

Agenda

Santa Cruz County Advisory Panel on the South32 Hermosa Project February 21, 2024

**Santa Cruz County Provisional Community College District
2021 N Grand Avenue, Nogales**

Timing	Focus	Task/Action	Who
10:30 30 mins	Lunch is Served		All
11:00 1 hour	Dr. Frank A. von Hippel, PhD Topic: <i>Ecotoxicology of Manganese</i> VIA Zoom	Presentation, Question/Answer	All
12:00 10 mins	Break		All
12:10 2 min	Panel Business – Welcome		Catherine
12:12 3 min	January Minutes	Approve	Catherine
12:15 45 mins	Mine Plan of Operation (MOP)	Presentation, Question/Answer	South32
1:00 25 min	Project Updates <ul style="list-style-type: none"> • IROC • Ongoing Permitting and Site Activity • Workforce/Procurement • Traffic/Trac Out • Water/Dewatering Options • Fast-41 Dashboard • Public Health Evaluation 	Share information, Q & A [Generally, up to three of the topics listed will have an update. If there is no new information, there will be no update.]	South32
1:25 15 min	Community/Panel <ul style="list-style-type: none"> • PARA • Town of Patagonia Flood and Flow Committee • FOSCR • Other? 	Share information, Q & A	Carolyn Ben Panel Members
1:40 15 min	Standing Topics: <ul style="list-style-type: none"> • CPBA (Community Protection and Benefit Agreement) • Q&A Document/Data Base 	Share information, Q & A	Damian Stephanie Smith Catherine
1:55 5 min	Wrap Up March Meeting: Patagonia	Final Comments	Catherine
2:00	End		All



Meeting Minutes for February 21, 2024
Santa Cruz County Advisory Panel on the South 32 Hermosa Project
Santa Cruz County Provisional Community College District, 2021 N Grand Ave, Nogales, AZ 85621

The meeting was called to order at 11:00 am by Catherine.

- 1. Guest Presenter – Dr. Frank von Hippel:** Dr. von Hippel, Professor, Mel & Enid Zukerman College of Public Health, University of Arizona gave a presentation on the Ecotoxicology of Manganese. See Attachment 1 for his presentation and slide deck.
- 2. South32 Hermosa Exploration and Critical Minerals Plan of Operations - Overview – Brent Musslewhite & Maggie Blais**



Brent: We have two portions of the orebody, a sulfide deposit, sometimes referred to as the Taylor deposit, which is zinc-lead-silver. And then we have oxide deposit, sometimes referred to as the Clark deposit, which is manganese-zinc-silver. Both targeted minerals (manganese and zinc) have been designated by the Department of Interior as critical minerals.

That feeds into how the facility is going to be permitted and what different statutes with which we must comply. Another part that is important, that you heard Pat and others talk about, how Hermosa is different than other mines that we see in Arizona and even others in the United States. There are some things that we think are beneficial from a sustainability perspective that set Hermosa apart. One is the footprint. When you look at the overall physical disturbance from the facility, it is much smaller than compared to another surface mine in Arizona. It will be a fraction of the area if you compare it to other mines being proposed.

Part of that is because of the mining method that we are using – it's an underground mine – what they call a longhole open stope.

You mine out blocks of ores, as compared to other kinds of underground mining methods like a block cave mine which is where you have a large area of subsidence. Here, you mine out a block, mix part of your tailings with cement, put it back in the ground, which creates a solid block that allows the mine to not subside. And provides for safety.

Tailings management is something that sets us apart. There is not another dry stack tailings facility in Arizona. Maybe one or two in the United States. Dry stack tailings have a number of advantages. One that helps us with the footprint. If you had traditional wet deposition tailings you're mixing, maybe up to 65% water, with your solids. It's pumped out, you end up with a big pond on the surface, with a lot of evaporation and a lot of drainage that goes through that pond and down into the groundwater. What we have is dry stack. You can think of it as an engineered fill. I think a lot of you have

Attendance:

Meeting Facilitators (Interfuse Associates):
Catherine Tornbom, Joanne Lamb

South32 Hermosa:

Brent Musslewhite, Victor Cook, Sandra Moraga, Stephanie Moreno, Maggie Blais

Panel Members Present:

Olivia Ainza-Kramer, Maureen DeLaOssa, John Fanning, Gerry Issacs, Ruth Ann LeFebvre, Ben Lomeli, Damian Rawoot, Fritz Sawyer, Carolyn Shafer, Guillermo Valencia, Marcelino Varona, Michael Young

Panel Members Absent:

Liz Collier, Linda Shore, Chris Young

Consultants/Guests/Visitors:

Ranay Guifarro, Kat Crockett, Wendy Islas, Joe Verdugo, Stephanie Smith, Eric Hiser, Ernie Edwards, Anita Conner, Stephen Fowler, Julie Good, McKinsey Lyon

Presenter:

Dr. Frank von Hippel (via Zoom)



already been out to the site and you have seen the one that we currently have there. It is also a lined facility, so it reduces the risk of getting contaminants down into the subsurface.

SETTING A NEW STANDARD FOR SUSTAINABLE MINING

The Hermosa Project is an opportunity for Arizona and the nation to demonstrate that next-generation mining can produce these important metals in a way that does not contribute to climate change.

Here's how we are working to minimize impact and target a low-carbon mining operation:

Design Element	Hermosa Focus
Footprint	Designing to operate on just 600-700 acres – 95% less surface disturbance of other mining projects, which often stretch 10,000+ acres
Mining Method	Mining underground and backfilling to reduce volume of stored tailings on the surface and all but eliminates surface subsidence
Tailings	Built one of the nation's first dry stack tailings facilities, limiting surface disturbance and achieving the highest standard of safety and water conservation
Transportation	Targeting all-electric fleets - above and below ground - to reduce noise, improve working conditions, safety and health and support the company's net-zero GHG goal. IROC facility reduces travel to site
Power Source	Partnering for potential to be fully powered by renewable energy, which could underpin new regional renewable energy capacity and infrastructure
Water Management	Designing for water use intensity 50% lower than traditional mines and eliminate the need for long-term water treatment

SLIDE 3

Something that sets us apart is we are designing the mine for full battery electric fleet underground. That helps with a number of things. There's diesel particulate emissions and other things from diesel powered equipment. And then also, we talked a lot about the remote operating center. That helps reduce traffic out to the site as well as keeping employees in this area rather than having to drive on the roads to the mine facility.

We are seeking to be the first low carbon mine of the future, and we are designing it to be that way and we are working with power providers like Unisource Energy on trying to develop green power, clean power partnerships to bring all renewable energy to the mine site.

And then the last is the water use intensity in the mine. I know we have to manage a lot of water, but in terms of our consumptive use of water, it is a fraction of what you would see at other mines. That goes back to the use of dry stack tailings. We are recycling as much water back through the plant as we can.

I thought something that might be helpful is to talk about what the regulations require. I think people can get mixed up on what is required by mining regulations versus what is required by NEPA. The Mine Plan of Operations (MPO) is required under 36 CFR Part 228. Essentially, what that requires is operators to submit an MPO, which we've done and provided that plan to this Panel. It requires information sufficient to describe or identify the type of operations proposed and how it will be conducted. The period of the proposed activity and measures taken to meet requirements for environmental protection. That is what is required under the mining laws.

PLAN OF OPERATIONS AND NEPA REQUIREMENTS

USFS mining regulations (36CFR 228.4) require operators to submit a Plan of Operations that includes information sufficient to describe or identify the type of operations proposed and how they would be conducted, period of proposed activity, and measures taken to meet requirements for environmental protection.

The National Environmental Policy Act (NEPA) requires federal agencies to assess the environmental effects of proposed major federal actions (such as authorizing a Plan of Operations) prior to making decisions.

Includes:

- Preparation of an Environmental Impact Statement (EIS) for major federal actions by the lead federal agency (USFS)
- Consideration of a reasonable range of alternatives that accomplish the purpose and need of the proposed action
- Describes the area to be affected by the proposed action and alternatives under consideration
- Analysis of environmental effects and their significance

Involves:

- Public scoping and participation
- Input from cooperating and Participating agencies
- Consultations required under the National Historic Preservation Act and Endangered Species Act

Nations first FAST-41 covered mining project. Follows the same NEPA process with the same requirements as other projects and includes enhanced coordination from the Federal Permitting Improvement Steering Committee pursuant to FAST-41

SLIDE 4

What is not included are all the requirements under NEPA, the National Environmental Policy Act. NEPA requires federal agencies to assess the environmental effects of proposed major federal actions, such as authorizing operations. When a federal agency has to make a decision on something or contract or permit, they have to consider the decision on the environment. In this case, the Forest Service is making the decision, they are the lead the Federal Agency for preparing the environmental impact statement. They prepare an Environmental Impact Statement for major federal action, for instance, authorizing an MPO. They must consider a reasonable range of reasonable alternatives that accomplish the purpose and needs of the proposed action. Those alternatives are developed from several diverse sources – the agency, from cooperating agencies, participating agencies, and they come from the public. There will then be a scoping period, where public involvement is sought. People will have an opportunity to say, well, we should consider this alternative or that alternative. The agency must assess possible alternatives and then evaluate those that are reasonable alternatives.

The EIS has to describe the area to be affected by the proposed action, and those alternatives under consideration, to analyze the environmental effects and their significance. They make a rating as to how significant the effects are of the proposed action of the various alternatives. One of the alternatives is always the no action alternative. If the Forest Service does not authorize it, what are the effects of that? I mentioned this before, but the NEPA process involves public scoping and participation. That is an important part of the process. If you look at the FAST-41 dashboard scoping is supposed to start mid-May. Scoping meetings will be an opportunity for people to provide comments around the scope of the analysis. That will also include input from cooperating and participating agencies. There is representation from some of those here in this meeting, and other federal agencies and state agencies are involved in that process.

During NEPA, there are consultations between the lead agency and other federal agencies to be considered. There are consultations, for example, on the National Historic Preservation Act and Section 106 on adverse effects on cultural resources. Another consultation typically involves the Advisory Council, a number of tribes, and the State

Historic Preservation Office. The consultations are robust and take a long time. There is also a consultation that is done that involves the US Fish and Wildlife Service under the Endangered Species Act which looks at adverse effects to threatened endangered species.

I think it's important to understand there's two different things. There's the MPO you can think of as the permit application, and then there's the NEPA process which is longer and involves analysis of all the environmental effects and public disclosure.

PART 228 REQUIREMENTS FOR PLAN OF OPERATIONS	
36 CFR 228.4(c) The plan of operations shall include:	Section within Exploration and Mine Plan of Operations
§ 228.4 (c)(1) - The name and legal mailing address of the operators (and claimants if they are not the operators) and their lessees, assignees, or designees.	Described within the Introduction of the MPO
§ 228.4 (c)(2) - A map or sketch showing information sufficient to locate the proposed area of operations on the ground, existing and/or proposed roads or access routes to be used in connection with the operations as set forth in § 228.12 and the approximate location and size of areas where surface resources will be disturbed.	Figures within the MPO for vicinity, site layout, TSF detail and phasing, geology, sloping diagram, water balance, and beneficiation flowcharts
§ 228.12 Access: Proposals for construction, improvement or use of such access as part of a plan of operations shall include a description of the type and standard of the proposed means of access, a map showing the proposed route of access, and a description of the means of transportation to be used. Approval of the means of access as part of a plan of operations shall specify the location of the access route, design standards, means of transportation, and other conditions reasonably necessary to protect the environment and forest surface resources, including measures to protect scenic values and to insure against erosion and water or air pollution.	Described within the Roads section of the Project Description (Chpt 2) and development of a Road Plan (Appendix A) that includes maps and figures.
§ 228.4 (c)(3) - Information sufficient to describe or identify the type of operations proposed and how they would be conducted, the type and standard of existing and proposed roads or access routes, the means of transportation used or to be used as set forth in § 228.12, the period during which the proposed activity will take place, and measures to be taken to meet the requirements for environmental protection in § 228.8	Described within the Project Description (Chpt 2) of the MPO: -Exploration on surface and beneath NFS land -Mining -Tailings and Mine Rock Management -Water Use and Treatment -Materials and Supplies -Maintenance during Operations and Public Safety -Prevention and Control of Fire -Roads -Power -Operations on Private lands (milling, beneficiation, surface support facilities and mining infrastructure)

This is the first mining project that is covered under FAST-41, Fixing American's Surface Transportation Act. That does not mean that this project doesn't follow the same NEPA processes as any other project. It has to meet all the same requirements, all the same stipulations, and it does not predict any particular outcome. What it does do is provide enhanced coordination and oversight from the Federal permitting improvement council to the FAST-41 process.

These are the specific requirements of the regulations if you want to dig into the Code of Federal Regulations 36 CFR Part 228.8. This is how we addressed it in the MPO.

- 228.4 (c)(1) Name and legal mailing address of the operators and their lessees, assignees and designates.
- 228.4 (c)(2) A map or sketch showing information sufficient to locate the proposed area of operations on the ground.
- 228.12 Access, which include proposals for construction, a description of the type and standard of the proposed means of access, a map showing the proposed route of access, and description of the operation shall specify the location of the access. We have described that in the MPO in chapter two if you want to refer to the link that was sent out. It is also in Appendix A which includes maps and information on what the proposed long-term access is.
- 228.4 (c)(3) Information sufficient to describe or identify the types of operations proposed and how they would be conducted, the type and standard of existing and proposed roads or access routes, the means of transportation, the period that the activity will happen and then also this last piece of measures to be taken to meet the requirements for environmental protection in 228.8. We talked about exploration, water use and treatment, prevention, and control of fire, roads, power, and operations on Forest Service land. All this is described in chapter two, which is the project description.

This is information on the specific requirements under environmental protections.

- 228.8 (a) requires air quality. That has been described in chapter three on environmental protection of air quality.
- 228.8 (b) Water quality is described in the environmental protection measures chapter and there is also what is required around stormwater management.
- 228.8 (c) Solid waste is described in the

PART 228 REQUIREMENTS FOR PLAN OF OPERATIONS	
36 CFR 228.8 Requirements for Environmental Protection	Section within Exploration and Mine Plan of Ops
§ 228.8 (a) Air Quality	Described in the Environmental Protection Measures section on Air Quality
§ 228.8 (b) Water Quality	Described in the Environmental Protection Measures section on Water Quality and within Appendix for Stormwater Management
§ 228.8 (c) Solid Wastes	Described in the Environmental Protection Measures section on Solid Waste/Hazardous Materials
§ 228.8 (d) Scenic Values	Described in the Environmental Protection Measures section on Scenic Values and Recreation
§ 228.8 (e) Fish and Wildlife	Described in the Environmental Protection Measures section on Fish and Wildlife
§ 228.8 (f) Roads	Described in the Environmental Protection Measures section on Road Plan (Appendix A)
§ 228.8 (g) Reclamation	Described in the Reclamation and Closure section of the MPO

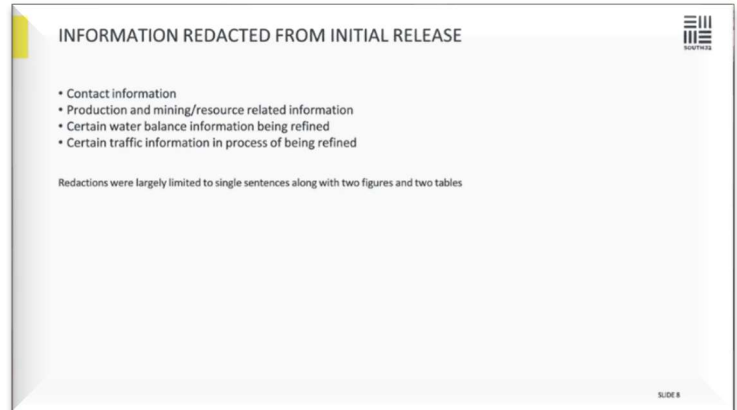
REVIEW OF MPO CONTENT	
Submitted the initial MPO August 17, 2023.	
Accepted by USFS on Dec 17, 2023 and voluntarily released by South32 on January 30, 2024	
Revised MPO outline	
- Chapter 1. Introduction	
- Chapter 2. Project Description	
- Chapter 3. Environmental Protection Measures	
- Chapter 4. Temporary Cessation of Operations	
- Chapter 5. Reclamation and Closure	
- Appendices (5)	
> App A. Roads Plan	
> App B. Stormwater Management	
> App C. Materials Management	
> App D. TSF Design Drawings	
> App E. Typical Facility Layouts	
- Figures (24)	
- Tables (13)	

environmental protection measures section as well as scenic values (228.8 (d)), and fish and wildlife (228.8 (e)). Roads we have talked about (228.8 (f)). And then there is a reclamation chapter (228.8 (g)).

Our MPO is about 250 pages long, and we submitted the MPO to the Forest Service on August 17. On December 17, they accepted the MPO, and then we released it on January 30th. I think everyone on the panel got an email about that. It includes five chapters: introduction; project description; environmental protection measures; temporary cessation of operations; and reclamation and closure. We have five different appendices: roads; stormwater management;

materials management; and TFS2 tailings design. And then typical facilities layouts. There are 24 different figures and 13 different tables.

When we released the MPO, there were some questions about information that was redacted. There were nine different pages with redacted information. The type of information redacted included contact information, information related to production of mining and resource related information content that could be business confidential related to the overall quantity of the resource mineralogy, certain water balance information that is getting updated, and traffic information is in the process of being refined. So those were the four categories of things that were redacted in the document. Most of those redactions were one sentence or a couple that were two or three.



Fritz: *Will that be released during the NEPA process?*

Brent: Ultimately, that will be the decision of the Forest Service. They have specific requirements in terms of what information can be maintained as business confidential. We will adhere to those requirements.

Ben: *It seems like you are only talking about tailings at the site. What about at the processing plant? That is a big concern for us because the concentration is low, yet the volume is high. So, you are going to have a lot of tailings at the processing plant that are not being talked about, and neither is the water management. You have 6.5 million gallons a day dewatering which is almost two million gallons more per day than all of Rio Rico and Nogales use, but we do not hear much about that we only talk about use on site.*

Brent: I want to make sure I am clear on the first question about the processing plant, you are referring to the on-site processing plant for the zinc?

Ben: *No, the one that is 250 or 350 acres, I do not know where they are going to put it.*

Brent: There is a map in the MPO, that that shows where the location is being proposed. That location will be considered as part of the NEPA analysis. Maggie will talk about Water Management in terms of what is being proposed. The consumptive use is small compared to mines where we do have to manage a lot of water.

Ben: *And the tailings at the processing plant are a concern because of the volume and exposure.*

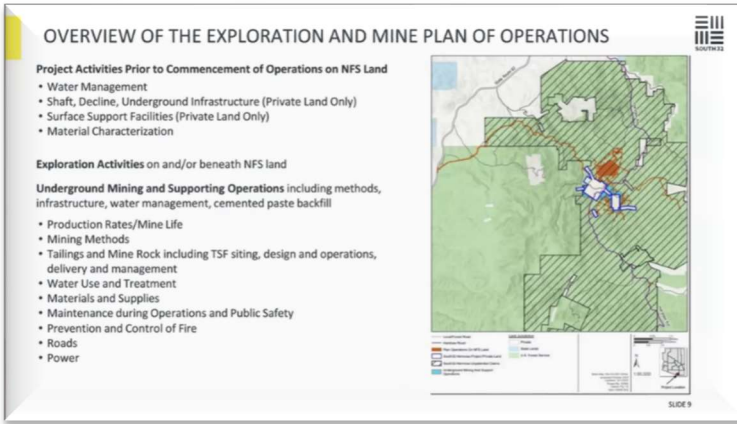
Brent: This will be a dry sack tailings facility. It's the parallel of what is on site, located adjacent to the site. It would be the same design type as the onsite facility. It will be lined with a drainage system, compacted tailings will be placed on it, and collected water will be pumped back for water treatment.

Carolyn: *I am confused about which one is being talked about here, because I am hearing Ben's question to include what was the proposed manganese processing plan on I19. Maybe I am hearing incorrectly but I am hearing you respond only with respect to the mine site in Patagonia?*

Ben: *The question is are tailings ever mined at the manganese process plant? The volume of those tailings honestly has not been represented. The other one is about Part 228. The requirements there are for water quality. What about water quantity? 6.5 million gallons per day is a lot of water. You're talking about stormwater protection management but what about the aquifer?*

Brent: As for the manganese facility, we are still working on that facility. The market is still evolving, and so I do not have a number for you today on what the size of that facility is, but that is something we can follow up on. Regarding the quantity of water, yes, it will have to be analyzed and considered as part of the NEPA process where the lead agency will look at what the direct, indirect, and cumulative effects of the proposed action are which includes dewatering. Just because it is not a specific requirement in the MPO does not mean, and that was the point, is that NEPA is a much more expansive analysis of environmental effects that goes beyond what the specific regulations require to comply with the part 228 regulations. NEPA is much broader as you know. Maggie is going to talk about some of the specifics of the MPO. This information is pulled from the plan itself. This is going to be a refresher of what you have seen in the plan.

Maggie: The MPO is focused on those facilities and activities that are going to be on Forest Service land because that is what the federal action is looking at. But the MPO still describes activities that are happening on our private lands.



There will be activities happening on our private lands before operations on Forest Service land begin. That's because the ore body is located under our private lands.

Private land activities that have or will begin include water management, managing the groundwater to dry out the ore body in order to access the ore and start mining. Also, development of the shaft and decline to access the ore body itself. Underground infrastructures and surface facilities will or are being built on our private lands.

This mine proposes to have all the beneficiation facilities that support the mining to happen on private land as opposed to some of the other mining

operations that occur that use federal land for things like the concentrator, etc. All the beneficiation facilities are going to be on private land and that will be due to characterization before any sort of start on Forest Service land.

The MPO is a combination of exploration and mining operations. The plan describes our exploration activities that will be on and beneath forest land, as well as the underground operations under the Forest Service land. The MPO describes surface facilities that are needed as the expansion onto the Forest Service land occurs which include things like a secondary storage facility, and a primary access road. You can see on another figure, a little bit more detail, exploration, groundwater management. And then we also have some recharge locations that have been proposed.

Fritz: I just want to clarify. NEPA is only required if you are on or under federal land?

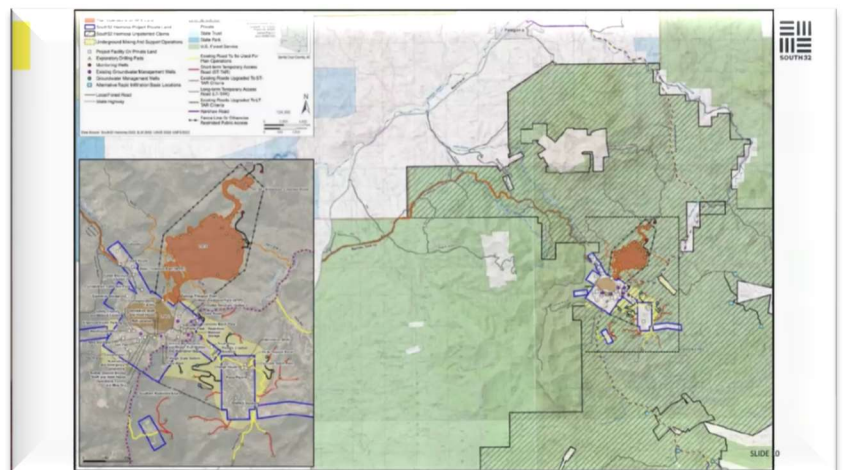
Maggie: NEPA is for any major federal action, for example, providing permit, providing funding, anything like that, which requires that agency to take a hard look at the effects of that action.

Brent: Another way to say that it might be if you had a mine proposed on just private land, you might not need a NEPA analysis. But if you go underground on federal land or any surface disturbance of road.

Ruth Ann: You are saying that most of the mining is done on private land? So, you do not have to follow NEPA?

Brent: We do. An example is, there's a ski resort in Colorado, and they're going to build a big set of condominiums on private land, and they have their whole ski facility on private land and there's a road that's 200 feet long and they're going to go build this road, cross Forest Service land. One of the most controversial ski projects has been litigation for 10 years. But the trigger is the Forest Service must issue a permit for that road. So now, the project must be analyzed in compliance with the National Environmental Policy Act. There will be a NEPA analysis. Again, the MPO is focused on what are the operations that are on or below federal land.

Maggie: It is good to highlight the trigger of the federal action is request for authorization of constructing of a primary access road, exploration on Forest Service land, underground mining from beyond the extent of our patented claims, recharge locations, and then tailings storage facility on Forest Service land. That is the scope of the proposed action MPO. You have access to the online version¹ of the map. I will try to direct you spatially, so you get a sense of it.



To give you a sense of where we are at, blue is our patented claims. These lots of little dots over here are the surface facilities I was talking about, paste plant, filtration plant, those facilities that help us mine access ore, bring it to surface process the sulfide ore.

¹ MPO: https://south32hermosa.com/wp-content/uploads/2024/01/2024_01_South32-Hermosa-Critical-Minerals-Plan-of-Operations_RE.pdf Chapter 2, Figure 2-1, page 21

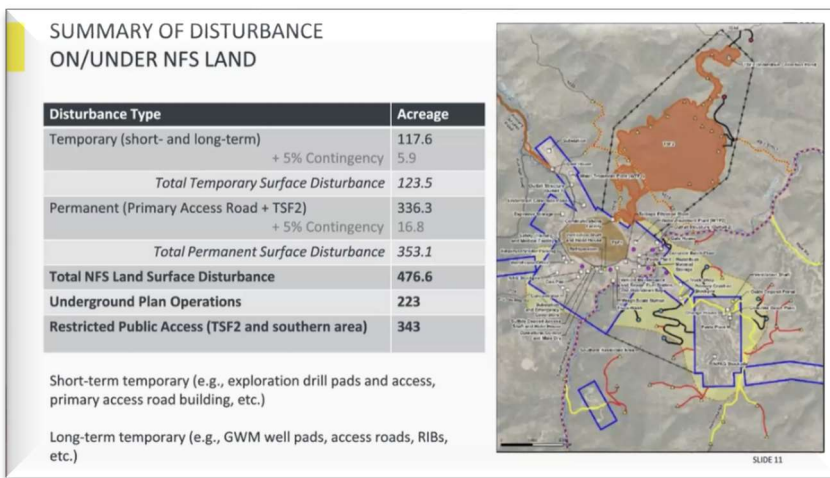
The yellow is the extent of the underground workings beyond the patented claims. We also have groundwater management wells. There are six proposed on Forest Service land. We also have existing wells on our private land that are bringing ground water up to surface to treat so that we can access the ore body. We have exploration pads that are focused around our patented claims. Right now, access to the site is through Harshaw Road, which is an existing road that traverses through our private lands. The MPO talks about short term and long-term access. Upon approval from the Forest Service, we will use the Cross Creek Connector bypass which bypasses the Town of Patagonia along Hershaw Road to access the site. And while that is being used, geotechnical investigations will help us finalize the design for the primary access road. Then upon completion, all the mine traffic would shift over to using the primary access road. Harshaw Road will remain open for the life of the mine and still be used for emergency access, and potentially limited employee access.

Ruth Ann: *The Cross Creek Connector meets up with 82 which then goes 90 and then up on I10. How long are you all going to be using 82 to 90? Is there a requirement about the amount of time?*

Brent: Upon approval for the primary access road from the USFS, we would construct the road as quickly as possible. I am not a road engineer, but it will most likely take a year or longer.

Carolyn: *How is Nogales impacted? You cannot stay on eighty-two forever. Eventually you must make a choice.*

Brent: That will be evaluated as part of the NEPA process.



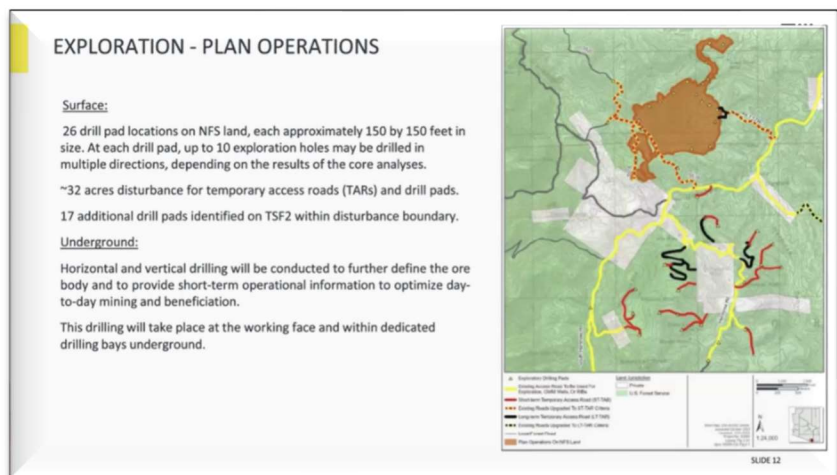
Maggie: The MPO also provides disturbance acreage. Here is a summary of the longer version shown in the MPO. We have determined short-term and long-term disturbances. Short-term temporary disturbances are associated with our exploration drill pads and access to those pads.

Long-term temporary disturbances are associated with long-term groundwater management wells, the recharge basin locations, and those access roads. And permanent disturbance describes disturbance associated with the primary access road and the TSF2 (tailings storage facility 2). That disturbance totals about 353

permanent acres of disturbance and 123 acres for temporary disturbance, totaling 476 acres of disturbance on Forest Service land. We have some proposed fencing around TSF2 and in an area to the south to protect some of this infrastructure.

Carolyn: *How are you proposing tailings on public lands when there has been a legal case that that is not possible?*

Brent: The requirements can be cited in different ways. One way is to use the reasonable prudence test, and to determine if there is a reasonable likelihood of mineralization underneath the areas in which the tailings are sited. Another way to do it is to cite Mill Site Claim². The Forest Service and the Department of Interior are working on ways in which they need to comply with the Rosemont decision and subsequent decision. Thacker Pass³ was able to



² <https://www.blm.gov/programs/energy-and-minerals/mining-and-minerals/locatable-minerals/mining-claims>

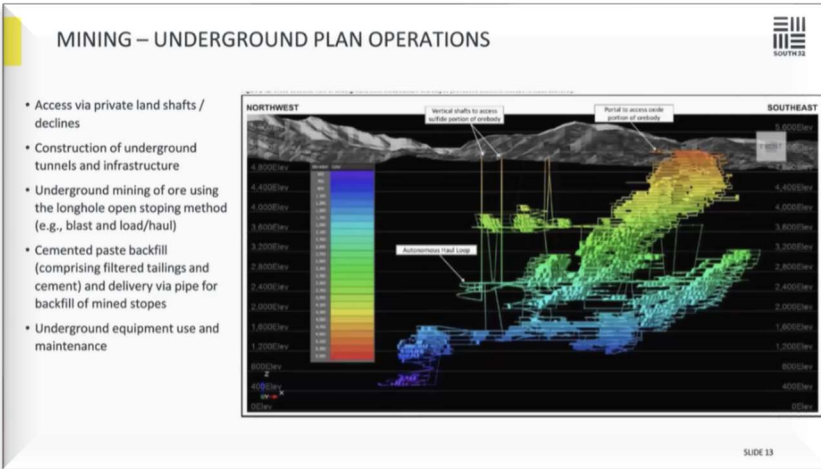
³ <https://lithiumamericas.com/thacker-pass/overview/default.aspx>

navigate some of this. That is the work that is happening in the background.

Maggie: We have proposed 26 drill pads on Forest Service lands focused on exploration. They each have some temporary access routes totaling about thirty-two acres of temporary disturbance on Forest Service land. We have proposed 17 additional drill pads within the TSF2 footprints. We will also be doing underground exploration to help us further define the ore body and then provide information to optimize day-to-day mining and beneficiation.

Brent talked about the longhole open stope methodology that we are going to be using. You all might remember that the oxide portion of the ore body, also known as Clark, would be accessed through a decline. The sulfide portion ore

bodies would be accessed by shafts. Both of those access points are from private land. The description in the MPO describes the method of longhole open stope, which includes blasting, hauling the muck out and then backfilling with mine rock or with cemented paste backfill comprising filtered tailings and cement delivered via pipeline to create the stability to continue mining.



Ruth Ann: Help me understand the colors.

Maggie: Colors are elevations from surface.

Ruth Ann: That is not the ore?

Maggie: No.

Ben: Is that graphic to scale?

Maggie: I did not design it so I cannot speak

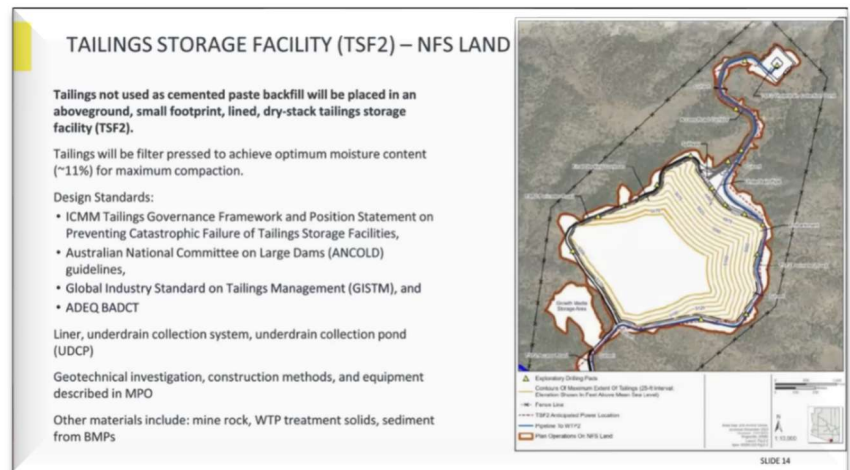
to that.

