

Appendix 1 - Alkaline Addition Study Sites

Site No.	Issuance date	Facility Status	Alk add coal seams	Target NNP	NNP Class	Alk add tons/acre	Approx. lbs/yr	Monitoring point ID	OP Limit?	Sub F point?	Spec.Cond. Pre	Median Spec. Cond.	Med. Os. Press	Calc. OP from spec.cond.	TDS - Pre	Med. TDS	Sulfate - Pre	Med. Sulfate	Alkalinity - Pre	Med. Alkalinity	Med. Fe (pre)	Med. Fe (postmining)	Med. Mn (pre.)	Med. Mn (postmining)	Comments	Success?	metals OK?
C1	4/29/2010	STE	LK, MK	7.6	A	1275	23.2	SP 25	no	no	190	534		5.6			54	200	13.6	126	0.04	0.49	0.01	0.07	100 % on pit floor	yes	yes
C2	6/25/2015	REG	LF, UF	6	A	840	30.7	LF DISCH	no	no		750	11	8.2				177.7		174.6		0.3		0.05	25% on pit floor; no premining WQ data	yes	yes
C3	11/26/2013	REG	LK	8.5	A	875	32.6	FH1	no	no										371.9		1.42		16.33	used only overburden hole ETI-8; alk add, 50% to pit floor; MP FH1 dry	yes	no
C4	2/9/2010	REPA	Dudley, Barnett	2	C	440	4.2	SP15 & SP59	no	no	494	1344		14.6	322	889	188	580	0	0	0.41	2.82	1.72	7.24	SP-15 background only, since SP-59 was new discharge	no	no
C5	8/11/2000	COM	LK	3	B	1030	24.9	SP 16	no	no	316	735		8.0	300	500	155	305	8.9	49.5	0.86	7.05	0.97	4.15	weighted avg. alk add; 100% on pit floor	yes	no
C6	10/23/2007	RECH	LF, UK	1.3	C	544	5.4	Pit Water	no	no		2350		25.6				1370		108		41.7		33.5	alk add as two layers in backfill, only raw pit water	yes	no
C7	1/18/2017	Active	LK	11.4	A	938	49.7	D-3, D-4	no	no		2180		23.8				1188.7		357.29		13.99		25.84	combined OBA, OB7, OB12; 25% on pit floor; alk add rate based on reported total of 50,670 tons at 60% CaCO3	yes	no
C8	3/10/2008	STA	LK, MK, UK, LF	2.1	B	270	6.9	S1	no	no		2400	29	26.2				1290		397.8		2.89		4.7	chk to see that all 4 areas report to S1; 100% on pit floor	yes	no
C9	8/18/2009	TTC	LK, MK, UK	6	A	305	22.9	SP15 & SP28	no	yes	608	956.75		10.4	398.5	642.5	188	453	0	0	1.51	6.78	3.39	9.33	Sub F Permit, averaged the mean of the two monitoring points; did not use Sub F 62; 100% of alkaline material on pit floor	yes	no
K1	6/4/2008	Active	UF, LF	6w/out	B	672	20.8	SP3	no	no	110	719		7.8			22.1	230.2	9.79	138.68	0.86	3.77	0.18	0.7	200 tons acre on pit floor, 472 tons per acre spoil	yes	yes
K2	3/13/2013	Active	LF	6w/out	B	672	18.5	SP8W	no	no	228	398		4.3			46.9	91	57	98	0.04	0.38	0.02	0.06	112 acres mined and 95 ft average cover; 2/3 used in backfill	yes	yes
K3	4/17/2012	Active	MK, LK	3	B	1273	63.1	MW1, MW2, MW3	50	no		334		3.6				96		40.6		0.9		0.98	Minor limestone mining, backfill wells	yes	yes
K4	6/30/2008	COM	UCI	6	A	673	55.6	DH4	no	no	713	989		10.8			288	462	0	94	6.31	0.6	1.42	1.42	No water in monitoring well, used D-4H, 15 feet average cover	yes	yes
K5	10/28/2008	COM	MK, LK	6	A	2200	83.2	SP10	no	no	82	1744		19.0			16	1155	4	107.1	0.14	4.07	0.02	22.28	Did not use SP11 (little impact); used SP10; 2/3 used in backfill	yes	yes
K6	12/16/2014	REG	UF	6	A	656	35.5	MP7, MP9	no	no	175	263		2.9	121	158	30.8	50	31.8	46.4	0.22	0.1	0.05	0.05	Did not use MP8(well)	yes	yes
K7	6/15/2015	REG	LK	0	C	2840	91.4	SG4	50	no	121	967		10.5			35.3	442	4.63	1.19	0.1	0.12	0.17	6.05	SG13 very low sulfate, SG3 water quality variable; SG4 is acidic, way below crop, took time to get there. Appears they limed the pit floor, flash of alkalinity and then ran out?	no	no
