Minutes of Twentieth Meeting

The DRCCC held its 20th meeting on 21 June 2016 at the Dargues Gold Mine Site at Majors Creek Road.

Meeting

Attendance: Brian Elton Chairperson, Peter Cormick, David Lever, Belinda Royds, Tom Wells (alternate member – Jackie French), James Dornan (Diversified Minerals), Chris Corcoran (Diversified Minerals), Paul Rouse (Diversified Minerals), Andrew Rouse (Diversified Minerals), Linda Clipperton (Diversified Minerals – observer), Mitchell Moon (Diversified Minerals – observer), Hannah Bubb (Elton Consulting – minutes)

Apologies

Apologies were received from Matt Darwon and Jackie French.

Pecuniary and other interests

In keeping with the guidelines for establishing and operating CCCs for mining projects (Dept. of Planning and Infrastructure 2007) all members are asked to declare any pecuniary or other interests. No changes were reported by members present.

Minutes

The minutes of the March 2016 meeting were adopted.

The minutes of the CCC meetings are available to the public at the Braidwood office of the Queanbeyan-Palerang Regional Council and via the Company’s website (www.unitymining.com.au).

Correspondence

No correspondence since the last meeting.

Diversified Minerals presentation

James Dornan introduced Paul Rouse and Andrew Rouse from Diversified Minerals and updated the CCC members on the new ownership of Unity Mining.

The sale process of Unity Mining to Diversified Minerals was completed on 1 June 2016, and Diversified Minerals are currently in the process of understanding and transferring the assets acquired in the sale.

A slide show (Attachment 1) was shown and Andrew Rouse introduced Diversified Minerals to the members.
Diversified Minerals is a family owned business and is within the PYBAR group.

Since acquisition, Unity Mining has been delisted from the ASX. Diversified Minerals believes being a privatized business ownership structure has advantages for the project as there are no expectations from the market. Diversified Minerals aims to maintain a small company culture with the support of a large organization, the PYBAR group employs more than 600 people.

The owners are from Broken Hill have lived and worked throughout regional NSW, including involvement in the Parkes and Cadia Valley mines.

Currently, Unity Mining is in a transitional phase of the corporate transaction which was interrupted by the interest from a major shareholder based in Singapore. Unity Mining still exists and Diversified Minerals is the parent company.

Andrew Rouse presented Diversified Minerals four core values for the business, and acknowledge the company’s preference to hire local employees and engage local suppliers where possible. Diversified Minerals wishes to maintain an open dialogue with community and operates with a ‘no surprises’ rule. Examples of the company working with the community include, the Mount Isa Chamber of Commerce, local sporting groups, and charities in Orange (cancer care bash). They have raised over $500k for the Variety club bash. Diversified Minerals intends to continue this at Dargues, and keep the community informed.

From this point, Diversified Minerals is getting an understanding of projects acquired from Unity Mining. This includes developing a plan to get the Dargues mine into production. Diversified Minerals is not considering onsite processing. At this stage, care and maintenance will progress for the time being.

Andrew noted that Diversified Minerals have the experience and knowledge to make the project a successful one for the community.

Peter Cormick asked for an explanation of the relationship between Diversified Minerals and Unity Mining.

Paul Rouse provided that Diversified Minerals is the only shareholder and has delisted Unity Mining from the ASX.

An explanation on what operating in an environmentally conscious manner means for the commitments and conditions at Dargues was requested. In particular, is Diversified Minerals confident in finding a location for offsite processing?

Diversified Minerals believe an agreement is still sometime away but are confident that they will find a location. Andrew Rouse said Diversified Minerals believe in the Dargues project. They are currently looking at the process to restart Henty.

The Chair noted Unity was previously close to a deal to have Westlime as the offsite processor, and asked whether Diversified Minerals was continuing with this option?

Paul Rouse noted that Westlime remains a live option and Diversified Minerals will go over all options considered by Unity Mining.
Peter Cormick asked whether there was any particular maintenance to occur on site.

Andrew Rouse provided, maintenance would be general works to demonstrate the site as a show piece mine.

James Dornan responded that Unity Mining had not heard from DPE regarding approval for Modification 3, when asked by a community member.

The CCC members asked whether the Unity Mining staff would remain on board at Dargues.

It was noted, the Unity staff are still on board.

An update on the status of Modification 3 was requested.

The Modification is still with DPE and Unity anticipates it going to PAC within the next two weeks. Unity also anticipates the Environment Protection and Biodiversity Conservation approval referral going to exhibition within two weeks. At this stage, DPE will make a recommendation on Modification 3 to PAC.

James Dornan undertook to provide an email to the CCC regarding the approvals.

Following Diversified Minerals’ presentation, the CCC members asked for clarification regarding the position on onsite processing at Dargues.

Diversified Minerals has no intention to process onsite. The onsite processing option is now a matter of history. Currently, Diversified Minerals is looking for a number of offsite options beyond those presented by Unity Mining.

Peter Cormick asked when the decision was made that PAC would review Modification 3?

James Dornan noted, this was decided early on and that PAC will consider DPE’s recommendations.

Andrew Rouse stated that Unity Mining will go through a new branding process resulting in a change to the website. In the short term the CCC meeting minutes will continue to be placed on the Unity website and Diversified Minerals will continue to keep the CCC informed.

Belinda Royds asked what are the plans to keep the greater community informed, as four companies have owned the site, there is community sensitivity around the Dargues project and onsite processing is a significant concern for the community.

Diversified Minerals noted that the history of Unity’s holding in Dargues is good and they discussed this with Unity in organizing the sale. There was a level of uncertainty associated with the sale due to the interruption of the Singapore firm, which altered the acquisition process. Diversified Minerals attended the CCC meeting to meet the CCC members.

The Chair noted the role of the CCC members is to advise the proponent on mechanisms for local engagement and acknowledged CCC members have an excellent network of local contacts. Diversified Minerals may consider a community newsletter distributed through these contacts.
James Dornan provided that Unity met with DPE last week, which is the first step in this process. Meeting with the CCC was the next step and now the company is looking for guidance from the CCC to distribute this information to the community. All other agencies are to be brought up to speed in the following week, and then the community.

