Presentation to Wek'eezhii Land and Water Board Workshop on Sable, Pigeon and Beartooth Water Licence Renewal

November 4/5, 2008





































Water Qualit	у		
Parameter	Two-Rock Lake	Horseshoe Lake	CCME
pН	6.54	6.55	6.5-9.0
Ammonia-N	0.007	<0.005	pH and Temp dependant
Nitrite-N	0.005	0.002	0.06
Nitrate-N	0.007	0.004	2.9 (interim)
Total Phosphorus	0.0067	0.006	-
Metals			
Total Aluminum	0.0164	0.0155	0.1
Total Arsenic	0.00008	0.00016	0.005
Total Cadmium	<0.00005	0.00003	0.000017
Total Chromiun	0.00005	0.00005	0.089
Total Copper	0.0003	0.0005	0.02
Total Lead	0.00007	0.00010	0.001
Total Nickel	0.00035	0.00033	0.025
Total Zinc	0.0005	0.00045	0.03









		Diav	ik WL		SPB V	VL
	TAC Recom	nendation	Final E			
	Max Average	Max Grab	Max Average	Max Grab	Max Average	Max Grat
Ammonia	2	4	2.0/6.0	4.0 / 12.0	2.0	4.0
Aluminum	0.1	0.2	1.5	3.0	1.0	2.0
arsenic	0.05	0.1	0.05	0.10	0.050	0.10
copper	0.02	0.04	0.02	0.04	0.02	0.04
caumum	0.001	0.002	0.0015	0.003	0.0015	0.003
lead	0.015	0.03	0.02	0.04	0.02	0.04
zinc	0.01	0.02	0.01	0.02	0.01	0.02
nickel	0.05	0.2	0.01	0.02	0.01	0.02
nitrite	1	2	1.0	2.0	1.0	2.0
TSS	10	20	15.0	25.0	15	25
turbidity	5	10	10 NTU	15 NTU	10 NTU	15 NTU
phosphorus	0.1	0.2	loading based	-	0.2	0.4
pH	-	6.0-8.4	-	6.0-8.4	-	6.0-9.0
acute toxicity	-	non-toxic	-	non-toxic	-	non-toxic
oil&grease	3	5	3.0	5.0	-	3

WL: Issued: Renewed:	EKATI NWTWB MVLWB	WL 1997 2005	Diavik NWTWB WLWB	WL 2000 2007	SPB MVLWE WLWB in	WL 3 2002 progess	Snap Lal MVLWB -	ke WL 2004
Parameter	Max Average	Max Grab	Max Average	Max Grab	Max Average	Max Grab	Max Average	Max Grab
ammonia	2.0	4.0	2.0(6.0)	4.0 / 12.0	2.0	4.0	-	20
aluminum	1.0	2.0	1.5	3.0	1.0	2.0	1	2
arsenic	0.50	1.0	0.05	0.10	0.050	0.10	0.020	0.040
copper	0.10	0.20	0.02	0.04	0.02	0.04	0.010	0.020
cadmium	-	-	0.0015	0.003	0.0015	0.003	0.001	0.002
chromium	-	-	0.02	0.04	0.02	0.04	0.020	0.040
ead	-	-	0.01	0.02	0.01	0.02	0.005	0.009
zinc	-	-	0.01	0.02	0.01	0.02	0.010	0.020
nickel	0.15	0.30	0.05	0.1	0.05	0.1	0.050	0.100
nitrite	-	-	1.0	2.0	1.0	2.0	1	2.0
TSS	15.0	25.0	15.0	25.0	15	25	7	14
urbidity	-	-	10 NTU	15 NTU	10 NTU	15 NTU	-	-
ohosphorus	-	-	loading based	-	0.2	0.4	loading based	-
H	-	6.0-9.0	-	6.0-8.4	-	6.0-9.0	-	6.0-9.0
acute toxicity	-	non-toxic	-	non-toxic	-	non-toxic	-	non-toxic
oil&grease	-	-	3.0	5.0	-	3	3.0	5.0
<u>Obs</u> Ami	ervations monia is r	<u>:</u> noticeat	nly lower ti	han the	Diavik ar	nd Snap .	Lake WL's	



	3FB						COML	
	Max Average	Max Grab	Max Average	Max Grab	% of MMER	Tier 1 WQG	times CCME	Note
mmonia	2.0	4.0	-	-	-	10.3	5 X LESS	pH=7.0;T=10C
luminum	1.0	2.0	-	-	-	0.1	10 X	pH>=6.5
rsenic	0.050	0.10	0.50	1.00	10%	0.0050	10 X	
opper	0.02	0.04	0.30	0.60	7%	0.002	10 X	hardness<120mg/L
admium	0.0015	0.003	-	-	-	0.000017	(88 X)	
hromium	0.02	0.04	-	-	-	0.0010	20 X	Cr(VI)
ead	0.01	0.02	0.20	0.40	5%	0.001	10 X	hardness<60mg/L
inc	0.01	0.02	0.50	1.00	2%	0.030	3 X LESS	
ickel	0.05	0.1	0.50	1.00	10%	0.025	2 X	hardness<60mg/L
itrite	1.0	2.0	-	-	-	0.060	17 X	
SS	15	25	15.00	30.00	100% / 83%	-	-	
urbidity	10 NTU	15 NTU	-	-	-	-	-	
hosphorus	0.2	0.4	-	-	-	-	-	
H	-	6.0-9.0	-	-	-	6.5-9.0	-	
cute toxicity	-	non-toxic	-	-	-	-	-	
il&drease	-	3	-	-	-	-	-	















