2018 Annual Performance Report

Aberthaw Ash Disposal Site

Permit Number: DP3432SW

March 2019

RWE
The energy to lead

Summary

This document gives details on the performance of Aberthaw Ash Disposal Site over 2018, as required by condition 4.2.1 of the site's Environmental Permit (EP), DP3432SW.

CONTENTS

1. Operational Update

Aberthaw Ash Disposal Site has reached its maximum height and the only area used for depositing Pulverised Fuel Ash (PFA) is the temporary storage area on the western side. The site has been restored as per plans approved by the Local Authorities. In 2018 there were no changes to the operational activities and no Environmental Permit variations.

2. Review of Results for Emission Monitoring

2.1. Hydrogeological Risk Assessment Review

In accordance with the DP3432SW Permit requirement a 6 yearly review of the HRA was carried out during late 2017 and into 2018. The purpose of the review is to determine whether there has been any significant change in conditions at the site and whether the site remains in compliance with the Environmental Permitting Regulations. The review was carried out by an external specialist consultant which in this case was Caulmert Ltd. The review process included an initial meeting between the consultant and RWE staff followed by a detailed review by the consultant of monitoring data gathered since the previous review. The conclusions were that there is a discernible effect from the ash on groundwater & surface water environments however this effect has stabilised over time and there is little change in quality over the review period. Indeed the stable nature of the results led to a recommendation to remove Aluminium, Selenium, Nickel and Antimony from the monitoring suite. There was a note that elevated Ammoniacal Nitrogen concentrations were detected in borehole 10B and the Group 5 Spring however more detailed analysis of other parameters suggest that ash is not the source of the elevated levels, this will continue to be monitored. It was also recommended to include a new Surface Water Monitoring Point at the mouth of the River Thaw to provide confidence that any impact to the wider environment at the point of discharge remain acceptable. In essence the review reflected the expected stable nature of the Ash Mound which for several years has been capped and seeded with grass cover to seal the ash surface.

2.2. Groundwater Quality Review

Monitoring Objective

To carry out routine monitoring of groundwater to monitor the performance of the ash disposal site by measurement of absolute levels and concentrations and trends relative to relevant criteria including background levels and concentrations, control levels and compliance limits.

Number and Location of Monitoring Points

A summary of the monitoring boreholes is provided in Table 1 below and the locations are shown in Appendix A. In January 2015, borehole improvement works were completed to improve water sampling. BH3B was unblocked, BH7B was re-drilled (new details provided in Table 1) and the top hat cover was replaced on BH6. There are 8 boreholes in natural ground, of which 6 are completed in the Porthkerry Member limestone and 2 in the Alluvium (clay), and 2 shallow boreholes in fill material, BH7A with a response zone partly in clay fill and BH11A with a response zone partly in fill containing coal ash (BH11A).

Groundwater flow beneath the ash disposal site is directed towards the River Thaw to the west and the sea to the south. Due to the ash disposal site's contact with the sea, the southern boundary of the site is a downgradient boundary. There are 4 boreholes on this boundary, BH10B, BH11B, BH7B and BH9B, with an average spacing of approximately 250m. The two shallow boreholes, BH7A and BH11A are situated close to boreholes BH7B and BH11B respectively. There are also 2 boreholes on the western downgradient boundary, BH3B and BH8B, with an average spacing of approximately 800m, borehole 8B was found to be damaged in Q2 2017 which resulted in the low flow sampling method to be inoperable and therefore samples were not obtained from this borehole for the remainder of 2017, this decision was agreed by NRW due to the fact that a Hydrogeological Risk Assessment HRA was in progress and a decision was made to wait for the outcome of the HRA to determine if this borehole would need to be re-drilled.

BH6 and BH5 are located on the eastern boundary with an average spacing of approximately 750m and as both response zones are overlain by PFA they cannot be considered truly upgradient. Upgradient monitoring boreholes at the nearby Aberthaw Quarry Ash Disposal Site (Environmental Permit BP3339BH) are used as an indication of upgradient groundwater quality data for the limestone aquifer (Details of these boreholes are in italic in table below).

Table 1: Summary of Monitoring Boreholes

Monitoring Borehole	Formation Sampled	Lithology Type – Natural (N) Imported Fill (F)	Response Zone Depth (m b GL)	Geological Barrier Thickness above Response Zone (m)	Other Lithology above Response Zone
BH3B	Limestone	N	13.5-23.0	6	PFA: 6m
BH5	Limestone	N	2.5-11.5	0	PFA: 1.5m
BH6	Limestone	N	13.0-20.5	0	PFA: 12.2m
BH7A	Clay fill and Gravelly clay	F/N	2.0-9.5	8	PFA: 1.5m
BH7B	Limestone	N	17.0-26.0	3.9	Fill: 7.4m Sand & gravel: 5.7
BH8B	Limestone	N	30.0-38.0	19	PFA: 9m
BH9B	Limestone	N	6.0-13.0	0	PFA: 3m
BH10B	Clay	N	23.0-30.0	6.6	Fill: 2.8m Sand: 13m
BH11A	Fill – ash and clay	F	1.5-5.0	0	N/A
BH11B	Clay	N	9.5–19.0	4.5	Fill: 4.9m
E09-01A	*Limestone*	*N*	*18-24*		
E09-01B	*Limestone*	*N*	*24-30*		
E09-02A	*Limestone*	*N*	*21-27*		
E09-02B	*Limestone*	*N*	*27-33*		