Tailings will initially be placed on our private lands in TSF1 that is currently in operation on our site, holding legacy tailings that have been cleaned up under the voluntary remediation program.

Once that reaches capacity, the expansion would allow us to place tails in a second tailings facility adjacent to the site on forest land. That is what we are calling TSF2. That is going to be the exact same design as TSF1.

TSF2 will be a lined dry stacked facility where tails will be filter pressed to reduce water, trucked to the facility and placed in stacks. The facility will be lined with an underdrain collection system (like a French drain) where drain down will be captured, conveyed to an underdrain collection pond, and then pumped back via pipeline for treatment at Water Treatment Plant 2 located on South32 property.

This facility, like TSF1, was designed to meet ADEQ BADCT standards, and in fact exceeds those standards by also meeting requirements that are stipulated under ICMM, ANCOLD, and GISTM.



The Plan of operations describes the materials that are to be placed in the tailings storage facilities which include tails, mine rock, WTP solids, and sediment from settling ponds. The plan also describes geotechnical investigation activities proposed to finalize construction as well as construction methods and equipment that will be used to construct and operate the facility.

Based on feedback from the community, Harshaw Road is not the preferred access to the mine. South32 has undertaken a number of road and routing studies and from those studies, the Flux Canyon route was selected as one of the preferred routes. Based on additional community feedback, especially residents in Flux Canyon, we adjusted the

PERMANENT ACCESS ROAD

Primary access to the Project currently occurs using Harshaw Road at its intersection with State Route 82 (SR 82) near Town of Patagonia.

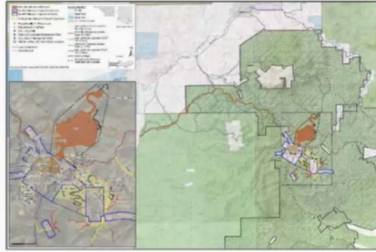
Temporary Town of Patagonia bypass being constructed on Santa Cruz County lands.

Development of a new Primary Access Road utilizing existing segments of Flux Canyon Road (FR 812), Flux Road (FR 4654), and Barrilles Tank Road (FR 4653).

Upon completion of Primary Access Road construction, the new Primary Access Road will be used for all Project activities described in the MPO, including heavy truck traffic.

Harshaw Road would remain in use by public, limited employee traffic and emergency access.

Geotechnical investigation, construction methods, and construction equipment described in MPO.



SLIDE 15

route further to follow Barrilles Tank Road. It added length on forest land, but it helped avoid some residents. The MPO describes some geotechnical investigations that will be needed to finalize the design to then build and then use. Harshaw will remain open after the primary road is built. It will be used for emergency situations with some limited employee traffic.

We are going to begin mining on private lands bringing groundwater up to the surface and treating it on site at WTP2. It is going to be treated to meet stringent surface and groundwater standards before discharge. Part of this proposed plan with the Forest Service includes something called Rapid

Infiltration Basins, which are recharge locations. This was proposed based on community feedback that the preference for water management is to try and keep as much of the water in the mountainous aquifer as possible as opposed to strictly discharging down Harshaw Creek.

The MPO proposes six possible locations where two final locations would be selected, one to the east of the site in Goldbaum area, and one to the south of the site in the Mowry area. Each location would have a series of basins that are used for the recharge. Based on hydrogeologic characterization work that would happen after Forest Service approval, we would select which basins would work best for recharging the aquifer.

Ben: *Are the basins engineered bottoms because that's all fractured rock up there. How are you going to get those to be rapid infiltration?*

Maggie: These are really recharge basins and we anticipate infiltration rates of approximately 12 inches per day. Part of the hydrological characterization proposed within the MPO would be needed to understand the alluvium and ensure it is going to drain appropriately and do what we want it to do.

Ben: *Do you have a maintenance plan?*

Maggie: A maintenance plan will be developed. Generally, maintenance for these basins includes a sequence of drying among the basins to perform required maintenance and allow for continued functioning of the infiltration basins.

Ruth Ann: *Were there groundwater modeling? When did that happen? It says expected discharge report by groundwater modeling.*

Brent: I do not think it has been done yet. It was based on Tomas looking at geology maps, and other things around where he expected there to be some unconsolidated sediments. That needs to be verified with geophysical work and other investigation work. The Forest Service has a modeling team, plus some other cooperating agencies, that they've assembled that will be working through some of this in terms of the groundwater model and the evaluation of alternatives like groundwater basins.

Ben: *We are talking about a Forest Service model?*

Brent: They are reviewing the Newfields conceptual model that has been in development to decide whether that is the appropriate model that can be used to do groundwater simulations.

WATER MANAGEMENT

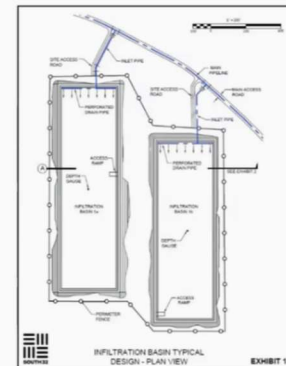
Groundwater management (GWM) is necessary to reduce hydrostatic pressures to allow safe underground exploration and mining. The reduction of pressure is achieved through GWM wells from surface (on private and NFS lands).

Extracted groundwater will be treated to meet stringent surface and groundwater standards before discharge from WTP2.

Expected discharge rate informed by groundwater modeling, as are the proposed rapid infiltration basin (RIB) locations and designs.

As part of MPO, portions of treated water from WTP2 would be routed to RIBs to support aquifer recharge.

High operational water use efficiency (UG mining, filtered tailings, water reuse).



INFILTRATION BASIN TYPICAL DESIGN - PLAN VIEW EXHIBIT 1

SLIDE 16

POWER OVERVIEW



Line power is currently supplied to the Project by a UniSource Energy Services (UNSE) owned and operated 13.2-kV power line.

Line will be supplemented by natural gas and diesel-fueled generators that will operate on S32 private land.

Self-generated power option is included in air quality permit application and will be used until line power is available.

UNSE's proposed 138-kV project (Special Use Permit [SUP] application accepted by USFS Nov. 2022) would avoid emissions from the natural gas engines (~80% reduction in pollutants), enable power from renewable energy sources, and achieve low-carbon targets.

SLIDE 17

Maggie: For power, currently, the site is powered by a 13.2 kV distribution line that is owned and operated by UniSource. That power would be supplemented with natural liquid gas and diesel fuel generators. UNSE has proposed a 138 kV transmission power line that would help support the project and once that becomes available, we would avoid emissions from our natural gas engine. So that would enable us to use renewable energy and help us achieve our low carbon targets.

Fred: *Have you guys have done a sound study for your old gas generators?*

Maggie: Are you talking about a noise analysis type of thing?

Fritz: *Yes. Pretty noisy.*

Maggie: Yes, all those things are going to be looked at during NEPA focused impacts and effects analysis.

Ben: *So, the 138-kV line. We would like to see that underground. Is that in the plan so we don't have fires like California?*

Maggie: The 138-kV that is proposed and has been approved by the line siting committee for UNSE is an overhead line. I think as part of the alternatives, the Forest Service may consider looking at undergrounding as an alternative. That's where NEPA will look at impacts and trade off of impacts. The underground has some benefits, but then there are also disadvantages. Overhead has advantages and disadvantages and all that needs to be looked at in the alternatives analysis and the impacts analysis.

Ben: *Who is doing the NEPA? The Forest Service or a consultant?*

Brent: The Forest Service has staff dedicated to this process and hired a third-party consultant.

Ruth Ann: *So, while NEPA is being analyzed, you are still going ahead and doing all these things, even though NEPA hasn't been established. That is going to take a long time. Do you just adapt to whatever the NEPA says?*

Maggie: NEPA is about disclosure of effects and taking a hard look. The Forest Service, based on the activities that they have regulatory authority to look at, will make a decision on what that outcome is. What we are going to be looking at from our proposed action is the mine facilities, and then they'll also be looking at the 138-power line from UNS and they'll assess those impacts, and then they'll make the decision, for instance, for the MPO of whether to authorize it. And through Alternatives Analysis, there might be modifications needed to the MPO and to the power line.

Ruth Ann: *As they say it is a living document and there'll be changes along the way.*

Brent: The MPO can evolve over time based on feedback from the Forest Service, public, etc. So that that is true. The Forest Service will look at a range of alternatives. Undergrounding, I suspect, will be one of those alternatives. I do not know if that is their decision. If that's something that the public wants them to consider regarding scoping, I would suggest making that comment that we want you to evaluate and consider underground power as an option and so they would take those scoping comments and then they would consider that as a possible alternative.

Ruth Ann: *What if they say put it underground. Can you appeal that decision?*

Brent: At the end of the process, they write a record of decision.

Fritz: *So, you guys just approved \$2.2 billion dollars for this project. Did you put money in for underground? It can be a huge cost.*

Brent: The proposed action is what the ACC has approved.

Fritz: *That's not what I asked. Have you budgeted the money for underground?*

Brent: The capital cost estimate is based on what the proposed action is. If that was the change it would change the capital cost.

Fritz: *Getting back to Ruth Ann, basically, you start the mining process without having any approval because you're bringing generators, new propane tanks. I do not think it is part of your traffic study. I did not see it there.*

Ruth Ann: *It just sounds like we need to really depend on the NEPA process to get a lot of these things corrected. It sounds like our quality control is the NEPA process.*

Brent: NEPA requires a broader analysis. What is different about Hermosa is that we can start it and operate it from private land and that is what we have been progressing towards doing since day 1.

Carolyn: *Once you have state water permits and state air quality permits which you do not have yet.*

Brent: We have the state water quality permit, and the air permit is out for public notice.

Carolyn: You do not have the state water permits for the APP and AZPDES. The AZPDES haven't even released the next decision and that decision will decide whether or not that gets appealed. The APP is going through the appeal process.

Brent: We have a current valid AZPDES and APP permit.

Carolyn: *As I have said to Pat any number of times, that is why we all have lawyers.*

Maggie: Reclamation closure as described in the MPO includes descriptions of interim, concurrent, and final reclamation. A high-level overview for reclaiming TSF2 and the underground collection pond are going to be graded, capped with a capillary break placed on it and revegetated with native seeds.

The UDCP will be converted to passive treatment, removed, backfilled, and then mounded and revegetated. The GWM and monitoring wells, exploration holes will be closed per ADWR standards and access roads regraded, scarified, and revegetated.

Underground workings infrastructure is going to be dismantled. The stopes are going to be backfilled and then other disturbed areas are going to be recontoured, scarified, and seeded. We will conduct post closure monitoring afterwards. The MPO does not propose reclaiming the primary access road. That can continue to be used as Forest Service road.

Carolyn: *This was helpful, and I appreciate it and I would ask for a copy of the slides immediately. Not two weeks or four weeks, please ASAP would be helpful. Thank you for the presentation.*

Fritz: *I read this. Was the manganese processing plant site put into it?*

Maggie: No.

Fritz: *There is one thing that you need to consider, and probably Tomas, but as you shut down the dewatering that cone of depression will start to recharge. What effect is that going to have on that regional model? Right now, we are putting a whole bunch of water in Harshaw Creek to keep everything charged. Once you start shutting down, what is going to happen once that water source disappears? I have not seen anything. That needs to be looked at. And then, one last question. You are bringing in cyanide. What form? How is it going to be used?*

Brent: We'll follow up on that.

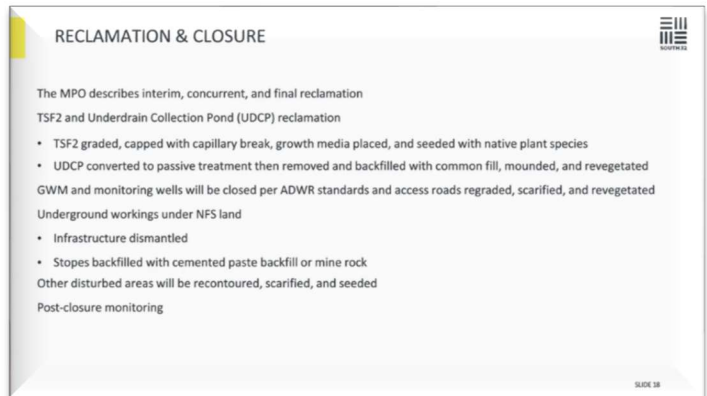
Ben: *When will we get to see the upgrade on the Newfields model? I am concerned that it does not recognize the fact that there are two groundwater basins there. Dr. Ty Ferre agreed he was going to push for that.*

Brent: We'll follow up on that.

3. Community/Panel Updates – Panel Members:

3.1. Patagonia Area Resource Alliance (PARA)

(Attachment 3)– Carolyn: I sent everybody the monthly updates. We discovered that the Office of Administrative hearings had not forwarded the hearing record to the Superior Court so the date to respond to that has been extended. I do not have a new date yet. But that is a non-legal opinion. Comments for the AZPDES permit were filed by January 12 and the agency has 30-45 days to release its decision. I am expecting that



by the end of February. The air quality permit comments are due next Monday, the 26th. PARA released a newsletter today with suggested comments in layperson words from the air quality lawyers who are working with us at the Center for Biological Diversity. I don't want to be so bold as to send you all the newsletter, but if you want to receive our newsletter you can send me an email and I'd be happy to put you on the list. The oral arguments are set for March 25 on the lawsuit against the Forest Service permitting

exploratory drilling at Barksdale Resources and South32. Related to the NEPA FAST-41 process, PARA hosted a meeting from about 12 conservation organizations and set up a “NEPA Coordination Team.” This is an important process to understand the value of the process. So, if you are at all interested, please do let us know.

3.2. Town of Patagonia Flood & Flow Committee (Attachment 4) – Carolyn:

The next meeting is tomorrow in case any of you want to attend. There is a lot going on there and a lot of this will also be related to the NEPA process. The Town of Patagonia had asked for a comprehensive groundwater study from the Forest Service, originally in the summer of 2020. Forest Service ignored the letter. The Town sent a follow up letter in the summer of 2021. Several months later, the Forest Service got back to us and the gist of it was that we were doing some monitoring, and we are understaffed and underfunded. It is the town's position that you can't authorize a mine operation without having basic comprehensive groundwater study. How long will it be before you dry out the mountain? This is the most critical one on this list of things the town's been working on.

3.3. Friends of Santa Cruz River – Ben Lomeli:

The most exciting thing is we are working with the Sonoran Institute on this year's Santa Cruz River Research Days that will be April 24 - 26th in Tucson. It is an international affair that is both in-person and virtual. People will be chiming into zoom with translation in Spanish. There will be presentations on all the science related to the Santa Cruz River including cultural aspects, the water aspects of the river and biodiversity. We are very concerned about the trash in our waterways. It comes from various places primarily Nogales Wash. We are working with Sonoran Institute, Santa Cruz County Public Works, and others to try to address that trash. Our IBWC (International Boundary and Water Commission) meeting is coming up in March. It is open to the public.

4. Standing Topics:

4.1. Community Protection and Benefits

Agreement (CPBA) Working Group – Damian:

This will be our last update on the Community Protection and Benefits Agreement. The last meeting was about a week ago. There were two big topics: one the transfer process handing this off to the signatories that are now working towards a legally binding agreement; and there was a discussion about confidentiality and whether to share the draft Framework. Regarding the transfer process, this is the official letter handing off this effort to the signatories. It includes a thank you to Gerry for

his work on this as well as the other Working Group members. The proposed signatories are the Town of Patagonia, Santa Cruz County, and South32. Our hope is that this effort is a starting place for them to continue to negotiate. This afternoon, I'll officially send this to Mayor Wood, Stephanie, as the county representative, and Pat Reisner. Included in that will be the link to the current version of the Framework. The letter I'm sharing with you is not the same level of transparency you all wanted. The Working Group had a robust discussion about this confidentiality. I heard loud and clear from various Panel members that they wanted to see the draft Framework. However, concerns were raised about the Framework, as it is right now, could create confusion in the community, and it would lead to taking away from the effort as opposed to supporting it. Ultimately, the Working Group came to a consensus, and I'll respect that consensus, that the Framework will remain confidential.

The Working Group did not have complete agreement on the current version of the Framework. The comments from the Working Group members are part of the Framework that the signatories will see. The concern is that it would reflect an endorsement and the Framework is not an endorsement. It is more a brainstorming tool. I invite my fellow Working Group members to share their thoughts.

The work of the Working Group is suspended for now. If there is a need down the road for us to pick it up again, that's fine. This will be my last update.

Fritz: If we are going to do this down the road, it has to be transparent. I've asked for this document. I understand what you're saying, but if we do this again, it needs to be transparent. But I do think that discussion needs to happen next month, when we take an hour because there's things we need to hash out. I think everyone on this Panel, to a certain extent, has axes to grind. Now that this is done, the only thing in front of us is the Q&A and we are not getting anywhere with that. By the way, do we have a person from the City of Nogales?

Damian: No. I think the City of Nogales should be engaged in this, but they are not now.

Marcelino: *When this committee started the question was asked, how many of you want to be on it? That committee is a subset of this entire committee here. Since it is a subset of this committee, then the approval of this agreement must come back to this committee. If you want to keep it confidential then it goes to nobody. Nobody gets it because it represents all of us here. And there has to be agreement among all*

of us. Whether we are in accord or not in accord. I don't care if it passes by four, but it has to come back to us. You are not the owners of the agreement. You do not make the decision about who or where it gets distributed. If it isn't approved by this group. Then it dies.

Damian: This is not an agreement. This is brainstorming. We don't own the agreement.

Marcelino: *Whatever you want to call it. If you say, there's dissension among the group there needs to be clarity. It doesn't go any further with any governmental agent or anything unless it has the approval of this committee here. It doesn't go any further with this confidentiality or that kind of hide and go seek game.*

Carolyn: *That's the way it should be, but the reality also is amongst the five Working Group members from this Panel, there was no agreement between the five of us as to what was the last version of this Framework. So, the conclusion was, the Working Group is not going to come up with a Framework that the Working Group would recommend to the panel to recommend. It doesn't exist Marci.*

Damian: I would say it's a little bit more challenging than that because this Working Group is partially a subset of this committee. It also has representatives from the County, from the town, and from South32 on it. So, it is not just a part of this I'm representing in this letter, the position of Working Group members from the Advisory Panel, but not these others.

Marcelino: *They joined the subcommittee without the approval of this committee, is another question. Because you are not empowered to say who's going to be on the committee. The ones who say who's going to be on the committee is this committee. Somebody else tries to tag on to it is fine. But it's got to be approved here.*

Gerry: *People from the County and the Town of Patagonia were invited to come in as participants to see what was going on. They are the people who are going to develop the final agreement. This Working Group is not developing any final agreement. Those two people, there are only two of them – one from the county and one from the Town of Patagonia. Nogales opted to stay out. So, there's are two people from the government side and one person from the South32 side. It's now in their court.*

Marcelino: *Okay, Gerry, I agree with you. Here's where I get back to you, Catherine. When we have subcommittees, we need to have clear criteria on the scope of the subcommittee. Now if you're going to invite somebody else to come*

in as participants to listen and all that, well, fine, but they don't have a vote. They just came in to listen. The only ones that I think should have a vote were these people here and they come back to us and say, this is our recommendation to you and then we discuss it here.

Ben: *I've said that from the beginning, that's the way it should be. We should not be in some kind of secret cloak and dagger five-person subcommittee without going back to the full committee. That's just not right.*

Marcelino: *Gerry, all you had to do was come back and say, hey, we think it's pertinent to have Patagonia. I agree with it. Nobody would disagree with that.*

Gerry: *My recollection is one of these meetings over the last couple of months there was discussion when we were giving an update in which we said we were reaching out to the County and the Town of Patagonia and the City of Nogales to find representatives who would take this as an ongoing process to get a legal agreement.*

Marcelino: *And Gerry, I concur with your statements. I remember hearing that. But what I'm saying is let's not get slippery with our verbiage. Let's have more accountability. Don't just come and tell us. Bring it back to the committee so that we can formally approve it.*

Carolyn: *That's what this letter is Marci. This is what the Working Group is recommending.*

Gerry: *What this letter is doing is saying, hey, we're done with it. You all take over.*

Marcelino: *I guess but there was a lot of distortion and a lot of hard feelings, not taking away anything of your work. Because you all volunteered to do that. And that took time. If it goes out to the public, it has to first be approved.*

Gerry: This agreement will never see the light of day in public until the people who make the agreement, the County, the Town, and South32, decide to make it public. They are the principles of this agreement. This piece of paper is not an agreement. It's just saying here's some stuff for you guys to think about. We've done a little bit of work and given them a starting point. That's all it is. There's nothing final about it. It could change hugely from whatever work we did. And they specifically ask that we not make it public at this time. And the reason they didn't want it public is because they are planning to hold some public meetings, and they want to talk to people about it and they don't want them to be polluted by any other ideas that are sitting out there. So, when the signatories receive this, like, Cliff Notes, they're going to do their own work. They're going

to do their own public meetings. And they asked us specifically, don't pollute our water by sending your stuff off. That's all it is.

Marcelino: *Well, it shouldn't go out and I don't want anything to be polluted, but I don't want to find out that while it goes to these entities, the Board or the Town of Patagonia or the City of Nogales, and they get a copy of this and they said, well, we're making these recommendations based on the recommendations that were given us to us from the Working Group of the committee. And then suddenly, Patagonia Times comes over and asks were you in agreement with that? And I don't even know what you're talking about. Then that's going to add more negativity to the validity of the work that you guys have done. That's what I'm trying to avoid.*

Guillermo: *As much as I hate to admit it, I concur with Marci. Any subcommittee of this Panel needs to be transparent. That's my position. Maybe we didn't make the position clear, but going forward it needs to be in place. And we think you folks did great work, I really do. It is great work, and your comments are valid, that Patagonia and other stakeholders didn't want it to be made public, but we should have been made aware of that. Regarding the City of Nogales, a couple of Panel members approached me to see if I could approach the City of Nogales. I did reach out to the Mayor and the City Manager, and they are amenable for us to go there and give a presentation and on making a good neighbor agreement.*

Ruth Ann: *But at this point, it's out of the Panel's hands and the Working Group's hands. So, the signatories then must present to the City of Nogales.*

Guillermo: *They don't know what's going on so we as a Panel can go out there and present to them what we've been working on for the last three years. We want to get them on board. There could be a little bit of an education process.*

Marcelino: *And that's no different than when Catherine made a presentation to the County Board of Supervisors.*

Ruth Ann: *Do you want to make a motion for Catherine to present to the City of Nogales?*

Guillermo: *The mayor and city manager told me to just get back to him if we wanted to do a presentation.*

Catherine: *I'm hearing consensus that I should set up a presentation time with the City of Nogales. And if I could have a couple of folks join me as they did for my presentation to the County. That was very effective. I happen to be*

having dental surgery the day of the next meeting, so I will reach out and work with the City Manager on timing.

Victor: *We are planning to set a meeting with the City and Town to start the process of discussing the agreement. This is a process that's going to take a few months. It's not going to happen overnight. I mean if you can present soon, that would be good, but if it takes a little bit more that's not going to be a problem.*

Fritz: *Has this memo been released?*

Damian: *No, it has not. I brought it here first.*

Fritz: *I hate to say this, but we are going to have to release this. We have to trust the members that did this. And let's kick the ball down the road. Sure, all of you all have differences. I've heard them, but we need to get this thing out and let's keep going although at some point, maybe two weeks, I get the appendix. This is critical. You all did a great job and maybe there's something you just overlooked.*

Damian: *Yes, definitely, what we've done is not exhaustive. There are limitations to what we can do, whether it be the advisory panel or the subcommittee. Ultimately, this belongs to the people who are negotiating it. The Town, the County, South32.*

Ruth Ann: *I would like this to be a standing update to find out what's happening.*

Gerry: *We're not involved anymore. That's why they don't have to tell us what they're doing.*

Marcelino: *I concur with your statements overall. Maybe Catherine can ask Stephanie she can be included as a part of the monthly updates of where she is in the process of the Good Neighbor Agreement.*

Stephanie: *Respectfully, I'm part of a larger group of signatories. That larger group of signatories could decide to brief this entity and it's something to discuss, but it wouldn't just be me.*

Damian: *Is there a decision as to where this letter goes?*

Marcelino: *No. it stays here. Unless we want to take a vote on it. As far as I'm concerned, it dies because of the Patagonian Times comes and asks about this document here, or whatever was put out, what is your comment on it? Well, I'm going to tell them what I think about it. And it's not going to be very pretty verbiage. I'll tell you that. And you know what? The elected officials are going to say, what the hell do we get into?*

Catherine: *I would like to remind the panel that you're not authorized to speak on behalf of the*

Panel. I request that you be very mindful of how you express information shared here. Please keep that in mind.

Gerry: *I would like to have it put to a vote whether this letter is issued. I want to hear yes or no. And if the answer is no, then the message is clear. It's still been handed over to the principals and we're done. We're just not going to send them a letter. They'll know that we're done. And they can take it from there.*

Damian: This letter is formalizing a hand off. The fact is the Town of Patagonia, Stephanie, the County and South 32 already have access to the Framework. They've contributed to it. If this panel votes not to proceed with this letter, that's fine.

Ben: *Any time a subcommittee skips the full committee and hands it off to a higher level there's an ethical question there.*

Damian: I take offense, Ben, to your comment that something unethical has happened here.

Ben: *That could happen if we go ahead and pass it off to the signatories without the Panel seeing it. That's my point.*

Ruth Ann: *Would it solve some of the problems if this letter, I mean, I appreciate all your efforts, Damian, is signed by the panel rather than you.*

4 Attachments:

- 1 – Dr. von Hippel's Presentation
- 2 – Dr. von Hippel's PowerPoints
- 3 - South32 MPO Briefing Slides
- 4 – PARA Update
- 5 – Town of Patagonia Flood & Flow Committee Update

Damian: Yes, certainly.

Catherine: *Do I have consensus in support of Ruth Ann's motion to have the Panel sign the letter? It looks like everyone is in agreement.*

Damian: I'm happy to rework this letter, make it from the panel, and say, these are the key elements that we think the Framework should include. There has been some work that has been done. The key point of this letter is this process belongs to you, the signatories. I'll have it for the next Panel meeting.

4.2. Q&A Document – Catherine: There are two tracks on the Q&A document right now. South32 is addressing unanswered questions. And the online version is in production. I do not have the completion date right now.

4.3. Approval of the Minutes: The January Minutes were approved.

5. Upcoming Meetings – Catherine: The March 20 meeting will be held in Patagonia at the Wild Horse Restaurant. The first hour will be Panel business and the second hour will be an Executive Session with Panel Members only. There will be no minutes of the Executive Session.

The meeting was adjourned at 2:04 p.m.

Presentation: Dr. Frank A. von Hippel
SCC February 21, 2024



Thanks for the invitation, and sorry I can't be there in person. I teach a seminar immediately after this, so today was not a day I could come in person. I'm a professor of Environmental Health Sciences at the College of Public Health, at the University of Arizona, and I'm an ecotoxicologist.

I also run the University of Arizona One Health Research initiative which is a state funded initiative to tackle problems where they can be addressed through looking at human health, animal health, and

environmental health simultaneously. So that's a bit about my background.



In addition to my role as a professor, I want to share two things with you today. One is a little bit of the work we've done down in Yuma County on toxic metals and metalloids, including manganese. This work has been supported by the Flinn Foundation with three different grants in partnership with hospitals in Yuma County, Campesinos Sin Fronteras, and also with Cocopoh Tribe down on the border.

YUMA REGIONAL MEDICAL CENTER
 Clinical Flu: Trudie F. Mihoc, Administrative Director, YRMC
 Amanda Aguirre, CEO and President of YRMC

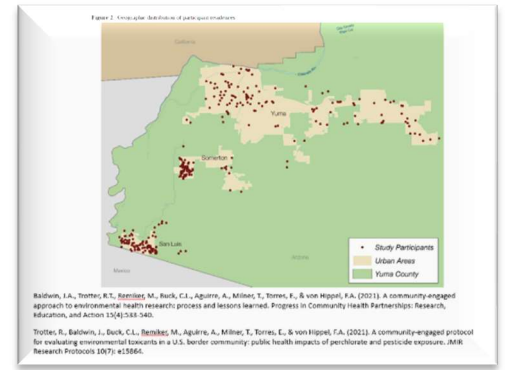
CAMPESINOS SIN FRONTERAS
 Emma Torres, Executive Director, CSF

FLINN FOUNDATION

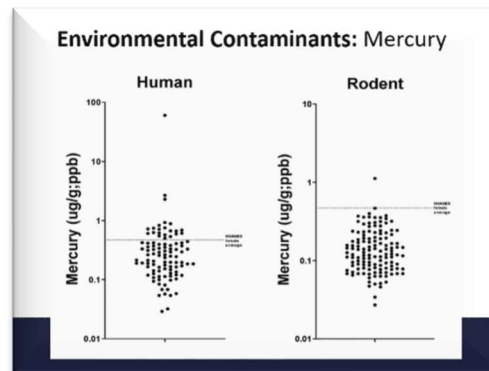
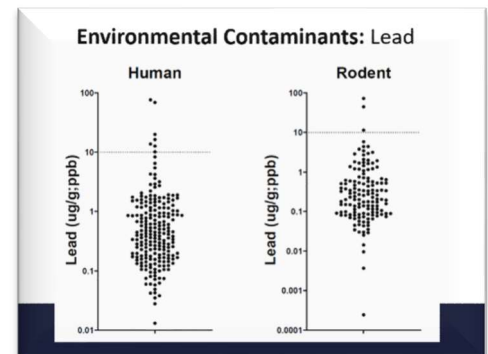
Dr. Frank A. von Hippel
 Co-PIs: C. Loren Burk, Julie Ann Salafsky, Jose Aguirre, Robert F. Trotter, Heather Zitting, Erin Baker
 Project Manager: Sarah Kesteven

"Environmental correlates of patient health outcomes in Yuma, Arizona"
 "Health disparities associated with fungicide exposure among residents of Yuma, Arizona"
 "Neurological effects of pollutant exposures in model rodents collected on Cocopah Tribal lands"

This shows the distribution of participants we've had in our study. We sampled 323 Yuma residents, and each resident provided a hair sample for the quantification of top toxic metals and metalloids, a urine sample for perchlorate, and a blood sample for hormones. And then we had health records. All I'm going to show you today from this study is a little bit of data comparing the levels of toxic metals in our animal model for the study, which is the cactus mouse, with levels in human hair, to show that animals can be a good model for human exposure.

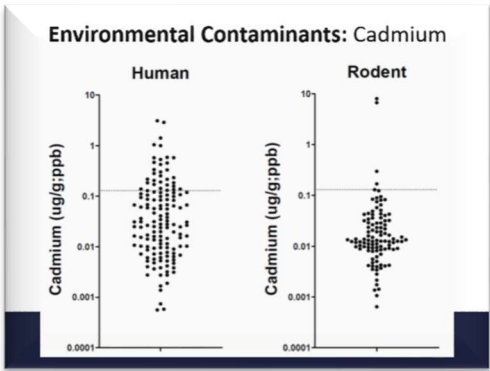


So here, for example, is our data for lead, comparing rodent samples with human samples for Yuma County; they have a quite similar distribution.

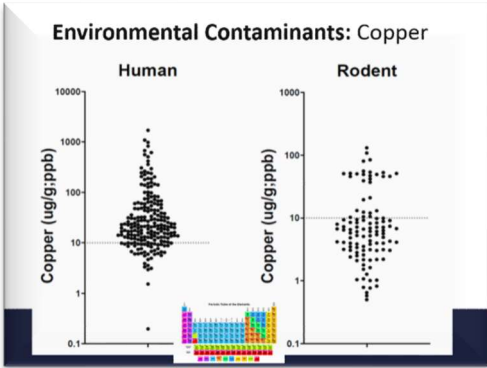


These are levels of mercury in hair between the rodents and people. Again, very similar distribution.

Here it is for cadmium. These are toxic in all circumstances. They have no biological function as opposed to metals like copper and manganese, which are essential metals we have to have. It leads to problems with building enzymes and other issues if you don't have

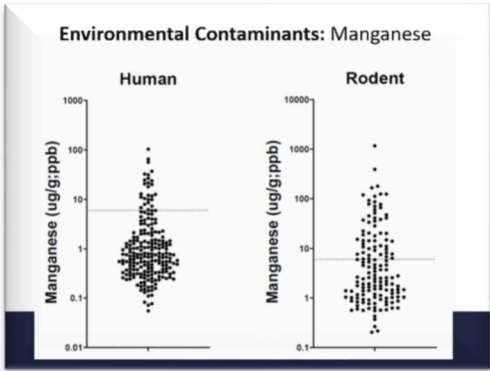


sufficient amounts of copper and manganese. But when the levels are too high, then they can become toxic. So you can think about elements such as copper and manganese as essential necessary elements. But too much becomes a problem.