David Lever asked whether Unity still has responsibility for environmental monitoring?

Yes, nothing has changed onsite, Unity has different owners and will continue to have information on the Unity website.

Andrew Rouse acknowledged Diversified Minerals is happy to hear concerns and how the community can be informed. He considers the change in ownership an opportunity to reengage with the community.

Paul Rouse noted the need to build a relationship with the community, stating Diversified Minerals would like to develop a mine without onsite final processing as well as engage local suppliers and workers.

Tom Wells provided that an advertisement in the local Fairfax media newspaper would be a good way to inform the community. He added that there is a lack of awareness around Dargues, particularly in the larger towns, and that some community members believe that the mine is no longer going ahead as the proposal for onsite processing has been withdrawn.

Tom Wells asked for an example on how Diversified Minerals exceeds minimum environmental requirements, referencing the company’s commitment to best industry practice?

Andrew Rouse provided an example regarding safety standards required in WA and noted that this standard is applied in all states. Diversified Minerals leverages off the experience of all their mine sites and standardize across all projects, this includes environmental requirements. Diversified Minerals certainly meets minimum standards and if practicably possible will work above them.

David Lever asked what factors Diversified Minerals was considering in looking for an offsite processor, and whether the company would consider safety or CO₂ emissions in this decision?

Andrew Rouse provided, Diversified Minerals will address all issues in looking for a location.

Peter Cormick raised that there is community tension regarding the impact of Modification 3 on existing conditions and commitments at Dargues. Adding, the community did not want to see the watering down of existing conditions.

The CCC members noted that information should be distributed to the community about Diversified Minerals and Unity sooner rather than later.

Presentation on sediment and erosion control

James Dornan provided a chart of June rainfall measurements onsite (Attachment 2). He stated the measurements are available online. Community members can log into the weather station online, which updates daily with measurements from the previous day in 15 minute intervals.
Dargues received approximately 180ml of rainfall in two days in June 2016, and its current systems are designed for 106.3ml. The water was managed so that none was discharged from the site using the current systems.

The sediment basin is one part of the sediment and erosion control system onsite, which includes:

1. Excluding water onsite
2. Stabilizing all surfaces onsite
3. Capturing water and maintaining sediment basins
4. Removing water

Between June 1 and 20, approximately 225ml of rainfall was received onsite.

A community member noted that this was less rainfall than lower down the catchment.

The Chair asked the CCC members whether there had been any local evidence of discharge from the site?

Belinda Royds noted that some community members have asked how the site managed with the rain, but she was not aware of any evidence of discharge.

James Dornan noted, Unity has not received any enquiries from agencies or the community.

Tom Wells provided that the creek water is already murky that it would be difficult to notice any change if there was a discharge from the site.

James Dornan noted, if sediment basins were to discharge, the water quality is equivalent to the water that is already in the creek.

A community member queried the response if the systems were at capacity?

Chris Corcoran noted that if the freshwater catchment dams were close to overflowing, water is pumped from these dams into the box cut, which can take more water than is currently there. The dam levels are always kept as low as possible, and if need be additional pumps can be mobilized to site.

James Dornan noted that the repair and maintenance of surface works will include the water management system.

Tom Wells pointed out that Modification 3 removes a number of commitments for erosion and sediment control, which are inadequately replaced by the Land and Environment Court condition 3(28).

James Dornan noted that Modification 3 contains a sediment and erosion control plan, and the currently approved water management plan contains all of the commitments

David Lever asked whether this reduction of the statement of commitments was being considered by PAC?

Yes, PAC will determine Modification 3 and DPE will provide PAC with draft conditions.

The Chair noted that DPE understands the community’s position on water management at Dargues.
**AEMR meeting update**

The Annual Environmental Management Report meeting was attended by representatives from EPA, DRE, DPE, and Unity Mining.

The meeting is an annual meeting of all agencies on site regarding the Report, which is available online.

The agencies brought two issues to Unity’s attention.

1. Signage on topsoil stockpiles
   a. Even though the stockpiles are outside areas of active operation they need to be signed. This has been completed.

2. Caps missing on old exploration drill holes
   a. Unity is currently surveying all drill holes onsite. They are about halfway through the process of checking all drill holes.

A community member asked were only two matters identified?

Yes.

James Dornan met with Katrina O’Reilly from DPE’s compliance team regarding the compliance notice issued, which was discussed at the last CCC meeting.

He provided that as a result of this meeting, DPE is happy with where Unity is at regarding compliance at Dargues.

Unity is still in discussion with OEH regarding biodiversity monitoring. The company believes there are better way to address this requirement, and they are currently waiting for response from OEH.

**Matters which community representatives wish to raise with Unity Mining**

A community member asked whether Diversified Minerals have a sense of when work would commence on site?

Andrew Rouse provided, not at this point but it is intended to be within 2017. There will be a gradual increase in activity over time taking care of surface infrastructure towards this time.

Tom Wells noted that the Knight Piesold fact sheet provided in the previous meeting did not address the original contention he raised regarding the Mt Polley TSF and queried whether Knight Piesold was still engaged by Unity. A document regarding the Mt Polley TSF and Knight Piesold was tabled at the meeting (Attachment 3).

James Dornan noted Knight Piesold is recognized as one of the best TSF engineering company in the world and that they have produced high quality work for Australian projects. He added that Knight Piesold have had a significant association at Dargues and that he believes changing engineers would be detrimental.
Tom Wells added this is something to consider, and that either way he considers the site inappropriate for a mine.

David Lever asked whether Diversified Minerals will accept PAC decision regardless of the result, and whether there is an intention to modify Modification 3 at this stage? He added, will further changes be made by a Modification 4?

Andrew Rouse provided that Diversified Minerals will accept the PAC decision, and at this stage there were no changes proposed.

In response to a question from a CCC member, Andrew Rouse stated he is a mining engineer and Paul Rouse is a registered miner.

