do I understand that -- that some of these guidelines -- these FWAL numbers are wrong in this document? Are you saying that, for instance, for selenium, these shaded areas are wrong, that they shouldn't be shaded orange?
A Now, if I could clarify, this is data for 2016. It is using the 2014 guidelines. And -- and in the 2014 guidelines, as you showed in your aid to cross, the -- the guideline was 1 in -- in Alberta. And that -- that had been taken from a 1987 guideline for -- that was produced by CCME.
The current Alberta guideline is derived from the BC 2014 guideline and was adopted after this table would've been made. So it's not incorrect, but it's no longer accurate with regard to the current set of guidelines.
Q And it hasn't been updated for the -- for the Joint Review Panel?
A This table?
Q Yes.
A I'm -- I can't speak to that, actually. No. It's included in the baseline from 2016, I believe.
Q Okay. So as things stand, then, the presence of some trace elements of levels above established guidelines for drinking water and/or the protection of freshwater aquatic life has been confirmed in some of the

monitoring well samples assessed by Benga. So that's --
A MR. HOUSTON: That's -- that's correct.
Q So that's what's produced at Table B8?
A That's right.
Q And do you agree that in addition to selenium, this includes aluminum, cadmium, chromium, copper, mercury, nickel, and zinc?
A I -- I -- I would note, Mr. Secord, that in -- in some of the samples, that is correct, but not in all.
Q Do you agree that these results indicate their natural presence in the waters of the project area and the risk of them being mobilized as a result of Benga's mining and waste management processes? This would probably be a question for Mr. Day.
A So what -- what -- I'll -- I'll start, and -- and if Mr. Day has something to add, he -- he can jump in, but these water samples were taken at a variety of locations, and some of them were in historical mining works, for example, or close to, and -- and so we would expect -- first of all, we expect some level of all of these elements to be -- to be present in -- in most water samples, and I -- I think we need to get down to specifics of each sampling location to -- to understand whether -- whether an exceedance in one location is a significant issue.

MR. SECORD: Well, let's look at PDF 137, Zoom Master.
Q MR. SECORD: So these are some of the few -- the -- some of the 19 monitoring wells that you managed to drill on the project area; correct?
A That -- that's correct.
Q That's what you're talking about in terms of exceedances of FWAL and guidelines? That's a good picture of -- of what you found from some of the 19 wells that were drilled that weren't -- didn't end up being dry?
A Yeah. Yeah. So -- so, Mr. -- Mr. Chair, Mr. Secord, yes, these are -- these are samples that are taken from groundwater wells, and, you know, using a wildlife criteria for groundwater is -- is not really appropriate. It's -- it's a way for us to identify and -- and screen the -- the various elements that may be present in the water. But using a -- a wildlife lens and -- and saying there's an -- exceedances, it's -- it's really just to highlight which -- which elements are -- are -- need to be looked at closely -- more closely.
Q What do you mean by "a wildlife lens", Mr. Houston?
A The -- the FWAL is -- aquatic life. I'm sorry.
Q You thought it was wildlife?
A No. No. I -- I misspoke, Mr. Secord.

Q Yeah, you did.
You might not want to jump in in the rest of these questions, Mr. Houston.
If you could turn up -- so -- so do you agree that the results -- these results indicate their natural presence in the waters of the project area and the risk of them being mobilized as a result of Benga's mining and waste management processes? And that's a question for you, Mr. Day.
A MR. DAY: Yeah, I'll -- I'll -- I'll take that.
So, yeah, you -- you're correct that we -- we do look at -- we look at waters that are close to the -- the mine -- the existing mine operations as a -- as a -- an indication of what might leach from them. And we -- we actually did incorporate that into our assessment. So it is -- it is appropriate to use the data that way, yeah.
Q Do you agree that there is no SRK modelling done to explore how these contaminants might be mobilized and moved through the subsurface of the mine project area?
A Actually, we do. We use the -- we do -- we do modelling of the -- the waste rock dumps, for example, of pit walls to -- to understand what mobilizes from the -- from them.
Q And where are those model results?

A   You can look in Appendix 10.
Q   Okay. I've done that. I've done that. I know where those are.
A   Yeah. So --
Q   And we're going to look at some of those.
A   Okay.
Q   Okay. I'm trying to speed through my questions, as my time is evaporating.
    Oh, yeah. Yeah. So this is interesting. So please turn up PDF page 112 of Addendum 10, which is Package 5 of CIAR 251. So the response here -- so: (as read)

> So identify all planned source locations, i.e., rock pile areas and other -- any other potential sources of contamination, including sources that may arise due to extreme flood events.

