
U.S. ARMY CORPS OF ENGINEERS

Public Hearing

Clean Water Act 401(a)(2) Decision

PolyMet Mining/ NorthMet Mine

DAY 2

May 4, 2022

Black Bear Casino

Carlton, Minnesota

9:00 a.m.

REPORTED BY: Lisa M. Thorsgaard, RPR

INDEX

P-R-O-C-E-E-D-I-N-G-S

COLONEL JANSEN: Good morning, everyone, and welcome back for Day 2 of our three-day public hearing regarding the Corps Section 404 permit for the PolyMet NorthMet mine project near Babbitt, Minnesota.

Again, my name is Colonel Karl Jansen. I serve as the Commander of the U.S. Army Corps of Engineers, St. Paul District. I thank all parties for joining us again today to provide statements.

Our schedule for today is as follows: First, we'll hear PolyMet's views, opinions, and recommendations, and they have a two-hour allocation for this purpose.

Following PolyMet's presentation, we'll recess for lunch until 12:30. After lunch, Fond du Lac is allocated a two-hour rebuttal opportunity. Following their rebuttal, we'll take a recess and then PolyMet will have a two-hour rebuttal opportunity as well.

Following the rebuttals, I'll review instructions for tomorrow's public hearing and then we'll adjourn for the day.

So with that, I'd like to recognize

Ms. Christie Kearney.

MS. CHRISTIE KEARNEY: Thank you, Colonel, for having us today.

My name is Christie Kearney. Kearney is K-E-A-R-N-E-Y. I'm the vice president of environmental affairs for PolyMet Mining. I've been with PolyMet for six years now. I joined the team just before we started environmental permitting, although I was a consultant for PolyMet for 10 years prior to that throughout the environmental review process.

My background is I'm a licensed professional environmental engineer. I've been doing environmental review and permitting for close to 25 years throughout the Midwest and in Alaska.

I'm originally from Hibbing, Minnesota, which is where I live right now with my husband and my daughter. I'm an avid outdoorswoman. I hunt. I fish. I play in northeastern Minnesota. Most of our team live right around the mine and the plant site, and it's important to all of us that we protect the natural resources around us.

Yesterday you heard close to 8 hours of testimony from the Band and the Band's experts that we'll violate the Band's water quality standards.

This is in direct conflict with our final EIS and our environmental permits.

There are two main reasons that we will not be violating the Band's water quality standards.

First and foremost is we're cleaning up a Legacy brownfield plant site with Legacy water quality issues which in turn will also clean up the St. Louis River.

And second, we're 116 river miles upstream from the Fond du Lac Reservation. The water from our discharges is about 0.5 percent of the flow at Fond du Lac.

This is a picture of our plant site, our Legacy plant site. This is the concentrator at the plant. This was built in the mid-1950s. Our tailings basin is shown here in the background, the large green field-looking area and the pond on the right.

Today I'm going to start with an overview of our project explaining a little bit about our project, our project's location, where we are in relation to the Fond du Lac Reservation, which you also heard about yesterday, and characterize our discharge relative to the St. Louis River flows.

First, let's talk about why we're all here and why this all matters. Our project will mine and process key metals such as copper, nickel, and cobalt which are essential for the clean energy transition. If we assume all of our metals go to electric vehicles, our 20-year mine plan has enough copper to supply 6.7 million electric vehicles, enough nickel to supply 2.6 million electric vehicles, and enough cobalt to supply close to of 690,000 electric vehicles.

By replacing this number of gas-powered passenger vehicles, we'll be offsetting more than 30 million metric tons of CO2 with copper alone.

If our metals went to wind turbines instead, we'll have enough copper for approximately 130,000 wind turbines.

This statement by the World Bank Association in international policy and financing organization is stunning. In the last 5,000 years, about 550 millions tons of copper has been produced. The world will need the same amount of copper in the next 25 years to meet the global demand. And this demand is driven by the Clean Energy movement and renewable energy.

The Biden Administration has focused on the transition to electric vehicles and renewable energy and has taken many steps over the last year to strengthen and boost the domestic supply chains of critical metals needed.

In June 2021, last year, this White House report shown on the left came out as a result of an executive order requesting review of America's supply chains. The PolyMet project was specifically cited on page 99 of this report as a fully-permitted domestic nickel mine.

At the end of March, about a month ago, President Biden invoked the Defense Production Act meant to encourage and help responsibly developed projects such as the NorthMet project move forward.

Now, let's look at where PolyMet is located in northeastern Minnesota. This figure outlines the St. Louis River watershed, as you've seen yesterday. The stars here show the location of the plant site and mine site at the upper part of the watershed on the eastern side of the Mesabi Iron Range where mining has occurred for over 130 years. Lake Superior is shown at the bottom of the watershed near Fond du Lac's Reservation.

There's a few important points here. Our NorthMet project is located at the very top of the watershed, very close to the headwaters of the

St. Louis River. You can see the magnitude of the watershed above Fond du Lac's Reservation with nearly 85 percent of the watershed coming in above Fond du Lac and the last major watershed, the Cloquet River, coming in between Fond du Lac's borders.

Our nearest discharge point is 116 river miles from Fond du Lac's Reservation. That's from the northern most part of Fond du Lac's Reservation to our closest discharge point at PolyMet.

Just to put into context how far Fond du Lac is from the PolyMet project, we have some comparisons shown here. It's 150 road miles from Duluth to St. Paul, 120 road miles from L.A. to San Diego, 116 river miles from PolyMet to Fond du Lac, as I mentioned. 124 miles gets you halfway to the International Space Station. The Corps of Engineers' headquarters is 130 miles from Black Bear Casino. It's a long way.

Now I want to call your attention to two specific evaluation locations that we use to bookend potential impacts to Fond du Lac as part of our permitting process. These locations have been used by the DNR and the MPCA in their mercury evaluation reports over the years which is why they were chosen for our project. There's a lot of published literature on mercury specifically from both of these locations.

PolyMet and the MPCA reference these two evaluation locations throughout our permit documents, including the 401 water quality certification fact sheet and the NPDES permit fact sheet. This includes the Forbes USGS site, which is 50 miles downstream from PolyMet and 66 miles upstream from Fond du Lac, and the Cloquet River which is 143 miles downstream from PolyMet and just five miles downstream from Fond du Lac.

Now, to zoom into these two locations, these two aerial photos are set at the same scale showing the size of the St. Louis River at these two evaluation locations. The average flow at Forbes is 570 CFS. The average flow at Cloquet, it's actually Scanlon just immediately south of Cloquet, is 2300 CFS, four times the flow.

This graphic is intended to provide some context to the river flows that we're evaluating. The figure is intended to be to scale relative to the flows of the river. To orient you, our northern streams are shown to the left with the Partridge River, the St. Louis River headquarters, and the Embarrass River shown here. Fond du Lac is shown to the right with the Cloquet River coming in between its borders.

Now to add the mine site and the plant site flows. These flows couldn't be shown to scale or you wouldn't see them on the figure.

So these are the flows that come from our mine site and plant site. We have 4 CFS coming off of the mine site. This is water that's unimpacted by mining activities, so it's storm water and natural runoff. From the plant site we have approximately 8 CFS of flow; 1 CFS going to the Partridge and 7 CFS going to the Embarrass River. This is water mainly coming from our wastewater treatment system discharge, so treated wastewater and some storm water.

We have evaluation locations just downstream of both our plant site and mine site. Our flows at the mine site are captured in the Partridge River at this location shown here with about 49 CFS of flow, and downstream of the Embarrass -- in the Embarrass River is about 87 CFS of flow.

As I mentioned earlier, Forbes is 570 CFS of flow, and the Cloquet -- at Cloquet we have about 2300 CFS of flow.

To put into context the size of our flows, we have some graphics shown here. Our flow at the mine site is about 10 percent of the flow in the Partridge River. Our flow in the Embarrass River is about 8 percent of the flow in the Embarrass River. At Forbes our discharges from the mine site and plant site represent 2 percent of the flow of the river there. And just downstream of Fond du Lac our mine site plant site flows represents about half a percent of the flow in the river in that location.

Now, turning back to the plant site, we saw this figure before, our brownfield plant site. We're going to talk a little bit about our existing conditions that are in place today before the NorthMet project comes online.

As I mentioned earlier, we have -- we are using a Legacy taconite mine that has water quality issues on site. Zooming out to an overview of the site, our plant site is shown here. We have streams to the north that are fed from the seeps that are currently coming out of our tailings basin. We have seeps to the south feeding second creek downstream of the plant site. To the east we have our mine site which is the green field with the Partridge River running to the north, to the east, and to the south of it. We're immediately south of the north shore mine, Peter-Mitchell mine. We have a transportation utility corridor between the mine site and plant site with an existing haul road, an existing railroad, and power lines between that we'll be reusing for our project site.

And then the last thing I want to point out is Colby Lake which is just south of the plant site. This is a makeup water source for the plant site so when we need additional water to run our plant, we have an appropriation permit to take water from Colby Lake. This is significant because Colby Lake water -- Colby Lake is high in mercury as well.

This is an aerial photo zoomed back to the plant site and the tailings basin. So we're reusing a former taconite tailings basin to hold our tailings as well as the plant site which you can see here on the south side of the tailings basin. This large building which was shown in prior photos is about a quarter mile long for context. The tailings basin is very large. It's about four and a half square miles.

The tailings basin holds just over 800 million cubic yards of taconite tailings which is the cause of the Legacy water quality problems that we see downstream and around our site. This site has been closed for over 20 years. It closed in January of 2021 [sic]. However, the tailings basin is covered under a consent decree and an MPDS permit. It's the source of several elevated constituents to downstream waters including sulfate which ranges from 200 to 300 mg/L and specific conductance which ranges from 900 to 2600 µS/cm that's currently flowing downstream.

The PolyMet's NorthMet project design accounts for these Legacy water quality issues at this brownfield site. It's the water management that we're planning for our project that the Band omits from their "will affect" letter and from their descriptions of our project site.

In addition to the water collection and reuse, we'll be using best available technology for water treatment for our project site, membrane treatment technology.

So you'll recall this figure showing our mine site and plant site. Zooming over to the mine site, I want to walk you through our project.

This figure reflects our maximum build-out approximately mine year 11. The gray polygons here are our mine pits. The yellow polygons are our stockpiles. We have our haul roads shown here in black crosshatch and our overburden storage and laydown area where we're storing peat for future reuse and reclamation shown here.

The pink polygons are what I want to call your attention to. These pink polygons are our mine water ponds. We'll be collecting mine water that's impacted from runoff from our stockpiles, our haul roads, our pits, and our overburden storage and laydown area. This water will be pumped down to our equalization basin south of the mine site and pumped over to the plant site for treatment and reuse at the plant site.

Separate from our mine water management we have storm water management. This is the natural runoff in storm water that's unimpacted by mining activities. The yellow dashed lines are storm water ditches that route storm water around and away from our mine features. These lead to our blue storm water ponds.

The blue ponds are retention ponds that allow storm water to slow and settle any suspended solids from the runoff in storm water before leaving the site.

Our mine water management actions collecting water that's been contacted by mine water are estimated to reduce flows on the mine site by about 48 percent. This sounds significant but we're just talking about this immediate area.

The 48 percent reduction of flows from collection of our water off our mine features is estimated to result in less than a 5 percent change in the Partridge River just south of our project site.

We're required by our permit conditions to maintain plus or minus 20 percent of the flows in the Partridge River. Regardless, the mine impacted water capture system is what provides us with a reduction of sulfate and mercury from the mine site.

Now to move over to the plant site and tailings basin. We'll use the eastern half of the existing tailings basin for storage of our tailings on the project. This figure is a representation of mine year 20 with full build-out at the end of our project and a pond at the top of our tailings basin.

The plant site is shown to the south of the tailings basin with storm water ponds that are fairly small and may be hard to see but they're blue, similar to what you saw at our mine site. And then we have our hydrometallurgical residue facility which is a double line separate system.

The important mine water feature I want to call your attention to here is this light blue and dark blue dash line around the tailings basin. This is our seepage containment system. It isn't shown in areas where there's high bedrock where there would be no seepage but it is surrounding our tailings basin.

You'll also see arrows coming out from that system. They actually continue along the east side as well. This represents our stream augmentation system. Because we're collecting the seepage that's currently feeding streams to the north and to the south of our tailings basin, we're required by our permits to augment the streams on the outside of our containment system with treated water from our wastewater treatment system. We're required to augment these streams at a rate of plus or minus 20 percent, mimicking natural conditions in the streams. This figure shows that containment wall and cross-section.

Seepage flows down through and out of our tailings basin into the surficial aquifer. This is happening now with that water flowing off site and into the downstream waters and ultimately to the St. Louis River.

Prior to discharge of any tailings into our tailings basin, we'll be installing a cut-off wall tied into bedrock to stop further seepage from leaving the tailings basin.

Nancy mentioned in her presentation yesterday that she's seen these cut-off walls only 50 to 60 percent effective. Cut-off walls have been used for decades around the world in landfills, in remediation sites, and in dams by the Corps of Engineers.

That seepage stopped from our cut-off wall will be collected in a series of pipes and pumps that will be pumped back up to the tailings basin for future -- for reuse as well as to our water treatment system to clean up and discharge.

The wastewater treatment system will -- the augmentation system will be fed by the water treatment system discharged downstream of that cut-off wall system.

PolyMet's water management system and treatment system is critical to understand to really understand the protections that are in place for the downstream waters. It's these water management actions that weren't mentioned by the Band yesterday or in their "will affect" letter.

Just to walk through them again, PolyMet will collect and treat tailings basin seepage with this containment system. We'll also be collecting and treating mine impacted waters from the mine site. We'll be using water from Colby Lake for plant makeup. Colby Lake being high in mercury, we'll remove that load from the St. Louis River system for use in our plant site and treatment before discharge.

These actions will reduce mercury loading, specific conductance, and sulfate loading in the St. Louis River watershed. Sulfate loading will be reduced by 1,380,000 kilograms per year, totaling just under 28 billion kilograms over the 20-year life of the mine.

Critical to this reduction is our use of best available technology for treatment of sulfate and other constituents. We're using membrane treatment technology. This water treatment design is a tried and true method used for drinking water around the world and in many mine applications.

This technology is actually also used in Michigan over at the Eagle Mine to meet their mercury standard of 1.3 ng/L. Eagle's last permit fact sheet from 2015 states they're required to use a detection limit of 0.5 ng/L of mercury, and they've been measuring nondetects in their discharge, so something less than 0.5 ng/L.

We've tested our wastewater treatment system in a pilot plant shown here that ran over 3 million gallons through, successfully meeting that 10 mg/L sulfate standard. This is proven technology.

The NorthMet project is the only project permitted to meet the sulfate limit of 10 mg/L at the end of the pipe. This was just confirmed with the MPCA last week.

The water quality standard is actually at the wild rice stand, and the nearest stand from our discharge is 10 miles downstream. We agreed to meet this 10 mg/L wild rice standard at the end of our pipe during our environmental review process. For comparison, the federal drinking water standard is 250 mg/L.

This slide provides some context to the mercury story. Rain is falling on our site at about 11 to 12 ng/L. Runoff in the watershed around our site is 3 1/2 to 6 ng/L. Our permits require us to discharge water at something less than the 1.3 ng/L standard. This is nine times cleaner than rainwater. It's three times cleaner than what's found in the natural watershed.

From a simple mass balance perspective, this is easy math. PolyMet's treating runoff from 3 1/2 to 6 ng/L from 4800 acres down to something less than 1.3 ng/L. We're removing a lot of mercury.

Let's go back to our graphic with these flows. You've seen these numbers already. Our mine water management actions at the mine site will result in a reduction of 4.4 grams per year of mercury from the mine site. So a capture of the 48 percent of the flows at the mine site, which is mostly rainwater, will reduce mercury in the Partridge River by 4.4 grams per year.

Our mine water actions at the plant site reduces mercury by 0.8 grams per year in the Embarrass River. At Forbes this equates to a reduction of 5.2 grams per year of mercury from the St. Louis River which is carried down to Cloquet and to the Fond du Lac Reservation.

The story is similar but more astounding for sulfate. A collection of rainwater at the mine site, our mine impacted waters, we're reducing sulfate by 100,000 kilograms.

At the plant site our seepage containment system which is currently capturing that seepage water that's ranging from 200 to 300 mg/L and we're discharging water at 10 mg/L, results in a significant reduction of sulfate, 1,280,000 kilograms per year. Add these together and you get a reduction of about 1.4 million kilograms per year at Forbes which continues down to Cloquet.

Over the 20-year life of our project, this results in a little over 100 grams of mercury being removed from the St. Louis River and close to 28 billion kilograms of sulfate being removed from the system, all as a result of a brownfield cleanup.

It's these reductions that allowed the MPCA to issue the 401 certification.

So in summary, our project's water management strategy improves water quality in the St. Louis River. The project's water management actions are designed to remove mercury and sulfate and specific conductance. Most mercury load comes from rainwater which we're collecting and treating. Our wastewater treatment system is best available technology, membrane treatment, to meet that sulfate standard.

And the overall design of our project results in reductions of mercury and sulfate loads and specific conductance concentrations in the St. Louis River.

Now to look at the Band's claims. Their four main claims in violation of water quality are related to sulfate, mercury, methylmercury, and specific conductance.

In making those claims, the Band ignores the project's water management actions. They weren't even mentioned yesterday.

