

**Table S1:** Biogeochemical and optical data for upstream, within-slump, and downstream locations on the Peel Plateau. Blank cells indicate data not available or not collected.

Site	Sample Location	Sample Date	Sp. Cond. $\mu\text{S cm}^{-1}$	Na	Ca	Mg	DOC	TSS	S <sub>R</sub>	S <sub>275-295</sub>	S <sub>350-400</sub>	SUVA	$\delta^{18}\text{O}$
HA	Downstream	9-Jul-14	1531	33.2	220.8	75.5	10.5	26,040	0.85	20.2	23.7	1.3	-22.0
HA	Downstream	17-Aug-14	108.3	4.3	14.8	4.7	8.9	7,600	0.83	13.9	16.8	3.5	
HB	Downstream	9-Jul-14	355.8	7.6	42.8	16.0	6.3	16,338	0.87	15.9	18.4	2.6	-20.4
HB	Downstream	17-Aug-14	206.6	6.6	27.1	9.3	5.9	9,700	0.98	14.0	14.3	3.2	
HC	Downstream	9-Jul-14	194.3	4.5	23.9	8.9	7.6	20,884	1.02	13.9	13.6	3.0	-20.4
HC	Downstream	17-Aug-14	175.5	5.1	24.6	8.6	6.1	33,188	1.07	13.2	12.4	3.2	
HD	Downstream	9-Jul-14	195.3	4.4	22.5	7.4	12.6	3,818	0.78	14.7	18.8	3.2	-20.7
HD	Downstream	17-Aug-14	94.7	3.3	16.6	4.3	14.1	947.1	0.78	13.3	17.1	4.0	
SA	Downstream	6-Jul-14	335.5	23.3	35.9	1.3	19.0						
SA	Downstream	21-Jul-14	307.0	16.3	41.6	11.5	22.0	3,564	0.79	14.5	18.3	3.6	-20.6
SA	Downstream	29-Jul-14	141.3	8.3	23.8	7.4	21.2	4,047	0.76	13.5	17.9	3.9	
SA	Downstream	11-Aug-14	218.4	10.0	26.6	8.0	21.7	5,364	0.78	13.6	17.4	3.7	
SB	Downstream	7-Jul-14	561.2	29.7	93.0	33.6	9.5		0.96	16.0	16.7	2.5	
SB	Downstream	19-Jul-14	741.0	36.6	96.4	32.4	11.1	7,400	0.81	16.7	20.7	2.3	-20.7
SB	Downstream	27-Jul-14	392.6	12.0	46.4	17.8	11.8	8,456	0.82	13.9	16.9	3.4	
SB	Downstream	10-Aug-14	586.7	22.3	67.1	30.2	10.9	35,500	0.82	15.3	18.6	2.9	
SC	Downstream	16-Jul-14	271.1	9.6	32.8	11.7	12.6	14,000	0.91	13.5	14.9	3.4	-20.7
SC	Downstream	31-Jul-14	256.1	9.7	28.9	10.4	9.4	27,050	0.92	14.2	15.4	3.2	
SD	Downstream	15-Jul-14	168.0	2.1	18.2	6.9	6.0	11,033	1.01	15.7	15.4	2.4	-19.9
SD	Downstream	1-Aug-14	90.3	2.9	12.0	4.4	7.8	2,117	0.78	14.4	18.3	3.5	
SD	Downstream	22-Aug-14	163.3	3.8	18.9	7.1	6.0	1,160	0.82	14.0	17.0	3.1	
HA	Upstream	9-Jul-14	34.8	0.5	7.2	1.8	11.8	149.1	0.7	13.5	19.3	4.0	-19.8
HA	Upstream	17-Aug-14	20.4	0.3	6.4	1.1	11.1	31.9	0.73	13.6	18.7	4.1	
HB	Upstream	9-Jul-14	177.0	1.0	23.9	8.7	6.8	57.8	0.77	13.8	18.0	3.8	-20.0
HB	Upstream	17-Aug-14	112.5	0.8	18.4	6.1	7.6	8.0	0.76	13.3	17.4	4.1	
HC	Upstream	9-Jul-14	79.5	1.2	10.6	4.2	9.1	9.0	0.74	14.5	19.6	3.4	-20.1
HC	Upstream	17-Aug-14	55.1	0.7	9.1	3.1	7.8	8.6	0.73	14.1	19.3	3.6	
HD	Upstream	9-Jul-14	129.7	2.0	17.8	5.5	13.3	161.7	0.77	14.2	18.4	3.7	-20.6
HD	Upstream	17-Aug-14	98.5	1.2	16.8	4.2	14.0	1,213	0.76	13.3	17.4	3.9	
SA	Upstream	6-Jul-14	113.5	0.9	21.9	5.4	23.7		0.77	14.1	18.3	3.6	
SA	Upstream	21-Jul-14	121.5	0.7	24.5	5.7	26.1	3.7	0.78	14.4	18.5	4.1	-20.4
SA	Upstream	29-Jul-14	73.2	0.5	15.6	3.3	23.9	35.1	0.74	13.3	18.0	4.2	
SA	Upstream	11-Aug-14	107.1	1.0	20.6	5.6	23.8	46.6	0.74	13.3	18.1	4.1	
SB	Upstream	7-Jul-14	523.5	4.3	85.9	24.8	10.8		0.82	15.7	19.2	3.2	
SB	Upstream	20-Jul-14	306.1	18.9	29.5	14.5	11.8	905.7	0.74	14.5	19.6	3.1	-20.4
SB	Upstream	10-Aug-14	322.0	18.7	28.5	12.6	10.2	632.7	0.8	14.0	17.5	3.7	
SB	Upstream	27-Jul-14	211.0	7.3	18.9	7.7	10.6	1,571	0.74	14.5	19.4	3.3	
SC	Upstream	16-Jul-14	54.2	1.5	7.9	2.7	16.0	2,940	0.76	13.4	17.8	3.7	-20.3

