Best Available Techniques (BAT) assessment of the process for the crushing of Incinerator Bottom Ash (IBA) and Incinerator Bottom Ash Aggregate (IBAA) to be operated by Johnsons Aggregates and Recycling Limited (JARL) at Saxon Brickworks, Whittlesey

Scope of the BAT Review

1. In the decision document for Environmental Permit number EPR/DP3131NM (the permit) issued on 14 January 2022 for the non-hazardous waste treatment facility operated by JARL at Whittlesey, the Environment Agency (EA) confirmed that the operating techniques at the site are in line with the Waste Treatment BAT Conclusions[1] (WT BAT) and the Waste Incineration BAT Conclusions[2] (WI BAT). As shown in the revised version of Table S1.1 provided with this application to vary the permit, with the exception of changes to the tonnages of material handled, the only new Installation activity is the crushing of IBA/IBAA on a campaign basis. As this comprises a new treatment activity under Installation activity reference A1, a BAT assessment of the crushing activity has been undertaken and is presented below. As the crushing of non-hazardous waste primarily is a waste treatment process, the BAT assessment has been undertaken primarily with reference to the WT BAT however, where relevant, reference is made to the WI BAT. The BAT assessment focusses on WT BAT 14 *Diffuse emissions to air* and WT BAT 17 and 18 *Noise and vibrations*, as these are the elements which are most relevant to the crushing activity. The General WT BAT Conclusions BAT 1 to BAT 6 (eg management systems, waste acceptance, waste tracking, waste inventories, waste storage and handling, etc) and the monitoring WT BAT Conclusions BAT 7 to BAT 11, have not been re-assessed as part of this BAT review as these techniques remain consistent with those assessed in support of the permit issued in 2022 as do the remaining BAT conclusions, many of which are not relevant to the activities at the site (eg flaring, etc). The assessment demonstrates that the plant and techniques for the crushing of IBA/IBAA comprises BAT.

2. As there are no other changes to the operating techniques for the activities already permitted under installation/DAA activities A1, AR2, AR3, AR4, AR5, AR6 and AR7 and as the EA have confirmed that these activities already comprise BAT, it is unnecessary to re-assess these activities as part of this permit variation application hence they are not considered further within this BAT assessment.

[1] COMMISSION IMPLEMENTING DECISION (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council
[2] COMMISSION IMPLEMENTING DECISION (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration

Activity for the crushing of Incinerator Bottom Ash Aggregate (IBAA)

3. BAT 36 of the WI BAT states:

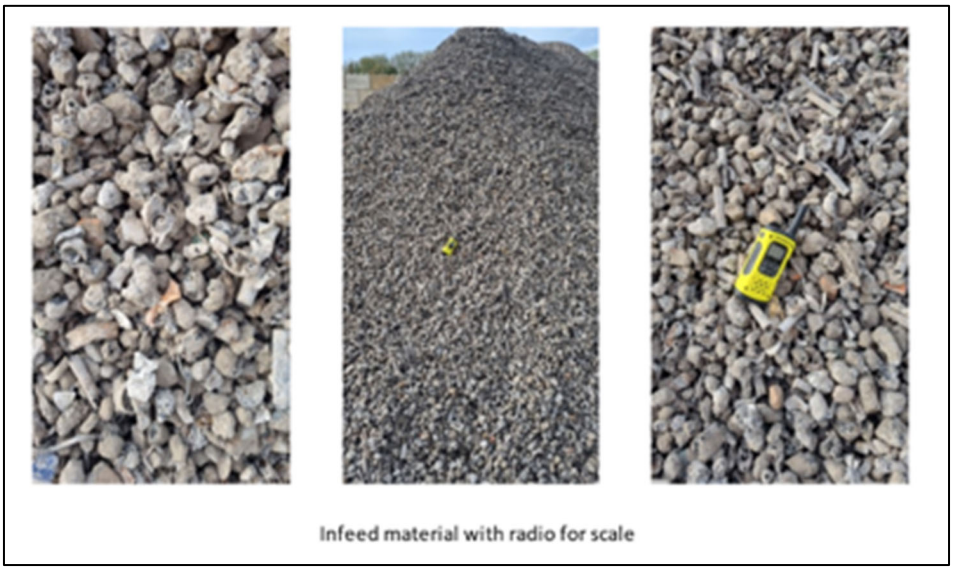
> *"BAT 36. **In order to increase resource efficiency** for the treatment of slags and bottom ashes, BAT is to use an appropriate combination of the techniques given below based on a risk assessment depending on the hazardous properties of the slags and bottom ashes".* **[our emphasis]**