They also assert a number of other violations in their "will affect" letter including antidegradation, narrative standards, designated uses, and wetland water quality, but they're all based on a claim that we will significantly increase sulfate, mercury, methylmercury, and specific conductance enough to violate those other water quality standards.

We will now have our expert witnesses come up and talk through the Band's claims to show that not only will we not increase the concentrations of any of these parameters, but we will reduce the loads of mercury and sulfate and the concentration of specific conductance in the St. Louis River waters, including at Fond du Lac's Reservation.

As a preview, we'll have three different technical experts come up to present the science as it pertains to the Band's claims.

Steve Donohue from Foth will come up first who will show how the primary source of mercury to the watershed is from precipitation. He will present the results of a new analysis showing that the project will not cause a measurable change to specific conductance or salinity. Fond du Lac's specific conductance water quality standard of 300 μS/cm was not in effect when our project was permitted, so this is a new analysis.

He will also explain the relationship between sulfate, mercury, and methylmercury which you also heard yesterday.

Cliff Twaroski from Barr Engineering is our mercury expert that led our cross-media analysis and permitting and the mercury work in our EIS process. Cliff will summarize the detailed water modeling work that shows the project will decrease the loading of sulfate, mercury, and methylmercury in the St. Louis River.

And lastly, we'll have Greg Council from Tetra Tech who will explain how the Band's assertions of indirect wetland impacts are significantly overstated, explain why the methods they state should have been used are not actually appropriate, and how the processes they state will cause concerns actually result in less methylmercury reaching the St. Louis River.

MR. STEVE DONOHUE: Good morning, Colonel Jansen and participants in this hearing. My name is Steve Donohue. Last name spelled D-O-N-O-H-U-E. I work at Foth Infrastructure & Environment, and I am the vice president of mining sector services.

I have, by way of background, about 32 years of experience working in the mining industry, principally on the permitting of new metallic mining projects, including the Eagle project that Christie Kearney referenced previously. I'm also a licensed professional hydrologist, so my technical expertise is in the area of water resources, hydrology, and hydrogeology.

I'm going to focus today on four key points that we actually addressed in technical memoranda that have been provided to the U.S. Army Corps of Engineers.

First, we're going to focus on mercury loading to the St. Louis River and provide information to the hearing here showing how that is driven by atmospheric processes, principally precipitation that deposits mercury into the entirety of the St. Louis River watershed and also the same type of process occurs with sulfate. That is the driver behind the behavior that we see in the St. Louis River related to mercury as it relates to the Fond du Lac Reservation and the St. Louis River as it flows by and adjacent to that reservation.

Secondly, we're going to focus on another memoranda that we provided which is the Band's claim that specific conductance will be violated in the waters of the Band. The analysis that we provided in the memorandum looks at the various types of discharges that are going to take place, the various types of water management activities that are going to take place on the project that are going to pull out things like sulfate and other constituents and show how that reduces, actually, specific conductance in the St. Louis River and also reduces salinity in the St. Louis River which is another issue that has been raised by the Band.

Finally, I will focus on water level fluctuations, the inputs of sulfate and mercury via these atmospheric processes into the wetlands, and the types of behavior that occurs in these wetlands that drives the generation of methylmercury which, as we heard from Dr. Branfireun yesterday, is the form of mercury that people are concerned about as it relates to migration through these water resources.

So to begin with, we're going to start at a fairly high level here, and what we have here is we're looking at mercury loadings via precipitation upstream of the Fond du Lac Reservation boundary. This is based off of data that is referenced in this footnote here on the figure where we've looked at data on what is the mercury concentration in precipitation in this area. And on average it averages about 11.7 ng/L in precipitation over the last 20 years.

If we apply that precip, which is about 29.8 inches per year, at 11.7 ng in that precip water to these various watersheds, sub-watersheds that drain into the St. Louis River, and we've identified all these sub-watersheds along the bottom of the graph here, we can see that some of these sub-watersheds are catching significant amounts of mercury just due to precipitation alone. That is what some of that mercury, although it all doesn't run off into the streams that feed the St. Louis River watershed, it is the driver behind the mercury that ends up there. It is the driver behind the mercury that ends up in the wetlands where some of it is converted to methylmercury which then makes its way into the river that flows by the Reservation.

The least significant source of natural mercury input into this watershed is the sub-watershed around the NorthMet project. This figure alone demonstrates that the behavior of mercury in the St. Louis River near the Reservation is really driven by these other watersheds and what's occurring there naturally via precipitation.

As Christie Kearney mentioned, once the project goes into operation, water management is key to the behavior of mercury as it relates to the PolyMet project. With that capture system around the flow -- the tailings basin, with the containment of water at the mine site, the pumping of that water through the water treatment system, we will actually see a reduction in mercury loading in the sub-watershed around the project by about 5.2 ng/L. It's all driven by the engineering and the treatment of water at the mine operation.

Another way of looking at this is on this flow diagram that Christie provided earlier. Here we've got all the different tributaries flowing into the St. Louis River. We've got the mine site tributary and the plant site tributaries, which are pretty minor, flowing into the Partridge River and the Embarrass River which feed the St. Louis River.

We're looking at that same data that we had on the previous figure. This is -- if we look at the upper part of the Partridge River, this is the amount of mercury that's coming into that watershed vis-a-vis precipitation on an annual basis.

Same thing in the Embarrass River. We've got about 4,183 g/yr that's impinging on that watershed on an annual basis. A portion of that ends up in the river that then drains into the St. Louis River.

Likewise, as we go downstream and we see larger watersheds feeding the St. Louis River, that loading of mercury and as a result methylmercury that goes into the river increases such that by the time we get to the upstream boundary of the

Reservation there's about 56,000 g/yr of mercury that is naturally coming into the system in this watershed, some of which makes its way into the St. Louis River and drives the mercury behavior that we see in the St. Louis River.

Another way of looking at it is vis-a-vis this pie chart. We're looking at the same type of data. And we can see that the NorthMet project under existing conditions is an insignificant contributor to the amount of mercury loading that takes place in this watershed on an annual basis.

Again, once the project goes into operation, the amount of mercury coming from the small watershed around the PolyMet project, which is already a small contributor to this watershed, is actually going to be reduced. Again, it's due to the containment of water that capture that water and the treatment of that water through the membrane filtration technology that's built into the water treatment system.

As Christie mentioned, we know that this technology works. It's not speculative. It's been used at other mine sites, notably the Eagle mine site. And just by way of background, there were a lot of claims made at that project 10 years ago that the technology wouldn't work. It has worked. It's in operation and it's working today.

Here we're looking at the same data with the project in operation. And again, about a 5.2 gram of mercury per year reduction that's going to go into the St. Louis River from the PolyMet project. That results in a 104 grams reduction in mercury loading to the St. Louis River over the 20-year life of the mine.

Now, a 5.2 g/yr or 104 grams removed over the 20-year mine life may not sound like a whole lot of mercury, but when we're talking nanograms per liter, which is a billion times less than a gram, this is a pretty significant reduction in mercury loading to the St. Louis River due to the clean up of brownfield site at this project.

We're now going to look at sulfate. As Dr. Branfireun mentioned yesterday, sulfate is also one of the constituents that drives methylmercury behavior which is what everybody is concerned about when we talk about mercury. And it's basically the same story. Sulfate comes in via atmospheric precipitation into the watershed. Some of that makes its way into the wetland systems, into the river, and that's what drives the methylation behavior that we see in these wetland systems, creating the more mobile form of mercury that people are concerned about.

So same type of data. We're looking at sulfate loading to these various watersheds. In the upper Partridge River we've got 149 tons per year of sulfate that naturally comes onto the landscape from precipitation.

The Embarrass River, 179 tons per year.

West Two River, Mud Hen Creek, Sand Creek, and the headwaters to the St. Louis River, 719 tons of sulfate is deposited on the landscape into some of the wetlands. That's what makes its way into the water resources in this system and drives the behavior of methylmercury.

740 tons at West Swan River, Flood River, Artichoke River, East Savanna River. And another 576 tons per year are coming into the system from Whiteface River and the Flood River.

So in total there's about 2,400 tons per year of sulfate that is deposited on this watershed upstream of the Fond du Lac Reservation.

When the project goes into operation, again, we're going to be collecting water at the tailings basin through the seepage collection system. All of what I refer to as the contact water at the mine site, that's the water coming out of the mine, the water coming off of the haul roads, et cetera, anything that's going to be carrying sulfate or constituents of concern, all of that water is routed to the water treatment system, and it's treated to very low concentrations, below 1.3 ng/L mercury to 10 mg/L of sulfate before that water is returned to the environment. So we're pulling, if you will, constituents out of the system and returning cleaner water back to the environment.

That results in a net effect from the operation where there's going to be 1,380,000 kilograms of sulfate that are pulled out of this system every year due to the water management strategy. It's a significant reduction over the life of the project. That is 27.6 billion kilograms of sulfate that are going to be pulled out of the system due to the operation of the water management and the water treatment features at this project.

I'd next like to turn our attention to specific conductance and salinity. Start out by saying that the project we did provide a memorandum looking specifically at specific conductance. And that memorandum that we provided to the Corps shows that the project will comply with the Band's water quality standard for specific conductance. The project will cause a reduction in specific conductance in the St. Louis River. The project will also cause a reduction in salinity in the St. Louis River at Forbes. We looked at Forbes because Forbes is the furthest upstream spawning area for sturgeon.

So the Bands have established water quality standards of 300 µS/cm. Just to clarify, specific conductance refers to the ability of water to conduct electricity. It's based on dissolved anions and cations in the water. Cations like magnesium, calcium and anions like sulfate and chloride and things like that. That's what drives the ability of the water to conduct.

So the baseline in the St. Louis River near Cloquet is about 189 µS/cm at peak project operation. The analysis that we provided to the Corps in our memorandum shows that there will be a 0.4 to 0.66 µS/cm reduction in specific conductance in the St. Louis River. This, again, is due to the fact that we're collecting water coming out of the -- seepage water coming out of the tailings basin that's high in sulfate, high in specific conductance that's going through a membrane filtration system to remove that load of anions and cations in that water. That's going to reduce the specific conductance in the water when that water is returned back to the environment.

Likewise, if we're going to reduce specific conductance in the water, we will also reduce salinity.

The Band has noted that a salinity of 23,000 or 23 parts per thousand will impede sturgeon spawning. We looked at the incremental effect on salinity from the project and there will actually be a reduction in salinity in the St. Louis River at Forbes of between .0007 and .0012 parts per thousand. There will be no impact on spawning of sturgeon due to the operation of this project.

Next topic is methylmercury. First, it's noted that mercury methylation will be inhibited by a reduction in sulfate loading from the project. We're pulling a significant amount of sulfate out of the system. That's sulfate that's naturally making its way into the environment today. By pulling that sulfate out of the headwaters that drain into the Embarrass River and the Partridge

River, that will reduce the sulfate loading further downstream and will reduce methylmercury formation.

We're also going to talk about natural seasonal fluctuations in water levels in these peatland environments as they are the primary driver for mercury methylation, not drawdown. We're going to get into this a little later with some of the subsequent speakers here.

First of all, we note that reduction in sulfate loading from the water treatment system will inhibit methylmercury formation. The Band's allegations of increased mercury methylation are predicated on an increase in sulfate loading. There will be no increase in sulfate loading at the project because all that water's going to be pulled out and treated.

As noted previously, project-related activities will reduce sulfate loading to the St. Louis River by 1,380,000 kilograms per year over the life of the project. That's 27.6 billion kilograms removed from the system.

Let's look at the effects of precipitation which brings in mercury, brings in sulfate. Let's look at the effects of precipitation on sulfide oxidation, methylation of mercury, kind of the natural cycle that generates this.

So here we have a cross-section schematic of a peat wetland. We've got a shallow water table that's maybe 18 inches, 20 inches below the land surface, and we've got roughly unsaturated, partially saturated peat environment above that.

Precipitation impinges on the wetland. And that precipitation, as we discussed earlier, brings in sulfate from the precip and mercury. That sulfate and mercury is then dissolved or available in the pore water of that peat environment.

There's also soil dust that is deposited on the landscape in these peat environments, and that soil dust can have sulfide mineralization, sulfide particles.

In this upper unsaturated portion of the wetland those sulfide particles can oxidize. And when they oxidize from sulfide, they go to sulfate which is soluble in the water and makes its way as a source of sulfate loading into this peat environment. Over time those particles settle through the peat environment down below the water table. Once they're below the water table, their source of oxygen is cut off and that oxidation no longer occurs, so they're no longer a source of sulfate to the system.

As the water table fluctuates and they -- the water levels in these wetlands fluctuate due to seasonal variations and input. So that could be snow melt, variable precip events. Large storms are going to bring the water level up. The snow melt, when it melts, it's going to bring the water level up in the wetland. So when that water level comes up, that sulfate and mercury is mixed into the water table. So that water table goes down. That sulfate and mercury is in an anaerobic environment. And in an anaerobic environment that sulfate, which is now in the groundwater, if you will, is available to bacteria. These are sulfate-reducing bacteria. They respire just like we do. But instead of using oxygen in the respiration process, they are using sulfate. And when they reduce sulfate to sulfide, there's a co-metabolic process that also methylates the mercury. And that's where the mobile form of mercury is generated is through the sulfate-reducing bacteria. That methylmercury is now available to be mobilized in these wetland systems where it can migrate out into adjacent streams and things like that that flow into the

St. Louis River.

This cycle goes on naturally every day, every year seasonally due to these variable inputs of sulfate, mercury, variable water levels in these wetlands that drives the formation of this compound.

It's noted here that the water level fluctuations in these wetlands, which there's been some debate on, are actually -- PolyMet's got data that shows that these water levels fluctuate by about 18 inches per year around the mine site. So we know that this process is naturally occurring and will continue to occur once the project is in operation.

So in summary, the analysis of potential effects on water quality, notably mercury, methylmercury, sulfate, and specific conductance as documented in the materials that PolyMet has provided to the PCA and the Corps of Engineers as part of the 401 water quality certification, the cross-media analysis as it's been referred to, was a thoroughly quantitative and exhaustive scope and evaluation to look specifically at the Band's claims that their water quality standards would be 0ed.

I've been working in this industry for about 30 years. I've seen a lot of this type of work on various types of projects. This was very exhaustive and it was very much on point directly to the questions that the Bands have raised throughout the EIS and throughout the permitting process.

The analysis, which is conservative, shows that the project will reduce loading of sulfate and mercury to the St. Louis River. There will be no violation of the Band's water quality standards for specific conductance, sulfate, or any other standard.

There will be a reduction in specific conductance in the St. Louis River. There will be a reduction in salinity in the St. Louis River. There will be no impact on sturgeon spawning. And water level fluctuations in the wetlands will not alter the generation of methylmercury as has been alleged in prior presentations.

So with that, I'll hand it over to the next speaker.

MR. CLIFF TWAROSKI: Hello. My name is Cliff Twaroski, T-W-A-R-O-S-K-I. I am an environmental scientist with Barr Engineering

Company. I've been with Barr for almost 25 years. Prior to that, I was with the Minnesota Pollution Control Agency for a little over 15 years. And my thesis work was done on the Krone bog just to the west of the casino here looking at peatland reclamation.

Today I'd like to talk about points of the project as far as the detailed modeling that shows we have a reduction of mercury and sulfate as well as methylmercury.

Unfortunately, I do need to talk about the Band not accounting for the project water management and treatment. It's an important part of the project that needs to be accounted for.

We also have heard the Band and their concerns about flushing events. And so we have done a screening analysis to address that. And I'll talk more about that. But that screening analysis is indicating that the project is still reducing sulfate, mercury, and methylmercury loading even under those high flushing events.

We heard a little bit about linkages yesterday. And I'd just like to refresh everybody's memory for methylmercury that is linked to sulfate and mercury and the anaerobic environments and wetlands and lake sediments. For the export of mercury and methylmercury from wetlands, that's linked to organic matter and water flow. Organic matter is a carrier of mercury and methylmercury. And as increasing flows occur, you will be increasing organic matter export. The DNR has documented that and there's studies of the St. Louis River and we'll talk a little bit more about that later.

Fish uptake of methylmercury is linked to the formation of methylmercury which is linked to the sulfate and mercury. And the export from wetlands to downstream waters is linked to the water flow.

And the main point here is that if we affect one part or one parameter, we are going to be affecting other parameters as well.

I'd like to talk a little bit more about the sulfate and methylmercury linkage with mercury being transformed to methylmercury, again, occurring primarily in wetlands and lake sediments. The methylation process does not so much occur in flowing waters where you have more oxygen occurring and we call that channel flow. Methylmercury, once it's in the food chain, as Dr. Branfireun pointed out yesterday, there is biomagnification up the food chain, and that has resulted in a number of fish consumption advisories, including for the St. Louis River.

One of the other points I'd like to make about this sulfate methylmercury is that MPCA did an analysis around a tailings basin. And they found that if you increase sulfate load, you will be increasing methylmercury.

The amount of sulfate increase is important, though. In this watershed, in the St. Louis River watershed an increase in sulfate may not show an increase in methylmercury and that is included in the DNR studies as well as PolyMet studies.

The MPCA has also concluded in their statewide mercury TMDL that sulfate loading will -- decrease in sulfate loading will decrease mercury in fish. USEPA approved that TMDL. And by that approval, they also concur with that finding. Also, the USEPA in another report, I think in 2009, also identified that if you reduce sulfate loading, you are reducing methylmercury.

