

Jacques Whitford AXYS Comment Table – ICRP WORKING GROUP #3, November 2007.

ICRP SECTION	TOPIC	COMMENT
6.4.1.1.	Pre Disturbance Conditions	p. 195: Figure 59. – Pre-disturbance conditions are shown, but not existing - where is the facility?
6.4.1.2.	“ “	p. 196: -Table 52. - How was Max. Depth and Mean Depth surveyed? (with respect to total volume available to fill) -How was the Average Discharge determined? (how has this changed during operations and what will it be at closure?)
6.4.1.2.	“ “	p. 197: -Table 53. – “Values given are half the lowest detection limit to provide an assumed baseline” This does not seem to be an accurate representation. Why assume elements are present? -State what was known at the time; i.e., actual MDL’s.
6.4.2.1.	Development Status	p. 199: - What is the meaning of “occasional remedial work”? -“Lake bottom sediment and rock” are comprised of what constituents and what concentrations? -Are there analyses of the treated sewage effluent and other constituents in the pond? - Figure 62. – Is there a map/plan of this facility with dimensions and annotations?
6.4.2.2.	“ “	p. 200: -Cells- Currently D acts as pre-polisher; if results of SNP/AEMP suggest any increasing trends of analyzed constituents, would it be possible to divide D into D1 and D2 for further pre-polishing? Although all below water quality criteria, are there any increasing trends? -Dykes- How does filter work and how does its efficiency change over time? -Dam- Spillway not shown on figure? -Water Pumps- Reclaim Water Barge not shown on figure. -When pumping from Cell C, is the water filtered? -Drainage Channels, Diversion Channels, and Diversion Berms- A & B- Where will they be - not shown on Figure 62? - Par. 2- What is meant by “avoid depositing PK into cell D for as long as possible?”
6.4.2.2.	“ “	p. 201: Table 54. – Update data through current conditions. From figure appears like there’s much more capacity still left in Cell C – how was 79.8% determined? Also, data would be more instructive if filling volumes were shown by year and not just cumulative totals?
6.4.2.2.	“ “	p. 202: Figure 62. –Why no Dyke A?, How are cells A and C separated?
6.4.2.2.	“ “	p. 203: – Why are other metals not included?

6.4.3.1.	Projected Development	p. 203: When will facility be reclaimed?
6.4.3.2.	“ “	p. 203: -How can the MAA have been completed in 2004 and incorporate LLCF performance in 2005? -DFO not in attendance during options development? -“Aim of this option is to delay placement of FPK into Cell D” - okay, but why at all? What is the meaning of Accounts Analysis? p. 204: -Not sure what is meant by “will be discharged to maximum height of expected active layer? -As lake volume decreases, its capacity to dilute and polish will also decrease – would it advantageous to allow tundra runoff into LLCF, rather than divert along east side of B and C? What are drainage basin boundaries for these diversions? Not clear how water will be routed during all stages of development through closure. -Pelzer Pond location not shown.
6.4.3.2.	“ “	p. 206: Figure 63. – Show future and current watershed boundaries. Show in stages, ie: pre and post cell D filling? Use 2006 photo?
6.4.4.1.	Final Landscape at Closure	p. 207: -What are elemental concentrations of facilities constituents? When will revised engineering plans be completed? LLCF: -Will there be any need to re-grade surfaces of Cells to enhance drainage (prevent or encourage ponding)? -Re-vegetation is proposed for mid-slope section, what about upper section? p. 208: Upper Zone- 100% rock (1.0 meter thick) What will be minimum size of cover – will it be crushed and sorted prior to placement? Graded during placement? What are anticipated surface gradients? Central Zone- How will the waste rock be selected? What is meant by irregular pattern and how achieved? What is the objective? Are band widths sufficient to minimize wind erosion? From Table 56, the rock cover footprint area is assumed to be 30% of the total (or 700,000 of 3,000,000 m ³), but based on band width only 10-20% (i.e., 10/50 to 10/100). Water Interface Zone- What is 50m zone width based on - height difference of seasonal water fluctuations – if so, how determined? It is not clear at ‘final condition’ that there will be stability from wind and water erosion – what is expected re-vegetation rate? Ponds- Is the final water surface area at max, min or mean (how much variation is expected)? How will overflow structures be designed to preclude the need to conduct maintenance to keep pond heights within expected ranges? p. 209: Table 56. –What is the basis for determined design thicknesses?

