

Mr Mark Howe,
Mining Regulation and Rehabilitation Branch
DMITRE
CPO Box 1264
Adelaide 5001

8th November 2013

Dear Mr Howe

Proposed Rex Minerals Mining Lease Proposal for Hillside

Please find attached the final submission and attachment 1 from the Yorke Peninsula Land Owners' Group.

I am submitting this on behalf of the YPLOG.

Yours sincerely,

[Redacted signature]

Joy Wundersitz

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HILLSIDE MINING LEASE PROPOSAL AND MANAGEMENT PLAN: A RESPONSE

**Yorke Peninsula Land Owners' Group
8th November 2013**

INTRODUCTON

About us

The Yorke Peninsula Land Owners' Group (YPLOG) was established in 2010 in response to Rex Minerals' exploration activity at Hillside on the Yorke Peninsula and the need for affected farmers, landowners and other interested parties to form a united voice to protect their land and community.

In 2011 the YPLOG and Rex Minerals engaged in a lengthy consultation process to update the pro forma Access & Compensation Agreement to minimize the impact of exploration activity on farmland in the Hillside area. The updated version of the form has been accepted by the industry and is now used by Mining Companies and landowners state-wide for better outcomes for all.

Earlier this year, when the full scope of the proposed mine at Hillside became evident, the people of the Yorke Peninsula became increasingly concerned by the negative social, economic and environmental impacts that the mine will have upon the area.

As a result of these concerns, the YPLOG broadened its activities and its membership criteria to include any individuals on Yorke Peninsula or elsewhere in the state who share similar concerns.

The broad objective of the Group is to ensure that agriculture, tourism and other sustainable land use is protected on the Yorke Peninsula from inappropriate developments such as the Hillside mine proposal.

Membership of the Group has now reached approximately 150, with a following of over 550 people on its Facebook social media page.

We stress that we are not opposed to all mining and recognise the importance of mining to the future prosperity of South Australia.

However, we believe that the current Mining Lease Proposal for Hillside has many flaws and inconsistencies, and if approved, poses a significant threat to the long-term future of Yorke Peninsula, its land and its people.

Recommendation

We urge the State Government to reject Rex Mineral's Hillside Mining Lease Proposal.

SECTION 1

1.1 Impact of mine footprint on Yorke Peninsula's long term economic security

Hillside has been described as the largest open pit copper mine in Australia.

The proposed mining lease covers approximately 3,030 hectares (Rex Minerals' Hillside Copper Mine Information Sheet, Sept 2013; page 1).

Its size far exceeds any of the existing mines on Yorke Peninsula and unlike these others, which extract benign materials (dolomite, salt, gypsum) the heavy metals that will be mined at Hillside are highly toxic and have the potential to cause major damage to surrounding farmland, the waters and marine life of St Vincent's Gulf and the health of local Yorke Peninsula residents.

- It is totally inappropriate to locate a heavy metal mine of this size in such a sensitive, populated rural area within close proximity to towns and holiday settlements.
 - Pine Point, for example directly abuts of the mining lease, Rogues Point is only two kms away and Black Point and James Well sit within 3 to 5 kms of the site. These settlements contain approximately 600 dwellings.
 - The nearest farm houses sit within 500 metres of the pit.

On this basis alone, we believe the mine should not proceed.

- Rex Minerals keeps changing its plans. The footprint of the overall mine site as detailed in the MLP is significantly bigger than outlined in earlier plans.
 - The size of the pit has increased;
 - The size of the tailings dam has increased;
 - The waste rock piles are higher and cover significantly larger areas;
 - More road closures are required.

How do we know that these plans will not continue to change and grow? Is that a reason for Rex Minerals' bid for 5,000 hectares of land to be rezoned as mining?

1.1.1 Farming productivity

- Only 4.3% of South Australia is available for cropping. What remains should be protected, especially the very rich, highly productive cropping land on Yorke Peninsula.
- Agriculture is of primary importance to the economic prosperity of Yorke Peninsula and the state as a whole.
- The region contributes \$400 million to the state's economy each year.
- The figures in Table 1 illustrate the region's most recent contribution to South Australian broadacre crop production in 2012-13.
- While we acknowledge that only a portion of Yorke Peninsula will be directly affected by the Mine's foot print, crop contamination beyond that footprint is possible. There is also the possibility, as discussed later in this submission, that many more mine sites will be established on the Peninsula, putting the entire region at risk.

Table 1: Crop Performance Summary, March 2013

Crop	Tonnes produced	% of State total
Wheat	480,000	13.5 %
Barley	477,500	25%
Durum	90,700	50 %
Lentils	68,500	70%
Canola	52,000	13.5 %
Peas	32,550	28 %
Beans	16,800	16 %
Chickpeas	12,000	55 %

Source: PIRSA (2013) Crop and Pasture Report South Australia: 2012-2013 Crop Performance Summary, March 2013. Primary Industries and Regions South Australia, Adelaide. Accessed online 17 July 2013
<http://www.pir.sa.gov/grains/cpr>

- Apart from the revenue directly generated from agriculture, farming is a major source of employment both for those directly involved and for the wide range of spin-off industries and services in the district.
- The argument that mining and agriculture can co-exist is nonsense. Mining destroys the very land that agriculture depends on. When a mining company moves on, the land impacted by that operation can never be returned to pre-mining productivity levels, despite mining claims to the contrary.
- When mining ceases, the community is often left to cope with the aftermath, including permanent loss of productive agricultural land and potentially an environmental legacy in the form of a minesite inadequately rehabilitated and continuing to produce contamination, requiring ongoing maintenance a massive clean-up bill which could run into the tens of millions of dollars.
- Agriculture has been the mainstay of the Peninsula's economic security since initial settlement began almost 150 years ago and, if unthreatened by external pressures such as mining, will continue to do so for hundreds of years into the future.
- With increasing world population and decreasing amounts of farming land, food production is becoming one of the most critical issues confronting humanity.

1.1.2 Tourism

- In 2009-2010 there were 883,000 visitors to Yorke Peninsula.
- Total tourism expenditure was estimated at \$166 million, resulting in 1,100 jobs.
- Given its proximity to Adelaide, its natural beauty and varied attractions, tourism has the potential to grow significantly in coming years.
- Like agriculture, tourism will generate sustainable, long-term economic returns for the Peninsula.

- Hillside extends for approximately six kms along prime coastal beaches, in close proximity to major tourist and holiday settlement locations. These settlements and the tourists they attract will not remain viable following the establishment of a ugly, polluting open-pit mine.
- Proximity to a mine will inevitably result in significant reductions in property values, and an out-movement of families seeking a quiet rural and coastal lifestyle.

We know what the current economic returns are from agricultural and tourism and have hard data to predict future returns. We have no such clarity when it comes to mining. So far, all we have to go on are promises – promises of jobs, of better infrastructure etc. There is no guarantee that any of this will eventuate. We are trading what we know for what we are simply promised by a company whose primary aim, like other mining companies, is to make as much profit for their (mainly foreign) shareholders as possible.

1.2 Mine contravenes existing legislative, management and development plans

1.2.1 Exempt land under the Mining Act (1971)

Under Section 9 of the Mining Act (1971), land that is lawfully used as a cultivated field is exempted from mining operations, unless the exemption is waived by the landowner under S 9AA.

There are five farms which Rex Minerals are still trying to buy. All of the landholders are, at present, either involved in court-directed negotiations with Rex Minerals or are refusing to enter into such negotiations to waive their rights.

Rex Minerals will probably have to rely on the Environment, Resources and Development Court to determine if exemption should be waived and if so, how much compensation should be paid by Rex to each landowner.

The State Government must explain

- **Why it opposes legislative change to the Mining Act (1971) that would provide greater protection for farmers' rights under the Act than is currently the case?**

1.2.2 Protection of Coastal Reserve Land

Under the Mining (Reservation from Act) (Coastal Land) Proclamation 1973, all parts of the South Australian coast situated within 800 m of the high water mark are declared as coastal reserves with the specific intent that exploration and mining leases will not be granted in these zones.

However, in June 2010, Rex was granted a variation to this proclamation to enable their mining activities to intrude on the coastal reserve land between the existing St Vincent's Highway and the coast of St Vincent's Gulf adjacent to the proposed mine site.

According to Rex, it

'consulted with those stakeholders regarded as most relevant to the activities proposed within the coastal land and DMITRE provided the opportunity to stakeholders for comment including ... Affected landholders and the wider community through the established Community Consultative Group' (4.1.1.5 4-2).

As will be discussed later, the CCG has been an ineffective body that has not reflected the views or opinions of the local community. As far as we can ascertain, no consultation with the wider community occurred and local landholders were not contacted.

This coastal protection land will be destroyed to make way for the road realignment of the St Vincent's Highway, for a bore field and for waste dumps.

It will be permanently alienated from the protections afforded coastal protection zones, and will never be returned to its natural state.

The State Government, DMITRE and Rex Minerals must explain

- **why coastal land designated for protection against mining was made available for exploitation by a mining company.**

1.2.3 The Northern and Yorke Regional NRM Plan and

This plan identifies local natural resources management goals as:

- healthy soils
- viable water resources
- healthy coastal, estuarine and marine ecosystems
- healthy terrestrial ecosystems
- minimal pest impact
- community driven NRM.

Despite Rex Minerals' claim that *"the Hillside Project will be implemented so as to respect, preserve and where possible, enhance the specific features and values of ecosystems in the area"* a large open cut mine is totally contrary to the above principals.

1.2.4 The Development Plan, Yorke Peninsula Council – Consolidated 22 November 2012 (Government of South Australia 2012)

Its objectives include the following;

- areas with scenic or conservation significance protected from undue damage arising from mining operations
- mining operations undertaken with minimal adverse impacts on the environment and on the health and amenity of adjacent land users
- minimization of the impacts from mining activities upon the existing groundwater level and the quality of groundwater resources
- mining operations that make adequate provision for site rehabilitation.

The DCYP Development Plan also specifies principles of development control relating specifically to mineral extraction. These state that mining in scenic and native vegetation areas should only be undertaken if "there are a limited number of known reserves of the minerals in the area of elsewhere in the State".

Hillside contravenes this, given its location and the fact that Olympic Dam has greater copper reserves than Hillside (Rex Minerals Ltd, ASX and Media release, Feb. 2013, page 1). Moreover, Olympic Dam is located in a remote sparsely populated region of SA, poses no threat to agriculture and already has a range of infrastructures in place.

DMITRE and the State Government must:

- explain how a vast open cut heavy metal mine can be given government approval in light of the above management plans;
- guarantee that if the mine proceeds, all of the above objectives will be met.
- explain why Hillside is being supported when the expansion of Olympic Dam is not proceeding.

SECTION 2 POLLUTION

2.1 Accuracy of data analysis and modeling – some preliminary comments

Much of the information on the likely environmental consequences of Hillside – such as dust levels, ground water, noise levels, impact on marine environment etc - are based on modelling. Modelling is notoriously difficult and is heavily dependent on the assumptions made in designing the model and on the accuracy of the baseline data on which the models are predicated.

Other analyses in the MLP – such as the determination of whether acid mine drainage will be a problem and the viability of blending uranium to reduce concentration levels to acceptable levels – also rely on accurate baseline data.

Our reading of the MLP and the associated Appendices lead us to question the validity of the modeling and analytical results because of major flaws in the baseline data used.

There are also examples where critical modeling and investigation are entirely missing from the report.

If the 'research' underpinning the Hillside project is flawed, then the consequences for the surrounding land and marine environment, for local residents, for farming and local flora and fauna if the project is approved will be dire.

2.1.1 Lack of accurate, comprehensive baseline data

There is evidence to indicate that baseline data used in the various consultants' reports are incomplete or inaccurate, thereby rendering the conclusions based on these data highly questionable.