And then the response is listed. And I want you to focus on the last sentence here. It says: (as read)

> The end-pit lake is not identified as a potential source as the water stored in the lake is located in its own groundwater catchment area.

The statement then is made that the EP -- the end-pit lake is not identified as a potential source of contamination to the groundwater and potential receptors; correct?

A I -- I see that, yeah.

Q So if we turn up Appendix 10B, the water and load balance model in CIAR 42, and then if we go to PDF page 380. This shows the pit lake -- the mercury level in the pit lake; correct?

A Yeah. Correct. Yeah.

Q And it shows from 2040 -- 2041 on that the mercury level is at -- at or above .000012. Can you confirm that the FWAL for mercury is .000005?

A I'll have to let Martin respond on that.

A MR. DAVIES: Yes, I believe that's correct.

Q Okay. And then if we turn to PDF page 404. For the end-pit lake, we have the selenium concentrations -- starting in 2041 and continuing to 2099, the selenium levels being at .006, which is well above the FWAL of .0002; correct, Mr. Davies?

A It -- it's above .002.

Q Right. And have these -- and were these -- were these projections also changed in Addendum Number 10, or did they remain the same after you reworked the model?

A MR. HOUSTON: I -- I don't believe the numbers for the end-pit lake changed, Mr. Secord.

Q Right. And then if we go to PDF page 410 for the end-pit lake, we see zinc levels from 2041 to the end of the life -- to the end of the next -- or I guess the end of this century at .03 -- sorry, at -- at above .05. Can you confirm, Mr. Davies, that the FWAL is -- is .03?

A MR. DAVIES: Yes, I believe that's correct.

A MR. HOUSTON: So, Mr. Secord, we -- we recognized that the numbers in the end-pit lake based on the modelling that we've done to date, in a few cases, may exceed water quality guidelines. We -- we also understand that we -- we have options for -- for treatment, especially of the metals or of the selenium. So there are options available.

But more -- more importantly, with the conservative nature of the modelling, we -- we'd like to get a little bit further down the line so that we could see which of those mitigation measures, if necessary, would be best suited to -- to managing the water in the end-pit lake.

Q If we could turn up PDF page 255 of the same appendix, 10B. And this is under the heading 5.4, "Concentration Limits". And in the second sentence, it states: (as read)

> Elevated concentrations in pit lake water may occur due to potential acidity. Pit lake water leaves the project area via two pathways: One, as overflow to the northeast sedimentation pond and subsequently to Gold

Creek via horizontal drains after reaching
the flood elevation; two, as leakage. Once
the pit lake begins to fill, pit lake leakage
reports to Gold Creek at Prediction Node
GC10.

I take it, Mr. Houston, all of this has changed? None of this is correct information?

A We're -- we're not currently planning an overflow for the end-pit lake. That's correct.

Q So the overflow to the NESP is not something that you're applying for?

A No.

Q And in terms of this Point Number 2: (as read)

As leakage, once the pit begins to fill, pit
lake leakage reports to Gold Creek at
Prediction Node GC10.

How was that determined?

A MR. JENSEN: So that was determined based on sort of the general direction of the groundwater flow in -- in that area. We looked to -- we looked to the groundwater model assessment for some input to what appropriate assumption to apply in this case.

Q Okay. So I thought, Mr. Jensen, from my extensive conversation with Ms. Grainger, that the groundwater flow was north-south, that the model constrained groundwater flow to -- from the -- from -- in the

directions from the west to the east and from the east
to the west. So I just am confused now how you're
saying that the groundwater flow would be east --
sorry -- yes, it would be east from the end-pit lake.
A   I apologize, Mr. Secord. We're just debating who best
to answer this question. I think Nancy will handle it.
A   MS. GRAINGER: I just wanted to provide a
clarification, Mr. Secord, 'cause this morning we were
speaking of hydraulic conductivity and the differences
in the north-south direction versus east-west, and
that's not synonymous with the direction of groundwater
flow. So I can provide you references to maps in
CR 3 -- 'C' -- Consultant Report Number 3 which show
the groundwater flow direction, but it's -- it's not
just north-south or east-west.
Q   And what is the groundwater residence time from the --
travel time from the end-pit lake to Gold Creek?
A   Well, perhaps the map that is relevant is to look at
Consultant Report Number 3 in CIAR 42, PDF 109.
Q   Is that the one we looked at already?
A   No. This is a different map than what we've looked at
previously. This map shows the groundwater flow
contours at long-term closure. Or, sorry, the flow
direction at -- at -- at long-term closure.
So this map shows in the area of the end-pit lake
at the north end that there's a -- sort of a mini

