Note that minutes are paraphrased to an extent and may not match actual statements exactly.

Project	Hydro Kurri Kurri site redevelopment project	From	Emily Rindfleish
Subject	Community Reference Group Meeting	Tel	1800 066 243
Venue/Date/Time	Thursday 19 October 2017 Hydro Aluminium Kurri Kurri 6.00pm – 8.00pm	Job No	2218982
Copies to	All committee members		
Attendees	Mr Andrew Walker – Hydro Kurri Kurri Project Manager Mr Richard Brown – Managing Director, Hydro Kurri Kurri Mrs Kerry Hallett – Hunter BEC Mr Kerry McNaughton – Environmental Officer, Hydro Kurri Kurri Mr Toby Thomas – Community representative Mr Bill Metcalfe – Community representative Mr Brad Wood – Community representative Mr Mark Roser – Strategic Planner, Maitland City Council Mr Gareth Curtis - Director of Planning and Environment, Cessnock City Council Mr Michael Ulph – CRG Chair, GHD Ms Emily Rindfleish – Minutes, GHD		
Guests/observers	Mrs Fiona Robinson – Ramboll Environ		
Apologies	Clr Arch Humphery – Maitland City Council Mr Alan Gray – Community representative Mr Rod Doherty – Kurri Kurri Business Chamber Clr Darrin Gray – Cessnock City Council Mr Martin Johnston – Manager Strategic Planning Manager, Cessnock City Council Ms Tara Dever – CEO Mindaribba Local Aboriginal Land Council Mr Ian Shillington – Manager Urban Growth, Maitland City Council		
Not present	Ms Debra Ford - Community representative		

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1 Welcome and Acknowledgement of Country

Meeting commenced at 6:00 pm

Michael Ulph (Chair)

Acknowledgement of country.

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2 Meeting agenda

- Welcome and meeting opening
- Apologies
- Acceptance of minutes from the last meeting
- Project update
- Capped Waste Stockpile options study
- CRG questions and answers
- CRG membership & Terms of Reference review
- All other business
- Next meeting / Meeting close

3 Welcome and meeting opening

Michael Ulph welcomes the committee and notes apologies.

Around the room introductions.

Provided draft guidelines in relation to pecuniary interest and discussed the need for people to indicate if they have a pecuniary interest (e.g. engaged to be there).

Michael Ulph: Is anyone in any doubt about having a conflict of interest in a meeting such as this and what it means? I will ask people to acknowledge if they have a conflict at all.

I will declare a conflict, my employer is paying for my attendance here tonight therefore I have an interest in being here. Would anybody else like to declare interest?

Michael Ulph and Emily Rindfleish as Hydro contracted staff declared interest.

Hydro staff as representatives of the owners of the land declared an interest.

4 Last meeting minutes

Michael Ulph requested a motion that the minutes be accepted as a true and correct record of the last meeting.

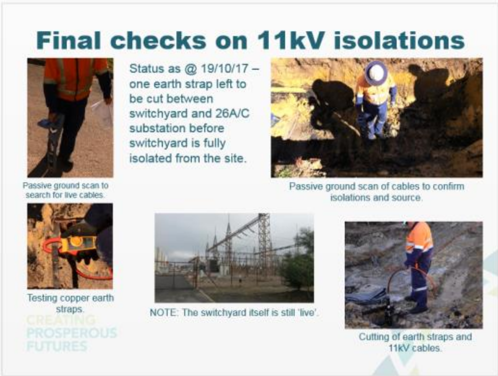
Moved: Toby Thomas
Seconded: Bill Metcalfe

5 Project update

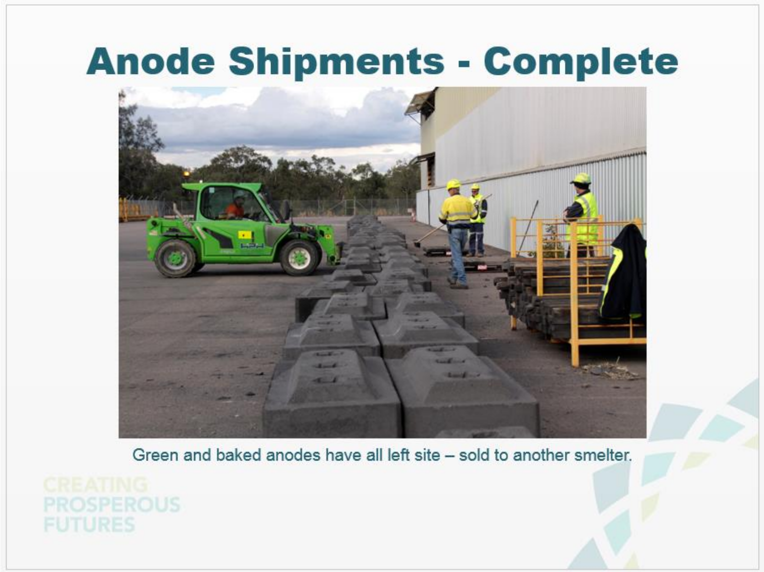
Andrew Walker:

Ran through agenda for the project update presentation.

Since the last meeting we've been continuing to check the isolation of the switch yard. We just have one earth strap left to cut between the switch yard and the substation which is the one powering these buildings but not effecting the demolition contractor. We are planning to do this in about three weeks time.



All the annodes have left site and we were able to sell them to a smelter in the Middle East, we just had to cover the cost of the transport. This included the green annodes and the black annodes.



We have cleaned up the fuel oil that was found remaining in the tank in this photo (*points to slide*). After we removed a valve during the asbestos removal works we thought the tank was empty but over summer during the hot months the oil oozed out. When it gets to a certain temperature it becomes fluid and it filled up the bunded area but nothing leaked out of the bund. Our guys removed the heating elements and then we flushed the tank with a little bit of diesel and then removed all the liquid and residue, cleaned up the bund and that went to a recycling plant at Kooragang Island. EPA waste tracking was undertaken for this. The tank is now in a state where the steel can be recycled and the concrete has been cleaned up.

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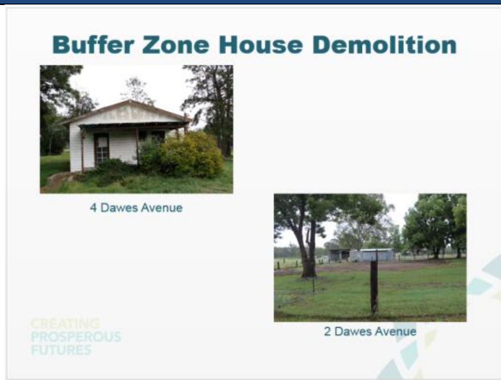
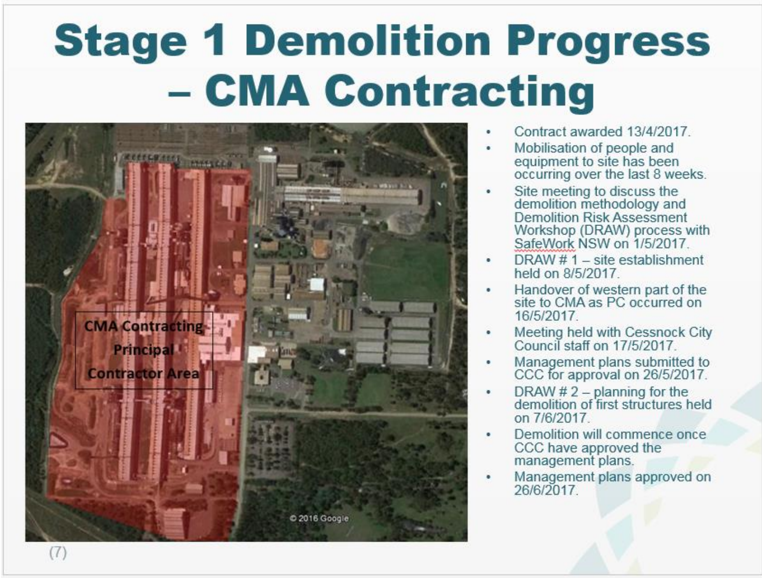
This week we are cleaning up the asbestos at this house (*points to slide*) and it will be demolished this week along with the shed and small outhouse on the block next to this.