We'd also like to talk a little bit about existing conditions. And we are talking about this to make sure that everybody has a proper understanding of how the project fits into these existing conditions. This is sulfate. And sulfate, as you heard yesterday, there's sulfate coming from the mining watersheds which are these dark gray watersheds on the top part of the St. Louis River watershed. And with the loading estimates, the mining watersheds provide about 70 percent of the sulfate load in the St. Louis River.

You can see that from the proposed project area the former LTV tailings basin provides some sulfate as well. There's also sulfate provided by the future mine site. Even though it's not -- it's a natural site right now, there is sulfate loading that is occurring from that area.

The other part of the slide is that there is sulfate coming from non-mining watersheds. And as the DNR has identified, that is a significant loading to the lower St. Louis River. If you took away all the mining sulfate, you would still have a methylmercury problem in the lower St. Louis River. And during storm events, high flow events like occurring now, the sulfate loading from the non-mining watersheds, in particular these large watersheds on the southern part of the St. Louis River watershed, can contribute as much sulfate as the mining watersheds. So they are not insignificant. And we just want to make sure everybody understands that.

For methylmercury and for mercury, the contribution is primarily from the non-mining watersheds. And again, this is different than sulfate.

Here, the non-mining watersheds, particularly the Cloquet River watershed and the Whiteface River watershed, are primary contributors of methylmercury loading to the lower St. Louis River. Both of these systems come in below the mining district. And the Whiteface comes in just north of the Fond du Lac Reservation and Cloquet comes in within the Fond du Lac Reservation boundaries.

I did not hear the Band identify this type of loading to the lower St. Louis River yesterday nor have I found any of this loading information in any of their documents that they've presented or prepared as part of the environmental review process or in this proceeding.

Again, the non-mining areas are the major contributor. One of the reasons for the Whiteface, that watershed has about 31 percent of its area in wetlands and that is contributing to its contribution.

The Cloquet River watershed, though, only has about 13 percent of its watershed in wetlands. But the Cloquet also has a very high flow. It's a major contributor to flow in the lower St. Louis River. So even at moderate methylmercury concentrations, its higher flow produces a loading that is just slightly less than the Whiteface River.

The one interesting point on this slide is that for the Partridge River it's identified as a mining watershed, and it's standing out a little bit more than, say, the Embarrass River watershed or the Swan. Those are also mining watersheds. And for the Partridge there is not much mining development in that watershed. It has the north shore Peter-Mitchell pit dewatering water that is provided to the Partridge. But otherwise, that watershed is fairly undisturbed.

But one of the things about the Partridge is that it has two major sub-watersheds within it, the south branch of the Partridge as well as Colville Creek. And those two tributaries to the Partridge enter the main stem of the Partridge below the project area, but they are originating wetlands.

And that baseline data we have for the Partridge River indicates that they provide more loading to the Partridge River than does the upper part where the mine, proposed mine area is located.

So again, wetlands within the Partridge River are providing this methylmercury load. And the project will have no effect on 99 plus percent of the loading of methylmercury to the St. Louis River. The project will address -- will be reducing loading from its area, but overall it will not have an affect on the majority of methylmercury showing up in the lower St. Louis River.

Now let's talk about the project. And the project does have additions. We do have a wastewater treatment discharge. We have sulfate in that discharge at 10 mg/L. We have mercury in that discharge at 1.3 µS/L. And it does add up to a load going out to those wetlands. And the Band has focused on this part of the project.

However, if you really want to look at the overall project, and you need to look at the overall project, there is a lot of reductions in sulfate and mercury occurring with the project in operation. And when we look at, in particular, the headwater wetlands, which the Band has identified as an important area of concern, the loading of sulfate is reduced by some 265,000 kilograms per year. And if you multiply that number by 20, it gets up very high over the life of the project. Mercury is also reduced to those headwater wetlands about 2 grams per year.

And the other part that I'd like to emphasize is that with the wastewater treatment system discharge, that discharge needs to be within plus or minus 20 percent of existing conditions average annual flow, and that is what is showing up on this slide. And so with the load reductions to the headwater wetlands due to the water capture and treatment, there is no increase in loading to those wetlands.

I'd like to talk about that water and water loading a little bit more because that seems to be an important part of the Band's comments.

Again, the wastewater treatment discharge needs to be within plus or minus 20 percent of the average, annual average existing conditions flow. The Band claimed that there will be excess flushing of these wetlands. That is not -- that can't happen if we're within plus or minus 20 percent of existing conditions.

In addition, the Band has said that the flushing of the wetlands will increase organic matter export downstream. If we're not increasing flows, not having excessive amounts of water being released to those headwater wetlands, then we will not be flushing more organic matter that will carry more mercury and more methylmercury downstream than what is already occurring.

So again, we're staying within pretty much existing conditions with the wastewater treatment system discharge to those headwater wetlands, and water loading is not an issue for this project.

For the sulfate for project impacts we looked at a number of evaluation points around the project in the Embarrass River, the Partridge River watershed, as well as locations in the St. Louis River and the Partridge River. Or sorry. In the St. Louis River upstream of the Fond du Lac Reservation as well as downstream.

For the plant site area in the Embarrass River, we found, again for the headwater wetlands, that we will have reductions of sulfate, about 126,000 kilograms per year, to the Trimble Creek headwater wetlands, about 139,000 kilograms per year to the unnamed creek headwater wetlands, and by the time we get down to PM13 in the Embarrass River itself, we have a reduction of about 1,280,000 kilograms per year. And this is cumulative loading. This accounts for the project's air emissions of sulfur as well, and that includes sulfur emissions from stacks, mobile sources, as well as fugitive sulfide mineral dust.

For the mine site we also see a reduction of sulfate, about 9,000 kilograms per year, due to water capture and treatment. We also see a reduction at discharge location SD026 which is the headwaters of Second Creek. That reduction is a little more than 84,000 kilograms per year. And again, that is wastewater discharge at about 10 mg/L.

We also see a reduction of about 15,000 kilograms per year due to the transfer of Colby Lake water to the plant site for use as process water. And overall, when we look at the Partridge River, we have about 100,000 kilograms per year reduction. And again, this is taking into account the project's air emissions. In the Partridge River most of those air emissions are being driven by the sulfide mineral dust, and that's accounted for in these loading reductions.

When we get to the St. Louis River, when we combine up the reductions in the Embarrass River and the Partridge River, we're looking at a reduction of about 1,380,000 kilograms per year. And again, when we look at 20-year life, we're in that approximately 28 billion kilograms per year of sulfate reduction that's getting to the river.

Forbes is above the Fond du Lac Reservation. This loading reduction carries down to Cloquet and to the Band's boundaries.

If we are reducing sulfate loading in the headwaters, we cannot be increasing sulfate loading downstream. If we're reducing sulfate loading around the plant site, mine site, that means we are also reducing methylmercury both around -- in both the Embarrass and Partridge River watersheds as well as downstream at the Fond du Lac Reservation.

For mercury we also evaluated loading close to the project in the same locations as we did for sulfate and also in the St. Louis River. For that analysis the numbers are smaller but we are still showing a reduction of mercury loading to those headwater wetlands near the tailings basin, 1.5 gram per year reduction to Trimble Creek.

Headwater wetlands, a small reduction, about

0.2 grams per year to the unnamed creek headwater wetlands. And when we get out to PM13 in the Embarrass River itself, the reduction is about 0.8 grams per year. And again, this includes the project's air emissions of mercury which were modeled out to about 10 kilometers away from the project and estimating deposition from those emissions.

At the mine site we see a reduction of about 6 grams per year. We also see a reduction when we transfer Colby Lake water over to the plant site. However, we also see an increase at SD026 which, again, is the headwaters of the Second Creek. That increase is due to a small increase in water flow due to the wastewater treatment system. And it's also an increase based on our assumption that the mercury concentration of 0.5 ng/L now goes up to 1.3 ng/L with the wastewater treatment discharge. And that was a conservative assumption that we made for our impact calculations.

However, as you've heard two previous speakers talk about, the Eagle Mine in Michigan has the same technology for water treatment as being proposed for the PolyMet project. My understanding is there's at least three years of data that are showing mercury concentrations in that discharge water of about 0.5 ng/L or less. So the increase that we have identified here for SD026 is likely an overestimate and that with the project in actual operation, any increase in mercury is likely to be less than what we have calculated.

So when we look at the reduction of mercury loading in the Embarrass River of .8 grams per year, a reduction from the Partridge River watershed of 4.4 grams per year, that totals to a little over 5 grams per year reduction in the St. Louis River at Forbes. And again, Forbes is upstream of Fond du Lac Reservation. This reduction carries down to the Fond du Lac Reservation as well as to Cloquet. And because of the relationship of mercury, sulfate, and methylmercury, if we're reducing mercury in the headwater regions, then we will be reducing methylmercury in the lower St. Louis River as well.

So we've conducted a number of evaluations for the project. We've looked at the Embarrass River, Partridge River, St. Louis River at Forbes and Cloquet, and all of those are identifying that there will be a decrease in sulfate and mercury loading and methylmercury loading to the watersheds where the project is located as well as to the St. Louis River at Forbes and Cloquet.

Cross-media analysis was conducted to specifically address the Band's concerns about sulfide mineral dust adding sulfate to wetlands and the methylmercury formation within those wetlands due to this extra loading of dust.

What you can see in this table is that on an overall basis, the loading of sulfate from the project is small. And the same for mercury.

And when we look at the historic loading, especially of sulfate, which has been much higher than it currently is, and we take into account that methylation has occurred at higher background loading, it's occurring now under existing conditions, and this small potential increase from the project, our conclusion is that we are not changing the methylating environment of wetlands in and around the project.

But the Band still has concerns, and they're expressing concerns about flushing events. And so we took a look at those flushing events to see what it meant. And in particular, the methylmercury was of interest to us because -- and as it is to the Band as to what's happening when we have these flushing events.

The one thing that we are doing here is that we are comparing a flushing event in existing conditions to a flushing event with the project in operation. All of our previous mass balance calculations and analyses have been on average conditions. And the Band has seemed to take those average conditions and compared them to flushing events. And under that kind of comparison, yes, there is an increase -- the project would show an increase. But we want to look at a fair comparison of the project in operation to a flushing event in existing conditions.

So we assimilated data for looking at maximum flows from the project's water modeling data packages. We looked at mercury and methylmercury concentrations from the baseline data that's been collected for the project, as well as supplemental information from the DNR studies and Pollution Control Agency studies.

For the Embarrass River and Partridge River watersheds in particular, we're using a baseline data but there is some DNR data for both of those watersheds.

For the St. Louis River at Forbes and Cloquet, that data is primarily coming from DNR reports, USGS flow information, as well as the Pollution Control Agency and some of their data.

And again, the project in operation does reflect water capture and treatment. And that, again, is a primary part of the project that needs to be incorporated into all of these understandings of what this project means.

So when we look at the project and a high flushing condition, we can see that there is still a reduction occurring even under these flow conditions, again, because of the water treatment and water capture occurring due to the project.

The other part of this information is that this net change, this reduction due to the project carries down to Forbes, but we also see a very high contribution from non-project areas. And as you recall some of the slides presented by Steve Donohue, there is a significant amount of mercury that's being deposited to the St. Louis River watershed as a whole, and that's being reflected in these non-mining area contributions, non-project area contributions as being much more significant than what's coming out of the project area in existing conditions. And that's the same whether you're at Forbes or whether you're at Cloquet. And again, we have the Whiteface River and Cloquet River coming in in this lower part of the river, and they are major contributors to this non-project area loading.

With the project in operation, there is, again, a reduction in mercury loading. And that is again carried through to Forbes and it's also carried down river to Cloquet.

For methylmercury we have the same story that the project does reduce loading of methylmercury under these high flow scenarios. Again, that loading is occurring at Forbes up above Fond du Lac. It's also occurring downstream at Cloquet. And again, we have a large contribution from the non-mining, non-project areas and only a small contribution from the project area itself whether it's existing conditions or in operation.

And again, the overall conclusion here is that we have, under this worst-case scenario where -- and this incorporates all the severe flushing, severe water level declines that the Band has talked about, this incorporates all of that and still we show a reduction in both mercury and methylmercury under this high-flushing scenario.

So in summary, our modeling work and the support analyses that we've conducted identify decrease in sulfate, mercury, and methylmercury loading in the St. Louis River.

The Band does not seem to account for this water management treatment. The direct discharges from the project will not increase loading of water, organic matter, sulfate, mercury, or methylmercury.

The wastewater treatment discharge to headwater wetlands will be similar to existing conditions flow, so there's, again, no excess water loading, no excess flushing of organic matter.

If we are reducing loading in the headwaters region, we will not be increasing loading in downstream areas. And even under a high-flushing scenario, the project is still reducing loading. And again, if we're reducing sulfate in the headwaters region, we are reducing methylmercury in the downstream waters.

And so that's the end of my preparation.

MR. GREG COUNCIL: Good morning. My name is Greg Council. That's spelled C-O-U-N-C-I-L. I am an environmental engineer with Tetra Tech.

My background is I have about 28 years of experience focused on groundwater hydrology, groundwater modeling, and the interaction of groundwater and surface water and modeling of that process, those processes. My work on the project to date primarily has been peer review-type work in the modeling area.

Today I'm going to discuss the claims that were made by the Band related primarily to groundwater drawdown and how such a groundwater drawdown might affect water quality in downstream waters.

The items I'll be talking about, the analyses are documented in a memo that we provided to the Corps.

As Ms. Schuldt did yesterday, I'd like to start with a map of the watershed just to orient ourselves. You've seen this map before. I'll point out that for the purpose of the presentation today, we're going to focus right here just on the mine site where drawdown from development of mine pits would occur because of the groundwater that would flow into those pits.

So focusing now just on that area, let's look at these features around in the mine site.

This particular figure shows the Partridge River flowing around the mine site. This is the flows on the north side, the east side, and then the south of where the mine pits would be. Those mine pits are outlined here in black, the west pit and the combined central and the east pit. Not developed yet but if the mine is permitted, these pits would then be excavated and groundwater would flow into them.

Shaded in green here are the extensive wetlands throughout this watershed. We've talked a lot about the wetlands in the mine site area. And we're going to talk a little bit about them over the next few minutes. I'll just point out that, yes, there are extensive wetlands in this area. It covers a lot of this map.

I'll also point out that in the upper left-hand corner you see a portion of the Peter-Mitchell mine, an active, existing iron mine that's somewhat near the proposed mine site.

So I want to point out, just make sure that we're all clear and we all agree, I believe, that these wetlands do now produce sulfate, mercury, methylmercury. These are constituents that are currently stored in the peats of these wetland sediments and can be released when sulfur is oxidized and then that sulfur promotes methylmercury creation from the mercury through the sulfate-producing bacteria. This is happening now. It's happening in this watershed and all throughout the St. Louis River watershed, as Cliff Twaroski pointed out earlier.

So we're going to talk a little bit about the claim that there would be a massive drawdown here as a result of development of these pits and that that massive drawdown, according to the Band, would lead to drastically more sulfate oxidation and that sulfate oxidation in the sediments would lead to methylmercury creation that would then be transported to the Partridge River and then downstream to the St. Louis River.

We're going to talk about that and try to at least give some sense of the quantities involved here. There's really not a quantification of those processes in the Band's claim but we'll try to at least provide some calculations in this discussion.

So to overview the Band's claims here related to drawdown. The Band -- and also, a little bit of my summary that is detailed more in the memo.

Basically we're going to show in some of these subsequent slides that the Band is really not accounting for the fact that wetlands in this area will actually be directly removed. And while that will have to be mitigated and is, in fact, being mitigated, the removal of the wetlands actually removes the sulfate-generating portion of those wetlands.

The Band's analysis overstates the amount of drawdown that would occur. We'll get into that a little bit. And through that overstatement, basically implies that you're going to get a net increase of sulfate, mercury, methylmercury reporting to the Partridge River and to downstream waters. We'll go through those claims and show you why that is not the case.

Additionally, the Band claims that MODFLOW should have been used to predict what the impacts would be in wetlands. Going to talk about that on one slide just to show that that's really not what MODFLOW is intended for.

And then lastly, we'll talk about some mitigating factors, some hydrogeochemical mitigating factors that influence what actually happens with the sulfate and the methylmercury so that we get a little bit better handle on what's really going on in the system.

Back to this figure. Again, this is just an overview figure showing the area around the mine site. I'll superimpose on that the acreage of wetlands that would be removed, basically filled and excavated, as a product of building these mines and the stockpiles. These wetlands now, once the project would go into effect, no longer generate sulfate or methylmercury.

Going one step further, this figure shows some of the wetlands that would be potentially impacted by drawdown. This is from the analysis in the FEIS, so this analysis is based on the analog method which uses the data from a nearby mine to estimate how much drawdown would occur in and around the mine. We all agree that drawdown would be greater near the mine and near the mine pits and that it would be decreased as you move away.

This one, this particular rendition shows the drawdown -- or shows in orange, I should say, the areas that are in the FEIS predicted to be highly likely affected by drawdown or moderately likely affected by drawdown. The FEIS also points out some wetlands that are low likelihood drawdown wetlands.

But this acreage, high and moderate, is 160 acres, a little bit more than 160 acres. Again, it's based on the analog method from the nearby Canisteo Mine. It's conservative in one way in that the Canisteo Mine is actually developed into the Biwabik formation, which is a permeable relative to the Duluth Complex and the Virginia formation where these mine pits, where the PolyMet mine pits would be developed. The Canisteo Mine is in a much more permeable unit.