K8	4/19/2011	COM	mk	6	A	1654	58.6	D1, D2	50	no	96	206		2.2	74	125	15.7	29.2	5	42.4	0.14	9.12	0.02	3.04	Only mined a limited portion of the site, D-1 and D-2 are right next to each other, can't distinguish the difference between aa so split the difference. Cover of 60 feet was the lower aa rate, anything greater than 60 feet was the higher aa rate	yes	no
K9	1/14/2013	COM	lc	3	B	765	47.4	D2	no	yes	670	1360		14.8	540	1028	335.2	723.1	0	0	0.07	3.22	6.82	18.16	38.81 median acidity pre; 40 feet of cover or less, 765 tons acres, greater than 40 feet 2932 tons acre. It doesn't appear any areas were mined at greater than 40' so just use the lower alkaline addition rate.	yes	no
K10	3/31/2015	COM	lk, mk	12w/out	A	587	19.8	SP9	no	no	122	650		7.1			15	172	34	119.8	0.16	0.1	0.05	0.05	MK mined without LK	yes	yes
K11	9/23/2010	COM	lk	6	A	600	37.2	MW2	no	no	-	598		6.5			-	136.4	-	191.8	-	5.63	-	0.12	Backfill well, no background	yes	yes
K12	4/2/2013	COM	mk	6	A	881	36.4	C20	50	no	172	234		2.6			46	74	21	26	0.07	0.46	0.46	0.43	Only used MP20 - others showed no effect	yes	yes
K13	8/7/2012	COM	lk, mk	6	A	1208	48.5	S36 SW126	50	no	90	166		1.8			18	42	21	16.1	0.31	0.4	0.04	0.22	Used MPs S36 and SW126. Others did not reflect AA acres.	yes	yes
M1	9/26/1996	STE	LK, UK, LF	3	B	1156	22.3	127	none	yes		1970		21.5				1340		23		0.05		7.6	127 new point; directly from backfill	yes	no
M2	8/16/2013	REC	MK	6	A	1500	96.8	MW-100	none	no	165	1190		13.0			16	545	63	84		6.21		13.2	virgin site; high alk add	yes	no
M3	9/22/2006	REC	CI	2	C	1170	28.8	D-3	none	no	65	1130		12.3			17	478	11	162		4.17		18.59	virgin site; high alk add	yes	no
M4	10/7/2011	REC	LK, MK	6	A	3000	37.2	BF-1	50	no		2425	17	26.4				1502		112		0.06		18	backfill well 8.11/18; OP from pit water	yes	no
M5	11/29/2010	REC	MK, UK	3	B	302	6	11, 13	non disch.	yes	959	1308		14.3		900	282	627	0	0		1.13		2.05	avg pts 11&13; 11 dry premine; Sub F moderate	yes	yes
M6	6/3/2013	Active	LK, MK, UK	6	A	1254	52	MP 46	non disch.	yes	386	505		5.5	144		90	162	0	0		0.47		1.53	Sub F moderate impact	yes	yes
M7	11/19/2008	Active	UK	5	B	1000	31	MP 15	none	no	707	1060		11.6			294	520	64	78		2.03		0.5	same site as above; split phases	yes	yes
M8	2/23/2009	REC	MK, UK	6	A	1850	38.2	MW 1	none	no		1530		16.7				605		320		10.2		4.8	used last 12 quarters for data stability; backfill mon. well	yes	no
M9	10/18/2011	RECH	LK	6	A	1600	37.8	5	50	yes	228	2060		22.5	141	1936	80	1373	6	2		0.06		30.96	degraded MP 5; OP limit on t.p.	no	no
M10	10/18/2011	RECH	MK	4	B	1891	59.4	P4	none	yes	1860	2300		25.1			895	1321	0	0	47	16.46	7.21	17.2	non complying Sub F discharge; combined with alkaline addition from RES Robison	no	no
M11	3/8/2010	REG	MK	3	B	500	12.4	MP2, MP9	none	yes	1003	1458		15.9			588	911	3.5	6	1.16	0.28	1.36	1.31	Averaged MP2 and MP9. MP2 higher alk, SO4; MP9 no change	yes	yes
X1	NA	NA	Bald Eagle SS	6	A	9400	400	East Sump	none	no		1948		21.2		1617		933		88		0.48		1.28	waste rock fill; calculated TDS; spec conductance = TDS * 0.83	yes	yes