groundwater basin that's formed where the -- the mining has occurred, and groundwater flow direction is actually very localized and towards that end-pit lake in that area.
Q Okay. So going back to your August 2019 response to the information request in CIAR 251 that the end-pit lake is not identified as a potential source of contamination and the statement in -- in -- on PDF page 255 of Appendix 10B in CIA 42, that is leakage -- (as read)

> Once the end-pit lake begins to fill, pit leakage reports to the Gold Creek Prediction Node GC10.

Can you -- can you tell me -- can you explain this discrepancy?
A MR. JENSEN: Well, I would say -- oh, am I ...
Q Yeah, you're on.
A Okay. There appears to be -- it might have been a misinterpretation of some sort in classifying this as not a -- as a source. It certainly is incorporated in our water and load balance as a source. So there might have been a misunderstanding on the -- you know, perhaps the -- the author of this response was not aware that we are treating it as a source, and it is incorporated as a source in the assessment.

Q Okay.
A MR. HOUSTON: I think that, Mr. Secord, the confusion might come from the question. I mean, we're talking about extreme flood events. And so in extreme flood events, the end-pit lake wouldn't create an additional source of contamination, but we have recognized in the modelling that seepage from the end-pit lake can and does -- will occur.
But just specifically in the case of an extreme flood event, it's not an -- you know, an additional source under those circumstances.
Q So, Ms. Grainger, would you agree that it looks like -- looking at this figure that you pulled up, that the travel time would be somewhere between zero to ten years from the end-pit lake to Gold Creek?
A MS. GRAINGER: I don't think that's evident on this picture. We can go back to 112 -- PDF 112, which is the map which shows the groundwater travel time --
Q That's the one --
A -- for creek discharge.
That is the one we were looking at this morning.
Q Okay.
A You're right.
Q Okay. So we don't need to go there, then.
A Okay.

Q All right. I'm going to pass over my questions on the waste rock humidity salt test charts. You'll probably be happy to hear that.

MR. SECORD: If we could please turn up PDF page 251 in Appendix 10 in CIAR 42. That is not it. 251 in Appendix 10 of CIAR 42. There we go. 5.2, "Groundwater Quality" at the bottom.

Q MR. SECORD: So it says: (as read)

Due to limited data availability, certain parameters have not been analyzed for -- in groundwater, including beryllium, bismuth, lithium, molybdenum, ammonium, phosphorous, tin, strontium, titanium, thallium, vanadium, and zirconium. For these parameters, no source term was included for groundwater, and the concentration was assumed to be 0 milligrams per litre.

Mr. Day, are any of these elements considered toxic to humans or aquatic life?

A MR. DAY: Again, I will have to ask Martin to respond on that, please.

A MR. DAVIES: What -- what I can say is that, you know, pretty much anything at -- at some dose is toxic to something. Yeah. What -- what stands out in this list to me: Most of these are metals that -- that don't receive very much attention in -- in environmental quality studies. Ammonium does. Molybdenum does sometimes. The others much less so, I would say.

Q Okay. So would you agree, subject to check, that ammonia -- how do you say it -- "molybdenum" and --

A Perfect.

Q -- and thallium, would you agree, subject to check, that they have listed guidelines in Alberta for the protection of freshwater aquatic life? Those are the 2014 guidelines marked as CIAR -- CIAR 849. Do you accept that?

A Yeah, that sounds reasonable.

Q And would you accept that ammonia, molybdenum, and thallium also have listed guidelines in the 2018 guidelines marked as CIAR 850?

A I believe that they do, yes.

Q When faced with no data -- maybe this is for you, Mr. Jensen.

When faced with no data for chemical constituents, is it common to use some percentage of the respective method-detection limits, e.g. 50 percent, so that the impact modelling can be done in a conservative manner?

A MR. JENSEN: I would say generally, yes, I'd agree with that.

Q And why did SRK choose not to employ this common approach in its impact modelling in this case?

