

## NSW coal-ash impacts

Hunter Community Environment Centre

> September 2022



- Legacy coal-ash waste in NSW
- NSW Treasury's Baseline Contamination Assessments
- HCEC sampling results
- Metal bioaccumulation in water birds
- The true cost of coal ash.





## Liddell Environmental Site Assessment

- Arsenic, cadmium, lead, nickel and selenium in excess of the NHMRC drinking water values in groundwater across the site.
- Lead, selenium and nickel exceeded NHMRC recreational water guidelines in some areas.
- Substantial exceedances (above an order of magnitude of background) boron, cadmium, lead, nickel, selenium, zinc at the ash dam boundary.

## Bayswater Environmental Site Assessment

- Pikes Gully ash dam Boron, cadmium, copper, lead, manganese, nickel, and zinc in excess drinking water guidelines. Lead and nickel above the recreational use guidelines.
- Ravensworth Rehabilitation Area ash dump in contact with regional groundwater flow.
- Impacts observed in the other areas within this catchment would be minor contributors to the overall potential impacts arising from the ash dams.

4 Lake Liddell

Liddell Ash Dam

3 - Tinkers Creek

Bayswater Ash Dam

6 - Pikes Gulley Creek

2 - Bowmans Creek

Former fly ash disposal (now capped)

CONFES & ATOMS

Howick

Ravensworth \*

Void 4

Current fly ash disposal

1 - Bowmans Creek

Hebden

60

Google Easthe

## HCEC sediment testing: Bayswater and Liddell, 2020

HCEC collected water and sediment samples from waterways draining AGL's Bayswater and Liddell ash dumps in July 2020.

#### Metal concentrations in Lake Liddell sediment



■ Se ■ Hg ■ Pb ■ Cd ■ As

Results for Lake Liddell sediment included: Selenium - 3mg/kg Arsenic - 19 mg/kg Lead - 9 mg/kg

# Toxic Habitat: *Heavy metal impacts on water birds near NSW coal fired power stations*

Half of all birds from which we sampled feathers were potentially suffering health impacts from heavy metals emitted by coalfired power stations.



## Results summary: Bird feather study

#### Lake Macquarie

Significant concentrations of lead were found in all the waterbird feathers.

#### Lake Wallace

Seven of the nine feathers collected from Lake Wallace contained detectable concentrations of lead, mercury, and selenium.

Seven feathers had detectable lead. One almost six times the adverse health impact threshold.

Three of the nine feathers contained detectible selenium. All three were above adverse health impact thresholds

#### Lake Liddell

Selenium was found in all the feathers collected from Lake Liddell. Many in excess of estimated health impact thresholds.

Arsenic was found in 4/10 feathers from Lake Liddell. Feather from the other sites had no detectable arsenic.

Highest concentrations of arsenic, lead, and selenium was taken from an adult Black Swan carcass.

#### Cumulative metals – all sites



Annual metal
leaching from
NSW ash

Zinc	5t
Copper	3t
Selenium	3t
Chromium	2t
Arsenic	1.6t
Nickel	681kg
Nickel	681kg
Cadmium	193kg
Lead	80kg
Mercury	40kg

Metal (mg/k - ppm)			NSW co	oal-fired	Fatimated engual					
		1	2	3	12	13	Mean ppm	leachate (kg)		
Arsenic	As	12	4	6.6	12	43	16	1,634		
Boron	В	25	56	89	75	80	65	44,428		
Barium	Ва	393	420	653	393	510	474	29,668		
Berillium	Ве	22	15	4	9	6	11	1,473		
Cadmium	Cd	0.4	0.9	0.25	0.44	0.35	0	193		
Cobalt	Со	11	10	6	11	38	15	220		
Chromium	Cr	50	40	18	45	72	45	2,017		
Copper	Cu	52	50	28	47	151	66	2,940		
Gernanium	Ge	40	18	5	10	10	17	2,998		
Mercuy	Hg	0.02	0.03	0.15	0.12	0.22	0	39		
Lithium	Li	180	28	48	58	106	84	12,540		
Manganese	Mn	88	200	899	321	413	384	7,939 10,802		
Molybdenum	Мо	8	5	5	6	10	7			
Nickel	Ni	41	30	11	24	70	35	681		
Lead	Pb	59	60	48	68	48	57	78		
Antimony	Sb	2.9	2.3	3.1	3.9	2.9	3	760		
Selenium	Se	5.2	4.7	2.5	3.5	3.7	4	3,068		
Tin	Sn	10	12	6	10	11	10	13		
Vanadium	V	128	120	49	109	172	116	10,896		
Tungsten	W	5	7	6	6	3	5	1,805		
Zinc	Zn	108	86	67	124	142	105	5,210		
Zirconium	Zr	600	440	250	400	450	428	14		
TOTALS								139,416		