2.1.1.1 Hydrology/water balance

Relevant comments from Mining Plus are as follows:

- *"It should be noted that the model was developed at an early stage in the evaluation process and is a simple representation of the aquifer system using the information available at the time. Subsequent assessments may provide information that may lead to the model needing to be revised. Pit design and scheduling also effects the model so if there are any significant changes to either of those the model will need to be re-run (App 5.10A, pg 61).*
- *The main contribution to the water balance is pit inflows. Any future work to better define the pit inflows will have the most significant effect on the water balance. It is recommended that wells are constructed at an angle of 6 [degrees] in locations where significant structures are known to exist but where groundwater assessment to date has not encountered high yielding rock units. This could include areas where weathering has been found in resource drilling to be shallow, where the rocks are siliceous (i.e. unlikely to be significantly weathered) or at locations where structures have been identified that post date major weathering events.*

Water investigation wells have been installed to depths of approximately 200 metres. This is significantly shallower than the anticipated pit floor level of approximately 400 metres. Hydrogeological parameters have been assumed at depths greater than 200 metres. It is recommended that wells be constructed to pit floor depths to enable hydraulic properties

to be evaluated from 200 metres to the base of pit. These wells should be inclined at an angle, e.g. 60°.

All wells should be test pumped in the manner described above. Additional long term tests may be carried out in wells that have intersected significant high yielding fracture sets.

Water samples should be collected from all wells installed and analysed as described. Results of the coastal granites groundwater assessment should be incorporated in the model as appropriate.

The significance of the electromagnetic (EM) anomaly should be investigated further to determine if there is any correlation between the electromagnetic response and groundwater yields.

Drilling depths were planned to be 200 metres. Some wells were completed shallower due to not having the capacity to dispose of the water produced, and 2 were drilled to 204 metres. All were drilled to target zones of structural complexity or areas in which significant intersections of water had been encountered during reverse circulation (RC) drilling. (appendix 5.10A, Page 11)

- All groundwater assessments carried out included drilling to depths not exceeding approximately 200 m, whereas the pit is expected to extend to depths greater than 400 m and the underground operations could occur at depths to nearly 700 m. The relatively shallow depth of assessment is considered a significant constraint to (dewatering) model reliability and confidence." App 6.5Apg 9
- The initial modelling was based on the performance of only 22 water wells of which 11 were drilled in and around the proposed pit. Test pumping was conducted for a maximum of less than 24 hours.
- While there is some indication that a further 14 wells were drilled, it is not clear whether all of the methodological limitations raised by Mining Plus have been adequately redressed.

2.1.1.2 Acid Mine Drainage

The report by Mining Plus (Hillside Pre-feasibility Study, Waste Rock Sampling report) concludes that

"Given the large volume of waste rock associated with the project, further sampling may be required".

Their analysis was based on only 57 samples, which seems extremely small given the huge volume of rock that will be excavated.

While the MLP (5.8.3 5 - 62) notes that a "second round of sampling was undertaken where 125 samples were analysed to further evaluate the uncertain classifications from Phase 1, we are unable to find details on this additional work. It does not appear in the Appendices and there no specific details on who undertook the extra work, what methodology was used etc.

2.1.1.3 Dust

Ambient PM10 monitoring for stations located in the region surrounding the mine site was conducted from 10th January 2012 to 2nd November 2012. However, data availability for this period was a low 67%.

More specifically,

- data were not available at all for February and March due to "complications in the data transfer/download" and
- data were only partly available for six of the other months, due to things such as broken tape, complications in data transfer/download, failures and hardware issues.

The consultants, Pacific Environment Limited, concluded that

Due to its limited availability, the site baseline PM10 data was not considered sufficient for use as background data. ...Instead, Whyalla Shultz Reserve PM10 data was [sic] used (Appendix 5.6C, 4.5 p 11).

There is no guarantee that Whyalla data represent an acceptable substitute for locally-sourced data.

More importantly, given that it should not be difficult to collect dust samples, this failure to successfully complete what should be the relatively simple task of dust collection at Hillside does not auger well for the operational efficiency of what will be a huge, complex mining operation.

If Rex Minerals and their consultants cannot get this simple task right, what else could go badly wrong once mining commences?

2.1.1.4 Uranium

Mining Plus concluded that:

"it may be possible to blend material that has elevated Uranium and exceeds the threshold Uranium concentration with lower-concentration material in order to construct a waste rock dump that would be classified as non-radioactive under Schedule 4 of the National Directory for Radiation Protection"

However, "In order to design and schedule such a waste rock facility, there is a need to define the schedule for waste rock extraction in terms of its Uranium concentration;

In order to achieve this, the following would be required:

An accurate understanding of the distribution of Uranium throughout the waste zones of the deposit; and

A schedule for waste rock extraction.

Therefore, it is recommended that during the feasibility stage of the project, Rex Minerals undertake an additional waste rock sampling and analysis program, designed to enable mapping of the Uranium concentration throughout the deposit. The current waste rock sampling and analysis program is insufficient for the level of accuracy that would be required.

We could find no indication in either the Appendices or the MLP that this further work was undertaken.

It should also be noted that the samples provided to Mining Plus were all selected by Rex Minerals. There was no independent sampling selection undertaken by the Consultants.

DMIRE, the State Government and Rex Minerals must

- Engage independent consultants to review the accuracy of the science underpinning every component of the Hillside project.
- Re-do the analysis as required.
- This work should be undertaken by consultants who are totally independent of Rex Minerals or the regulatory authorities.

2.2 Hydrological and water-related issues

2.2.1 Hydrology and de-watering issues

We understand that the hydrological model for the mine site is inadequate.

For this reason, the YPLOG commissioned an independent review of the hydrological content of the MLP and its associated Appendices and that report is attached as ATTACHMENT 1.

Our own reading of the MLP and Appendices indicates that the hydrological assessment does accurately describe how sea water and fresh water interact at the lease site and how this will change as mining proceeds.

The region has a complex geology – limestone overlaying bedrock. Water may move in one direction in limestone, but in a different direction in bedrock. This does not appear to be well understood or modeled comprehensively.

- Of particular concern is how Rex Minerals will deal with the issue of dewatering – ie removing or preventing the water in-flows into the pit.
- Rex Mineral's consultant, Mining Plus, has modelled projected water flows into the mine area as well as investigating disposal options. However, as described earlier (see Section 2.1.1.1 above) the consultants pointed to a range of inadequacies in the baseline data collection processes. To reiterate just one conclusion from Mining Plus:
 - *"All groundwater assessments carried out included drilling to depths not exceeding approximately 200 m, whereas the pit is expected to extend to depths greater than 400 m and the underground operations could occur at depths to nearly 700 m. The relatively shallow depth of assessment is considered a significant constraint to (dewatering) model reliability and confidence." (App 6.5A pg 9).*
- The predicted flows based on the work that was undertaken range from 170 litres per second to 440 litres per second. This equates to between 14,688 metres cubed (kilolitres) per day up to 38016 M3/d. (App 5.10A, pg 5 and App 6.5A pg 15).
- Water use by the mine's two dust suppression trucks is estimated to use up to 1,960 M3/d. However, this still leaves from 12,700 to 36,000 M3 per day to be disposed of. As evaporation has only a minor impact, there will be significant water volumes to dispose of.
- The holding pond size is not mentioned, but the 100 ML tailings dam seepage storage pond area is. This would only take between 3 to 8 days to fill based on the above figures.
- This raises the issue of how Rex will dispose of excess water, particularly after year 5 when groundwater inflows are likely to increase considerably.
- App 5.10A pg 5 lists a range of contingency plans. Including
 - *Utilisation of in pit bores to allow the pit dewatering volumes to be more consistent year to year;*
 - *Temporary storage in the pit during times of peak flow;*
 - *Temporary storage in the 100 ML tails dam seepage storage pond area;*
 - *Evaporation using mechanical means such as evaporators;*
 - *Utilisation of in pit bores that can be used in the summer months to advance dewatering and thus reduce the flows short term in the winter months;*
 - *Utilisation of pit perimeter bores to form a cut off bore field between the Gulf St Vincent and the pit with discharge to Gulf St Vincent;*

- *Discharge of excess pit water to the Gulf St Vincent;*
 - *Disposal of excess water via an injection bore field; and*
 - *Grouting the aquifer to reduce inflows.*
- Of these options the most worrying are :
 - an injection borefield located on the eastern side of St Vincent's Highway
 - disposal into the Gulf.
 - Grouting the aquifer to reduce inflows.

The first two of these options will either require extensive filtering and decontaminating to protect the environment or risk while the third runs the risk of permanent interference to the aquifers.

It appears that water control will be technically and environmentally challenging for Rex and also very expensive, given the cost of moving up to 38 megalitres of water per day.

There is also little understanding of what the proposed dewatering will do to the underlying aquifers. Rex Minerals state that their "use of groundwater will only lower the water table in a very localized area immediately around Hillside" (Rex Minerals' Hillside Copper Mine Information Sheet, Sept 2013; 4).

This seems extremely unlikely, given the huge amount of water that will be drawn from the groundwater system and the length of time (12 + years) over which this will occur. There is anecdotal evidence that during the exploration drilling stage, the water table on a farm located 8 kms away dropped significantly, making it impossible to pump water. Once exploration drilling ceased, the water levels returned to normal.

With a full scale mining operation, there is a significant risk that ground water from a very wide area of the Peninsula will be depleted, which has implications for sub-soil moisture and crop production.

There are also 17 farms within a 15 km radius that have access to good quality groundwater which is used for stock watering and some domestic purposes.

DMITRE and the State Government must ensure that

- **An independent and comprehensive review of Rex's hydrology/water balance study is done. If the hydrological model is not right, and the systems are not will understood and monitored appropriately, there will be major risks of contamination to the ground water and potential leakage of contaminants off site and into the Gulf.**

2.2.2 Offsite contamination via run-off and leaching

The engineered protection against risks to water quality and offsite contamination proposed in the MLP is minimal, possibly because of the costs involved to do this properly.

2.2.2.1 Acid rock drainage and contaminant leakage (MLP: 5.8.3: 5-61)

Acid drainage and contaminant leaching are the most important sources of water quality contamination resulting from copper mining. The potential for acid mine drainage is of key concern.

As a result of oxidation of the sulfide ore minerals contained in waste rock piles and tailings dams, or in the walls of the pit and underground workings, sulphuric acid may be generated. This acidic water can dissolve other toxic metals in the surrounding rock.

These contaminants may seep into surface and groundwater systems and eventually into the nearby St Vincent's Gulf where they would be highly toxic to fish and other marine life.

While Rex states that "*the waste rock from the Hillside project exhibits very limited potential to generate acid*" (MLP, 6-99), the report by the consultants, Mining Plus, warns that "*Given the large volume of waste rock associated with the project, further sampling may be required*". Their assessment involved the analysis of only 57 samples selected by Rex themselves.

As noted earlier, the only indication that further sampling was undertaken is a reference in the MLP (p 5.8.3 5 - 62) that a "*second round of sampling was undertaken where 125 samples were analysed to further evaluate the uncertain classifications from Phase 1.*"

However, we were unable to find any report detailing this second study.

Having concluded that the risk of acid mine drainage is low, Rex does acknowledge that not all of the oxide ores will be 'environmentally stable'.

"16Mt of oxide ore will be contained within a 'stand along' stockpile located adjacent to the low grade ore stockpile in the northeast of the production area". (5-62). "The ore contains a variety of copper minerals, including ... atacamite" which is not environmentally stable. It is solubilised in rainwater and so has the potential to cause contamination. (5.8.3 5-62).

They note that "*Provision to capture draining from the stockpile during operations and appropriate sealing of the stockpile should it remain at the end of operations are included in operational plans for Hillside*".

What guarantee is there that this will work?

Rex Minerals need to answer the following

Where are these plans documented?

Will these strategies guarantee there will be NO contamination from the oxide stockpile?