These results show that copper levels in rodents and humans are quite similar in Yuma County.

And here are the data for manganese between the mice and humans in Yuma County. Again, very similar.



And here are the data for manganese between the mice and humans in Yuma County. Again, very similar.



But what I want to focus on for the rest of today is showing you an example of a manganese ecotoxicology study coming from Groote Island, off the north coast of Australia. This is an aboriginal land. The Anindilyakwa people live there. We work there at the invitation of the tribe, with funds from the tribe and from Australia's equivalent of the National Science Foundation.

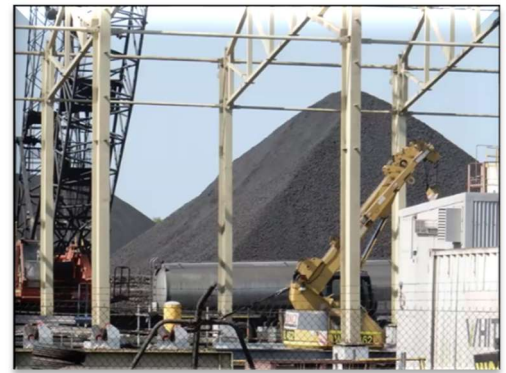


What is the problem there? This is one of the world's largest manganese mines. It's on the western side of Groote Island, and the community of Angurugu is right in the middle of the mine. When Australia did a national survey of the performance of elementary school children, they found that the kids in Angurugu were doing about the worst of any kids in the country. There was concern



that this might be due to high exposure to manganese, and our group worked on the wildlife side of this. Not the human side. But I'll show you some of the results of that.

Here's the Angurugu community. Like all complex projects such as this one, it's a project involving many different scientists. Robbie Wilson is the lead biologist for this project at the University of Queensland, he's a wildlife biologist, and he worked with our Ph.D. student Ami. And then I was supervising ecotoxicology along with one of my Ph.D. students Elise. We had John Postlewait from the University of Oregon doing gene expression work, and Loren Buck from Northern Arizona University on the endocrinology side. This shows the proximity of the open pit mining for manganese to the Angurugu group community.



The ore is stored at the port for export (right).

This is an aerial image of the port showing there's also a community of people living right next to this storage area at the port.

This mine started in the early 1960's.

[NOTE: Dr. von Hippel showed a brief video. The slides with the green band

are from the video and not his slide deck]

What you can see here is a manganese ore being transported from the open pit mining to the port back in the 1960s.

And throughout this process you have the liberation of fine particles of manganese dust, which is really what we are studying, because that's going to be the major exposure pathway for both wildlife and people.



Today they are running 49-meter-long trucks along this route. They're still uncovered trucks. So, there's still a lot of liberation of fine manganese particles from the mine site through the transportation corridor to the storage at the port.

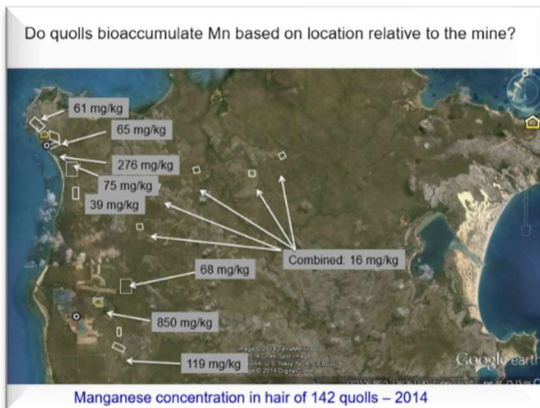
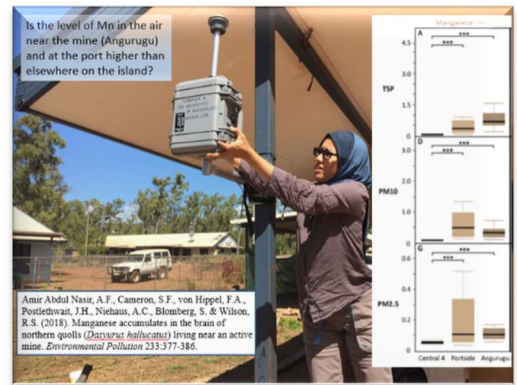
Again, the concern there is about children's cognitive development.

But there's also concern about wildlife. This is an area of high biodiversity and a lot of the species that have been extirpated from the mainland of Australia are still abundant on the islands, such as the northern quoll that you see here. The northern quoll is an endangered carnivorous marsupial and they've been wiped out for most of Australia because of the invasive cane toad. If they eat the cane toad, they get the bufotoxin that kills them. But there are no cane toads on Groot



Island and they're still abundant. We mostly worked with the northern quoll, both because they're an endangered species of wildlife that's important to biodiversity, and because they're exposed in a similar way as people are, and they live in the same communities around people.

This is our Ph.D. student Ami deploying an air sampling device at the one of the homes in the community there, and the first question we asked is, whether levels of manganese in the air near the mine and at the port are higher than they are elsewhere on the island. What you see on the right side of this figure are 3 different particle sizes, so 2 and a half micron particles on the bottom, 10 microns in the middle, and then 100 microns at the top, and in all 3 cases the concentrations at the port and at the village that's within the mine are substantially higher than they are away from the mine in the central side of the island. So yes, levels of manganese in the air near the mine and transportation are much higher than further away from the mine.

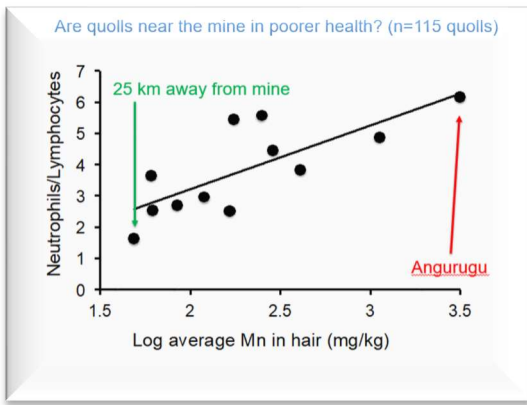


And then we asked, do quolls bioaccumulate manganese based on location relative to the mine? And the answer here again is, yes. If you look in Angurugu down here, where we collected quolls, they had 850 milligrams per kilogram manganese in their hair, as opposed to the central part of the island, well away from the mine, where it was about 16 milligrams per kilogram. Much higher levels. Over where the manganese ore is stored by the port it's elevated in the quolls. This is based on 142 quolls that we collected in 2014.

We also asked, what is the relationship between concentration of manganese and

health of the quolls? And we've looked at this in a variety of different ways.

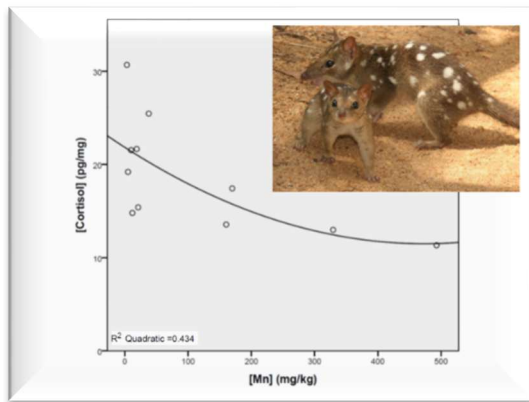
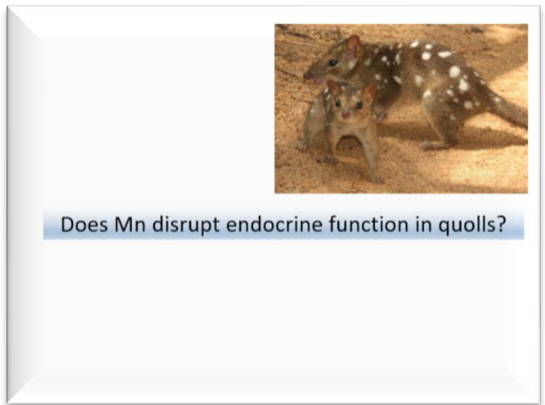




One preliminary way was looking at the average manganese concentration in the hair (which you can see on the X-axis is the log average) against the ratio of neutrophils to lymphocytes on the y-axis. And that's just a marker of inflammation. From these data it appeared that the quolls with more manganese in the hair have more inflammation.

We decided to follow this up with a more detailed study, and one of the things we looked at is whether manganese disrupts hormone function in

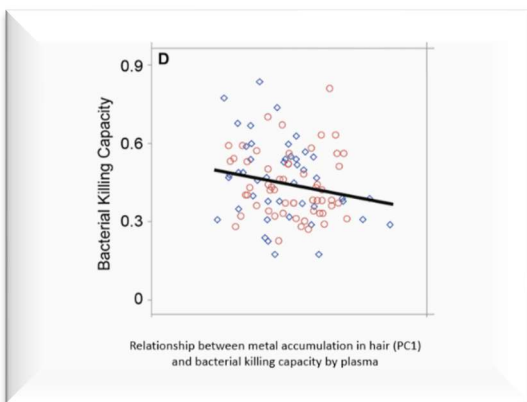
the quolls.



The early evidence suggested that it might. So here you have concentration of manganese on the X axis and concentration of cortisol on the Y axis, so the manganese is measured in the hair and the cortisol in a blood sample. This is all non-lethal sampling. With higher concentrations of manganese they appear to have lower concentration of cortisol. The stress hormone is actually a very common finding in ecotoxicology that animals that are

exposed to high levels of contaminants often are unable to mount a normal stress response. So, they end up having lower levels of cortisol in their blood.

But the story is actually more complicated than that. There appears to be some difference during the breeding season, but not outside of the breeding season, and these differences are therefore not a strong effect across the lifetime of the quoll.



Another assay that we did was looking at the relationship between metal accumulation in the hair and the ability of the blood to kill bacteria. This is an assay called bacterial killing capacity where you see how effective the blood from the animal is at killing bacteria in a petri dish. On the X axis we have an overall measure of concentration of toxic metals in the hair, not just manganese, but all of the metals, and on

the Y axis the ability to kill bacteria in the blood. The higher the concentration of toxic metals in the hair, the lower the ability of that animal's blood to kill bacteria. This is a significant effect. So there appears to be an impact on immune function in quolls.

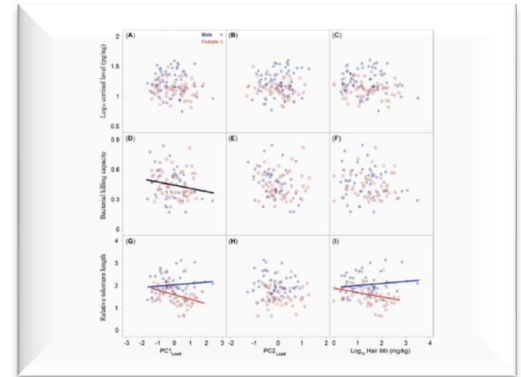
This is showing the seasonal differences. The main effect is that there is an impact on immune function.



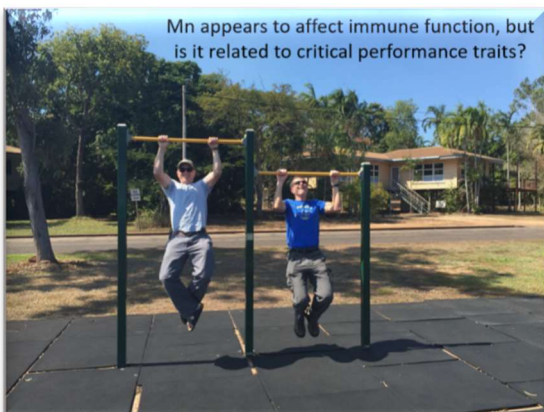


We also looked at something called relative telomere length (which is a measure of aging in the chromosomes) and related that to concentration of manganese and overall metals in the hair, and there the story is not clear at all, because there's differences between males and females in telomere length. I won't go over that today.

But to summarize these findings so far on the X axis. Here you can see on the right-hand side the concentration of manganese in the hair. On the left side you can see PC1, that's all of the metals together, the main axis of variation in total metals concentration that we



can discuss so far is that the total concentration of metals in the hair, if you look in panel d, the higher the metals, the lower the bacterial killing capacity, that there's an impact on immune function. But the other measures don't really seem to have an effect, so no effect on cortisol. When you combine all the seasons together and relative telomere length, we get different effects in males versus females, which makes it an unclear story. To summarize, we have an effect on immune function in the quolls, based on the total content of metals in the hair.



So mainly these effects appear to affect immune function, and we wanted to know if it's related to critical performance traits.

And for this we did a series of behavioral assets that our Ph.D. student Ami led. The first was looking at sprint speed. We put out traps in the evening, collect the animals at dawn, bring them into the field lab, and then we collect a hair sample to measure the metals and a blood sample for endocrinology and immunology, and a DNA sample. We tag all the animals and then put them through a series of behavioral tests. This first one is using a high-speed camera to measure the sprint speed of the quoll from one line to another.

The second test is their acceleration from a fixed point.

Performance Measurements

- 8 performance traits:
- 1. Sprint Speed

Ami Akshay, A.J. Cameron, S.J. Hatcher, A.C. Glenister, C.L. van Riper, F.A. & Wilton, S.S. (2020). Manganese contamination affects the motor performance of wild northern quolls (Diposops dorsalis). Environmental Pollution 241:59-62.

Performance Measurements

- 8 performance traits:
- 2. Acceleration

Ami Akshay, A.J. Cameron, S.J. Hatcher, A.C. Glenister, C.L. van Riper, F.A. & Wilton, S.S. (2020). Manganese contamination affects the motor performance of wild northern quolls (Diposops dorsalis). Environmental Pollution 241:59-62.

The third test is their bite force. They want to bite onto this instrument and not let go, and we can measure how strong their bite is.

The fourth one is their grasping strength. As you pull on them, and they're trying to hold onto the wire, when do they let go? We can measure that strength.

Performance Measurements

- 8 performance traits:
- 3. Bite Force

Ami Akshay, A.J. Cameron, S.J. Hatcher, A.C. Glenister, C.L. van Riper, F.A. & Wilton, S.S. (2020). Manganese contamination affects the motor performance of wild northern quolls (Diposops dorsalis). Environmental Pollution 241:59-62.

Performance Measurements

- 8 performance traits:
- 4. Grasp Strength

Ami Akshay, A.J. Cameron, S.J. Hatcher, A.C. Glenister, C.L. van Riper, F.A. & Wilton, S.S. (2020). Manganese contamination affects the motor performance of wild northern quolls (Diposops dorsalis). Environmental Pollution 241:59-62.

The next one [#5] is their jumping power. They jump running up a slippery vertical wall. Watch their ability to do that, which is really pretty remarkable.

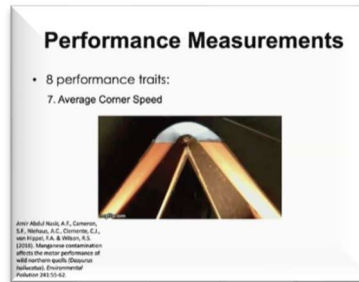
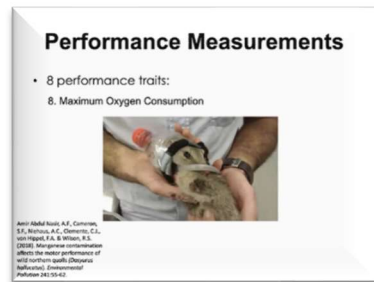
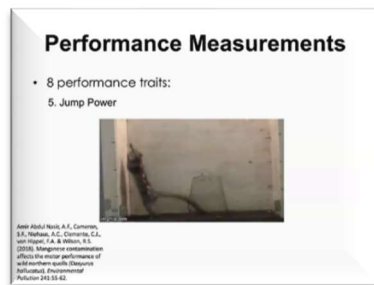
The next one [#6] is their ability to run up a slippery beam. The cameras will measure all of their errors, all of their feet slippage running up this beam.

This one [#7] is their speed rounding a corner and whether they make a mistake. If they make a mistake, they crash into the paper barrier at the corner. We're able to measure the speed of both successful and unsuccessful attempts.

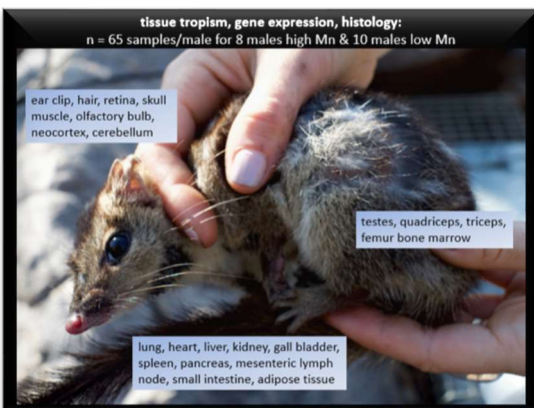
And then we related all of these measures to the concentration of manganese in their hair. The only one of these that was related to manganese was the one that we're seeing now. The animals that had higher manganese concentrations in their hair had to negotiate the corner at a slower speed, or they would wipe out into the paper, and this, of course would be related to their ability to capture prey and to evade predators.

We also looked at their oxygen consumption.

Then another question we asked is, how does manganese affect the expression of genes involved in locomotion, cognition, immune function? And so on. The way that we did this, because they're an endangered animal, you can't euthanize them for studies like this normally. But the northern quoll is the largest semelparous mammal in the world. Semelparous means like a



salmon where they grow up to breeding age, they put everything into breeding, and then they die. The male quoll is semelparous. He lives for a year. When he gets to be a year old, he puts absolutely everything into breeding, mates with as many females as possible, and then once the breeding season is over there's a 2- or 3-week period during which that male is still alive, but he's starting to fall apart and die. The females will



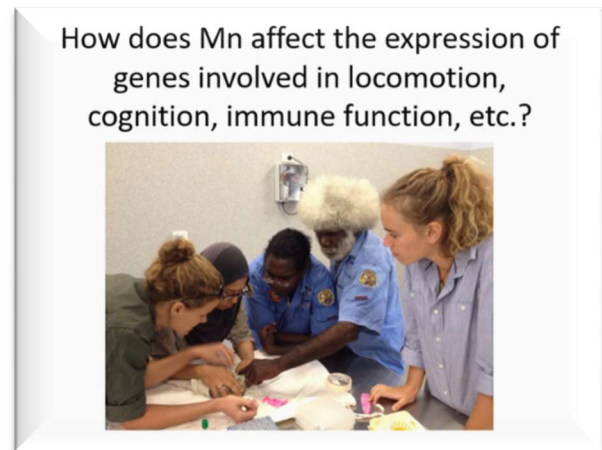
live for 2 or 3 years. We waited until every female was impregnated by inspecting their pockets and then we

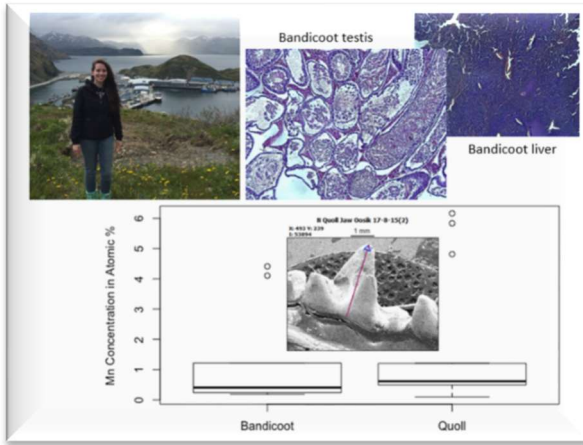
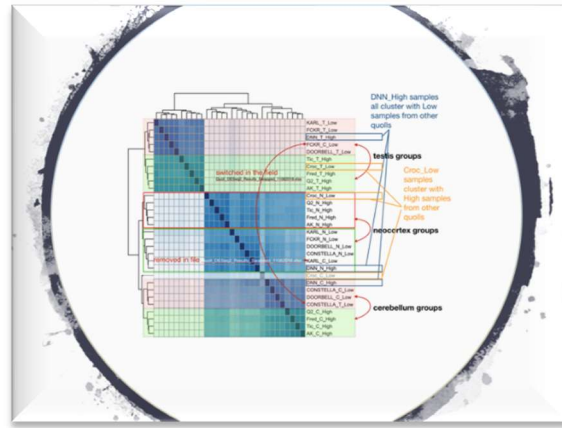
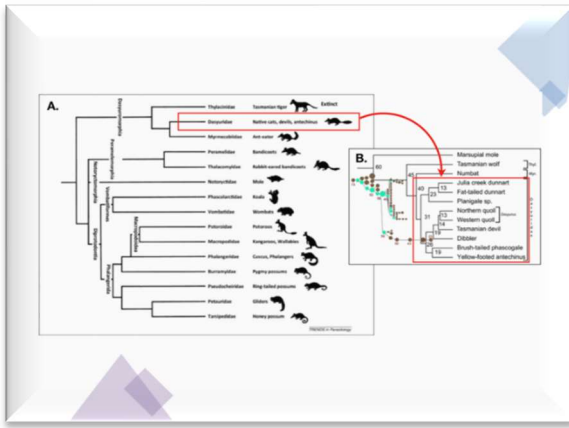
euthanized some males from next to the mine, and some males away from the mine, and these were males that were in that couple of week period before they die.

We had 8 males from next to the mine, and 10 males from away from the mine. Because of the value of these samples, we took them apart into 65 different samples per animal. Lots and lots of different assays were done from each animal to look at: where in the animal is the

manganese accumulating, how's gene expression affected, does it affect the development of any of the tissues, and so on.

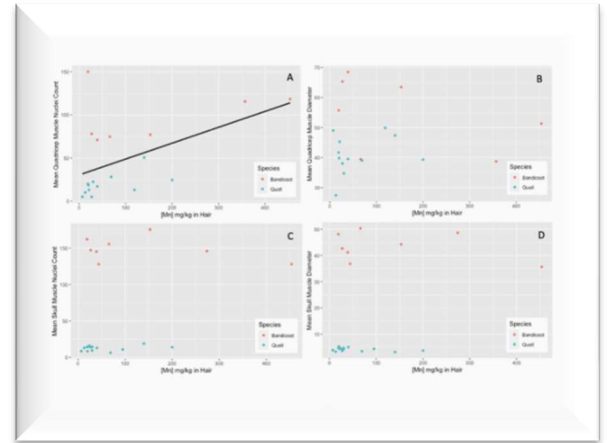
And the gene expression work is still underway and is kind of a mess right now. So, I don't have any gene expression results to show you. But we've been working on the histology of looking at the tissue development.





This is work I'm doing with my Ph.D. student, Elise, shown here in Alaska. We've done this work with both the Northern quoll and another marsupial, the northern brown bandicoot. We've done a series of things, including measuring the elemental composition of their teeth, using scanning electron microscopy, but also looking at their tissues using histology, as you can see in those images.

And the main finding from histology is that the concentration of manganese



in the hair is impacting or related to the quadricep muscle nuclei. Basically, there's a relationship between how much manganese there is and the structure of the of the cells in the quadricep muscles, which might be related to the effect that we found in their ability to corner a turn at speed.

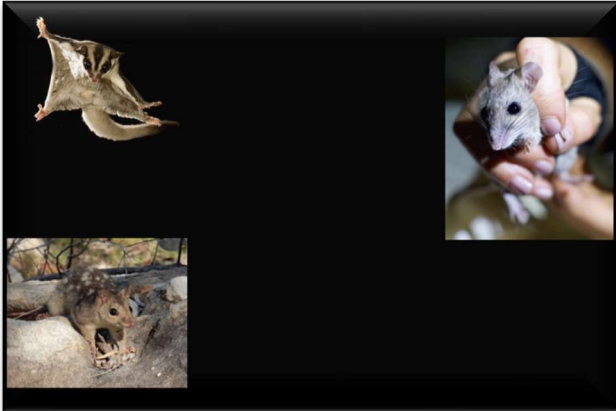


What's next for Groote island? There's a group working on whether children with higher manganese body burden have poor cognition and motor performance. Manganese and other metals in the group like lead and cadmium and mercury at high concentrations cause irreversible damage to the brain. And so, they can impact intelligence and impulsivity and those kinds of things. And they also impact motor performance, just like we saw with the quolls. They do that in people. The people who have the highest exposure to manganese are in occupational settings like welders, who are exposed to a lot of vapors from manganese, and they can develop a disease called manganism, which looks a lot like Parkinson's disease. There's a group now looking at the kids there to see whether there's a relationship between their manganese exposure and cognition and motor function. We're also asking how

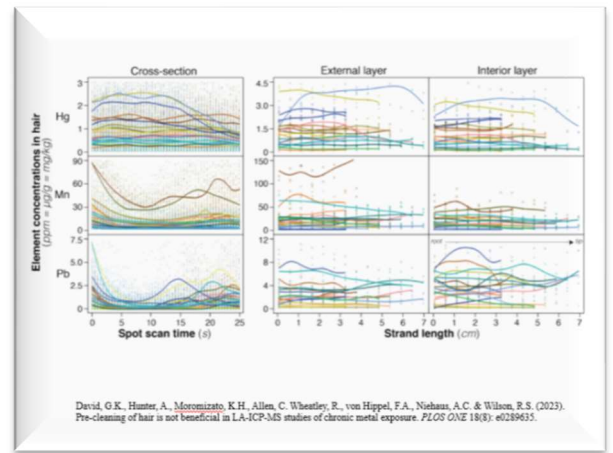
the trophic ecology of an animal or where it sits in that food web determines its bioaccumulation of manganese. I'll mention a couple of things briefly, and then we can use the rest of our time for any questions and discussion. We've done some studies now, looking at different techniques of measuring manganese in hair. This is using

a technique called laser ablation ICP-MS (inductively coupled plasma mass spectrometry) and looking at the manganese accumulation that's metabolically deposited inside the hair versus on the surface of the hair.

We've looked at the northern quoll as we've discussed. We wanted to look at some other species like the sugar glider and some native rodents, but the only 2 species we've examined so far are the northern quoll and the northern ground Bandicoot.



This is a bandicoot we're releasing from a trap. Right after doing the sampling (right).



I would love to turn it over for questions. I wanted to not take too long on the presentation slides so that I can address any questions or comments anybody has.

Marcelino: *I have a question. I'm trying to bring your presentation into perspective. What kind of impact would this have based on your research in Australia here to our area in Patagonia? And what kind of an impact magnesium could possibly have adversely to the students which are in a close proximity to where the mine is?*

Dr. von Hippel: Those are really good questions. One little thing is that people often confuse magnesium and manganese. Those are 2 different elements and here we're talking about manganese. Manganese exposure can happen

through a couple of different means, and the route of exposure is important to answer your question. We get exposed to manganese through our food and through our water. But because manganese is an essential metal that we have to have, our digestive system is actually quite good at pulling out the amount that we need, and so we don't tend to get too much excess manganese from water or food.

I'll put a caveat there because there is some effect. So, for example, there was a study done in Canada that compared the upper quintile or the upper 20% of drinking water concentrations, and I think it was in Quebec, to the bottom 20%, and then looked at the IQ of the children who are drinking water from those two different sources, and there was something like a four or five point IQ spread between these naturally occurring levels of manganese in the drinking water. There is some effect from drinking water, but the bigger effect that occurs around places like mines is through the dust, the fine particles of dust, and we get exposed to this dust, both through breathing it in (the 2.5 micron dust particles permeate the alveoli, the lungs, and therefore are in circulation throughout the body), but also, we breathe it through our nose, and it can pass up the olfactory nerve directly into the brain, and the brain accumulates manganese.

To answer your question on what effect it might have on kids or on wildlife, it depends mostly on the levels of the fine manganese dust that would result from the mine, and I don't know the answer to that. I don't know if dust control measures are being proposed. That's an empirical question about how much dust there would be. But that would be the critical question in my mind, and that's what we see on Groote Island, is that the effects on the wildlife are very much related to the levels of the fine dust that's near the mine. They don't have any controls on dust liberated during transportation in this area in Australia.

Marcelino: How do I prepare myself when all of these studies come up? How do I prepare myself to make sure that the people who are going to be impacted that I asked the right questions.

Dr. von Hippel: In my mind, the most important thing to be addressing would be the levels of manganese dust produced at this mine, both at the mine site and then, during whatever transportation and processing is occurring of the ore. How are they going to monitor the levels? There are good techniques to monitor them. And ideally, you would want some kind of independent monitoring, so that there's full transparency that you can rely on the data. I would want to have some ability to do something if the dust levels were getting high enough to cause a problem.

Marcelino: In your experience who selects the third party?

Dr. von Hippel: For examples like this where it's a mining site the mine might be required to do it. They may do a great job monitoring it, but they're not unbiased. By getting someone who's independent, then you have an unbiased measure. In the example of our project in Australia we got funding from the Australian Research Council, which is an Australian Federal source of funding to do the monitoring so that was independent because the Federal Government of Australia was paying for the monitoring. There's no influence of the mine on that monitoring. and how you know how it's done. You want all the data to be open and available to everyone. I teach a graduate toxicology class here and I do work with communities all over the world on pollution problems. There are two big risks you have to think about in these kinds of projects. One risk is that if you say there's no problem when there is, then people and wildlife are exposed to something that's toxic. Another problem is if you say there is a problem when there's not, then you're scaring people unnecessarily and probably spending money, resources, and time on something that's not necessary. So you want to avoid both saying there's a problem when there isn't, and saying that there's not a problem when there is. I think that's best done if there's some kind of independence between the testing and the people making the money from the site.

Marcelino: Is there an agency in the United States that you would suggest that we could look at here in the States to help us?

Dr. von Hippel: There are a lot of possibilities for the monitoring. I think it comes down to the community groups being able to get funding in order to do the monitoring, which comes down to being able to pay for and use the devices that scientists use to measure these things. And then to do the analyses. I would suggest as one possibility you could use the University of Arizona's core analytical chemistry laboratory for the measurements once the samples are collected. They could do the measurements at the core lab. It's the University of Arizona. So it's a state funded operation. That's a good possibility. There are others as well. But you still somehow have to find the resources to be able to buy the devices, deploy them, and pay for the sampling. It might be something we need to have a bigger discussion on at another time, or I might give you some advice, but there are a lot of different possible ways to do the monitoring.

Marcelino: Catherine, I think that the monitoring aspect of it and very important to add that transparency and the credibility to the magnesium coming out of that mine and it's impacts on the population, and that we need to bring back the professor to give us more advice on this. I just don't see at this point of us using mine money. I think that there'll be too much of a dark lens in interpreting that data. We need some help with that. How we can get an actual third party and have a professional to give another presentation of what we could look for as an actual, critical independent third party to monitor and establish them. Thank you.

Dr. von Hippel: I think there are community grants that you can get to pay for this. I know the University of Arizona, under Professor Paloma Beamer, recently received a large EPA grant to help communities with these kinds of issues. They have staff that are paid by the EPA, that can help you to figure out what kind of a monitoring program you should do and how to do it. And that's independent. It's funded by the Federal Government.

Ruth Ann: Did I hear you say that the trucks that are hauling the manganese on the island are still uncovered today?

Dr. von Hippel: That's right

Ruth Ann: I would say, whoever's paying you, I can't remember the name of the council that you said that was backing the study, why aren't they saying something to the mining company to cover the trucks. Obviously, there's proof that it affects animals and people.

Dr. von Hippel: In this case, the tribe that lives there is benefiting financially from the mine. They get a lot of royalties from the mine, and it's up to the community how they want to handle the information and what to do about it. It remains to be seen what the community there will decide, but they now know that there's impacts on wildlife. Another group is currently studying the impacts on children. And I think, based on that, they would perhaps change the way they're doing some of the practices. But it's not illegal what the mine is doing. It's under Australian law. They're allowed to transport the ore that way. You get into the question of if they have a permit and this is legal then how do you get them to do things in a more protective fashion?

Carolyn: If your research has established, whatever is the correct word, what would be an acceptable level of manganese in the dust and that's the ceiling. Anything beyond that is going to create all of the negative results.

Dr. von Hippel: There's a lot of research from all over the world on basically looking at the question you're asking. There's been work done in Mexico looking at impacts on children's development around manganese mines. There's, of course, our project in Australia. There's work that's been done in other parts of the world, and there are advisories for the amounts of manganese that that are acceptable. It's really important to remember that at low concentrations manganese is not toxic. It's an essential metal. It's not like lead or mercury where you have to be concerned about any level that you're seeing. It's not like that. But it's also important to remember that mines typically don't just have one metal. And so that's why we also measure other metals in projects like this. We looked at, I think, 22 different metals in our project in Australia, because a lot of these metals co-occur with each other. Where you find manganese, you're also going to find some of the other elements like lead, and so on. As you're thinking about a monitoring program for air you can also do human biomonitoring quite easily with these metals. They bind to protein in the hair, and so you can collect hair samples and measure the concentrations of these metals in the hair to understand what people are getting exposed to chronically. Which is nice because it's an easy, non-invasive method. As you're thinking about what you want to do, I'm happy to give you some advice, and I would really recommend working through this EPA funded center here at the University of Arizona to help you get funding to do what you want to do. But yes, there are guidelines out there for these things.