Note: mb GL – metres below ground level

Monitoring Measurements

The groundwater monitoring analytical suite contains a range of parameters which are monitored on a quarterly basis along with the groundwater level and standard field measurements in accordance with the Environmental Permit. An independent external contractor is responsible for the sampling of the groundwater boreholes and an independent external laboratory is responsible for the analysis of the samples. The independent external contractor changed for the groundwater sampling from Q2 2011 and the independent external laboratory changed for the groundwater analysis from Q1 2010. Table 2 summarises the changes to the groundwater sampling method since monitoring began to improve the sample quality.

Table 2: Summary of Groundwater Sampling Methods

Monitoring Borehole	Purge Strategy	Purge Equipment	Date From	Date To
BH3B	1 x Well volume	Bailer	Quarter 3 2006	Quarter 1 2011
	1 x Well volume	Inertial pump	Quarter 2 2011	Quarter 2 2013
	Low flow steady state	Submersible pump	Quarter 3 2013	---
BH7A	1 x Well volume	Bailer	Quarter 3 2006	Quarter 1 2011
	1 x Well volume	Inertial pump	Quarter 2 2011	Quarter 2 2013
	3 x Well volume	Inertial pump	Quarter 3 2013	---
BH7B, BH8B, BH10B	1 x Well volume	Bailer	Quarter 3 2006	Quarter 2 2013
	Low flow steady state	Submersible pump	Quarter 3 2013	---
BH5, BH6, BH9B	1 x Well volume	Bailer	Quarter 3 2006	Quarter 2 2013
	3 x Well volume	Inertial pump	Quarter 3 2013	---
BH11A	2 x Well volume	Bailer	Quarter 3 2006	Quarter 2 2013
	3 x Well volume	Bailer	Quarter 3 2013	---
BH11B	3 x Well volume	Bailer	Quarter 3 2006	Quarter 2 2013
	Low flow steady state	Submersible pump	Quarter 3 2013	---

Note: Inertial pump used at BH8B in Q4 2016 as BH damaged by grass cutting machine.

Figure 1 shows the recorded groundwater elevations for the previous 12 years which vary between +1 (BH10B/BH7A) to +12m OD (BH5). Groundwater elevations in limestone boreholes are characterised by seasonal cyclic water level fluctuations with annual winter influxes of rainfall recharge.