If these strategies fail, then given that the 16Mt Oxide dumps are in the catchment area of two creek systems and given that those creeks flow from west to east into St Vincent's Gulf, what is the risk of contaminated runoff and leaching from this oxide ore stockpile contaminating the paddocks to the east of the dumps and the Gulf waters?

2.2.3 Other concerns

- **Tailings Dam**

Engineered protections for tailings and contaminated water dams are missing. The company is proposing clay liners for the tailings dam but this is not considered best practice. Dams need to be properly engineered, double poly-lined and monitoring devices put in place to identify leaks. Without this, the environmental impacts are likely to be significant.

▪ *Slurry Pipeline*

The company's proposal to bury the slurried concentrate and return water pipelines leading to and from Ardrossan port is bad practice. Pipelines carrying toxic product must be above ground so that they can be inspected daily over the full route to ensure there are no visible leaks. This is in addition to being: appropriately banded to contain any spills, fitted with leak detection systems to register catastrophic failure and shutdown pumping systems.

There are several recent examples of failure to detect leaks from buried pipelines at mining operations, and consequently significant environmental impacts, and large fines have been administered

• *Dewatering system*

- Some form of water treatment system is needed to treat excess contaminated water at the mine and port. This is very important because (apart from dust) water is the major vector for contaminants to escape the operations. A dewatering system should also be in place to consolidate the tailings to remove the risk of offsite seepage and contamination.

Rex Minerals must:

- Explain what the tailings dam will actually contain and in what concentrations (heavy metals, uranium, waste processing chemicals etc.)
- Provide guarantees that there will be no leakage from the dam over the full life of the mine.
- Explain why the pipelines will be buried.

2.3 Air quality/Dust emissions

Given the sheer size of the mining operation, dust emissions pose one of the biggest threats to Yorke Peninsula's community health and environment.

2.3.1 The type of dust considered

The modeling in the MLP focuses on two types of dust:

- Ambient PM10 concentrations -- ie particles with a diameter of less than 10 um) and
- Total suspended particulate matter (TSP); ie the total amount of particles suspended in the air regardless of particle size.

No modeling of PM2.5 is included even though we understand that this measurement will soon become the industry standard.

A recent Senate inquiry recognized that current measurement standards ie the PM10 and PM2.5 are inadequate.

Rex must explain

- why it failed to consider or undertake any modeling of PM2.5 dust emissions.

2.3.2 Total amount of dust generated and dispersal distances

- At the mine site huge amounts of dust will be generated by the mining operation itself and by wind-blown dust from the exposed surfaces of the huge waste rock dumps, the exposed pit faces and the exposed haul road surfaces.
- At Ardrossan, the port infrastructure will generate further dust concentrations.
- As detailed in the table below., over 1.6 million kg of TSP (ie the total amount of particles suspended in the air regardless of particle size -- referred to as 'nuisance dust') will be emitted each year, including over 620,000 kg per year of PM10.

Appendix 5.6C, Appendix B.3.1: Summary of TSP and PM10 Emissions

Source of EIs	Amount TSP emissions (kg/year)	Amount PM10 Emissions (kg/year)
Pit Activities (including haul roads within the pit)	687,570	369,775
Loading and Unloading Activities	68,957	29,026
Wind Erosion from Exposed areas	19,249	9,625
Haul Roads outside of pit	808,462	201,564
Crushing Activities	22,500	9,000
Port Operations	6,111	2,444
TOTAL EMISSIONS	1,612,849	621,434

Appendix 5.6C 20;

2.3.3 PM₁₀

- Rex Minerals' Dust Predictive Map (Figure B5.4, based on full production for all days with no limitations on operations, and all 'so-called' dust controls applied shows maximum levels of dust that would be experienced in a 24 hour period. As shown, PM₁₀ emissions extend from the north of Ardrossan township, covering a wide area to the south of Black Point, moving inland and also extending well into the Gulf, raising issues of sea water contamination from dust settling on the surface of the water.
- High concentrations of dust (in excess of NEPM guideline of 50 ug/m³) are predicted
 - at the mine site itself where concentrations will reach 200 ug/m³ and
 - at the Port where in excess of 50 ug/m³ will occur around the conveyer transfer point and the ship loading locations.
- A large area outside of the mine itself will experience a 24 hour maxima of 25 or greater.
 - The settlements of Rogues Point and Pine Point will experience predicted 24 hour maxima of between 30 and 40 ug/m³,
 - Black Point and Ardrossan will, experience predicted maxima of 22 – 25 ug/m³.
- A section of St Vincent's Gulf adjacent to the mine falls within the 50+ range, and a much larger area is predicted to have dust concentrations in excess of 25 ug/m³.

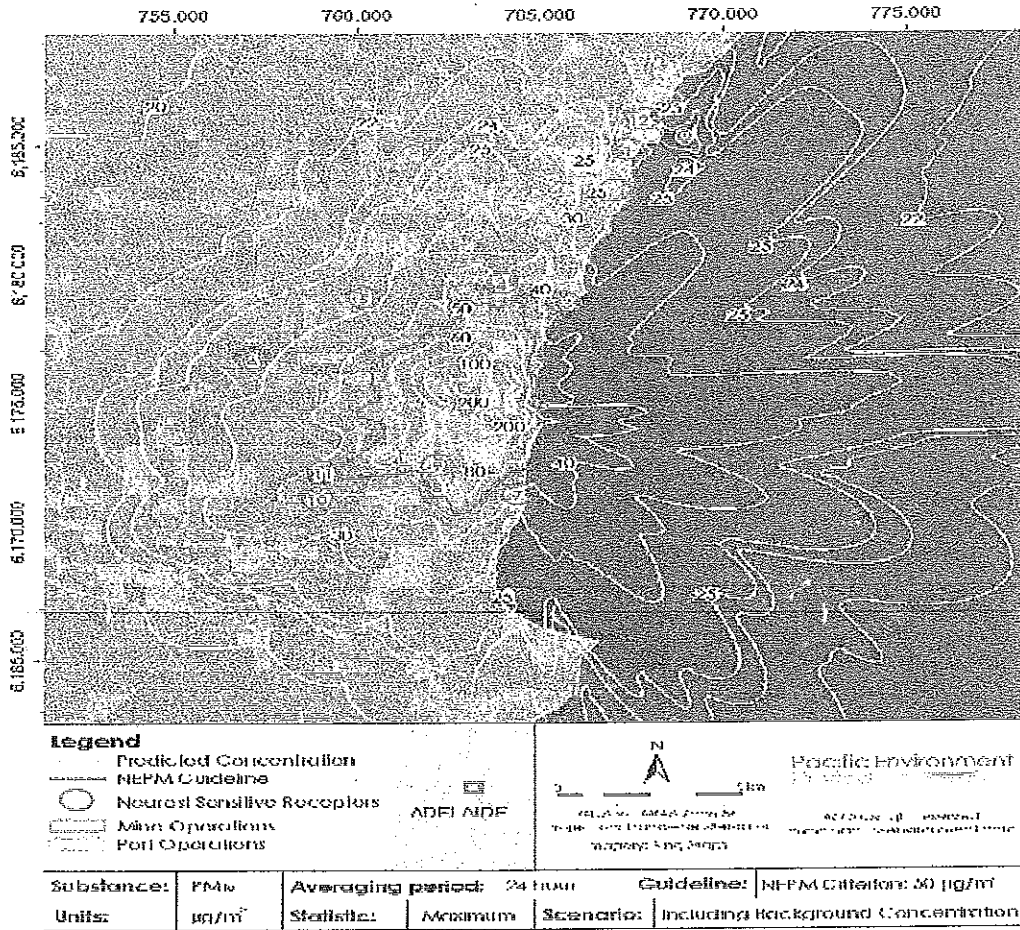
Rex Minerals' argue that, according to the model, full compliance with the NEPM criterion of 50 ug/m³ is predicted at receptors 1 – 7 (including Rogues Point) and receptors 10 to 12. Receptor 8 would comply on all but 1 day per year, and receptor 9 on 3 days per year.

These predictions seem highly questionable given that baseline data found that NEPM air quality standards were exceeded on 6 occasions during 2012 as a result of strong northerly winds. And these high levels occurred without the 1.4 million tons of dust that the mining operation will generate.

Given this huge amount of additional dust generated by the mine, it is highly unlikely that there will be only three days of 'extreme climatic conditions'. Yorke Peninsula has far more than only three or six windy days per year as evidenced by the winds that have buffeted the region in the last month or so.

Figure B.5.4 shows the predicted PM₁₀ impacts from the revised haul road dust emissions scenario. The increased is very limited. (Note that this Figure reflects the results from remodeling work undertaken at the request of the EPA (see page. for further comments). When compared with the original Map (Figure 9.2) there is a slightly increased footprint of the 50 ug/m³ contour.

Figure B.5.4: Predicted maximum 24-hour PM₁₀ Concentration (Mine Operations) – including background concentration



How much more PM10 dust will there be compared with pre-mining levels?

- PM10 concentrations in the region bordering the mining site currently have very low dust levels across all months.
- Although there was a considerable amount of missing data, figures indicate that during the dust monitoring period (January 2012 to November 2012) low PM10 concentrations were recorded across all months, varying from 8.4 to 21.1 depending on the location of the dust collectors. (Table 8.1 MLP 8.2, 25)
- The average for the whole period was a very low 12.8.
- There were six instances when the National Environment Protection (Ambient Air quality) Measure (NEPM) guideline of 50 ug/m3 were exceeded which, it was noted, occurred on days with high northerly wind speeds.

Even if the mine manages to comply with NEPM criterion (50ug/m3), it is inevitable that residents within at least a 10 km radius of the mine site will be exposed to considerable increases in dust concentrations once mining commences than is currently the case. And given that this will be a 24/7 operation, these increased dust levels will be present around the clock, rather than on isolated occasions, as is currently the case.

While Rex Minerals are keen to stress that dust levels will be below the NEPM criteria, experiences in other locations suggest there is a major dysjunction between what a regulator considers acceptable and what the local community, accustomed to living in a relatively dust-free environment, consider to be acceptable.

For example, dust emissions constitute one of the major criticisms raised by residents at the regular CCG meetings regarding the Kanmantoo copper/gold mine. Kanmantoo mining personnel assure local residents that the dust emissions are still well below the standards set by the regulator. But this is not considered satisfactory by residents. Kanmantoo is a very small mining operation compared with the proposed Hillside mine and so dust levels are far below those anticipated at Hillside.

Rex Minerals must explain :

- **How much more dust (especially PM10) will local communities (notably Pine Point, Rogues Point, James Well and Black Point) as well as surrounding farms actually experience compared with the baseline situation? More specifically:**
- **On how many days will PM10 concentrations approach or actually reach the maximum 24 hour levels depicted in Figure 8.5.4?**
- **On how many days will increased levels (compared with pre-mining days) be experienced?**
- **What is the average level of PM10 concentrations that we can expect?**
- **On how many days will that average be exceeded?**

2.3.4 How effective will the dust control measures be?

The predicted maximum 24 hour PM10 concentration shown above reflects the dust levels expected with all dust control measures in place. Rex are clearly placing considerable reliance on their dust suppression methods, but these seem totally inadequate.

Table 7.4 in Appendix 5.6C illustrates what we had assumed were the main dust suppression measures at the mining site. Subsequent advice indicates that further modelling was undertaken at the request of the EPA, resulting in some changes to the suppression measures.

Specifically, the new modelling involved the replacement of salt sprays with water sprays to control all haul road dust. We understand that the reason for this change was that the EPA did not accept the prediction that salt sprays would produce a 93% - 97% efficiency rating.

Using water sprays, the control efficiency factor for haul road dust is a lower 83.5%.

The substitution of water spray for salt spray does nothing to address our concerns about the totally inadequacy of the dust suppression measures.