X2	NA	NA	Bald Eagle SS	6	A	9400	400	West Sump	none	no		2494		27.2		2070		1310		98		0.24		0.06	waste rock fill; calculated TDS; spec conductance = TDS * 0.83	yes	yes
X3	REG	REG	LK	12w/out	A	4000	310	CR2U Drain 1	no	no		3010		32.8		1586		343.2		1110.8		0.371		0.01	previous AMD site reexcavated and mixed with lime waste	yes	yes
NS1	8/2/2001	REPA	LF	2.8	B	205	13.6	SP-2/RAW	No	No	60	118		1.3			16.8	580	1.6	0	0.06	0.56	0.18	12.66	205 tons/acre 100 tons in spoil	no	no
NS2	4/13/2004	COM	MK	6	A	845	41.9	MP 26	No	No	185	1308		14.3			12	800.6	77	40.8	0.24	2.74	0.1	0.16	Alkaline addition area C only. MPs 14, 19 no response; used MP 26	yes	yes
NS3	5/15/2003	COM	MK	7.3	A	1900	58.4	MP-14	No	No	678	1335		14.6	454	934	294	491	0	296	0.76	0.74	2.25	1.49	14.65 target NNP (Without thresholds)	yes	yes
NS4	2/13/2008	COM	UF	6	A	1885	40.4	28	No	No	79	2011		21.9	44	2120	13	1592.6	13	55.87	0.03	0.35	0.2	9.14	Area A (Post-mining only 1 sample)	yes	no
NS5	2/22/2013	STE	Brush Creek	8.5	A	1000	32.9	12	No	No	63	345		3.8	43.5	243	14.5	99.2	21	34.78	0.21	0.11	0.55	0.05	Possibly alkaline redistribution; follow up with Andy.	yes	yes
NS6	8/29/2013	ACTIV	Waynesburg	6	A	750	20.7	S-9 & S-10	No	No	300	572		6.2			35	118.9	108.17	163.9	0.32	0.16	0.05	0.06	Averaged S9 and S10	yes	yes
NS7	7/30/2013	ACTIV	LK	6.1	A	2922	65.2	S-13	No	No	112	582		6.3			14.9	242	6	39	0.02	0.04	0.01	3.42	Rec-mix	yes	yes
NS8	12/16/2002	REG	UK	6	A	560	23	S1	No	No	68.5	1218		13.3			16.4	704	4.8	1.6	0.05	0.03	0.04	10.2	Alkalinity did go down, discrepancy in AA rate between Modules 7.4 (415 tons/acre for a NNP of 4) and 10.8 (560 tons/acre) Used the higher	yes	no

Sites excluded from study due to low alkaline addition rate, low sulfates in MP, or lack of SC data.

Subchapter F permits

Selected Alkaline Addition Site Monitoring Points

Site No.	Status	Monitoring Point	Sub F?	Sample #	Date Collected	Field pH	Field Temp	OP	Lab pH	Specific Cond.	Alkalinity	Acidity	Sulfate	TSS	TDS	Aluminum	Iron	Manganese	Comment
M1	STE	127	yes	4402001	5/23/2019	6.50	20.00	16.00	7.10	1587.00	49.40	-34.40	1133.00	5.00	966.00	0.30	0.100	5.230	COMPLETED
M2	REC	MW100	no	2124001	6/12/2019	4.75	16.10	25.00	4.80	2290.00	13.00	305.80	1452.00	8.00	2474.00	8.95	147.000	68.600	COMPLETED
M3	REC	D-3	no	4402001	6/10/2019	6.80	12.00	12.00	6.40	1002.00	157.20	-127.40	402.90	10.00	822.00	0.30	7.265	13.660	COMPLETED
M4	REC	BF-1	no	4463123	6/5/2019	6.50	13.40	33.00	6.60	2810.00	251.00	-171.40	1928.00	62.00	3008.00	0.30	13.800	30.500	COMPLETED
M7	Active	MP 15	no	2319001	6/13/2019	7.00	12.80	10.00	7.30	998.00	89.00	-74.80	503.20	8.00	850.00	0.30	1.000	0.618	COMPLETED
M8	Active	MW-1	no	4463122	6/5/2019	7.00	15.20	26.00	6.60	1983.00	421.60	-376.20	970.50	16.00	1824.00	0.30	16.000	8.930	COMPLETED
M5	REC	11	yes	2319002	6/11/2019	3.00	11.00	11.00	3.20	1319.00	0.00	112.60	843.70	5.00	1060.00	9.495	0.957	1.954	COMPLETED
SEE ABOVE		13		2319001	6/11/2019	3.50	11.00	3.00	3.30	929.00	0.00	80.00	402.70	5.00	666.00	6.54	0.318	1.313	COMPLETED
M9	RECH	5	yes	4455048	5/23/2019	-	-	23.00	4.20	2150.00	5.80	160.80	1592.00	5.00	2244.00	19.91	0.100	44.040	COMPLETED
