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Water & Mining in Australia :

Towards an Improved Future ?

“In 2006 in Australia no other issue dominates day-to-day life and politics more than security of water. In most cities we are, or have recently been, restricted in its use in our homes. The minerals industry, therefore, has a role to play in demonstrating ourselves to be responsive to this context and to provide leadership where plausible and appropriate.”

Prof. Chris Moran, AusIMM ‘Water in Mining’ Conf, Brisbane, 2006

Georgius Agricola (1556) :

“... the strongest argument of the detractors is that the *fields are devastated by mining operations* ... Also they argue that the *woods and groves are cut down*, for there is need of an endless amount of wood for timbers, machines, and the smelting of metals. And when the woods and groves are felled, then are exterminated the beasts and birds, very many of which furnish a pleasant and agreeable food for man. Further, when the ores are washed, *the water which has been used poisons the brooks and streams*, and either destroys the fish or drives them away.

Therefore the inhabitants of these regions, on account of the devastation of their fields, woods, groves, brooks and rivers, find great difficulty in procuring the necessaries of life ... Thus it is said, it is clear to all that *there is greater detriment from mining than the value of the metals which the mining produces.*”

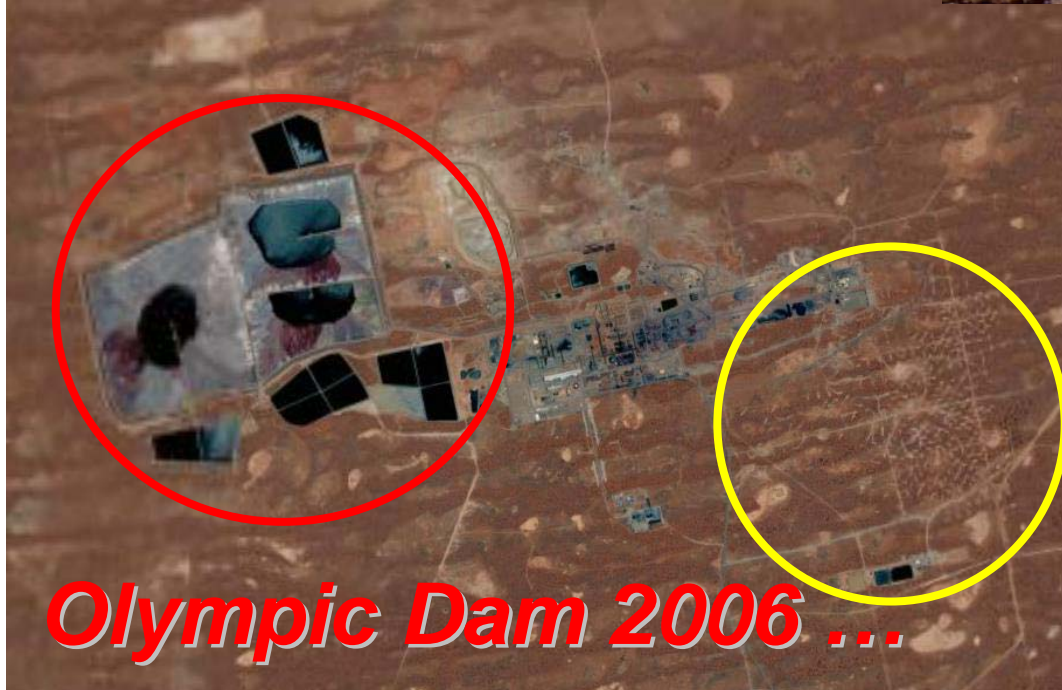
**Mt Lyell
2007 ...**



Rum Jungle 2004 ...



Olympic Dam 2006 ...



Ranger 2001 ...



Presentation Overview

- **Brief Overview of Water & Mining** (*very brief !!*)
 - *Quantity v Quantity*
- **Sustainability & Water versus Mining**
 - Understanding & *Using* Sustainability Reporting
- **Case Studies :**
 - Olympic Dam, Beverley, Rum Jungle
- ***Summary & Synthesis of Issues***

Brief Overview : Water vs Mining #1

- **Mining cannot occur without water :**
 - interruption to hydrologic cycle; water needed for milling; water needed for workers / communities; etc.
- **Primarily, modern mining needs large volumes of water to mill and extract minerals**
- **Water can be obtained from surface water systems or groundwater sources (*marine?*)**
- **Nature of mining creates significant disturbance to local hydrologic regime**
 - depends on geology; open cut or underground mine; earth works for infrastructure; tailings; waste rock; etc.