6.4.4.3.	LLCF Vegetation	<p>p. 209: In the first 10 years to establish a self-sustaining plant cover. How much of the first ten years will be conducted in the absence of fertilizers and enhancements? Are the expectations of the effects of random rock placement based on any experiences? What is the expected timeframe to achieve the goals described in second paragraph? What monitoring and maintenance will be required?</p>
6.4.4.4.	Permafrost Development	<p>p. 209: States that PK will be well-drained - Where will the infiltrated water go as permafrost develops? How was the observation of permafrost development measured - with thermostats, test pits, etc? Pointed downward to what point? p.210: Is there any idea of the extent of the 'deep water' in the ponds? FPK stratigraphy may inhibit migration of water in certain directions (ie: proximal-distal facies are prograding during filling) – would this be a concern during permafrost/talik development.</p>
6.4.4.5.	LLCF Water Management	<p>p. 210: The revised operational drainage plan summarized in Sec 6.4.2 is not very clear – at least in detail. Are all the permanent streambeds constructed? Nature, need and extent of diversions is a bit confusing. What is the meaning of internal, external systems and extra flow? How will the weirs be designed (sizes, elevations) – and what is basis for design? Explain term “filters blind off”. Is there evidence today of this process? What is the basis for the 450 m elevation? Why will a fish barrier be constructed at Cell E?</p>
6.4.4.6.	Water Quality	<p>p. 210: Since reference is to section 8.6, we assume that a review of water quality issues will be handled during Step 4.</p>
6.4.5	Closure Objectives and Criteria	<p>p. 212: How long will routine monitoring last? p. 213: Physical Stability: AIR - how does the air criteria incorporate gusts or wind entrainment of LLCF fines with only annual and 24 hour concentrations? LAND – how will “no significant wind or water erosion” be measured or defined? Would appear that objective and quantifiable criteria are necessary to avoid subjectivity or ambiguity. This concept is applicable for all closure criteria. Chemical Stability Criteria Water- does water management structures mean “reclaimed” dams, dykes and diversions? p. 214: Biological Stability- How is functional defined? Establish quantitative criteria and Landuse - how is suitable for land use determined? p.215: Physical Stability- What happens if greater than 1:100 occurs and inflicts “damage” during monitoring</p>

		period? Establish objective quantifiable criteria for stability of structures. Biological Stability- How will self sustaining be demonstrated?
6.4.6.	Engineering and Environmental Work	p.217: Table 58- Environmental Works: missing re-vegetation plans and monitoring for wind erosion? Table 59- Before or during the period of monitoring will there be any pilot studies/activities? What data will be used to support weir designs?
6.4.7.	Designing for Closure	p. 218: Are there pilot studies for the progressive reclamation? Bullets 3 and 4 need to be better described. Bullet 5 mentions a pilot that was not discussed until now, what are they? p. 219: Figure 65. – For research column - what data collection is occurring for each bullet and what is status of each research topic (question to be deferred to Step 4)?
6.4.10.	Post Closure Monitoring	p.220: Suggest re-wording to indicate that the proposed 10-year post-closure monitoring be modified – duration reduced or increased (for specific aspects) to reflect trends and results. p. 221: Table 60- Response triggers need to be as objective and quantifiable as possible.
6.5	Dams, Dykes and Channels	
6.5.1.4.	Grizzly Lake	p. 227: What is the frequency of water level monitoring for Grizzly Lake? Will the outflow not allow levels higher than 468.1m? What is the volume of water used as a % of the total lake volume?
6.5.2.	Development Status	p. 227: What is meant by “effective” containment (no leakage)? What are the current depths of active zones for each dam and what will they be after thermosiphons are removed?) p.228: Will criteria to meet design specifications change upon closure?
6.5.2.1.	Dams and Dykes	What is “a water up? And the meaning of “ without significant discharge”? What is the defined maximum temperature? Bearclaw Dam: how many vertical cables? p. 229: King Pond Dam- holds mine water - is this unique from other dams? Is there more than one cell in Cujo Lake? What water quality constituents require one year of retention? Waste Rock Dam – has water been discharged to receiving environment? Eat West Coffey Dams- has there been seepage?
6.5.2.2.	Diversion Systems	p.229:

		<p>Panda Diversion Channel- Is a photo record of PDC development available that demonstrates bank and bed conditions, degree of stability, development of habitat diversity, re-vegetation and seasonal fluctuations of flow/snow cover, across various reaches, etc?</p> <p>p. 230: Is stage/discharge monitored/measured?</p>
6.5.2.3.	Settling Facilities	<p>p.230: Which Figure is Desperation Pond shown on? Where does the pond discharge to now? Or is it a zero Q facility? What is the volume - water balance for the King Pond Settling Facility? Are there any water quality trends identified? Is the Grizzly Lake storage facility a pond or tank? What is the proportion of flow consumed? What will flow be in PDC at closure?</p>
6.5.3.1.	Dams and Dykes	<p>p. 232: Is the semi-pervious filter dyke different than the LLCF dykes? How will the design parameters be determined for the weir constructed for the Misery Dams?</p>
6.5.3.2.	Diversion Systems	<p>p.232: How will the design parameters be determined for the Pigeon Stream Diversion? How has the 2:1 replacement ratio will or has been achieved? p. 233: Why is the channel not functioning as compared to the natural streams in the area? What are the negative effects if snow and ice were slow to clear and nothing was done at closure?</p>
6.5.3.3.	Settling Facilities	<p>p. 233: What happens to the King Pond Settling Facility during closure? Will the Desperation Pond become permafrost?</p>
6.5.3.4.	Grizzly Lake	<p>p. 233: Assume 0.45 m³/day – what is average annual consumption? Does the population peak mean near camp capacity?</p>
6.5.4.1.	Final Landscape at closure: Dams and Dykes	<p>p. 233: Are the slopes stabilized with riprap the only means of ensuring stability? What will be thermal effect on stability? Is natural colonization expected on the riprap? p. 234: What is current condition of thermosiphons compared to when installation? What is basis for assuming they will last in excess of 20 years? Will cooling trend be expected to reach equilibrium temperature? What is the depth of the active layer? Will this change if thermosiphons fail?</p>
6.5.4.2.	Diversion Systems	<p>p. 234:</p>

		<p>What is the reason for the fish barrier in the Pigeon Stream Diversion? Where is the Bearclaw jetty located and what are the dimensions? What happens if trends indicate volume capacity reached prior to achieving WQC (ie: like Colomac)? Will conveyance capacity be maintained after rip-rap is placed in the Panda Diversion Channel?</p>
6.5.4.3.	Settling Facilities	<p>p. 235: What are the plausible methods being considered to achieve stability of sediments in the Two Rock Settling Facility? What does “These” refer to in the first sentence of the King Pond Settling Facility? Does the “migration corridor” refer to fish? p. 237: Table 62- Physical Stability - LAND: What is the meaning of “beds and banks restored close to original flow” ? Need to establish quantifiable criteria for “restoration” No permafrost degradation - outside of natural forces? Biological Stability – Vegetation: need objective/quantifiable criteria to measure recovery. p.238: How is “no major surface erosion” defined? Needs to be more explicit and measureable. What compensation requirements are stipulated in the Fish authorization? p. 239: The designed parameters for the Engineered structures will be based on what database? Criteria is vague – need to provide specifics for re-establishing hydraulic flow to ensure Biological Stability.</p>
6.5.6.	Engineering and Environment Work	<p>p. 241: Table 63- What is the max slope criteria for breaches? What is the slope protection criteria? Removing instruments: Will any instruments need to be maintained as part of the monitoring program. P. 241: Table 64- What are some of the lessons learned so far (i.e., construct to avoid steep banks, establish bank stability criteria, prevent snow build-up, create channel sinuosity to enhance habitat development) Environmental works – Why no erosion monitoring and re-vegetation? p. 242: Table 65- Is it acceptable to bury the pipeline? What is the slope stability criteria for bullet 5? Environmental works – Why no slope stability and erosion monitoring, and re-vegetation? Table 66- Environmental works – Why no erosion monitoring and re-vegetation? p.243: Table 67- same comments as table 66 Table 68- How will deleterious sediments be characterized prior to removal? What is the meaning of migration corridor? Expand on the meaning of “enhance bathymetry”, this is too vague.</p>