**Matters which Unity Mining wishes to raise with the community representatives**

James Dornan noted he followed up claims made against Unity at the last CCC meeting regarding complaints made to the EPA, DPE, and DRE. He noted that no complaints had been received by these agencies regarding Dargues. DPE did receive enquiries about the drilling conducted, but DPE were kept informed about the activity by Unity. As a result, James Dornan has provided the Chair with correspondence regarding discussions and he maintains the position in the minutes.

The Chair noted he had offered to sight correspondence as raised by Jackie French. This has not been put forward to date, and as such the Chair does not have an evidence base for the claims.

**Other business**

In response to a question from a community member, the Chair noted the submissions received by DPE on revised CCC guidelines, which the Dargues CCC provided a submission on, had all been considered. He added DPE are close to issuing final guidelines and that concerns with the revised guidelines have been seriously considered.

In response to the matter of having an environmental group representative member, the Chair noted that the outcome of the PAC decision will provide an opportunity to look at the composition of the Dargues CCC membership.

Belinda Royds noted that communication of the purpose of CCC meetings should be included in the distribution of the standard agenda.

**Next Meeting**

The Chair stated an additional meeting may be held for Unity to present the outcome of the PAC decision.

The Chair provided the below dates as tentative days for future meetings.

- Tuesday, 20 September 2016
- Tuesday, 13 December 2016
The Chair will negotiate the dates and times between meetings, and will endeavor to give at least 10 working days’ notice if any additional meetings are to be held.

These minutes are endorsed by

Brian Elton

Independent Chairperson

Dargues Reef Community Consultative Committee
Dargues Gold Mine
Community Consultative Committee Meeting

21 June 2016
Diversified Minerals – Who are we?

• Diversified Minerals, a family owned company.
  • Was originally formed in 2014 for the purpose of investing in the mining industry and identifying business opportunities that complement our core associated businesses.

• PYBAR, an associate of Diversified Minerals, has been in operation since 1993.
  • has operations at a number of sites across New South Wales, Australia and internationally.
  • Business within the PYBAR Group include PYBAR Mining Services, HMR Drilling Services, JTMEC Mining Electrical, PJL Group Mine Equipment Maintenance.
Diversified Minerals – Our intentions?

• Develop the Dargues Gold Mine consistent with the way we run our other businesses.
  • Safety
  • Service
  • Respect
  • Results
• Employ locally where possible.
• Engage with local suppliers.
• Become a part of the community
• Operate in an environmentally conscious manner.
• Keep the community informed and part of the process.
Diversified Minerals – Where to from here?

• Planning
  • Develop a plan for bringing the Dargues Gold Mine into production.
  • Finalise the secondary processing route for the gold concentrate.
    • The use of Cyanide at the Dargues Gold Mine is not being considered.

• Care and maintenance
  • To continue in the interim.
  • Some repairs and development of surface infrastructure to be undertaken.
Questions?
Knight Piézold’s Complicity in the Mt Polley Disaster: An Introduction

- The ‘Knight Piézold fact sheet’ distributed at the last meeting (15_03_2016) does not address my original contention that KP failed to properly assess the geological foundations on which the Mt Polley TSF was built.

- The Knight Piézold disclaimer refers only to the steepening of perimeter embankments and the increasing of supernant pond volume, both of which occurred after KP’s withdrawal from the project.

- It fails to mention the soft layer of glaciolacustrine (also known as GLU or glacial till), underlying the site of the breach for millennia, into which a section of the perimeter embankment suddenly sunk by approximately 5 meters in the early hours of August 4, 2014 (MEM report, p. 158), causing the facility to overtop and rupture.

- Neither investigation cited in the Knight Piézold fact sheet (the Independent Expert Investigation and Review, and the Ministry of Energy and Mines Investigation), vindicates Knight Piézold. Rather they testify to Knight Piézold’s negligence by demonstrating that the root cause of failure was in the original TSF design, namely its failure to take into account the nature of the ground on which it was built.

- Independent Review Panel:


- The reports show that also show that the overly steep embankment would not have collapsed had it not been built on a layer of geological jelly, whose depth and weakness Knight Piézold failed to detect or disclose, and on top of which they chose to build the tailings storage facility from which they would profit as engineers on record for 20 years.

- The ‘KP fact sheet’ claims that the increase in supernant pond volume (water and tailings in the TSF), after their withdrawal from the project, and its proximity to the embankments was a ‘key contributing factor to the erosive development of the breach,’ (KP fact sheet, p. 2). But this is disproved by both investigations. The Independent Review Panel concluded that ‘there was no evidence that the failure was due to […] overtopping of the perimeter embankments and that piping and cracking, which is often the cause of the failure of earth dams, was not the cause of the breach,’ (IRP Media Release, January 30, 2015). Likewise, the Ministry of Energy and Mines states that ‘the stability of the embankment with regard to foundation failure would not have been affected by piping caused by internal erosion of the core,’ (MEM Summary of Opinions, August 2015, p. 119).

- The Independent Panel use the metaphor of a loaded gun to describe Knight Piézold’s TSF before subsequent engineers (AMEC) allowed the embankment to be raised at too steep an angle. If I leave a loaded gun on a table, between men who profit from its use, and I walk out the door, am I innocent when someone is killed?
- The independent panel’s report shows that the site’s natural foundations were not adequately assessed before, during, or after the construction of the TSF. The responsibility for which must fall to both the mining company, Imperial Metals, and their engineering consultants, Knight Piésold, who selected the site, designed the TSF, and oversaw its construction and its first two decades of use.

-Knight Piésold accepted the contract from Imperial Metals to build an enormous TSF, which they endearingly call ‘tailings ponds’, to store tens of millions of cubic meters of toxic waste, where the ground was unstable and where the environmental consequences of failure would be of terrible magnitude (destroying Hazeltine Creek, fouling Quesnel Lake, ‘the cleanest deepwater lake in the world’, and contaminating hundreds of kilometres of freshwater systems with a reeking grey slurry teeming with heavy metals). That they withdrew from the project over twenty years later, when they became anxious about a catastrophe, (‘kp fact sheet’), does not vindicate them. Their complicity is implied ad nauseum by the results of the Mt Polley Review Panel’s report, and stated explicitly in the subsequent investigation by the Ministry of Energy and Mines. Why Knight Piésold is not subject to prosecution is a mystery deserving of its own investigation.

