Evaluating the effects of moving to a low maintenance ARD control strategy at the Victoria Junction coal tailings site

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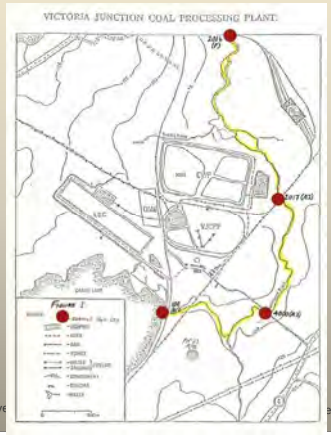
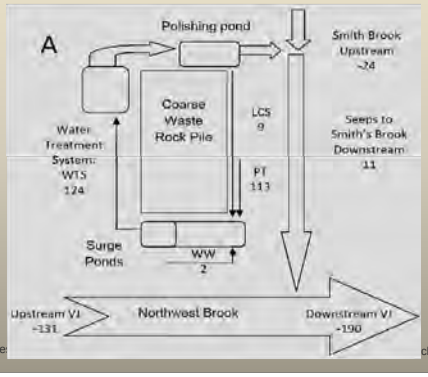
Victoria Junction showing the surface water sampling points



Pre-closeout surface water system



Pre-closeout acid base balance

Acid-Base Balance Victoria Junction				net
Current Situation				acid load
	Source			(tonnes/yr)*
A	System In**	VJ ST 2017		-131.3
B	Smith Brook: SBU			-24.4
C	Polishing pond: PP			-4.6
D	All AMD sources***			
	1	LCS	9.1	
	2	WW	1.7	
	3	PT	113.1	
	4	SBD	11.1	
		Total	135.0	135.0
E	System Out**	VJ ST 2016		**-190.1**
F	net alkaline sources (A+B+C)			-160.3
	unaccounted alkalinity (E-F)			-29.8

Shut-down schedule

Monitoring Project		Project Month 0	1	2	3	4	5	6	7	8	9	10	11	12
Phase 1.	Historic													
Phase 2.	Initial sampling	S^2 G^2 B V C^2												
Phase 3.	Implementation	S^1 G^1	S^1 G^1	S^1 G^1 B	S^1 G^1	S^1 G^1	S^2 G^2 B C^2	S^1 G^1	S^1 G^1	S^1 G^1 B	S^1 G^1	S^1 G^1	S^1 G^1	S^2 G^2 B V C^2

		Project Month 23	24	25	26	27	28	29	20	22	22	23	24
Phase 4.	Post-closure	S^1 G^1	S^1 G^1	S^1 G^1 B	S^1 G^1	S^1 G^1	S^2 G^2 B C^2	S^1 G^1	S^1 G^1	S^1 G^1 B	S^1 G^1	S^1 G^1	S^2 G^2 B V C^2

S = Stream samples: primary chemical analytes only
G = Groundwater samples: primary chemical analytes only
B = Benthic samples
V = Wetland vegetation survey (during growing season)
C = CWRP monitoring wells: primary and secondary analytes
¹ = primary analytes only
² = primary and secondary analytes

Key questions

- The monitoring program is meant to address six questions with respect to the environment adjacent to and down gradient of the CWRP. Three will be addressed during phase 1: historical analysis:
  1. The effect of capping the CWRP on water quality and aquatic life in Northwest Brook
  2. The effect of capping the CWRP on wetland vitality
  3. The effect of capping the CWRP on groundwater
- Three further questions will be addressed after implementation of the closure plan:
  1. The effect of closing the WTS on water quality and aquatic life in Northwest Brook
  2. The effect of closing the WTS on wetland vitality
  3. The effect of closing the WTS on groundwater

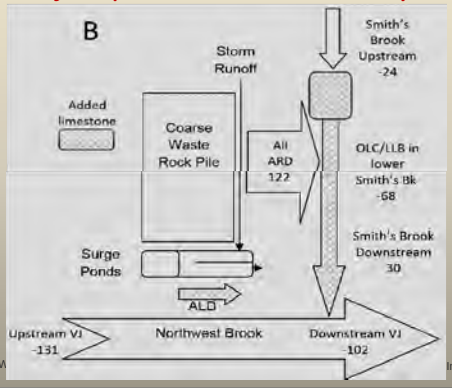
Criteria for success

- The success of the closure plan will be measured by whether the water quality of Northwest Brook, measured at VJ ST 2016 improves downstream of VJ ST 100 or deteriorates below MMER or CCME-FAL water quality standards.
- The distinction is made since the water leaving Grand Lake was measured by AMEC’s 2008 monitoring below a pH of 6.5 and in excess of mercury standards on several occasions.