6.5.7.	Identified Risks and Contingencies	p.244: Will the sediment curtains remain in place?
6.5.8.	Reclamation Research	p.245: Table 71- Identified Research concepts are vague, expect that these will be better developed during Step 4 so that specific tasks can be better understood
6.5.9.	Post Closure Monitoring	p. 246: Perhaps five years will not be sufficient to demonstrate long-term stability or that criteria are met. Providing a minimum “additional time” of monitoring after criteria are initially achieved is suggested.
6.6.2.1.	EKATI Main Camp Surface Facilities	p. 250: Was oil and sludge in vacuum truck removed offsite?
6.6.2.3.	Satellite Facilities	p.252: Are there plans to upgrade the prototype of Land Treatment and Atomization System?
6.6.2.4.	Exploration Camps	p.253: Are there photo records available for the Mark’s Camp, Culvert Camp and Boxcar Camp? How have these sites changed since the reclamation (ie: status of re-colonization etc...)? Are there any remedial measures undertaken (e.g. PHC clean-up) for any of the camps in this section? What is current condition of the airstrip at Norma’s Camp?
6.6.2.8.	Quarry Sites	p.255: Will positive drainage be maintained at closure?
6.6.2.11.	Roads and Airstrip	p. 257: How will the required crossings be maintained at closure? What are other widths of the Misery Road (range of widths), as opposed to only “mostly” 21m? How is the Norma-Nero Bridge constructed - similar to the Paul Lake Bridge?
6.6.4.1.	Buildings and Infrastructure	p.259: Will the Environmental Site Assessment be conducted across the entire site or just at specific facilities? Will it be done in phases or all at once?
6.6.4.4.	Exploration Site	Will only the highly erosive areas be re-vegetated?
6.6.4.6.	Quarry Sites	p.260: What does “especially where excavation has been temporarily delayed” mean? What is the criteria stabilizing slopes for these sites? p. 261: Have additional measures been identified to increase survivability? What further work will be required in this area?
6.6.4.7.	Laydown and Camp Pads	p. 261: What is meant by the “as-built conditions” – no change to pad geometry?
6.6.4.8.	Ore Storage Pads	p. 262: Is the vegetation density or productivity measured and monitored over time as it is expected to establish

		slowly?
6.6.4.9.	Roads	p.262: What techniques are used to enhance the process of natural colonization?
6.6.4.10.	Bridges and Culverts	p. 263: Will the stabilization with riprap have bank slope criteria to meet?
6.6.4.11.	Airstrip	p. 263: Is all material to be landfilled assumed to be inert? At what rate is the re-colonization occurring?
6.6.5	Closure Objectives and Criteria	p. 265: Is there a Peak or Maximum TSP concentration? p. 268: Criteria for Physical Stability - How are design parameters determined for engineered structures?
Appendix D		
4.2	Panda Diversion Channel Stabilization	How has the “functioning well as fish habitat” been determined?
4.2.1	Spring Blockage of PDC	By eliminating any practical means – is channel reconstruction/re-alignment not a possibility? When Panda Pit is full, what happens to contingency to spill to the Panda Pit? Will a flow reversal occur at any time? What will be expected long-term stability of a concrete weir in a non-maintained environment? Success of concept of spillway seems tenuous. Spillway blockage by snow/ice seems just as possible – how has this been considered? Are there any negatives (e.g., to habitat development) if channel is not flushed – or will this occur as soon as ice/snow are gone?
4.2.5	Panda Diversion Dam	Can low heads be assured or is spillway only means of maintaining low head?