Stage one demolition progress – we have handed over half the site (*points to red shaded area on slide*) to CMA contracting. They are currently working through removing the pot ring scrubbers, line 3 south, line 3 north, line 1&2 south and line 1&2 north. They have been working on this over the past few months. They will be moving over to the buildings (*points to buildings in shaded area*) in the next few weeks and then the cast house.



Andrew ran through a series of slides with photos of the Stage 1 demolition works that have been happening on the site over the past few months.

Points to slide – this shows the separation of the line 3 scrubber from the line 3 building where they have removed duct and an air side gantry and some of the infrastructure down the bottom.

Points to slide – this shows the scrubber tower fully removed and the preparation of the aluminous silo bucket elevator removal.

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Points to slide – these photos show the line 3 south alumina silo being demolished with a 160 tonne excavator. This first photo shows some cuts in the bucket elevator. The second photo shows the bucket elevator felled and being processed for scrap.

Points to slide – this shot is of the line 1 & 2 south scrubbers being demolished including fans and ductwork.

We knew there was some asbestos in the scrubber fan, so they have been very careful to mark this up with pink fluro paint (*points to slide*). The flanders will be oxy cut, wrapped in plastic and moved into the story shed so there is not contamination of the scrap.

Points to slide - The line 2 baghouse has been completely demolished and only the line 1 baghouse remains.

Points to slide - We have thousands and thousands of the pot ring scrubber bags which we are removing as soon as possible. There is a moxy on site that's been taking these down to the 7A furnace where we are storing any demolition waste that contains fluoride or PAHs.

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Points to slide - The contractor has been cutting busbar and leaving 100 mm at the top which will be cut by an excavator during demolition.

We have also been doing testing of substations. We knew the 3C Centre substation on the west side of line 3 had PCVs in the oil from the transformers. We undertook some testing with Ramboll Environ where we took samples of the concrete plints and scraped away any soil stained with oil. We removed all the visible oil but the levels in the soil were still around 2.1 to 2.2 ppm of PCVs and we have to be below 2.0 ppm. So we had to come back and do another round of scraping the soil. We ended up approximately 300 mm below the ground surface where we eventually got to 0 ppm. This has given us an indication of what we need to do so we will follow this procedure for the other substations as they become available. The contaminated soil material is being kept on black plastic in a storage shed where it will most likely be taken to Kemps Creek landfill in Sydney.

Toby: Why wouldn't we put this in the containment cell?

Andrew: We are not allowed to put this in our containment cell because there is a chemical control on PCVs contaminated soils so the cell isn't licensed to contain this material.

The oil that was removed from the transformers has gone to a recycling plant at Wagga which is licensed to treat PCV contaminated soils. Most of the transformers on site are PCV free but there were a few that contain PCVs.

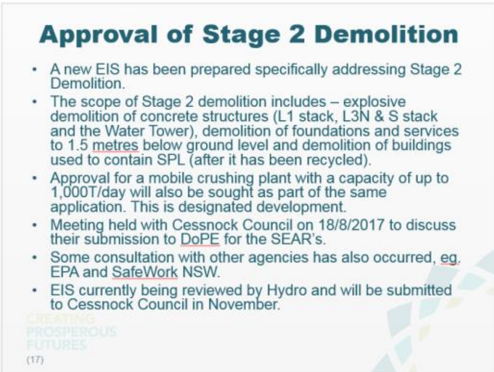
We are working through getting approval for stage 2 demolition. We had a meeting with Cessnock Council on the 18 August 2017 to go through their submission to the Department of Planning and Environment (DP&E) and the SEARs. There has also been some consultation with the EPA and Safework NSW.

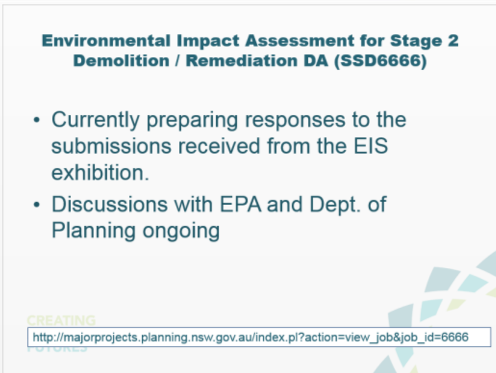
We are currently reviewing the draft EIS. Once we finish reviewing this we will finalise it and send to council before the end of November.

Andrew played a video of the demolition works undertaken over the past few months.

Bill: How many people have been working on the demolition?

Andrew: About 12 people.





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Michael: This video would be a bit confronting for some of the guys who have worked here for years and seeing it being demolished.

Gareth: was there any dust management for that Richard?

Richard: yes we had big water canons spraying the dust.

Gareth: was there any monitoring?

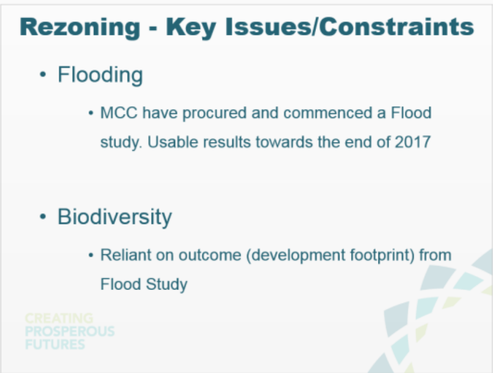
Kerry McNaughton: Yes monitoring is undertaken at 5 locations around the north and south east. The September results showed a slight increase in particulates but still well below the threshold of 4 ppm. We are currently sitting on about 1.5 ppm. If the results indicate that we are above we would investigate into this further.

Richard: We will bring along the dust monitoring results to each meeting from now on.

Michael: There was some discussion around the monitoring last meeting and is on page 12 of the notes.

Bill: It is heartbreaking to see it all being ripped down. How long did that take?

Andrew: They have been working on this since June so 4 months.



Richard: We are continuing to work with a number of recyclers to determine recycling options for SPL. We are currently drafting a recycling contract so that's a key indicator that we are getting close. Our ambitions are that we will commence the SPL recycling activities before the end of this year.

Bill: That's for both the first and the second cut?

Richard: yeah. The whole investigations are for both. It might be that one might precede the other or there abouts.

Mark as I understand it the flood study work is still undergoing, we are anticipating some usable information from that work late this year early next year which will start to inform the final footprint which flows into everything else on biodiversity offsetting and everything else.

We are continuing to work with a potential investor of the site. We are slowly but surely working our way towards an agreement with this potential purchaser. When this potential purchaser gets enough comfort to come off, I'm sure they will present themselves here. Really at that point the will probably become an integral part of the project that they will be joining us on a

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regular basis. So hopefully that's late this year or early next year all things being equal.	

6 Capped Waste Stockpile options study

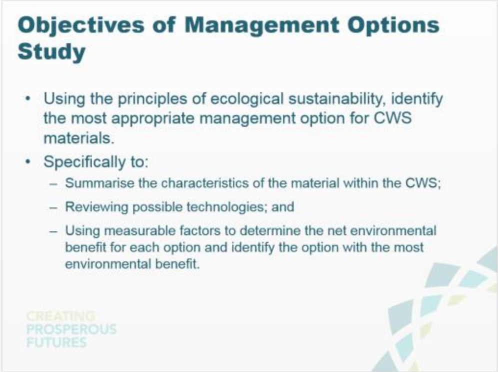
Michael: I would like to introduce Fiona. Fiona has been working on the project for a while now and works for Ramboll Environ who have been working on the EIA. Fiona has been working on the capped waste stockpile and will be speaking about that.

Richard: I just want to go back through some information to give everyone an overview of what's been going on. So this information was used to inform the response to submissions. The EPA felt that containment was an appropriate strategy for many of the materials but had some concerns around the regulation of the capped waste stockpile and how that would be regulated under current legislation. So they have said that there are mechanisms by which they can make regulatory adjustments or provide different mechanisms for which the cell could be regulated but we needed to provide some additional information for them to be able to do that. So what we have prepared over the last few months is an analysis of the preferred option. We have done an analysis on the range of options that we have considered for the remediation strategy and trying to valuate which of the options under the analysis that we have done represents the option that has the most optimal environmental impacts and represents the best outcome.