So if we look at these orange-shaded wetlands that are potentially affected by drawdown, they obviously -- the obvious question is what if the high -- what if these drawdowns were affected by drawdown in a way that increased the oxidation, therefore, increasing sulfate and increasing methylmercury production.

So as I said, you've got about -- I may not have mentioned the acreage. You've got about 750 acres taken away as methylmercury producing acreage of wetlands, so those now produce sulfate, methylmercury, would be taken way from this system producing sulfate methylmercury. And you still got -- maybe you've got 160 or so acres that have an additional oxidation capacity because there's drawdown that creates a little bit dryer wetland.

Well, in order to make up just for the 750 that you've removed, you'd have to more than quintuple the amount of sulfate creation from those 161 acres that have been increased in oxidation. Nowhere do any of the data or any of the scientific studies suggest that this type of increase is likely.

One of the studies, I believe, that Dr. Branfireun pointed out yesterday showed 190 percent increase in methylmercury. But again, not quintupling of that amount.

It's important. You can't ignore the loss and load due to the removal of wetlands in capture of the water. The net effect here is a reduction in methylmercury creation.

Now, what if the area of impact is much larger as the Bands claim. This figure, I've zoomed out a little bit so that we can show the entirety of what -- approximately at least is what the GLIFWC analysis, the Band's analysis, has alleged would be the actual affected acreage based on their alternative analyses.

So this shows in blue, combined with the previously shaded orange and black areas, about

6,000 -- actually a little bit less but roughly 6,000 acres that are within 10,000 feet of the proposed PolyMet pits.

So I wanted to look at this 6,000 acres and say, well, if the drawdown is massive enough to create this big of a drawdown, this much wetland impact, how much would the wetland impact be on average? Or how much -- how could I get a bounding calculation to see what additional loads of sulfate and methylmercury would actually be generated from this much wetland impact.

And here, I think it's important first to just sort of -- first of all, we just developed a little illustration to show how big the 6,000 acres is compared to what's being removed and what we really think would be affected by drawdown.

So this shows -- this is just a simple illustration. Again, in blue just an area that's 6,000 acres if every square on this figure is assumed to be one acre. We'll compare to that the amount of wetlands that would be directly affected, basically removed through filling or excavation. That's about 750 acres. And we'll also show the area that the FEIS shows would be highly or moderately likely to be impacted by drawdown, a much smaller 161 acres. But if it was -- if drawdown actually affected the entirety of the 6,000 acres, how severe would that impact be?

For this it's important to look at how much groundwater is actually going to be flowing into the pit. We have estimates of this from the detail modeling, the MODFLOW modeling that was developed for the project.

The MODFLOW, by the way, the groundwater model, is a good tool for estimating groundwater inflow to a mine pit.

So this figure shows, on the X axis, the year of operation of the mine. And the Y axis shows the estimated modeled inflow to the groundwater pits from groundwater. Each pit, the central pit, the east pit, and the west pit, are shown on different line, different colors with the black line being the total groundwater inflow to the entire mine.

It averages over time, if you just take a simple time average over this entire 20-year mine life, the average inflow is about 502 gallons per minute. Roughly 1.1 CFS, just for context. I think Christie Kearney pointed out earlier that the flow in the Partridge River just downstream of the mine is about 49 CFS on average, so we're talking 2 to 3 percent of the total flow is groundwater flow coming into the mine.

Where is this groundwater flow coming from? Well, it's not all coming from just wetlands but it could be -- some of it could be coming from wetlands. A lot of it's coming from groundwater storage because as you draw down the water table, you're pulling water that had previously been stored in the pores and the unsaturated -- and the unconsolidated system, and you're pulling in water that was previously in fractures. You're also perhaps pulling in water that would have been evapotranspirated in uplands. And you are pulling in water that would have reported instead to wetlands or maybe even more that seeps out of wetlands.

So let's assume that a lot of this water, maybe even all of this 500 gallons a minute, was pulled from these 6,000 acres of wetlands. What would that really mean?

So if we take the Band's assertion that 6,000 acres would be affected, on average, pulling out 500 gallons a minute out of 6,000 acres of wetland results in a .083 gallons per minute per acre removal out of those wetlands.

Now, we've made some assumptions here, conservative for the most part in that we've taken the entirety of the predicted groundwater inflow and assumed it's all taken from the water budgets from these 6,000 acres of wetlands around the mine, within 10,000 feet of the mine.

So with that average effect, we're pulling out basically 1.6 inches per year out of the water budget of the wetlands around the mine in this particular analysis. That 1.6 inches per year is about 5 percent of the average precipitation in this area of Minnesota. Average precipitation being around 30 inches per year.

So we're pulling out perhaps 5 percent of the water budget of these wetlands through development of the mine, pulling groundwater into the mine instead of going to wetlands. We basically, in a way, made the wetlands 5 percent dryer. If we take what that 5 percent dryer wetland really means, it's effectively like having the original 6,000 acres and adding another 5 percent. So you've got 6,000 acres that are already now producing sulfate through these processes, natural variation in water levels going up and down. You get sulfate creation. You get methylmercury creation. If you think about a 5 percent dryer case, it's effectively like adding 300 acres back in. That's 5 percent of 6,000. You still haven't accounted for the removal -- you still haven't made up for, rather, the removal of the 750 acres through the original direct removal of wetlands.

So you still, in this analysis, have a net loss of sulfate, methylmercury, and mercury reporting to the pore waters and the wetland sediments.

Let's talk for a second about MODFLOW. As I mentioned, MODFLOW, very good tool for estimating what's going on in groundwater.

In this case we've used MODFLOW to calculate mine inflow. That's a good use. There is many limitations with using MODFLOW to predict what's happening in wetlands. It really doesn't have the capability of simulating wetlands in any detail. And that's important because wetlands are complex. They're very variable on a spatial scale and on a temporal scale. There are natural fluctuations in the way that wetlands behave that go on now, and these are hard to capture, especially with models that have a large grid cell size and typically have a long time still.

Importantly, wetlands have low permeability peat sediments in many cases. And those, without doing a lot of layering and a lot of detail, real, real fine-tuning, it's just really, really difficult to get that right even if you were to use something like a numerical simulator to try to predict that.

There are other wetland processes going on. They're basically impossible to use -- impossible to model with MODFLOW. So while it's a useful tool, the important limitations of MODFLOW with regard to wetlands make it really not useable for predicting directly what's happening in wetlands.

Some of the complications actually also come into play when you think about how the sulfate and mercury and wetland sediments may mobilize down gradient.

For this I'm going to turn a little bit to just a brief overview of the hydrogeochemical conditions that have to occur for the sulfate to oxidize and to create methylmercury. I won't go into this in detail because we've covered it. We covered it yesterday with Dr. Branfireun. We covered it today on a couple previous presentations. Just to say that we all know it's happening that naturally this happens and that, yes, in certain circumstances it could be exacerbated by drawdown.

But there are at least four mitigating factors that we're going to go into that describe why -- you take a little bit bigger picture, you take a step back, any sulfate, methylmercury, mercury that's created in the pores of the wetland sediments, instead of reporting down to the Partridge River and downstream waters, is actually going to report to the mine, or otherwise, not go downstream and would eventually be pumped over to the plant site where it would be eventually treated by the reverse osmosis, by the membrane treatment system that we discussed earlier.

So in the bigger picture, this cross-section -- it's just a conceptual cross-section -- this cross-section shows a little bit of the processes that actually happen once a mine pit is developed and water begins to drawdown near it.

So in much of the area around the mine what you have is a decreased water table and water that would have flowed via runoff out to the Partridge River, would have potentially flowed via shallow groundwater flow. Maybe during high storm events the groundwater would have discharged to the surface and then through runoff. A lot of that water now is going to report to the mine pit instead. Again, it just gets captured and eventually treated. You get less runoff. You get less flow of groundwater, lower gradient. I'll talk about -- basically less driving force of groundwater toward the Partridge River. And you actually get some mobilization of mercury downward into the soil column which tends to sequester it to some degree.

So effectively, these processes are mitigating in that they limit the downstream, the down gradient movement of the sulfate and methylmercury to downstream waters.

As I said, there are at least four processes here that we'll just briefly touch on.

These processes mitigate the transport of the sulfate and mercury to downstream waters.

The first one is you've reduced now, through the development of the mine, the hydraulic gradient that naturally goes from the mine site area, the upland mine site area, down toward the Partridge River. You've reduced that hydraulic gradient and you, therefore, reduce the driving force that would push groundwater toward the Partridge River. This results in a lower load of water, of sulfate and other constituents to the Partridge River.

In fact, nearest the mine where the drawdown -- where the increased oxidization is alleged to occur, nearest the mine, that is where you're more likely to have the water flowing toward the mine where it would eventually get captured.

Second mitigating factor. As I mentioned, you've pulled now the water table down so that during high flow events like the large snow melt event, like really what's going on now with the high flows in the rivers, during these high runoff events, you're less likely to have wetland pore water discharging up into runoff and making it to the Partridge River and then to downstream waters.

So during these high events, you're going to have greater infiltration, a greater balance of more infiltration and less discharge, and you're going to have less runoff, less sulfate and methylmercury making it to the rivers.

Thirdly, mitigating factors. There will be some vertical redistribution of methylmercury downward into the soil column. Some of the experiments show that -- and these are some of the experiments, I think that Dr. Branfireun was talking about yesterday -- they show that actually the process moves -- the process of the cycling that was illustrated well, I think, in Steve Donohue's animations earlier, that process tends to move the mercury down in the sediment column during the process once there is some drawdown underneath.

This graph shows -- this was pulled directly from one of those -- it's footnoted here -- directly from one of those papers. It shows the mercury concentrations in soil, in sediments of the wetland, rather, measured as a function of depth. So we have concentration on the X axis up here and we have depth on the Y axis.

In the high water table or base case, let's say, the water tables varying between 7 and 11 centimeters below land surface. And in this case you've got your peak mercury concentrations occurring at about 20 to 35 centimeters below land surface. Once the low water table is established in the same sediment column, what happens is you get the higher mercury concentrations, similar levels but much lower in the soil column down to 30 to even 60 centimeters deep. So you got less mercury in the more available, shallower portion of the soil column and more mercury down deeper. You've effectively sequestered some of the mercury into a deeper portion of the sediment column.

Finally, demethylation. Well, we all agree that the methylation of mercury is an important process. It's important to also consider that demethylation occurs. So it's a reversible process and it can occur where the actual mercury that's created, rather than making it downstream to the Partridge River, could be, by the same basic processes, could be demethylated.

And in fact, one of the studies that, I believe, Dr. Branfireun talked about yesterday talks about this demethylation and about how important it is in that it prevents what you might expect otherwise to see in the downstream waters.

So in summary, we find that the Band's "will affect" analysis related to drawdown and its creation of mercury -- methylmercury, rather, sulfate in downstream waters is overstated not only because it overpredicts the drawdown in wetlands relative to what the FEIS describes, it also implies that they -- that the oxidation in the sediments in these larger area of wetlands would overwhelm the other impacts that we've talked about before that tend to reduce the loads of sulfate, mercury, and methylmercury to downstream waters.

It's important to not only assess what might happen due to drawdown to increase oxidation, but also the important mitigating factors that I describe that would tend to pull any increased sulfate and any existing sulfate and mercury and methylmercury into the mine where it would be treated before discharge.

So as part of the project, not only do we expect the sulfate and mercury and methylmercury to decrease rather than increase as a result of the development, we're also going to institute a thorough monitoring plan and adaptive management to ensure that that's the case. We're going to be monitoring the impact on wetlands. The project will adapt the project as needed to ensure that water quality is preserved. It's just not waiting or planning for bad things to happen.

The analysis shows that the loads are going to decrease. But we're going to be monitoring so that if something we don't expect does occur, we get an early warning, and we can use our known mitigating actions to ensure that a negative environmental consequence does not occur such as a water quality violation.

These monitoring ideas and adaptive management will be discussed now as Christie Kearney comes up for our last portion of the presentation. Christie.

MS. CHRISTIE KEARNEY: Thank you. I'd like to take a moment. My name is Christie Kearney. Kearney is K-E-A-R-N-E-Y. I'm going to take a moment to step us back for a moment.

So it was recognized in watching our presentation, we have a typo in our presentation. I've talked about -- these numbers on the side are correct overall with the exception of this sulfate total for the 20-year total. That number should be 27.6 million kilograms. Still a huge number but it's not billion.

So our experts today have explained in great detail the science behind our analysis. It's the details that matter, which the Band has left out of their "will affect" letter or mischaracterized in their presentations yesterday.

The understanding of these details is what led the agencies to the issuance of our permits. However, the agencies didn't just rely on the science and our modeling. I'm now going to talk through the monitoring required by our environmental permits, the annual analyses and verification evaluations that we're required to do, and the adaptive management and mitigation laid out in our permits.

This slide shows our extensive comprehensive water and wetland monitoring required as a result of our NorthMet permits. This compilation of monitoring required is from our two NPDES permits, our consent decree, our 401 water quality certification, our 404 permit, our Wetland Conservation Act decision, and our permit to mine.

This includes stream water quality, stream flow, groundwater quality, and groundwater levels, wetland hydrology, wetland vegetation, wetland water quality, industrial water collection, treated water discharge, and macroinvertebrate and fish monitoring that we're required to do. 280 monitoring locations in total.

Many of these have been underway throughout the environmental review process, but there's a number of these that are new monitoring locations that have started once our permits were issued.

For example, we have 16 years of wetland hydrology data. This creates a robust data set to evaluate potential project impacts from baseline conditions. We're not aware of any other mine that has a monitoring program as robust as this.

Now let's focus in on the mercury monitoring since that's what's most important in the presentations yesterday and today.

We are and will be monitoring mercury at 66 different locations around our project site. In stream water quality, in wetland water quality, in industrial water collection, and in our treated water discharge.

The MPCA required monitoring to confirm the expected outcomes of our cross-media work and to ensure the ability to perform adaptive management if changes were found that were attributable to the project. This mercury monitoring is compiled from our two NPDES permits, our 401 water quality certification, and our permit to mine.

The Band has contended that there's not enough monitoring to detect harm. This slide and the prior slide showing our 280 monitoring locations shows that that claim is incorrect.

In addition to monitoring, the agencies also required -- also included numerous permit conditions that require annual review of our monitoring results. Many of these analyses are listed on this slide. We're required to perform an annual potential indirect wetland impact assessment to evaluate wetland water levels and vegetation. This is from our 404 permit, our 401 water quality certification, and our Wetland Conservation Act decision.

We're required to do an annual evaluation of stream and wetland of interest water quality monitoring data to evaluate against our baseline conditions and our cross-media analysis results and predictions based on our 401 water quality certification conditions.

We're required to do an annual groundwater evaluation to assess monitoring results, the suitability of our monitoring network, spatial distribution of our groundwater quality, and potential for north flow at the mine site according to our NPDES permit conditions.

Our NPDES conditions also require us to do an annual comprehensive performance evaluation to assess the performance of our engineering controls and our monitoring network.

And we also have many other annual reviews that we're required to do for our permit to mine and our water appropriation permit that I won't get into today.

Additionally, once our monitoring results have been analyzed, we're also required by permit conditions to perform an annual verification, modeling, and evaluation.

In this annual assessment we'll be assessing the predictions of our water quality and quantity and comparing them to the actual observed monitoring data. We'll be verifying previously predicted long-term impacts from our EIS and permitting by rerunning our water models with the actual observed data from the monitoring.

We're required to determine if changes are needed to remedy unacceptable impacts that might be recognized in the rerunning of our water models or in the monitoring data itself and implement our adaptive management and contingency mitigations that we've already laid out.

And every 5 years we're required to reevaluate, rerun our underlying conceptual models such as our MODFLOW model. This is required by our permit to mine, our NPDES permit, and our water appropriation permits.

Now let's talk about adaptive management and mitigation because it doesn't appear that that was well understood by the Band based on the discussion yesterday.

PolyMet has proposed an adaptive management approach. Adaptive engineering controls can change as a result of monitoring or monitoring data or modeling data. Our water treatment plant is an example of an engineering control. It's designed to be modular so if we're seeing higher flows or higher loads, we can add additional units to it to be able to expand the engineering control and make sure that we're meeting our permit conditions and requirements.

Additionally, contingency mitigations have already been laid out in our permitting documents and could be enacted if required.

Every one of our major permits includes adaptive management processes and mitigation measures to evaluate and consider.

For example, the 404 permit states that when changes are recognized, monitoring report shall include recommendations for appropriate steps to respond to the documented changes to include additional monitoring, adaptive management, and/or compensatory mitigation. Note that it says when changes are recognized, not when permit violations are made. So this is required in addition to our 404 permit by our 401 certification, our NPDES permit, our permit to mine, our Wetland Conservation Act decision, and our water appropriation permit.

So to wrap up, our project will not affect the quality of the Band's waters so as to 0 any of the Band's water quality requirements.

In summary, our project will reduce sulfate and mercury loading and specific conductance in the St. Louis River. This statement was true from the EIS as well as the additional analyses completed for permitting. The Band needs to show that both the EIS and the permitting documents were wrong. Fifteen years worth of analyses to show a violation of their water quality standards. They have not so far. Speculation is not enough to show a violation of a water quality standard.

There are adequate controls in place, both in project design and as permit requirements, to ensure that the project will not cause or contribute to a violation of water quality standards for sulfate, mercury, methylmercury, or specific conductance or any other water quality standard at the Fond du Lac Reservation in the lower St. Louis River 116 river miles away.