Brief Overview : Water vs Mining #2

- **The volume of water needed by mining projects will vary considerably :**
 - different ore types; metallurgy; available water quality; etc.
- **In general, a water supply is obtained, used in processing ore, then used to slurry tailings**
 - *often leads to a significant decline in water quality*
- **Additionally, water falling on a mine site must be managed, eg. through retention ponds**
- **Finally, the legacy of mining should not lead to ongoing leaching of pollution**

Brief Overview : Water vs Mining #3

- **Water, as a resource, has multiple values :**
 - ENVIRONMENTAL
 - CULTURAL
 - ECONOMIC
- **Some mining companies well recognise the above, & the complex varied perspectives ...**
- **Finally, it is imperative to understand the link between QUANTITY and QUALITY**

Sustainability & Mining Water ... #1

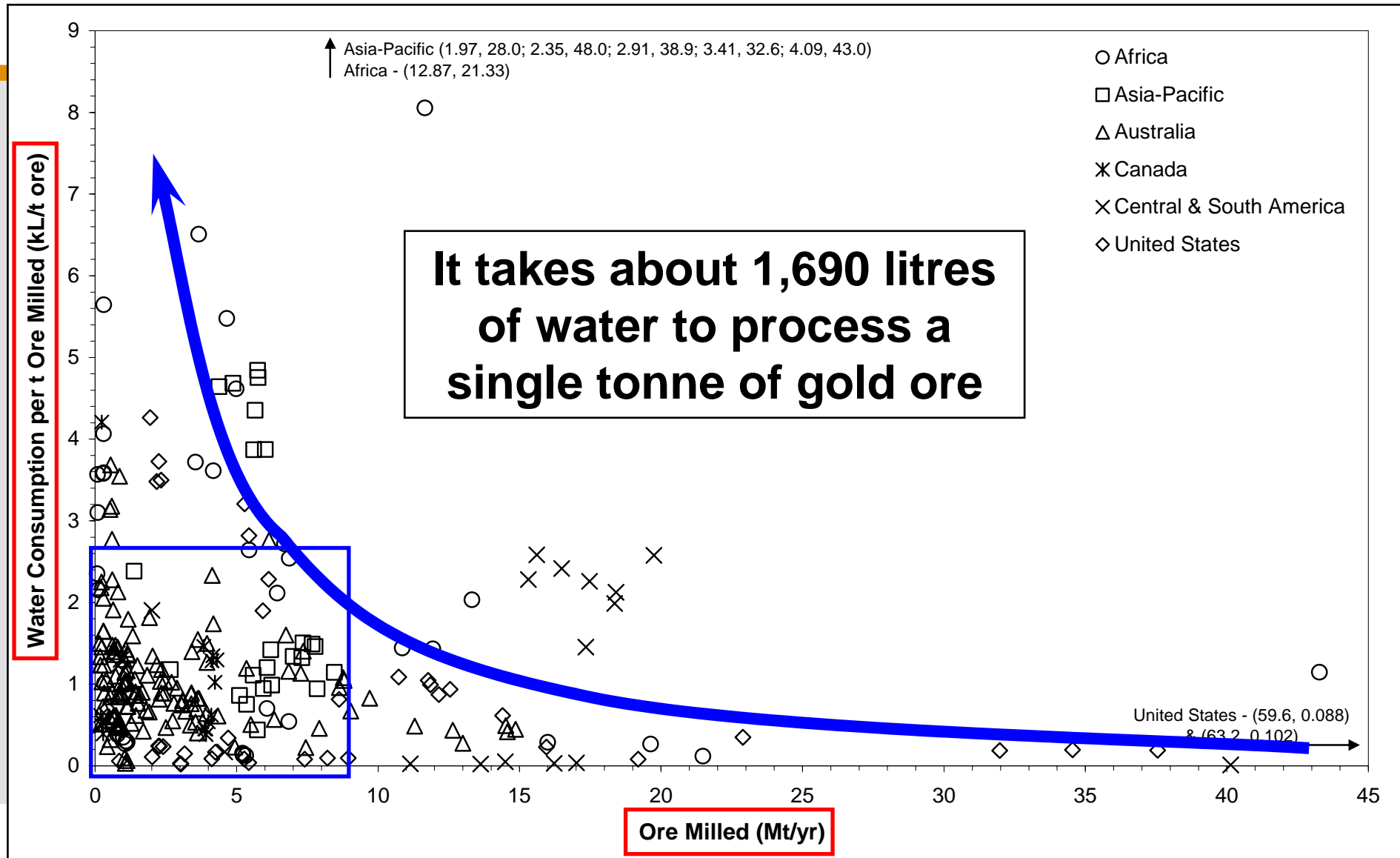
- **Most water issues are commonly viewed first and foremost as a production/economic priority for mining**
- **Some see water in a true 'triple bottom line'**
- **From sustainability principles, some cornerstone issues stand out :**
 - **ongoing availability of water resources**
 - **ongoing assurance of water quality**