One of the things that we done in this study is that we've excluded cost as a differentiator. It is our view that the solution should be identified for having the best environmental outcome. So we have deliberately not included an analysis of the cost in this assessment. The other issue we have not included is those issues around regulation.

It is important for us to break this process down to understand the type of material we are dealing with because when you look at the different types of management options that are required for this material we need to have a good understanding of what it actually is that we are trying to deal with.

We have gathered information and done an analysis to be able to see what material we have and what we can do to remediate it. The capped waste stockpile originated as a waste deposit on site and was contained within a bunded area where leachate was captured and probably treated at the point with some lime additions and managed accordingly. One of the important factors that weve looked at with this material is that if we were to start to consider at some point, segregating materials out for the purposes of recycling or treatment we'd need to be able



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understand how the material was placed in the cell and what the nature of that material is. You can see from these photos (*points to slides showing series of photos of the CWS*) that there is no order to how the material was being placed there. It has simply been a dumping ground for all the materials that really didn't have another disposal pathway such as recycling through the operation or disposal offsite. There's black stuff, white stuff, big stuff, small stuff, rubbish, hoses, dirt and all sorts of material mixed in there. It is everything all over the place. The material ranges from powder and dust to material which is large in size.

Bill: Originally it just began with annodes but then it became a growth area for dumping.

Richard: There was the perception that this was the SPL pile but it's not even the majority of the waste by a long way.

Within the stockpile there are quiet large pieces and quite small pieces. So any management strategy has to accommodate for the range of different sizes of materials that are present in the pile.

Toby: What do you propose to do with the cathodes you dig up?

Richard: we will move them into the containment cell.

We know the shape of the pile and from that we can calculate a volume. From what we know of the types of materials we can estimate the bulk density and we can calculate an amount of material in tonnes using this formula (*points to formula on slide*).

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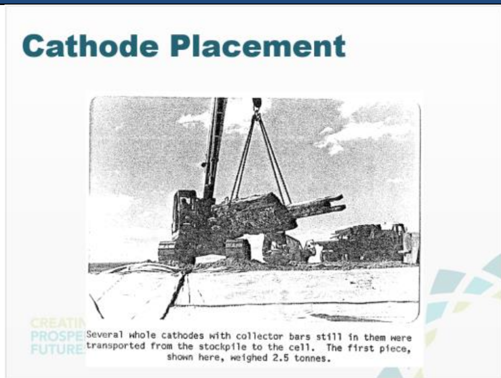
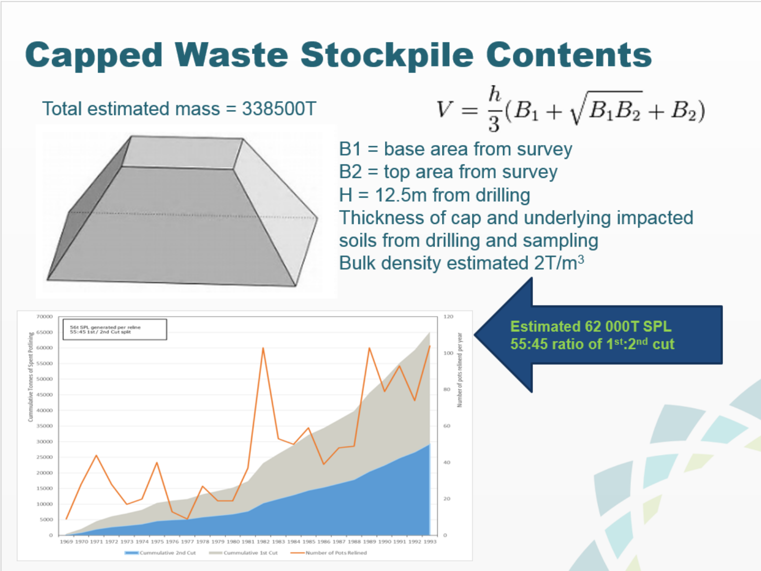
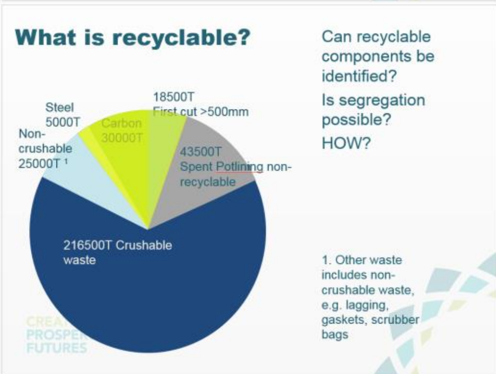
We can estimate that there is approximately 338,500 tonnes of material in the pile. Now, how much spent pot lining is in there? We've got records of every pot that has failed from since day dot. From the period between 1969 and 1993, these are the numbers of pots that have failed and understanding how much material is generated form each failing pot we can estimate how much 1st cut and 2nd cut there is from each pot and we can estimate a cumulative amount of spent pot lining. This is approximately 62,000 tonnes of SPL. There is no way to distinguish between 1st cut and 2nd cut within this amount.





One of the considerations for determining the types of activities that we need to undertake is looking at the waste hierarchy (*points to slide*). We looked at whether or not there is material in the stockpile that could be recycled. We know that there is steel within there, collector bars, discrete pieces of steel and aluminium. We also know that there is carbon in there. We've got carbon cathodes which too could be recycled theoretically. So of this, we would have to take out this material from the stockpile. This would involve segregating these components to be able to send that off to be recycled.

We then had to consider what could be separated by an excavator. These materials would have to be able to be reasonably easy to identify and segregate out of the stockpile. We arbitrarily picked 500 mm pieces. We can confidently assume that everything that is big and black is either going to be anode or cathode. We know that approximately 50% of that 62,000 tonnes of SPL is going to be carbon and then of that a



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portion of it is going to still be in big pieces. We have estimated around 19,000 tonnes of that material could be recycled. The rest would be non-recyclable material because we can't distinguish it from the rest of the waste. We are estimating that there are other sources of carbon, there is probably anode butts in there which are likely to be distinguishable similar to the SPL as big black pieces.

There will also be rubbish within the stockpile. We would need to go through a process of crushing this material down for a treatment process. We would need to first pull out the non crushable materials before anything further was able to happen with the rubbish material.

So we end up with just over 50,000 tonnes of material within the stockpile that can be recycled. Knowing this amount of material, we need to then understand what people do with this type of material.

Bell Bay – oldest smelter in Australia other than Kurri. They are still operating but they had had similar waste management practices over the same era. All smelters do essentially. Smelters built up until the 1980's managed waste by stockpiling it on site. This was an international practice. We know at Bell Bay they have taken the stockpiles and consolidated them into containment cells on site.

Point Henry – Smelter which closed around the same time as Kurri. They also had similar waste management practices up until around the same time period. They have two landfills that contain smelter wast including SPL. Our understanding from both discussions with Point Henry and the literature for plans for redevelopment is that that material is planned to remain in-situ. These are not purpose built containment cells like we are proposing to build. Essentially the landfills are material placed and capped.

Toby: so both those situations which happened in the mid 1990's, why didn't the smelter here look at building a containment cell in the mid 1990's?

Richard: I think you'll find that the smelters around the mid 1990's and onwards, started segregating out those wastes for the purpose of recycling. So you wouldn't find that many smelters from that period on actually putting it in a containment cell.

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Toby: ok, so from the mid 1990's they were putting the SPL in these containment cells?

Richard: well in this case they were, they were still putting the material in there up until 2000 but at that point you'll probably find that Point Henry started constructing storage sheds as well as storage facilities for SPL. As would most other smelters.

There are also numerous international examples where smelter waste is contained and capped on site. *Richard showed the following slides of examples where other smelter waste is being contained on site.*

There's an example in the hydro system. There is another example where mixed smelter waste has been placed at a landfill in Norway. There are plenty of examples where this legacy waste is being managed in situ.