The agencies didn't just rely on the science or our modeling that they reviewed and approved. They put into effect, we have over 7,000 permit conditions that we need to comply with, including comprehensive monitoring, annual verification modeling and evaluation, adaptive management, and contingency and required mitigations.

Our project reuses existing infrastructure bringing the site up to modern standards and cleaning up legacy issues in the process, including cleaning up the Embarrass River, the Partridge River, and the St. Louis River as a result of past mining disturbances that have occurred on our site.

Currently, we're the only discharge in Minnesota that's required to meet the wild rice standard at the end of our pipe, which will result in a significant reduction in sulfate in the St. Louis River. This project is for the betterment of these streams, including the betterment of the St. Louis River and water quality at the Band's reservation.

Regardless, 116 river miles downstream is a long way, as I mentioned earlier. And although the Embarrass River and the Partridge River will clearly show this cleanup, it will be mostly undetected in the St. Louis River at Forbes and at Fond du Lac because our flow is less than 1 percent of the flow at the Fond du Lac Reservation.

PolyMet will produce metals that are essential for the U.S. sustainability and energy goals and will be one of the only sources of nickel and cobalt which are essential to battery storage.

Our project has gone through extensive joint state and federal environmental review and permitting processes with unprecedented community and tribal involvement.

Fond du Lac and the EPA were both cooperating agencies for the supplemental EIS and for the final EIS. And what wasn't mentioned yesterday was that although we did get a failing grade on an earlier version of our EIS, our draft EIS, we went back to the drawing board. We did a supplemental EIS, completely changing our project, including adding the requirement for the 10 mg/L sulfate standard. And as a result, the EPA gave our supplemental draft EIS an EC-2 rating which is the highest rating a mining company has ever gotten in the U.S.

And lastly, our project meets the definition of responsible domestic mining called for in the Presidential Decree on the Defense Production Act.

I thank you for allowing us the opportunity to present the full story of our project.

COLONEL JANSEN: Thank you, Christie and thank you to Steve, Cliff, and Greg for your presentations.

Greg, I'll make a note that our YouTube recording cut out at the period of your summary slide. However, we have a backup recording and a backup to the backup recording and a transcript, so we're sure to capture that portion.

So now we'll take our recess until 12:30.

(A break was had in the proceedings.)

COLONEL JANSEN: Welcome back, everybody. We'll move into our afternoon session. Each party has a chance for two-hour rebuttal. We'll have a recess in between.

I'll go ahead and recognize Vanessa representing Fond du Lac Band.

MS. VANESSA RAY-HODGE: Good afternoon. My name is Vanessa Ray-Hodge, and I am outside counsel for the Fond du Lac Band of Lake Superior Chippewa.

In attempting to discount the Band's, well-grounded and scientifically based "will affect" determination and objection, PolyMet continues to try to hide behind smoke and mirrors. Its contention that the Band's reservation is located too far downstream from the project to suffer impacts is simply wrong as laid out in the Band's objection and presented by our experts yesterday.

Significantly, EPA agrees with the Band that its downstream reservation waters will be impacted by the proposed project.

PolyMet continues to assert that there will be no violations of the Band's water quality standards, but PolyMet ignores the fact that under existing conditions, there are already exceedances of many of the Band's downstream water quality standards, including its numeric standard for mercury and specific conductance.

Additional discharges from the proposed project which assume that the state standards will be met have nothing to do with the Band's downstream standards. And as you heard yesterday, PolyMet's conclusions are based on significantly flawed studies which are insufficient to show all hydrologic impact, studies which EPA in its recommendations characterize as extremely cursory.

PolyMet also suggests that the Band ignored concepts like alleged reductions in mercury and sulfate due to the proposed project's operations. That is incorrect and our experts will address briefly today those contentions and more fully address those in written comments.

Our experts will similarly address PolyMet's absurd conclusion that the Band's objection is speculative and not based on evidence that concretely shows that there will be violations of the Band's downstream water quality standards.

A contention by PolyMet that EPA has also implicitly rejected by agreeing with the Band and finding that the Band's objection is, "well-grounded in contemporary scientific research."

More broadly, despite PolyMet's allegation that the project has been fully considered and evaluated as part of the EIS process, the Band has been challenging the conclusions in the EIS since the beginning, including the efficacy of things like the seepage capture system, the construction of the tailings basin, water treatment, and more.

The Band submitted its comments and concerns on these issues as part of its "will affect" determination.

It is true that the Band was a cooperating agency during the environmental review process, but the Band was never respected or listened to as a cooperating agency. In fact, the Band made it very clear during that process and in the federal litigation that the federal agencies wrongly disregarded the Band's expertise and information during that process. And we are here today due to the Band's continuing and ongoing concerns because the federal court in our litigation agreed that EPA failed to issue a "may affect" determination that considered the potential impacts of the proposed project's discharges to the Band's downstream waters and other treaty resources.

So this is the first time that both the EPA and the Corps are being required to take a look at the Band's evidence and address the Band's concerns. So to be clear, the EIS is being challenged as part of this process.

Moreover, the Corps cannot look to permits issued to PolyMet to provide cover to PolyMet despite their contention that somehow the Band's claims are contradicted by those other permits.

It is also important to note that the Band is engaged in ongoing litigation that is far from resolved on many of the State permits issued, including the NPDES or Section 402 permit.

In any event, EPA agreed that those permits do not protect or ensure compliance with the Band's downstream reservation water quality requirements.

More specifically, EPA agreed that there is a clear violation of the Band's standards because no agency ever made PolyMet comply, for example, with the Band's numeric mercury standard that is twice as low as Minnesota's finding, and I quote, the Clean Water Act Section 402 individual permit authorizes continued exceedance of the Band's water quality standards for mercury because it allows a discharge from the wastewater plant in excess of the Band's water quality standards for mercury of .77 ng/L. And the receiving waters to this discharge within the headwaters of the St. Louis River already exceed the Band's water quality standard for mercury.

Under Section 401 of the Clean Water Act, as I mentioned yesterday, the Corps has a statutory obligation to look at and evaluate all discharges from the project and the impacts of those discharges on the Band's downstream waters, including the discharges discussed in the NPDES or 402 permit issued by the State and the State's 401 certification.

So while PolyMet alleges that they are subject to 7,000 permit conditions, importantly, not one of those conditions is keyed to the Band's downstream standards.

Additionally, because this matter involves the Fond du Lac Band, a federally-recognized Indian tribe that is a sovereign nation with a government-to-government relationship with the United States, the Corps has an independent legal obligation to look at and evaluate any impacts its action has on the Band's treaty rights pursuant to this process, which PolyMet completely ignores.

Similarly, the Corps has an independent responsibility to consider environmental justice issues when it takes agency action.

I also want to note for the record that the Band also contends that a dam failure of the tailings basin will lead to violations of the Band's water quality standards.

For example, a catastrophic failure will release hundreds of gallons of tailings into the watershed which will flow down the St. Louis River to the Band's reservation. While EPA reviewed the Band's objection on this issue, it ultimately deferred to the Corps on the dam construction analysis.

The Band has been challenging the upstream dam construction method for years. And while this matter is also in litigation before the state courts on State mining permits, the Corps has an independent obligation to review the Band's concerns on the tailings basin's dam as part of this process. And, therefore, we formally request that the Corps do that and submit that the Corps cannot rely on the State permits which continue to be tied up in litigation as part of its decision.

In sum, the Band's scientifically grounded analysis that show the project's discharges will 0 the Band's downstream water quality standards as you heard from the Band yesterday.

EPA agrees with the ultimate conclusion of the Band. There are no conditions that could be placed on the suspended 404 permit that would ensure compliance with the Band's downstream water quality standard.

PolyMet's presentations which either continue to rely on prior faulty evaluations or add window dressing in attempt to minimize the Band's objection do nothing to change this outcome.

Again, PolyMet attempts to characterize their conclusions with certainty but those assertions are based on flawed and inappropriately limited studies.

As mentioned by Chairman DuPuis yesterday, the Corps has only two options under Section 401(a)(2). Place conditions on the Section 404 permit that would ensure compliance with the Band's water quality standards or not issue the permit. Only those two options.

Based on the evidence before the Corps, including PolyMet's futile attempts today to discount the Band's objection, the Corps cannot reissue the suspended 404 permit and must revoke it.

Although we will more fully respond to PolyMet's presentations in writing, our experts will now like to address some of the contentions made by PolyMet today.

And I'd first like to call up Nancy Schuldt, the Band's water project coordinator.

MS. NANCY SCHULDT: Hello again. I'm Nancy Schuldt, Fond du Lac water projects coordinator.

So there were a lot of interesting contentions this morning in the presentation from PolyMet and their experts and consultants. And there's a number of times when I really wanted to jump up and say something but that would not be appropriate. And I appreciate that that didn't happen yesterday when we were speaking about our perspectives.

As Vanessa mentioned, despite our engagement in this project throughout the environmental review process and the permit review, as a cooperating agency that involvement and engagement absolutely did not result in a reasonable or fair consideration of what we brought to the table for the co-lead agencies and the permitting agencies to incorporate in the information that the public saw and could respond to and what ultimately formed the basis of the records of decision and the permits that were issued.

And there were some comments made earlier this morning about how we didn't, in our presentation yesterday, account for the fact that the project, particularly after the draft EIS was deemed inadequate and unsatisfactory, the supplemental draft environmental impact statement included a lot of changes, a lot of mitigations that were intended to improve the project from an environmental performance standpoint. But from the very beginning we have been really clear about identifying substantive deficiencies in the project and in the studies that underlie the information that was presented in the various EIS chapters and versions.

I'm going to touch upon just a couple of examples that I think might help clear some misrepresentations up.

The discussion about the seepage capture system at the tailings basin, you know, in our admittedly limited experience, none of us are mine engineers or professionals in the field of mining activities, but we've had to learn an awful lot about what happens at a mine to be able to understand and advocate for the protection of the resources we're concerned about.

And what we have seen in action just a few miles away from the project site at another taconite facility is that a seepage capture system that has been in place now for, oh, at least eight or nine years that was touted to be virtually 100 percent capture rate and is only performing at about 50 to 60 percent capture rate, that's a real consideration for what is being proposed with the PolyMet project.

Like at U.S. Steel Minntac, there's supposed to be a cutoff wall that is keyed into bedrock, and that bedrock is assumed to be a no flow boundary. U.S. Steel, operating in the same kind of landscape and glacially-influenced terrain, was not able to key in their sheet piling to bedrock. They encounter glacial erratics and boulders and there is just certainly no integrity to the wall as it was represented when they were going through permitting.

So fundamentally, structurally, that confidence that you can put a cutoff wall from the ground down to bedrock and assume that water is not going to get past it, both through the bedrock, it is not a no flow boundary, there are fractures, that's a misrepresentation of what the reality of this landscape is.

But the second element of their seepage capture system which is intended to improve upon that structurally is that they're proposing to install a series, a network of groundwater wells around the perimeter where the cutoff wall is installed. And those wells are intended to pump groundwater sufficiently to create an inward head pressure so that all of the water that is seeping out of the tailings basin already, by design, will be pumped back by those groundwater wells.

So I would expect that they will see perhaps a more than 50 percent capture rate, not 100 percent, but more than a 50 percent capture rate because they are literally creating conditions that will keep the water flowing intending to flow backwards towards the tailings basin.

But what is not considered or discussed in any way, shape, or form in the environmental review or in any of the documents underlying the permits is that this scenario effectively cuts off the source of waters to the wetlands just outside the tailings basin cutoff wall. And that's a complete complex of wetlands to the north of the tailings basin. And they are completely fully saturated with contaminated tailings water from the former LTV operations. So right now they are fully saturated with highly-contaminated tailings basin water, but they are not going to continue to be replenished as the existing conditions have right now once this cutoff wall and those groundwater pumping wells are operational.

So you're going to change that hydrology in those wetlands over time, but you are going to continue to have the release and the northward migration of that plume of contaminates for many years to come. And the simplistic, arithmetic accounting of the improvements that PolyMet asserts that they're going to make in water quality and sulfate loading to the Embarrass River watershed have completely ignored the fact that they're not stopping that massive volume of water and its contaminant load in those existing wetlands as it migrates north to the Embarrass River watershed.

So the numbers that they were promoting in terms of the improvements in sulfate loading because of that seepage capture system are in incomplete at best.

Over at the mine site in the Partridge River watershed there was much made about our failure to account for how they were going to manage stormwater and mine contact water, that it was going to be captured, collected, transported over to the wastewater treatment plant. In other words, whatever water was contaminated by contact with waste rock or dust or pumped out of the mine, the stormwater that fell within the footprint of the mine site would be collected and treated and essentially cleaned up and that there would be no adverse impacts from the mine site.

But there was a stormwater general NPDES permit that was issued for that particular source of water and its pollutant load. And as a general permit, you well know it's not subject to the same kind of public review and comment. We objected to that. We argued that it should have been an individual permit, that there should have been scrutiny and public review but there was not. And because there was not, we didn't get a chance to talk about where we thought the deficiencies were and how that was going to not be sufficient to mitigate for the problems that were going to be caused by stormwater contacting mine waste.

There's a lack of liners, for instance, in the detention ponds or underlying the OSLA, the overburden storage and laydown area. And there are sources of mercury and methylmercury from this disturbed landscape and these peatlands that have been excavated for the construction of the mine site itself that are themselves a source of mercury, and any runoff water, contact water from those materials is going to be flushing and releasing mercury and methylmercury.

And it isn't just a matter of capturing what is running off on the overland on the surface flow, it's also an issue where it can be in the shallow subsurface flow and escaping the berms that are intended to control the stormwater runoff and exiting into the adjacent wetlands and the adjacent open waters like the Partridge River.

So the accounting, again, the simplistic accounting for how their stormwater management was going to control all of the problems over at the mine site has a big gaping hole in it from our perspective.

Finally, I would just like to say that generally we never made the argument or the contention that it was the sulfate loading or the mercury loading from the project that were the real issue with regards to compliance with our water quality standard. That was not the primary problem. But that's what PolyMet focused on today in their presentation.

Really, it is all about this massive wetland destruction and disturbance to the watershed and the profound hydrologic changes that we've described that will contribute to or exacerbate existing exceedances impairments, exceedances of our water quality standards.

And the EIS and the permitting process, no matter how long it took, and I know painfully how long it took, never addressed these known reasonably foreseeable ecosystem processes that increase mercury methylation and subsequently bioaccumulation, and that's at the crux of our concern.

So there were some, I would call, incomplete representations of the sources of what we believe would be the exceedances or contribute to the exceedances of the Band's water quality standards.

And then I'll let the others follow up with some points about other issues that were raised today. Thank you.

MR. ESTEBAN CHIRIBOGA: Hello again. So my name is Esteban Chiriboga. Last name is spelled C-H-I-R-I-B-O-G-A. And I have just a few points to address.

As Nancy said, a lot of the point of presentations for Fond du Lac had to do with the scale of land use alterations. And earlier this morning there were some examples and trying to link the proposed PolyMet project with Eagle Mine in Michigan and this is incorrect. This is not an acceptable approach given the difference between these mines.

Eagle is a very small mine. It is completely an underground mine. The surface footprint of that mine is a fraction of what PolyMet's would be. Mineral processing is all done off site in a different area located about of 60 miles away. Wetland fill at the Eagle Mine was really less than 10 acres. There's really no comparison to what PolyMet would be. And indirect wetland impacts from groundwater drawdown were not a problem or not an issue that that mine had to contend with. It had other issues and other points of discussion. It's not a comparable project to PolyMet.

Second point I'd like to make is Mr. Council mentioned that MODFLOW is not a good tool to assess hydrologic impacts to wetlands. I believe the USGS would be surprised to hear that.

MODFLOW can and is used to assess impacts to wetlands throughout the country. It has a wetland data package that is used to predict project effects on wetland water levels, things like flow routing, import and export of water in wetlands, evapotranspiration. The list goes on. And Brian, in his presentation, gave the example of the DeBeers Diamond mine that, in fact, uses MODFLOW to predict impacts to surface water features like wetlands.

But ultimately, the point was beliefs in misdirection because in my presentation yesterday and throughout the history of our comments, we never suggested that MODFLOW should be the one tool to be used in a quantitative wetland impact assessment. As I said yesterday, the process that federal, state, and tribal agencies that participated in the wetland IAP suggested or brought forward involved use of a groundwater model to determine drawdown, but also using the gathering of additional hydrology information at the site, plant lists, all of the types of information that you would need to link these wetlands and to characterize their connection to groundwater one way our the other and this was not done.

The last point I think I'd like to make, Mr. council also referred to GLIFWC's analog analysis. I think all I'll say, and as I said yesterday, is that the USGS groundwater modeling results, the new USGS groundwater model recently completed, supports our contention that the FEIS underpredicts drawdown related at the mine site.

And so these -- there were two different methods; our analogue approach and the USGS. They agree on the broad points of impacts, and they were done by two different agencies.

That is all I have. Thank you.

MR. MATT SCHWEISBERG: Good afternoon. Matt Schweisberg, S-C-H-W-E-I-S-B-E-R-G, with Wetland Strategies and Solutions for the Band.

Just a couple of points. One of the first slides that was shown by PolyMet today provided a distance comparison to other features in the watershed. Some weren't in the watershed. They were a bit farther away. Those are all irrelevant. It's like comparing the distance from my heart to my finger or the end of my finger and the capillaries of my finger. That's not the point. The point is that they're inextricably connected as the Fond du Lac Reservation is to where the mine site is via the streams, the wetlands, and the St. Louis River.