Figure 1: Groundwater Hydrograph

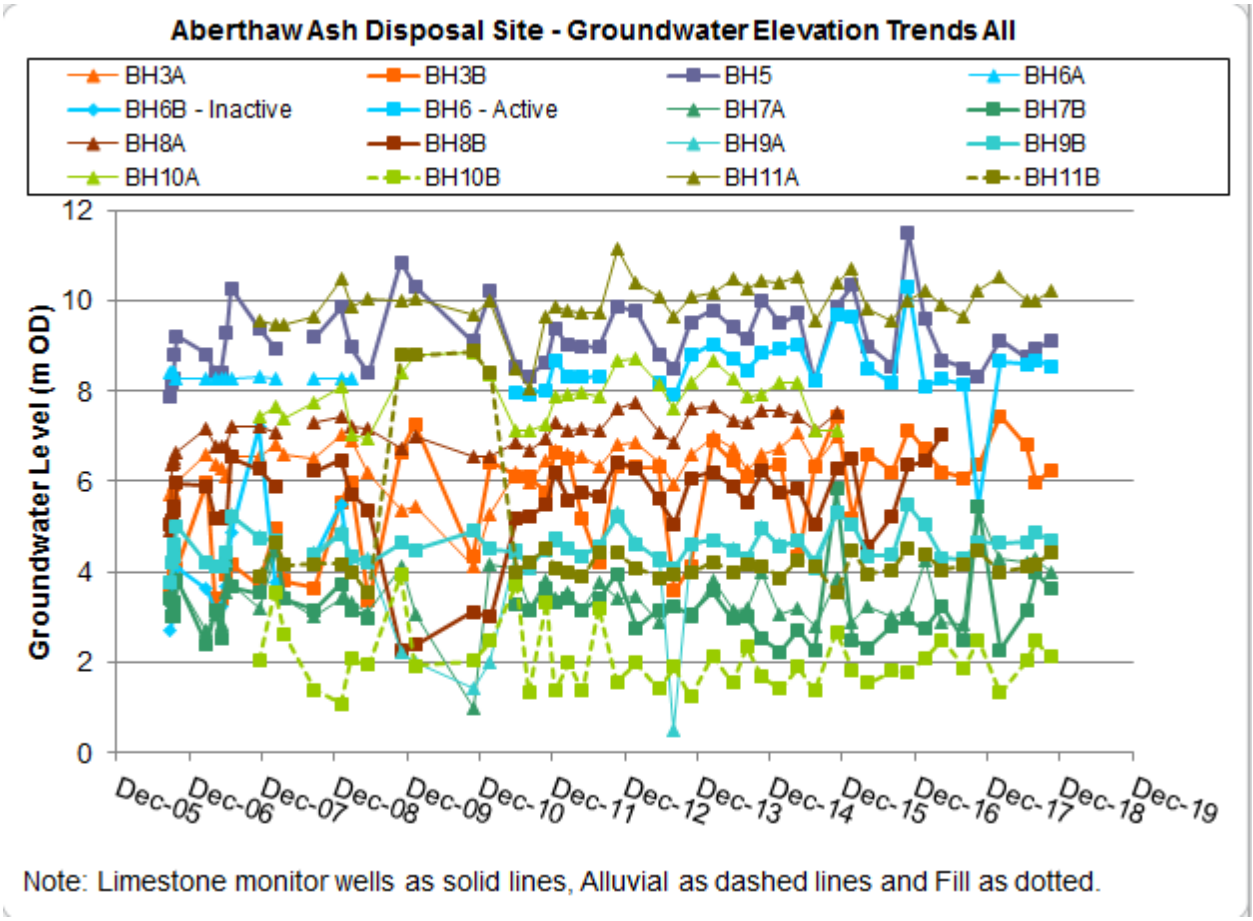


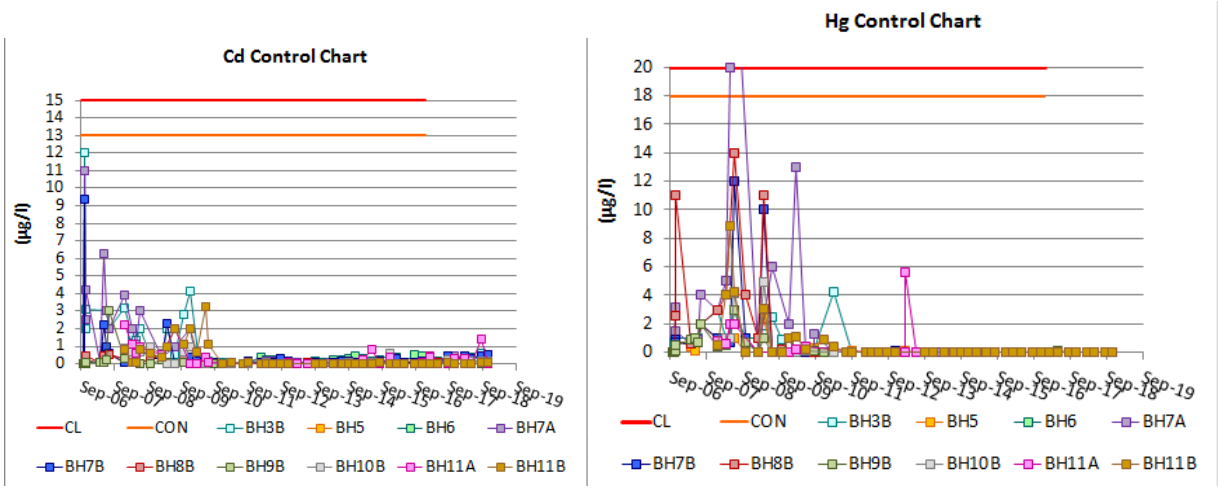
Figure 2 shows the groundwater control charts with concentrations of all boreholes plotted. It should be noted that the compliance limits and control levels (where defined) apply to boreholes BH3B and BH7B. An exceedance is defined as a result above the compliance limit or control level for 3 consecutive sampling events.

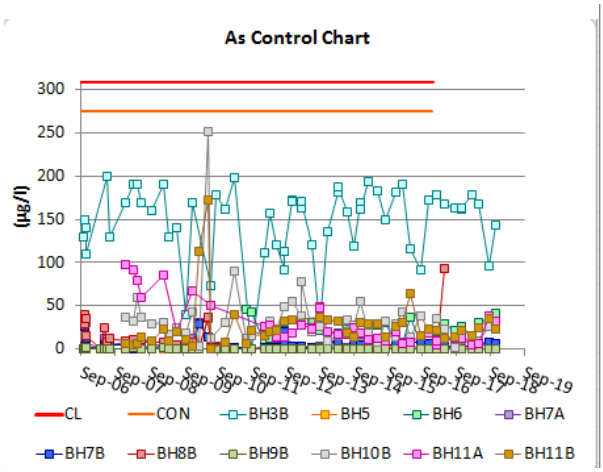
In 2018, there were no exceedances of the compliance limit or control level for any critical parameter. As in 2017 there was still elevated concentrations in BH3B of arsenic, boron, molybdenum, sulphate and vanadium. In BH7B there are elevated concentrations of boron, molybdenum, sulphate and ammoniacal-nitrogen.