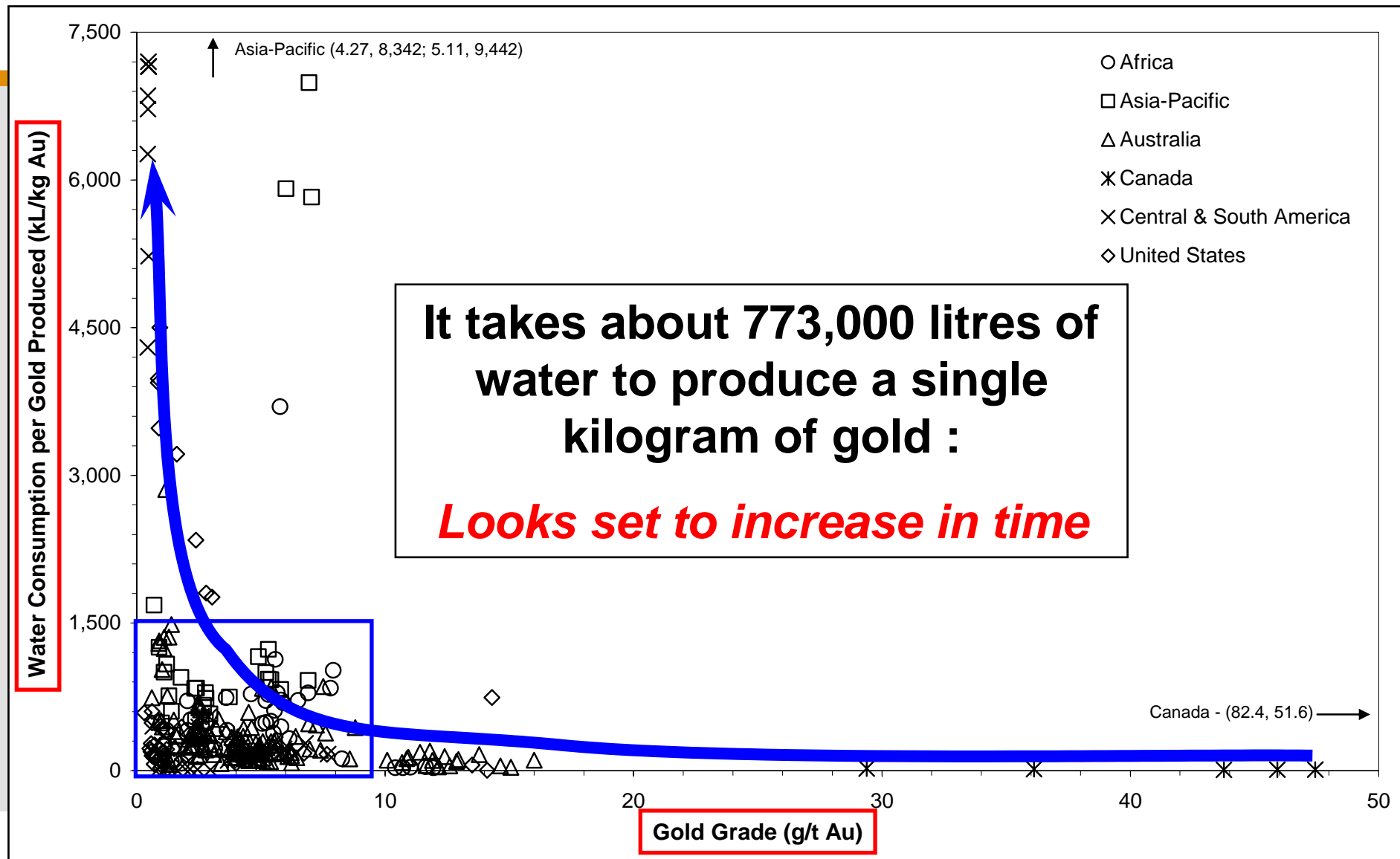
Sustainability & Mining Water ... #2

- Sustainability reporting has increased over the past decade (should continue to improve)
- Reporting often based on GRI
- Key Indicator is WATER
 - total quantity (*rarely* quality), sometimes %recycled
 - no consistency in exact reporting as yet