4. The techniques listed under BAT 36 include a number of the techniques already permitted and carried out at the site including ageing, screening and sieving and recovery of ferrous and non-ferrous metals by magnetic and eddy current separation respectively. BAT 36(b) (copied below) comprises crushing.

(b)	Crushing	Mechanical treatment operations intended to prepare materials for the recovery of metals or for the subsequent use of those materials, e.g. in road and earthworks construction.	Generally applicable.

5. In order to increase resource efficiency, consistent with the aims of BAT 36, JARL are proposing to undertake further processing of IBA/IBAA at the site to prepare materials for the more effective recovery of metals to enhance ferrous and non-ferrous metal recovery rates. This further processing will take the form of crushing and will include crushing of material identified as ISS IBAA and oversize IBA. The crushing of these wastes facilitates further metal recovery by releasing metal from the IBAA/metal compressed matrix to increase the potential for capture of the metal for recovery via magnetic separation and eddy current separation.

6. ISS IBAA comprises IBAA which has already been processed through building 1 at the site and has a particle size range generally between 22-40mm hence comprises a coarse material. A series of photographs of ISS IBAA are presented below.



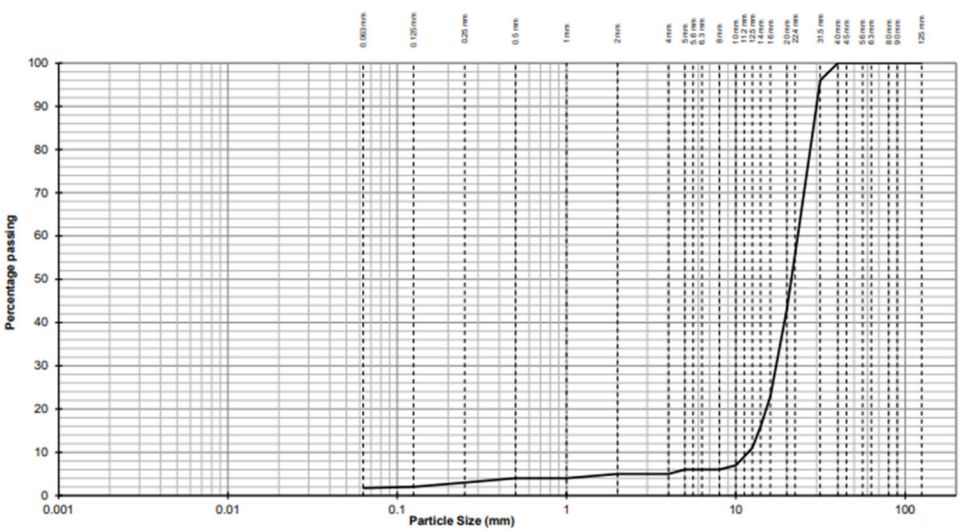
Infeed material with radio for scale

Photographs of ISS IBAA

7. JARL collected a sample of ISS IBAA and submitted it to a UKAS Accredited laboratory for testing pursuant to BS EN 933-1:2012 *Tests for geometrical properties of aggregates. Determination of particle size. Sieving method*. The results of the particle size distribution (PSD) analysis of the ISS IBAA are provided at Annex A and are discussed below. For reference, a conversion chart for the unit conversion from mm to µm is also provided below.