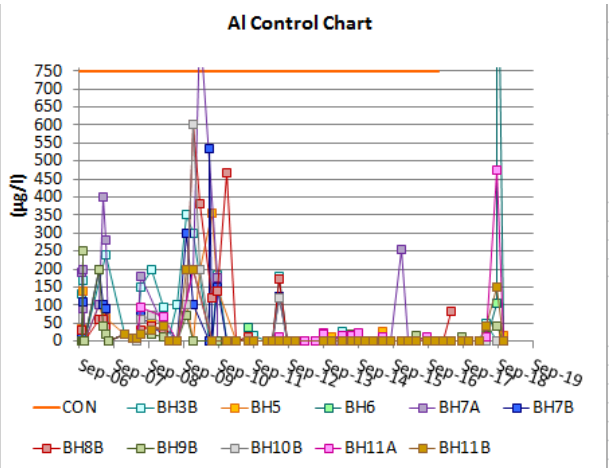
The control charts show that there are no increasing trends in critical parameter concentrations. Other key points to note are:

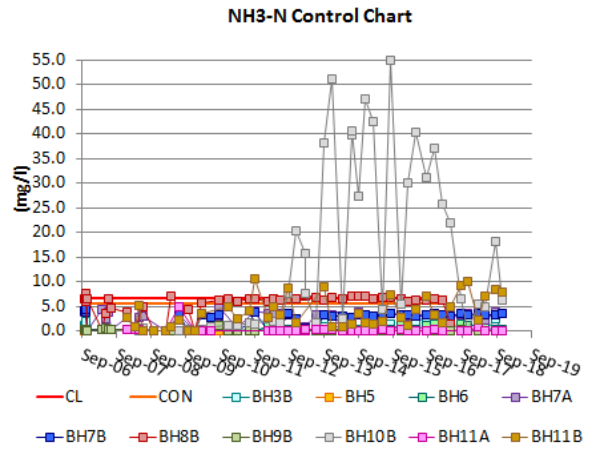
- Decreasing trend in cadmium, mercury, aluminium, chromium and selenium since sampling began;
- Highly variable ammoniacal nitrogen concentrations in BH10B and;
- Elevated sulphate, boron and molybdenum in most boreholes.

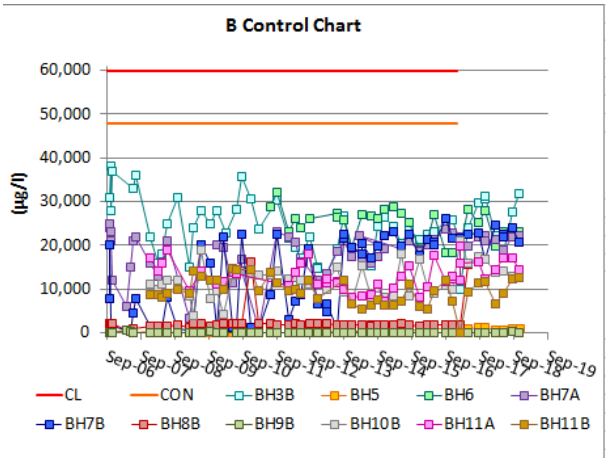
Figure 2: Control charts for groundwater boreholes
(CL – Compliance Limit, CON – Control Level, 0 – result at Method Detection Limit)

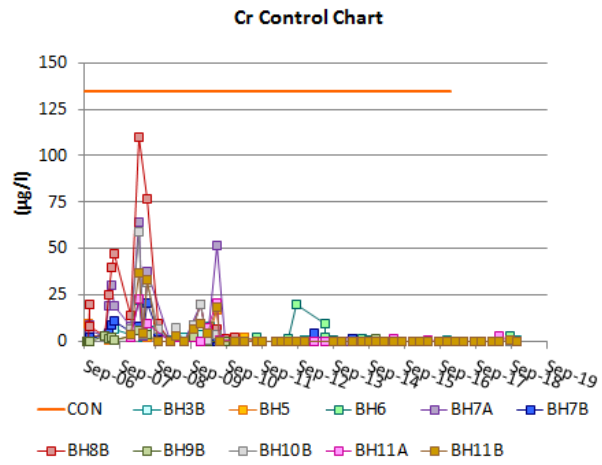


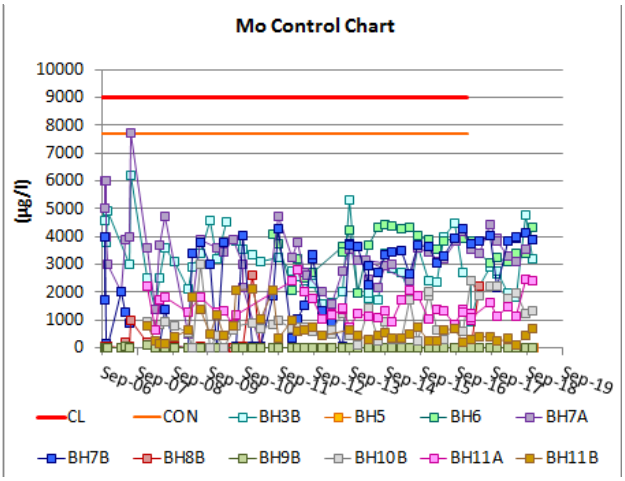

As Control Chart
(µg/l)
CL
CON
BH3B
BH5
BH6
BH7A
BH7B
BH8B
BH9B
BH10B
BH11A
BH11B