PolyMet couches several of its arguments by using percentages. Percentages are an inappropriate way to present impacts. It's a common tactic that I've encountered in my 40 plus years of experience numerous times, and it's used to trivialize the appearance of adverse impacts. It's the absolute numbers that really matter here, not the percentages.

PolyMet said that removal of wetlands to reduce impacts to -- I'm sorry -- to reduce inputs of methylmercury will be a benefit. It might work that way, but when you think about the bigger picture, that's kind of an absurd argument. It completely ignores all the ecological services and functions of the wetlands that will be removed and that would degrade the designated uses and 0 antidegradation of the Band's water quality standard. In particular, fish and wildlife. And it disregards the Band's treaty rights.

As Nancy mentioned, the ring of capture system, the ring of wells, capture system wells to prevent migration of contaminated water will actually dewater the wetlands and streams outside that capture system. It's both unrealistic and it's totally unaddressed by PolyMet in its documents.

The entire watershed is already 0ing water quality standards. That's been mentioned a few times. This is a matter of cumulative impacts. Whether a relatively small percentage or a large percentage, it's still a discharge that will contribute to violations of the Band's water quality standards. That's what really matters.

(A break was had in the proceedings.)

DR. BRIAN BRANFIREUN: Thank you very much.

This morning we saw some very nice graphics. I wish that for my courses that I teach at the undergraduate level that I could produce figures that look like that. I think my students would really appreciate them.

I have a number of things that I'll address ultimately in writing on behalf of the Band. There are just a few things that I think are important to highlight today as part of that process.

The first is that there was actually a misrepresentation of the way that mercury is delivered to the environment this morning. And it's one that's important because it reveals a lack of contemporary understanding of the processes that are at work here.

Mercury in rainfall is, in fact, not the largest source of mercury to watersheds anywhere in the world. Atmospheric gaseous mercury, so the mercury that's in the air around us right now is assimilated by plants directly. Those plants become part of the soil and that actually makes up the largest input of mercury to soils anywhere. And that was in some very important work but Daniel Obrist in 2017 using new techniques to look at natural stable isotopes of mercury in the environment.

So what that means is that mercury that is deposited to the landscape in rain isn't directly conveyed to streams and rivers. In fact, the only mercury that's delivered from the atmosphere directly to streams and rivers is the rainfall that falls directly on that water surface, the rain drop directly to the stream or to the lake. The rest of the mercury that falls from the atmosphere is incorporated almost completely into soils, and it's slowly released from that pool to soil water, groundwater, runoff. And that was work what we did in the early 2000s in the Experimental Lakes area which is actually just north of International Falls in Minnesota. It's very similar border landscape.

So the mercury that comes from the atmosphere as a gas and is incorporated into plants then gets incorporated into the soils as organic matter. And this large pool of mercury that exists in soils is the main source of mercury to surface waters and streams. And in fact, that pool of mercury is large enough that even if we cut off mercury today from the atmosphere -- and we've done a very good job of that, in fact. I mean, as I discussed yesterday, there's some evidence that in Minnesota and Voyagers National Park that mercury in rainfall is down 30 some odd percent over the last couple of decades, which is great news. The bad news is that there's probably several hundred years of mercury still in soils to continue to contribute to mercury exceedances in stream waters and lakes in Minnesota.

So what that means is that, as Matt just suggested, looking at this as a game of percentages really doesn't matter because there's more than enough mercury in the environment already to methylate, especially in these wetland soils. And the emphasis on the mass balance with precipitation that we saw this morning kind of draws our attention away from the indirect effect of project impacts that we discussed yesterday which is really focusing on hydrologic changes and interactions with soils and this existing pool and the existing condition that Nancy just highlighted.

We'll also recall from both Mr. Donohue's and Mr. Twaroski's presentation that there is no plus or minuses on any of those numbers, particularly for mercury.

I think it's interesting that when we have the presentation of a change in load does something like the third decimal place in a value in a mass balance. There's a misleading and, in fact, scientifically incorrect implication of precision where real precision is when we actually express uncertainty. What is the plus or minus value associated with that? What does that plus or minus that's both a function of the concentrations and the variability in that concentration in the environment as well as our uncertainty in our hydrologic budget.

I would also like to suggest that in this case, and in most cases, there's no consideration of our changing environment, our increasing frequency of wetting and drying extreme events and the potential for flushing events that exceed those which we are currently experiencing.

Mr. Donohue had a very nice graphic about where methylation occurs in wetland sediments as well as where the mercury in sulfate comes from. Unfortunately, it was technically a little bit incorrect.

He suggested that methylation happens in the wetland sediments, which indeed it does, but that the sulfate and mercury was associated with the mercury and sulfate that's coming from the atmosphere on an annual basis. So that's the diagram here on the left. Of course, I didn't have the luxury of putting together a nice graphic, so it's a little rough.

He suggested that the fluctuation of the water table created the conditions that then resulted in the formation of methylmercury as a result of the input of sulfate and mercury from the atmosphere. That's actually technically not correct.

As I just suggested, the pool of mercury that's in the soils is plenty. In fact, it's plenty to continue to be methylated for decades or centuries, in fact. And the inputs of sulfate, both from the atmosphere as well as from runoff and additional sources like streams and discharges, are actually the input into the reactor where methylmercury is formed and where sulfate is regenerated. Water table fluctuation influences all of those processes but it's actually a much more complex interaction, and it's one that's in fact driven more strongly by interactions with the catchment hydrology than the input of mercury from the atmosphere, which I think was sort of a bit of a redirect.

We also had some discussion about water table fluctuation and how natural fluctuation was the force in action here driving methylation. Indeed it does influence this process. We argued in the "will affect" memo and in previous opinions that I've written that underdrainage amplifies the natural fluctuation that we may expect as a result of both annual variability, as well as climate change-induced increases in fluctuation invariability. It also discounts the fact that the wettest time of year in the spring during snowmelt is when we have our major runoff events in landscapes like northern Minnesota.

The frost table in wetlands does, in fact, create a transient perch situation in which the exchange of water and the delivery of mercury sulfate and methylmercury is actually at its peak. We published work to that effect with my own students in the late 1990s. Sorry. The late 2009s.

There are a number of other issues that I think are important. However, we ended the presentations this morning with some discussion about demethylation. Demethylation is not a process that's going to offset increases in methylation because the concentrations of methylmercury that are in the environment are actually the result of the competitive processes of methylation and demethylation that are happening all the time. So there is no failure to discuss demethylation as a white knight process that might result in the reduction of methylmercury in the environment because it's not something that needs to be discussed separately from the concentrations of mercury that's in the environment.

All experimental data that I presented yesterday are concentrations of mercury and methylmercury in the environment. And those concentrations are the net product of the competitive processes of methylation and demethylation. So when we have increases in methylmercury as a result of sulfate, for example, we have the lower case where methylation is enhanced. It's greater than demethylation, so the methylmercury concentrations will increase.

We can also have geochemical conditions in which demethylation, the process of demethylation exceeds methylation and methylmercury concentrations will go down. But everything that we presented yesterday is consistent with our scientific consensus that when we add sulfate, we increase the absolute concentrations of methylmercury in the environment and that includes processes of demethylation which are also ongoing at the same time. It just means that methylmercury is winning under those circumstances. And methylmercury or methylation, the process of methylation wins when extra sulfate is added because it fuels the sulfate-reducing bacteria that are the primary methylators of mercury in the environment.

Sulfate-reducing bacteria are not one organism. They are a group, a complex group of bacteria. And indeed, as stated this morning, there are some sulfate-reducing bacteria that are also capable of demethylating. They are not the same organisms that methylate. They're a different group of sulfate reducers.

We also know that there are many other organisms that also methylate mercury. However, in systems like fresh water systems like northern Minnesota, the sulfate-reducing bacteria -- species of sulfate-reducing bacteria are the dominant methylators.

So what we measure in the environment we can measure methylation and demethylation together. It's much more complicated. We have to use stable isotopes of mercury to do it. But really, what we're interested in is the net outcome. And the net outcome of adding sulfate is increased methylation which results in a net increase in methylmercury concentrations in the environment.

I'd like to end with this final reference to this manuscript, which I would expect everyone is fairly common -- fairly confident that I would comment on since I'm a coauthor of this paper from 2012. This comment was used to support the contention that demethylation will somehow be a mechanism that will reduce mercury in the environment. Some sort of remediation approach.

This statement was both selected quite specifically and also redacted in a way which quite significantly changed its meaning.

The quote on the left is the one that was from the presentation and submission to the Corps. That says that "The finding that most of the methylmercury lost, redacted, was likely due to in situ demethylation rather than export from the system implies that the majority of methylmercury produced in response to elevated sulfate deposition may not be transported to downstream aquatic systems."

This implies that methylmercury that's produced in wetlands may never get out, may never leave. It would be wonderful if that was the case because we wouldn't have a surface water methylmercury problem if that was true.

The full quote from the manuscript which, not surprisingly, I had on my laptop. It was easy for me to find because I was the coauthor of it, is that: The finding that most of the methylmercury lost from the recovery treatment -- because this was a sulfur reduction experiment -- was likely due to in situ demethylation...

The following sentence is perhaps the most important. "This is supported by the finding that peat and porewater methylmercury increased by four times in response to the four times increase in sulfate deposition."

So the paper demonstrated a proportional increase in wetland methylmercury to sulfate inputs. The qualifying statement is: "but methylmercury flux from the wetland" -- so the methylmercury lost from the wetland -- "in the first year of this study was only two times." So we had a 400 percent increase in sulfate loading, a 400 percent increase in methylmercury in porewaters, but only a 200 percent increase in export. 200 percent increase is still a significant increase. The mass balance, if we actually would like to use that term appropriately here, is that we had a 200 percent increase in porewaters that we couldn't account for. Naturally, demethylation is a process that's happening.

This quote is misused in this case to imply that demethylation is going to remove mercury and methylmercury from the system and prevent export to downstream waters which, in fact, is most certainly not the case and certainly misrepresents the finding of this paper, which I felt important to present clearly here for the record.

Thank you.

I'll restate that. I did forget to make one point that I will.

So I think our representation has given you sort of a slate of people with the longest and most complicated names for the record that I apologize for. Brian Branfireun.

The final point that I would just like to make is that the word speculation came up a lot in a lot of the written submissions as well as the presentations over the last day.

To me, as an academic, speculation has very specific connotations. Speculation is usually -- it certainly implies, if not directly, means an unfounded conjecture, some sort of a statement that isn't based on fact or preexisting knowledge. I would prefer to use the term conceptual model or hypothesis for the kinds of work that we have presented and that was supported by the EPA. Speculation implies that there isn't a scientific basis, which is not true.

A conceptual model or hypothesis is based on the knowledge that we have in our contemporary scientific understanding of the way the world works. It also implies something that's testable. It implies a collection of measurable parameters that could be evaluated for their relative importance.

I believe that what's been put forward from the Band is a conceptual model, a series of hypothesis that are based on sound scientific evidence and fact based on other work that's been done in our discipline and other disciplines related. And a sound conceptual model that incorporates both direct and indirect effects associated with the proposed development is something that hasn't been done.

The only discussion that we heard today was about direct effects. We didn't hear about indirect effects of wetlands. We saw minimization about the indirect effects in the area of drawdown and none of the mercury or sulfate processes associated with those have been considered. And despite the discussion about methylmercury this morning, there has been effectively no discussion about the processes of methylmercury and methylation in the environment in the proximal regions associated with the development.

Thank you.

MR. THOMAS HOWES: Good afternoon. Thomas Howes, Fond du Lac Band's natural resource manager. Last name H-O-W-E-S, since we're using English today for the most part.

I guess I just want to sum up and end, you know, our address to the Corps and for, you know, purposes of this rebuttal part of the hearing and kind of going back to things that I discussed yesterday and things that others have brought up is about our relationships.

Federal agencies and the federal government have a broader responsibility to tribes, and in particular in this case to the Fond du Lac Band and by extension to myself and the 4800 other Fond du Lac Band members. And that extends to the way that you -- your agency takes action as it pertains to our treaties and not just individual permits.

Treaties are the supreme law of the land, in my understanding. I think you can find those that corroborate that. And so this isn't exclusively about compliance with the Band's water quality standards but also the broader responsibility or the sort of dual responsibility that federal agencies have to the Band and to all tribes.

So in my mind permitting decisions that abrogate the treaty, that degrade our rights that we've retained in those treaties shouldn't be allowed. It's a violation of the federal government's trust responsibility.

Beyond that, our sitting president has issued an executive order on environmental justice. We feel that allowing this permit to stand is a violation of our standing as people, that it's an issue of environmental justice.

These wetlands that we're discussing in great detail by people far more qualified than myself to discuss are extremely valuable. And that's probably the thing that I want to leave you with is these areas will be gone forever. And, you know, we talked about wetland ecology and the values that those things have but there's also the wildlife connectivity and the plants and the diversity that those places support. Those are treaty rights that we retained and that we expect federal government to uphold.

So I guess I would just remind you yesterday of the Chairman's request since he can't be here and just reiterate that. I think Vanessa made that clear. I appreciate your time and your attention.

It's a lot of information in a short period of time. So migwetch for your understanding. Thank you for your understanding.

MS. VANESSA RAY-HODGE: Thank you to all the Band's experts. We appreciate all the hard work that you guys have done throughout this process.

Thank you, Colonel Jansen for your participation and hearing us out the last couple days. That concludes the Band's rebuttal presentation, so I'll turn it over to you.

COLONEL JANSEN: Thank you all for your final statements. I appreciate that. We're a little bit ahead of our normal schedule. I think we're able to compress our afternoon schedule, so we'll move forward with a 30-minute recess. We'll return at 2:05 and then we'll proceed with PolyMet's rebuttal. Thank you.

(A break was had in the proceedings.)

COLONEL JANSEN: Welcome back everybody. We'll resume our hearing and I'll recognize Ms. Christie Kearney for PolyMet 2-hour rebuttal, which is our final event of the day.

MS. CHRISTIE KEARNEY: Thank you for this opportunity to say a few more words about what was just said.

So I want to start with the fact that the Band's claims have been extensively studied and resolved. The Band has been a cooperating agency throughout the environmental review process, and they provided a lot of feedback throughout the environmental review and permitting. Many of our expanded studies are specifically to address the comments that they raised.

As mentioned earlier, our project completely changed between the draft EIS and the supplemental draft EIS. We took a step back, reassessed our project from the get go.

Some major changes that happened since that time as a result of the process that we had just gone through on the draft EIS was that we added that containment wall around the tailings basin to capture all of the water from the tailings basin.

Early on in the draft EIS, our earlier project, we had a series of interception wells that just pumped the water out of that area. We realized that really to effectively capture all that flow, we needed a more robust system, so we designed the seepage containment system to do that. And I'll get into more detail on that as we go.

We also added our membrane treatment plant in order to meet the sulfate standard of 10 mg/L. We needed a system that could really remove a lot of constituents from the water. There's quite a bit of constituents that's coming out of the tailings basin now, and in order to meet water quality standards at the project boundaries, we needed to reduce those parameters and constituents of concern significantly, which we added into our project.

And then lastly, the other major change that we made to our project was that we took all of the waste rock that could have potential acid rock drainage and backfilled that into our pit at the end of our project so that wouldn't be a concern long term.

As a result of our significant changes to our project, our supplemental draft EIS got an EC2 rating from the EPA. This is significant because, as was mentioned, our earlier project got an EU2 rating, environmentally unsatisfactory.

EC2 rating, environmental concerns of 2 is the highest rating that a mine mining project has ever received in the U.S. It's the same rating as the St. Croix Bridge project and the St. Paul to Minneapolis light rail project.

I just want to go through a few of the comments that were raised by the EPA throughout our process. So this is the same letter that that rating was part of.

We appreciate the extensive improvements to the project and the clarity and completeness of the environmental review that are reflected in the supplemental draft EIS.

The FEIS refined the quoted statement to more clearly characterize the risks associated with mercury releases. Based on this risk characterization, the FEIS should explain what has been and will be done to avoid, minimize, and mitigate the mercury releases from the project. That was March of 2014.

In August of 2015 another letter came out from the EPA. The PFEIS which is the preliminary final EIS that was circulated for review by the agencies, the cooperating agencies, and the consultants on the project to review it before it's finalized, they stated that the PFEIS reflects many improvements to the project and to the clarity and completeness of the environmental review. Our extensive discussions with the co-lead and cooperating agencies have helped to resolve virtually all of our previous comments.

Next the co-leads received a letter in December of 2015 when the FEIS came out. The FEIS adequately resolves EPA's comments on the preliminary FEIS pertaining to base flow and cumulative impacts, model calibration, and contradictory information. Ultimately, the FEIS found no exceedances of the Band's mercury standard.

The FEIS statement was that the net effect of these project changes would be an overall reduction in mercury loadings to the downstream St. Louis River upstream of the Fond du Lac Reservation boundary. Therefore, the NorthMet project's proposed action would not add any potential exceedance of the Fond du Lac mercury water quality standard of 0.77 ng/L within the reservation.

So the FEIS stated that there would be no exceedance of the Band's mercury water quality standard within their reservation.

The Corps of Engineers' record of decision came out and also found that there would be no exceedance of the Band's mercury standard.