- Therefore, we can compile and analyse this data to 'quantify' sustainability & mining
- Water resource monitoring rarely presented
 - *spatial & temporal scale of monitoring often poor ...*

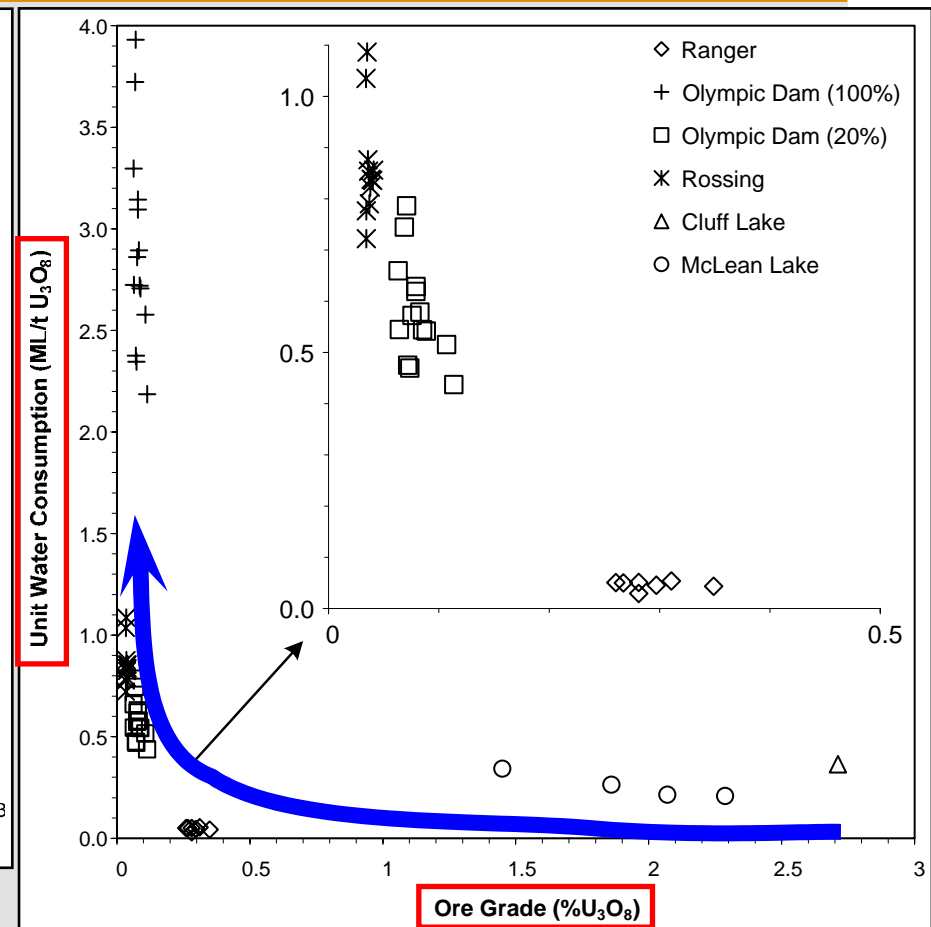
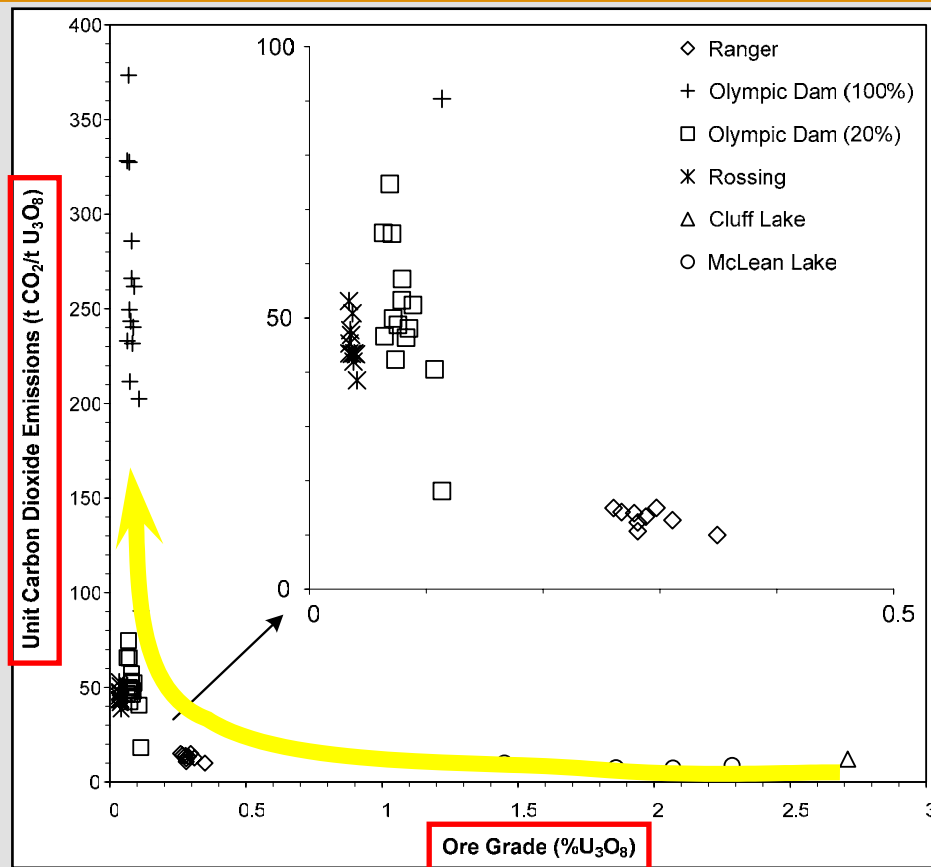
Sustainability & Mining Water ... #3