- KP predictably states that it is ‘confident that its designs for each stage of the Mount Polley TSF were appropriate.’ (KP fact sheet, p.2). This flies in the face of the evidence presented in both official investigations which show that the fatal flaw, the glaciolucustrine layer, was present throughout the entire development.

- The obvious must be stated: The site was not appropriate for the establishment of a tailings storage facility due to the weakness of the foundation. Let alone the ecological sensitivity, human importance, or former beauty of the freshwater systems and riparian corridors downstream.

- why this matters:
  a) Trust: Unity Mining intends to entrust our water, along with our health and livelihoods, to the designs of a company that summarily failed to protect the water, people, and habitats of British Columbia in the course of turning its profits. This is irresponsible on Unity’s behalf, for this trust is undeserved.

  b) Ethics: We (Australia) should not supply contracts to a company that, along with Imperial Metals, were responsible for one of the worst environmental disasters of our time. Especially not when they remain in a state of complete denial over their involvement. They have contributed nothing to rehabilitation of the Quesnel Lake or the riparian corridor upstream or downstream, and offered nothing in the way of compensation to landholders whose property is worthless and whose water is tainted for the foreseeable and unforeseeable future.

-As of December 18, 2015, nobody had been held to legal account for the Mt Polley disaster by the government of British Columbia. No charges, no fines, no jail time. If we based our own conclusions on the environmental justice system of British Columbia, we must assume that this entirely preventable, man-made disaster was the fault of the earth itself.

-Knight Piésold has neither accepted nor been imposed one ounce of responsibility, despite rigorous investigations pointing directly at their oversights. To my knowledge, they have done nothing for the fouled Quesnel Lake or River, paid nothing towards the fiction of rehabilitation, and offered nothing by way of compensation to the people of Likely. They have borne no consequence, and heeded no lesson. They deserve neither our trust, nor Australian business. Yet Unity Mining intends to entrust our river, our water, our national park, our ecosystems and livelihoods, along with the
value of our homes, to the designs of this very company. Not in my name, not in the name of the
downstream community whose overwhelming majority is ignored, but in the name of temporary
profit to be made and spent elsewhere, leaving only tailings to the Araluen Valley, to be suspended
in perpetual uncertainty above our homes.

A re-cap on the spill itself...

Extract from *Letter in Defence of the Deua River, its Ecosystem, and its People*
Tom Wells
August 26, 2015 (edited June 21, 2016)

The Reality of a Tailings Storage Facility Failure: The Mt Polley Disaster, Canada

I was witness to the immediate effects of the Mt Polley tailings spill of August 4, 2014, as seen
from a commercial rafting expedition entering the Fraser River days after catastrophic failure of the
Tailings Storage Facility engineered by Knight Piésold and owned and operated by Imperial Metals.
I will therefore give my own testimony as to the immediate consequences, as observed with my
own senses.

The Mighty Fraser River is the main artery of British Columbia, uniting the collective water of
thousands of tributaries and escorting them to the Salish Sea at the metropolis of Vancouver. I’d
rafted, kayaked, and swum in the Fraser hundreds of times before, and although brown with silt and
the combined shades of its myriad waters, and although cattle farms dot its drainage, it was free
from pollution detectable to human senses. The Fraser’s immense volume (100,000 – 300,000 cubic
feet [or 2,830 – 11,326 cubic meters] per second at normal flows) was its coping mechanism against
contaminants, and until that August it had supported a healthy salmon run every autumn. The
Fraser’s salmon stock is one of the largest in North America, and has supplied bands of First
Nations (indigenous Canadian) people for millennia. Their dependency on fishing the Fraser and its
tributaries continues to this day. Bald and golden eagles, osprey, black and grizzly bears, also live or
die by the health and numbers of the Fraser’s salmon.

When our expedition met the Fraser via at its confluence with the Chilcotin (some 200 river
kilometres downstream of the Mt Polley tailings facility), we’d been on-river and isolated from all
outside contact for five days. I didn’t know the Mt Polley Tailings Storage Facility existed, but my
ignorance had no bearing on its burst embankment or the 14.5 million cubic metres of the toxic
slurry spilling into the formerly pristine Quesnel Lake and its drainage, the wild, crystalline Quesnel
River. The flood of effluent, containing concentrated levels of arsenic, lead, nickel, and other heavy
metals (many of which will be present in the Tailings Storage Facility planned for the Dargues
Mine), coursed through the Quesnel River’s 50-odd kilometres and joined the Fraser some 150km
upstream of our location. It was teeming under our rafts. Although the cause was unknown to me at
the time, I didn’t need a governmental water analysis or belated disaster declaration to tell me that
something was very wrong. The moment we entered the Fraser, an unfamiliar, septic waft invaded
my nostrils. It smelled like an infected wound, singed the throat like bile, and left a yellow-green
foam spinning in eddies. When we reached our take-out, we lifted the rafts from the water and
discovered a film of green mucus clinging to their undersides.
The Fraser was flowing at well over 100,000 cubic feet per second that day (well over 3,500 cubic meters per second – Water Office: Hydrometric Data). And yet the dilution was insufficient even to mask the effluent from my own unaided senses. The Deua River, by comparison, flows through the Deua National Park at a mere few hundred cubic feet per second. During dry periods, it barely flows at all. It has negligible power of dilution for an industrial scale spill of any waste material. Furthermore, when Dargues TSF reaches its 900,000 tonne capacity, the proportion of tailings to Deua riverwater would be more than 20 times greater than the proportion of spilled Mt Polley tailings solution (14.5mt) to Fraser riverwater.

As we loaded the reeking rafts into the trailer, the Fraser salmon run was just beginning. First Nations People fished from the shores. Black bears were on their way to the riverside too, looking for an early salmon. Eagles and osprey circled overhead, awaiting their catch. The entire food chain was contaminated.