The net effect would be an overall reduction in mercury loadings to the downstream St. Louis

River upstream of the Fond du Lac Reservation boundary. The project is not expected to add any potential exceedance of the Fond du Lac mercury water quality standard of 0.77 ng/L within the reservation.

Additionally, there would be no expected change in mercury fish concentrations and no substantial change in human health risks related to fish consumption.

Notably, that record of decision came out after the MPCA's 401 water quality certification. This is the fact sheet that came out with this, with the findings. This 401 certification fact sheet is really based on the more extensive cross-media analysis that we've talked about a little bit today that took into account not only our water discharges and our water management actions, but also took into account our air emissions that could potentially affect water quality as well, which is why it's called the cross-media analysis.

That fact sheet states that based on the cross-media analysis, the PCA concludes that the project would not result in any measurable change to water quality downstream of the project in the

St. Louis River, including downstream locations at Forbes and the upper St. Louis River.

It's been mentioned that our NPDES permit was just through the court system. The Court of Appeals did uphold our MPDS permit that it would comply with the Band's water quality standards. The Minnesota Court of Appeals concluded that PolyMet's MPDS permit, 402 permit would comply with the Band's water quality standards because discharges from the project will not alter the waters within the Band's Reservation boundaries. And the permit ensures compliance with the Band's water quality standards.

I want to talk a little bit about the seepage containment system because there does seem to be some confusion still on that system.

So our cutoff wall surrounds the tailings basin, and it is keyed into bedrock. This cutoff wall was put into our project -- designed as part of our project after the supplemental draft for the supplemental EIS when we took a step back looking at our project. There's several different features of this cutoff wall that I want to point out.

We do have a continuous pipeline that follows the cutoff wall around the perimeter of the tailings basin with lift stations. I believe there's three lift stations with pumping systems that will pump that water out. The result of that pumping system will be that it will maintain an inward gradient to make sure that we're capturing all of the seepage in that area.

We have extensively modeled the system. It is keyed into bedrock, but we have modeled it through the bedrock. Although this figure says it assumes a no-flow boundary, we did model it through bedrock. There is very little seepage that could escape from this. The EIS assumed 93 percent capture. There are a lot of different designs of cutoff walls whether it's sheet pile wall, a soil bentonite wall, as this is intended to be, and it's all the design that matters with the these systems.

The Minntac cutoff wall was brought up today as an example of what this might be. The Minntac cutoff wall was designed to be essentially a French drain system to capture the water from the surface aquifer. It wasn't intended to capture 100 percent of the flow.

Another feature of this containment system, while we had 93 percent capture assumed in the environmental review process, we have permit conditions that require it to be better than that.

Before I get into those permit conditions, I want to point out we do have -- when we proposed this system, we submitted a memo to the co-lead agencies on the degree of use of these type of systems in the industry. I have several listed here. This memo included a list of about 15 and had a number of design guidance documents that were referenced for the design of these systems. One was the Corps of Engineer's design guidance, one was the Bureau of Land Reclamation guidance. As I said, these systems have been used around the world for decades.

I did mention earlier that we have over 7,000 total permit conditions. I have a few listed on here from our NPDES permits specifically to the containment system design that PolyMet must construct a permeability cutoff wall keyed into bedrock with collection and capability of removing collected water to the treatment system or the tailings basin. We have to maintain a system of paired monitoring wells and paired piezometers.

The reason we have those paired systems is so that we can make sure that we have -- we are maintaining that inward gradient between the outside and inside of the cutoff wall. If we're seeing higher water table on the outside of the cutoff wall, we know we have inward gradient.

PolyMet must maintain an inward hydraulic gradient across that system. And if necessary, PolyMet must immediately commence mitigation measures, including sampling, inspection, assessment, pumping, removal, repairs, and upgrades. There's a whole slew of different things in our permit conditions specific to design and operation of this system to verify that it's operating appropriately.

I also want to touch briefly on our membrane treatment system, our best available technology for water treatment. I did mention in my earlier slide that the Eagle Mine in Michigan uses this technology. They use reverse osmosis as their primary means of removal chosen as the best available technology, and it was mercury that they were concerned specifically for treatment. They have an RO system at both their Eagle Mine and at their mill for water treatment.

When these systems were put in, when that project was proposed, the opponents of the Eagle Mine claimed that it wouldn't work and that it was unproven technology. We do have a lot of data that they have shared with us. We actually used this data in our permitting process because Eagle Mine's been operating for several years with actual data to show the successful removal of mercury.

And this is a slide that I used during our permitting process in a meeting with the EPA and the PCA when the EPA expressed concerns about mercury removal from our RO system. This is showing about three and a half years of data. They do have more data since then, and I haven't reached out to them yet to get it but I plan to for our written comment period. But this is the data that we used in permitting and I thought was appropriate to share here.

The red line is the influent water coming into the water treatment plant and the blue line is the effluent, so what was treated and discharged.

You can see there's one data point that was above the detection limit in their three and a half years of treatment and sampling and discharge. All of those other points are at the 0.5 ng/L detection level. So it is a proven technology and have data to support that.

Now I'll turn it over to Steve.

MR. STEVE DONOHUE: Good afternoon again. My name is Steve Donohue. Last name is spelled D-O-N-O-H-U-E. Spoke this morning so I won't get involved into the details on my background or anything.

I want to provide just a few rebuttal and concluding comments as it relates to some of the water management features of this project. There's been a lot of discussion, a lot of detail about water management, water treatment containment, all this kind of stuff.

I want to try to boil that down for the hearing here into some very simple concepts that are really at play here to try to help provide some clarity to what we're talking about here.

So I'm going to begin with this graphic. It's just a conceptual schematic of what the project looks like today. We know we have there is we have a tailings basin. We know this tailings basin is seeping water out into these riparian wetlands around the streams that drain into the Embarrass River.

The seepage water from the basin is high in sulfate, 300, 400 mg/L, and it's very high in specific conductance. This tailings basin at the plant site are subject to a consent decree to actually clean this facility up. What this project is really about is a brownfield redevelopment effort.

We've done this before at the Eagle Mine that Christie just mentioned. The mill processing site which is about 55 miles to the south of the mine is a refurbished brownfield redevelopment project. They have a mill there. They have a tailings basin that was in an iron pit lake that was seeping contaminated water out into a stream that drained into our river like the St. Louis River that was all cleaned up as part of the re-permitting effort. That's really what's being proposed here.

The other component of this project is the undeveloped mine site. What's going on there today is we have precipitation going onto the site. Some of that precip goes in the groundwater. It drains into the Partridge River. Some of that water runs off and drains into the Partridge River.

At the plant site we also have stormwater runoff from the plant site that drains down either into the Embarrass River or makes its way into the Partridge River. So this is a brownfield that is currently impacting water quality in the upper parts of the St. Louis River watershed.

We're now going to look at what's actually taking place, in a nutshell, once this project goes into operation.

There's a number of very basic features here that are going to improve water quality just like you would do if you were remediating a site. Many of us who have been in the industry for a long time have been involved in remediation projects where we have waste sites that are leaching chemicals into the groundwater, into the surface water. We've applied all sorts of different types of engineering techniques to clean those sites up. And that's really what's being deployed here at the tailings basin.

The first thing that we have to do to clean this site up per the consent decree is to contain this water that's seeping out of the tailings basin. The way to do that is put in this containment wall with, in essence, a French drain on the inside of the containment wall to pump water out, and route that through a water treatment system and then return that clean water to the environment just like you would do for any kind of a remediation project. That's all that's really happening at this tailings basin during operation.

These containment features, the slurry wall, very conventional technology. Christie mentioned the Eagle Mine a little earlier. The tailings basin at the mill site actually contains a cutoff wall, slurry wall that goes down about 75 feet. It's keyed into bedrock and that's to hold the contaminated pit water back from seeping out into a wetland and a stream that drains into the Escanaba River.

So it's the same type of technology that's being used at that project is being employed in the perimeter of this tailings basin. You can go up there today and do a tour of the site and see how it's working. It's been a very successful brownfield redevelopment. It's had tremendous benefits to the community in terms of employment in allowing that one project to go forward. And as Christie mentioned yesterday, it's the only nickel producing mine in the U.S. right now. Tremendous site.

Other features of this project are this water that is collected out of this treatment -- or out of this containment system is going to be routed through a wastewater treatment plant. As Christie mentioned, this is going to employ membrane technology like reverse osmosis. It's been used in many operations. It's used in many industries, pharmaceutical industries, any industry where you have to generate really high quality water or you have to discharge water into an environment where you have very stringent environmental standards like we do in this particular project.

So this technology has been employed. The Eagle project, as Christie mentioned, there was a very lengthy contested case hearing. The opponents of the project brought in witnesses that said it was unproven technology. They testified to that. We were involved in that contested case hearing and personally testified in it. There was a professor that was brought in from the University of Nevada Reno who claimed that technology wouldn't work. It's now up and operating. And as the data that Christie showed, it's working as designed. And it is protecting the environment, which we all want to do here. So that's proven technology.

The other aspects of this project relate to the mine site. Here at the mine site we have two types of water that are going to be generated. I like to characterize it as contact water so that is water that is coming in contact with the mine pumped out of the pit. It's water that is generated from runoff from the haul roads where it could pick up constituents from the mining operation. So you don't want to let that run off into the environment. All that contact water that is picking up regulated pollutants is routed to mine retention basins and then pumped over to the wastewater treatment plant. It's either reused in the -- that water is either reused in the mill operation or it goes through the water treatment plant.

All that water that is treated is then used to augment the wetlands and in the streams around the perimeter of the tailings facility. So we're balancing the system back out. Yes, we're pulling water out of the tailings facility, but we're treating it, and by reintroducing that clean water into these streams through these wetlands, we're balancing the hydrologic system back out with clean purified water.

The only other sources of water to the environment are stormwater that's running off of the mine site. This is what I generally refer to as noncontact water, so it's like natural stormwater. It's not coming in contact with any of the mine materials. It's not picking up any regulated pollutant.

Same thing at the plant site. There will be stormwater runoff from there. All of that stormwater runoff is routed through sedimentation basin so you're not loading that runoff with sediment that's made its way into the system. Very conventional stuff that's employed at many industries.

So at the end of the day what we're really talking about here and why we get the reduction in contaminate loading into the system and reduction in sulfate, the reduction in mercury, the reduction in specific conductivity is because we are cleaning up this site and reducing contaminate loading that's going into the system.

If you weren't doing a mine, if we weren't employing and developing an open pit mine here and you wanted to clean this site up, you'd be doing the same thing that is being proposed by PolyMet.

The logic that we've heard over the last couple days almost indicates that it's impossible to clean the site up because by cleaning it, we're going to increase loading to the system, and that really defies logic.

So I think another way of looking at this project is because it is a brownfield site, there's actually environmental benefits that will be derived from this mining operation.

First of all, I think it is fair to say that through the presentations we've seen over the last day and a half that the Band really ignores key water management features of this project. There will be a reduction in mercury due to these water management features and the water treatment system. That's real reduction in mercury that's going into the environment.

There will be a reduction in sulfate loading to the environment. There will be a reduction in sulfate loading to those wetlands north and east of the tailings facility that will have a benefit on reducing the amount of methylmercury that's formed in those wetlands. And that's to the tune of 1,380,000 kilograms of sulfate that's removed from this area on an annual basis. That's a project improvement. It's an environmental benefit.

Increases in mercury sulfate and specific conductance, as alleged in the Band's "will affect" letter will not happen because of the engineering features that are built into this project.

Finally, I'd like to just draw a little bit of a comparison for everybody in terms of a nanogram. We talk about 5.2 grams of mercury being pulled out of the system on an annual basis. And on one level a gram, 5.2 grams, doesn't sound like a lot. But I think another way to look at it is it is a pretty significant reduction because the standards that we're talking about as it relates to mercury in the water is that nanogram per liter. So a nanogram is one billionth of a gram. Another way to visualize that is it's the equivalent of a one-pound coffee bag. If A nanogram was one pound of coffee, what's -- what's the -- what would be the weight of a gram? Well, the comparison, an analogy is it's the combined weight of more than 2,470 Boeing 747 planes. So there's quite a bit of difference there between an nanogram and a gram when we pull out 5.2 grams out of the system, that's pretty significant reduction to the environment for this project.

So with that, I'll conclude my remarks and hand it over to Greg Council.

MR. GREG COUNCIL: Thank you. Good afternoon again, everyone. My name is Greg Council. I'm back up to talk again about what is going on and give a few clarifications.

We heard yesterday about an analysis that was new and I hadn't -- I don't think it had been previously explained in the "will affect" letter, but it was a modeling analysis that showed drawdown contours and it was referred to as USGS GLIFWC analysis. And this is a report that was noted in the slides yesterday where to get that and then this is the actual record. I hadn't looked at it before about. It does say this is a USGS report and that it was prepared in cooperation with GLIFWC. So it's a GLIFWC USGS report. I believe this is the one that Mr. Chiriboga referred to yesterday and today.

I just want to point out if you read this, it tells you exactly what the purpose of the model is. And it tells you also what the purpose of the model is not. Specifically, importantly, it says that the model scenarios in the report, the model mining scenarios were not designed to predict effects from any specific future mine, including PolyMet, within this basin. They predicted several mines. None of them were supposed to be used. This is not a prediction model. That is not what the purpose of the model was for.

It goes on to say what you have to do to make it for that purpose, but clearly the study itself done by USGS was not intended to be used to predict the effect of the PolyMet mine.

Furthermore, if you dig into the details, you'll see that the wetlands were not simulated with any kind of wetland package. They were simulated just standard MODFLOW tools as a standard boundary condition, which actually does limit the amount of infiltration that wetlands are allowed to provide. And what that does, actually -- go through the long explanation. It actually shows -- I can show you that that actually limits the amount of drawdown that the MODFLOW model will produce at wetlands. So the groundwater drawdown that's produced is limited.

Furthermore, what it does show you is groundwater drawdown in the mine, even though it shouldn't be used for that purpose, it was shown for that purpose, and I just want to point out that groundwater drawdown is not the same as the water level desaturation level in a wetland. They're related but they're not the same. And it's not at all easy to translate, especially because you ignore -- if you ignore, as this analysis did, the entire less permeable conductance of the wetland sediments.

I'll stick by the standard -- by the statement, rather, that MODFLOW by itself is not a great tool. It's not an appropriate tool for assessing wetland impacts. Yes, you can use MODFLOW with some other analyses to do so but MODFLOW by itself is not an appropriate tool to assess wetland impacts.

One more point is that the USGS model is a steady state model. So rather than predicting what happens on a transient yearly basis like the graph I showed earlier today that showed the mining flow, for instance, as a function of a mining year. The MODFLOW model in the USGS report, USGS GLIFWC model is steady state. It's just a worst case. We're going to assume the mine goes in all at once and see what the maximum impact would be.

Yesterday we also heard a little bit about the method that GLIFWC suggested should be used rather than what was used for assessing impacts to wetlands using MODFLOW. We had some other -- I think Mr. Chiriboga pointed out some other assessment called the Crandon Method. This refers to, I believe, a method that was applied in the

'90s. I was actually one of the modelers involved in the Crandon project back in the '90s. I remember most of this. It was a while ago. But at that time we used MODFLOW to help understand drawdown around a mine that had been proposed. It's a little better tool in that situation because in Crandon, unlike here, you had thicker unconsolidated, so the drawdown there is little more closely related to what you can expect a wetland drawdown to be.

But it wasn't just that. You had to also assess the wetlands to some degree and figure out which ones are precipitation dominated and which ones are groundwater dominated. The groundwater dominated ones are more likely to be impacted by drawdown.

And then look at the water budget. Remember I looked at the water budget when we talked this morning. Look at the water budget. Assess the vegetation type and try to figure out what the impacts will be in that way.

Now, for the Crandon project there was all separate models according to which model was good enough. Do we need to create another model? And it actually just added a lot of delay because they were competing models at the end of the day. Ultimately, there was never a formal agreement on what would constitute the proper method to define what a wetland impact would be. So the Crandon Method didn't work, at least not for the Crandon project, to the best of my knowledge.

Furthermore, the technical part of this, first figure out where did we expect drawdown would likely occur. Then using the information about the wetlands, figure out which of those wetlands are more likely to be impacted by the drawdown. That technical piece is the process that was followed by PolyMet. The only difference is that the drawdown assessment was done using data in an analog site as opposed to a MODFLOW model.

So lastly, I'll say that the drawdown impacts, just to reiterate from this morning, they're likely to be somewhat -- we agree that drawdown decreases as you move away from the mine. The Band, of course, suggests that the drawdown should be much larger.

This issue was specifically addressed in the FEIS. One of the results, one of the changes or one of the -- yeah. One of the changes in the FEIS relative to prior versions of the document is that they -- in a certain drawdown zone they change the definition of unimpacted wetlands to low likelihood of impact on wetlands based on a reassessment based on some of the Band's comments of how certain types of wetlands behaved.

Still, they use distance zones based on observed effects. And I like that because it shows a preference for data over a model.

Importantly, the PolyMet mine, as I mentioned this morning, will be in a much less permeable rock formation than steel mine which was the analog model used to pull the data that used to assess how much drawdown occurred.

Finally, predicted mine inflows. Again, 1 CFS. These are a small percentage of the sub-watershed basin for the Partridge River which means that the effects are not expected to be huge. MODFLOW, while it's a good tool for predicting these kinds of things like mine inflow, it's not a good tool for predicting the level of desaturation from the wetland.