A Well, Mr. Secord, as you were posing your questions, I'm -- I'm just looking for the model 'cause our use of -- of background water quality for groundwater is very, very limited in this model. We only used that particular input in situations where groundwater's directly, you know, somehow extracted and then -- and then, let's say, conveyed to another surface water, another reservoir.

So in this case, whenever we have, for example, quality of water that would seep from the end-pit lake into Gold Creek at GC10 following a groundwater path, we wouldn't be using this source term. And, in fact, I'll have to get back to you, but I'm not 100 percent sure if -- you know, exactly how much -- sometimes we'll use easier -- easier -- "easier" assumptions when we know that the source terms have absolutely no relevance to the outcome of the model, and that's most certainly the case here.

So I hope -- I hope that makes sense. It -- I'm not excusing our use of -- of zero in -- in this case. You know, we really don't expect there to be any detectible limits of any of these -- well, for sure ammonia -- the ones that matter -- in this groundwater source, and most certainly loadings would be, you know, not -- not measurable, really, in terms of the final outcome. So we -- we don't -- whenever we do this, we don't do it lightly. We always do it as an -- we don't try and cut corners in that sense, except when it's completely irrelevant to the outcome of the model.

Q Mr. Houston, I'm not sure who is best for this question, but is it clear from the humidity cell tests that when oxic conditions exist, selenium and other harmful trace elements increase in concentration?

A MR. HOUSTON: Mr. Day --

A MR. DAY: Yes.

A MR. HOUSTON: -- would that be something for you?

A MR. DAY: Yes. So I can speak to that.

Yeah, the humidity cells are a very useful indication. It's a -- actually, why we perform them is to understand weathering of the materials. So they are a very useful indication of what -- what will come out of them as they -- they get exposed to the atmosphere.

Q Right. So is it clear from the humidity cell tests that are part of this application that when oxic conditions exist, selenium and other harmful trace elements increase in concentration?

A I certainly agree that selenium is shown to come out when these materials are weathered, yeah.

Q And do you agree the success of the SBZs to sequester selenium is dependent on the conditions in those structures remaining anoxic?

A I agree that the option must be low. I -- I take issue with the use of "anoxic". It's more like suboxic, but low oxic conditions is correct. Yeah.
Q How will Benga ensure that the SBZs remain anoxic or suboxic into perpetuity after Benga is gone?
A Well, the -- the -- the way that suboxic conditions are created is using methanol, and my expectation is that that would continue until those conditions can be demonstrated to be sustained.
Q Now, a void ratio of 25 percent -- that's porosity, and I don't think we -- I don't know if you need to turn it up; the reference is Appendix 10, PDF page 249 -- was used for the SBZs. Do you agree that -- would it be fair to say, Mr. Day, that you would've expected that this number would've been much higher, around 40 percent or so, given the volume expansion to the excavated rock or maybe put -- or maybe --
A Yeah.
Q Or maybe put another -- maybe put another way, another way to approach it is: What is the justification for the selection of 25 percent? And if a higher number had been used, how would this affect the mine water balance?
(SIMULTANEOUS CROSS-TALK)
A MR. DAY: Go ahead.
A MR. HOUSTON: Okay. Mr. Jensen's going to

answer that, Mr. Secord.
A MR. JENSEN: Okay. Yeah. So the assumption of 25 percent is another example of -- of a conservative assumption we used. It -- it certainly is low. It -- it's not outside the range of what you might expect for -- for waste rock. But, you know, in -- in certain cases, we are -- we're closer to 30, and in other cases I'm aware of we're as high as 35.
25 just means that it gives us the least amount of residence time and the least amount of -- of available storage volumes within the -- within that -- in this -- the saturated backfills. So that means when we are looking to evaluate mitigation measures and constraints on -- on managing the volume of water, we're saying, Okay. Let's say 25 percent -- that's the least we would -- we would ever expect. So what does that give us in terms of a volume? If we increase that number, it just means we have more storage volume, and -- and in terms of planning for mitigation, it's -- you know, I prefer to be conservative on that count.
Q And what was the void ratio selected for the waste rock dumps?
A I believe it was 25 percent. Let me just quickly check that.
Yes. That's correct.
Q So, so much attention has been given to selenium that

other harmful elements appear to be overlooked. Is there a reason for that and, if so, please explain.

A MR. HOUSTON: I -- I don't know if that's a fair statement, Mr. Secord. We've -- we've modelled many elements that we believe will be present in the treated water, and we have identified a few, like -- like zinc, for example, or aluminum, that may be issues. Our modelling is conservative, and so -- and the results are, in many cases, on the borderline. So they -- they may be issues. If they are issues, we've committed to installing a metals treatment plant to -- to deal with that. So -- so I -- I don't think it's fair to say they've been ignored.