2.3.4.1 Water sprays

Water sprays will now be used to control:

- All wheel generated dust, both inside and outside the pit.
- Materials handling dust emissions from activities outside the pit.
- Dust emissions from crushing activities.
- Wind erosion dust emissions from exposed areas

There will be only two water trucks available for these tasks. This number was totally inadequate when the intention was to use salt sprays as well as water sprays, but given the rejection of salt sprays and the increased reliance on water sprays, two trucks will be even more inadequate.

The efficiency for this control measure varies from 65% to 85% - ie far from 100% effective. Assuming that most of the water available for use will be from salt water pumped back from the port of Ardrossan or ground water (which according to the MLP has a higher salt content than seawater) the extensive use of water sprays is likely to be highly detrimental to the environment and to future plans for returning the mine site to cropping and grazing land.

2.3.4.2 Pit retention

This assumes that that the dust generated within the pit will remain in the pit. It constitutes the main dust control measure for dust emitted from blasting, use of heavy plant machinery (excavators etc inside the pit) and open pit maintenance.

- Dust emissions from blasting are considered to make a significant contribution to overall dust emissions (MLP 8-31). However, the control efficiency in relation to CE_{isp} is 50% while control efficiency for CE_{pm10} is estimated at 5%. These values are extremely low.
- Similarly low levels of efficiency are anticipated for
 - controlling dust from the use of excavators/shovels/front end loaders within the pit
 - open pit maintenance by bulldozers

2.3.4.3 Wind erosion from waste rock dumps

- There will be no dust measures in place to control wind-borne dust erosion from the waste rock dumps.
- The MLP talks of progressive rehabilitation of open areas and stabilization of soil stockpile through the planting and establishment of annual grasses. But this will not occur while the waste rock dumps are in active use, And even then, it is not clear whether and how long such revegetation will take.

2.3.4.4 Real time monitoring

The MLP argues that real-time monitoring systems will be put in place to inform when additional dust suppression, adjustment or shutdown of the operations is required.

Rex Minerals needs to explain:

- What are the additional dust suppression measures?
- Under what specific conditions will shutdown of operations occur?
- Who will monitor compliance with this?
- What criteria will be used to determine when such measures need to be implemented?
- And how will the waste rock piles be "shut down" given that no control measures will be in place for each one while they are in active use?

Appendix 5.6C Table 7.4: Dust Sources from Mine Operations with Dust Controls and Control Efficiencies

Description of Activity	Description of Dust Control	Control Efficiency	
		CE _{15m}	CE _{10m}
Ore loaded into crusher	Water Sprays Enclosure	85%	85%
Unloading of ore at ROM pad	Water sprays on unloading trucks	70%	70%
Unloading of waste rock at waste rock dumps	Water sprays on unloading trucks	70%	70%
Wheel generated dust from transport of copper ore in pit	Salt sprays on road (now water sprays?) Pit Retention	97%	93%
Wheel generated dust from transport of waste rock in pit	Salt sprays on road (now water sprays) Pit Retention	97%	93%
Wheel generated dust from transport of copper ore outside pit	Salt sprays on road (now water sprays?)	93%	93%
Wheel generated dust from transport of waste rock in pit	Salt sprays on road (now water sprays?)	93%	93%
Drilling Operations	Pit Retention, Fabric Filter for Drilling	99.6%	99.1%
Blasting Operations	Pit Retention	50%	5%
Wind erosion from ROM pad stockpile	Water Sprays, Wind Breaks	65%	65%
Wind erosion from copper ore main stockpile	Water Sprays Wind Breaks	65%	65%
Wind erosion from waste rock dumps	No controls (disturbed monthly)	0%	0%
Primary crushing of copper ore	Water Sprays, Enclosure	85%	85%
Conveying from Primary crusher to main stockpile	Water Sprays, Wind Breaks	65%	65%
Conveying from main stockpile to SAG mill	Water Sprays Enclosure	85%	85%
Use of excavators/shovels/front end loaders within the pit	Pit Retention	50%	5%
Use of excavators/shovels/front end loaders at the ROM pad	Water Sprays	50%	50%
Open pit maintenance (bulldozers)	Pit Retention	50%	5%
ROM pad stockpile maintenance (bulldozers)	Water Sprays	50%	50%
Main stockpile maintenance (bulldozers)	Water Sprays	50%	50%

From table 7.4 b

2.3.6 Potential impact on environment and communities of dust

2.3.6.1 *How hazardous will the dust be?*

One of the key questions posed by the community is what types of contaminants are likely to be contained within the dust.

- *Copper Sulphide*

Dust blown from the low grade copper stockpile may contain sulphides which are known to contaminate crops and pastures.

- *Uranium*

Uranium will end up in the dust produced by the excavation process, the proposed 'blending' operation and the crushing process as well as being blown from the exposed waste rock piles.

Radon gas from uranium decay will accumulate in the pit at mine's end. This will potentially cause a health risk. Thorium and uranium, their decay product radium, and its decay product radon, will continue to occur for tens of millions of years at almost the same concentrations as they do now.^[3] As radon itself decays, it produces new radioactive elements called radon daughters or decay products. Unlike the gaseous radon itself, radon daughters are solids and stick to surfaces, such as dust particles in the air. If such contaminated dust is inhaled, these particles can adhere to the airways of the lung and increase the risk of developing lung cancer.

- *Diesel fumes*

These are now recognized as carcinogenic.

All of the haul trucks at Hillside will be diesel, including up to 34 Extrac Quiet (xq) 793 Cat D Haul Trucks which are not compliant with U.S Environment Protection Agency Tier emissions standards.

Diesel emissions was not included in the table detailing dust sources (see Table 7.4 above). Yet diesel fumes could pose a significant public health risk for nearby residents and an occupational health and safety issue for the mine workers themselves.

2.3.6.2 *What impacts will the dust have?*

At the mine site

If the dust suppression measures do not meet the predicted efficiency levels, the implications for surrounding communities and the environment will be considerable.

The MLP (8-31) has identified a range of potential impacts on air quality during construction and mining operations.

Table 8.3-3: Air quality potential impacts during construction and operations (including rehabilitation) at the proposed ML and EML

Potential impact ID	Potential impact description
ML-A1	Decrease in air quality resulting in human health impacts at neighbouring sensitive receptors from dust emanating from mining operation.
ML-A2	Human health impacts resulting from the contamination of rainwater tanks with dust from the mining operation.
ML-A3 & EML-A1	Decrease in ambient air quality resulting in public nuisance at neighbouring sensitive receptors from dust emanating from Hillside
ML-A4	Decrease in ambient air quality from odour emanating from the site impacting neighbouring sensitive receptors.
ML-A5	Reduced native plant growth or abundance resulting from increased dust deposition resulting from mining operations.
ML-A6	Reduced agricultural crop growth rates/yields from increased dust deposition on leaves.
ML-A7	Degradation of marine environment from dust deposition resulting from the mining operations.

- ***Impact on health of local residents***

There are approximately 600 residences located within an 0.1 – 5 kms of the mine. Elevated dust levels could cause major health problems, especially for those suffering from asthma or other associated breathing disorders.

- In respect to PM10 dust emissions, the MLP (8-33) acknowledges that *“Without monitoring and operational controls it is likely that PM10 impact levels higher than NEPM guidelines from the site will occur, which could have negative impacts on the health of the local community* The risk is rated moderate to high.
- In respect to nuisance dust, it notes: *Without dust emissions controls and operational restrictions “it is highly likely that the mining operation would generate substantial volumes of dust and almost certain that this dust would create a significant nuisance for the local community ... (MLP 8-35)*
- While the MLP concludes that nuisance dust deposition impacts would not be significant, it acknowledges that *“the averaging times available in relation to dust deposition monitoring for the evaluation of nuisance dust did not provide the resolution required for the evaluation of nuisance dust impacts occurring over shorter time periods”*.

- ***Crop contamination***

The MLP notes that *“There is some evidence that dust can inhibit light transferal to leaves and therefore slow the rate of photosynthesis and plant growth.”* But again, we are assured that with dust controls in place it is unlikely that there will be any impacts.

However, there is documented evidence that crops and vegetation located more than 5 kms from open cut mines on Eyre Peninsula are dying as a result of being smothered in dust. There is a high probability that the same will occur in relation to Hillside.

We are assured that *“ongoing monitoring is... proposed to be undertaken by Rex to address any community concerns’*, Appendix 5.6C 9.2.3 –46).

- ***Rainwater contamination***

- Contamination of rain water tanks is of critical concern, particularly in relation to local retirement/holiday locations that rely exclusively on tanks as their sole source of drinking water.
- The MLP (8-35) acknowledges that *"dust deposition from mine related activities in rainwater tanks is possible at the nearest receptors ... reliant on rain water (Rogues Point and James Well residents) which are totally reliant for tanks.*
- One suggestion by Rex is that *first flush systems will be discussed with concerned residents and that tanks are sampled for baseline results before mine operations commence.*
- It seems that only one rainwater tank at Rogues Point and one at James well has been sampled to date. If the intention is to limit testing after mining commences to these 2 only, then this is not acceptable. Two tanks out of the several hundred at these locations are not a representative sample. Nor has there been any discussion with most local residents in these locations about the viability of first flush systems.

At the port of Ardrrossan

- The MLP notes that

The storage and handling of concentrate at the port site could possibly result in increased dust generation throughout the life of the project. Without adequate design and operational controls this dust would be likely to travel beyond the site boundaries and potentially have impacts on the human health, amenity and quality of grain stored at Viterra. Dust and particulates from port operations entering the coastal and marine environment have the potential to smother marine flora and fauna (see Section 8.4.9). Dust emanating during construction and operation of the Option 1 of the port facility may impact coastal flora".

The list of potential impacts are detailed in Table 8.4-1 below.

Table 8.4-1 Air quality potential impacts during construction, operation and closure at the corridor and port site

Potential impact ID	Potential impact description
MPL-A1	Decrease in ambient air quality resulting in human health impacts at neighbouring sensitive receptors from dust and particulates generated by the port operation.
MPL-A2	Contamination of grain at Viterra storage facility with base metals in dust generated by concentrate handling operations at the port facility
MPL-A3	Reduced native plant growth or abundance resulting from increased dust and particulate deposition arising from port operations (option 1)
MPL-A5	Decrease in ambient air quality resulting in public nuisance at neighbouring sensitive receptors from dust emanating from the port operation
MPL-A6	Degradation of marine environment and negative impact on marine flora and fauna from concentrate dust and particulates generated from the port operations entering the ocean

Again, though we are assured by Rex that "extensive dust control systems are proposed for the port operations that will effectively control dust emissions".

2.3.6.3 On-going monitoring of dust control measures.

As a community, we are being asked to place a great deal of trust in the proponent's dust/control measures and the "active dust management/monitoring systems" But for the community to have any faith that these measures will prevent the negative impacts that may occur:

DMITRE, the EPA and Rex Minerals must

- Give unconditional guarantees that all of the controls and monitoring proposed in the MLP will achieve the efficiency levels predicted
- Guarantee that there will be no negative impacts on the health and well being of local residents, on the water and marine life in St Vincent's Gulf and on surrounding crops, livestock and environment.
- Explain in detail
 - What monitoring will be in place to gauge the effects of these remedial actions
 - How independent will that monitoring be
 - Under what conditions will mining activities be reduced or suspended.
 - What information will be provided to the community on a regular basis to enable public scrutiny of the levels of dust concentrations in neighboring areas and the effectiveness of dust control strategies
- Given that the proponents themselves will be responsible for day-to-day management of dust suppression levels, DMITRE and the EPA must
 - Provide details on the timeliness and effectiveness of the reporting systems they will put in place to ensure Rex Minerals comply with all regulatory requirements.
 - Provide details on the mechanisms to be used to provide independent feedback to the community on compliance levels, including when and how the community will be notified of any breaches of that compliance.