Carolyn: My understanding is that neither EPA nor the state has that number for manganese.

Dr. von Hippel: There's two things you're bringing up here that are really important. One is that the EPA has enforceable guidelines for some kinds of pollutants, and they don't for most kinds of pollutants. Just as an example, we do a lot of work on perchlorate, which is a contaminant of water and all across the United States, and there's no Federal limit for how much perchlorate can be in water. But 22 States in the US have state standards. Arizona doesn't, by the way. But sometimes there's state standards without a Federal standard. With something like perchlorate, we know that it's toxic at part per billion levels and yet there's no Federal standards. So just because something is toxic doesn't mean that there's going to be a standard for it. There's a lot of politics that goes into whether something gets into enforceable standards or just advisory levels or nothing. With manganese, the suggestions at this point are based on what's been found in research studies rather than any kind of enforceable standard. If that makes sense.

Carolyn: it makes sense. And thank you.

Fritz: If we're going to do a study on wildlife, do you have an idea what that wildlife might be in the area?

Dr. von Hippel: Usually with studies like this, the way that we do it is we choose an animal model, if it is for human health, that's exposed in the same way that people are exposed in the same place. The work that we've done in Yuma County suggests that peromyscus mice are actually a really good model for exposure to metals like manganese. The levels in mice hair are very similar to the levels in human hair, and they're getting exposed in the same ways in the same places. If there were a study focused on a particular sensitive species, then it would be about getting hair samples and other kinds of samples like we did with the northern quolls in Australia. For human health I'm happy to talk to you about this again further when we have more time.

Ben: What about the topography of the site, because the island has a certain topography that's significantly different than Patagonia Mountains, and of course, air, the dust distribution is affected by topography. Is that taken into account?

Dr. von Hippel: When we did our study on the island, we set up these air monitoring devices in different key locations, where people and wildlife could get exposed, and both near and far from the from the mining operations. A similar study where you are would need to do something similar where you would think about, what are the key

areas of concern like it might be where children go to school, or where people are living and then you're doing the air quality testing for the manganese. The way that those work is air is forced through the filters at a known rate, and then we digest the filter in the lab to measure the concentration of the metals in the air. They're simpler devices. It will tell you the total concentration of dust of a particular size. And those can be done without any laboratory analysis. But to understand the concentrations of particular elements like manganese the filters have to be taken to the lab, digested, and analyzed.

Ben: How about vegetation differences, because obviously just ground cover as opposed to tree canopies would make a difference in distribution by wind and air of that test.

Dr. von Hippel: You guys are asking really great questions. The manganese is going to be in the water, which means it's going to be in the plants because the plants are taking water up through their roots. All of these kinds of things you're suggesting you'll find differences depending on location relative to the mine and the flow of water and the dynamics of air movement.

Ben: We also have preferential pathways for storms in this area and obviously, somewhat influenced by topography. Is that a factor?

Dr. von Hippel: Any kind of wind prevailing pattern is going to be a factor in where that manganese dust ends up.

Ben: Is climate change going to make any difference for distribution?

Dr. von Hippel: With climate change is more variability in precipitation and in storms. You end up with sometimes more severe storms, but also just greater variation from year to year and precipitation. That could cause impacts. It's hard to say with something like manganese what those would be. We are studying the effects of climate change in the Arctic, on mobilization of persistent organic pollutants from glaciers and tundra and things like that where they've been sequestered. But that's not the situation we have in Arizona. I'm not really sure with something like manganese, but in the sense that if it's impacting windblown dust, then that would be one way that it could impact it.

Fritz: Can we record this and pass it along?

Dr. von Hippel: Yes, you can share this however you want. It's fine with me, and I'm happy to, if there's another time when I'm not teaching right afterwards, I could come down and talk in person. That might be more effective. But I would certainly recommend as a next step you talk to this EPA funded Environmental Justice Center here that Paloma Beamer runs.

Ecotoxicology of Manganese



Frank von Hippel

Professor, Mel & Enid Zuckerman College of Public Health

University of Arizona = frankvonhippel@arizona.edu

 THE UNIVERSITY OF ARIZONA
Mel & Enid Zuckerman
College of Public Health

 College of Medicine
Phoenix

 College of Medicine
Tucson

 R. Ken Coit
College of Pharmacy

 College of Nursing

 THE UNIVERSITY OF ARIZONA
Eller College
of Management

 THE UNIVERSITY OF ARIZONA
College of Social
& Behavioral Sciences


 College of Humanities

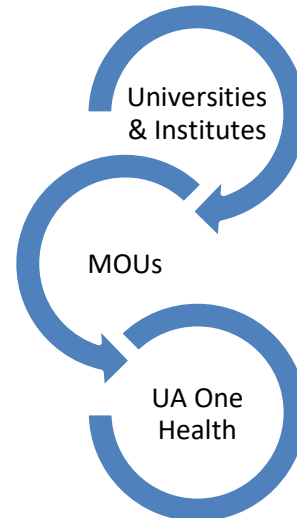
 College of Agriculture
& Life Sciences

 College of
Veterinary Medicine

 Arizona Institute for
Resilient Environments
& Societies

 College of Science

 THE UNIVERSITY
OF ARIZONA
James E. Rogers College of Law





YUMA REGIONAL MEDICAL CENTER

Clinical PIs: Trudie F. Milner, Administrative Director, YRMC

Amanda Aguirre, CEO and President of RCBH



CAMPESINOS SIN FRONTERAS

Emma Torres, Executive Director, CSF

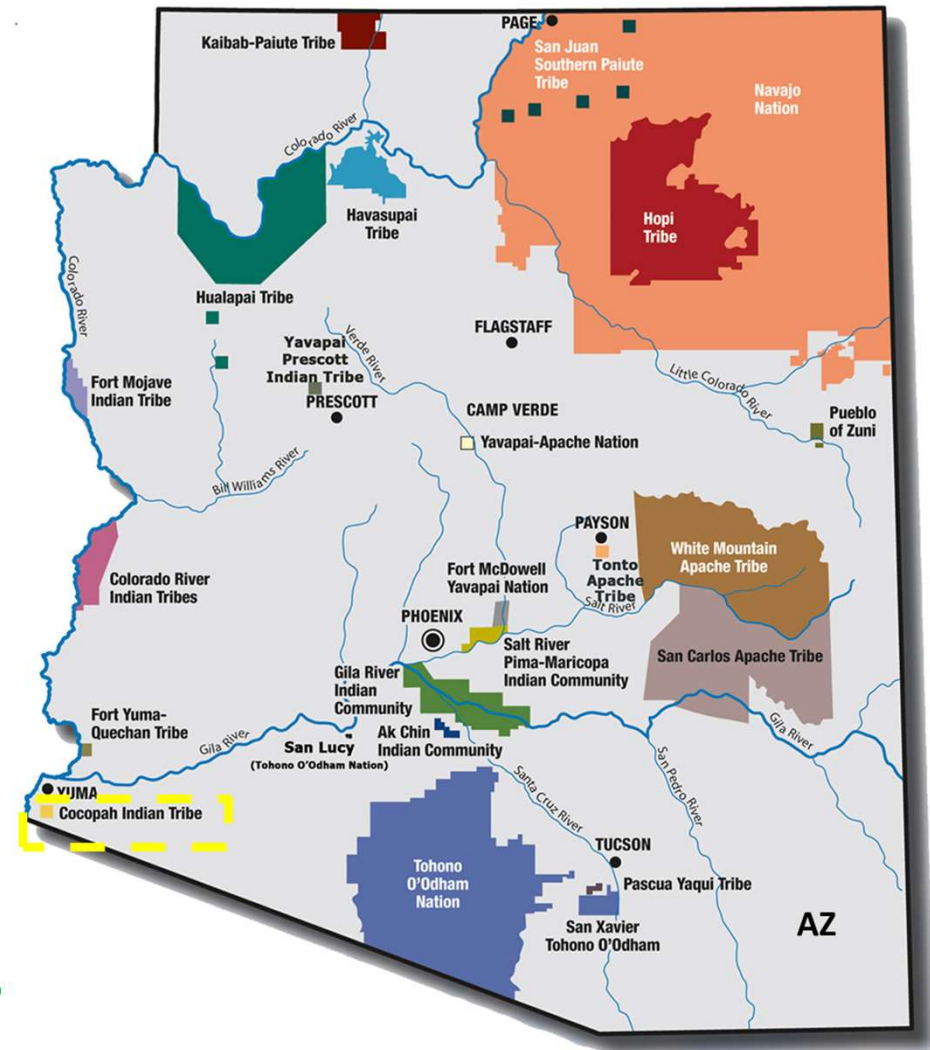


FLINN FOUNDATION

PI: Frank A. von Hippel

Co-PIs: C. Loren Buck, Julie Ann Baldwin,
Jani Ingram, Robert T. Trotter,
Heather Patisaul, Erin Baker

Project Manager: Mark Remiker

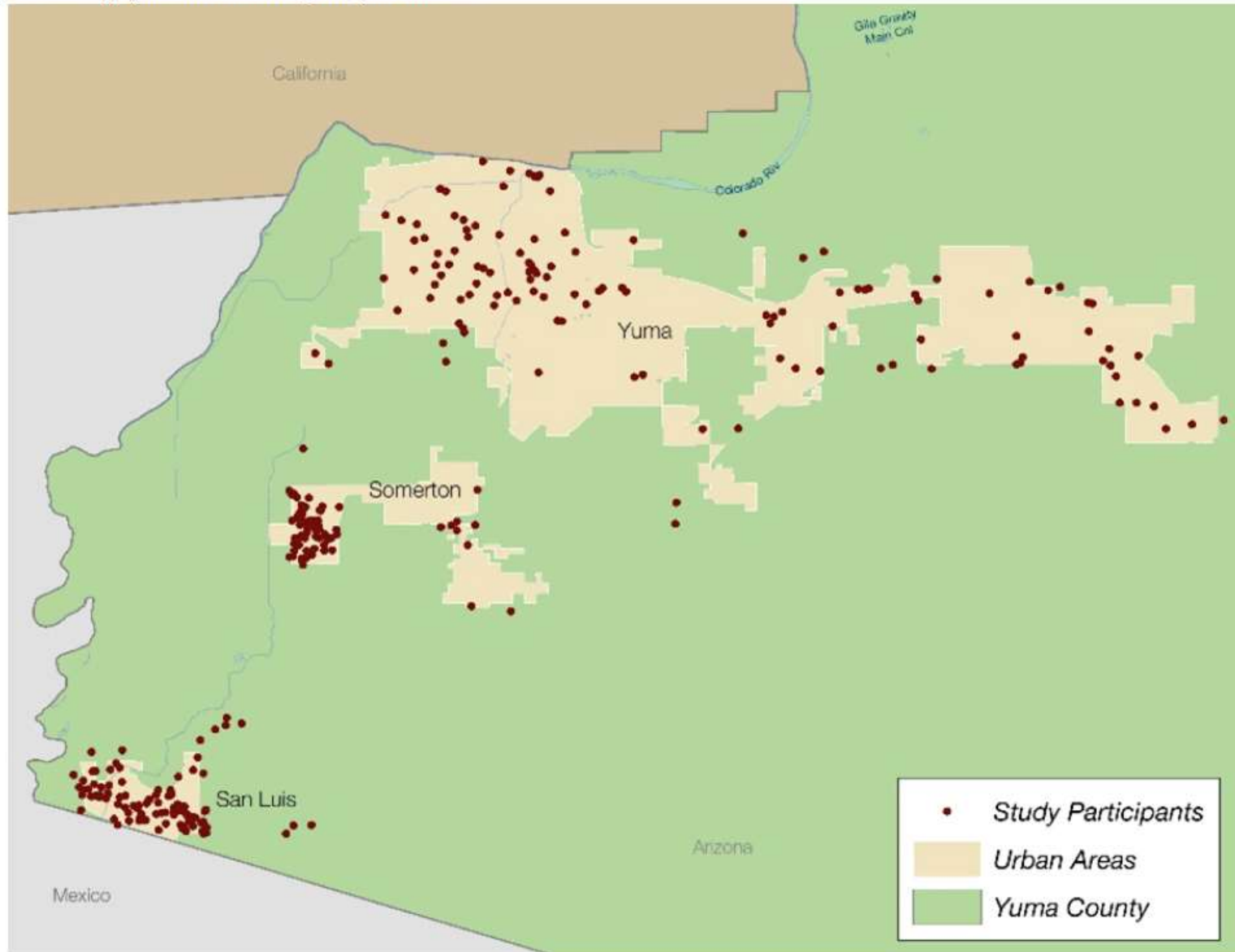


“Environmental correlates of patient health outcomes in Yuma, Arizona”

“Health disparities associated with fungicide exposure among residents of Yuma, Arizona”

“Neurological effects of pollutant exposures in model rodents collected on Cocopah Tribal lands”

Figure 2. Geographic distribution of participant residences.



Baldwin, J.A., Trotter, R.T., Remiker, M., Buck, C.L., Aguirre, A., Milner, T., Torres, E., & von Hippel, F.A. (2021). A community-engaged approach to environmental health research: process and lessons learned. *Progress in Community Health Partnerships: Research, Education, and Action* 15(4):533-540.

Trotter, R., Baldwin, J., Buck, C.L., Remiker, M., Aguirre, A., Milner, T., Torres, E., & von Hippel, F.A. (2021). A community-engaged protocol for evaluating environmental toxicants in a U.S. border community: public health impacts of perchlorate and pesticide exposure. *JMIR Research Protocols* 10(7): e15864.



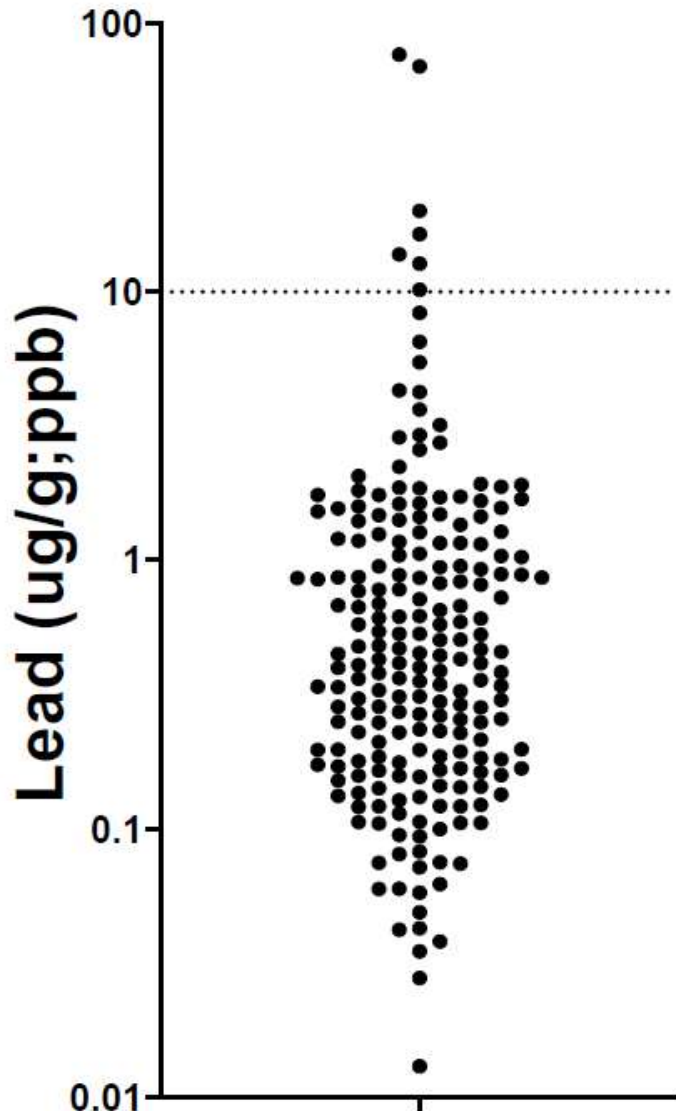
Peromyscus eremicus



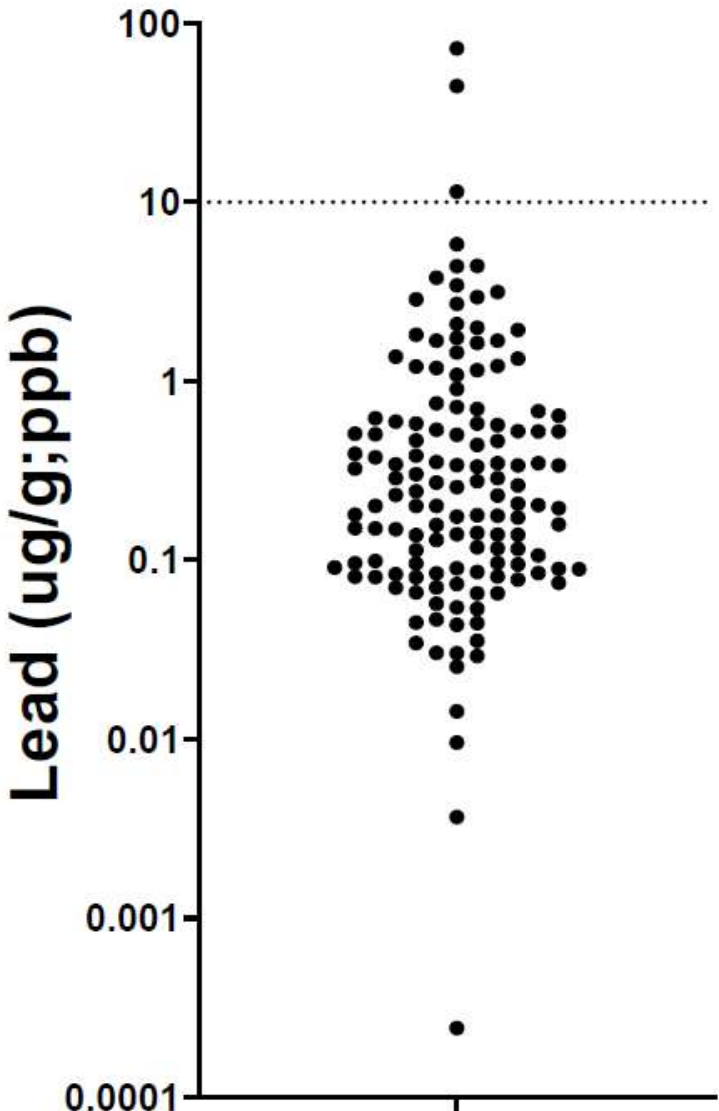
By North_America_second_level_political_division_2.svg: Alex Covarrubiasderivative work: Totodu74 (talk) - North_America_second_level_political_division_2.svg, CC BY-SA 2.5, <https://commons.wikimedia.org/w/index.php?curid=9286150>

Environmental Contaminants: Lead

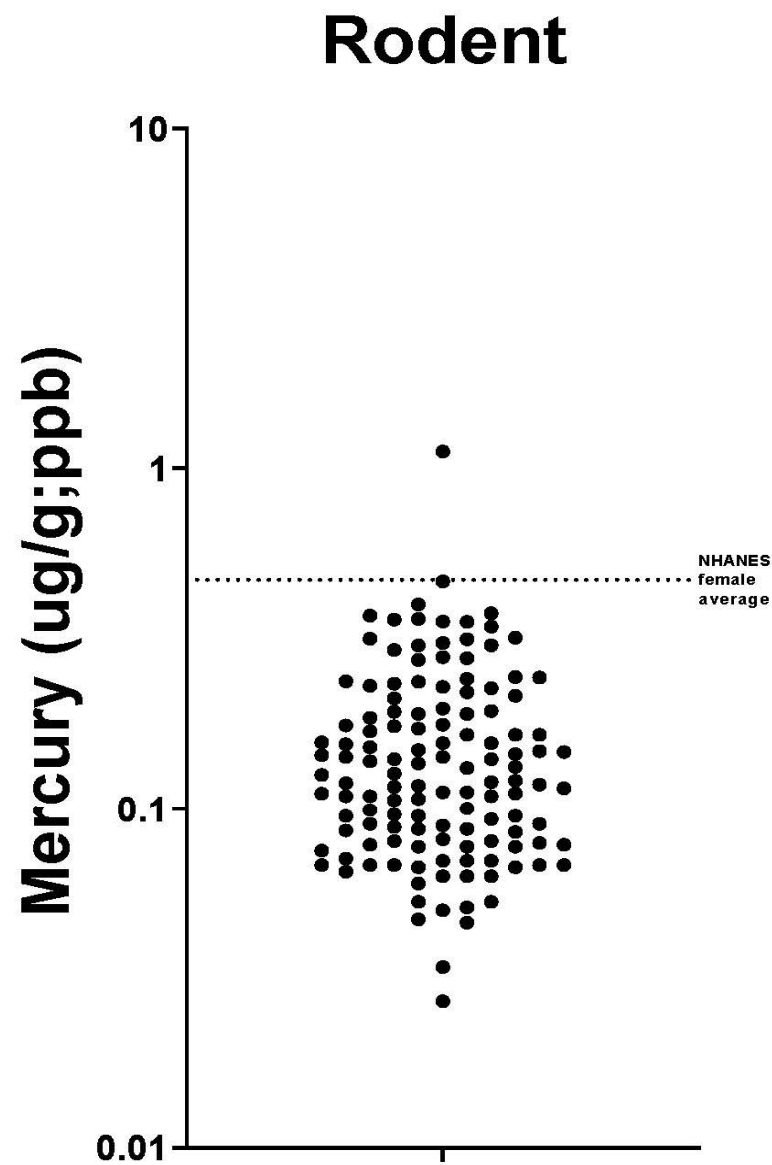
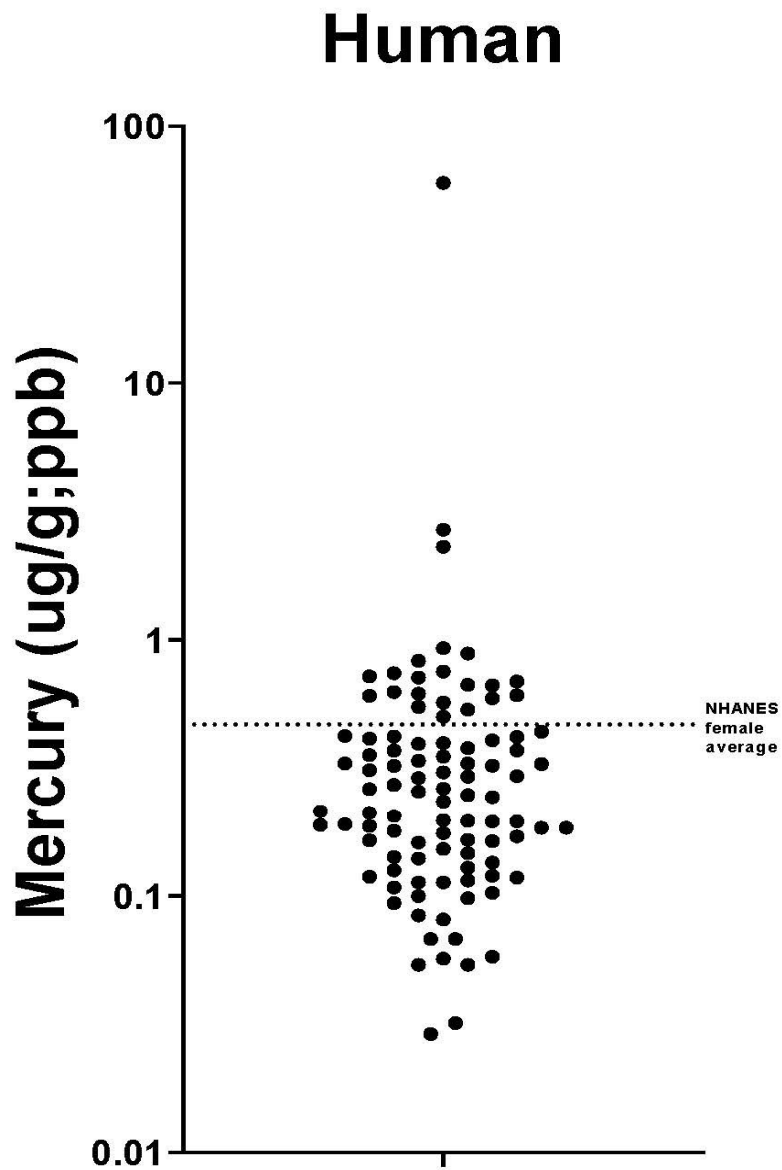
Human