Site	Sample Location	Sample Date	Sp. Cond. $\mu\text{S cm}^{-1}$	Na	Ca	Mg	DOC	TSS	S <sub>R</sub>	S <sub>275-295</sub>	S <sub>350-400</sub>	SUVA	$\delta^{18}\text{O}$
SC	Upstream	31-Jul-14	0.99	mg L <sup>-1</sup>	mg L <sup>-1</sup>	mg L <sup>-1</sup>	mg L <sup>-1</sup>	mg L <sup>-1</sup>	0.72	x 10 <sup>3</sup>	x 10 <sup>3</sup>	L mg <sup>-1</sup> m <sup>-1</sup>	
SC	Upstream	31-Jul-14	70.8	1.0	9.3	3.7	11.6	220.9	0.72	13.5	18.8	3.9	
SD	Upstream	15-Jul-14	68.1	0.6	10.2	3.7	6.6	34.5	0.74	13.7	18.6	3.7	-19.6
SD	Upstream	1-Aug-14	34.4	0.3	7.5	1.8	8.8	9.0	0.73	14.1	19.4	3.9	
SD	Upstream	22-Aug-14	53.9	0.3	9.0	2.4	7.4	3.7	0.71	13.5	18.8	3.7	
HA	Within	9-Jul-14	1802	44.9	283.7	87.4	12.0	20,645	0.88	20.7	23.7	1.2	-22.2
HA	Within	17-Aug-14	1035	57.6	147.2	56.4	10.5	185,667	0.99	24.0	24.3	1.0	
HB	Within	9-Jul-14	691.5	34.9	74.3	28.8	10.1	111,491	1	23.2	23.2	1.1	-24.4
HB	Within	17-Aug-14	556.5	30.0	61.2	25.1	9.2	165,600	1.03	22.1	21.5	1.0	
HC	Within	9-Jul-14	263.5	6.1	30.3	11.0	6.6	42,475	0.96	16.6	17.3	2.3	-20.8
HC	Within	17-Aug-14	561.2	29.6	122.0	55.6	13.0	1,039,100	0.92	20.1	21.9	1.3	
HD	Within	9-Jul-14	782.0	45.6	73.7	27.0	18.5	63,456	0.85	17.2	20.2	1.3	-22.4
SA	Within	21-Jul-14	2353	134.9	422.0	137.4	25.0	2,156	0.88	19.5	22.2	1.1	-21.3
SA	Within	29-Jul-14	1560	42.5	240.4	76.4	17.4	44,200	0.84	19.6	23.3	1.3	
SA	Within	11-Aug-14	2029	82.3	323.8	107.9	21.1	42,200	0.84	19.6	23.4	1.3	
SB	Within	7-Jul-14							1.19	20.3	17.0		
SB	Within	19-Jul-14	1929	61.4	427.9	169.1	5.8	610,400	0.97	22.8	23.4	0.9	-24.3
SB	Within	27-Jul-14	2417	42.9	450.2	123.5	8.9	44,567	0.89	19.8	22.2	1.2	
SB	Within	10-Aug-14	2500	54.1	510.8	171.2	6.6	143,600	0.91	20.7	22.7	1.2	
SC	Within	16-Jul-14	1507	86.9	172.2	81.8	10.5	101,367	0.87	20.7	23.8	1.4	-25.8
SC	Within	31-Jul-14	1388	79.3	134.9	66.1	9.7	136,000	0.87	20.6	23.6	1.4	
SD	Within	15-Jul-14	146.8	1.8	16.0	6.2	5.4	14,800	0.98	14.4	14.7	2.7	-19.9
SD	Within	1-Aug-14	56.8	2.0	8.8	2.5	7.7	1,966	0.79	14.1	17.9	3.7	