2.4 Uranium

The focus of our concerns is on the mining of the uranium ore zones, the proposed 'blending' of these higher grades with other ore to 'lower' the grade, and the resulting overall operation (including transport of slurry and management of tailings) on radiation levels and radiation protections.

2.4.1 How much uranium?

In published reports and media releases issued during the exploration phase, Hillside was promoted both by Rex Minerals and DMITRE as containing significant uranium grades.

- In October 2010, former managing director Steve Olsen said that Hillside has two economical sections of uranium (*per. com. Stewart Lodge*). Similar comments were also made in a radio interview
- Fabris (2011; 21) describes radon emanations that are "several times a background of 3000 $aRn(Bq/m^3)$ " over the ore, indicating anomalous uranium grades. He also states: '*Uranium values*

up to 955 ppm have been obtained in primary mineralisation (Parsee Fault zone at 512 m; Rex Minerals 2009).

- The MLP (5.8.2.1: 5-61) also states that at Hillside uranium has been found in concentrations up to 10,100 parts per million (ppm) which, in mining terms, is high enough to be economically mined if present in large quantities. (For example, Toro Energy's prospective Wiluna mine in WA will be mining a grade averaging 452ppm). The Beverly Uranium mine, (in-situ leaching process) east of Arkaroola has an average of 0.3 of 1% uranium concentration (3000 ppm)
- However, Rex Minerals made no mention of uranium grades in its Referral to the Commonwealth (SEWPaC) in 2012 under the Environment Protection and Biodiversity Conservation Act, although the Company was clearly aware of the elevated uranium content of the ore in places. Mining of uranium is a trigger in the Act, and would normally have required the Company to prepare a much more comprehensive Environmental Management Plan than the current one. The Commonwealth determined that the proposed mine action was not a 'controlled action'.

Rex Minerals must explain

- Why were the uranium grades not mentioned in its Referral to the Commonwealth?
- Was the Commonwealth's conclusion that the proposed mine action was not a 'controlled action' based in incorrect information?

2.4.2 How will the uranium be managed?

- The MLP argues that the average of uranium over the whole mine is low MLP (5-61).
- It also notes:
 - *"The statutory limit as set by the EPA in SA for the management of radioactive materials requiring a radiation management plan is 200 ppm uranium. When a cut-off grade of 200ppm uranium is applied to the total volume of ore and waste from within Hillside, a total of 4.1 Mt of material (ie 0.3% of 1.2 Bt) is present with an average uranium grade of 284 ppm. Planned scheduling of material movements from within the pit will ensure material with elevated uranium concentrations is blended with ore of lower uranium grades so that sufficient dilution occurs on the ROM pad to ensure uranium grades of less than 200 ppm are delivered to the milling circuit. A similar scheduling arrangement will be utilized to ensure the concentration of uranium of material on waste dumps is also diluted to such uranium concentrations do not exceed 200 mmp". (5.8.2.1 pg 129*
- However, we understand that with the adoption in South Australia of the Commonwealth's *National Directory for Radiation Protection* in 2010/2011, the statutory limit for the management of radio-active materials requiring a radiation management plan will change from 200 ppm for uranium to 80 ppm uranium.
- These new standards are used by the consultants Mining Plus in their report:
 - Using the *National Directory for Radiation Protection* (Australian Radiation Protection and Nuclear Safety Agency, 2011), it was determined that material containing over 80 ppmU would be classified as radioactive, and would need to be managed under the RPC Act (Appendix 5.8A).

- In relation to blending, the consultants Mining Plus concluded that:

"it may be possible to blend material that has elevated Uranium and exceeds the threshold Uranium concentration with lower-concentration material in order to construct a waste rock dump that would be classified as non-radioactive under Schedule 4 of the National Directory for Radiation Protection"

However, *"In order to design and schedule such a waste rock facility, there is a need to define the schedule for waste rock extraction in terms of its Uranium concentration;*

In order to achieve this, the following would be required:

An accurate understanding of the distribution of Uranium throughout the waste zones of the deposit; and

A schedule for waste rock extraction.

Therefore, it is recommended that during the feasibility stage of the project, Rex Minerals undertake an additional waste rock sampling and analysis program, designed to enable mapping of the Uranium concentration throughout the deposit. The current waste rock sampling and analysis program is insufficient for the level of accuracy that would be required.

The Regulators and Rex Minerals must answer the following:

- Why they are planning to reduce uranium concentrations through blending to no more than 200 ppmU rather than adhering to the new best-practice limits of 80 ppmU?
- Was this further sampling and analysis program undertaken?
 - If so, who undertook this work and are the findings detailed in the MLP?
 - If not, why are they not available for public scrutiny and what were the findings?
 -

2.43 What will be the consequence of high uranium concentrations?

- REX argue that some natural occurring outcrops on YP have uranium concentrations higher than the Hillside "average" (although they do not specify where). The important point though, is that these outcrops are not being ground up by mining operations and so the contained uranium is not vulnerable to wind borne dispersal.
- Averages aside, Rex will be blasting, excavating, loading onto haul trucks, dumping and blending the uranium to achieve an EPA standard below 200ppm.
- All these activities could produce radioactive dust that could be spread by the prevailing winds
- Radon gas from uranium decay will accumulate in the pit at mine's end. This will potentially cause a health risk.

Rex must answer the following:

- **Will the operators in the open cut mine and in the concentrator plant be exposed to radiation**
- **Could elevated uranium end up in the concentrate streams which will be slurried to the port and exported? Note that BHP Billiton attempted to get permission to export uranium-bearing concentrate from Olympic Dam to China but there was a considerable backlash and the proposal didn't proceed. We understand that this was based on 100ppm in the concentrate which is well below the 200 ppm that Rex is aiming to achieve.**
- **Could the elevated uranium end up in the tailings and the waste rock piles?**
- **How will the mine be safely managed and rehabilitation completed effectively to ensure there are NO radiation hazards?**

2.5 Contamination of St Vincent's Gulf

Of major concern is the detrimental effect that the mining operation will have on the waters and marine life of St Vincent's Gulf and in particular on the recently declared Marine Park extending northwards from Parara Point to the head of the gulf. This Park, designed to protect the upper reaches of St Vincent's Gulf, is of particular significance because it provides:

- nursery habitats for the King George whiting, garfish, mullet, western king prawn and blue swimmer crabs, which underpin the lucrative professional and recreational fishing industry in the Gulf and
- it provides important food and nesting places for thousands of migratory shorebirds during summer (Marine Park 14 Upper Gulf St Vincent Marine Park: govt of SA).

While Rex Minerals has consistently stressed that the mine will have only minor consequences for the Gulf, the submission by marine biologist, Associate Professor Jochen Kaempf, indicates otherwise (Kaempf, J. 2013. *An Independent Scientific Assessment of the Hillside Copper Mine Proposal (Mining Lease Proposal and Management Plan)* by Rex Minerals Ltd with a Focus on Marine Impacts. Report, 7 pages. School of the Environment, Flinders University).

Prof. Kaempf is a recognized research specialist on the waters of St Vincent's and Spencers Gulf. His assessment of the potential dangers posed by the Hillside mine on the Gulf cannot be ignored.

His particular concerns include:

- The possibly continuous influx of mining related pollutants into the ecologically significant upper St Vincent's Gulf marine park, and the concomitant risk it poses to the region's distinctive marine biodiversity and birdlife
- The effect of runoff and sediment deposition on sea grasses
- The potential pollution caused by the significant increase in shipping to Ardrossan, including the 'potential import of marine pests'.

His assessment of the MLP's technical inadequacies is scathing:

- "The proponent did not undertake any marine dispersal studies as part of their proposal. For a project of this enormous scale, the use of state-of-the-art hydrodynamic modeling tools should be

a standard requirement for the assessment of the effects of the dispersal of dust and potential coastal surface discharged into the marine environment (page 1).

- The proponent has neither reviewed nor scientifically explored the physical oceanography of Gulf St Vincent or its upper reaches.
- The proponent has decided not to simulate the pathway and dispersal of coastal surface run-off events and the sediment contained in it.
- The proponent has also decided not to scientifically study the pathway and dispersal of mining related dust deposition in the marine environment.
- Consequently, the proponent's claims in the impact assessment that both factors are of minor consequences cannot be scientifically tested being void of any credible scientific evidence. and are pure speculations presented as part of the proposal.

He argues that

- *“both the locally enhanced air-sea flux of dust and the occasional surface run-off of mining-related pollutants should be legally classified as point-source discharges that must comply with the Environment Protection (Water Quality) Policy 2003. and*
- *the company should be asked to demonstrate that such events will comply with regulations set out in that policy; in particular that:*
 - 1) *adverse marine impacts of pollution events are limited to mixing zones with a radius of less than 100m and*
 - 2) *there are no risks to the adjacent marine park.*

In contrast to the assurances provided by Rex Minerals, Prof Kaempf concludes that

If this project goes ahead, substantial negative inferences between mining operations with the marine ecology at a large scale are unavoidable.

2.6 Other concerns

Apart from the five key issues discussed above, we have concerns about a range of other issues that are likely to impact on the surrounding environment and local residents. These include

- Noise pollution
- Vibration from blasting
- Light pollution
- Visual pollution
- Road and traffic issues
 - Road closures and redirection of St Vincent's Highway
 - The closing of Reddings Road
 - The increase in road traffic to and from the mine site
 - The increased likelihood of road accidents

However, because of time restrictions it is not possible to elaborate on these in this submission.

SECTION 3

REHABILITATION, MINE CLOSURE AND FUTURE MINING

3.1 Rehabilitation

Many mining companies now recognise that they need a social licence to operate, which includes the ability to demonstrate that they can rehabilitate a mining site according to best practice. What this entails is well described in the series of Best Environmental Practice in Mining booklets) generated by the Australian Government in partnership with 'enlightened' mining companies.

(<http://www.ret.gov.au/resources/Documents/LP/SDP/BPEMOverview.pdf>)

To quote from Booklet 4: **MINING AND THE ENVIRONMENT**

- *[The community] expects that no legacy of environmental damage is left after mining ceases, and that no liability is transferred to it or the government for the costs of repairing environmental damage or restoring the mined area to a safe condition which may be suitable for some subsequent beneficial land use.*
- *.... Mining as an activity which renders the land unsuitable for any subsequent use is no longer a valid concept; the "user pays" principle ensures that those that profit from mining are now held liable for any negative impacts the mining activity has on surrounding areas and its peoples.*

We do not believe that best practice rehabilitation will occur at Hillside.

The Mining Lease Proposal states that after mining the site will be rehabilitated to a level which is acceptable to the local community (as per the expectations expressed by the Community Consultation Group) MLP (6-151) are unlikely to be met.

Rex (MLP: 3.5.1; p 3-12) states that it will

"rehabilitate the proposed ML and MPL areas to achieve a stable and sustainable landscape, consistent with prevailing conditions and surrounding natural landforms.The closure principles that will guide the rehabilitation of areas including the residual open pit void disturbed by the Hillside Project will include:

1. *developing landforms that are consistent with the surrounding area and/or meet community expectations .*
2. *rehabilitating the site to an appropriate land use consistent with the standards identified for that land use*
3. *protecting human health and safety*
4. *reducing the need for long term monitoring and maintenance through design and construction of landforms that are geotechnically and geochemically stable*
5. *ensuring visual amenity meets community expectations*
6. *developing appropriate monitoring system and remedial action program*

Based on the details provided in the MLP and accompanying appendices, these goals are unlikely to be achieved.