Rodent

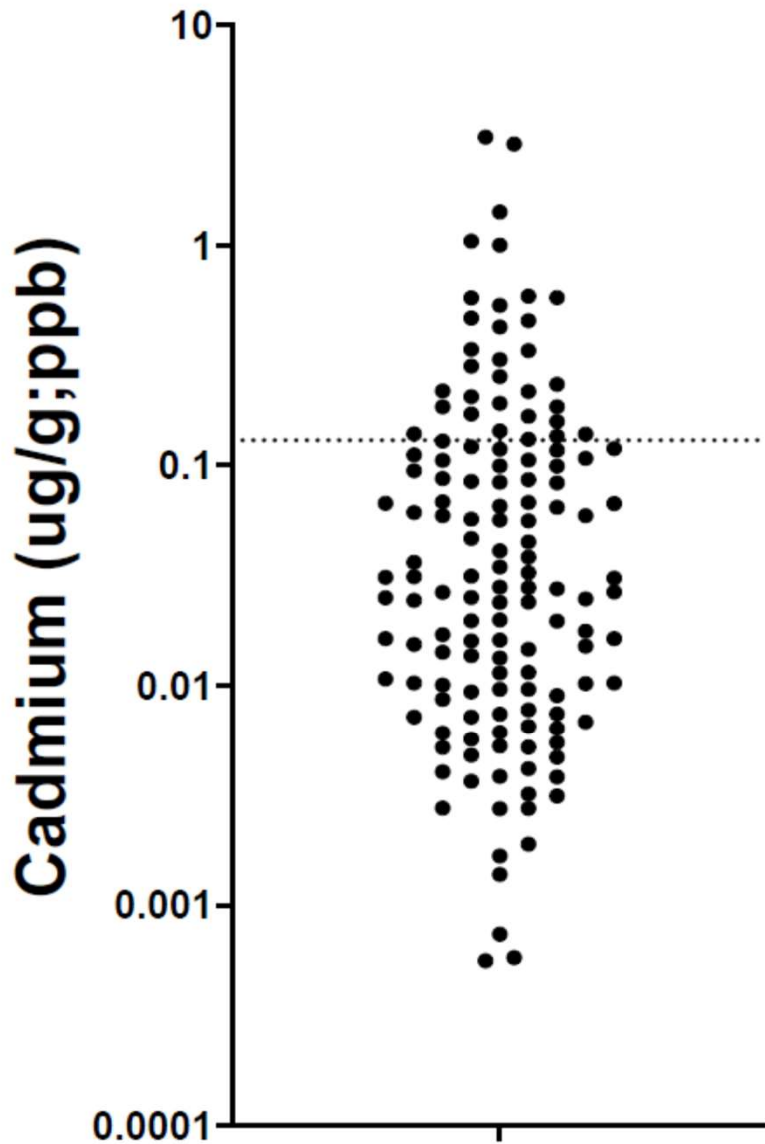


Environmental Contaminants: Mercury

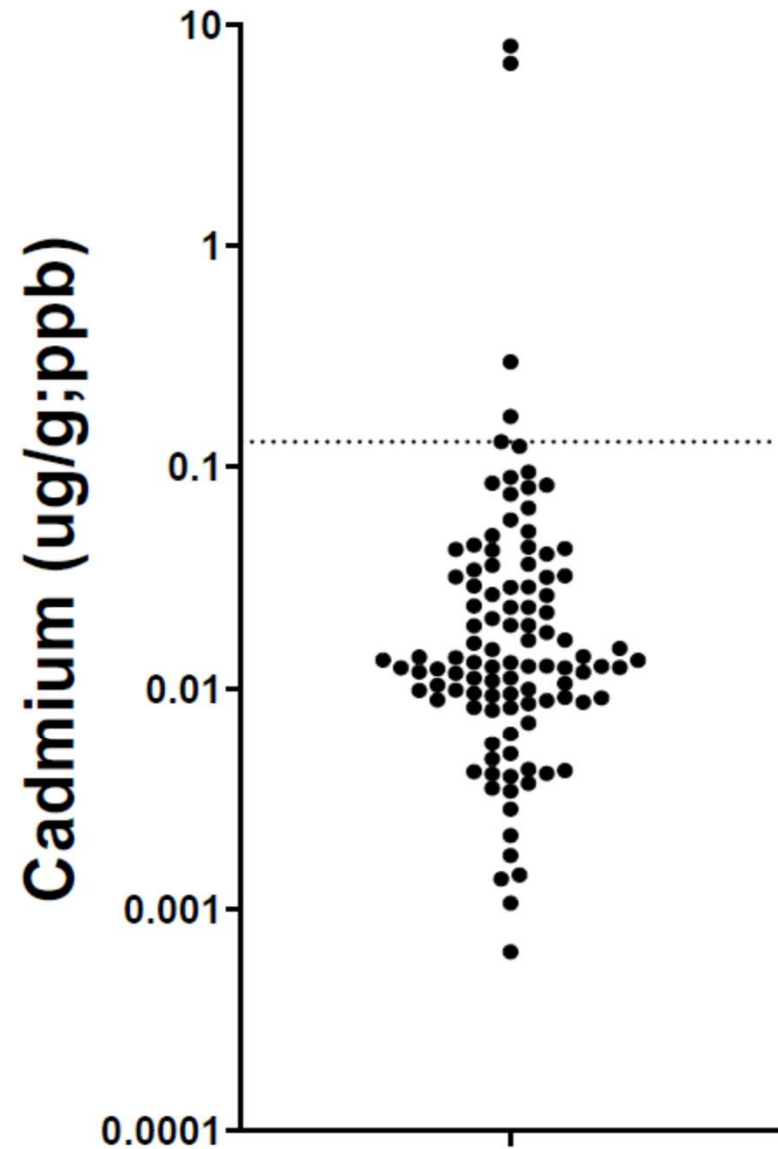


Environmental Contaminants: Cadmium

Human

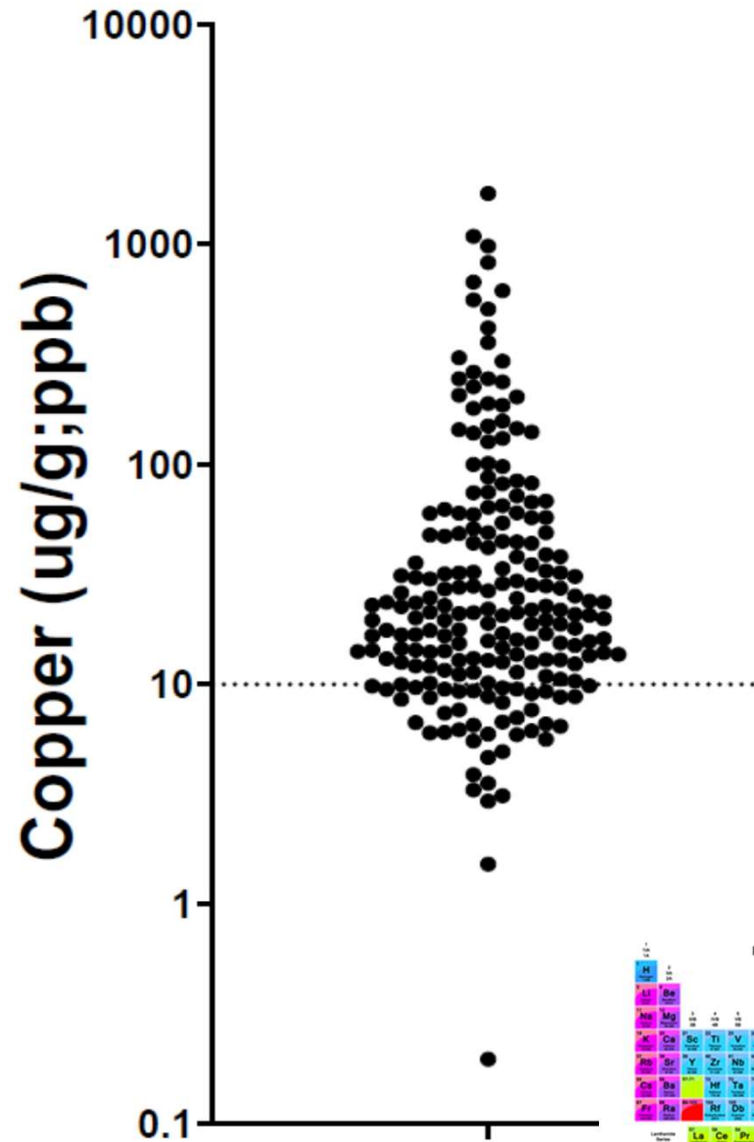


Rodent

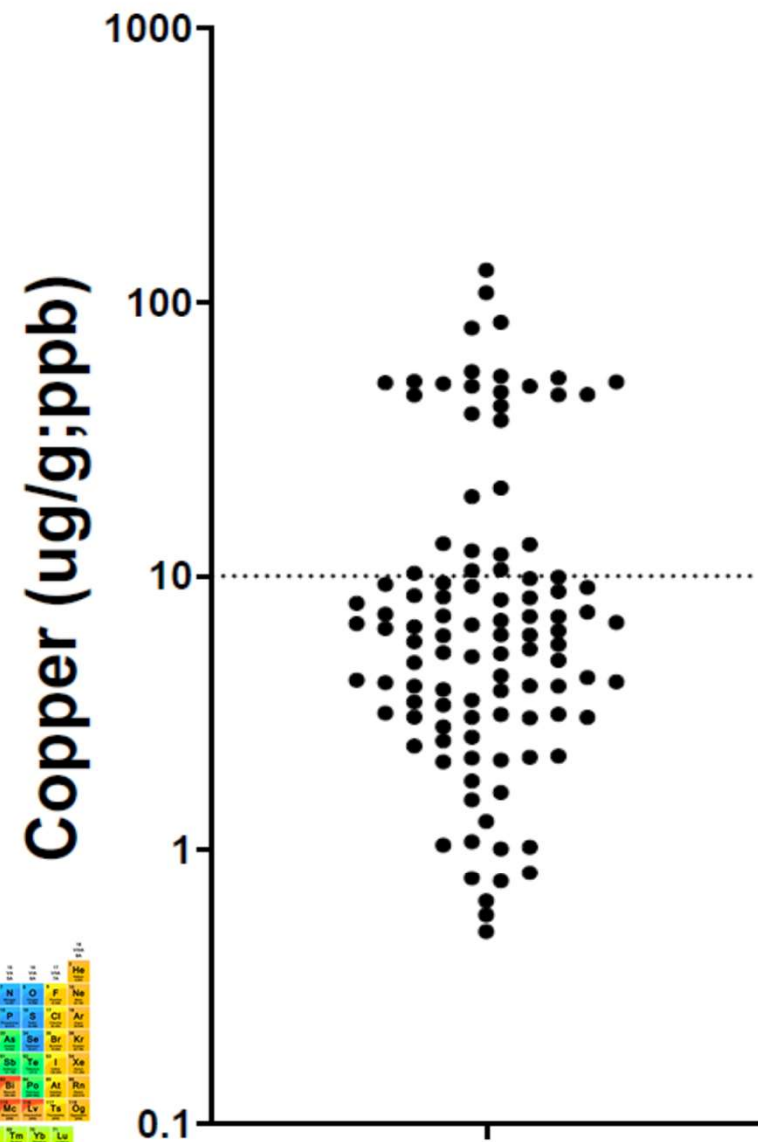


Environmental Contaminants: Copper

Human



Rodent

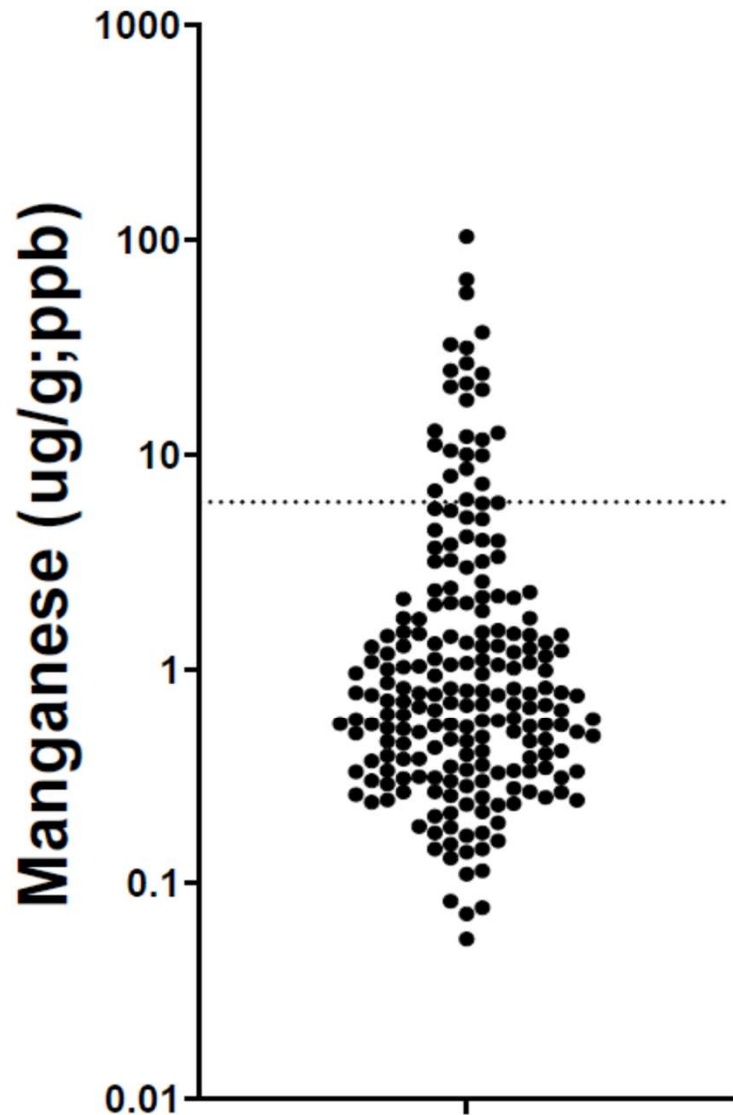


Periodic Table of the Elements

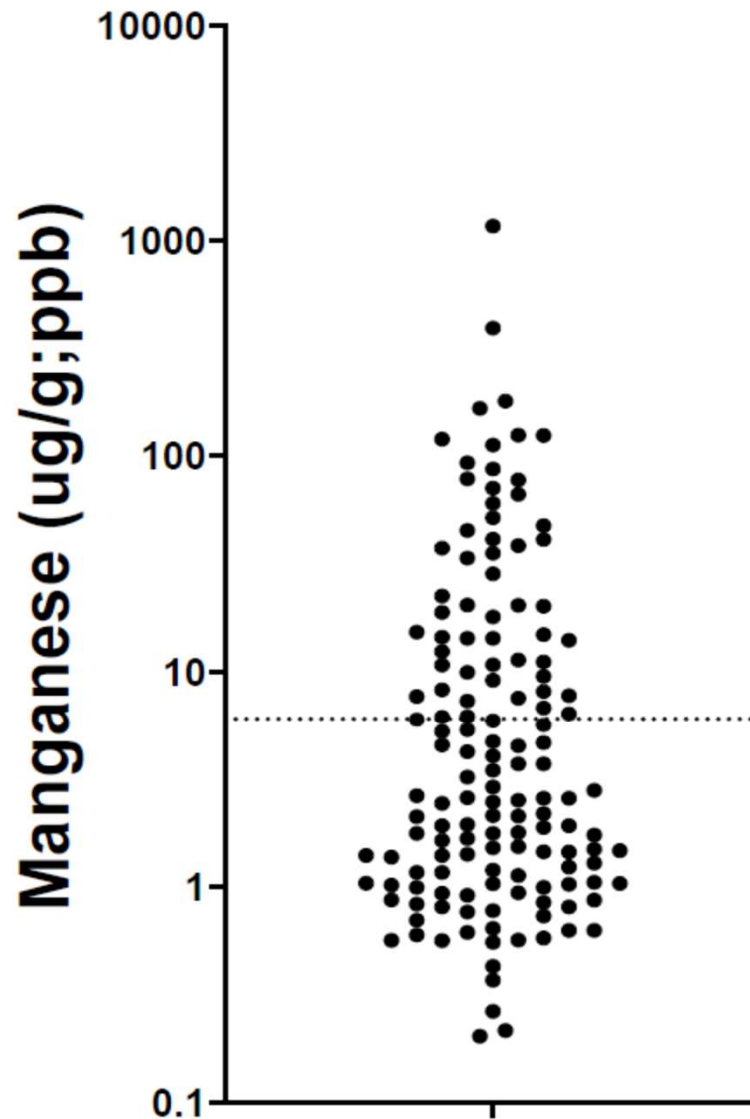
A small, colorful periodic table of elements is located at the bottom center of the slide. It shows the standard layout of elements, with colors used to group them into categories like alkali metals, transition metals, and noble gases.

Environmental Contaminants: Manganese

Human



Rodent





What is the problem?

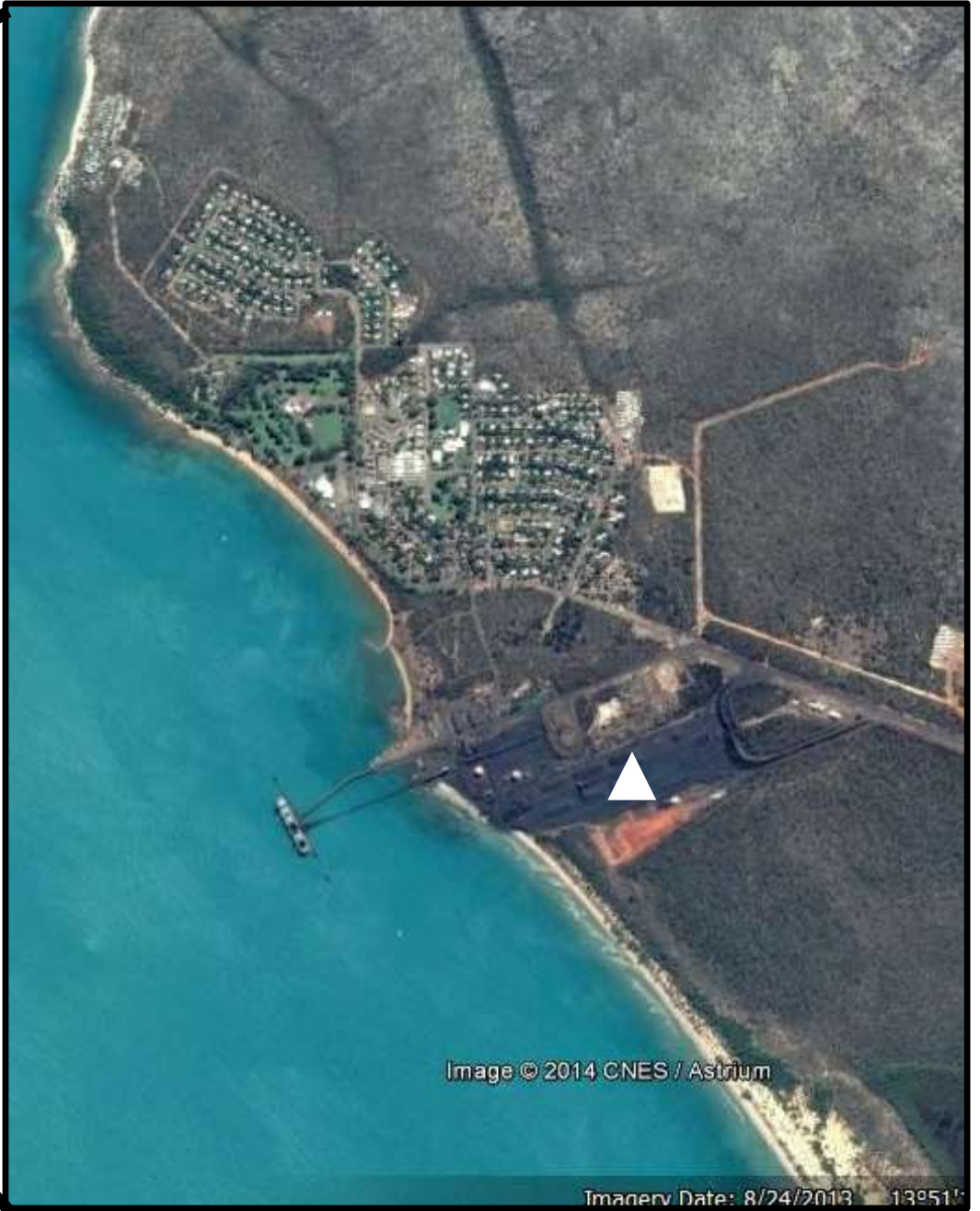


Angurugu



performance biology: Robbie Wilson & Ph.D. student Ami Fadhilah Amir Abdul Nasir
ecotoxicology: Frank von Hippel & Ph.D. student Elise Contreras
gene expression: John Postlethwait
endocrinology: Loren Buck





Alyangula



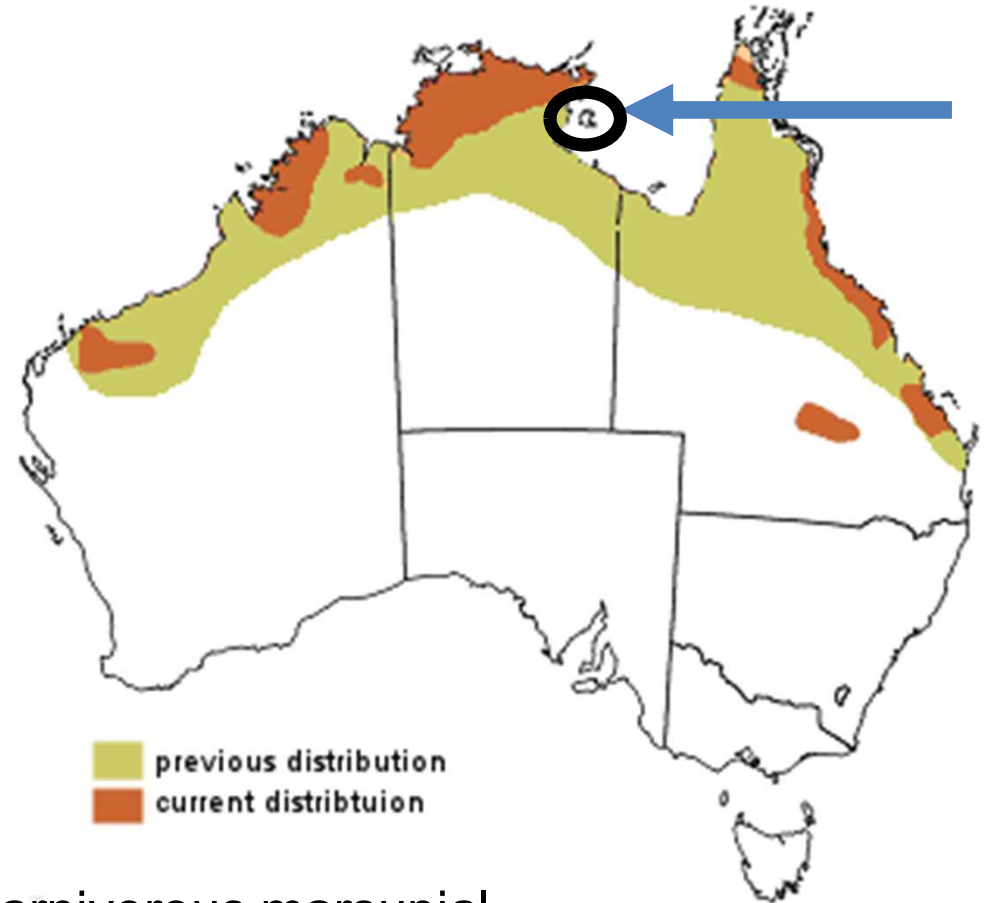
CAUTION
LONG WIDE HAULAGE TRUCKS
USING ROAD 24 HRS A DAY

49 METRES LONG

A black silhouette of a long haulage truck is shown on a yellow background. The truck consists of a tractor unit on the left and four long, rectangular trailers in a line. Each trailer has a series of small circles representing wheels underneath it. The entire truck is oriented horizontally, facing left.



northern quoll (*Dasyurus hallucatus*)



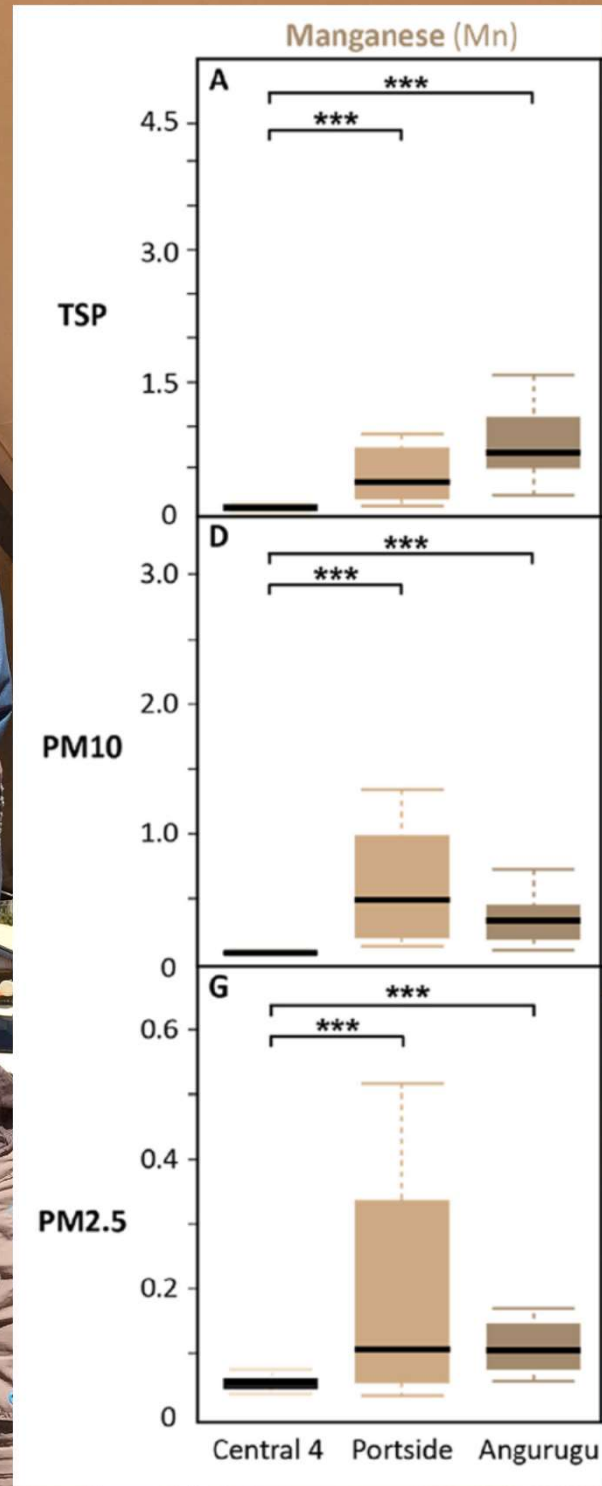
carnivorous marsupial
diverse habitats, partially arboreal
0.3 – 1.2 kg
endangered

Funding from the Anindilyakwa Land Council
& the Australian Research Council

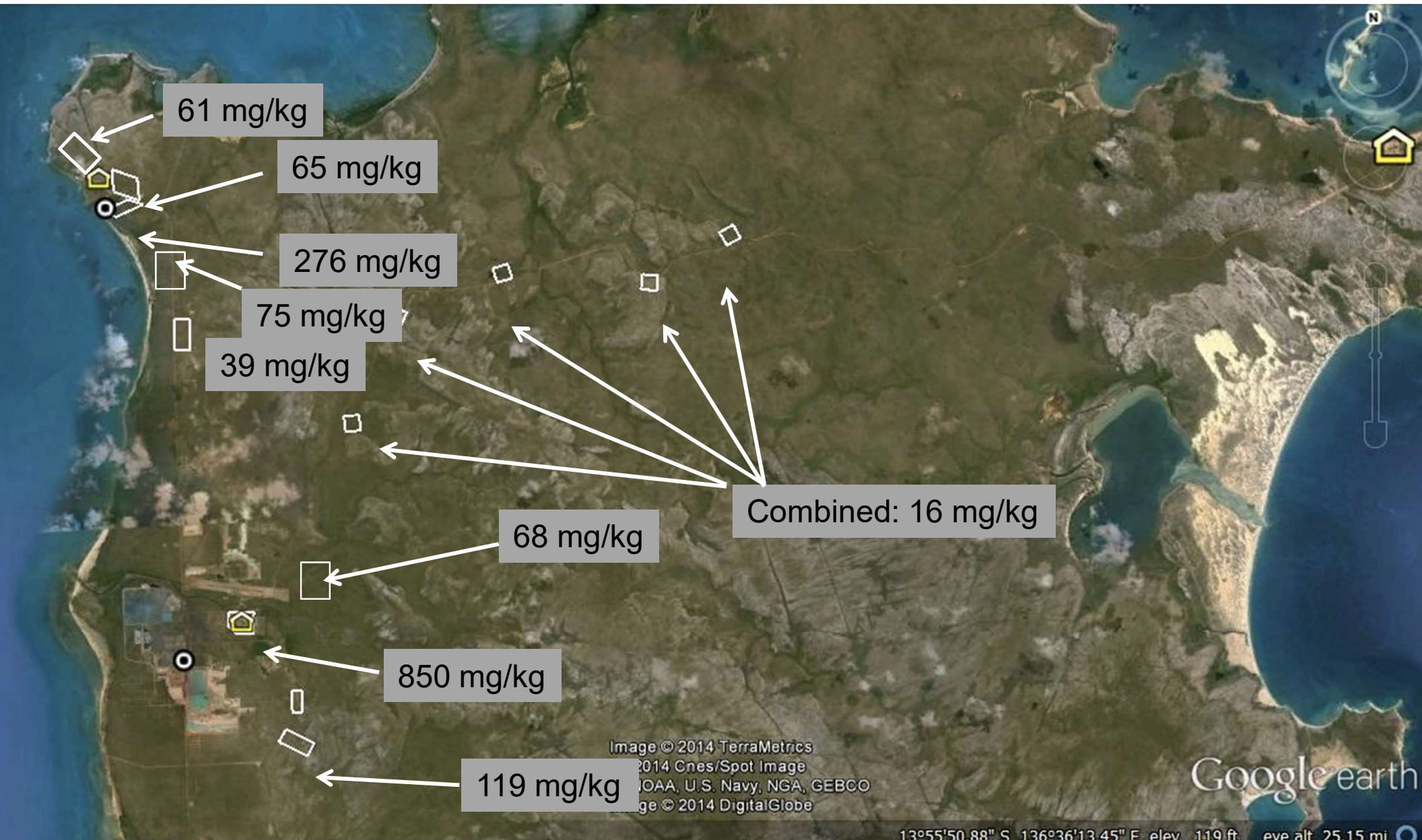
Is the level of Mn in the air near the mine (Angurugu) and at the port higher than elsewhere on the island?



Amir Abdul Nasir, A.F., Cameron, S.F., von Hippel, F.A., Postlethwait, J.H., Niehaus, A.C., Blomberg, S. & Wilson, R.S. (2018). Manganese accumulates in the brain of northern quolls (*Dasyurus hallucatus*) living near an active mine. *Environmental Pollution* 233:377-386.



Do quolls bioaccumulate Mn based on location relative to the mine?



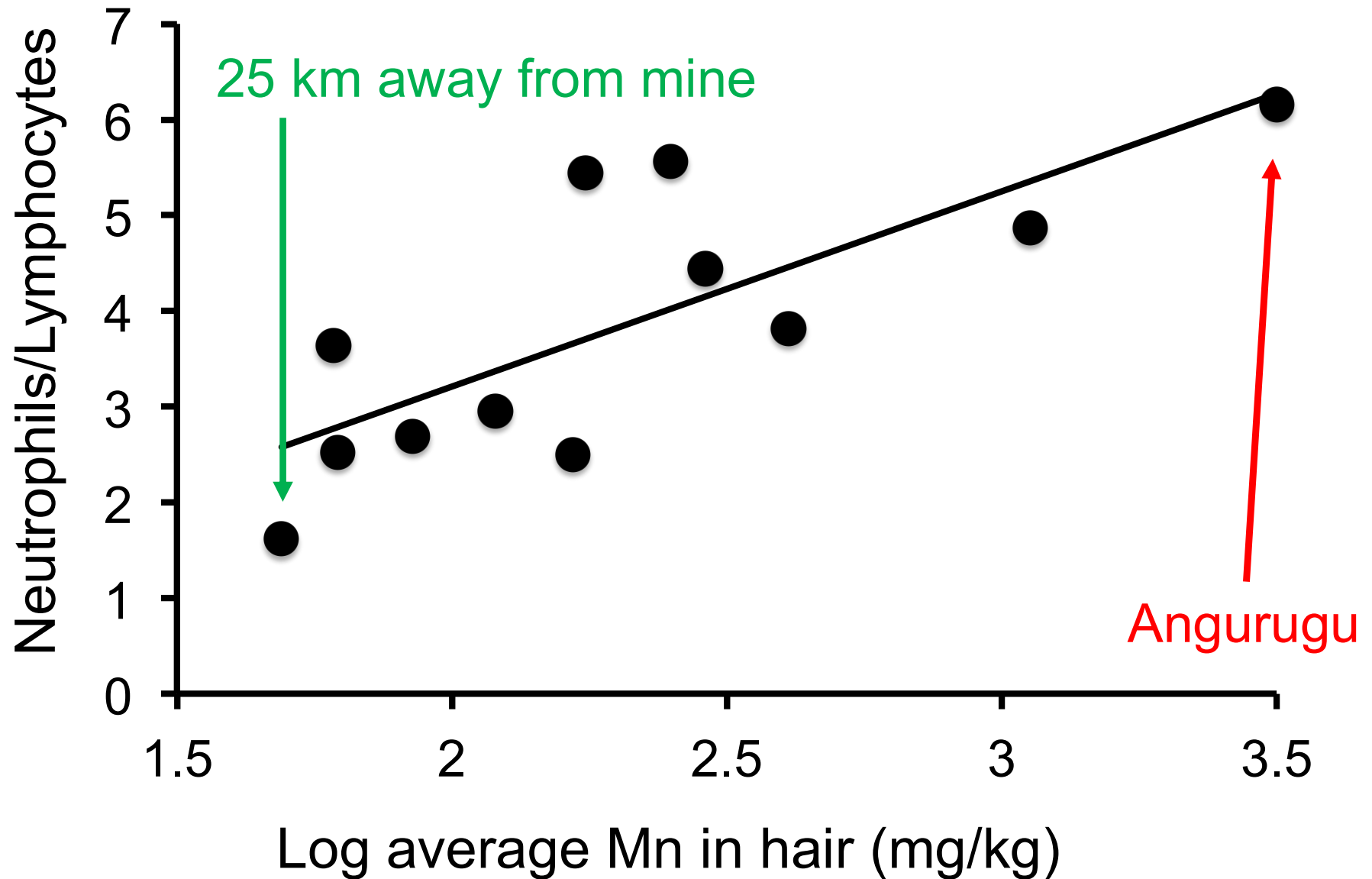
Manganese concentration in hair of 142 quolls – 2014

Amir Abdul Nasir, A.F., Niehaus, A.C., Cameron, S.F., Ujvari, B., Madsen, T., von Hippel, F.A., Gao, S., Dillon, D.M., Buck, C.L., Charters, J., Heiniger, J., Blomberg, S. & Wilson, R.S. (2024). Manganese exacerbates seasonal health declines in a suicidally-breeding mammal. *Environmental Toxicology and Chemistry* 43(1):74-86.



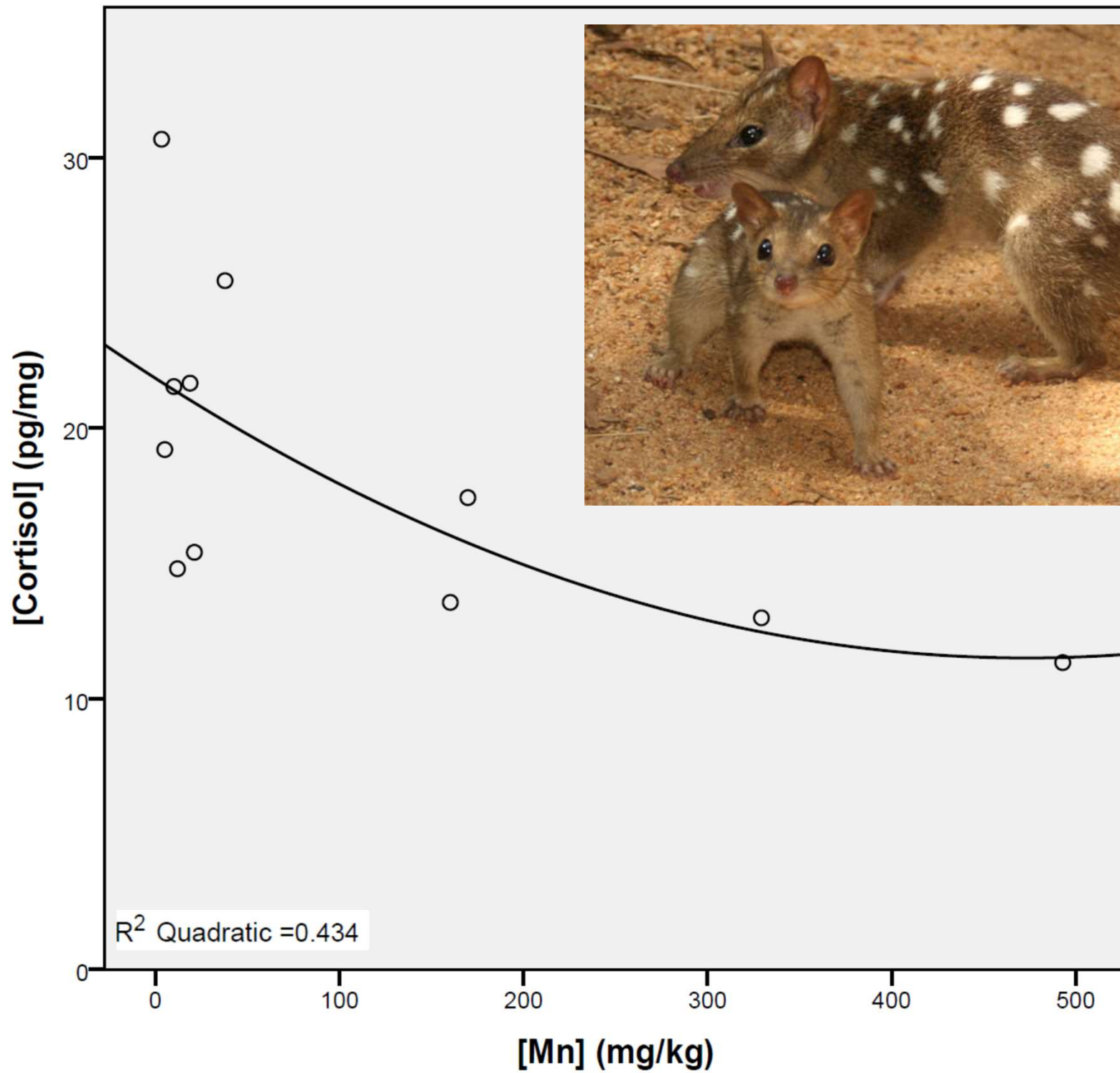
What is the relationship between [Mn] and the health of the quolls?