Sustainability & Mining Water ... #4



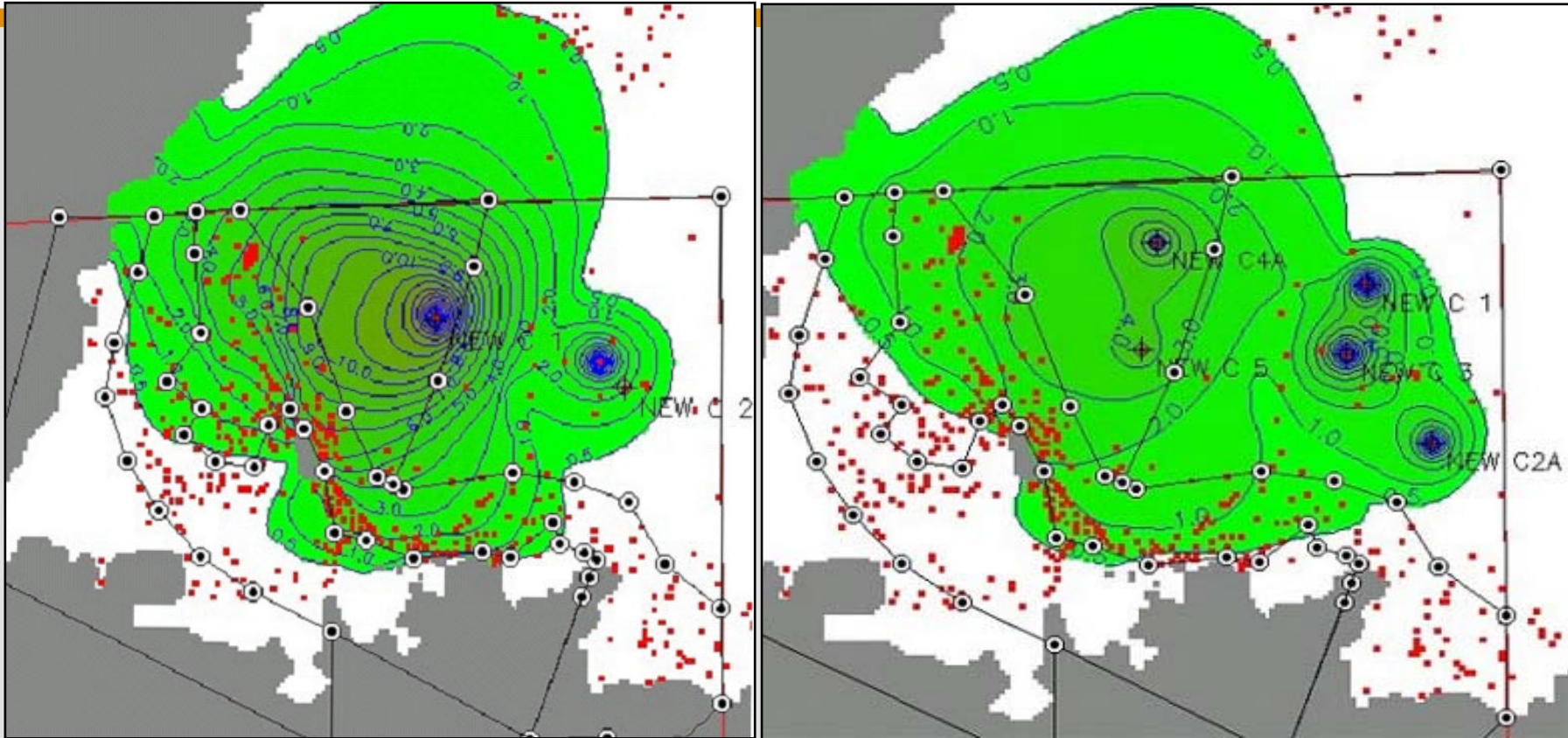
Sustainability & Mining Water ... #5



Case Study : Olympic Dam

- To date, all water pumped from SW region of Great Artesian Basin
- Heavy impacts on mound springs
- Major seepage problems with mine water ponds and tailings dams
- Currently uses about 35 ML/day
- Proposed 'Mega-Expansion' will need some five times more to 150 ML/day (*or higher?*)
- Current proposal is for desalination plant ...