3.1.1 The Pit

- According to Rex, *the open pit void will remain. Innovative uses for the void will be explored.* (Rex Minerals Hillside Copper Mine Information Sheet Sept 2013"
- This is not consistent with *"developing landforms that are consistent with the surrounding area and/or meet community expectations".*

- The pit will be fenced off and, with the cessation of any dewatering operations, will start to fill with water. *“Post closure modelling of pit water level recovery shows that the pit will fill very slowly around 300 metres AHD by year 62... It will reach long term equilibrium level after 500 years. (MLP 6.9.4 P 6-170).*
- This pit water is likely to be highly toxic. We understand that the water, when combined with dissolved oxygen, allows sulphide minerals in the ore and wall rocks to decay, releasing acid. When the pit water level eventually reaches the natural water table, the direction of water flow will reverse and flow back into surrounding groundwater.
- The argument proposed in the MLP that the enclosed pit area could become a sanctuary for native flora and fauna is bizarre, given the high water contamination levels.
- What guarantees are there that there will be no leakage of pit water into the aquifers, and ultimately into the Gulf waters, over the next 500 plus years?
- The pit should be backfilled in such a way that the original landscape is returned as closely as possible.
- Rex state that to backfill the pit would not be economically viable.
- They also state (MLP 6.9.6.4) that: *“The South Australian government (DMITRE) requires that access for any future mining or reprocessing is maintained.*

This is an untenable proposition.

- Presumably, Rex will have extracted all useful ore by the end of the project, with the site holding no further interest for any other large-scale mining company.
 - It also presupposes that any subsequent mining company (if there is one) will have the resources to rehabilitate the site appropriately.
 - With this statement, Rex seems to be evading their environmental rehabilitation responsibilities.
 - Rehabilitation should be the responsibility of the primary mining company, not put to one side in the off-chance that another company will want to mine there in the future.
 - Rex Minerals should commit to **completing** a comprehensive rehabilitation program after mining and not on-sell the property with its rehabilitation liability.
- Apart from the economics, a more likely explanation for why Rex intend to leave the pit open is that they intend to use it as part of their expansionist plans to haul material to Hillside from 50 other mine sites, and potentially dispose of waste rock by backfilling the pit. (see Section 3.2)

Rex Minerals must explain:

- **Why it is not adhering to best practice by opting not to place contaminated tailings and rock into the pit and backfill it?**
- **If this decision is based on economic grounds, what other decisions regarding rehabilitation are motivated by economic considerations?**
- **How contaminated will the pit water become and what will be the consequences if it leaches into the Gulf?**

3.1.2 Tailings

- The tailings and other contaminated wastes will not be returned to the pit for safe encapsulation after mining. Instead, the rock waste pile in the west will remain in order to retain and encapsulate the tailings dam. This is not best practice.
- Prior to encapsulation, excess water in the tailings dam will be pumped back into the pit. Rex argues that *"The tailings contained in the TSF are non-acid forming therefore the water is unlikely to require treatment."* Where is the evidence for this?
- Above ground structures such as waste rock piles and tailings dams are engineered structures that will ultimately fail in the long term unless costly on-going management is undertaken. In contrast, the underground voids and the pit are an effectively stable geological containment structure. The risk of erosion of tailings from the waste rock impoundment or seepage of contaminants from such structures would not exist if these materials were returned to the pit. There are now many examples of erosion issues and contaminant leakage from old mines such as Rum Jungle (a uranium/copper mine in the NT) and the Mount Lyell copper mine in north west Tasmania near Queenstown.
- During the mine operations, some form of dewatering system should be in place to consolidate the contaminated tailings rather than relying on natural evaporation. This would enable these metal-rich materials to be trucked back to the pit at the end of operations.

Rex must explain why it is not adhering to best practice by placing tailings and other contaminated waste in the pit for safe encapsulation

3.1.3 Land Reclamation

- The assertion that arable land can be reclaimed from the stockpile and tailings area is highly questionable. The overburden stockpiles are mostly granite and gabbro which are igneous rocks and not soils that will support future farming.
- Rex's proposal to cover much of the site with the original topsoil is questionable. Even if the topsoil is completely stripped from the whole area before work starts there does not appear to be a sufficient amount available to do much with anyway. Stored topsoil loses its viability within 6 to 12 months.

Rex must answer the following:

- Does the description of the post-mine land use as 'arable' mean that it will be suitable only for grazing?
- What about the fenced pit and the lake?
- If not, precisely how much of the mine site will be returned to cropping land which was the prime agricultural pursuit across the entire site prior to mining?

3.1.4 Slurry pipeline

- The Company's proposal to bury the slurry concentrate and return water pipelines leading to and from Ardrossan is not best practice. Pipelines carrying toxic product must be
 - Above ground
 - Appropriately banded, in case of spills.
 - Inspected daily over the full route to ensure there are no visible leaks.
 - Fitted with leak detection systems to register catastrophic failure and shut down pumping systems.
- There are several recent examples of failure to detect leaks from buried pipelines at mining operations, and consequently significant environmental impacts, and large fines have been administered.

3.1.5 Road Diversion

- The diversion of St Vincent's highway will remain.
- Sections of this road will be almost at the cliff face and several bridges will have constructed across the major creeks.
- The MLP states that the portion of land containing the road will, at mine closure, be transferred to DPTI/ DCYP To take over responsibility of the care control and management of the proposed highway.
- With climate change and rising sea levels, coastal erosion and cliff undercutting is inevitable, and is already occurring on the section of St Vincent's Gulf earmarked for the road diversion. Road maintenance may therefore become another financial burden for the community.

In sum, we believe that there is no beneficial land use to the community or former (and future) landowners from a mined landscape in which an open pit filled with potentially contaminated water and mine tailings contained within a waste rock dump about the original land surface are allowed to remain.

3.2 Who will wear the costs of rehabilitating the site according to 'best practice'?

- If Rex Minerals leaves the open pit, the waste rock dumps and the tailings dam after mining, and this results in leakage into and contamination of the surrounding environment, who will wear the cost? Who will monitor and maintain this effectively un-rehabilitated mine site? What value could it possibly have for the community in this state?
- We are fully aware that the company is required to lodge a bond with the regulator, to cover rehabilitation costs if it is not done to the standard required.
- Unless the bond is large enough to cover the full costs involved in doing the rehabilitation to best practice standards rather than to the minimal standards described, local residents could be left with a huge cleanup bill and long term environmental management and maintenance costs.
- It is unlikely the community or Council will have the millions of dollars that may be needed to do this. Hence, the community will be stuck with the problem. There are many examples across Australia where this has happened - where the local community has been left with a major financial and environmental burden.
- There is also a risk that the mine might cease operations prematurely because of low grade ore, low market prices or if the company becomes insolvent. (One example is the Angas Mine near Strathalbyn. If this happens, what are the plans to deal with the potential environmental legacy of the minesite and its operational infrastructure.

3.2.2 Need for independently verified Bond

- It is imperative that the regulator sets an environmental bond that would regularly increase over time as the mine development progresses. The further along in the mining process the greater the cost of rehabilitation and so the greater the amount of bond required.
- The bond needs to be properly calculated and independently verified to ensure that it adequately covers the costs of closing, decommissioning and rehabilitating the mine, particularly if the project closes unexpectedly. For example the Ranger Uranium Mine in Kakadu has a rehabilitation bond of \$640 million in 2012 (Energy Resources of Australia Ltd, *Annual Report*, 2012) because the mine site has to be restored to World Heritage status.
- The bond agreement should be in place now.
- A full scale monitoring program should also be in place to ensure the rehabilitation process is fully adhered to.

3.3 When will lease relinquishment occur and rehabilitation be completed?

- While Rex Minerals claim a 15+ year life for Hillside, based on open-cut and then underground mining, they already have plans for extending the life of the project once the ore body has been exhausted...
- In the MLP, it is argued that once mining at Hillside ends, the crusher and processing plant could be used to process ore from other mines established in the region either by themselves and other mining companies.
- This would entail
 - Trucking excavated rock to Hillside from these other sites,
 - creating *additional stockpiling of waste material [from these new mining activities' MLP: 3-11 para 1].* Alternatively, Rex notes that the waste rock "could be disposed of into the existing open pit".
 - creating more tailings dams.
 - creating haul roads across the Peninsula, thereby destroying even more farming land.
- In a presentation at ASX Spotlight May 2013, Hong Kong, Singapore, Rex Minerals' Mark Perry noted that, outside of the 15+ year life of Hillside, "*within our existing exploration licence, there are 50 highly prospective targets that we will start to aggressively look at as we get through funding and start to build the plant*". Through the use of haul roads into Hillside "*we can increase the life of Hillside*".
- This is backed up by statements in Rex Minerals Ltd Quarterly Activities Report, for the period ended 30 June 2013 (ASX Release; 29 July 2013) p 6).

Regional exploration work during the quarter focussed on the analysis of a regional soil and historical calcrete sampling data designed to provide an initial evaluation of several priority target areas, including the historical Yorke Valley copper mine and a series of newly identified targets. The results identified several discrete zones of elevated copper mineralisation (including an anomaly around the Yorke Valley copper mine), requiring further investigation and follow-up over the coming 12 months. At present, at least 5 high priority targets exist within a 40km radius of Hillside with a further 45 requiring further reconnaissance work before being elevated to high priority status.

- In addition to Rex Minerals expansionist plans, another eight exploration companies have taken out tenements that cover 90% of YP with promising discoveries already reported at Alford West.
- If Hillside gains approval it will be very difficult to stop these other mines from going ahead. Yorke Peninsula could end up as nothing more than a devastated wasteland, totally unsuitable for agriculture, tourism or any other activity. Under this scenario, Hillside would potentially remain operational as a processing/waste dump for as long as these other mines continued to operate.

The State government must

- Give categorical assurances to the people of Yorke Peninsula that the region will not be destroyed by the establishment of further large open-cut mining ventures.

3.4 Need for community and independent technical representation in monitoring Hillside during and after mining.

Given the potential for major environmental and human damage if the various operational controls and strategies promoted by Rex Minerals fail, there must be a rigorous, highly visible and publicly scrutinized monitoring program in place from the commencement of mining to lease relinquishment.

At present, responsibility for monitoring the Hillside site rests with the proponents themselves. It will be the mine operators, for example, who will decide if and when to implement additional dust strategies, be responsible for identifying and responding quickly to contamination leaks from the site or the slurry pipeline etc. As has been demonstrated many times before, mining companies have a very poor track record for self-regulation.

Nor is it clear which Government Department – DMITRE, EPA – will have primary responsibility for overseeing Rex operations, to ensure adherence to set standards.

According to Rex (Rex Minerals Ltd; Hillside Copper Mine Information Sheet, Sept 2013; 4)

The Hillside Mine plan is assessed at each project stage; construction, during operation (at five year intervals), rehabilitation works (progressively occurring during operations) and closure. ...

An assessment of the Hillside plan at five year intervals during operation is completely unsatisfactory. A lot can go wrong within 5 days, let alone within 5 years.

The Australian Mineral Industry Code for Environmental Management, developed in response to a recognition that the “Australian community expects much better environmental performance by the mining industry”, requires signatory companies to prepare “annual publicly available reports that document their environmental performance and implementation of the code”. (A Milnes: A review of Key issues in Mine Environmental Management Decommissioning and Rehabilitation).

Even this is not adequate.

A better model is to establish a committee of stakeholders, community representatives and independent technical experts to oversee and monitor the environmental and human impacts of Hillside both during and after mining.

A precedent for this exists for the Ranger Uranium Mine at Kakadu where Energy Resources of Australia, has been subjected since mining commenced in about 1908 to a comprehensive regulatory regime overseen by several independent committees including:

- Mine Site Technical Committee
- Alligator Rivers Region Technical Committee.
- Alligator Rivers Region Advisory Committee. (A Milnes: A Review of Key Issues in Mine Environmental Management, Decommissioning and Rehabilitation.)

The regulatory agency (DMITRE, EPA) must guarantee that:

- 'Best practice' real-time monitoring and accountability structures are implemented at Hillside with frequent and regular oversight by DMITRE/EPA.
- company managers and directors will be held liable for any adverse environmental impacts, both during and after mining.
- the Government will establish a committee of stake holders, community representatives and independent technical experts to oversight and monitor the environmental management of Hillside both during and after mining?
- Rex Minerals will adhere to the Australian Mineral Industry Code for Environmental Management
- Rex will provide annual environmental reports that are independently audited and verified, as per that code.