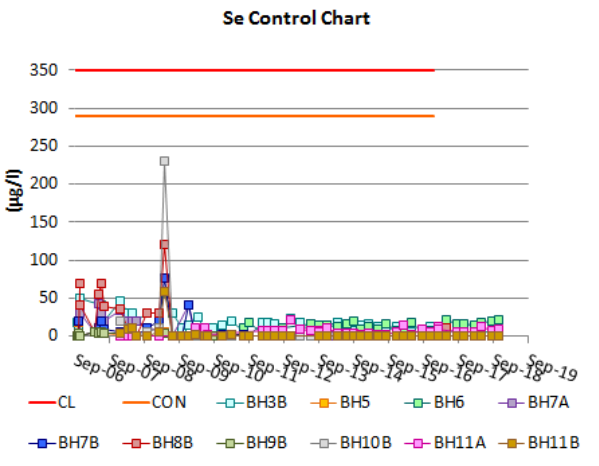

Al Control Chart
(µg/l)
CON
BH3B
BH5
BH6
BH7A
BH7B
BH8B
BH9B
BH10B
BH11A
BH11B

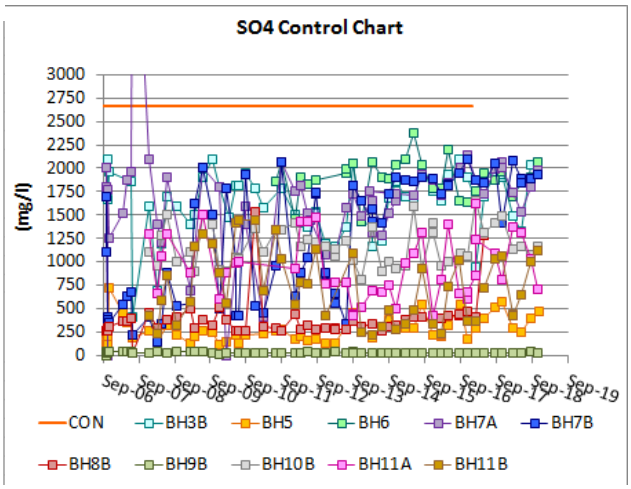

NH3-N Control Chart
(mg/l)
CL
CON
BH3B
BH5
BH6
BH7A
BH7B
BH8B
BH9B
BH10B
BH11A
BH11B

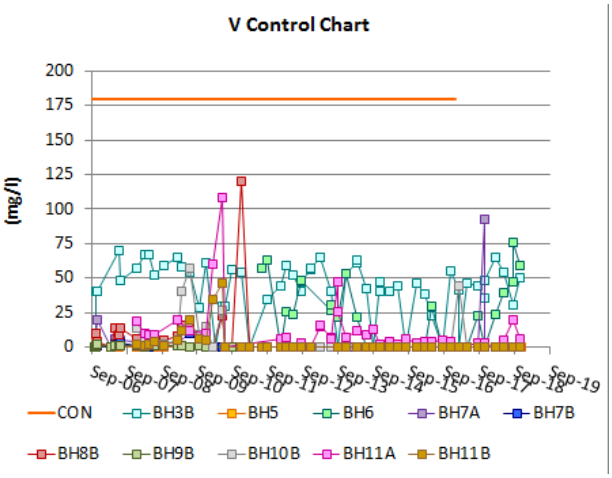

B Control Chart
(µg/l)
CL
CON
BH3B
BH5
BH6
BH7A
BH7B
BH8B
BH9B
BH10B
BH11A
BH11B


Cr Control Chart
(µg/l)
CON
BH3B
BH5
BH6
BH7A
BH7B
BH8B
BH9B
BH10B
BH11A
BH11B


Mo Control Chart
(µg/l)
CL
CON
BH3B
BH5
BH6
BH7A
BH7B
BH8B
BH9B
BH10B
BH11A
BH11B







2.3. Surface Water Quality Review

Monitoring Objective

To carry out routine monitoring of surface water to;

- monitor the performance of the ash disposal site by measurement of absolute levels and concentrations and trends relative to relevant criteria including background concentrations and control levels; and;
- identify and quantify effects on surface water receptors.

Number and Location of Monitoring Points

A summary of the surface water monitoring points is provided in Table 3 below and the locations are shown in Appendix A.

Table 3: Summary of Surface water monitoring points

Monitoring Point	Description	Direction from site	Remarks
Eastern Perimeter Drain (EPD)	Western bank of drainage ditch	East	
Brackish Lagoon (BL)	Saline lagoon	South-east	Surface water Receptor
River Thaw (S3)	Eastern bank, tidal mudflats below rail bridge	North upgradient	Surface water Receptor
Group 5 Spring (S1)	Wetland area adjacent to spring within ash disposal site	West	
Mouth of River Thaw	At the mouth of the river as it meets the sea	South West	Surface water receptor (added after suggestion by HRA review 2018)

Monitoring Measurements

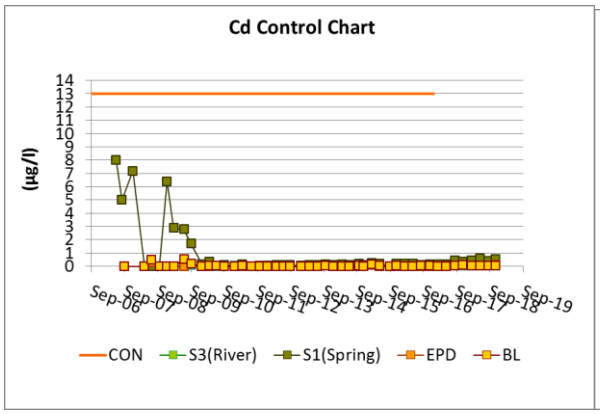
The surface water monitoring analytical suite contains a range of parameters which are monitored on a quarterly basis in accordance with the Environmental Permit. An independent external contractor was responsible for the sampling of the surface water monitoring points until Q1 2011 with trained in-house operatives becoming responsible for the sampling of the surface water monitoring points from Q2 2011. An independent external laboratory is responsible for the analysis of the samples. The independent external laboratory changed for the groundwater analysis from Q1 2010.