One more slide I want to draw on something that's monitor and the effects of drawdown can be mitigated. I want to point out that monitoring water levels is a fairly simple, straightforward exercise and it's being done. It's being done now and will continue to be to be after mine development.

If you see drawdown that you weren't expecting to occur, you don't wait and let that happen for a long period of time. You can implement actions early to correct that. You don't wait until the end of mining.

Another indication of a potential issue would be if the groundwater inflows are much large than you would expect, that would indicate that there may be more drawdown. Don't expect that to happen again but if it did, you could monitor for that and you could correct that by implementing mitigation.

There are mitigation measures for these sorts of things. There are mitigation measures such as grouting that would reduce inflow to the wetlands. And there are mitigation measures to reduce the effects of drawdown if they occur. For instance, adding water where that drawdown occurs.

With that, I'll let Cliff Twaroski come up and talk more about the sulfate reduction.

MR. CLIFF TWAROSKI: My name is Cliff Twaroski, T-W-A-R-O-S-K-I, and I'd like to continue some discussions on sulfate reduction -- or reducing sulfate and reducing methylmercury around the project area.

One of the things struck our group was when Dr. Branfireun presented this slide. And for me it represented some information that I hadn't seen before. There was the dosing study that Dr. Branfireun mentioned at the Marcell Experimental Forest. That was dosing with kilograms per hectare per year of sulfate. And Dr. Branfireun's information here is about milligrams per liter of sulfate and that by adding X amount of sulfate, there is a response in methylmercury of 4X, 20X, and 30X. And so one of the things that we are wondering about is that if this is what happens when you add sulfate, what happens when you take sulfate away?

And so taking the factor 30, because when we look at reducing sulfate in the wastewater treatment -- with the wastewater treatment system from 200 milligrams to 10 milligrams per liter, that's a reduction of about 190 milligrams per liter. And based on the previous slide, we're not sure where that really comes out on the scale that Dr. Branfireun has presented.

But just as an example, we'll use that factor of 30 to look at what happens when we take sulfate away. And for Trimble Creek, which is identified with this .7 ng/L concentration, we find that if this can be applied, this laboratory study can be applied to an actual environmental setting like plant site and tailings basin, headwater wetlands, there might be a reduction of over 1,000 grams per year of methylmercury.

And if we look at Unnamed Creek headwater wetland with a starting concentration of .4 ng/L, based on these values, there could be about a 700 gram per year reduction in methylmercury.

I don't know if there is uncertainty certainly associated with this, but it does provide some perspective as to the potential magnitude of the reductions that could occur with PolyMet's project and operation and the seepage capture and treatment removing sulfate from the system.

The other point that I want to talk about is mass balance. We heard yesterday that mass balance is a naive approach. I don't believe that's true. Mass balance is informative. It can explain watershed processes. It can help account for things in the watershed. It's used by a number of researchers, including Dr. Branfireun. And again, that's what we have used to address various questions that came up in front of the agencies. The agency has a series of Ph.D. scientists that we talk to about the best approach for using this in support of the FEIS and in support of cross-media analysis, and this is the approach that was recommended.

And specifically for the cross-media analysis, this was an analysis that was conducted to specifically address the Band's concerns about sulfide mineral dust adding sulfur to wetlands that would then create more methylmercury to be flushed downstream in the Partridge and Embarrass Rivers downstream to the St. Louis River and the Reservation.

That modeling used a combination -- or that assessment used a combination of models, air aspersion modeling with air model, which is a mass balance model for air emissions. GoldSim was also used for water flows. And where we had a gap in how to address certain watershed functions, including wetlands and what happens with the sulfate and methylmercury, we then used mass balance calculations to represent what might happen.

That modeling confirmed that -- that assessment confirmed that there would be a reduction in mercury and sulfate and also methylmercury. And we also assessed methylmercury impacts to fish in the Embarrass and Partridge Rivers. And at sites closest to the project we found that there was no measurable change in fish tissue mercury.

We did not use MPCA's mercury risk estimation method. We used calculations and provided data from the MPCA and Dr. Bruce Monson in calculation concentration change and found that we did not have a measurable change near the project. If we don't have a measurable change near the project, it would be very hard and almost -- and not likely that we would ever see a change in fish mercury down the St. Louis River.

That's the end of my presentation. Thank you.

MS. CHRISTIE KEARNEY: Thank you. I'd just like to touch briefly again on adaptive water management.

So adaptive water management is systematic monitoring, modeling, and review process to improve the performance of the project. This is used around the world, recommended by the EPA and a lot of processes and is a good way to be able to react and respond to changes that you're seeing in your project. It's a proactive approach that anticipates uncertainty and variability by using flexible and adaptive engineering controls like our water treatment plant and establishes processes for monitoring and responding to actual conditions as they're occurring.

The permit to mine includes a condition requiring an adaptive water management plan that's designed such that adaptive management systems can be implemented prior to reaching a water quality limit. This is just one example of adaptive management that is required by our permits.

The same plan is required by the NPDES permit and our water appropriation permit. And this plan is required to be reviewed and approved by the agency before we can start our operation.

I also want to talk about uncertainty on environmental outcomes since that's been discussed quite a bit today and yesterday.

Certainty, absent certainty in environmental predictions is a false goal. You will never have absolute certainty. There is always uncertainty. Therefore, you make reasonable and often conservative estimates of outcomes based on your data, your sound science, your engineering principles, and peer and agency review.

So let's talk about modeling for a minute. George Box, a well-respected statistician, once said "all models are wrong but some are useful." You use your data. You spend a lot of time in calibration to try to match that natural system as well as you can. You're never going to match a natural system. Natural systems are complex. There's a lot of different processes that happen, and no model can match them directly. So we do what we can and we spend time in calibration and peer and agency review to try to get as close as we possibly can.

The models that you saw us put up and the models that you saw the Band put up have been reviewed. They've been reviewed across the board by agencies. They've been reviewed by each side of this discussion today and yesterday. And the models that have been put forward by our project have been reviewed and approved by the agencies. They've been run and rerun by the agencies. And we've got our permits as a result.

We need to be conservative for immediate --

immediate critical risk items. So engineering designs always have a factor of safety. You add a factor of safety because there's uncertainty. In everything we do there's uncertainty. You just need to be able to make those reasonable conservative assumptions to move forward.

And then you have adaptive management. You need to identify a problem before a problem exists, and you need to watch to make adjustments for it to avoid the negative consequences such as a water quality violation. You need to look for those changes in water quality before they get to that violation. You identify triggers where you're going to take action to make changes.

Now, I'll turn it over to Jay.

MR. JAY JOHNSON: Good afternoon. My name is Jay Johnson, J-O-H-N-S-O-N, and I am outside legal counsel to PolyMet.

I had hoped that I would not speak at this hearing which PolyMet believes should be focused on science and facts. But having reviewed EPA's recommendation and the Band's comments, I think it's important to put some of PolyMet's legal views on the hearing record.

To explain these views I'm going to use some slides to walk through the text of Clean Water Act Section 401(a)(2). Here is just the text of 401(a)(2). Fair to say it's a bit dense but we will unpack it.

As we'll see, Section 401(a)(2) has six steps. The first step, EPA is notified of a Section 401 certification and a permit application. That's already happened.

Second step, EPA can determine that the permitted discharges may affect the downstream jurisdiction's water quality. That happened too.

The third step, the downstream jurisdiction, in this case the Band, can determine that the discharges will affect the quality of its waters so as to 0 any water quality requirements and then object to the permit.

We know this because in the text of the Act it says exactly that. The Band made this determination and sent in its "will affect" letter in August of last year.

The fourth step. Federal permitting agency holds a public hearing on objection where it hears recommendations and evidence. That's where we are right now. How do we know this happens? Again, we look at the text. It says that the permitting agency shall hold a hearing on the objection. That means on the objection of the downstream jurisdiction.

What's presented at the hearing? What's presented at the hearing are the recommendations of the State, in this case the Band, the EPA, and additional evidence.

The next step is the most important one in our view, but it's the step that both the Band and the EPA skip over. The federal agency decides whether the discharges that it has permitted will 0 the downstream jurisdiction's water quality requirements. Let's look at the text again. It says that the permitting agency makes a decision based upon the recommendations and evidence at the hearing.

Notice too the decision is on the objection. In other words, the agency decides, based on the evidence presented at the hearing, should the objection be sustained.

The next language is important too. The permitting agency must condition the permit but only as may be necessary to meet the downstream standards. This "as may be necessary" language is important because it means that condition may not be necessary. If the permitting discharges won't 0 the downstream standards, conditions aren't necessary. And if there is uncertainty, that doesn't mean that there is a violation. It doesn't mean the permitted discharges will 0 the downstream water quality requirements.

Finally we have step six. If the permitted discharges will 0 downstream water quality requirements, the federal agency decides whether additional permit conditions can ensure compliance with those requirements. Let's take a look at the text one more time.

This language tells us that the permitting agency -- it tells the permitting agency to condition the permit in a way that will ensure compliance with water quality requirements. This gives the permitting agency a lot of flexibility. The EPA suggests in its recommendations that monitoring and water quality requirements could work but then it just dismisses them as impractical. But as Christie just shared and as we've said throughout our presentation, PolyMet is already using many practical permit conditions to meet water quality requirements. 7,000 permit conditions total.

So in summary, the first issue in this hearing and under Section 401(a)(2) is whether PolyMet's permitted discharge violations will 0 the Band's water quality requirements. No permit conditions are necessary if there is no violation.

And the last thing I will bring up is the question of burden. Section 401(a)(2) puts the burden of persuasion on the party that is objecting, the downstream jurisdiction. And this hearing isn't happening on a clean slate. PolyMet's project has been studied for 15 years. The Corps and other co-lead agencies approved a final EIS. The Corps issued the permit. So did the Minnesota Pollution Control Agency. So did the Minnesota Department of Natural Resources. The Band is the one that's objecting and through this hearing, seeking a different result. That means the Band has the burden of persuasion.

Thank you. For listening. And now I'd like to turn the floor over to PolyMet's chairman and CEO John Cherry for the final word.

MR. JON CHERRY: Good afternoon. My name is John Cherry. I'm the chairman, president, and CEO of PolyMet Mining. It's J-O-N, C-H-E-R-R-Y.

I'm also a registered professional engineer in the field of environmental engineering, and I've spent a little over 33 years in the mining industry. The majority of that designing, permitting, and building mines in the United States.

You've heard about Eagle a few times today and I'm pretty proud of that. I was the general manager at Eagle. Did the design, permitting, and litigation and construction of Eagle. And it's turned out to be an incredibly successful mine in many aspects, including the environmental protections put in and designed into that.

The mine was originally started -- the construction started in late 2010. Went through 2013 into early 2014 went into operation and is still operating today.

During that entire period of time, it hasn't had a single notice of violation of its environmental permit conditions. I think that's a testament to the design and the adaptive management practices that were put in place at that operation.

Myself and some of the team that helped me at Eagle are also here with me on the PolyMet project. And we're taking many of the similar approaches and things we used at Eagle that were so successful, and we're implementing those on this project here.

I want to talk just for a second about real life verses modeling. We've heard a lot about modeling today. Christie touched on this and others touched on this as well.

There's a certain level of certainty and uncertainty in modeling. What I want to touch on for a second are a couple of examples.

So when we did Eagle, obviously there were project components that -- we were concerned about the environment. They raised various concerns. And they ran models. And one specific one that I'll point out is Eagle is an underground mine. And it -- the Salmon Trout River runs across the top of the mine. There's corresponding wetland corridor along the river across the top of the mine.

GLIFWC and others ran a model. And their model suggested that the river was going to dry up and flow into the mine. The riparian wetlands were going to dry up and be destroyed and there were going to be thousands of gallons of water per minute that would flow into the mine.

Our modeling estimate -- and I -- there's always conservatism built into the assumptions of the model. The modeling that our team and I put together suggested that there would be a couple hundred gallons per minute. So a couple of orders of magnitude difference in those estimates about those models.

So let's talk about what happened in real life. In real life after the mine was built, there wasn't a couple thousand gallons of water that went in. There wasn't a couple hundred gallons per minute of water that went in. The mine was so dry they were pumping water into the mine for dust control.

So these models are typically very conservative and intentionally so to protect the environment. Make sure we get it right. But when you build conservatism upon conservatism upon conservatism, sometimes you end up with overestimates. And that's typically what happens in these type of projects.

Other criticisms at Eagle by the opponents were that the treatment system wouldn't work. It wasn't a proven treatment technology. It was proven. Membrane technology has been around for a long time. People have been using that for a long time to make drinking water. It's also the technology that can knock mercury out. It can get sulfate out. In our case we have to use membrane technology to get the sulfate down to the 10 standard, 10 mg/L because that's what we committed to do. We're the only mining company that's agreed to meet that 10 sulfate standard for wild rice protection. And the membrane technology can do that.

So what we did -- so there's the treatment technology and there's also cutoff. We said the deep cutoff wall of 85. They said that would not work. That was installed. It worked and has been demonstrated. And again, Eagle has gone through all these years from about 2013 or '14 through current, as far as I know, without a single notice of violation to their environmental permits. So the technology is there. Can be done and can be done successfully. Technology has been proven.

So we've -- myself and my team and I, we've taken what we've learned, taken best of what we saw at Eagle and we tried to implement some of those best practices at PolyMet.

Part of the reason I'm at PolyMet -- I've been here about 10 years now. And shortly after I did

Eagle, I left there and worked on some other mining projects. But back in about 2010 or 2012 time period, you heard about EIS that was described yesterday where we got the EU3 rating, got the failed rating on that.

Shortly after that, I was approached and asked to join PolyMet, see if I can take what we learned at Eagle and apply it to PolyMet and make it better. And what I'd like to say is that the process worked. There was a public comment period. Everyone participated. Many people were listened to. And the project changed as a result of the project for the better.

Those changes to the project resulted in an EC2 rating, as Christie mentioned. And this is something I'm very proud of and I know our team is proud of. It's the highest rating that a mining project has ever received in the United States from the EPA. We're very proud of that fact. That told me we were on the right track and we were doing the right thing.

And it's -- I'm sure it was an oversight yesterday. We heard a lot from the Band about the failed EIS and the original EIS, but they never mentioned the improvements to the project in the

EC2 rating that the EPA provided.

Just last couple things I want to touch on as we wrap up here, and this was touched on earlier this morning but I think this is very, very important.

Last June the White House issued their report on critical minerals in the United states. On page 99 of the report it specifically noted that PolyMet would be the only nickel mine in the country when Eagle shuts down in 2025. Nickel is a critical mineral needed for batteries, needed for the green economy. And we don't want -- the majority of the nickel in the world right now comes out of Russia. Not a great place to be getting nickel from. So there's a strategic reason why we need to develop these resources in the United States and we have that. We have a permitted project ready to go and produce that nickel right here as well as cobalt and some other strategic metals.

Then just a few weeks ago President Biden issued a directive under the Defense Production Act about how important it is to develop these strategic metals and minerals here in the United States for our own strategic defense purposes.

Like I said, we've got a project that's permitted. We're ready to go. We think we can do it. I wouldn't -- I wouldn't stand here in front of you and promote this project and put it forward if I didn't think that we could do it and do it safely.

Protecting the environment, cleaning up the environment, and producing these metals, it's not a mutually exclusive proposition. We can do both. And our team, especially the team that lives at the site, they live there, they play there, they recreate there, they raise their families there. I can't think of anyone that has more vested interest in doing this correctly and doing it right and protecting the environment than our team that lives there, and they're the ones that will ensure that it's done correctly.

So in conclusion, Colonel Jansen, I want to thank you for your time and your team's time. I thought this was an excellent hearing. A great facility. Very well run, very efficient hearing today. Appreciate the attention and listening to what we have to say about the project.

And I want to thank our team specifically for all the hours and hard work they put into the presentation and sharing our story here. It's a great story. And if you can't tell, I'm very passionate and proud of what we have.

After 15 years, it's time to move this project forward. It's been studied to death. It's been looked at upside down, sideways, and from every direction. I think it holds up and I think we're ready to go. And we very respectfully ask you to consider what we've presented and to reinstate the permit as quickly as we can.

Thank you.

COLONEL JANSEN: Thank you, Christie, Steve, Greg, Cliff, Jay, and Jon for your statements. This concludes Day 2 of the public hearing regarding Fond du Lac's objection to the Corps' Section 404 permit for the PolyMet NorthMet Mine project.

Thank you to all the parties representing Fond du Lac, USEPA, PolyMet. To all of our witnesses I personally thank you for your preparation and presentation of valuable information and for sharing your social, cultural, legal, and scientific perspectives over the last two days.

Also, a big thank you to all of those who planned and facilitated the hearing here at the resort.

We'll reconvene tomorrow afternoon at 4 p.m. for Day 3 of this public hearing. Tomorrow we'll receive verbal statements from the public via teleconference. And information on the call in for tomorrow is available on the Corps' PolyMet project web page. That link is also on the slide displayed here.

So again, I want to thank all of you, wish you safe travels, and a good afternoon.

* * *

STATE OF MINNESOTA)
) ss.
COUNTY OF WASHINGTON)

BE IT KNOWN, that I took the proceedings at the time and place set forth herein;

That the proceedings were recorded in shorthand and transcribed into typewriting, that the transcript is a true record of the proceedings, to the best of my ability;

That I am not related to any of the parties hereto nor interested in the outcome of the action;

IN EVIDENCE HEREOF, WITNESS MY HAND AND SEAL.

____
Lisa M. Thorsgaard