The effects upstream were apocalyptic. Hazeltine Creek, which bore the immediate outflow, was inundated with a grey-brown sludge so voluminous that it tore trees from the earth and carved the creekbed into new dimensions. The Quesnel Lake below, ‘the cleanest deep water lake in the world’ (Wiki: Mt Polley Disaster) became the tailings storage facility, and the Quesnel River its overflow gutter. Ground zero is permanently disfigured, and the chemical fallout could last centuries or millennia. The salmon run, along with all aquatic life, were decimated. The value of houses and property in the region plummeted, tourism ceased, and the local community drank water from plastic bottles. Early estimates regarding the cost of ‘clean-up’, supposing such a thing were actually possible, were as high as $500 million, with current estimates reaching $1 billion (The Wilderness Committee). Imperial Metals had bonded only $14.5 million against environmental damages (Vancouver Observer).

The ‘bottom line’, irrespective of the environmental tragedy: the mine will cost more to the community, and the nation, that it ever has, or ever will, contribute over its lifetime.

An update of the effects of the Mt Polley disaster one year on (August 2015), can be found here: (The Wilderness Committee: Mt Polley one year on).

First Denial of Accountability: Knight Piésold
August 8, 2014 (4 days after the disaster)

Statement by Knight Piésold Ltd. regarding the Mount Polley Mining Incident
August 8, 2014, Vancouver, British Columbia – The breach of the tailings storage facility at Mount Polley is an extremely unfortunate incident and Knight Piésold Ltd. shares the concerns with respect to the effects to local communities, First Nations and the environment.

Going forward, there will be a comprehensive examination of this incident and there will be questions about the engineering and design of the tailings storage facility. As the former Engineer
of Record of the tailings storage facility at Mount Polley, we feel it appropriate to provide some clarity and transparency of the role of Knight Piésold Ltd.

Knight Piésold Ltd. informed Imperial Metals that we would not continue as the Engineer of Record for the Mount Polley Mine on February 10, 2011, and subsequently ceased to perform that role. During the time we acted as Engineer of Record, the tailings storage facility at Mount Polley operated safely and as it was designed. A third party Review Panel provided independent review of the tailings impoundment design during initial construction and permitting during 1995 to 1997. In 2006, while we were Engineer of Record, an Independent Third Party Dam Safety Review by AMEC* Earth and Environmental confirmed that the three embankments were well-designed and well-constructed entities from a dam safety perspective.

Since February 10, 2011, Knight Piésold Ltd. has not had any responsibility or knowledge of any aspects of the design, modifications or performance monitoring of the tailings storage facility at Mount Polley. The original engineering done by Knight Piésold Ltd. accommodated a significantly lower water volume than the tailings storage facility reportedly held at the time of the breach. Significant engineering and design changes were made subsequent to our involvement, such that the tailings storage facility can no longer be considered a Knight Piésold Ltd. design.

Upon completing all assignments as the Engineer of Record in 2010, Knight Piésold Ltd. wrote to Mount Polley Mining Corporation and to the Government of British Columbia’s Chief Inspector of Mines and stated that “the embankments and the overall tailings impoundment are getting large and it is extremely important that they be monitored, constructed and operated properly to prevent problems in the future.” (See letter dated February 10, 2011). A formal handover of design, construction and monitoring responsibilities was conducted on March 8, 2011 when AMEC* Earth and Environmental was acknowledged as the new Engineer of Record for all future work at the Mount Polley tailings storage facility.

Knight Piésold Ltd. is not familiar with, and therefore cannot comment on, the details of the incident, or on the design, construction, operations, water management practices or any other aspects of the Mount Polley tailings storage facility.

Knight Piésold is an international consulting group providing engineering and environmental services for the mining, power, water, transportation and construction sectors. With offices around the globe, our team of over 800 experienced professionals delivers high quality specialized services and innovative solutions that respect social, environmental and economic responsibilities.

Second Denial of Accountability: Knight Piésold
September 22, 2015
(See ‘Knight Piésold Fact sheet, appended to Dargues CCC minutes 15_03_2016)
Extract from *Modification 3: Impacts on Species*

Tom Wells  
April 18, 2016

The failed Mt Polley TSF was designed by Knight Piésold, the engineering firm contracted by Unity Mining to design the TSF near Majors Creek. It is Knight Piésold’s design upon which the security of the Eurobodalla Shire’s most important freshwater source will largely depend if the mine is allowed to proceed (i.e., if Modification 3 is approved).

**Knight Piésold was Complicit in the Mt Polley Disaster:** In addition to designing the Mt Polley TSF, Knight Piésold were also the engineers on record from 1989 to 2011. They began withdrawing from the project in 2010, when ‘the embankments and overall tailings impoundment [were] getting large’, (Knight Piésold Fact Sheet: Mt Polley Tailings Storage Facility, 2015).

Knight Piésold denies all responsibility for the disaster of August 4, 2014. They blame subsequent engineers (AMEC), claiming that they raised the wall embankment at too steep an angle (1.3 Horizontal: 1 Vertical, compared to Knight Piésold’s 2H:1V – Knight Piésold Fact Sheet). While the over-steepness of the walls is acknowledged as a factor by the official *Mt Polley Independent Expert Investigation and Review Panel*, they concluded that the underlying cause was actually ‘foundational failure’, without which the over-steep wall would have continued to stand (at least for a time).

A separate *investigation by the Ministry of Energy and Mines* confirms that foundational weakness was the underlying cause of the collapse: ‘The mechanism of failure was the embankment sliding on a weak layer of clay located approximately 10m deep in the foundation of the dam... the dam slumped (dropped in elevation) approximately 5m, which led to overtopping and erosion of the dam,’ (p. 158).

Knight Piésold continue to deny any responsibility whatsoever despite their documented and apparent failure (detailed in the MEM report on pages 20-21, 43-45, and 139) to properly assess the geological foundations of the facility throughout their involvement, namely the depth and nature of a soft layer of *glaciolacustrine* (also referred to as GLU or glacial till). ‘A root cause of the failure was an inadequate interpretation of the foundation geology, which was influenced by an inadequate site characterisation... the glacial history of the dam foundation was not adequately understood.’ (MEM, p. 158). In other words, no Tailings Storage Facility should ever have been built on Mt Polley.