Parameter	Sable Baseline	Sable WRSA	Sabl	e Pit	Two-Rock Pe	ond Average
		Runoff	(Beartoo	And	Best Es	And
Ammonia	0.000	0.035	10	10	2 Detween	6 1
Aluminum	0.009	0.000	25	47	0.79	1.5
arsenic	0.0008	0.0014	0.0032	0.0045	0.0013	0.0016
copper	0.00034	0.0054	0.021	0.026	0.0077	0.0010
cadmium	<0.00005	0.00007	0.00014	0.00021	0.00007	0.00089
chromium	0.000049	0.0005	0.0076	0.014	0.0024	0.0053
lead	0.00005	0.0002	0.0016	0.0024	0.00055	0.00082
zinc	0.00046	0.0075	0.013	0.02	0.0059	0.0075
nickel	0.00035	0.011	0.058	0.11	0.018	0.02
nitrite	0.0053	0.009	2.8	4.1	0.55	1
TSS	-	-	-	-	<15	<15
turbidity	-	-	-	-	<10 NTU	<10 NTU
phosphorus	0.0076	0.020	3.7	6	0.053	0.055
рH	-	-	-	-	6.0-9.0	6.0-9.0
acute toxicity	-	-	-	-	non-toxic	non-toxic
oil&grease	-	-	-	-	<3	<3

	Parameter	Two-Rock Po	nd Average	SPB WL	Comment	
		Best Est	imate			
		Between	And	Max Average		
	Ammonia	3	6.1	2.0	100% compliance unlikely	
	Aluminum	0.79	1.5	1.0	100% compliance unlikely	
	arsenič	0.0013	0.0016	0.050	100% compliance uncertain	
	copper	0.0077	0.0091	0.02	100% compliance uncertain	
	caumum	0.00007	0.000089	0.0015		
	chromium	0.0024	0.0053	0.02		
	zino	0.00055	0.00082	0.01	100% compliance uncertain	
	zinc	0.0039	0.0075	0.01	100% compliance uncertain	
	nitrito	0.016	0.02	0.05	100% compliance uncertain	
	TSS	0.00	<15	1.0	100% compliance uncertain	
	turbidity	<10 NTU	< 10 NTU	10 NTU		
	phosphorus	0.053	0.055	0.2		
	nH	6.0-9.0	6.0-9.0	0.2		
	acute toxicity	non-toxic	non-toxic	-		
	oil&grease	<3	< 3			
	onagrease	10		1		
Oho	servations.					
0.0	J V V V V V V V V V V V V V V V V V V V					







	Gr				
		ab Sample	S S	Possible Gr	ab Sample
A	median	75%'ile	95% ile	Between	And
Ammonia	9.4	18	58	6.1	6.5
Aluminum	2.6	5.4	78	2	4
arsenic	0.0032	0.0045		<0.01	<0.01
copper	0.023	0.035	0.31	0.01	0.02
cadmium	0.00013	0.00022	0.0012	0.0001	0.0001
chromium	0.008	0.016	0.69	0.01	0.03
lead	0.0017	0.0027	0.041	0.001	0.003
zinc	0.014	0.027	0.48	0.01	0.02
nickel	0.06	0.13	0.48	0.03	0.05
nitrite	2.6	4.2	5.5	1	1.2
phosphorus	<0.3	<0.3	6.9	0.2	0.3

Parameter	Two-Ro	ck Pond	SPB WL	Comment
	Possible Gr	ab Sample		
	Between	And	Max Grab	
Ammonia	6.1	6.5	4.0	100% compliance unlikely
Aluminum	2	4	2.0	100% compliance unlikely
arsenic	< 0.01	<0.01	0.10	
copper	0.01	0.02	0.04	
cadmium	0.0001	0.0001	0.003	
chromium	0.01	0.03	0.04	
lead	0.001	0.003	0.02	
zinc	0.01	0.02	0.02	100% compliance uncertain
nickel	0.03	0.05	0.1	
nitrite	1	1.2	2.0	
phosphorus	0.2	0.3	0.4	

100% compliance for Grab Samples appears unlikely or uncertain for ammonia, aluminum and zinc. bhpbillitan

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ion the future

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Further Review	v – Am	nmonia (2	2)			
Two	Rock Po	nd Predictio	n	SPB	NL	
no ammonia	loss	with amm	onia loss	0.2		
Est Average Po	ss Grab	Est Average	Poss Grab	Max Average	Max Grab	
3 - 6.1 6.	.1 - 6.5	2 - 4	4	2.0	4.0	
<u>Observations:</u> <i>With the estimate</i> <i>atmosphere, 10</i>	ed loss 00% co	of ammon ompliance d	ia from T continues	wo-Rock Po to be unlike	ond to the ely	ç S
Slide 44						bhpbillita

	рН	Total Ammonia Con	centration (mg/L)
		Average	Grab
BHP Billiton has	6.4	6.75	n/a
proposed a resoluting	6.5	6.67	n/a
proposed a receiving	6.6	6.57	n/a
water quality objective	6.7	6.44	n/a
for ommonia that	6.8	6.29	n/a
	6.9	6.12	n/a
works with the known	7.0	5.91	n/a
rolationship botwoon	7.1	5.0/	21.9
relationship between	7.2	5.39	19.7
ammonia, pH and	7.5	5.08	17.5
tomporaturo	7.4	4.75	13.3
•	n/a: not applicable because maximum allowable avera Note 1: All ammonia concentration effluent may be released at	e the acute toxicity threshold is grea ge concentration. ns are valid for water temperature u bove 14 degrees C unless specifical	p to 14 degrees C; no ly approved by the Board.
<u>BHP Billiton proposes that a possible future integration</u>	this be used a gration of an e	s the Sable EQC ffluent mixing zo	<u>, with the</u> n <u>e.</u> &

























![](_page_28_Picture_1.jpeg)