## Critical Minerals in NSW ashes

Alumina	2.2Mt	\$21b
Germani	um 3,650t	\$13b
Lithium	18,500t	\$1.2b
Nickel	7,740t	\$285m
Zircon	94,000t	\$235m
Cobalt	3,340t	\$197m
Copper	14,500t	\$180m

		NSW co	al-fired	power	Price per	Resources			
;/k -	1	2	3	12	13	Mean ppm	USD/Ton	(tonnes) in 220Mt fly ash	Resource value AUE
						20%	6,500	2,200,000	21b
As	12	4	6.6	12	43	16			-
В	25	56	89	75	80	65	750	14,300	16m
Ва	393	420	653	393	510	474		104,236	-
Be	22	15	4	9	6	11	3,500	2,464	13m
Cd	0.4	0.9	0.25	0.44	0.35	0	650	103	98,37
Со	11	10	6	11	38	15	40,000	3,344	197m
Cr	50	40	18	45	72	45	9,000	9,900	131m
Cu	52	50	28	47	151	66	8,500	14,432	180m
Ge	40	18	5	10	10	17	2,370,000	3,652	13b
Hg	0.02	0.03	0.15	0.12	0.22	0		24	-
Li	180	28	48	58	106	84	45,000	18,480	1.2b
Mn	88	200	899	321	413	384	1,000	84,524	124m
Мо	8	5	5	6	10	7	26,000	1,496	57m
Ni	41	30	11	24	70	35	25,000	7,744	286m
Pb	59	60	48	68	48	57	2,300	12,452	42m
Sb	2.9	2.3	3.1	3.9	2.9	3	12,000	664	12m
Se	5.2	4.7	2.5	3.5	3.7	4	650	862	824,02
Sn	10	12	6	10	11	10	40,000	2,156	127m
V	128	120	49	109	172	116	650	25,432	24m
W	5	7	6	6	3	5	6,000	1,188	11m
Zn	108	86	67	124	142	105	3,200	23,188	110m
Zr	600	440	250	400	450	428	1,700	94,160	235m
TOTALS								AU\$36b	
	<pre>/k - /k -</pre>	/k -1As12B25Ba393Be22Cd0.4Co11Cr50Cu6e40Hg0.02LiMn88Mo81Ni41Pb59Sb2.9Se5.2Sn10V128W52n108Zr600	/k -NSW color1212As124B2556Ba393420Be2215Cd0.40.9Co1110Cu5040Cu5250Ge4018Hg0.020.03Li18028Mn88200Mo85Ni4130Pb5960Sb2.92.3Se5.24.7Sn1012V128120W57Sn10886Zn10886Zn600440	/k -ISW coel-fired123As124As124Ba255689Ba393420653Be22154Cd0.40.90.25Co11106Cr504018Cu525028Ge40185Hg0.020.030.15Li1802848Mn88200899Mo855Ni413011Pb596048Sb2.92.33.1Se5.24.72.5Sn10126V12812049W576Zn1088667Zn600440250	NSW cosl-fired powerh12312h2312As1246.612B25568975Ba393420653393Be221549Cd0.40.90.250.44Cd1110611Cd50401845Cu52502847Ge4018510Hg0.020.030.150.12Iti180284858Mn88200899321Mo856Ni41301124Pb59604868Sh2.92.33.13.9Se5.24.72.53.5Sn100126100W55766W55766W55766W55766W55766W55766W55766W1088667124W55766W55766W55766W5576 <th< td=""><td>NSW col-fired power stations/k - 1Z31213As1246.61243As1246.61243B2556897580Ba393420653393510Be2215496Cd0.40.90.250.440.35Cd111061138Cr5040184572Ge401851010Hg0.020.030.150.120.25Ii180284858106Mn88200899321413Mo855610Pb5960486848Sb2.92.33.13.92.9Se5.24.72.53.53.7Sn101261011V12812049109172W57663Zr600440250400450Zr600440250400450</td><td>NSW col-fired power stations/k -1231213Mean pm123124366124361243625568975806583934206533935104748e221549611Cd0.40.90.250.440.350Cd111061138150Cr504018457245Cr5040184510117Hg0.020.030.150.120.220I18028485810684Mn88200899321413384Mo8556107Ni413041247035Pb596048684857Sb2.92.33.13.92.93Sc5.24.72.53.53.74Sn10126101110V12812049109172116W5766355Zn1088667124142105Zn1088667124142<td>/K -Price per stations:Price per stations:/K -1231213Mean