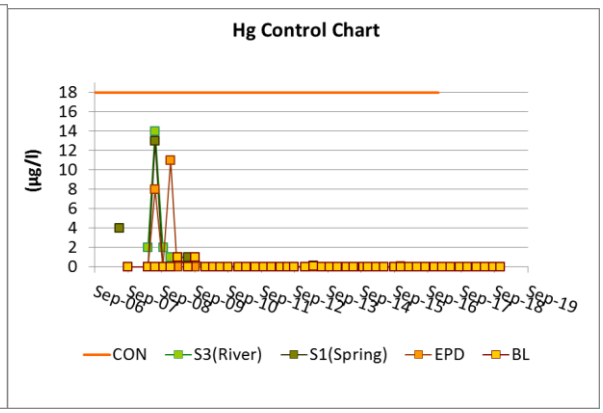
Figure 3 shows the surface water control charts for the surface water monitoring points. It should be noted that the control levels apply to all surface water monitoring points and are identical to the respective groundwater control levels. An exceedance is defined as a result above the control level for 3 consecutive sampling events.

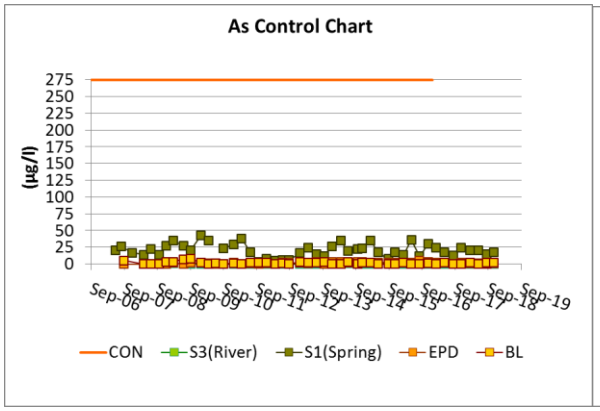
In 2018, there were no exceedances of the control level for any critical parameter. Ammoniacal-nitrogen levels remain increased and variable in Group 5 Spring (S1) however the sample is obtained from a stagnant pond into which the spring empties and therefore may not be representative of the actually concentration of the flowing water.

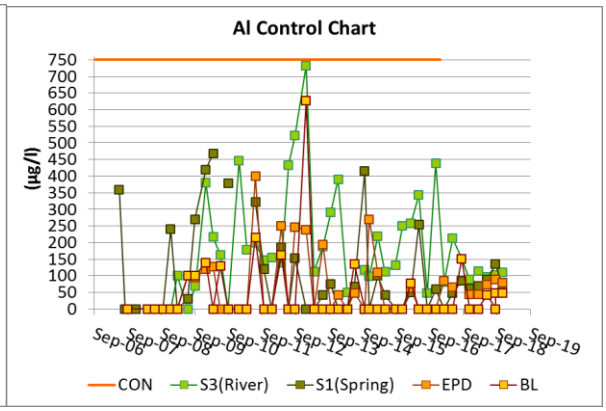
The control charts show that there are no increasing trends in critical parameter concentrations. Group 5 Spring (S1) generally has the highest concentrations of critical parameters, in particular, boron, molybdenum and sulphate, which suggests it is affected by PFA leachate, however, as the water ponds in a wetland area where it is lost by either evapotranspiration or seepage, it is not considered a discharge from the ash disposal site.

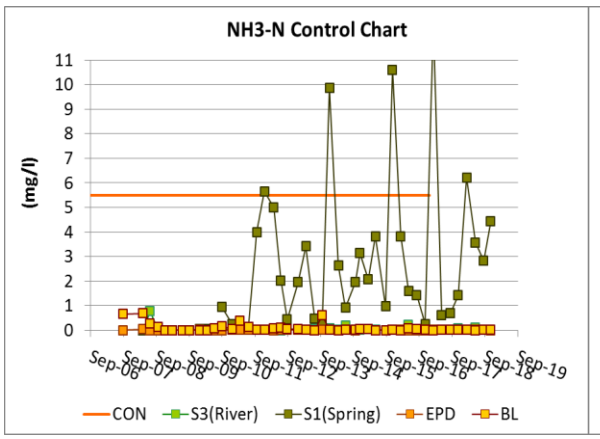
Figure 3: Control charts for surface water monitoring points
(CON – Control Level, 0 – result at Method Detection Limit)

