11/17/08

Welcome Mike Smith – purpose of work
- characterize baseline
- provide information for engineering
- prepare for applications

Pebble Project Update: John Shively
Keystone Institute – review – how does this relate to TWG?
- permitting – late 2009 or more likely early 2010.

Engineering Update: Steve Hodgson
- drilled out? mostly drilled out
- schedule for final plans (UG vs OP, tailings, or processing methods) concentrate transportation
  - coincident with permitting more or less

- block caving – currently ~20 world wide.
- pit vs. block caving vs. both undecided – both close
- tailings – still evaluating

Groundwater Hydrology: Rod Smith
✓ - how does permeabilities of bedrock compare to overburden?
- fault zones. All { BR 10^{-6} – 10^{-4} (10^{-3})
  OB $10^{-4.5}$ – 10^{-3} (10^{-7})

Deposit Area { BR 10^{-6} $10^{-3.5}$
OB

Deposit represents low GW recharge area.

EPA-6363-000011884

- Data gaps from process oriented studies
- Statistical comparison for data validation.
- Lake Studies
- Sed SEM/AVS
- Dating Tailings Area
- EQ hazards

Groundwater Quality: High McCreadie
10% triplicate
- no ORP sulfide
- max TDS 200 - 500 mg/L; highest in deposit.
- Low D.O. in deposit (0-2.5 mg/L) in gravel.
- Outside most 10-15 PQ4
- pH most 6-8; lowest in deposit 3-5 (5-6); just a few (generally higher @ depth EQ CO_2)
→ - In deposit, depth of screening (oxide vs. sulfide)
→ - No ORP
T $\bar{X}$ = 4°C

MW-12S Highest TDS 450 mg/L
MW-5D ~~[illegible]~~ lowest DO. 0.5 mg/L MW-5M, SRK
Carbonate EQ

MW-1S, 13S, SRK-5D, SS: lowest pH 5.5-5.8

GW in NFK have lower hardness
SFK and VT are similar
Highest SO_4 in SFK

In gravel, high TDS Ca - HCO_3^- - SO_4^{2-}

Max Fe in Dep 500-7000 µg/L
Mn 500-1000
Max depth 150'

EW
MCL exceed Al, Fe, Mg,

Ground water Flow Model: Hugh McCreadie

EW: MODFLOW-SURFACT

vertical conductivity is weighted average of two layers?? Weighted based on thickness?

Offsite	discharge	non 0	y-int.
Rechey		0	y-int
Onsite	discharge	0	y-int

X How do you reconcile cross watershed flux of mass-balance vs. modeling?

Surface water Hydrology: Jamie Carthcart

XX USEPA Hard Rock Mining Handbook

360 sq. mi. study area

18	19
18	19
144	171
180	19
324	381

Surface Water Quality: Charlotte MacCay

ALK UT > SFK, NFK

* Hardness: variation among watersheds

SO4 max 89.5 mg/L

Ca - HCO3- (-SO4)

Ca UT > SFK > NFK

Webinar 11/17/08
Dave Chambers
Carol Ann Woody

* CCC based on single hardness

SFK lowest, highest pH, Cu, Mn, SO4, T

NFK highest Zn,

UT high Ni, Ca, Mg, ALK, pH

Seep excedance Pb, Al, Cd, Cu, Zn, Ni, Mg?

Need to consider hardness of watershed in selecting site of Tailings Impoundment

Data Management: Dana Stewart

3 Levels of QC
- 1st in field
- 2nd in transfer to data base
- 3rd check for trends.

Richard Clements

Day 2 11/18/08

Geochemical Characterization: Stephen Day

pH ca. 3 for pre-Test. rocks
(longest duration 250 days (~5 yrs)
Treating ⇒ pH 6-7
Ave. SO_4^{2-} release rate ~25 to 50 (120) mg/kg/week
max sulfide 0-12 wt%

* Humidity cell ⇒ how waste rock treated/crushed
* In barrel test how will they scale to waste rock size?

Barrel tests: Most pH 6.4-8.2, (5.0, 4.4)
SO_4 2165 mg/L max

Tailings
- mostly Net Neutral, some net acid.

* Are all of the tails minus a Cu & Py con?
* What have they done with py con?
  Tails S 0.05 - 0.3 wt%

Trace Elements: Mark Stelljes

Organic carbon in seds??
SEM-AVS in seds?
111 soil samples 251 soils?
38 plant sites
17 ponds

Seds 24+56 + 33+18 + 14+14+14+14
Pond Seep seds 20 + 14+19+20+22 + (9+12) seeps
Ponds

Seasonality & CN abundance?
CN higher in Aug Plants vs. July Plants.

Inadequate coverage @ mine

Fish
Coho in SFK and UT

FWS AMD Report

p. 3-4: Need to consider environmental effects relative to deposit geology and in terms of climatic/hydrologic setting.

p. 5-6: Simplistic treatment of aquatic toxicity. Doesn't elaborate on role of hardness and DOC. Yukon example doesn't describe process (AMD?). Needs to elaborate more on modes of toxicity. Rarely a single metal; @ Pebble Cu, Al, Zn, Cd.
- Toxicity of Mo poorly known.
- Effect of on geochemistry of Lake is complex

p. 7-81: ABA sulfate not that simple (meteorite, jr) ABA can include long and short term acidity. Various ways to do NP.
ABA = potential; SPLP short term leachate
Hum. Cell ⇒ longer term.
Success of ABA will depend upon deposit type.
- Sobeck method specifically developed for porphyry copper deposits.

Borden R, 2001, Bingham. Geochem: Explor, Env., Anal, 1:1, 15-21.

Kuipers reports...

FWS AMD Report

Kuipers criticisms: yes-no approach, no separation of MCL vs SMCL vs increasing

Martin and Goldblatt (2007) Cu in AM stream. EST 26(12), 2594-2603.

Report by: Jennings, SR, Neuman DR, and Blicker PS (2008) Acid mine drainage and effects on fish health and ecology: a review. Reclamation Research Group Publ., Bozeman, MT.

Frances Mann

Geochemistry TWG 11/18/08

Kendra Zamzow - CSP

Charlotte: PLP looking for dialogue about geochem. program - all aspects

Other tests? NAG

Keystone ⇒ Anglo driven

LMPT: Large Mine Permitting Team

Email recommendation to Steve for DEC geochemistry consultant.

Deep GW!!!

Trace Element TWG Meeting 11/20/08

Jeff Estensen - ADF&G : TWG Lead

Bristol Bay Assessment - Technical Team Meeting

7/12/11

Cindy Godsey? Mining Engineer

Rick Parkin - EPA Anchorage Admin.
Phil North - EPA
Guy Adema - NPS
Paul Berger - NPS
Jim Wiggert - EPA - ORD
Toby - UAA Economist
Joe Ebersole - EPA ORD
Dave Aikens -
Becky Shaffel - UAA
Jeff Britson - EPA ORD
Katherine Knott - Anthropolys
Alan Boraas - Anthropolys
Doug - NOAA
Mike Weddmer - UW - Ecologist
Palmer Huff - EPA Oweth DC.
- EPA OW DC
Glen Sutter - EPA - ORD
Tammy - EPA Anchorage - Tribal Liaison.
Sheila

Phone
Barb
Kate Schoefield
Patty

BBAST Meeting
7/12/11

Jeff:

Time line:	Draft characterization report	Sept. 11
	Outline assessment report	Oct 11
	Internal agency review draft	Feb 12
	External review draft released	Apr. 12
	External panel review	May-Jun 12
	Final assessment report	Aug 12

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