The other consideration is within Hydro with the other examples of different types of waste. We looked at examples of mixed waste and how they are managed and this is an example where a Hydro owned industrial park contained a waste deposit that was excavated and removed to a landfill site. They identified that there were recyclable materials within the pile and that they should be looking to segregate those out so that the recyclable material can be processed that way and the non-recyclables and hazardous materials can be processed and go off to a special landfill. It took very little time for them to realise that what they planned was not actually do able due to the nature of the contamination. They were not able to validate that the materials they were removing to be recycled would be cleaned to the

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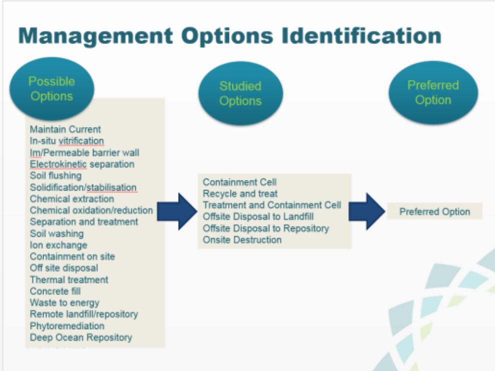
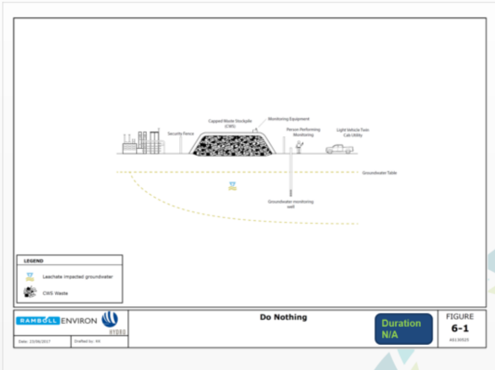
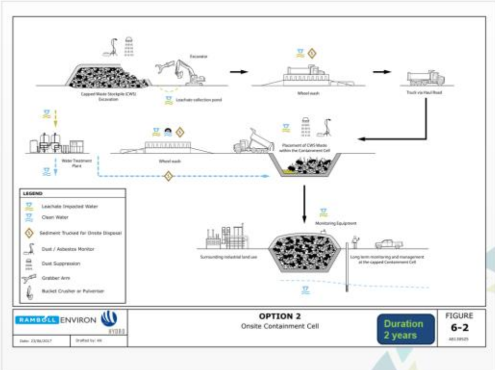
extent that they could be recycled. The process of doing this created more hazards.



Based on this experience both internationally and within the Hydro system of management practices of different types of waste, we had a broad range of different management options that we looked at. We have covered a lot of these different options and consolidated them into six different options. What we've done is to ultimately understand is look at what the process would be for each of these options. We have described the actual process for getting to the completion of the management of the different types of materials. We can then use this process to estimate the impacts on people's health when they are actually doing the work and community impacts. We have looked at the impacts on people's safety including the people doing the work. We have looked at ecological impacts including impacts on water quality, aquatic ecology and impacts on plants and animals. We have also looked at the amount of energy that it takes to do these different options and the amount of greenhouse gas that each option creates. These are the four metrics that we have used to actually measure these six different options. We have had to go through the process of estimating those different impacts for each of these options. In order to do this we have had to actually describe each step involved in all of the options. We have then compared this to an option of 'do nothing'. This is the base case that has been used as a comparison against the six other options.





Option 2 - the proposed strategy. This strategy involves removing the material from the pile. We know that there is asbestos in the pile. We did some core samples in the pile and the core samples and the analysis that we did confirmed what we had suspected in that the pile is full of asbestos. We know that the asbestos material comes from consumables that were being used in the operation. So this would include gasket materials, rope seals and marinate materials. The sampling confirmed that of the 50 different samples taken throughout the pile, half of these contained asbestos. Everything that we have to do from now on, involves managing the presence of the asbestos in this pile. So when we are excavating the stockpile, we have to manage that under asbestos conditions. This involves dust control when transporting the materials, we have to manage the risk of liberation of the asbestos fibres. Materials are then placed in the cell, capped and monitored in the future. A consideration with any option also is how long the materials

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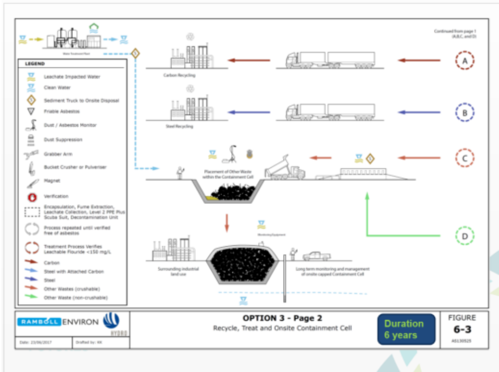
exposed to the environment and particularly when you think about issues around rainfall, if you have the cell open and you have rainfall you are going to generate leachate. So we have to be able to manage that leachate. We would have to capture it and treat it.

Michael: Mark mentioned before about dust management on site, would there be dust management when you are doing this stuff?

Richard: Of course. This little symbol that looks like a snake is actually air monitoring and dust control.

There is leachate management as part of the cell design.



Option 3 – this option considers those recyclable materials. So acknowledging that there is material within the pile that can theoretically be recycled. I say theoretically because to be able to recycle it you have to be able to do two things. One is you have to be able to separate it from the bulk of the material and the second is you have to be able to prepare it in such a way that the recycling option can take place. So for example it would not be possible to simply separate a big black piece and send it to the recycler because there is asbestos on it. So that asbestos would have to be removed before it was able to be legally sent off site and sent to the recycler. It would also have to completely free of asbestos to manage any ongoing risks to that legacy.

Bill: the duration says 6 years, is that how long you are thinking?

Richard: for this option yes.

So this option is very complex. So we have identified that there a number of potential recyclable streams that can come out of the pile .So what we would do is segregate it at the source. So the excavator driver is sitting there in his truck and he is pulling out the big black stuff and putting that in one pile, he's pulling out steel and putting that in another pile, he's pulling out non crushable materials so rubbish and he's putting that in a pile and everything else is going into another pile. So there's four streams of material coming out of this pile. 350,000 tonnes of material. If we think about then the carbon material, we know it's got asbestos in it so we have to clean it essentially. So for that to be recycled we have to clean it, we have to get it validated by an expert to say its asbestos free and then it can go to be recycled. How do you clean big black pieces of stuff? There is a risk that you will generate other issues. We think the best way to clean

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the materials is with a high pressure hose to clean these pieces. So essentially you are taking a piece and high pressure cleaning the surface, because it generates leachate you need to capture the water. If it's SPL then it will become water reactive and create fumes in particular ammonia and potentially hydrogen so you need to capture the gas and filter the gas. So you need to do all that, managing the asbestos, managing the air borne asbestos that will be liberated by high pressure water, so you have to do it in an enclosed environment. So you're taking a piece, it could be as big as the two tables or it could be half the size of this table and you put it into an enclosed space, think of a spray painting booth or something similar, its go to be a controlled environment with dust and water extraction, you put the material in there, you send guys in with the PPE they use a high pressure cleaner and clean it. Think about some of the practicalities of this, you've got a piece of material that's sitting down and you're spraying five sides but you can't spray one side so you've got to get some equipment in there to flip it, you can clean it and send that out to an environment to be checked, put another piece in and so on. Then that batch of material has to be tested by an independent specialist, they will swap the outside of these pieces and send that to a lab and the lab will look for the presence of asbestos. They will then say we haven't found any asbestos fibres on that material, if they do well then they have to go through that entire process again and then that goes off to the recycler once it is confirmed free of asbestos. The challenge becomes that at some point, you are not taking a swab of the entire surface so somebody has to take some responsibility for the fact that you could miss something. So that could be the hygienist that needs to take some responsibility, it could be the cleaners, ultimately if the recycler is doing his work and either here or their customers come across some asbestos, they wouldn't be very happy because they would be receiving material on the presumption that its asbestos free and they wouldn't be managing the material with the risk of asbestos in mind. So then there's a liability to everybody that was involved in the chain down the track. But it can be done, it's theoretically possible. The same goes for the steel, so we would break the steel out of it and you need to clean the steel off and send the steel off to the recyclers. Now we have had some advice from some recycling companies looking at different materials and they have said they just simply can't take that. They just can't take the risk. Similarly we have had some advice from Safe Work NSW who have said that high pressure water cleaning anything	