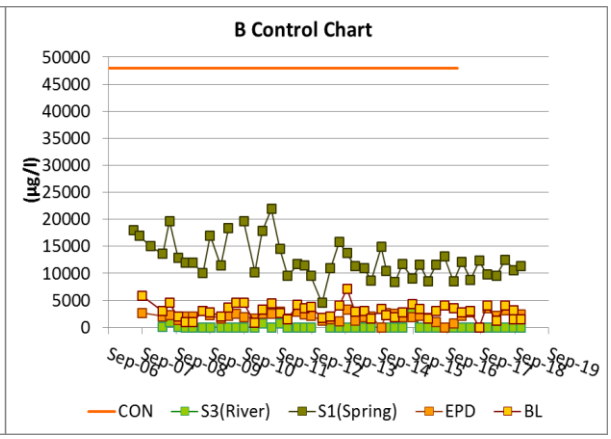

Cd Control Chart
(µg/l)
CON
S3(River)
S1(Spring)
EPD
BL

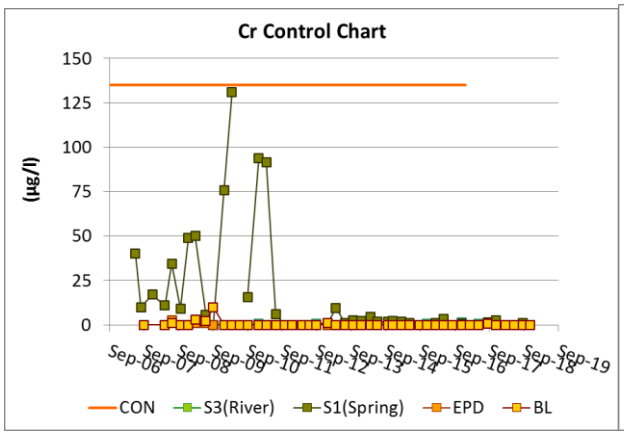

Hg Control Chart
(µg/l)
CON
S3(River)
S1(Spring)
EPD
BL

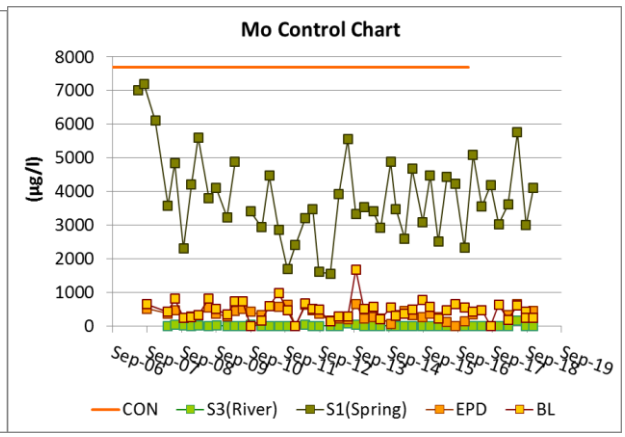

As Control Chart
(µg/l)
CON
S3(River)
S1(Spring)
EPD
BL

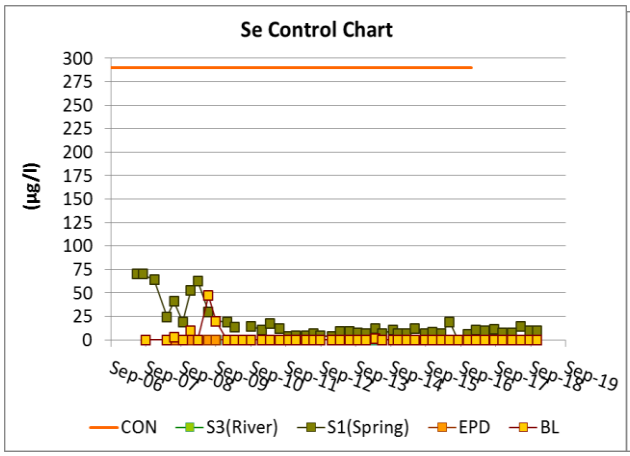

Al Control Chart
(µg/l)
CON
S3(River)
S1(Spring)
EPD
BL

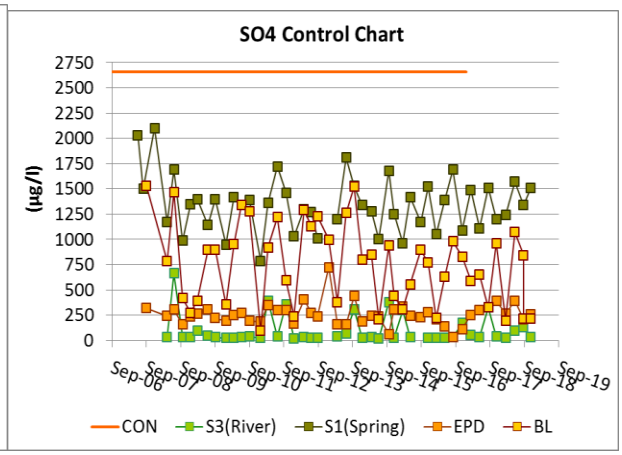

NH3-N Control Chart
(mg/l)
CON
S3(River)
S1(Spring)
EPD
BL

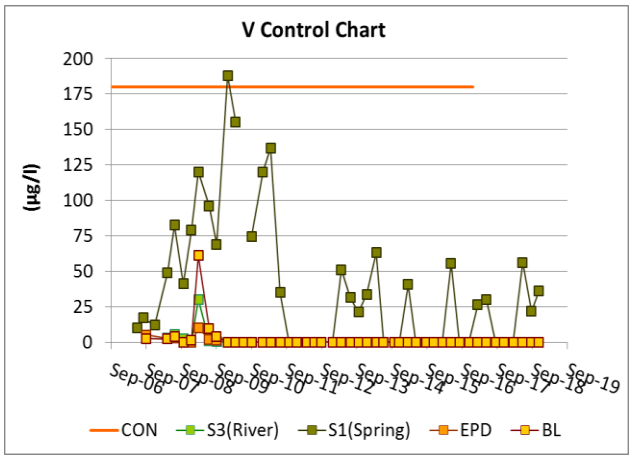

B Control Chart
(µg/l)
CON
S3(River)
S1(Spring)
EPD
BL


Cr Control Chart
(µg/l)
CON
S3(River)
S1(Spring)
EPD
BL


Mo Control Chart
(µg/l)
CON
S3(River)
S1(Spring)
EPD
BL







3. Annual Production/Treatment Data 2018

Table 5: Annual Production/Treatment Data(Table S5.2 EP)

Parameter	Value	Unit
Surface water disposed off site	0	m^3/yr
Groundwater disposed off site	0	m^3/yr

4. Contamination/Decontamination of Site

There have been no incidents or emissions which may have caused any site contamination during 2018, and, therefore, no requirement to decontaminate the site during 2018.

5. Topographical Surveys

The last topographical survey to ordnance datum was carried out in May 2009 which was effectively after the ash disposal site had been closed with exception of the temporary storage area on the western side.

6. Landfill Capacity

Aberthaw Ash Disposal Site has reached its maximum height and the only area used for depositing Pulverised Fuel Ash (PFA) is the temporary storage area on the western side. Hence, there was no PFA permanently deposited at the ash disposal site in 2018 as recorded Table 6 below and reported to Natural Resources Wales via the Waste Return Form. It is estimated that around 133,588m^3 of void capacity remains within the temporary storage area on the western side of the ash mound.

Table 6: PFA Deposited

Reporting Period	PFA Deposited (tonnes)
1st January – 31st December 2018	0

7. Waste Acceptance Compliance Testing

Aberthaw Ash Disposal Site is a mono-landfill site which is under the direct operational control of Aberthaw Power Station. All the ash is transported directly from the Power Station which is adjacent to Aberthaw Ash Disposal Site.