Knight Piésold cannot learn from what they deny, and we should expect no better from them here. Indeed, Dr Beck of GHD identifies a similar negligence in their assessment of the Dargues foundations: ‘While some investigations were undertaken as part of the original approval there was no detailed soil property assessment [...] Further the Knight Piésold report 2015, clearly states that the TSF soil liner design was based on assumed rather than measured soil properties,’ *(GHD, Proposed Dargues Reef Mine, Modification 3: Comments on Response by Proponent, p. 10).*
Knight Piésold’s Complicity in the Mt Polley Disaster: Investigation Extracts

The extracts below are from the Independent Review Panel and Ministry of Energy and Mines Investigations. They demonstrate that design oversights (referring to the original design) were the principle cause for the collapse of a section of the perimeter embankment on August 4, 2014. Note that although the Panel prefers not to refer to ‘the designer’ by name, the company in question is Knight Piésold.

The investigations also show that the first cause of failure cited by Knight Piésold in their ‘fact sheet’ (Dargues CCC meeting 19, appendices), namely the raising of the perimeter of the wall at too steep an angle after KP’s departure from the project, was a secondary and compounding factor, a ‘trigger’ to an already ‘loaded gun’. The concurrent increase in supernant pond volume (water and tailings), cited by KP as ‘contributing to the erosive development of the breach’, is shown by the investigations not to have affected dam integrity. There is no evidence that the process of liquid penetration into the embankment, also known as ‘piping and cracking’, was a factor in the breach. Further, the investigations show that no number of third-party dam safety reviews (such as those mentioned by KP in their statement of August 8, 2014) could have been expected to detect the ‘hidden flaw’ of foundational weakness as they are not of the scope to drill for subterranean soil samples. It was Knight Piésold’s responsibility as the engineers immediately responsible for design an oversight of the facility to drill, collect, and analyse samples in order to establish the strength of their foundations, or lack thereof.

Official Investigation 1: Independent Review Panel
Report on Mt Polley Tailings Breach
January 30, 2015

6.5 CAUSES OF FAILURE (p. 105)

[...]

“The dominant contribution to the failure resides in its design. The design did not take into account the complexity of the sub-glacial and pre-glacial geological environment associated with the Perimeter Embankment foundation. As a result, foundation investigations and associated site characterization failed to identify a continuous GLU layer in the vicinity of the breach and to recognize that it would be disposed to undrained failure when subjected to the stresses associated with the Dam.

At the time of Stage 4 (2006 – 2007), Knight Piésold (KP) had proposed a design for the Perimeter Embankment with a 2H:1V downstream slope and raises of the core and filter with a parallel inclined alignment to El.965 m. This design has been projected in Figure 6.5.1 to the core elevation at the time of failure (El.969 m), and adopting an undrained strength ratio of 0.27 and a high water table, the calculated FS is 1.02. At El.965 m, the FS is 1.04, much less than the design target of 1.3. Based on the back-calculated undrained strength ratio, the design was doomed to fail [my emphasis].”
10.1 MECHANISM OF FAILURE (p. 135)

"The breach of the Perimeter Embankment on August 4, 2014 was caused by shear failure of dam foundation materials when the loading imposed by the dam exceeded the capacity of these materials to sustain it. The failure occurred rapidly and without precursors.

Direct evidence of this failure mechanism is provided by an identified shear surface in surviving remnants of the dam core and by deformations consistent with shearing in a weaker glacially-deposited layer of silt and clay about 8–10 metres (m) below the original ground surface. This layer, its properties, and its extent received intense scrutiny during this investigation, and analyses using representative parameters provide indirect evidence that further supports this failure mechanism.

Deposited in a complex geologic environment, the weaker glaciolacustrine layer was localized to the breach area. It went undetected, in part because the subsurface investigations were not tailored to the degree of this complexity. But neither was it ever targeted for investigation because the nature of its strength behaviour was not appreciated.

Throughout, the design investigations took note of the stiff, dense character of foundation soils and used corresponding strength properties in stability analyses. But it was not recognized that this character would change, with a corresponding change in strength behaviour under the increased loading as the dam grew higher. Specifically, it was never recognized that the glaciolacustrine soils that were initially overconsolidated would become normally consolidated, requiring undrained shear strengths for stability analyses. This is the process that affected the weaker glaciolacustrine layer in the breach area that was not accounted for in the design of the dam.

Adding to the antecedent foundation conditions was the unprecedented steepness of the 1.3H:1V Perimeter Embankment slope. This was justified by design analyses without questioning its reasonableness. The higher Main Embankment had glaciolacustrine foundation soils with properties broadly comparable to those at the breach section. But here, the steep slopes were effectively flattened by the addition of a buttress, which explains why the failure did not occur at the highest part of the dam."

Official Investigation 2: Ministry of Energy and Mines
Summary of Opinion in Support of CIM Investigation
August 24, 2015
http://mssi.nrs.gov.bc.ca/1_CIMMountPolley/Appendix3.pdf
(See attachment: MEM Conclusions)

Knight Piésold’s Complicity in the Mt Polley Disaster: Media Appendices

News & other snippets summarizing the results of the mt polley Independent Review Panel, showing consensus in the interpretation that the original design of the TSF (by Knight Piésold) failed to take into account the nature of the foundations, and that this was the root cause of the disaster of August 4, 2014.
Knight Piésold, Ltd., the engineering firm that designed the Mount Polley mine tailings dam that collapsed last August in British Columbia, failed to properly analyze the strength of the dam’s foundation when it designed the tailings facility, a provincial-sponsored report released Friday concludes.

[...] The Independent Expert Engineering Investigation and Review Panel Report on the Mount Polley Tailings Storage Facility Breach “concluded that the dominant contribution to the failure resides in the design,” according to a media briefing.

Knight Piésold’s design did not account for the presence of a glacial lake deposit beneath the tailings dam foundation, the Vancouver Sun reported.

Knight Piésold has not responded to numerous calls from the media seeking comment, nor has the company posted anything on its website as of Tuesday. The company issued a statement four days after the Aug. 4 collapse of the Mount Polley dam stating that it had turned over all responsibility for the dam in 2011 to AMEC Earth and Environmental.