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with asbestos is not on. So as I said, it's theoretically possible but it may not be legally acceptable. That said, we have looked at this and we will continue through this to the analysis. Now that's only 50,000 tonnes of 360,000 tonnes. We have 310,000 tonnes left of material so what are we going to do with that? And in this case what we've looked at is a form of treatment. So the contaminant that is causing most of the issue is fluoride. The fluoride levels are above this limit which is prescribed by the chemical control order so anything greater than 150 mg. So the actual concentration of the fluoride in the material is around an average of 220 mg. If we are looking at waste guidelines then we would use the 95% upper percentile level to derive that that's what represents the material. So this would be around 337 mg. Keeping in mind that if this were not smelter waste this would be considered restricted solid waste which under the guidelines could go to a restricted solid waste landfill. Because its smelter waste is subject to this special chemical control order and can't do that. So we have to accommodate those issues. So the form of treatment for fluoride is typically to mix it with a source of calcium which could be something like lime. So when the material gets wet so if you have fluoride material that's leachable you leachable fluoride contained in the leachate. If you mix that with a form of soluble calcium in the form of lime then the calcium reacts with the fluoride to form insoluble calcium fluoride. This method of treatment is only effective when it gets wet. So you could mix the two material dry, there's no reaction occurring but it would be potentially effective if that material were to be wet. So we've looked then and said ok let's mix it with lime to reduce the leachable fluoride to beneath that threshold. **Gareth:** So the calcium fluoride actually prevents it from leaching any further? **Richard:** The calcium fluoride is the result of the leaching. It doesn't prevent it from leaching because it still leaches. It has to leach to become calcium fluoride. The calcium fluoride is insoluble so that's essentially inert. But to get those two materials to mix together effectively, you would need to take those big pieces and you need to break them down. So we would have to crush this down to be able to mix it with the lime so that you've got a treated material. **Fiona:** Essentially you force that reaction to happen. You force the leaching of the fluoride and then the stabilisation.	

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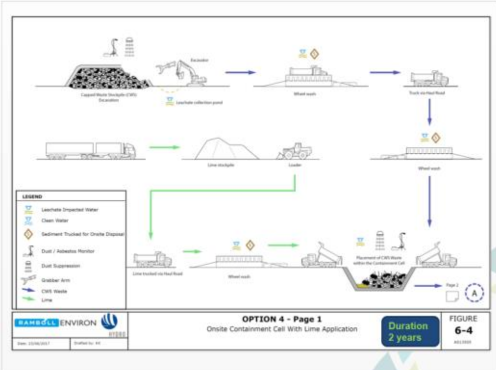
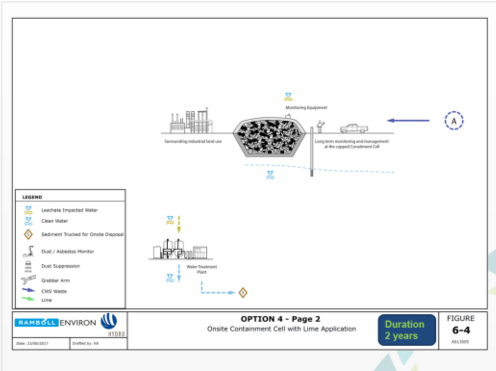
Richard: So that has some issues associated with it. We know that even after removing the SPL there could be some SPL still present that could be water reactive so it generates both toxic and inflammable gasses once it's crushed and wet and that's the issue that's particularly around the crushing. We know that doesn't generate a lot of gasses as it sits, it's been out in the weather for decade and the surfaces are already reacted but when you start breaking it down you create fresh faces, fresh sites for that reaction to occur, so you kind of liven it up again. So you crush it down, so that's one risk, you have to control the gas generations. So you either have to vent it or capture the gas. The other issue is of course the asbestos. So crushing material that already has asbestos you have to manage the risk of asbestos fibre liberation. So we need to do the crushing and mixing in a way that manages that process.

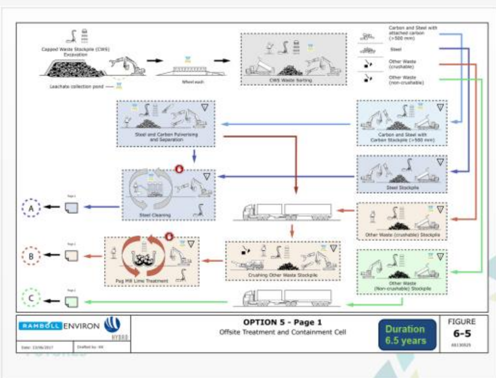
That mixing process could look something like this: you've got waste material and lime being mixed together in a big mixer and then you've got a treated material at the other end. That material would then go to a containment cell on site. You've got material going off to the recyclers assuming they can take it and the material that's gone into the containment cell. We are talking about material then when you test it, it could still have leachate with fluorides up to 150 mg, it's possible to do that.



Option 4 – this option looks at treating the material and placing it in the cell as is. So this would avoid a lot of the risks associated with crushing and recycling. It's possible that we could simply take the material from the pile and as the material is being placed into the cell we could add line to it. So this could be in the form of adding a layer of lime to the material or adding the lime as the material is being dumped into the cell which would mix it up. That becomes effective should the cell leak or rainfall gets into the cell and you get that reaction occurring and leachate is lower than that 150 mg of fluoride. Regardless of the leachability of the fluoride the cell design doesn't change and either does the long term manageability of the leachate.



Option 5 – this option involves taking the material offsite. This option is basically the same as option 3 minus some of the recycling steps but if you took the material offsite the same rules apply here as they apply in Sydney or anywhere in the state so any of the requirements to treat the material apply here as they would there so everything we would have to do here we would have to do there, the only difference is you are transporting this material from here to there so there's an additional risk from that



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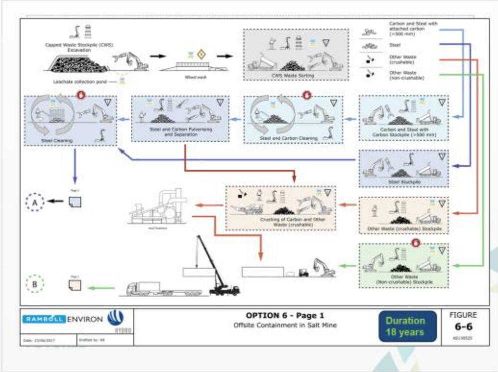
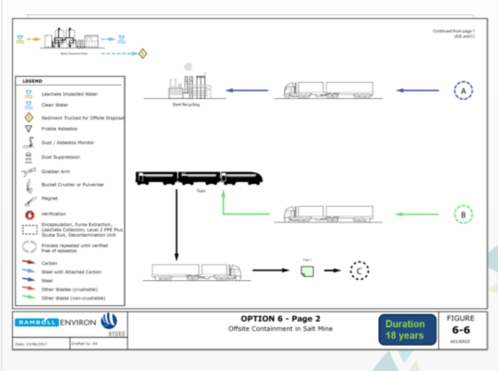
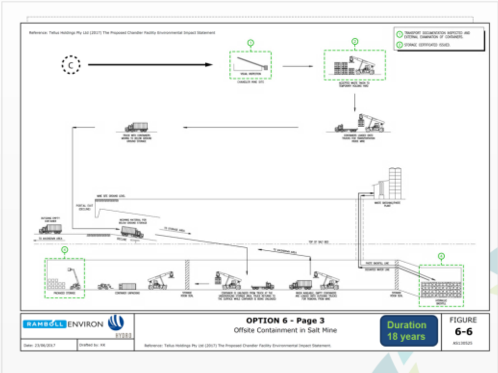
process. The other additional risk and exposure in this process is that either you are going to be placing this in another landfill environment so you could get issues associated with non compatible materials which could create adverse circumstances in an unknown environment in which that material is being placed.