ppmUSD/TonAs1246.6124316B255689758065750Ba393420653393510474Be2215496113,500Cd0.40.90.250.440.3500650Cd1110611381540,000Cd1110611381540,000Cd1110611381540,000Cd1110611381540,000Cd1110611381540,000Cd131611381540,000Cd1851010172,370,000Ge401851010172,370,000Ge401851010172,370,000Ge401851010172,370,000Ge402848581068445,000Min882008993214133841,000Mo855610172,300Sb5.9</td></td></th<> <td>NSW coal-fired power stationsPrice per (tonnes) in 220Mt fly ash1231213Mean pmUSD/TonResources (tonnes) in 220Mt fly ashAs1246.6124316USD/Ton2200,000As125568975806575014,300Ba25568975806575014,300Ba2215496113,5002,464Cd0.40.90.250.440.350650103Be2215496113,5002,464Cd0.40.90.250.440.350650103Cd1110611381540,0003,344Cr5040184572459,0009,900Cu52502847151668,50014,432Ge401851010172,370,0003,652Hg0.020.030.150.120.2202434Ma882008993214133841,00084,524Mb885561072,60001,496Ma885561072,60001,496Ma5960<t< td=""></t<></td>	NSW col-fired power stations/k - 1Z31213As1246.61243As1246.61243B2556897580Ba393420653393510Be2215496Cd0.40.90.250.440.35Cd111061138Cr5040184572Ge401851010Hg0.020.030.150.120.25Ii180284858106Mn88200899321413Mo855610Pb5960486848Sb2.92.33.13.92.9Se5.24.72.53.53.7Sn101261011V12812049109172W57663Zr600440250400450Zr600440250400450	NSW col-fired power stations/k -1231213Mean pm123124366124361243625568975806583934206533935104748e221549611Cd0.40.90.250.440.350Cd111061138150Cr504018457245Cr5040184510117Hg0.020.030.150.120.220I18028485810684Mn88200899321413384Mo8556107Ni413041247035Pb596048684857Sb2.92.33.13.92.93Sc5.24.72.53.53.74Sn10126101110V12812049109172116W5766355Zn1088667124142105Zn1088667124142 <td>/K -Price per stations:Price per stations:/K -1231213Mean ppmUSD/TonAs1246.6124316B255689758065750Ba393420653393510474Be2215496113,500Cd0.40.90.250.440.3500650Cd1110611381540,000Cd1110611381540,000Cd1110611381540,000Cd1110611381540,000Cd1110611381540,000Cd131611381540,000Cd1851010172,370,000Ge401851010172,370,000Ge401851010172,370,000Ge401851010172,370,000Ge402848581068445,000Min882008993214133841,000Mo855610172,300Sb5.9</td>	/K -Price per stations:Price per stations:/K -1231213Mean ppmUSD/TonAs1246.6124316B255689758065750Ba393420653393510474Be2215496113,500Cd0.40.90.250.440.3500650Cd1110611381540,000Cd1110611381540,000Cd1110611381540,000Cd1110611381540,000Cd1110611381540,000Cd131611381540,000Cd1851010172,370,000Ge401851010172,370,000Ge401851010172,370,000Ge401851010172,370,000Ge402848581068445,000Min882008993214133841,000Mo855610172,300Sb5.9	NSW coal-fired power stationsPrice per (tonnes) in 220Mt fly ash1231213Mean pmUSD/TonResources (tonnes) in 220Mt fly ashAs1246.6124316USD/Ton2200,000As125568975806575014,300Ba25568975806575014,300Ba2215496113,5002,464Cd0.40.90.250.440.350650103Be2215496113,5002,464Cd0.40.90.250.440.350650103Cd1110611381540,0003,344Cr5040184572459,0009,900Cu52502847151668,50014,432Ge401851010172,370,0003,652Hg0.020.030.150.120.2202434Ma882008993214133841,00084,524Mb885561072,60001,496Ma885561072,60001,496Ma5960 <t< td=""></t<>

## Thank you