[...] In Canada, Reuters is reporting the British Columbia government probe found that the breach at Imperial Metal’s Mount Polley mine, which sent billions of gallons of wastewater and sludge into waterways, happened because the dam’s weight was too much for the foundation to bear.

“The design did not take into account the complexity of the sub-glacial and pre-glacial geological environment associated with the perimeter embankment foundation,” the panel’s chair, Norbert Morgenstern, said after the 5-1/2-month investigation.

Morgenstern said design flaws created a “loaded gun” and the construction of the steep dam perimeter embankment slopes “pulled the trigger.”

A second report from B.C.’s chief inspector of mines will look at who should take the blame for the massive breach, but Jack Caldwell, a leading North American expert in the field of tailings dams, told the CBC that it’s clear that key questions remain unanswered.

Caldwell, who has more than 40 years’ experience, questions why the tailings pond was built atop unstable ground in the first place [my emphasis] — and indicated a perfect storm of little problems led to the massive breach at Mount Polley.

The Toronto Globe and Mail posted a timeline of key actions at Mount Polley that shows engineers knew the tailings dam was being constructed in an area where unstable post-glacial soils were present. Knight Piésold stated the softer deposits were isolated and would not affect dam stability.
Media Source 2: Mining.com

*Failure Resides in the Design: Mt Polley Review Panel*
January 30, 2015

Mount Polley's tailing dam failed *because of design failures*, wrote the government appointed panel that released its findings today.

*The panel said that "... there was no evidence that the failure was due to human intervention or overtopping of the perimeter embankments and that piping and cracking, which is often the cause of the failure of earth dams, was not the cause of the breach."*

Rather it was design failures that were the main cause:

"The breach of the Perimeter Embankment on August 4, 2014 was caused by shear failure of dam foundation materials when the loading imposed by the dam exceeded the capacity of these materials to sustain it. [...]"

*Deposited in a complex geologic environment, the weaker glaciolacustrine layer was localized to the breach area. It went undetected, in part because the subsurface investigations were not tailored to the degree of this complexity. But neither was it ever targeted for investigation because the nature of its strength behaviour was not appreciated."* *(quoted from the Independent Review Panel)*

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Media Source 3: The Globe and Mail

*B.C. conservation officers raid two sites in Mount Polley investigation*

February 4, 2015

The report, released last Friday, found the design of the tailings pond dam failed to address the unstable foundation on which it sat, a flaw that was compounded over the many years the dam was repeatedly raised.

[...]

Ms. Louie [of the Williams Lake Indian Band] said the spill has raised concerns about a nearby spawning creek and future salmon runs. Given the size of the spill, and the foundational issues identified in the report, she said it was difficult to imagine the mine reopening.

"The tailings storage facility sits on a glacial underground, like a stream. So who's to say whether or not it will occur again," she said.

[...]

The province has said it will require all operating mines with tailings facilities to provide a letter by the end of June that confirms their foundation is sound. It has said it will also require operating mines with tailings facilities to establish independent tailings dam review boards.
Media Source 3 (b): The Globe and Mail
Timeline from report of events that lead to Mount Polley Breach
January 30, 2015

1997-1998

Glaciolacustrine (GLU) fine sands, silts, and clays were observed in the main embankment foundation and established to be steady under pressure during the construction. (The embankment was one of three that made up the dam.)

1998-2000

Construction on the main embankment differed from the original design, and configurations were not in accordance with the stability analysis of the original design.

2000-2001

Each of the three dam embankments were to be constructed with a different material, but the Mount Polley Mining Corporation requested approval to use rockfill in all of them.

2001 to 2005

Mine operations were suspended for economic reasons

2005-2006

Renewed construction prompted questions from the Ministry of Energy and Mines about the effects of softer GLU foundation materials downstream on dam stability. Engineering consultant Knight Piésold confirmed the GLU deposits were isolated and would not affect dam stability.

2006-2007

A slope was placed at a steeper inclination than planned because of a delay in the delivery of construction material. A plan to rectify the steep slopes was never carried out.

2007-2011

Complications slowed the raising process. The main embankment buttress was not constructed as designed, turning out to be five metres below its design height and short of its design extent. A strength analysis was performed, and Knight Piésold concluded the embankment would remain stable. A tension crack appeared in 2010.

2011-2012

The 2011 geotechnical site investigation concluded GLU was not of concern.

2012-2013
Reducing the steep slope was deferred until the completion of the entire dam. The 2011 investigation showed the GLU went deeper than previously thought, but stability tests in 2012 did not take the material into account in all three embankments.

2013-2014

During the next months, water continued to rise in the dam. For years, the company managed to stay one step ahead of it by raising the dam, but on May 24, 2014, a small amount overflowed. The breach happened before a plan to add a new buttress to the perimeter embankment could be completed.

Media Source 3 (c): The Globe and Mail

*Mt Polley Spill Taints Alaska-BC Mine Relations*

February 1, 2015


The report, by an independent panel of geotechnical experts appointed by the B.C. government, found the tailings dam at Mount Polley collapsed because it had been built on a foundation that contained a layer of glacial till (fine sediment deposited by a glacier), which hadn’t been accounted for in the original engineering plan. As the dam grew higher to contain a growing amount of mine sludge, it increased pressure on the foundation until, after 18 years of safe operation, it suddenly gave way, releasing a flood of 10 million cubic metres of water and 4.5 million cubic metres of fine sand [tailings].

Media Source 4: Professional Engineers an Geoscientists of BC

*Mt Polley Geotechnical Report Released*

January 30, 2015

https://www.apeg.bc.ca/News/News-Releases/Mount-Polley-Geotechnical-Report-Released

The panel concluded that evidence indicates the breach was the result of a failure in the foundation of the embankment, a failure that occurred in a glaciolacustrine (GLU) layer of the embankment’s foundation.

[...]

The recommendation addressing professional practice states: “Encourage the Association of Professional Engineers and Geoscientists of BC (APEGBC) to develop guidelines that would lead to improved site characteristics for tailings dams with respect to the geological, geomorphological, hydrogeological, and possible seismotectonic characteristics.”
An independent investigation has determined the breach of the Mount Polley mine tailings dam in B.C. was caused by a failure to detect a weak layer in its foundation, likening the massive embankment to a "loaded gun."