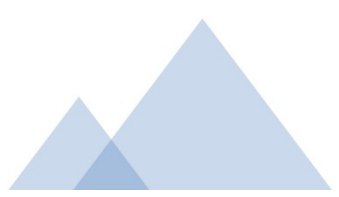
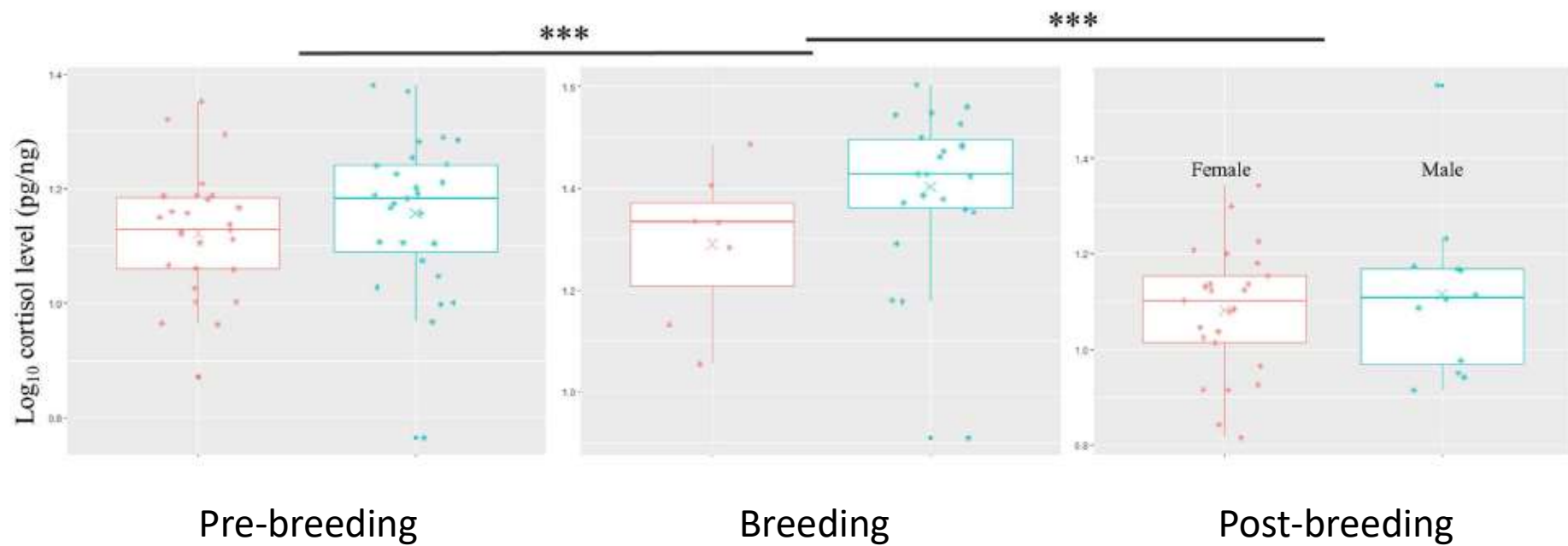
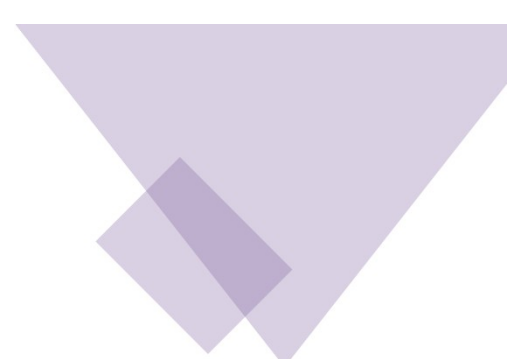
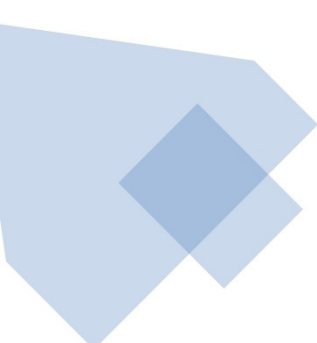
Are quolls near the mine in poorer health? (n=115 quolls)

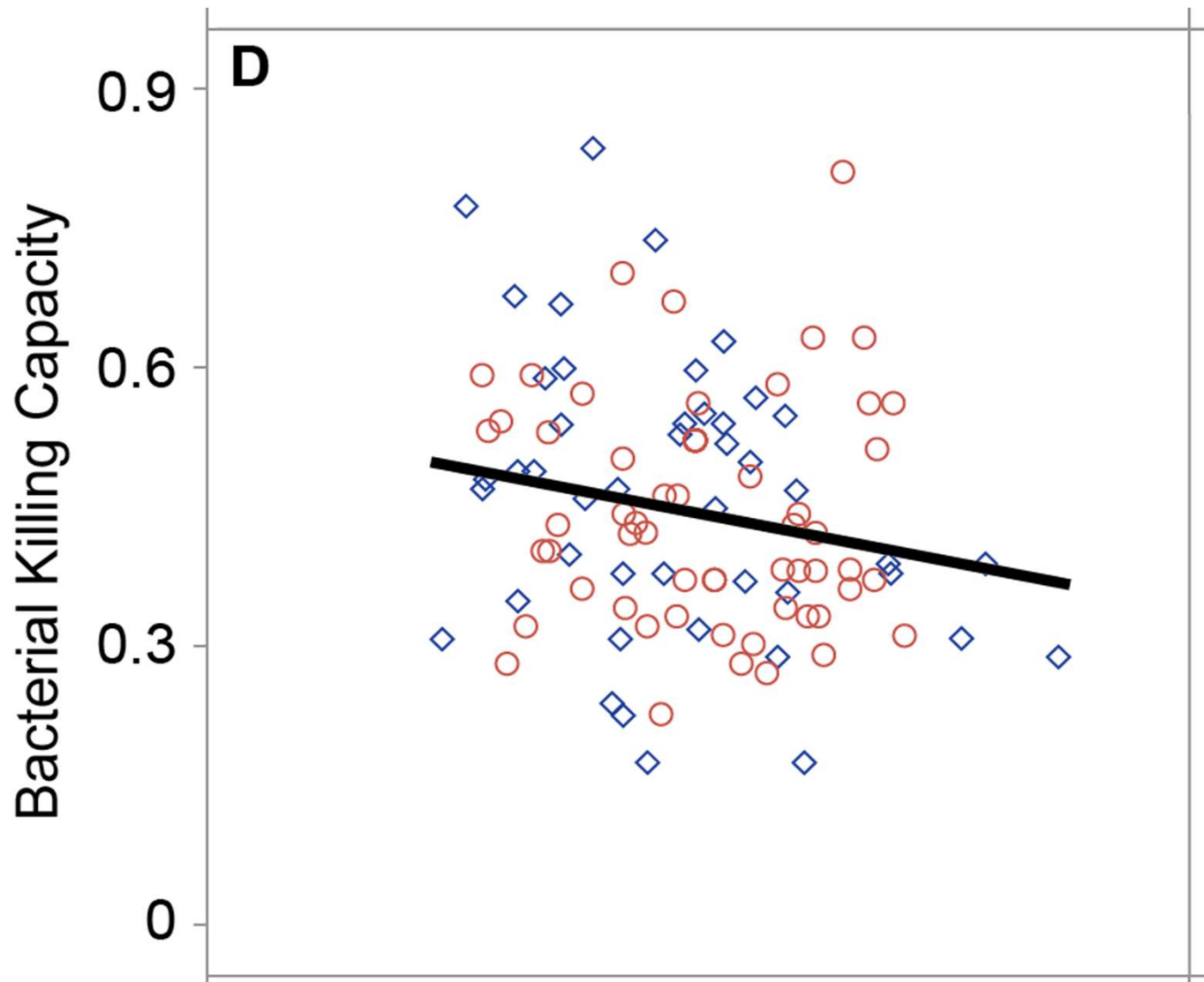




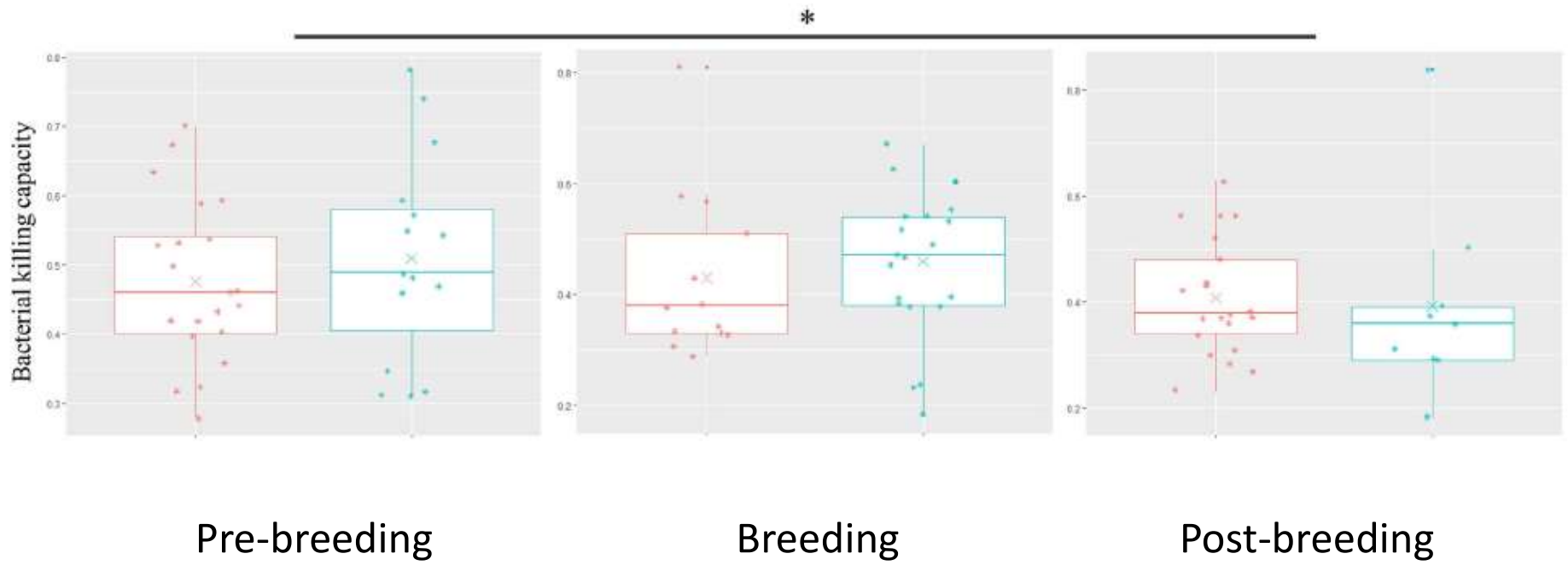
Does Mn disrupt endocrine function in quolls?

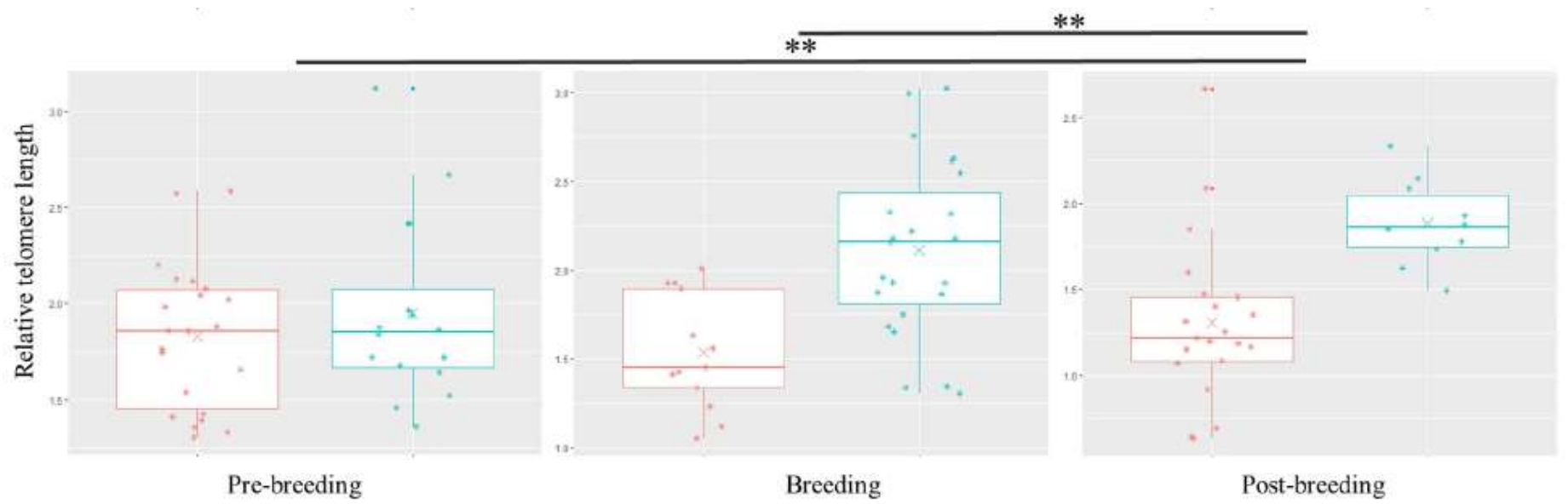


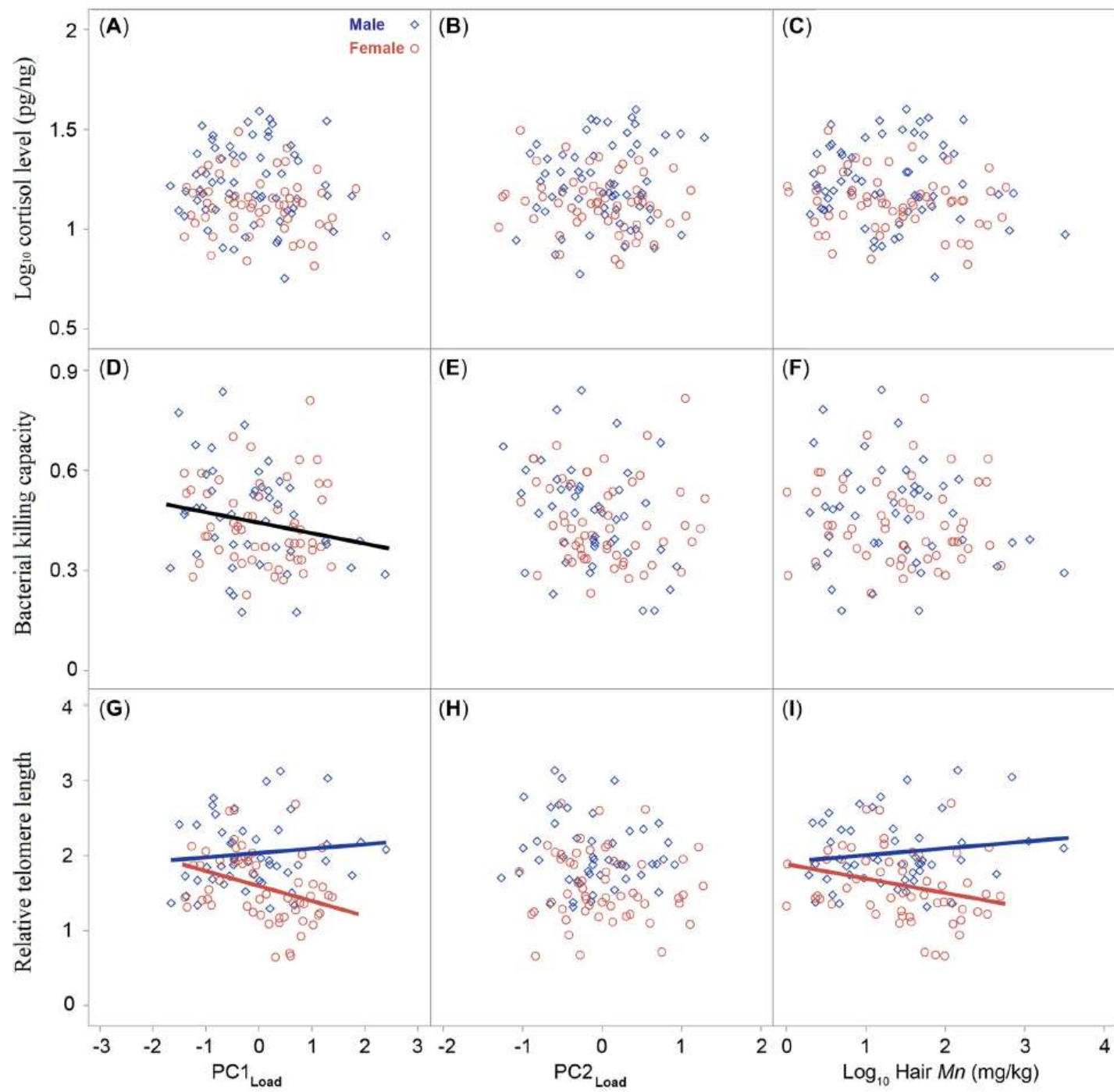




Relationship between metal accumulation in hair (PC1)
and bacterial killing capacity by plasma





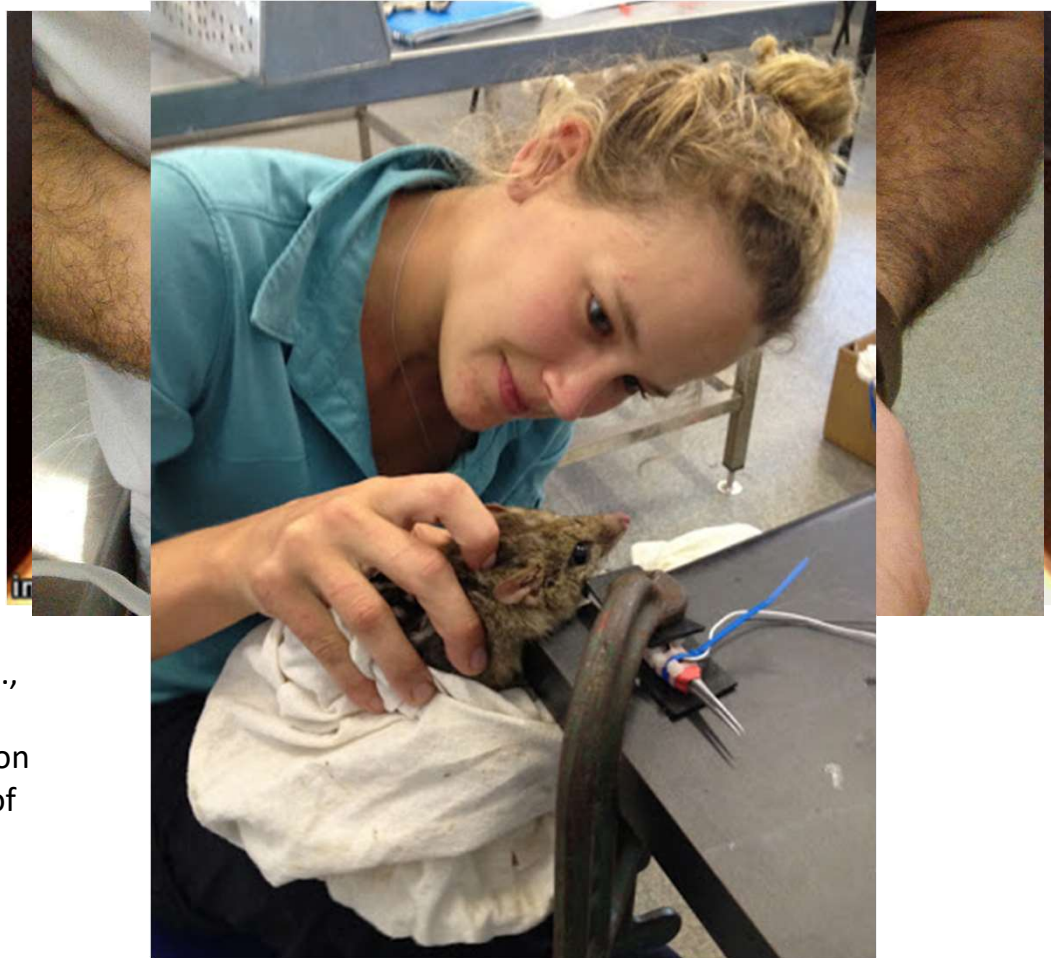


Mn appears to affect immune function, but is it related to critical performance traits?



Performance Measurements

- 8 performance traits: 7. Average Corner Speed
- 8. Start/End Speed
- 9. Maximum Oxygen Consumption



Amir Abdul Nasir, A.F., Cameron, S.F., Niehaus, A.C., Clemente, C.J., von Hippel, F.A. & Wilson, R.S. (2018). Manganese contamination affects the motor performance of wild northern quolls (*Dasyurus hallucatus*). *Environmental Pollution* 241:55-62.

How does Mn affect the expression of genes involved in locomotion, cognition, immune function, etc.?



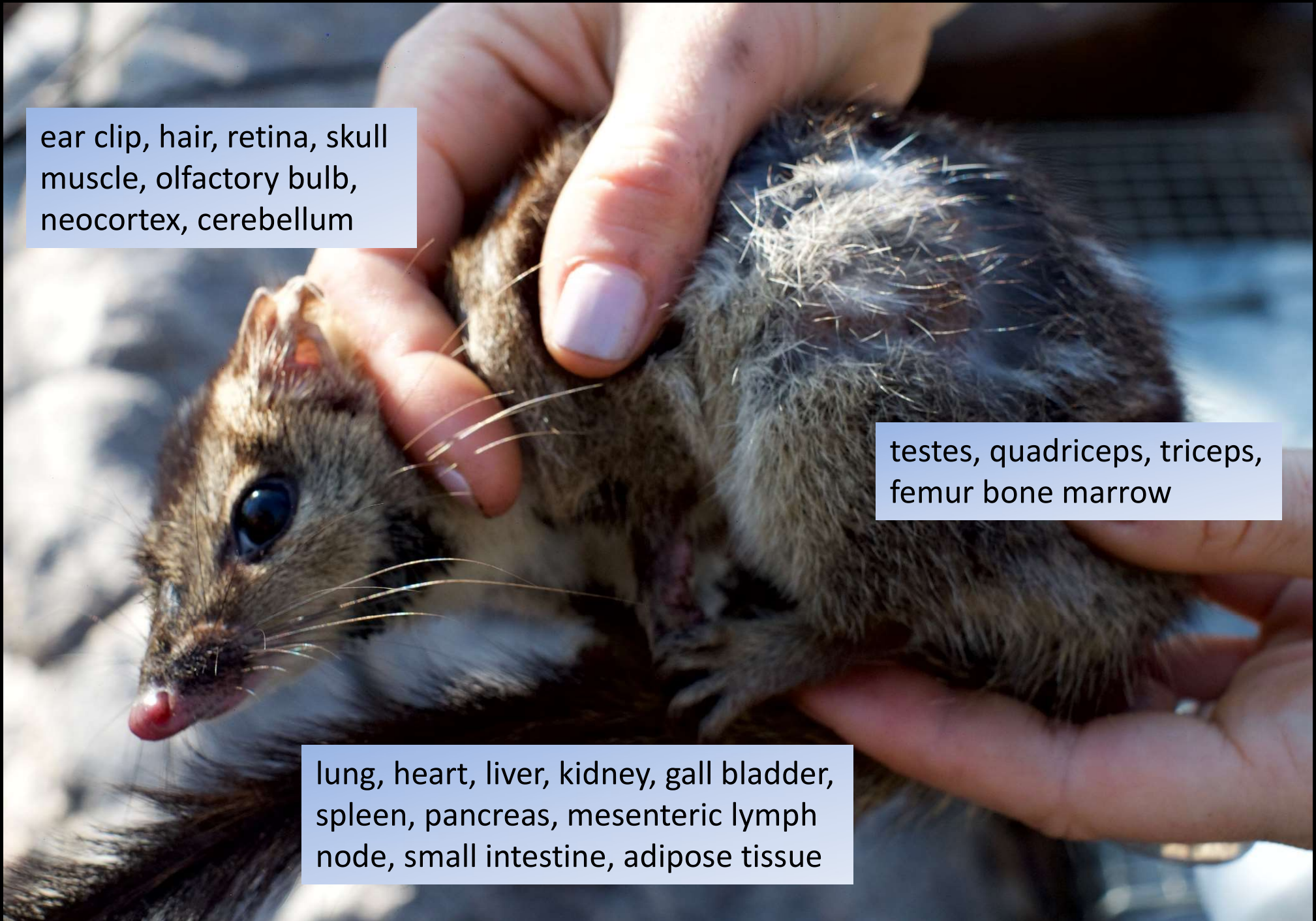
tissue tropism, gene expression, histology:

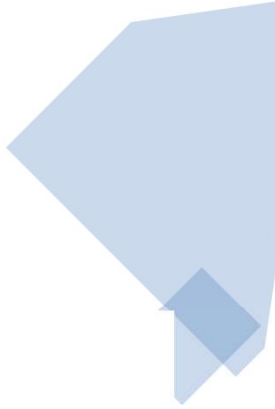
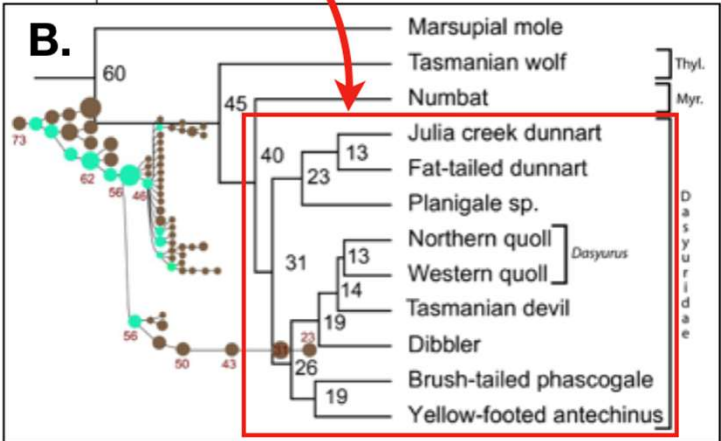
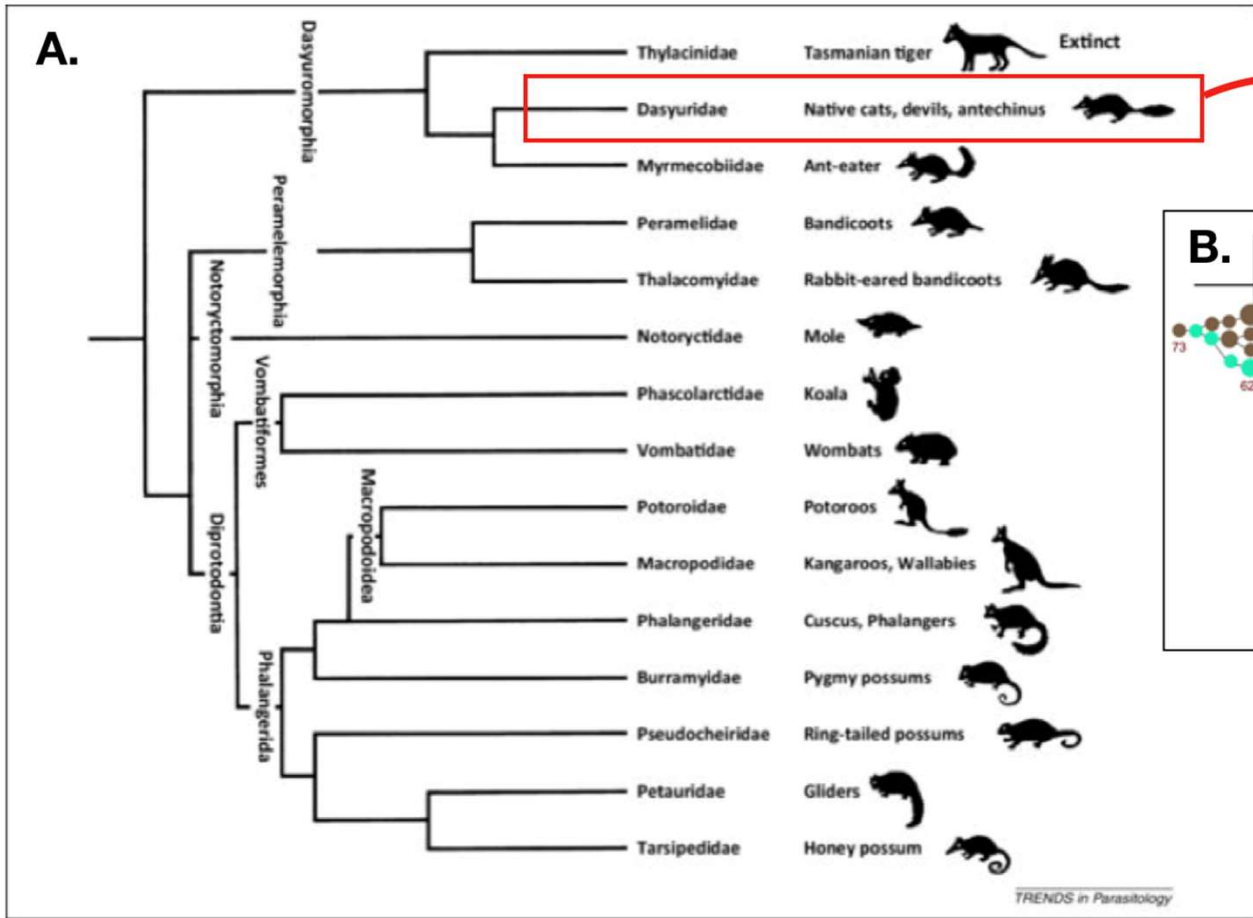
n = 65 samples/male for 8 males high Mn & 10 males low Mn

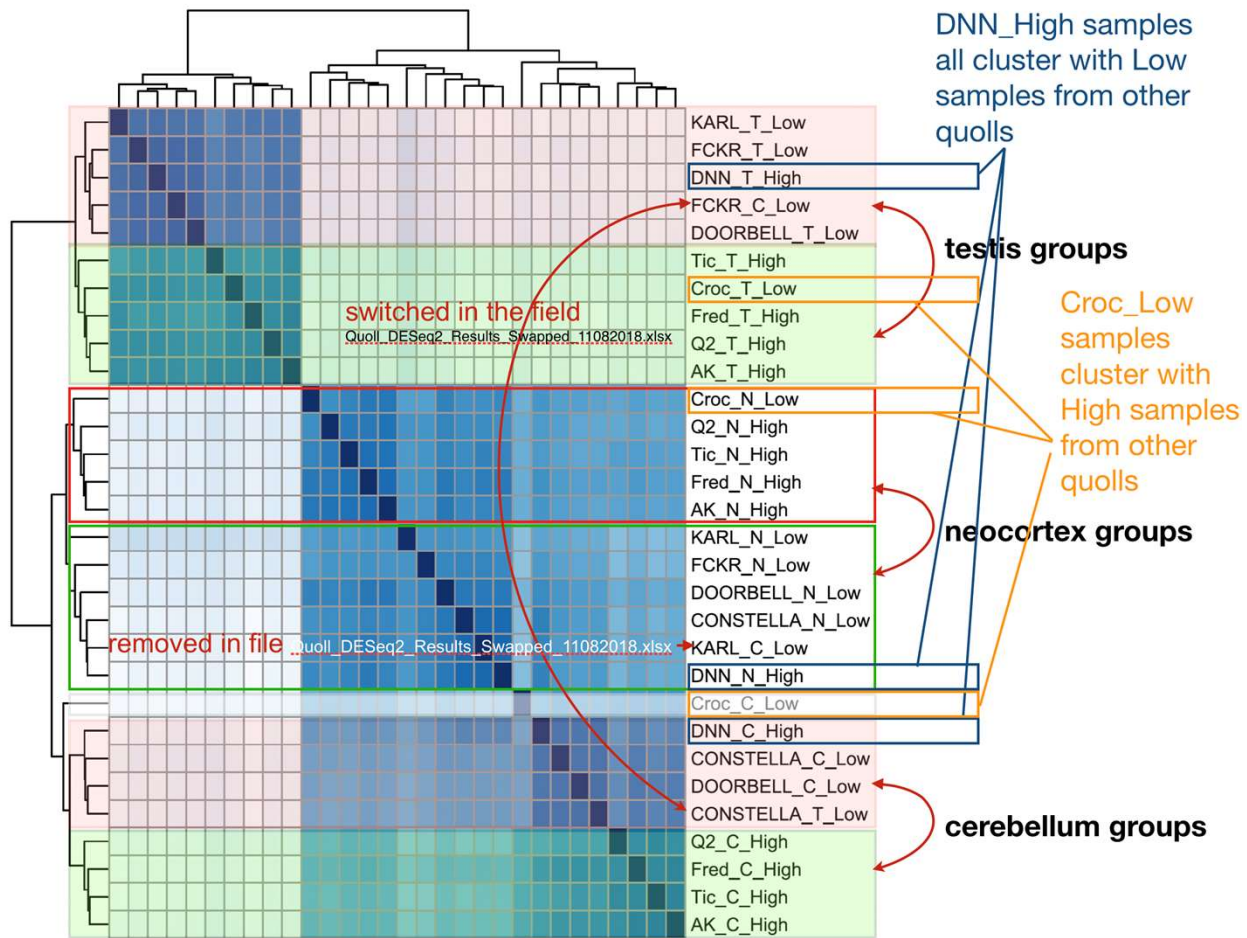
ear clip, hair, retina, skull
muscle, olfactory bulb,
neocortex, cerebellum

testes, quadriceps, triceps,
femur bone marrow

lung, heart, liver, kidney, gall bladder,
spleen, pancreas, mesenteric lymph
node, small intestine, adipose tissue