M6	Active	MP 46	yes	4402001	6/11/2019	3.50	10.00	4.00	3.40	445.00	0.00	64.20	167.90	5.00	260.00	5.31	0.322	1.714	COMPLETED
M10	RECH	P4	yes	2124006	6/10/2019	7.30	20.10	19.00	2.90	2160.00	0.00	246.00	1289.60	5.00	1950.00	21.54	13.140	19.590	COMPLETED
M11	REG	MP2	yes	4455010	5/29/2019	-	-	15.00	5.00	1566.00	10.00	9.40	1042.00	5.00	1432.00	0.79	0.122	1.043	COMPLETED
SEE ABOVE		MP9		4455049	5/29/2019	-	-	7.00	6.80	782.00	18.80	-7.20	428.50	5.00	608.00	0.30	0.100	0.247	COMPLETED
X1	-	East Leachate C.S.	no	4455049	6/18/2019	-	-	16.00	7.40	1439.00	162.00	-146.20	705.40	5.00	1316.00	0.30	0.116	1.160	COMPLETED
X2	-	West Leachate C.S.	no	4455050	6/18/2019	-	-	16.00	7.50	1364.00	181.60	-168.00	695.90	5.00	1234.00	0.30	0.100	0.010	COMPLETED
X3	BFR	CR2 Underdrain	no	4402001	6/20/2019	-	-	29.00	12.30	3010.00	1110.80	-912.00	343.20	5.00	1586.00	0.30	0.100	0.010	COMPLETED
C1	STE	SP 25	no	4161290	5/8/2019	-	-	5.00	7.30	419.00	130.80	-117.00	86.70	5.00	306.00	0.30	1.712	1.662	COMPLETED
C2	REG	LF DISCH	no	4125182	5/1/2019	7.50	-	11.00	7.80	750.00	206.60	-194.20	146.20	5.00	608.00	0.30	0.100	0.016	COMPLETED
C3	REG	FH1	no	-	6/4/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	DRY
C4	REPA	SP15	no	4336362	5/8/2019	-	-	12.00	3.60	1289.00	0.00	68.60	711.60	5.00	1198.00	7.00	0.336	6.160	COMPLETED
SEE ABOVE		SP59		4336363	5/8/2019	-	-	7.00	3.10	899.00	0.00	85.80	407.80	5.00	608.00	4.532	4.959	3.808	COMPLETED
C5	COM	SP 16	no	4363124	5/1/2019	-	-	8.00	6.50	678.00	60.00	-36.00	301.40	5.00	510.00	0.30	6.593	5.019	COMPLETED
C6	RECH	Pit Water	no	-	5/1/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	SITE HAS BEEN RECLAIMED
C7	Active	SP4	no	4125177	4/30/2019	7.20	-	10.00	7.30	667.00	38.00	-27.00	265.50	5.00	466.00	0.30	0.100	0.194	COMPLETED
C8	STA	S1	no	4161291	5/8/2019	-	-	29.00	7.00	2400.00	383.80	-361.80	2228.00	5.00	2452.00	0.30	3.383	4.829	COMPLETED
C9	TTCH	SP15	yes	4363120	5/1/2019	-	-	8.00	3.10	962.00	0.00	103.80	388.10	5.00	634.00	5.74	7.780	12.100	COMPLETED
SEE ABOVE		SP28		4363122	5/1/2019	-	-	7.00	3.40	762.00	0.00	74.80	339.70	5.00	538.00	7.040	0.465	8.990	COMPLETED
K1	Active	SP3	no	4240993	6/5/2019	-	-	3.00	6.40	290.00	61.00	-47.60	84.50	5.00	206.00	0.30	0.100	0.011	COMPLETED
K2	Active	SP8W	no	-	6/4/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	DRY
K3	Active	MW1	no	4242248	6/4/2019	-	-	-	6.60	259.00	64.00	-51.60	66.30	5.00	164.00	0.30	0.100	0.114	COMPLETED
SEE ABOVE		MW2		4242249	6/4/2019	-	-	1.00	5.80	192.20	10.00	-5.00	65.40	5.00	126.00	0.353	0.367	0.179	COMPLETED
SEE ABOVE		MW3		4242250	6/4/2019	-	-	1.00	6.90	192.50	49.80	-38.20	42.10	5.00	134.00	0.30	0.100	0.20	COMPLETED
K4	COM	DH4	no	4242243	5/28/2019	-	-	11.00	7.20	975.00	194.40	-171.60	385.50	5.00	824.00	0.30	0.513	1.730	COMPLETED
K5	COM	SP10	no	4240991	6/4/2019	-	-	24.00	6.30	2180.00	132.20	-95.60	1318.00	5.00	2170.00	0.39	8.464	26.580	COMPLETED
K6	REG	MP7	no	4242240	5/22/2019	-	-	4.00	6.30	283.00	59.20	-52.00	57.40	5.00	220.00	0.30	0.121	0.099	COMPLETED
SEE ABOVE		MP9		-	5/22/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	Could not sample, not home.