Q So dousing of the SBZs with an organic substrate will likely have to occur to promote the reduction in redox conditions necessary to precipitate and sequester the selenium. Has Benga looked into how this will affect the mobility of other harmful elements like arsenic, chromium, cobalt, copper, lead, mercury, molybdenum, and nickel?

A MR. JENSEN: Yeah. So our expectation is that certain elements, in particular manganese and possibly arsenic and -- and other metals that we -- that we know, tend to mobilize during reducing conditions, so under reducing conditions. We're keeping a close eye on those, and that's one of the reasons that we have recommended our -- and Benga has committed to two things. One is the -- the test work at various different scales to try and -- and come to terms with exactly what -- what concentrations or what constituents might be mobilized. The other one is the -- the post-SRF treatment that the company has committed to.

So we are -- we are by no means ignoring the potential for -- for constituents to be mobilized, and, in fact, what's required on our end is -- is a little bit better quantification of exactly which ones, if any, will be mobilized so we can -- so we can manage them appropriately.

A MR. HOUSTON: I think I'd just like to add to that, Mr. Secord. I forget what verb you used for the addition of the -- the hydrocarbon, which probably will be something like methanol. But it -- it's a very well-controlled amount of methanol we'll be adding to this -- this SBZ. We want to create just the right level of oxygen so that we reduce the selenium, we reduce the nitrates, but we don't go so far as to reduce other elements and -- and create problems. So it -- it's a very closely monitored process.

Q All right. So I think I'd like to move on to this last area of questioning. Monitoring conducted by Teck Resources Limited, Teck, in the Elk Valley to the west has identified the presence of elements such as cadmium, cobalt, nickel, and zinc above guidelines for the protection of freshwater aquatic life and occasional detections of chromium and uranium above those same guidelines. The same -- the same can be expected for this project given the similarity of the formations. So why would we create another problem in an area -- in another -- why would we create another problem area in another sensitive watershed of the Rocky Mountains?

A Mr. Secord, first of all, we can't speak to the situation at Teck. We -- we can only speak to the project we've got in front of us. We've -- we've gone to lengths to identify what are the potential contaminants of concern emanating from the Grassy Mountain Project, and -- and we've done our best to model those in a conservative fashion and develop mitigation techniques to -- to ensure that the environment is protected.

MR. SECORD: Zoom Master, if you could pull up Aid to Cross Number 4 Coalition, Elk Valley water quality 2018 annual report. If you turn to -- first of all, could you turn to PDF page 160?

Q MR. SECORD: Probably this is for you, Mr. Houston. Would you agree, subject to check on this figure, that the LC_WLC monitoring station is -- is

located in the lower left inset panel and basically at the south end of the operation -- of the Teck operation?
A MR. HOUSTON: I have to confess, I can't read it at this scale, Mr. Secord.
MR. SECORD: Can you blow it up there? The -- the -- the lower left inset panel? Go up. Up. No. Go up on the document.
Q MR. SECORD: There's the lower left inset panel. Can you see the LC_WLC?
A MR. HOUSTON: If that stands for West Line Creek -- is that what you're looking for?
MR. SECORD: Don't move the document. You're fine where you were. Just leave it there.
Q MR. SECORD: It's Line Creek WLC -- LC_WLC. You see that?
A MR. HOUSTON: I -- I see that, yes.
Q Okay.
MR. SECORD: And if we could then go to PDF page 85 -- sorry, 4858 in the Teck report. And if you -- if you scroll down, please. Put it at 100 percent.
Q MR. SECORD: So you'll see there is a line -- and this is probably for Mr. Day. There is a line for the LW_WLC [sic] --
MR. SECORD: And can we go up to the top so

we can see the -- and is it possible to -- to get rid
of Mr. Houston's picture so we can see the whole
document? Can you move the photograph over? Why don't
you reduce it further to 75 percent.
Q MR. SECORD: So, Mr. Day -- I guess it's --
maybe I guess we'll need it at 100 percent.
All right. So on page 4858 -- and I've got my --
you've got it at, I guess, 100 percent, so that's fine.
But, Mr. Day, you'll see the very first entry for
LW -- LC_WLC under the heading "Cadmium", there's a
reading of .307; correct?
A MR. HOUSTON: Mr. Chair, there's a lot of
things going on at Elk Valley. A number of mines --
Q Just let -- just let me --
A Yeah. I just don't want to be -- I don't want to be
answering for, you know, another company here. That --
that's where I don't want to go, Mr. Secord.
Q Sure. Let's just take a look at the data, Mr. Houston.
Perhaps we can just go there first.
A Okay.
Q On page 8 -- on page 8 -- 4858 of this aid to cross,
for the first entry for LC_WLC, for cadmium, there is a
reading of .307; correct?
A Cadmium. I've got Cadmium D and Cadmium T.
Q Yeah. So for --
A .322 and .307.