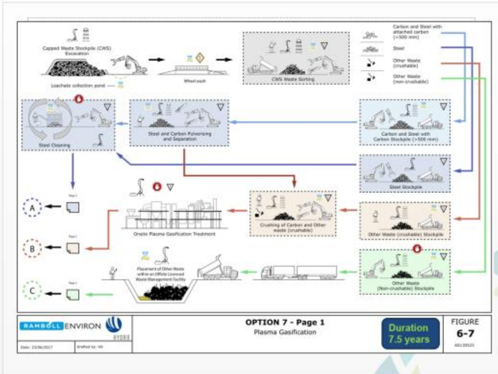
Option 6 – this option is similar to option 5 as it is an offsite disposal option. This option looks at a salt mine repository. In Europe in particular there is hazardous waste materials that are sometimes placed in old salt mines which are dry and geologically stable. The challenge with the rock salt mine is that there is proposals for one in the Northern Territory so this has been modelled around sending the material to the Northern Territory for deposit in that salt void but because of the nature of that deposit they can't accept material which is generating gases. They have a waste acceptance criteria that says they can't take this particular class of dangerous good which generates gases. This means that we could theoretically do something to it to reduce the water reactivity. We know that some of the SPL treatment processes that are around do this through heat treatment. This would remove the chemicals that create the gas. So in this process we've said ok to get it to the salt mine you need to heat treat it, you also need to prepare it for transport, you need to put it in bags, and you need to crush it for heat treatment. When it comes to this option here, that process of crushing, heat treatment, transport and deposit in the mine takes a bit of time.

Option 7 - The final option that we looked at was an onsite thermal treatment process, which was more like an onsite destructive process. The considerations when doing this is that to put it through a plasma plant which has never been done for mixed smelter waste. There are other smelter wastes but no one has ever done this. The other problem is that it is not just one type of waste, there is a mixture of waste and each different type would have to have its own procedure applied to it and as it's never been done before, we aren't certain if the outcome actually achieves what its designed to achieve which is to produce an inert material that's probably going to end up in landfill. To get it through that process, you can't put in 5 m long pieces through the plasma plant, you need to crush it down. To have the process run stably and in control you need to prepare the material so that it's reasonably consistent. So as you're processing the material you're not getting a whole bunch of









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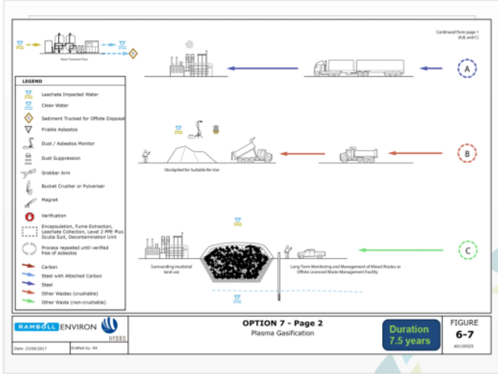
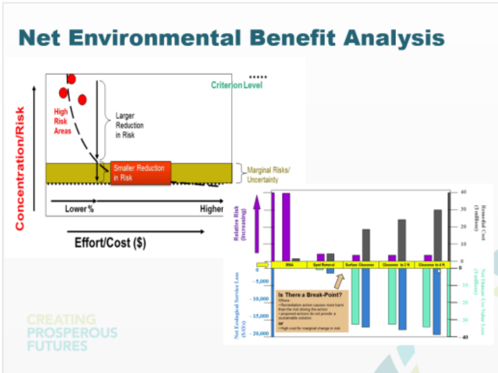
carbon in one batch and none in the next batch because that will affect how much energy is required to actually generate the plasma arc and then get the effective treatment of the material. The material would have to be crushed to get a reasonably homogenous material to go through the plasma arc. This would obviously have the same risks associated with the management of asbestos.

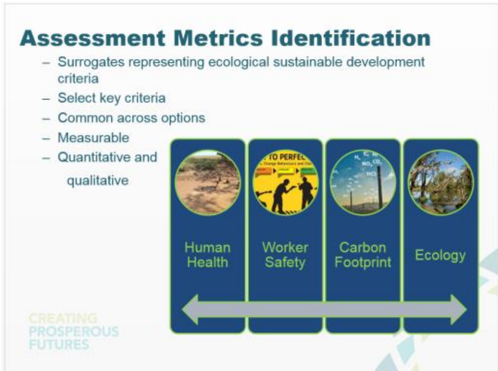
Fiona: we wanted to have a look at all of these options with a metrics that Richard described in a quantitative way. We used the metrics to calculate real numbers associated with each of the options so we weren't just saying well that option is more risk and that one is less risk, that one has a big carbon footprint and that one has a little carbon footprint. We wanted to actually put some real numbers around that so that we could actually see which option stands up the best. The tool we used is a net environmental benefit analysis which is a way of using none financial metrics and using other metrics in a calculated way to determine an option which stacks up better overall. This graph (*points to slide*)shows that when you are assessing different options you have a point when you can reach an asymptote in terms of improving the benefit with lots of costs potentially but actually no change in the risk profile. It's a processing of balancing up the risk reduction you get for the benefits you get in these parameters. You can evaluate risk and then you can have benefits to the environment and they can be measured off risk.

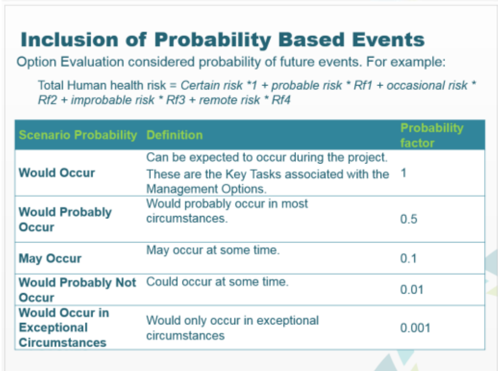
We identified metrics of human health, workers safety, carbon footprint and ecology. These came out of community reference groups and listening to regulators. Part of this also looked at what are the impacts on future generations which is one of the questions that comes up around the containment cell and what happens in 50 years time from now when the containment cell is still on site and we are no longer here.

We also looked at the probability of these events occurring. We included events that would occur which is the project that Richard has just described. Each of the options that Richard described was considered against the metrics for example a health risk or ecological impact that would occur and then we also looked at the impacts that might occur. That's where we contemplated things that could happen during the delivery of the project or that could happen in the future. So for the base case of doing nothing we said well if we left the cap waste stockpile there as is stood at the moment its likely we would have to do something within a reasonably short time frame because that's









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not acceptable to sit there as it is. This was considered as a would probably occur that we would have to move it and it would have all the risks associated with that activity added on to the risk profile. Another example is for the containment cell we considered what happened if it did leak. So say the containment cell does have a leak of leachate into the groundwater system, what are the effects on the metrics of environmental, health, ecology and carbon footprint and what would be the effects into the future. Then that got added into the evaluation. So we ran through a whole heap of scenarios that could happen during the project that are not designed to happen but they could happen at a probability factor associated with the event occurring. The human health risk assessment was undertaken by a human health risk assessor who is very qualified in his feels and it followed an Australian standard for human health assessment. What it looked at was the risk of asbestos exposure to the worker and to the community and that community could include cases where we are transporting the material from here to a landfill site in Sydney so it would include the community here and the community in Sydney and the risks that might occur along the way. This was a fully quantitative evaluation. It calculated the risk in terms of an increase in lifetime cancer risk or a hazard index for each of the chemical exposure and asbestos exposure that might occur throughout the project. The work health and safety was an evaluation following the OH&S guidance on worker safety risk analysis in the workplace. So it's a certain quantity of evaluation where it's more of a probability and consequence evaluation. The ecological risk was done following a quantity of evaluation where we looked hazard indices for things like leachate overtopping into Swamp Creek and what the concentration of that might be and how would the species in Swamp Creek handle that. So we looked at those processes and we incorporated what would happen if leachate leaked out of the cell and leached into the creek in a probability event. The greenhouse gas emissions is a straight calculation of carbon in Co2 Carbon tonnes equivalent and it captures all of the emissions that would occur from the machinery that would be used in the project. Under the various options what it does is look at the offset that would occur by the reuse of steel. So that offset you get in carbon that you would get from that product and reuse of SPL that would substitute another carbon source. The	