Shut-down sequence

		Project Month											
Implementation Project		0	1	2	3	4	5	6	7	8	9	10	11	12
Phase 1	Turn off LCS/WW pumps	X												
Phase 2	Reduce PT pumping 50%	X			X			X			X			X
	PT pumping rate (L/min)	227	114		57			28			14			0
Phase 3	Install ALD at WW	X												
Phase 4	Install LLB @ SBU	A[1]												X
Phase 5	Install OLC @ SBD	A[1]												X

Project post-closeout water system



Shut-down sequence, Q1

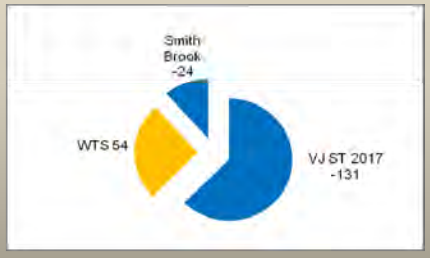
Acid-Base Balance Victoria Junction				
	Phased shutdown of WTS	**Q1**		net
	Shut off D1,2,4			acid load
	Reduce D3 pumping by 50%/quarter			(tonnes/yr)*
A	System In	VJ ST 2017		-131.3
B	Smith Brook SBU			-24.4
C	Polishing pond PP			-2.3
D	All AMD sources			
	1	LCS	9.1	
	2	WW/ALD	0.0	
	3	PT	56.5	
	4	SBD-OLC	5.6	
		Total	71.2	71.2
E	System Out	VJ ST 2016		-86.7

* Negative values represent alkalinity

Passive treatment will be installed as indicated by monitoring during shut-down

- The closeout plan involves installation of three passive treatment units:
- Limestone leachbed (LLB) immediately downstream of the railroad culvert at the head of the SBD channel
- Open limestone channel (OLC) in the SBD channel
- Anoxic Limestone Drain (ALD) at the wet well:

Scenario 3e: End of the evaluation period, assumes that all ARD from the LCS and PT comes to the surface and is partially addressed by passive treatment in SBD and WW



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Acid/base balance

sampling date	Grand Lk outlet	NWB US VJ site	upper Smith Bk.	lower Smith Bk	NWB DS VJ site	Net from VJ site
1-Sep-09	-203	-158	-8	-17	-314	111
15-Oct-09	-240	-150	-33	-31	-205	-36
11-Nov-09	-205	-175	-20	-6	-340	135
9-Dec-09	0	-56	-19	-63	-107	107
13-Jan-10	-93	-53	-19	-100	-42	-51
10-Mar-10	-66	-49	-40	-64	-258	192
19-Apr-10	-92	-16	-123	-47	-263	171
13-May-10	-251	-146	-10	-8	-455	204
10-Jun-10	-316	-248	-33	-20	-285	-31
14-Jul-10	-108	-57	-57	-41	-346	238

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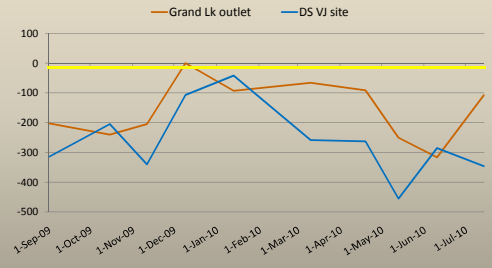
Net acid load (tpy) upstream and downstream of Victoria Junction



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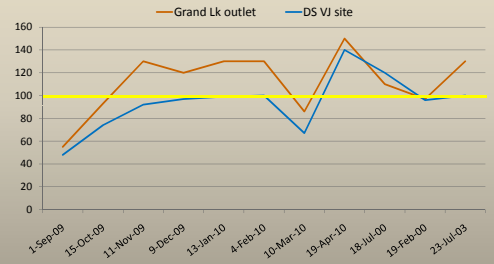
[Al] µg/L upstream and downstream of Victoria Junction



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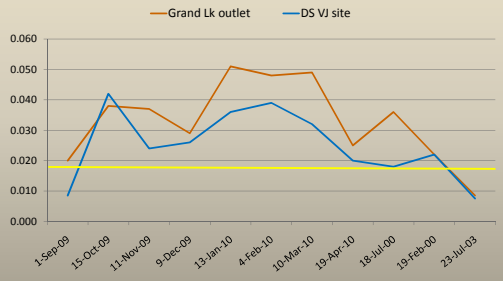
[Cd] µg/L upstream and downstream of Victoria Junction



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Questions?

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