Q So for cadmium -- for Cadmium T, it's .307. For
Cadmium --
A 'D', yeah.
Q For Cadmium D -- yeah, for Cadmium D, it's -- it's
.322; correct?
A Yes.
Q And then if we go to PDF page 848, so two more -- two
pages down -- or two pages -- yeah, two pages into the
document, so from -- so this would be 4860. We have
for mercury a reading of point -- this is in Mercury T,
a reading of .00111; correct?
A Where -- where are you reading that?
Q The first -- first line of LC_WLC for mercury --
A No.
Q -- we have --
THE CHAIR: I don't think we're on the
correct page anymore.
MR. SECORD: 4860.
A MR. HOUSTON: Okay.
Q MR. SECORD: So on the bottom, on the far
right-hand side of the document.
A Yeah.
Q Again, I don't know why the Zoom Master can't reduce
your screen picture, but there we go. There's a
reading of .00111; correct?
A I see that. Just above the dark -- darker black line,

the thicker black line, yeah.
Q That's right.
A Yeah. I see that, yes.
Q And then for -- on page -- so two further -- two further pages in, so this would be 4862, we have for the 'W' -- LC_WLC for Selenium D, 512 and 523 recorded; correct?
A 512 and 523. I see the numbers, yes.
Q Yeah. And then if we go to PDF -- two more pages over, so this would be 4864, we have, for the first entry for LC_WLC, uranium at 19.9 for Uranium D; Uranium T, 21; for zinc, 10.7 -- for Zinc D, 10.7; for Zinc T, 10.2.
A Yes.
Q Okay.
A Was there a question, Mr. Secord?
Q Yeah. I'm just going back to my -- my questions, Mr. Houston.
And perhaps you'd accept, just to speed things along, that that LC_WLC monitoring station -- it is listed in Table 4 on PDF page 25 as receiving environment West Line Creek. And we don't need to turn that up.
A Yes. That doesn't mean much to me, Mr. Secord, but --
Q You don't know what a receiving environment is, Mr. Houston?
A I do, but I don't know where these measurements are

taken. You know, I --
Q Yeah. What --
A This is not -- this is not my project, Mr. Secord.
Q Yeah. And what are the -- what will be the receiving environments for the Grassy Mountain Project?
A So the treated water, after it leaves the SBZ and after it leaves the -- the metals treatment plant, if -- if we need to install one, will eventually make its way into Blairmore Creek, only after it's been monitored and measured and -- and that we've ensured that it meets the requirements for return to the environment.
Q Has Benga assessed the risk that their operation might have -- has Benga assessed the risk that their operation might have on the concentrating and potential release of NORM -- in capitals -- naturally occurring radioactive materials, or TENORM, technically enhanced naturally occurring radioactive materials, into the local environment?
A No, we haven't looked at that, Mr. Secord. It wasn't one of the risks that we, you know, assessed important for the project.
Q Well, why not, when your neighbour a couple of valleys over is showing high uranium levels at one of its monitoring stations?
A Again --
Q Or do you know about that, Mr. Houston?

A No, again --
Q Is that a surprise to you?
A No. Mr. Secord, we're -- we're looking at the rock that we're dealing with for Grassy Mountain. We've done the testing on the rock to determine what metals, especially, and -- and other elements could potentially be released. I can't speak for Teck. There -- there's five mines. They date back 30, 40 years or more. So I can't speak to what the situation is for Teck.
All we can say is that we've evaluated the -- the issues related to Grassy Mountain mine. Yes, where we've been able to adopt technology that's been advanced by another company, we have done so. But we've done it based on what we've found at Grassy Mountain, not what somebody else has found in a different place.
Q Okay. So I guess what you can say is you haven't looked at -- you haven't looked at all at the potential release of NORM or TENORM, even though you're dealing with exactly the same type of rock, Mr. Houston?
A We -- we're -- we're dealing with the rock from Grassy Mountain. It's not exactly like anything. It's the -- the rock that we have for this project, and -- and that's the basis for our analysis, Mr. Secord.
Q It's the same type of rock that Teck are mining. It's a metallurgical mining rock; correct?