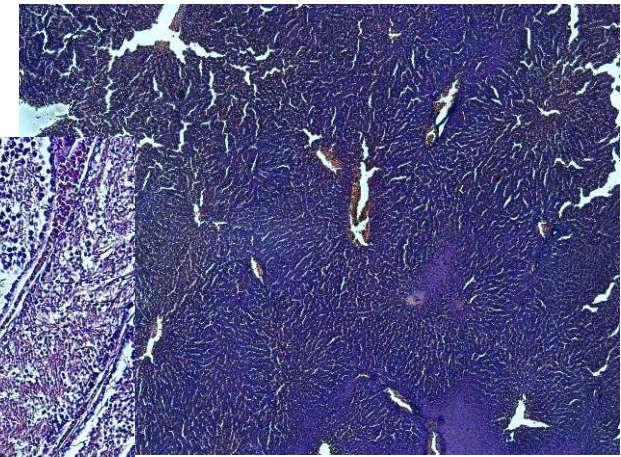
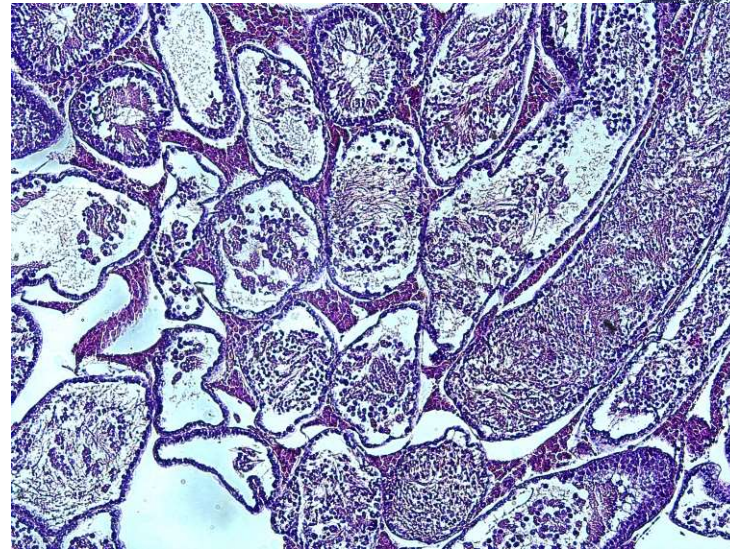




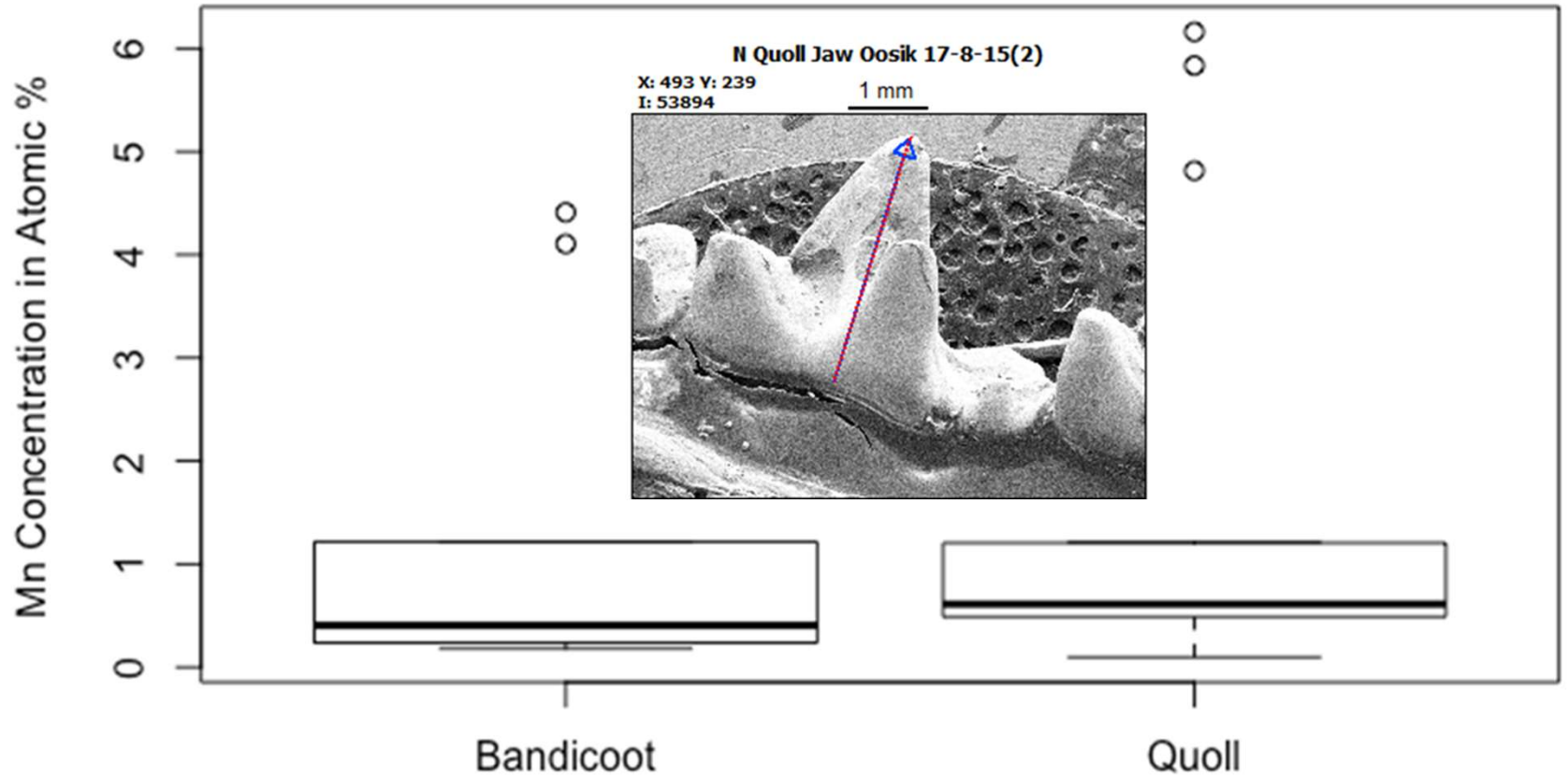


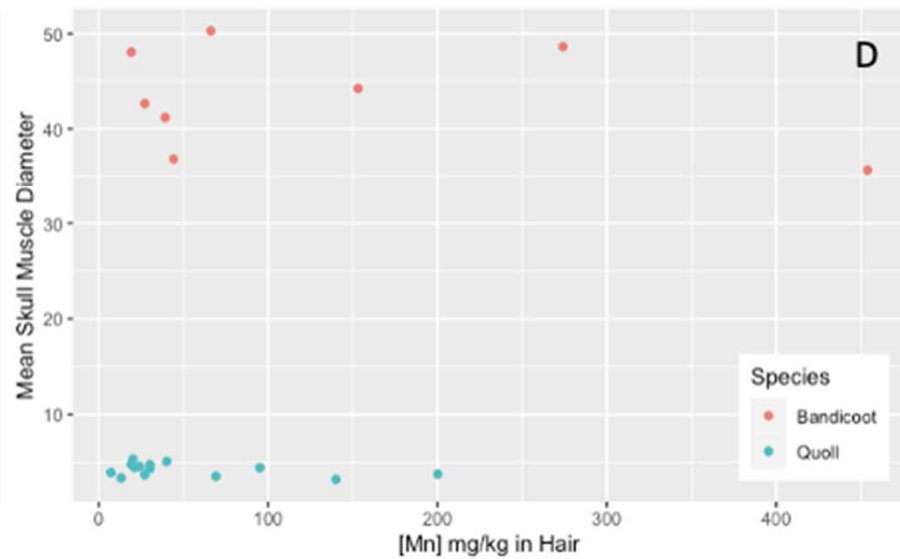
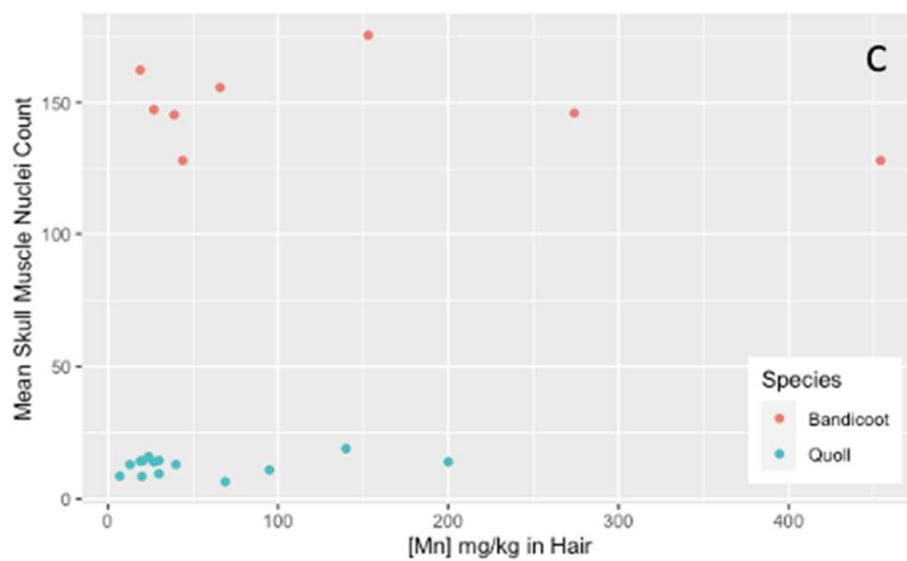
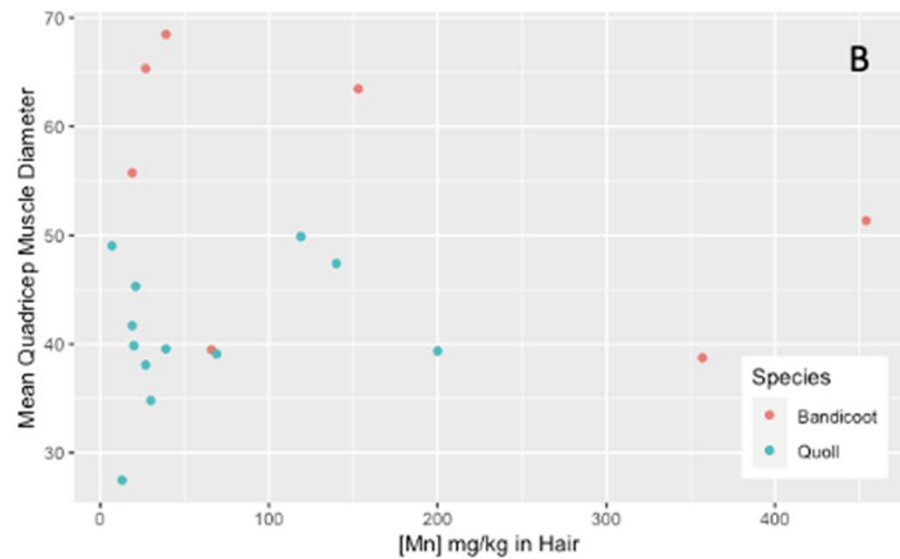
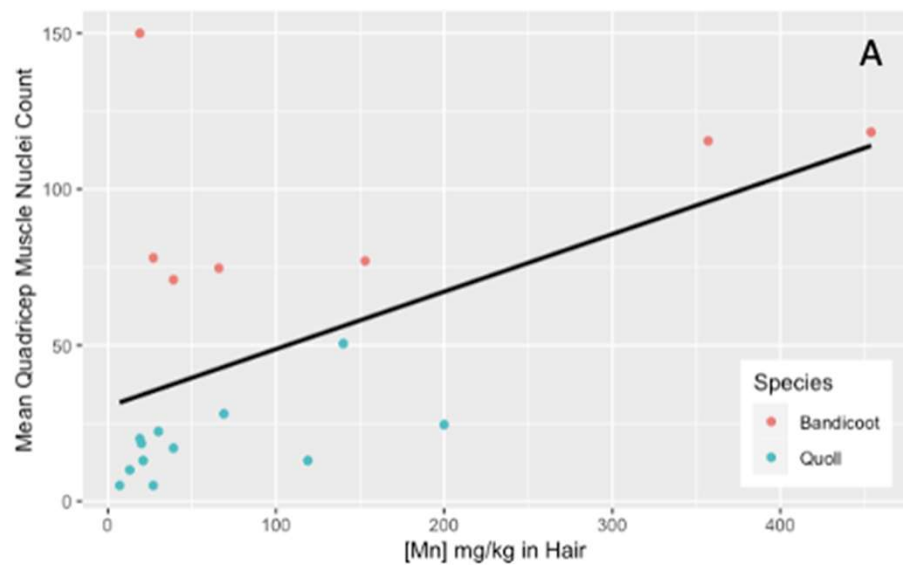


Bandicoot testis



Bandicoot liver





What's next for Groote Island?

Do children with higher Mn body burdens have poorer cognition and motor performance?

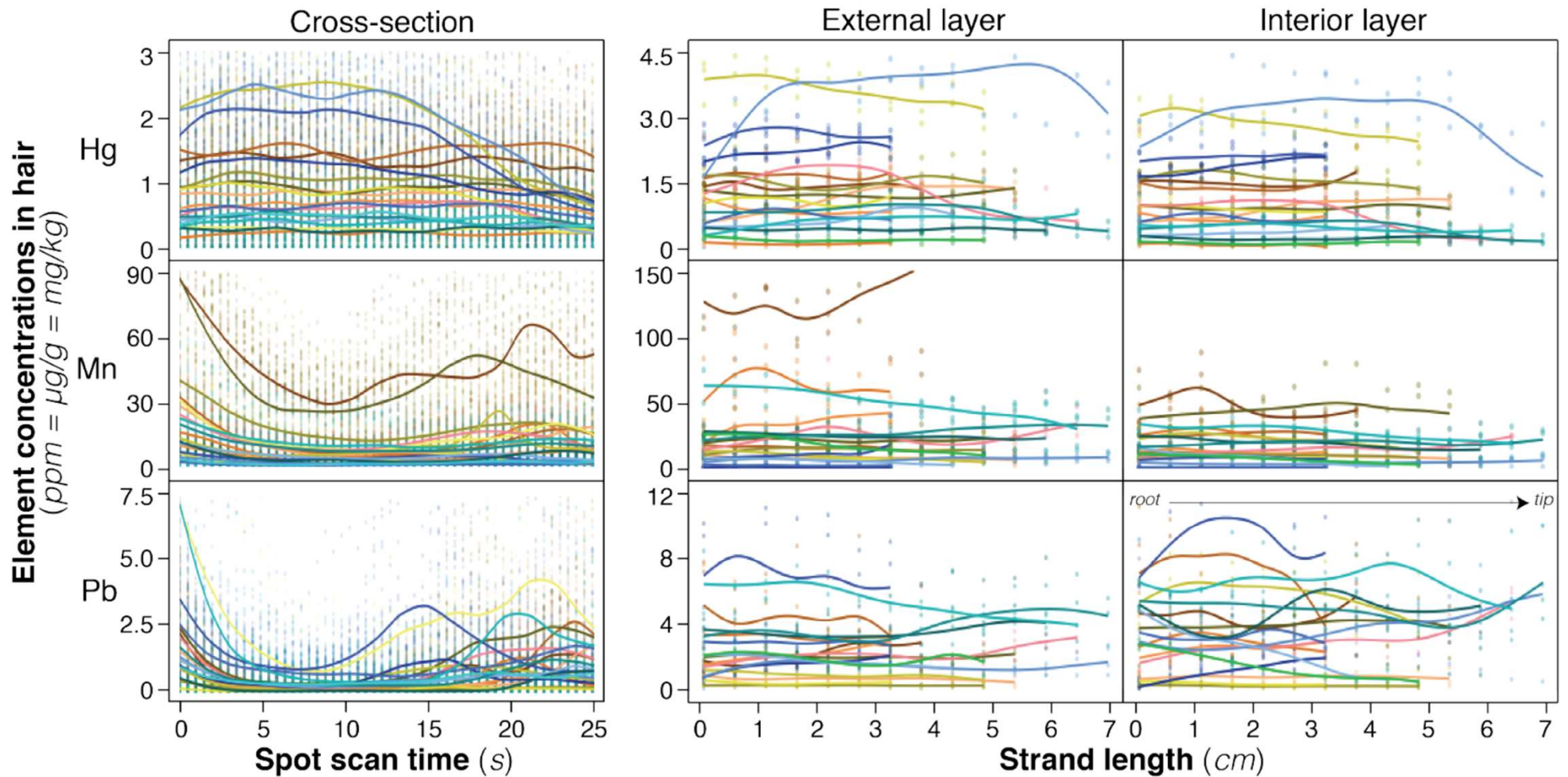
How does the trophic ecology of an animal determine its bioaccumulation of Mn?



ANINDILYAKWA RANGERS

THREATENED SPECIES
RECOVERY CENTRE





David, G.K., Hunter, A., Moromizato, K.H., Allen, C. Wheatley, R., von Hippel, F.A., Niehaus, A.C. & Wilson, R.S. (2023). Pre-cleaning of hair is not beneficial in LA-ICP-MS studies of chronic metal exposure. *PLOS ONE* 18(8): e0289635.









**SOUTH32 HERMOSA
EXPLORATION AND CRITICAL
MINERALS PLAN OF
OPERATIONS - OVERVIEW**

February 21, 2024

HERMOSA AT A GLANCE



The only advanced mine development in the US that will produce two federally-designated critical minerals

**Taylor zinc-lead-silver
development option**

**Clark battery-grade manganese-
zinc-silver development option**

One of the largest undeveloped zinc resources in the
world

Zinc is a DOI-listed critical mineral







Only advanced battery-grade manganese project in the
US

Manganese is a DOI-listed critical mineral

SETTING A NEW STANDARD FOR SUSTAINABLE MINING

The Hermosa Project is an opportunity for Arizona and the nation to demonstrate that next-generation mining can produce these important metals in a way that does not contribute to climate change.

Here’s how we are working to minimize impact and target a low-carbon mining operation:

Design Element	Hermosa Focus
 Footprint	Designing to operate on just 600-700 acres – 95% less surface disturbance of other mining projects, which often stretch 10,000+ acres
 Mining Method	Mining underground and backfilling to reduce volume of stored tailings on the surface and all but eliminates surface subsidence
 Tailings	Built one of the nation’s first dry stack tailings facilities, limiting surface disturbance and achieving the highest standard of safety and water conservation
 Transportation	Targeting all-electric fleets - above and below ground - to reduce noise, improve working conditions, safety and health and support the company’s net-zero GHG goal. IROC facility reduces travel to site
 Power Source	Partnering for potential to be fully powered by renewable energy, which could underpin new regional renewable energy capacity and infrastructure
 Water Management	Designing for water use intensity 90% lower than traditional mines and eliminate the need for long-term water treatment

PLAN OF OPERATIONS AND NEPA REQUIREMENTS

USFS mining regulations (36CFR 228.4) require operators to submit a Plan of Operations that includes information sufficient to describe or identify the type of operations proposed and how they would be conducted, period of proposed activity, and measures taken to meet requirements for environmental protection.

The National Environmental Policy Act (NEPA) requires federal agencies to assess the environmental effects of proposed major federal actions (such as authorizing a Plan of Operations) prior to making decisions.

Includes:

- Preparation of an Environmental Impact Statement (EIS) for major federal actions by the lead federal agency (USFS)
- Consideration of a reasonable range of alternatives that accomplish the purpose and need of the proposed action
- Describes the area to be affected by the proposed action and alternatives under consideration
- Analysis of environmental effects and their significance

Involves:

- Public scoping and participation
- Input from cooperating and Participating agencies
- Consultations required under the National Historic Preservation Act and Endangered Species Act

Nations first FAST-41 covered mining project. Follows the same NEPA process with the same requirements as other projects and includes enhanced coordination from the Federal Permitting Improvement Steering Committee pursuant to FAST-41

PART 228 REQUIREMENTS FOR PLAN OF OPERATIONS



36 CFR 228.4(c) The plan of operations shall include:	Section within Exploration and Mine Plan of Operations
§ 228.4 (c)(1) - The name and legal mailing address of the operators (and claimants if they are not the operators) and their lessees, assigns, or designees.	Described within the Introduction of the MPO
§ 228.4 (c)(2) - A map or sketch showing information sufficient to locate the proposed area of operations on the ground, existing and/or proposed roads or access routes to be used in connection with the operations as set forth in §228.12 and the approximate location and size of areas where surface resources will be disturbed.	Figures within the MPO for vicinity, site layout, TSF2 detail and phasing, geology, stoping diagram, water balance, and beneficiation flowsheets
§ 228.12 Access: Proposals for construction, improvement or use of such access as part of a plan of operations shall include a description of the type and standard of the proposed means of access, a map showing the proposed route of access, and a description of the means of transportation to be used. Approval of the means of such access as part of a plan of operations shall specify the location of the access route, design standards, means of transportation, and other conditions reasonably necessary to protect the environment and forest surface resources, including measures to protect scenic values and to insure against erosion and water or air pollution.	Described within the Roads section of the Project Description (Chpt 2) and development of a Road Plan (Appendix A) that includes maps and figures.
§ 228.4 (c)(3) - Information sufficient to describe or identify the type of operations proposed and how they would be conducted, the type and standard of existing and proposed roads or access routes, the means of transportation used or to be used as set forth in § 228.12 , the period during which the proposed activity will take place, and measures to be taken to meet the requirements for environmental protection in §228.8	Described within the Project Description (Chpt 2) of the MPO: <ul style="list-style-type: none"> -Exploration on surface and beneath NFS land -Mining -Tailings and Mine Rock Management -Water Use and Treatment -Materials and Supplies -Maintenance during Operations and Public Safety -Prevention and Control of Fire -Roads -Power -Operations on Private lands (milling, beneficiation, surface support facilities and mining infrastructure)

PART 228 REQUIREMENTS FOR PLAN OF OPERATIONS



36 CFR 228.8 Requirements for Environmental Protection	Section within Exploration and Mine Plan of Ops
§ 228.8 (a) Air Quality	Described in the Environmental Protection Measures section on Air Quality
§ 228.8 (b) Water Quality	Described in the Environmental Protection Measures section on Water Quality and within Appendix for Stormwater Management
§ 228.8 (c) Solid Wastes	Described in the Environmental Protection Measures section on Solid Waste/Hazardous Materials
§ 228.8 (d) Scenic Values	Described in the Environmental Protection Measures section on Scenic Values and Recreation
§ 228.8 (e) Fish and Wildlife	Described in the Environmental Protection Measures section on Fish and Wildlife
§ 228.8 (f) Roads	Described in the Environmental Protection Measures section in Road Plan (Appendix A)
§ 228.8 (g) Reclamation	Described in the Reclamation and Closure section of the MPO

REVIEW OF MPO CONTENT

Submitted the initial MPO August 17, 2023.

Accepted by USFS on Dec 17, 2023 and voluntarily released by South32 on January 30, 2024

Revised MPO outline

- Chapter 1. Introduction
- Chapter 2. Project Description
- Chapter 3. Environmental Protection Measures
- Chapter 4. Temporary Cessation of Operations
- Chapter 5. Reclamation and Closure
- Appendices (5)
 - > App A. Roads Plan
 - > App B. Stormwater Management
 - > App C. Materials Management
 - > App D. TSF2 Design Drawings
 - > App E. Typical Facility Layouts
- Figures (24)
- Tables (13)

INFORMATION REDACTED FROM INITIAL RELEASE



- Contact information
- Production and mining/resource related information
- Certain water balance information being refined
- Certain traffic information in process of being refined

Redactions were largely limited to single sentences along with two figures and two tables

OVERVIEW OF THE EXPLORATION AND MINE PLAN OF OPERATIONS

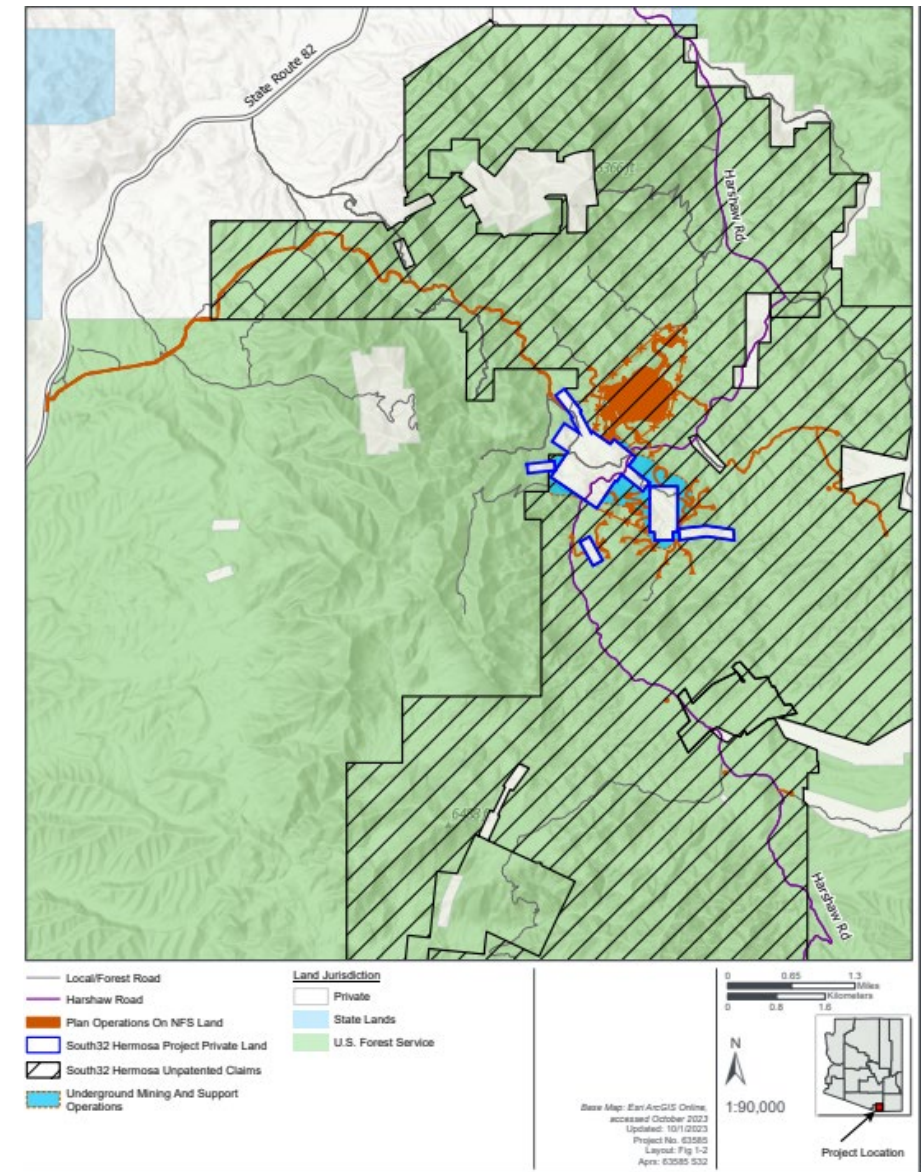
Project Activities Prior to Commencement of Operations on NFS Land

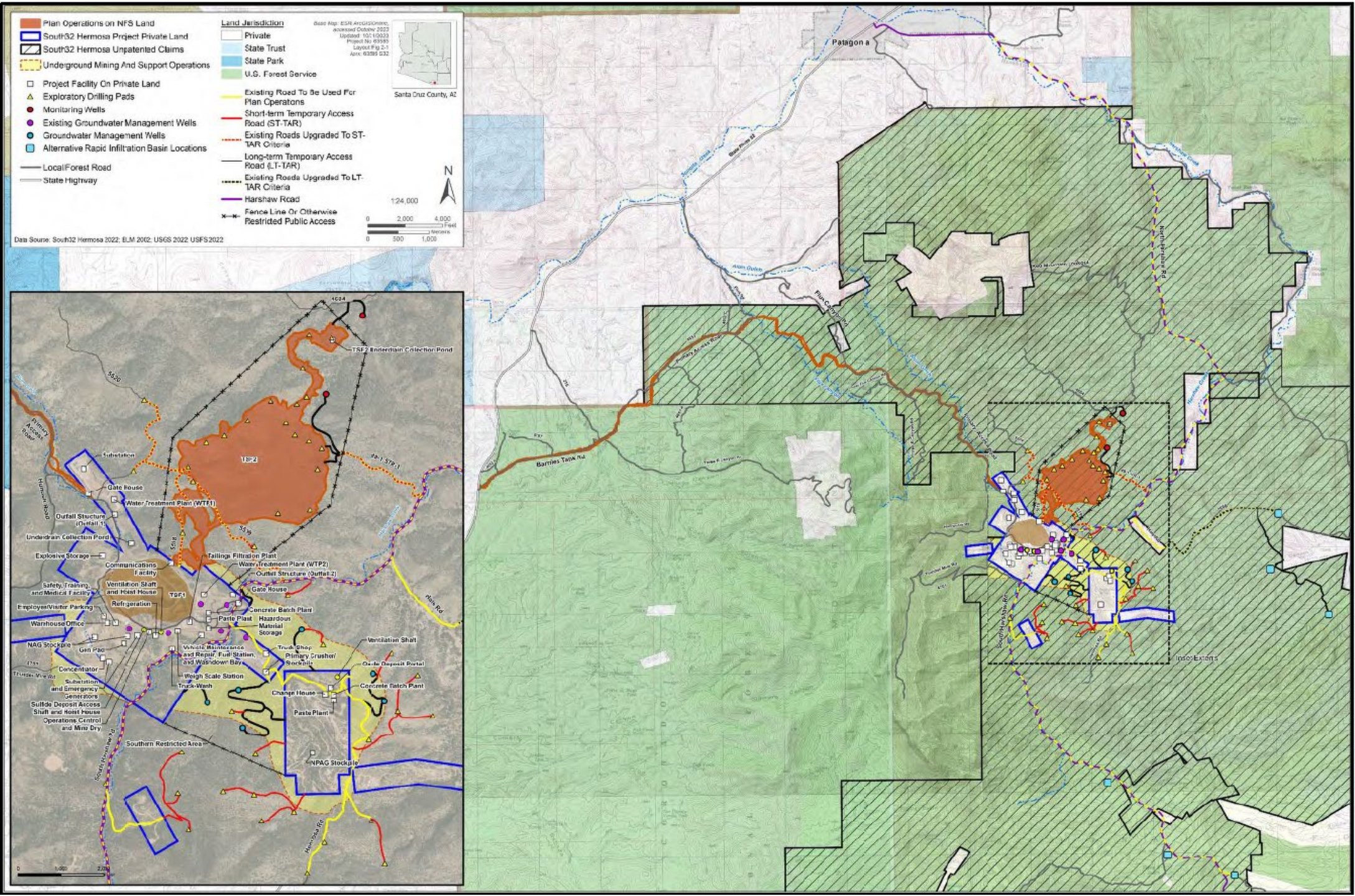
- Water Management
- Shaft, Decline, Underground Infrastructure (Private Land Only)
- Surface Support Facilities (Private Land Only)
- Material Characterization

Exploration Activities on and/or beneath NFS land

Underground Mining and Supporting Operations including methods, infrastructure, water management, cemented paste backfill

- Production Rates/Mine Life
- Mining Methods
- Tailings and Mine Rock including TSF siting, design and operations, delivery and management
- Water Use and Treatment
- Materials and Supplies
- Maintenance during Operations and Public Safety
- Prevention and Control of Fire
- Roads
- Power





Plan Operations on NFS Land
 South32 Hermosa Project Private Land
 South32 Hermosa Unpatented Claims
 Underground Mining And Support Operations

Project Facility On Private Land
 Exploratory Drilling Pads
 Monitoring Wells
 Existing Groundwater Management Wells
 Groundwater Management Wells
 Alternative Rapid Infiltration Basin Locations
 Local Forest Road
 State Highway

Land Jurisdiction
 Private
 State Trust
 State Park
 U.S. Forest Service

Existing Road To Be Used For Plan Operations
 Short-term Temporary Access Road (ST-TAR)
 Existing Roads Upgraded To ST-TAR Criteria
 Long-term Temporary Access Road (LT-TAR)
 Existing Roads Upgraded To LT-TAR Criteria
 Harshaw Road
 Fence Line Or Otherwise Restricted Public Access

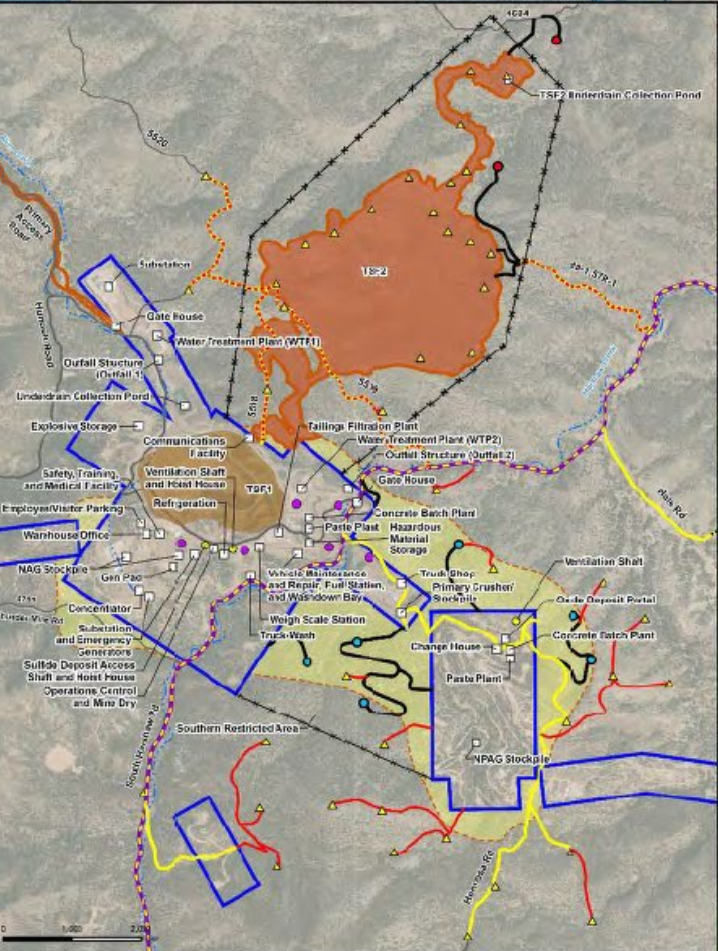
Base Map: ESRI ArcGIS Online, downloaded October 2022
 Updated: 10/1/2023
 Project No: 49395
 Layout: Fig 2-1
 Date: 03/28/23