The exact composition of PFA is dependent upon the composition of the fuel utilised by Aberthaw Power Station. RWE has well established procedures which control the quality of fuel supplied to its stations.

Table 7 summarises the analytical data obtained for leachate tests performed on composite samples of conditioned PFA from Aberthaw Power Station between 2012 and 2017. The CEN two-stage method for leachate analysis was used (BS EN 12457-3:2002 Characterisation of waste – Leaching – Compliance test for leaching of granular waste materials and sludges of which Part 3).

Table 7: Summary of 10:1 Leachate Calculated Results (mg/kg)

Period	Jan-17	Apr-12 to Jan-17			
Analyte:	Latest Result	Minimum	Mean	Maximum	Number of results
Aluminium as Al (Dissolved)	8.1	2.4	21.9	75.4	15
Ammoniacal Nitrogen as N	156.6	4.2	83.5	158.1	15
Antimony as Sb (Dissolved)	0.192	0.020	0.163	0.256	15
Arsenic as As (Dissolved)	2.449	0.077	1.907	3.313	15
Barium as Ba (Dissolved)	1.4	0.1	2.5	5.9	15
Boron as B (Dissolved)	12.1	0.7	12.8	17.7	15
Bromide as Br	36.3	0.6	71.5	293.5	15
Cadmium as Cd (Dissolved)	0.0010	0.0004	0.002	0.0056	15
Chromium as Cr (Dissolved)	0.19	0.01	0.3	1.03	15

Copper as Cu (Dissolved)	0.010	0.004	0.015	0.028	15
Cyanide (Total) as CN	0.5	0.2	0.3	0.5	15
Dissolved Organic Carbon	25.5	2.2	22.6	43.3	15
Fluoride as F	21.7	2.3	23.5	45.1	15
Iron as Fe (Dissolved)	1.16	0.52	1.03	1.52	15
Lead as Pb (Dissolved)	0.043	0.013	0.034	0.083	15
Manganese as Mn (Dissolved)	0.025	0.006	0.066	0.174	15
Mercury as Hg (Dissolved)	0.0019	0.0004	0.0057	0.0132	15
Molybdenum as Mo (Dissolved)	8.1	0.7	9.4	17.8	15
Nickel as Ni (Dissolved)	0.040	0.003	0.028	0.062	15
Nitrate as N	4.6	2.3	3.1	4.6	15
Selenium as Se (Dissolved)	2.8	0.2	2.1	3.5	15
Sodium as Na (Dissolved)	327	9	821	2696	15
Total Dissolved Solids	6787	350	8888	21800	15
Total Nitrogen as N	162.7	5.0	92.1	166.0	15
Total Sulphur as SO4 (Dissolved)	3745	170	3422	4271	15
Vanadium as V (Dissolved)	3.59	0.40	2.39	3.59	15
Zinc as Zn (Dissolved)	0.17	0.01	0.14	0.57	15

Appendix A. Groundwater and Surface Water Monitoring Locations