The report, which was released on Friday morning in Victoria, said the design failed to take into account the complexity of the instability of underlying glacial and pre-glacial layers under the retaining wall.

The Mount Polley crisis was a long time coming. A report on a breach last year of the tailings dam at the Mount Polley mine said the dam had raised incrementally to meet the requirements for upcoming years. A lack of long-term planning eventually contributed to a catastrophic dam failure, the report said.

A massive spill from a dam containing mine waste in British Columbia last year was caused by a flawed design for the embankment, which did not account for the presence of a glacial lake deposit at the foundation, an independent panel said on Friday.

The probe found that the breach at Imperial Metal's Mount Polley mine, which sent billions of gallons of wastewater and sludge into waterways, happened because the dam's weight was too much for the foundation to bear.

"We concluded the dominant contribution to the failure resides in the design," the panel's chair, Norbert Morgenstern, said after the 5-1/2-month investigation.

"The design did not take into account the complexity of the sub-glacial and pre-glacial geological environment associated with the perimeter embankment foundation."

The panel, appointed by the provincial government with the backing of two Aboriginal bands from the Mount Polley area, also found the collapse was triggered by the construction of a downstream rockfill zone at an overly steep slope.
...And on the lack of anyone being held to account (as of December 2015):

**Media Source 7: Desmog Canada**  
**No Fines, No Charges Laid for the Mt Polley Mine Disaster**  
December 18, 2015  

"How can so many things be done so poorly, sloppily or haphazardly and result in massive damage without someone being 'at fault?'" Ugo Lapoint, Canadian program manager with MiningWatch Canada, stated in a press release. [...] 'This was not an Act of God.'

**Personal Conclusions**

For consideration by all concerned with the Dargues Gold Mine.

In sum, two major investigations identify foundational failure as the root cause of the Mt Polley disaster. Knight Piesold designed and oversaw the construction and first 20 years' use of 4-square kilometre ‘pond’ for tailings storage, despite the location being inappropriate due to (a) pre-existing geology, namely the presence of soft glacial till or glaciolacustrine beneath the perimeter embankment, and (b): the human importance and ecological sensitivity of downstream catchments and corridors.

It is my understanding and belief that KP was negligent in (at least) the following ways:

1. Developing a tailing storage facility upstream of precious freshwater sources and habitats, including Hazeltine Creek, Quesnel Lake, Quesnel River, and the Fraser River. Together these systems – now polluted for the foreseeable future - comprise on of the most important salmon runs in North America, upon which indigenous people have survived and thrived for millennia, and continue to depend upon to this day. For a summary of the salmon’s importance to the affected areas, see the following article in the Globe and Mail of September 14, 2014:  

2. Failing to properly assess the layer of glaciolacustrine in the foundations, to establish its depth and strength characteristics, and to acknowledge that it would indeed compromise dam stability. Specifically, KP failed to: (a) drill deep enough for samples, (b) use proper drilling method for foundation investigations, (c) record the results of all laboratory testing of geological samples from around the perimeter (d) understand that the upper GLU layer would be subject to failure when compressed (see: MEM Report, p. 20-21, 43-45, 139).

3. Failing to illuminate crucial, albeit piecemeal information, concerning the possible weakness of the foundations to the subsequent engineers on record (AMEC), who proceeded to (recklessly) raise the embankment on the assumption that foundations were stable (MEM Report, p. 20-21,159).

Questions remain regarding the nature of KP’s negligence: were they truly unaware of the nature, depth and significance of the glacial till within the foundations? Or did they simply choose not to disclose, or act on, that particular danger, for the sake of maintaining the profitability of the facility, or pleading ignorance later? Why did they really begin withdrawing from the project in 2010?
10 CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

Mechanism of Failure

1. The mechanism of failure was embankment sliding on a weak clay layer located approximately 10 m depth in the foundation of the dam. The failure was initiated by the steep downstream slope, excavation at the toe and raising of the crest of the dam. These conditions induced an undrained shear response in the clay in the downstream toe of the dam, leading to progressive failure. The dam slumped (dropped in elevation) approximately 5 m, which led to overtopping and erosion of the dam. (KCB 2015).

The dam stability was positively influenced by an upstream drain, which was constructed upstream of the core zone of the dam to maintain a lower hydraulic head against the dam, in spite of a high pond water level. However, this was somewhat offset by the presence of confined glaciofluvial layers in the foundation, which confined the groundwater leading to increased pore water pressures in the foundation clay (KCB 2015).

2. The dam slump (failure) occurred at approximately 11:40 PM, August 3, 2015. Subsequently, the dam crest was eroded, with an acceleration of flow starting at approximately 12:50 AM August 4, 2015, and major flows and power loss at approximately 1:08 AM, August 4, 2014. The dam continued to erode overnight, with major erosion reducing until approximately noon on August 4, 2014.

Cause of the Failure

3. A root cause of the failure was an incomplete interpretation of the foundation geology, which was influenced by an inadequate site characterization. Until 2011, there was only one deep drill hole in the foundation of the PE, which is approximately 2 km long. Additionally, the drill hole was intended as geological condemnation holes and there was no geotechnical testing or collection of undisturbed samples. In 2011, geotechnical investigations included three drill hole locations. The drill holes were approximately 500 m apart and missed the upper clay layer (UGLU). In 2006 MEM noted the presence of the UGLU in a drill hole 140 m downstream of the breach area but the significance of this was discounted by both AMEC and KP as not being applicable to the dam footprint. The glacial history of the dam foundation was not adequately understood.

The interpretation of the geotechnical properties of the lower clay layer (LGLU) was appropriate and the dam would not have failed if the UGLU was not present. The planned implementation of a buttress and the use of the residual shear strength (BGC 2014) would have inherently accounted for an undrained strength response in the LGLU.

The use of the constructed 1.3H:1.0V slope was based on the inherent assumption that there was a high degree of certainty that the foundation soils were dense and strong. The site