K7	REG	SG4	no	4240992	6/4/2019	-	-	10.00	4.50	1134.00	7.40	35.20	651.50	5.00	972.00	4.75	0.292	11.250	COMPLETED
K8	COM	D1	no	4242241	5/22/2019	-	-	3.00	5.70	264.00	11.20	-0.80	101.30	5.00	242.00	0.30	0.333	2.479	COMPLETED
SEE ABOVE		D2		4242242	5/22/2019	-	-	3.00	5.90	153.30	17.40	-9.40	32.80	5.00	118.00	0.30	0.100	0.157	COMPLETED
K9	COM	D2	yes	4242245	5/29/2019	-	-	11.00	4.60	1149.00	8.40	53.40	641.70	5.00	1050.00	7.48	0.458	12.000	COMPLETED
K10	COM	SP-9	no	4242244	5/29/2019	-	-	11.00	6.60	863.00	199.00	-188.80	304.00	5.00	650.00	0.30	0.100	2.680	COMPLETED
K11	COM	MW2	no	-	6/4/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	REMOVED
K12	COM	C20	no	4251656	5/23/2019	-	-	11.00	6.90	305.00	47.20	-35.80	103.60	5.00	103.60	0.30	0.100	0.489	COMPLETED
K13	COM	S36	no	4242246	5/29/2019	-	-	3.00	7.20	535.00	55.60	-45.60	250.20	5.00	390.00	0.30	0.226	5.710	COMPLETED
SEE ABOVE		SW126		4242247	5/29/2019	-	-	13.00	7.50	1321.00	94.80	-79.20	684.70	8.00	248.00	0.30	0.350	3.980	COMPLETED
NS1	REPA	SP-2	no	4157360	5/15/2019	5.50	-	5.00	5.30	580.00	7.40	7.00	280.70	8.00	456.00	1.27	0.100	4.020	COMPLETED
SEE ABOVE		RAW		4157361	5/15/2019	4.50	-	5.00	3.90	593.00	0.00	43.00	272.90	5.00	430.00	4.830	0.264	5.940	COMPLETED
NS2	COM	MP 26	no	4129001	5/23/2019	-	-	9.00	7.20	573.00	165.80	-147.40	32.60	22.00	380.00	0.30	8.310	0.894	COMPLETED
NS3	COM	MP-14	no	4181996	5/16/2019	7.80	-	16.00	8.20	1131.00	331.60	-314.80	392.40	5.00	992.00	0.30	0.247	0.341	COMPLETED
NS4	COM	28	no	4181997	5/16/2019	5.50	-	20.00	7.10	1487.00	109.80	-90.40	880.80	5.00	1424.00	0.30	0.100	0.029	COMPLETED
SEE ABOVE		PS		4181998	5/16/2019	5.50	-	11.00	5.10	1940.00	11.20	14.60	1260.00	5.00	2000.00	2.640	0.100	3.640	COMPLETED
NS5	STE	12	no	4181999	5/20/2019	-	-	8.00	7.70	769.00	111.00	-100.20	324.30	10.00	676.00	0.30	0.137	0.010	COMPLETED
NS6	Active	S-10	no	4127085	5/20/2019	8.00	-	7.00	8.10	423.00	167.80	-159.00	57.10	5.00	284.00	0.30	0.100	0.010	COMPLETED
SEE ABOVE		S-9		-	5/20/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	Could not locate S-9
NS7	Active	S-13	no	4155307	5/15/2019	7.00	-	6.00	6.90	597.00	142.60	-38.00	255.70	5.00	422.00	0.30	0.100	1.380	COMPLETED
NS8	REG	S1	no	4131209	5/16/2019	-	-	10.00	4.90	900.00	8.60	16.00	486.90	5.00	798.00	1.98	0.100	6.200	COMPLETED