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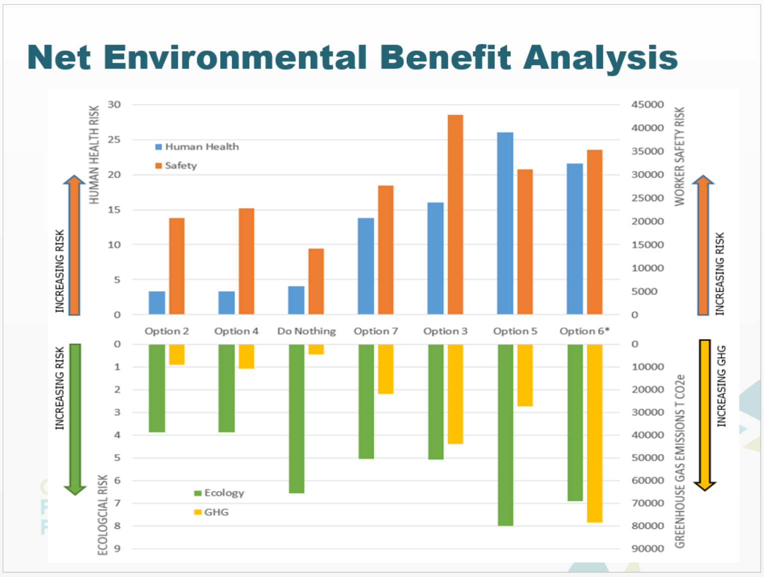
carbon footprint of generating that other carbon source was then deducted. So we incorporated the benefits of recycling into the process.	

Fiona refers to the following slide while explaining how each option weighed up.



So option 6 is the transport to the Northern Territory and the carbon footprint for the transport to the Northern Territory worked out to be about 3,000,000 tonnes which is the same as the annual carbon output of 1.5 times Newcastle cars. So this was just way off the chart which is why there is an astricts on option 6.

So when you look at this graph you can see that the human health risks for options 2 and 4 and do nothing are very low. The rest of the options all get very high very quickly because of the time and the exposure along with the number of people. Work health and safety also gets very high very quickly because of the risk of contact with machinery. The more machinery the higher the risk. Ecological risk for all options is actually pretty low which is largely because none of the options really require vegetation clearing and the aquatic risk even at the moment under the do nothing option is that there is not a risk to Swamp Creek at the moment so any of the options improve on risk from the current situation in terms of ecological risk. The greenhouse gas is lowest for the do nothing option but also options 2 and 4. This is due to duration and the amount of machinery required. Option 7 has a plasma arc torch included in it which is a very high energy consumer but it has some energy offsetting capability. Option 3

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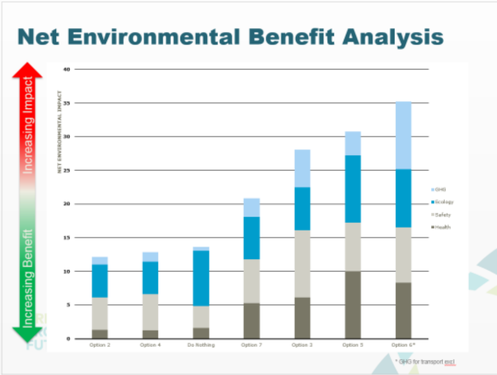
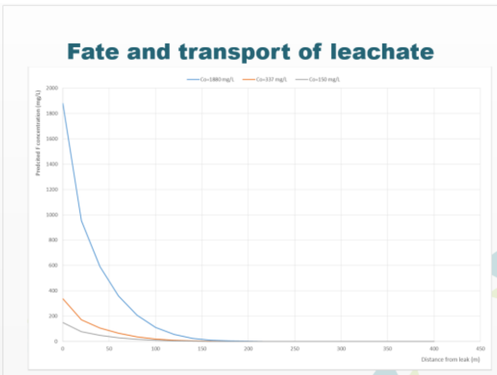
is high because of the amount of machinery and the duration and the amount of cleaning that is required. There was very little befit from the recycling of material. What you can see between the difference of option 3 and option 2 is the effort required in terms of energy required and carbon output to achieve recycling results in very little benefit.

We have ordered these options on a scale of 1 to 10. Even though this is referred to as a net environmental analysis all of the options have an environmental impact because they all have some environmental cost to implement them. We are really looking at which one has the lowest environmental impact overall. So you end up with options 2 and 4 coming out pretty close in the evaluation. The difference between them is the addition of lime in option 4 which involves extra machinery and so there's a slightly higher carbon footprint because of the use of the lime and the import of that to the site. The main difference between option 2 and 4 is fluoride concentration in the leachate and so both options have the same containment cell design theres no difference in the cell as Richard mentioned before. The real driver between option 2 and 4 is what the chemical control order currently says in terms of the disposal of aluminium smelter waste requiring leachate fluoride levels of less than 150 mg. So as Richard showed on that slide earlier, the current average 95% upper confidence limit of the average data that we have of the capped waste stockpile at the moment is 337 mg for fluoride. So we are talking about a reduction from 337 mg to less than 150 mg. The way that option 4 proposes to achieve that is by putting lime into the cell in calcium carbonate form. Then the fluoride ions will solulise to the calcium carbonate ions, they principate together and in our leachate we have the fluoride removed and we end up with a calcium fluoride precipitate in the landfill. So the only benefit of doing that is if in the event that the landfill might leak, you would be leaking a low fluoride leachate into the groundwater system.



We had a look at what the consequence of that was. If the landfill is leaking, what is the consequence? Does the difference between 337 mg/L and 150 mg/L matter in terms of the risk to the environment. So we completed what is called a fate and transport assessment and it's a groundwater modelling process where you look at the site specific geology and use a computer model, in this case we used two dimensional computer model that looks at how the contaminant migrates through the groundwater system. It uses both groundwater flow mechanics,



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so the rate at which groundwater moves through the particular geology we have at the site and it also includes chemical attenuation, so whether or not the chemistry of the soils would react to remove the fluoride ion out of the groundwater system. For the site here there is actually a lot of ability for the clays on site to remove the fluoride ion, it has an affinity for the fluoride ion and it will actually clean itself by precipitating the fluoride out. **Gareth:** which chemical would be doing that? **Fiona:** its calcium already within the clay. There are some studies done on the site where we have looked at the permeability of the material and the permeability with the leachate of the clay actually reduces because of the effect of the fluoride binding out and reducing the permeability of the clays on the site. **Gareth:** so it stops the more active transport? **Fiona:** yeah that's right. The other aspect of the fate and transport model is that the model leachate volume into the cell is around 400 litres in the long term – 400 litres per year is the anticipated amount of leachate that would be generated within the cell. So Dave came and presented on the landfill cell design and you saw all the lining materials that will be incorporated. The leakage through the cell is predicted to be very very low so 400 litres per year is a very small amount of leachate. You have to get through two line systems plus the groundwater collection system underneath to get into the aquifer. **Richard:** That just gets you into the clay. **Fiona:** And then the clay system up there is very low permeability, quite tight clay so we did a model of how if leachate did manage to get through those lines, how long would it take to get to a receptor and what would the concentration profile look like. This is the output of that. So what this shows on the axis across the bottom is the distance from the leak. Our nearest receptor is Swamp Creek which is some distance away but we also have no named Creek which is around the 150 metres from the site. This graph is actually at a time of 10,000 years. So 10,000 years from the time which the leak occurs this is what the concentration profile is predicted to be at the aquifer so orange is a starting concentration of 337 mg/L which comes down to 1 mg/L at around 100 metres from where the leak occurs and this is around 150 mg/L which is very similar limits	