A No. I -- I think that's a super oversimplification of -- of mining in general. We're -- we're -- we're dealing with the rock on Grassy Mountain.
Q And how does that differ from Teck's rock?
A I -- again, I don't have a sample of Teck's rock. What we do have are samples of Grassy Mountain rock, and -- and that's what we've been analyzing.
Q So it could be exactly the same as Teck's rocks?
A I don't have rock from the Teck project to compare with.
Q Right. Okay. I think we've established that success of the SBZs in sequestering selenium for the long-term will be contingent on keeping redox levels low in those waste disposal areas and in the suboxic range, as Mr. Day puts it.
What will happen after the mine is complete and reclamation is done? How will Benga guarantee that selenium will not be mobilized later by infiltrating oxygenated waters that will shift the redox conditions into a conducive range?
A So -- so, Mr. Chair, as we've discussed many times in this hearing, the -- the selenium will be removed from the water through this biochemical process, and -- and that will be at some depth within the SBZ to -- to avoid possible minor variations in the level of the natural groundwater.

So I -- I think we all can appreciate that even in a -- a very deep end-pit lake, even though it's exposed to oxygen at the surface, unless there is a mixing mechanism, it's -- it's very common to have suboxic or -- or low oxygen levels at depth, and it's simply because the -- without the mixing of the water from top to bottom, it's difficult for oxygen to -- to penetrate to depth. So we -- we would expect that once the selenium is deposited inside the waste rock saturated backfill zone, that -- and -- and left to its own devices, that the saturated backfill zone would not reoxygenate naturally.

Q It is indicated that it may take a long time, 50 years or more, for any contaminants mobilized by the mine development to be detected at monitoring stations. Benga will be long gone by then. So how can area residents be sure that legacy contamination will not become a problem for them down the road health-wise or cost-wise? I'm thinking specifically of Ms. Gilmar and her successors.

A Mr. Chair, I think what we've been discussing is exactly the opposite. We're expecting to see the selenium, nitrates, other metals during the life of the mine. And what we've said is that we fully expect to leave the water treatment facilities, some pumps, monitoring stations, maybe even injection facilities for -- for methanol -- we expect to leave that system in place for a number of decades after end of mining, and we expect to continue to operate and monitor the water quality and the water management system until such time as it's demonstrated that the -- the system is -- is naturally reaching a safe level of water effluent.

Q There is a lot of faith being placed in the SBZs to attenuate selenium. The retention factors are quite high at 95 percent -- that's in Appendix 10 water and load balance model -- and it is likely that this capture efficiency -- do you agree that it is likely that this capture efficiency will be much less, given some of the expected geotechnical complications, e.g. pH, CO_2 levels, redox conditions?

What would -- and then as a follow -- as a little add-on to that 'cause I'm down to my last -- I'm probably past my time. So as a little add-on to that question, Mr. Houston, what will be the time lag between when Benga finds out that the SBZs are not working as planned and when suitable water treatment can be deployed?

A Again, Mr. Chair, we expect that this system is going to be slow in developing. Mr. Jensen talked about the buildup time of -- to -- to get a minimum of water in the ex-pit rock dumps so that we start to see percolation of water through those rock dumps. And then the SBZ itself, water selenium concentrations, the -- the long duration of retention in the SBZ, that's all a very slow system.

We have committed, should that start to show signs of moving offtrack, that we would implement a water treatment plant or a gravel bed reactor in parallel or in series with the SBZ to take up the slack, so to speak. We -- we think that a gravel bed reactor based on the preliminary design that we -- we provided in one of our IRs that we could install that kind of a treatment facility in -- in a year, and that would be provided that we do some additional planning and design work in advance, but it would be about a year to put one of those in and -- and probably longer in -- in the two-year time frame or -- or -- or maybe three for a water treatment plant.

Q Will enough water treatment capacity be able to be achieved in the time needed to deal with the volume of water, given what we know about the challenges faced by Teck Resources in their Elk Valley operations?