**Table S2:** Data for the increased frequency ‘environmental controls’ measurements taken at slump FM3. Meteorological data presented in Figure 6 were obtained from the Government of the Northwest Territories Environment and Natural Resources Division and are not presented here.

Sample Date (2014)	Downstream DOC flux mg s <sup>-1</sup>	Upstream DOC flux mg s <sup>-1</sup>	Downstream [TSS] mg L <sup>-1</sup>	Upstream [TSS] mg L <sup>-1</sup>	Downstream [DOC] mg L <sup>-1</sup>	Upstream [DOC] mg L <sup>-1</sup>
12-Jul	288.3	227.9	61,633	236.0	10.0	14.3
14-Jul	158.5	148.4	50,940	228.6	11.3	16.0
16-Jul	1111	1133	27,050	2940	12.6	16.0
17-Jul	1170	844.2	14,633	384.5	12.0	15.1
18-Jul	530.6	403.6	16,800	205.1	12.6	15.2
20-Jul	383.0	333.1	18,267	219.3	12.7	16.4
22-Jul	130.9	165.9	9,750	81.2	13.7	16.8
23-Jul	255.5	175.8	9,875	79.6	14.2	17.9
28-Jul	1213	989.3	6,375	280.9	10.4	12.0
30-Jul	689.4	634.2	6,675	172.6	10.3	11.8
31-Jul	549.5	575.5	14,000	220.9	9.4	11.6
2-Aug	903.4	915.2	10,588	347.2	9.6	11.4
3-Aug	3574	3207	5,100	481.3	10.9	12.9
4-Aug	1944	1402	4,083	321.1	10.9	12.3
7-Aug	707.5	1116	6,038	228.1	9.9	12.1
8-Aug	457.1	744.8	7,238	165.3	10.0	11.5
10-Aug	282	304.3	10,129	299.0	9.5	11.4
11-Aug	341	229.1	15,950	204.4	10.1	11.8
12-Aug	315	207.1	9,300	141.2	10.2	11.9