SECTION 4

ECONOMIC ISSUES

4.1 Cost/benefit analysis

Cost Benefit Analysis attempts to measure all of the positive or negative consequences of a project.

Because they are relatively easy to calculate, direct financial costs and benefits (such as increased employment) are most likely to be documented in any development proposal.

In contrast, because putting value on factors such as the value of a human life or the actual compensation an individual would require to have his/her quality of life and wellbeing unchanged by a development is difficult. Putting a value on environmental issues is also difficult. This is now typically assessed by valuing ecosystem services to humans, such as air and water quality and pollution.

(en.wikipedia.org/wiki/Cost-benefit_analysis).

Given the magnitude of the proposed Hillside mine, and its potential for major environmental impacts on both the environment and local residents, a full cost-benefit analysis should be mandatory.

Yet Rex Minerals has chosen not to undertake a thorough and fully documented cost/benefit analysis.

Instead, they focus on the tangible issues such as the purported increase in employment opportunities, the increased water supply for the Peninsula, the amount of royalties that will be paid to the State Government etc.

The potential negative impact upon the social fabric and quality of life of residents in the region has not been costed or taken into account at all.

No attempt has been made to put dollar values on the following:

- The impact on landowners/householders adjacent to the mine as a result of:
 - Reduction in land and property values
 - Noise and light pollution from round the clock mining activity and heavy vehicle movements, 24 hours a day 7 days a week.
 - Vibrations from the blasting causing damage to homes and other buildings
 - Reduction in the aesthetic value with compromised views
- The impact on road safety as a result of:
 - increased traffic associated with the project, particularly an increase in heavy vehicles using roads also shared by rural bus routes
 - Ratepayers having to fund the cost of increased road repairs needed
- The impact on residents' health, including:
 - Increase in respiratory diseases such as asthma, caused by the dust
 - Toxicity in the groundwater and rainwater tanks impacting health
- Pressure upon local services

- Rex Minerals quote in their proposal that the workforce will vary between 383 to 1,000 people over the 15 year life of the mine, with a sharp reduction in employment of 40% between years 10 and 11. If that workforce is drawn entirely from the local region, the increased population will be only temporary. The region will therefore not qualify for any increased provision of health, childcare, education and other associated services, yet the Rex workforce will use these services.
- Decrease in property values
 - Decrease in property values in the long term due to the proximity of the mine and the long-term inertia on its completion.
 - Competition for rental and purchase of properties – the SA average wage is \$60,559 (ABS, 2011) whereas Rex quote in their proposal that the average wage at Hillside will be \$100,000+. This puts the general population at risk of not being able to afford homes in the area when competing with Rex employees for property sales or rental applications.
- Costs from possible reduction in tourism resulting from the Peninsula's loss of reputation for being "naturally beautiful".
- Costs to professional fishing if the waters of St Vincent's Gulf become contaminated.
- Costs of rehabilitating the mine site if this is not done appropriately.

To enable an accurate understanding of the economic import of the Hillside proposal, the State Government and the regulators must require Rex Minerals to undertake a comprehensive cost/benefit analysis.

At the very least, this should take into account the factors identified above.

4.2 How real are the projected economic benefits?

In the Hillside Copper Mine Executive Summary (August 2013) included in the MLP, Rex note the following socio-economic benefits:

- Economic benefits include project expenditure and investment in infrastructure, taxes, royalty payments and salaries from created jobs and indirectly generated jobs.
- Rex will continue to support a wide range of community initiatives through its Community Sponsorship Program, initiated in early 2011.
- Over the life of the Hillside Mine, it is likely that the majority of Rex's workforce will become, or are already, permanent residents within a radius of 50 km of the Hillside Mine.
- The new water supply will serve as a significant long term benefit well beyond the requirements of the Hillside Mine for the community in Yorke Peninsula.
- The Hillside Mine may act as a stimulus to upgrade power supply to Yorke Peninsula before 2018. Discussions with state power agencies include the timing of planned upgrades and the

opportunities to provide long term benefit with respect to improved power supplies for the Yorke Peninsula.

- Environmental benefits include best practice mine rehabilitation including increased area for native vegetation, provision of significant increase in environmental knowledge from collection of baseline data and improving the understanding of biodiversity, native vegetation and landscape values for the region.

Some of these are worth further examination.

4.2.1 Employment opportunities:

Rex consistently point to the number of jobs that will be created in the local region. However, these figures have shifted over the past twelve months.

Initially, Rex claimed that there would be 1,000 jobs during the construction phase and 600 during on-going operations. The 1,000 jobs has now been reduced to about 600 - 700 because, as we understand it, the Chinese company with whom Rex have a Memorandum of Understanding require that the manufacturing of the infrastructure should take place in China, therefore reducing the number of jobs available to Australian workers during the set-up phase.

The opportunities created by the mine at Hillside will only be temporary. Rex quote in their proposal that they expect to recruit 33% of their workforce locally, 33% from those living on the Yorke Peninsula but currently working elsewhere, and 33% from outside the region. Some of the workforce will also be sourced from "elsewhere and interstate".

These figures should give local communities such as Ardrossan pause to consider just how many of the promised 500 -600 jobs will in fact come from Yorke Peninsula itself.

Competition for employment with established local businesses may also be problematic. It is likely that these will not be able to afford to pay the same rates as Rex Minerals. Industries such as agriculture and tourism will be particularly affected, as they also have a highly seasonal, primarily casual employment profile.

4.2.2 Increased water security.

Rex have consistently lauded the fact that, as a result of their initiatives, a pipeline capable of carrying 2.2 ggl's of water will be brought to the Peninsula and, after Hillside has extracted its required 1.6 ggl's, the remainder will be available to increase water supplies to local communities.

This claim needs questioning.

- For a start, a report by SA Water earlier in the year indicated that Yorke Peninsula's water supply is secure through until 2050. This indicates that extra water is simply not required.
- The argument that holiday settlements such as Rogues Point and James Well will be able to receive reticulated water does not take account of the fact that many residents in these locations simply do not want mains water. Instead, we are very happy relying on rain water (unless, of course, it becomes contaminated by dust from the mine site. Then we may have little choice.

4.2.3 Royalties paid to the South Australian government

In the MLP, Rex indicate that the State Government will receive annual royalties of \$30m. However, they also note that the income from the mine will be \$800 m. per year. This means that SA will receive only 3.75% of the total. Royalty payments will only continue to be paid while the mine operates.

Given that the mine site can never be returned to the level of agricultural productivity experienced pre-mining, this represents 'short term gain for long term pain'.

4.2.4 Rehabilitation as an economic benefit?

The fact that Rex lists as one of its environmental benefit "best practice mine rehabilitation including increased area for native vegetation, provision of significant increase in environmental knowledge from collection of baseline data and improving the understanding of biodiversity, native vegetation and landscape values for the region" is strange to say the least, given that without the mine, the need for rehabilitation would not exist!

SECTION 5

Community Consultation

According to Rex Minerals Ltd (Hillside Copper Mine Information Sheet: Sept 2013: p 2)

A wide range of government and community stakeholder considerations have been integrated into Rex's mine planning process. The Hillside Copper Mine Community Consultative Group (CCG) was established in 2011 to act as an informed and representative group of community members. The CCG assist in passing on information provided by Rex and raise issues and concerns from the wider community. The CCG and Rex work together to understand concerns and to develop strategies to address the concerns raised.

However, we have major concerns about the validity and usefulness of the CCG

- The CCG is not representative of the community. Representatives from local communities were not elected by members of the community but were, in effect, nominated by the Progress Association.
- Information has not been passed onto the community by the CCG.
- Minutes of CCG meetings are not available on the Rex website and no minutes have been distributed to residents. (My attempts to obtain the minutes involved a phone call to my local representative, who told me to contact Rex. I did this, only to be told I had to get them from my local representative. I finally got copies but only of the minutes for meetings held in 2013.)
- Some CCG members expressed confusion about what information they were allowed to pass on and what was required to remain confidential. All information given to the CCG should have been publicly distributed. The distinction in itself engenders mistrust of the company.
- No attempt has been made by CCG representatives to distribute information to all residents in their locality by pamphlet circulation etc.
- Many people whom the YPLOG have contacted have been either unaware that the CCG existed or viewed it as a committee controlled by Rex to advance Rex's agenda.

5.1 Lack of broader public debate

To date, Rex Minerals have not held a public meeting along the lines organised by the YPLOG where informed residents and persons with technical knowledge could challenge the material being put to them by Rex in an open forum. Instead, Rex has relied on 'information sessions' where their representatives have been the only speakers.

If YP Land Owners Group could address 100 people at Pine Point (only 150 people live there) and could attract 300 people to a public meeting in Ardrossan with only 5 days' notice, it would appear that Rex's public consultation process failed in both its charters – to educate and to address the concerns of the public.

5.2 Community Perceptions Survey

In the MLP, Rex have placed strong emphasis on the responses to a Community Perceptions Survey, arguing that it represents the views of the community. However, it is completely misleading to label it as a community survey.

- The only respondents included in the 'survey' were those members of the Community Consultative Committee who happened to attend a meeting in July 2012. As such, it represents the views of CCG members only, who were not elected by the community and therefore do not speak on their behalf.
- The survey was conducted at the CCG's 4th meeting, just 6 months after the Group was established. At this early stage, the CCG did not have access to even the most basic information required to enable them to provide valid, informed responses. This is particularly true of the questions on Performance, which required them to assess Rex's ability to manage issues such as water seepage etc?
- The method of administering the questionnaire was highly suspect. We understand that:
 - CCG members were not notified in advance that they would be required to complete a questionnaire and so had no opportunity to seek the views of local residents
 - its purpose was not clearly explained to them and
 - they did understand the weight that their responses would be given in the final MLP
- The MLP does not state how many of the consultative committee actually completed the questionnaire. We are informed that the Committee consisted of approximately 20 people but how many of these actually filled in the questionnaire is not stated. Even if all 20 did so, this number is too small to provide valid data.
- All results are presented in percentage terms (see Community Perception Survey Results Hillside Project, August 2012). Given the very small numbers surveyed (at best, no more than 20), quoting percentages is highly problematic because small numerical shifts produce large percentage changes.

To fulfil their obligations to conduct meaningful consultation with the local community, Rex Minerals must be required to

- **Conduct a proper public perceptions survey, drawing responses from a randomly selected sample of residents of the affected communities (Ardrossan, James Well, Rogues Point, Pine Point and Black Point) and surrounding farms. With the release of the MLP, the community is now in a better position to make informed judgements about the Hillside Project.**

SECTION 6

CONCLUSION

Given the issues of concern raised in this submission and what seem to be inconsistencies and inaccuracies in the 'science' underpinning this project, we believe this Mining Lease Application should be rejected by the Government

Hillside represents a huge mining venture – lauded by Rex as the largest proposed open-cut copper mine in Australia – situated in a highly sensitive, highly productive rural environment within one half of a kilometre of the vulnerable waters of St Vincent's Gulf.

It is not as if SA does not have other copper deposits that could be mined, as evidenced by the deposits at Olympic Dam.

The environmental track record of heavy metal mines extracting copper, gold and iron are notoriously bad. There are many examples across the world where the environmental damage bill from badly managed and poorly rehabilitated mining operations has been huge.

Why should this one be any different, particularly given that the mining company seeking to develop Hillside is essentially an exploration company with no mining experience at all?

Rex Minerals is a young, financially vulnerable company with no prior mining experience, and no track record that would prove to the community that they could successfully undertake an enterprise of this size and sensitivity. Even the well-established companies with a long history of mining, such as BHP, still make mistakes.