Case Study : Olympic Dam



2 bores @ 32 ML/d/bore

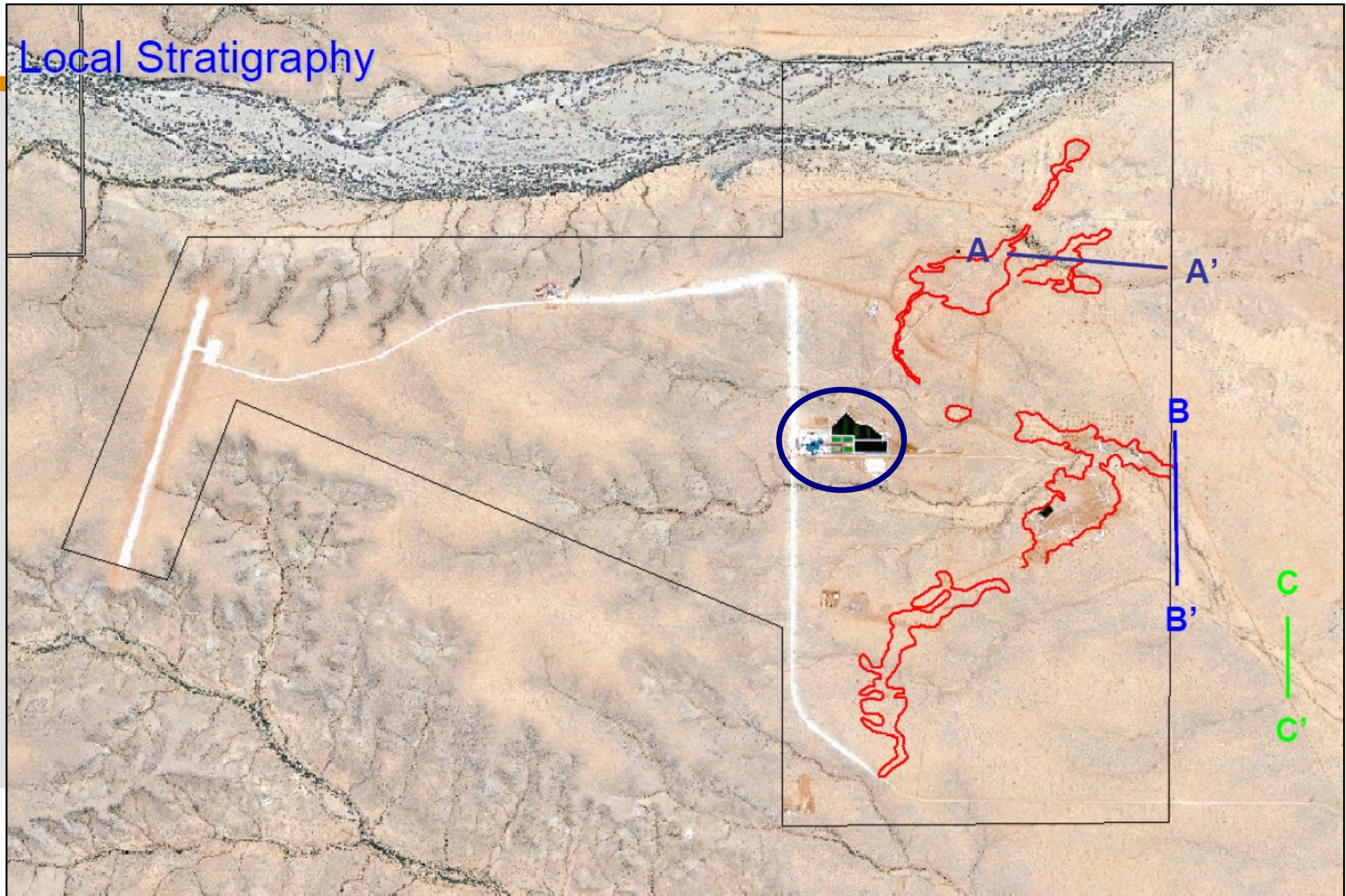
2 bores west of BT 5 ML/d/b

3 bores east of BT 33.3 ML/d/b

Case Study : Beverley & Acid Leach U

- **Beverley uses the technique of acid in situ leach mining (ISL)**
- **Approved despite major scientific concerns over long-term groundwater pollution**
- **Approved despite problems in proving regional hydrogeology & groundwater flowpaths**
- **Recent uranium exploration has clearly proven the connected nature of groundwater**

Case Study : Beverley & Acid Leach U



Case Study : Rum Jungle U-Cu

- Major uranium-copper project of 1950s-60s
- Dumped tailings & liquid wastes into Finniss River system & floodplain
- Abandoned in 1971, rehabilitated in 1980s, long-term water monitoring
- ***Major water pollution still ongoing ...***

Table 8 : Finniss River water quality, downstream of Rum Jungle, 1992/93 ($\mu\text{g/L}$) [Kraatz, 1998]

(\dagger mg/L)	Al \dagger	Ca \dagger	Fe \dagger	As	Ba	Co	Cr	Cu	Ni	Pb	Th	U
Average	3.6	9.9	1.71	4.1	37	176	5	485	169	76	3.3	33
Minimum	0.21	4.2	0.096	0.6	21	53	0.7	180	53	2	0.02	6
Maximum	9	29	14	41	120	480	33	1,100	430	880	26	63

The Rum Jungle Legacy ...

1970's
2000's



The Rum Jungle Legacy ...



Summary & Synthesis of Issues

- Mining is a major user of water
- Future is likely to see increasing use
- The water cost of minerals / metals is starting to become better understood
- Need to be aware of trade-offs between quantity and quality (eg. desalination)
- Stay wary of long-term effects / impacts on water resources and water quality

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- **Especially Techa Beaumont (Mineral Policy Inst)**