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around the 100 metre mark. By the time you get to any of the receptors, even if you had a concentration of the highest we have ever measured on site from the cap waste stockpile leachate, so even if you had a concentration up around the maximum we have ever measured, you would be getting down to very very low numbers within a pretty small distance from the site and this is after a very long timeframe. This is due to the fact that groundwater doesn't move fast up there and the infinity that the clay has for the fluoride ion itself. So attenuation. So we've done a lot of sensitivity analysis around this to see what drives the transport and whether this would change. This was a fairly conservative assessment in terms of how and leakage from the cell would affect the groundwater system. And so from that you would argue that there is really no benefit in adding lime to the waste to reduce the leachate. **Brad:** So that's in 10,000 years, let's bring it back to 100 years, where would it be? **Fiona:** 100 years it wouldn't even be 30 metres from the landfill. The other aspect that comes into the evaluation for the addition of lime is at the moment we understand the cap waste stockpile very well, it's been there for 20-30 years, it's been capped and we've monitored the leachate for a long time and we understand the chemistry of it. We've monitored the gas for a long time, all of that information goes into the cell design and just increases the confidence that we have in the way that the cell will perform. One of the concerns that we have is that if we start to add lime to that, we now change what we know about the landfill. So one of the risks that we have identified is that this precipitation of calcium fluoride within the cell in the event that it leaks could actually bind to form binding layers within the cell because it will form a precipitation and one of the consequences of that could be that it binds up our drainage layers and then we have a problem in that we can't drain leachate out of the cell. The consequence of that is probably not much, probably just a little bit of extra gas. **Richard:** or an accelerated leaked liner deterioration because it is exposed to the liquid for longer. **Fiona:** So we do consider that there are some risks involved with introducing lime whilst it might appear to reduce the fluoride below a regulatory threshold, it doesn't have a change on the risk profile, it doesn't change the way the cell is designed or managed in the long term and it does actually introduce another	

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level of risk that we would need to do some pretty detailed studies about to fully understand. So for that reason we are promoting option 2 to the EPA and the DP&E.

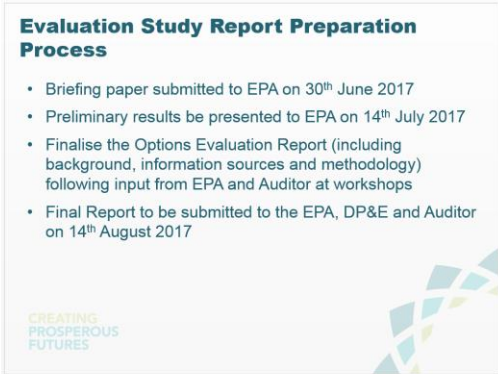
Richard: Well we are discussing that with them. This is yet to be any conclusion. It hasn't changed our proposal. This is additional information that we have been asked to provide to justify our position and our proposal. We have shown this to the EPA, we are just tidying up some of the reporting, so this is a challenge to anybody that wants to understand it. You've heard the 45 minute version. The way in which this is being presented to the authorities is an enormous document. There's a lot of work that's gone into it, it's very difficult for anyone, particularly a regulator to actually comprehend all of that detail. So we've been putting a lot of effort into summarising and extracting out the key information but support that by all of this material. So if the executive of the EPA or the DP&E read that and they have questions and they go well what does this mean and how does that work they'll send some of their staff and they will dive deep into that particular part of the work. So we have to do this electronically because it is so big. There's two volumes of this material each contain 8 or 9 appendices within each volume but the summary document we are still working through the final preparation of. We aim to get that to the authorities within the next couple of weeks and then we will give them some time to digest that and we will seek to meet with them and discus what their thoughts are around that, sometime towards the end of November or there abouts.

Bill: Can you just refresh what option 2 is?

Richard: the containment of the waste material on site.

What this is looking at is the capped waste stockpile only. Keep in mind that we have other material that we need to manage as part of the remediation of the site. So we will have contaminated soils that we recover from parts of the site and offsite. We will have demolition wastes that also need to be incorporated into that whole site remediation strategy. But in comparison to this capped waste material are not as large in volume and they are certainly not a concern to the authorities. So that's a next step for us.

Michael: can I just say, firstly Fiona you are a NSW EPA accredited auditor for contaminated land. So I'm guessing you do things at this level of detail all the time?



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Fiona: Yes.

Richard: What I understand we did was we prepared our discussions with the EPA a long time ago in the EIS based on what is common practice and the level of detail of what is normally acceptable. Under this circumstance because of that particular legislation they basically said in this case please give us some more.

Fiona: So normally when you evaluate remediation options you do it in a very qualitative way. You look at your metrics costs being one of them time, being one of them is that's more that's less that's quick that's fast and we are going to do this one. That's a fairly acceptable approach and that's where we started with this approach. We have gone through this evaluation several times at lots of different levels and lots of different risk workshops. We presented on this way back in 2014 but we were continually being asked how are you coming to these conclusions. How are do know you can't sort that material? How do you know it's going to be higher risk to the worker? And so that's why we then had to go on to say well this is what you have to do if you want to get this material out, this is what it's going to take and this is how it's just not practical.

Richard: we haven't said at all that it's not possible.

Fiona: we've never said it's not possible and we also didn't go into this process with pre conceived ideas that option 2 was going to come out the best. When we've done all our qualitative evaluations before, option 2 did come out the best but we've scrapped all that and have looked at this again and we have ended up in the same place with option 2 and 4 looking pretty similar. But then there is a bit of risk and uncertainty in option 4 and then cost becomes part of the evaluation when you get no benefit out of option 4 why invest money into it as well as consuming a pretty sizable lime resource into that process. It just doesn't make a lot of sense.

Bill: you've painted a picture that the existing waste stockpile is wrapped in asbestos and I just find that hard to visualise.

Fiona: That's right it's not wrapped in asbestos but we have analysed 65 samples out of the cap waste stockpile which half of them have contained asbestos fibres. Under the waste regulations any amount of asbestos is considered asbestos waste. There's no percentage, there's no grade of percentages. It has it or it doesn't have it.

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Michael: you remember earlier on, there was a lot of work that has gone in to identify the presence of asbestos. **Fiona:** there's a lot of lessons learnt around the capped waste stockpile. There's a lot of effort that would go into source separation. The discussions we've had with the recyclers is that they just can't take anything that has potentially been contaminated with asbestos. They are not able to take it under their licence. So we have to treat the whole stockpile as if it has asbestos in it because on piece might come out and it has a fibre on it and we swab it and it has asbestos on it then that's asbestos waste. It's a very difficult process that the waste is asbestos free. That's what the process we've outlined is what we think would be required to clean the asbestos off with a fair degree of certainty to be able to produce something that is asbestos free. But through that process we have leachate water that we would have to manage, the sediment will have the asbestos fibres in it and would have to be managed. So there's a whole process. It's not to say it can't be done but it does require a lot of effort. What the benefit analysis is showing is that there's no benefit in that process. There's no carbon reduction that you get from the recycling of that material. The effort that it takes to get the carbon out of the stockpile far outweighs the carbon you get from recycling it. **Michael:** you can to an extent neutralise some of the leachate when you've got lime and so on, is there some way of neutralising asbestos while you are sorting to make it less of an issue? **Fiona:** so in the way that the stockpile is moved there is obviously dust suppression measures in place but to take that to neutralise asbestos and take it off site, you can't do that. You have to take the asbestos out of the recyclable material to allow it to be recycled. You can't just encapsulate it. You can do that to move it from A to B but that's already incorporated into our assessment that you are doing that through dust management but to get it off site you have to get it out.	

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7 CRG Questions and Answers and all other business

Michael Ulph: For those who are attending these meetings for the first time today, we set aside a time for CRG members to bring up any queries, opinions or complaints from the wider community. Has anyone heard of anything recently?

Kerry: Toby was there through a conversation but he came in and saw me later with all of these great ideas.

Toby: I've been asked can the stacks stay as it's a symbol of the smelter. You can see them from everywhere.

Bill: I always get asked where are they up to on the demolition. That's about it.

Michael: Toby could you please provide us an update on where the mural is at?

Toby: We have hit a bit of a speedbump with suggestions that we will have to lodge a CC and a DA as we did last time but I've left it with the planners at council. We've been through such a big process leading up to this. The section 138 came through today. The panels are being cast. Steel work will be coming through soon, it has to go to the galvanisers. Probably if everything falls into place, possibly the week after next we will pour the pier holes and a couple of days after that we will put the structure up.

Michael: Once that starts to happen could you please give us a little bit of notice and we will come and get some photographs. Thank you.

8 Meeting close

Meeting closed: 7:55 pm

Next meeting: Thursday, 14th December 2017 6:00 pm to 7:30 pm