A Again, very different operation. Mr. Chair, Mr. Secord, we -- we like to think that we're -- and -- and Teck is moving forward and learning and -- and that we're also learning along with them, and -- and we've implemented -- we are implementing a number of -- I don't know if I should call them "technologies", but just practical measures in this mine to reduce the amount of water that we have to treat and to deal with the selenium issue from the ground up.

So -- so we're -- we're thinking this through from the very start of this project. We're at the conceptual stage now, but as we move into engineering -- detailed engineering designs, timelines will be developed that will be designed to deal with the selenium issue.

Q Okay. And this is my last question, Mr. Houston. Adaptive management seems to be the overarching solution to contaminant issues that are not completely understood at this point in time. Do you agree this is a reactive stance, not a proactive one; and how will Benga ensure that contaminants will be isolated from the groundwater and surface water environments during mine development and into perpetuity?

A I -- I don't think it's reactive at all. I -- I think we're trying -- first of all, we're -- we're modelling the -- the mine -- the project using conservative parameters, trying to err on that side of the equation, so that -- so that our predictions encompass an envelope that is -- and that the project outperforms the predictions.

The other thing I would say is that we've -- we've planned in advance for a metals treatment plant or for a backup selenium treatment plant. We -- we've done some preliminary design on groundwater extraction well systems. So we've thought through a lot of these things. We've identified that these are all possible solutions that we can employ practically on this project if required. And so I -- I -- I actually think that's a very proactive stance, and -- and I guess that's the spirit of adaptive management or contingency planning or -- or whatever you want to call it.

MR. SECORD: Mr. Chair, thank you very much for extending me the generous time allowance, and I will sign off.

I have to say this area is very complex, and I probably could've used the initial 12 that I asked for, but I appreciate these hearings have to have limits, so I'm done. Thank you very much.

And thank you, Mr. Houston, and your witnesses and the answers --

THE CHAIR: Thank you, Mr. --

MR. SECORD: -- they gave. Yeah.

THE CHAIR: Thank you, Mr. Secord.

Just one thing before you sign off. You and Mr. Houston had a discussion earlier, and I just wasn't quite sure it got resolved, and it had to do with ammonia levels in Blairmore Creek at 2039. And you were looking for a confirmation from Benga that those levels exceeded the environmental quality guidelines based on the Alberta surface water 2018 guidelines. And I think Benga agreed to get back to you. I think Mr. Houston was about to provide a response. You indicated it was an undertaking. We don't actually -- didn't actually assign an undertaking, so I guess my question for you, Mr. Secord, is that still a question that you want Benga to respond to?

MR. SECORD: Yes.

THE CHAIR: Okay. And, Mr. Houston -- yeah, Mr. Houston, were you able to respond to that?

A MR. HOUSTON: Mr. Chair, if we could come back to that first thing in the morning, I think that would be the best thing.

THE CHAIR: Okay. So we'll get a -- we will assign an undertaking number just to track it until you respond.

A MR. HOUSTON: Okay.

THE CHAIR: So what would that undertaking number be, staff?

MS. ARRUDA: It will be Undertaking Number 18, Mr. Chair.

THE CHAIR: Okay. Thank you.

Okay. Yeah. It's quarter to 5, so I think that's probably about as far as we can go today. So according to my list, up next for cross would be Mr. Rennie, if he has any questions for Benga, followed by Timberwolf.

Is there any other business we need to take care of today?

MR. RENNIE: I'm here. Jim Rennie.

THE CHAIR: Yeah.

MR. RENNIE: I have a quick question as to what time we will be starting tomorrow morning.

THE CHAIR: Yeah. We will be starting at 9 AM tomorrow.

MR. RENNIE: Thank you. That's good.

THE CHAIR: Okay. Thank you, Mr. Rennie.

Anything else?

MR. SECORD: No. Thank you, sir.

THE CHAIR: Okay. Have a good evening, everyone.

MR. SECORD: Yeah. Thanks.

THE CHAIR: See you tomorrow morning at 9 AM.

PROCEEDINGS ADJOURNED UNTIL 9:00 AM, NOVEMBER 18, 2020

CERTIFICATE OF TRANSCRIPT:

I, Christy Longacre, certify that the foregoing pages are a complete and accurate transcript of the proceedings, taken down by me in shorthand and transcribed from my shorthand notes to the best of my skill and ability.

Dated at the City of Calgary, Province of Alberta, this 17th day of November 2020.

<Original signed by>

Christy Longacre, RPR, CSR(A)
Official Court Reporter

B

G

I

N

O

U

V