Santa Cruz County, AZ

1:24,000

0 2,000 4,000 Feet
 0 500 1,000 Meters

Data Source: South32 Hermosa 2022; ELM 2012; USGS 2022; USFS 2022

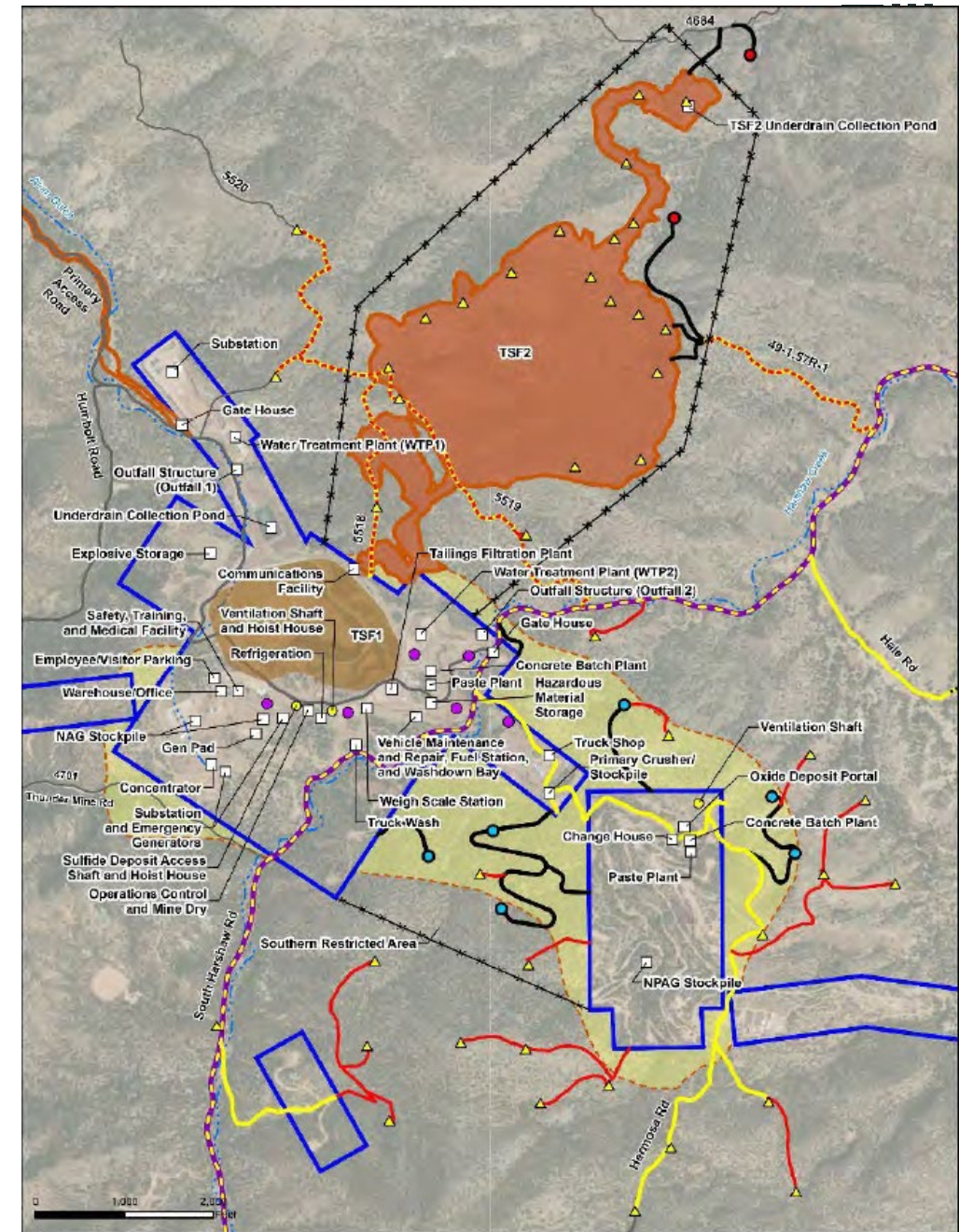


SUMMARY OF DISTURBANCE ON/UNDER NFS LAND

Disturbance Type	Acreage
Temporary (short- and long-term)	117.6
+ 5% Contingency	5.9
<i>Total Temporary Surface Disturbance</i>	<i>123.5</i>
Permanent (Primary Access Road + TSF2)	336.3
+ 5% Contingency	16.8
<i>Total Permanent Surface Disturbance</i>	<i>353.1</i>
Total NFS Land Surface Disturbance	476.6
Underground Plan Operations	223
Restricted Public Access (TSF2 and southern area)	343

Short-term temporary (e.g., exploration drill pads and access, primary access road building, etc.)

Long-term temporary (e.g., GWM well pads, access roads, RIBs, etc.)



EXPLORATION - PLAN OPERATIONS

Surface:

26 drill pad locations on NFS land, each approximately 150 by 150 feet in size. At each drill pad, up to 10 exploration holes may be drilled in multiple directions, depending on the results of the core analyses.

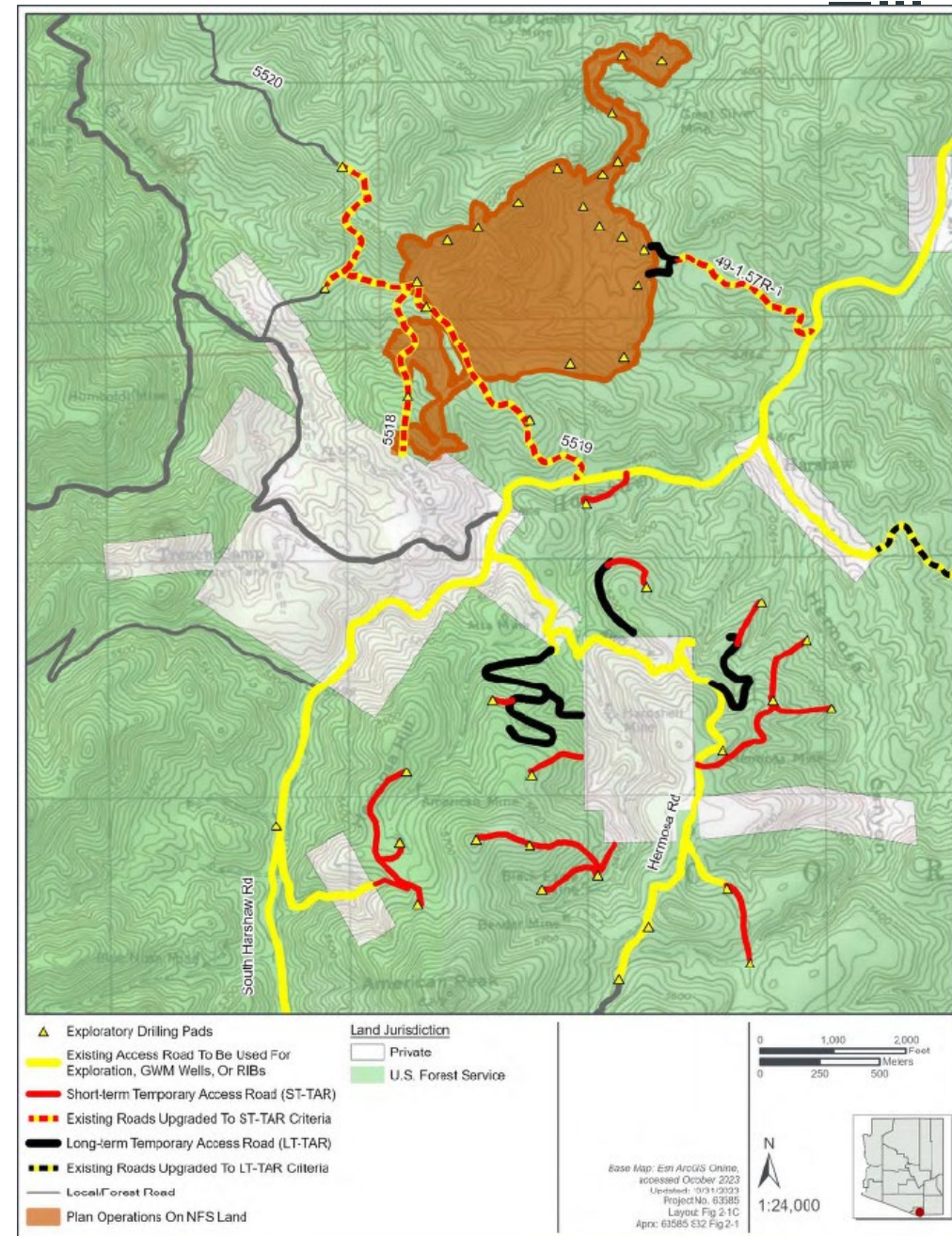
~32 acres disturbance for temporary access roads (TARs) and drill pads.

17 additional drill pads identified on TSF2 within disturbance boundary.

Underground:

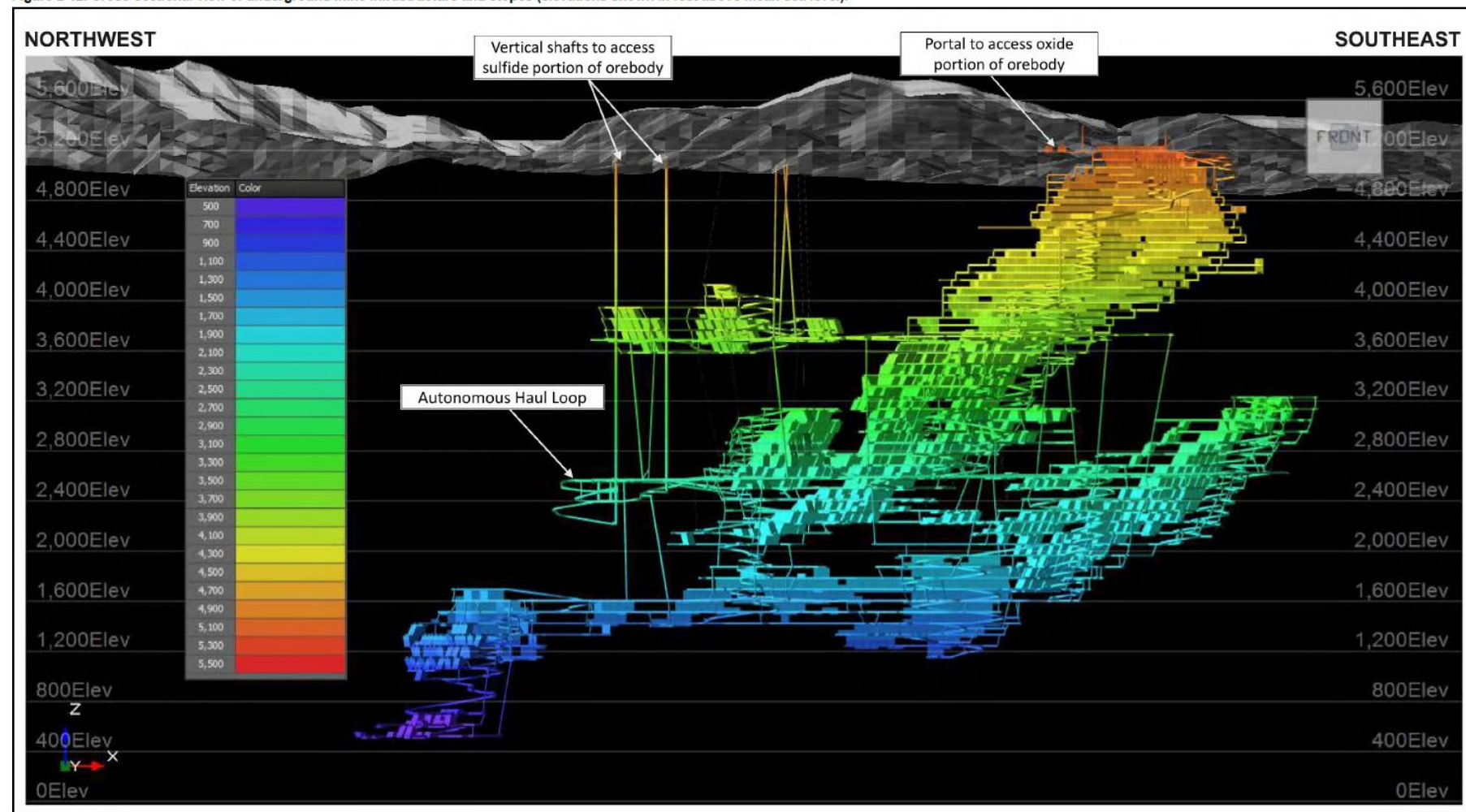
Horizontal and vertical drilling will be conducted to further define the ore body and to provide short-term operational information to optimize day-to-day mining and beneficiation.

This drilling will take place at the working face and within dedicated drilling bays underground.



MINING – UNDERGROUND PLAN OPERATIONS

- Access via private land shafts / declines
- Construction of underground tunnels and infrastructure
- Underground mining of ore using the longhole open stoping method (e.g., blast and load/haul)
- Cemented paste backfill (comprising filtered tailings and cement) and delivery via pipe for backfill of mined stopes
- Underground equipment use and maintenance



TAILINGS STORAGE FACILITY (TSF2) – NFS LAND

Tailings not used as cemented paste backfill will be placed in an aboveground, small footprint, lined, dry-stack tailings storage facility (TSF2).

Tailings will be filter pressed to achieve optimum moisture content (~11%) for maximum compaction.

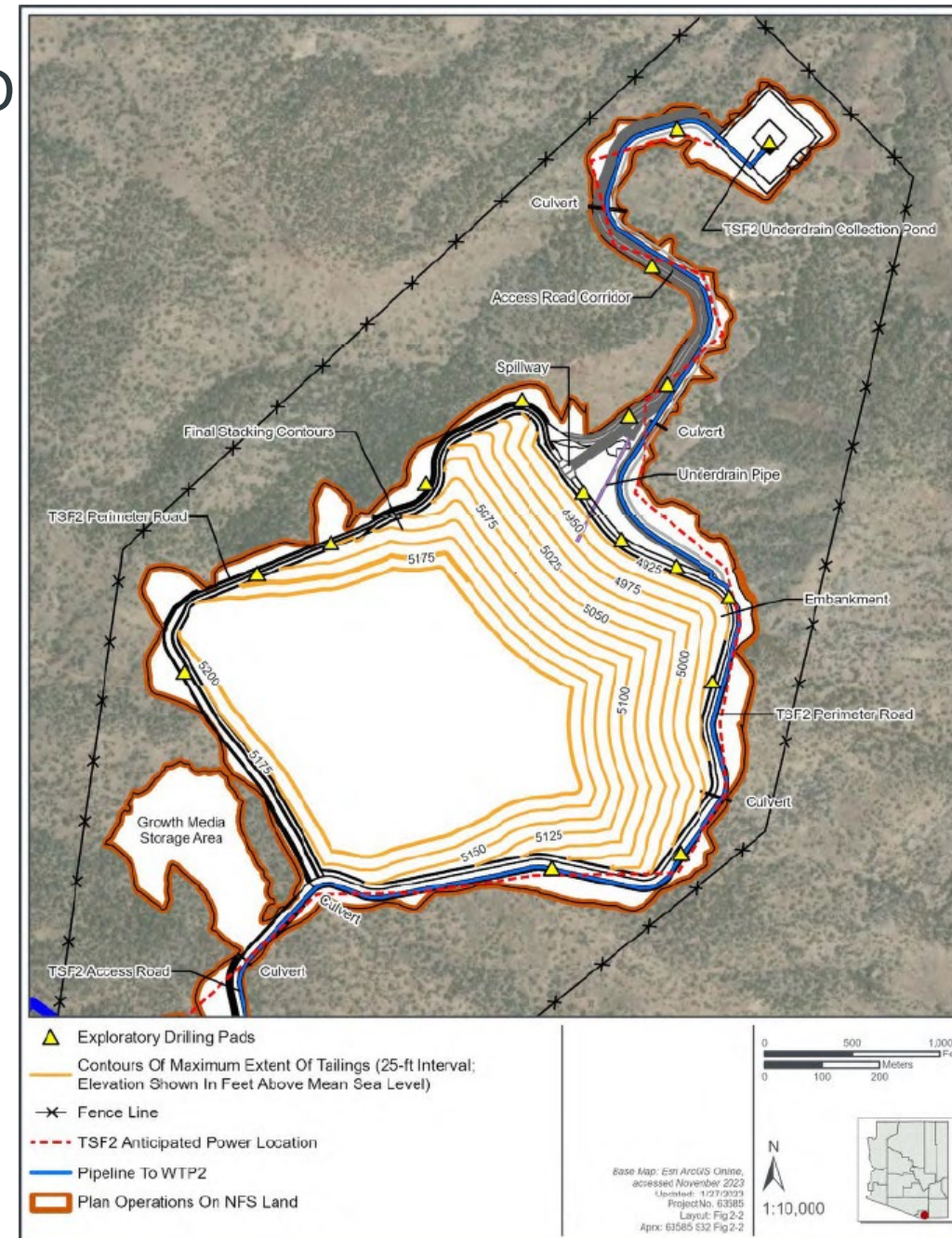
Design Standards:

- ICM Tailings Governance Framework and Position Statement on Preventing Catastrophic Failure of Tailings Storage Facilities,
- Australian National Committee on Large Dams (ANCOLD) guidelines,
- Global Industry Standard on Tailings Management (GISTM), and
- ADEQ BADCT

Liner, underdrain collection system, underdrain collection pond (UDCP)

Geotechnical investigation, construction methods, and equipment described in MPO

Other materials include: mine rock, WTP treatment solids, sediment from BMPs



PERMANENT ACCESS ROAD

Primary access to the Project currently occurs using Harshaw Road at its intersection with State Route 82 (SR 82) near Town of Patagonia.

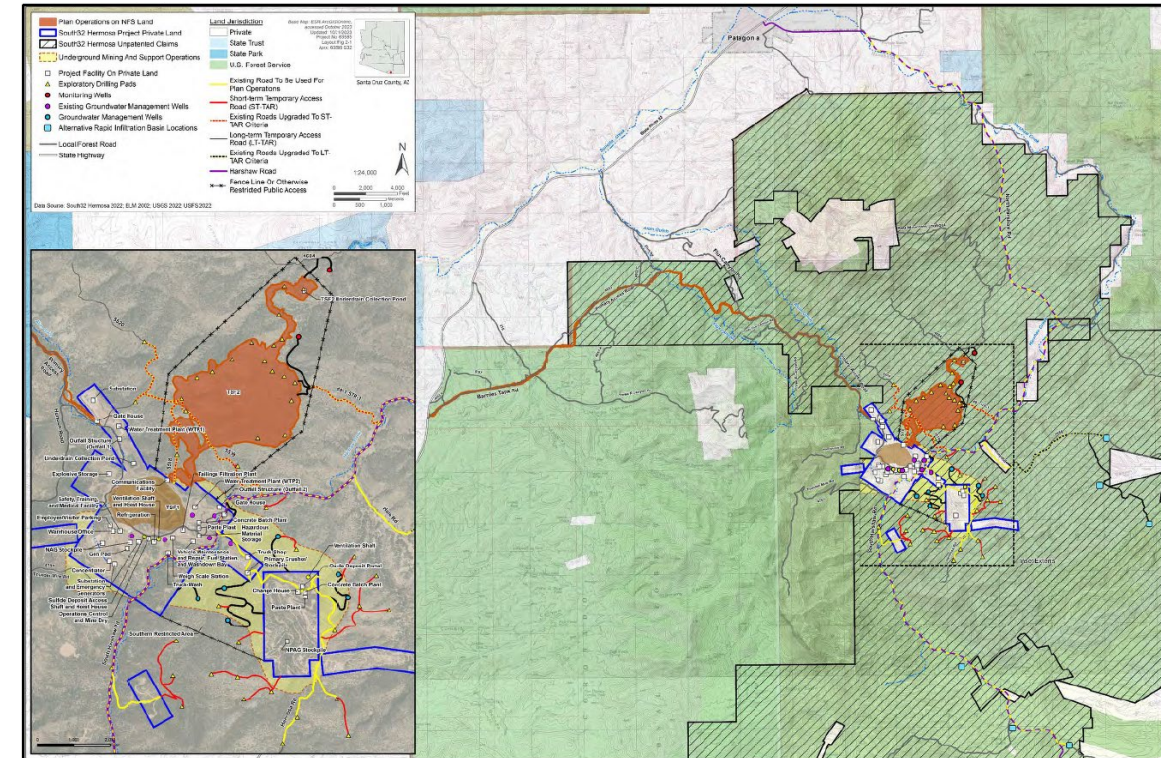
Temporary Town of Patagonia bypass being constructed on Santa Cruz County lands.

Development of a new Primary Access Road utilizing existing segments of Flux Canyon Road (FR 812), Flux Road (FR 4654), and Barrilles Tank Road (FR 4653).

Upon completion of Primary Access Road construction, the new Primary Access Road will be used for all Project activities described in the MPO, including heavy truck traffic.

Harshaw Road would remain in use by public, limited employee traffic and emergency access.

Geotechnical investigation, construction methods, and construction equipment described in MPO.



WATER MANAGEMENT

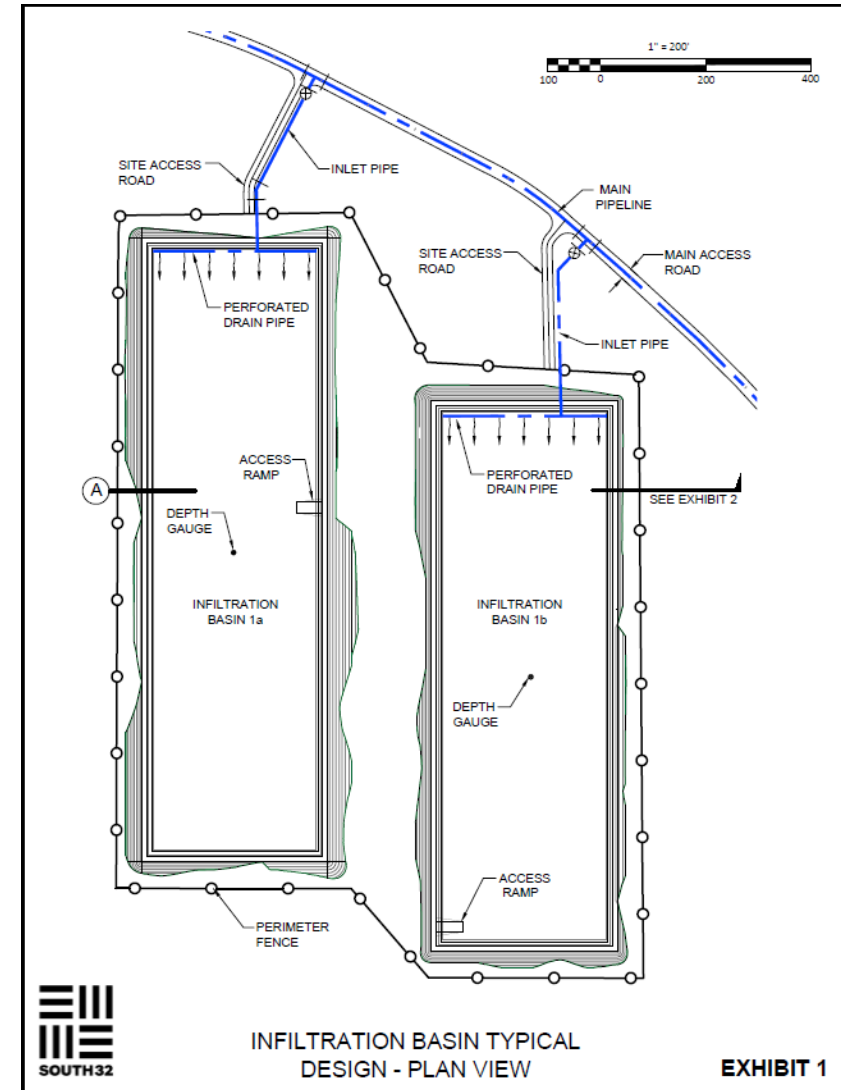
Groundwater management (GWM) is necessary to reduce hydrostatic pressures to allow safe underground exploration and mining. The reduction of pressure is achieved through GWM wells from surface (on private and NFS lands).

Extracted groundwater will be treated to meet stringent surface and groundwater standards before discharge from WTP2.

Expected discharge rate informed by groundwater modeling, as are the proposed rapid infiltration basin (RIB) locations and designs.

As part of MPO, portions of treated water from WTP2 would be routed to RIBs to support aquifer recharge.

High operational water use efficiency (UG mining, filtered tailings, water reuse).



POWER OVERVIEW

Line power is currently supplied to the Project by a UniSource Energy Services (UNSE) owned and operated 13.2-kV power line.

Line will be supplemented by natural gas and diesel-fueled generators that will operate on S32 private land.

Self-generated power option is included in air quality permit application and will be used until line power is available.

UNSE's proposed 138-kV project (Special Use Permit [SUP] application accepted by USFS Nov. 2022) would avoid emissions from the natural gas engines (~80% reduction in pollutants), enable power from renewable energy sources, and achieve low-carbon targets.

RECLAMATION & CLOSURE

The MPO describes interim, concurrent, and final reclamation

TSF2 and Underdrain Collection Pond (UDCP) reclamation

- TSF2 graded, capped with capillary break, growth media placed, and seeded with native plant species
 - UDCP converted to passive treatment then removed and backfilled with common fill, mounded, and revegetated
- GWM and monitoring wells will be closed per ADWR standards and access roads regraded, scarified, and revegetated

Underground workings under NFS land

- Infrastructure dismantled
- Stopes backfilled with cemented paste backfill or mine rock

Other disturbed areas will be recontoured, scarified, and seeded

Post-closure monitoring



INFORMATION for the Santa Cruz County Advisory Panel on Hermosa Project
Presented by Panelist Carolyn Shafer as a PARA Board Member
February 21, 2023

These are three sources for information relative to water issues in the Sonoita Creek Watershed that I recommend:

- The [Town of Patagonia “Sonoita Creek Flood & Flow Committee”](#) (“F&F”) which conducts (currently via Zoom) monthly public meetings the third Thursday of each month at 10 a.m.
- [Friends of Sonoita Creek](#) (“FOSC”)
- [Patagonia Area Resource Alliance](#) (“PARA”)

UPDATES:

AQUIFER PROTECTION PERMIT - a legal action by PARA against a state agency for failure to follow state statutes that require a point of compliance: PARA's Opening Brief was due (in Court of Appeals) on Feb 25, but the Court has extended the deadline because the Office of Administrative Hearing had not yet forwarded the hearing record from the administrative process.

ARIZONA POLLUTANT DISCHARGE ELIMINATION SYSTEM (AZPDES) PERMIT - a legal action by PARA against a state agency for failure to follow Clean Water Act regulations:

On January 11, ADEQ held a public meeting from 6 pm - 9 pm to hear comments on the draft renewal permit. There were about 150 people present from across the entire county. Comments were filed by the January 12 deadline; the agency has 30-45 days to respond to comments.

AIR QUALITY PERMIT - ADEQ has released a draft air quality permit for the Hermosa project. Comments are due February 26; there is a public meeting on February 26 at the Patagonia High School.

FOREST SERVICE PERMITTING EXPLORATORY DRILLING AT SOUTH32 FLUX SITE ON PUBLIC LANDS - a legal action by PARA against a federal agency for failure to follow regulations: On June 20, PARA and seven other conservation organizations filed a federal lawsuit against the Forest Service for issuing the permits for exploratory drilling at the Barksdale Resources Sunnyside site and at the South32 Flux site. The lawsuit states that the Forest Service provided these permits without consideration of the cumulative impacts. Oral arguments are set for March 25.

NEPA FAST41 PROCESS: On Feb 7, PARA hosted a meeting of 29 people from about a dozen conservation organizations (local, regional, statewide, and national). Since that meeting, the first step was to form a “NEPA Coordination Team” which has happened and is staffed by:

- Ben Lomeli (consulting hydrologist, President of Friends of Santa Cruz River, former BLM NEPA person),
- Eric Herman (AtoZ Environmental Services, including NEPA, PARA Board member),
- Ian Bigley (SW Earthworks representative with experience in NEPA, Section 106, Environmental Justice),
- Joni Clark Stellar (PARA Co-Chair, former environmental teacher and active with the Crested Butte CO resistance group that after 39 years achieved its goal of no mining on Red Mountain), and
- Carolyn Shafer (PARA Co-Chair).

The Advisory Councils will include individuals with subject matter expertise to advise on best practices, baseline information, monitoring programs; all designed to provide protections for the Impacted Communities natural resources and public health:

- Water
- Air
- Biodiversity
- Soils
- Public Health
- Environmental Justice
- Roads/Traffic/Public Safety
- Economy
- Transmission Line

The Santa Cruz County NEPA Advisory Councils are coming together under the guidance of the NEPA Coordination Team and will be initially focused primarily on the NEPA process; a future agreement negotiation will benefit from the NEPA process because we will all be better informed as a result of the NEPA process and we will have data from experts and science to support protections.

The importance of the NEPA process is that it will gather the story of this region and the many concerns about public health, environmental justice, environmental issues, and more. Most importantly, it will produce the science that will support this community's desire to protect this unique biological diversity hotspot and all life forms that thrive here.

PATAGONIA AREA RESOURCE ALLIANCE Works to hold federal and state agencies accountable to the laws and regulations on exploratory and mining activities in the Patagonia Mountains and the Sonoita Creek watershed; collaborates with Strategic Partners to (i) assure that any mining activities meet the highest science-based standards and (ii) protect the water, land, and wildlife of the Patagonia Mountains from the negative impacts of modern industrialized mining; and supports the expansion of the nature based restorative economy that depends on the remarkable biodiversity and cultural heritage of our region.

**Town of Patagonia Flood & Flow Committee Update
for the Santa Cruz County Advisory Panel on Hermosa Project
Presented by Panelist Carolyn Shafer as a Flood & Flow Committee Member
February 21, 2024**

Committee Members: Bill O'Brien, NextGen Engineering/Town Engineer, Town Manager Ron Robinson, Borderlands Restoration Network Rodrigo Sierra Corona, , Kate Tirion, Friends of Sonoita Creek Bob Proctor and Kathy Pasierb, The Nature Conservancy Aaron Mrotek, Patagonia Area Resource Alliance Carolyn Shafer and Chris Gardner, Tucson Audubon Howard Buchanan

- School Canyon Failure of CCC Structures (Bob Proctor) - Working with the County and Town to repair a breach in the Mesa area; impact would be felt in town at Fire Department. Forest Service said it didn't have money or time for NEPA process. The Town Engineer Bill O'Brien is working to document the water impacts and submit to the Forest Service for review.
- Patagonia Regional Flood Control Project Feasibility Study (Bill O'Brien) - Waiting on a January/February progress report from the county working through the data and meeting date.
- Watershed Stakeholders USBR/CWMP Grant Notice of Information and funding (Howard Buchanan) - Tucson Audubon, The Nature Conservancy, and Borderlands with the assistance of UA WRRRC are drafting a grant proposal for funding to establish a watershed management group.
- South32 CCC Flood Plain Use Permit (Bill O'Brien) - Application being reviewed by Town Engineer Bill O'Brien.
- Potential Aquifer Management Area (AMA) or Rural Management Area (RMA) for Cienega Groundwater Basin (Bob Proctor) - Working with Environmental Defense Fund to establish groundwater protections.
- Comprehensive Groundwater Study for Sonoita Creek Watershed (Carolyn Shafer) - A comprehensive groundwater study is needed with ground water criteria specific to Sonoita Creek watershed. Criteria would give a local view of local conditions and create a more accurate local model. Mayor Wood, Carolyn, and Ben worked on criteria and requested a study from the Forest Service in the summer of 2020. Forest Service has not addressed concerns about Patagonia and how it applies to our local conditions.
- Harshaw Creek Watershed Restoration Plan (Howard Buchanan & Bob Proctor) - Howard and Bob are working with Forest Service to draft a watershed restoration plan; a multi-year process. The Proper Functioning Condition (PFC) shows Harshaw creek sub watershed is rated poor for aquatic habitat. Rangeland management techniques may be applied to the upper Harshaw creek sub watershed to address and reduce sediment loads and erosion. Forest Service has gaps in data.
- Drought Preparedness Plan (Bob Proctor & Howard Buchanan) - The UA WRRRC has been working with the Town of Patagonia Flood & Flow Committee for more than a year on this project. The report is being finalized.

The next Committee meeting is scheduled for February 22, 2024.