As a fledgling mining company without the experience and financial reserves of the big mining companies, we have no confidence in Rex's ability to develop and manage Hillside in a way that will avoid all of the potentially damaging environmental impacts that could result.

We therefore urge DMITRE and the State Government to reject Rex Minerals' Application for a Mining Lease at Hillside.

8 November 2013

Yorke Peninsula Land Owners Group



Attention: The Chair – YPLOG Committee

Dear Madam/Sir,

Re: Rex Minerals Hillside Copper Mine project – preliminary independent technical review and comment

The Yorke Peninsula Land Owners Group (YPLOG) commissioned Gilbert & Sutherland Pty Ltd (G&S) to conduct a preliminary review of hydrogeology information contained in reports relied upon by Rex Minerals in its application to the South Australian Government (under the SA Mining Act 1971) for two leases and two licences for its Hillside Copper Mine project, Yorke Peninsula, SA.

Specifically, YPLOG asked G&S to conduct a preliminary review of the Hillside Pre-feasibility Study (Hydrogeology Report), upon which the Rex Minerals Mining Lease Proposal and Management Plan is reliant in relation to the site-specific Hillside/ Ardrossan area, and to prepare concise, Plain English written advice detailing any issues or concerns with the work as a series of dot-points to help inform its response to the SA Government's 'public consultation invitation'.

Scope and approach

This letter addresses the scope of works requested by YPLOG within the limited timeframe available to respond to the public consultation invitation. Our review of the voluminous information presented by the proponent is preliminary in nature, meaning that any and all observations stated herein recognise that additional time and resources would be required to fully investigate, interrogate, test and confirm the work we reviewed to the degree appropriate for a complete third party peer review.

The documents we reviewed were:

- '*Hillside Pre-feasibility Study – Hydrogeology*', prepared by Mining Plus and dated 19/1/2012.

- 'Hillside Project – DFS Groundwater Investigations', prepared by Mining Plus and dated 9/5/2013.

Our review has not examined the following aspects of the proposed project:

- Regulatory aspects of any water take/water licences.
- Surface water hydrology.
- Tailings storage facility and any water implications to the environment.
- Waste rock dumps and their water implications to the environment.

In gathering contextual information to inform our review, we identified that the community has stated 'high concern' with the following water and water-related issues:

- Loss of arable land.
- Possibility of groundwater seepage from mine into surrounding groundwater systems, including quality impacts.
- The fate of the final pit void (lake).
- Surface water / groundwater interactions.
- Sustainable water practices.
- Potential contamination as a result of seepage from the tailings storage facility.
- Potential leakage from the buried concentrate pipeline between the mine and the port.

This review recognises the SA Government's role and authority in assessing the proposal and would welcome any enquiry its officers may wish to make in respect of the matters identified and discussed herein.

Our preliminary review findings

The Hillside Project is situated 40 metres above sea level. The reported groundwater (GW) level sits at 30-80 m below ground level and this groundwater is highly saline. Groundwater discharges east into Gulf St Vincent. The proposal states a water demand of 155 to 170 L/s required for processing water, with 70% of that demand to be met from GW.

The documents reviewed cause us to raise concerns in three key areas:

1. **Data limitations** – where the documents fails to cite or provide sufficient, fit-for-purpose data.
2. **Modelling limitations** – where the documents demonstrate that applicable and/or appropriate modelling standards, guidelines or best practice has not been followed.
3. **Reporting limitations** – where the documents make statements or assertions that are unsupported or inadequately supported.

Our dot-point summary of the issues identified within each of these areas is presented below.

Data limitations

- Drill depths did not exceed 200m whereas the pit is to be excavated to approximately 450m and underground operations could extend to 700m. There is no explanation in respect of why the drilling program did not include deeper wells. A deeper investigation bore(s) is required down to some 500 m below ground.
- None of the drilling targeted the 'seasonal perched Quaternary aquifer', therefore in terms of test pumping and groundwater modelling, any potential impacts to this zone is unknown. This aquifer could be a water source for stock in the area.
- Wells for test pumping only targeted the deeper aquifer (represented by groundwater model Layer 3) and appeared to be focused on attaining estimates of likely inflow to the pit wall.
- The sole long-term pump test (conducted at well WBTH005, reported in Appendix A 9.7) is neither reported nor included in the tabulation in Section 4 of the body of the DFS report. The test indicates an acceleration of drawdown with time. There is very little by way of discussion of the implications of this test, other than a brief mention that it was conducted to gain an appreciation of the pumping effects on the fractured aquifer zone. This is perhaps the most important test data within the report and it is left only in the Appendix and not addressed in the body of the report.
- Hydraulic parameters from test pumping were used to inform the Groundwater (GW) model. Recharge and groundwater levels were not used as inputs.
- No baseline data including groundwater hydrographs (i.e. groundwater level fluctuations with time) were apparently available to calibrate the model. Whilst the dilemma of the modeller is recognised, this is a serious omission. Such baseline data should have been collected at an absolute minimum over one complete year and preferably years that included drought-dominated regime and a wetter year.
- GW test pumping durations were too limited. We understand this limitation may have been a product of finite onsite storage capacities and GW discharge to the environment (regulatory restrictions).
- The PFS categorically states that wells were installed in all hydrogeological zones. This does not appear to be accurate in that there are no details of wells targeting the 'seasonal perched Quaternary aquifer'.

Modelling limitations

The groundwater modelling *per se* is generally sound. However it is limited only to the moderately deep, immediate mine site environment and does not cover the near surface nor the deep geological formations.

The groundwater modelling presented in Mining Plus – *Hillside Pre-feasibility Study – Hydrogeology* dated 19/1/2012 and Mining Plus – *Hillside Project – DFS Groundwater Investigations* dated 9/5/2013 has failed to follow standard groundwater modelling guidelines. This is a serious procedural lapse for such a large, important and environmentally sensitive project.

Other key modelling limitations include:

- The confidence in modelling outcomes is compromised by limited reporting (see below), including lack of justification for a number of modelling assumptions and little discussion of the implications of the project to the environment.
- The permeability of Layer 4 has not been defined by field investigations; it is an assumed value. It appears to be a product of the lack of very deep drilling.
- It is noted that the outputs from the model indicate that Layer 4 is sensitive to changes in permeability and storativity (standard groundwater hydraulic parameters).
- The calibration of the model is questionable as it appears to rely on five bores only; two in the Coastal Granite and three in the pit area. The model has embraced a zone of potentially fractured granites to the north and east of the proposed mine in a zone that appears to have an enhanced permeability. More discussion of this is needed.
- A number of hypothetical cut-off wells have been modelled as intercepting groundwater flows that appear to exploit this zone of higher permeability. These cut-off wells are oriented north north-east of the proposed pit area to intercept 150L/s (essentially the mine processing water use requirement). Their role appears to be to intercept any potentially contaminated underground water migrating beyond the mining lease.
- Theoretically, under the modelling scenario adopted, all underground water leaving the mine site through this zone can be intercepted except in the final two years of mine operation, wherein there is an 11% excess volume. Accordingly, in the final two years of operations, there is a threat of contaminated underground waters leaving the site that has not been addressed.
- Post-closure, the dewatering cone of drawdown does not fully recover to pre-mining groundwater levels. Essentially, the pit (lake) becomes a permanent groundwater sink. Whilst this may, in the short to medium term, assist in restricting off-site migration of any contaminated underground water, there is nonetheless a stated effect for 550 years (the duration of the post-mining model). Whether this impacts on the 'seasonal perched Quaternary aquifer' or any other perched groundwater system remains unknown. If any connections exist, this would have implications for any stock bores in the zone of influence.

Reporting limitations

- Whilst technically sound, the reporting of the test pumping and groundwater modelling is lacking appropriate context. It neither transparently explains the assumptions of the hydrogeological conceptualisation nor does it discuss results in terms of the wider environmental implications.
- The report neglects to address any surface water and groundwater interactions.
- The report neglects to address any near surface waters.
- Inter alia, the report does not address potential impacts to any groundwater dependent ecosystems in the zone of influence.

- It is noted that the Coastal Granites are highly fractured and productive aquifers (up to 10 L/s) and GW discharge quality, as a result of mining, may have potential to exceed the ANZECC water quality guidelines for ecosystems.
- Only the middle two layers of the GWM are verified by field investigations.
 - The deeper 4th layer assumes the rocks are tighter at depth therefore less permeable. This may not necessarily be the case as deep fractures may occur in fault zones in the Yorke Peninsula.
 - The 'seasonal perched Quaternary aquifer' has not been the subject of any field investigations. We recommend that, at a minimum, existing geotechnical logs from drill-holes and/or excavated test pits should be examined and pertinent data extracted (e.g. permeability values) to inform the groundwater modelling (Layer 1).
- Operationally, it is unclear whether the mine is to have a dedicated water supply wellfield (to be drilled east of the proposed pit location of Wells 23-27 – Coastal Granites). This again requires clarification.
- The cone of drawdown will be steep; however there may be linear extensions of less steep but more extensive drawdown along lines of enhanced permeability due to fracturing sympathetic with the regional geological faulting. No discussion of this is offered.
- The water quality in the ore body versus the granite GW systems may be different. If so, a discussion is required as to how the disposal of the dewatered water and interaction between these different quality waters would be managed.
- The reporting results in an apparent disconnect between the high yields intercepted during mineral RC drilling and dedicated water well drilling. This may be because fractures are essentially vertical and therefore wells drilled at the vertical may fail to intercept the more permeable fracture zones (as opposed to mineral holes drilled at angles that may intercept a number of sets of the fracture by their orientation). This leads to some confusion in the conceptualisation of the hydrogeology in that testing is indicating relatively impermeable conditions whilst the mineral drilling suggests that the geological zones can be highly permeability. Further clarification is required.

Specific to the Mining Plus DFS Report, dated 9 May 2013, the following comments are made.

- The well completion summary Table 1 and Figure 1 appear to be a subset of the complete program of wells drilled. No clear reason is given for not including all wells.
- The drilling and test-pumping program is aligned to the pit rock mass, hanging wall and footwall zones only. Reasons are not given for the omission of other geological zones.
- Discussion the results of the test pumping program is perfunctory. The DFS report states that all wells with airlift yield more than 1L/s were tested, but in the pre-feasibility report there were more wells stated that fit this definition. If results were selectively reported, a reason for this is not given.

Recommendations

This review recognises that the effort put into a groundwater modelling study is dependent on timing and budgetary constraints that are generally not known to us. That said, our review identifies a clear need for a third party peer review of the Proponent's groundwater assessment, including the groundwater model. It is open to us to assume that the modellers have satisfied themselves as to the impacts, but have failed to articulate their outcomes to the extent required for the public and decision makers to have confidence in the work.

There are firm guidelines for reviewing groundwater models, but not for the associated groundwater assessments. For this reason, the checklists in the Australian groundwater flow modelling guidelines should be used for both assessments. The appropriate guideline is '*Australian groundwater modelling guidelines*', Waterlines report No 82 - June 2012, published by the Australian Government, National Water Commission ('the guidelines').

The guidelines act as a point of reference, rather than a rigid standard. They seek to provide direction in terms of the scope and approaches common to modelling projects. The guidelines seek to provide a common terminology that can be adopted by all stakeholders typically involved in modelling projects. They are directed at both non-specialist modellers and specialist modellers because they provide a view of the model development process as well as best practice guidance on topics such as:

- reporting
- data analysis
- conceptualisation
- model design
- calibration
- verification
- prediction
- sensitivity analysis and
- uncertainty analysis

to create greater consistency in approaches.

We recommend that the South Australian Government's assessment and approval bodies consider these key recommendations and defer its decision making processes until such time as such a review (conducted in accordance with appropriately defined terms) is presented by the Proponent.

We trust this is acceptable. Please do not hesitate to contact this office if you require any further details or elaboration.

Yours faithfully,

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