8. The data show that 93% of the ISS IBAA is larger than 10mm (ie larger than 1,000µm). Only 2% of the material passes through the 0.125mm (125µm) sieve. For context, Environment Agency technical guidance M17[3] discusses in Section 3.2 'The Importance of Particle Size' and references a standard definition of dust as 'particulate matter in the size range 1-75 µm in diameter'. The PSD data show that less than 2% of the ISS IBAA will fall in the size range 1-75µm hence the ISS IBAA is not considered to be a dusty material. The M17 guidance goes on to discuss that '*particles suspended in air can vary from the extremely small (in the nanometre size range) up to the rather sizeable (around 1mm).'* Based on this definition, the Environment Agency consider that particles around 1mm are 'rather sizeable'. The PSD data show that 96% of the ISS IBAA is larger than 1mm (ie only 4% passes this sieve size) hence the ISS IBAA is considered to be rather sizeable. This is consistent with the photographs above.

Sieve Size (mm)	% Passing
125	100
90	100
80	100
63	100
56	100
45	100
40	100
31.5	96
22.4	56
20	43
16	23
14	16
12.5	11
11.2	9
10	7
8	6
6.3	6
5.6	6
5	6
4	5
2	5
1	4
0.5	4
0.25	3
0.125	2
0.063	1.7



Comments: Test carried out in accordance with **BS EN 933-1: 2012**

Millimeter [mm]	Micrometer [µm]
0.01 mm	10 µm
0.1 mm	100 µm
1 mm	1000 µm
2 mm	2000 µm
3 mm	3000 µm
5 mm	5000 µm
10 mm	10000 µm
20 mm	20000 µm
50 mm	50000 µm
100 mm	100000 µm
1000 mm	1000000 µm

[3] Technical Guidance Note (Monitoring) M17 Monitoring Particulate Matter in Ambient Air around Waste Facilities Environment Agency Version 2 July 2013

9. Oversize IBA comprises IBA which has formed into larger aggregations of material during the maturation/ageing process (as shown on the photograph below, this results from the crusting effect on the surface of stockpiles of IBA as the IBA absorbs water and carbon dioxide from the air during ageing). This natural effect helps to reduce the potential for the release of particulate matter from stockpiles of IBA and is indirectly referred to in the WI BAT (BAT 36e) in relation to the ageing process and prevention of dust emissions. The clumps of oversize IBA have a significantly larger particle size than ISS IBAA. JARL are seeking to add to the permit an activity to crush the aggregated clumps of IBA prior to feeding this material into the further processing activities to improve the efficiency of the screening process and enhance metal recovery from the IBA.

10. It is understood that the maximum annual quantity of IBA/IBAA for crushing is anticipated to be less than 30,000 tonnes. The material will be crushed on a campaign basis. Based on a crushing rate of between 250 tonnes per day and 1,000 tonnes per day depending on which grade of material is being crushed, it is anticipated that the crusher will be employed on no more than 52 days per year.

11. As described above, the material that will be fed into the crusher does not in itself comprise a dusty material, however, the purpose of the crushing activity is to reduce the particle size of the material, hence the activity requires suitable control measures. Details of the particulate matter control measures employed at the site in respect of the crushing of waste are presented in the Dust Management Plan for the site, together with details of the dust monitoring to confirm the effectiveness of the control measures. The control measures and monitoring include:
    - Dust suppression will be in place either external to the crusher or via spray bars built into the crusher to minimise dust formation during the crushing process.
    - The availability of a mobile water cannon to be used when the crusher is mobilised.
    - Undertaking of the activity at a location that takes into consideration the prevailing wind direction.

- A commitment to postpone or cease activities, such as crushing, if the meteorological conditions (high winds) preclude effective particulate matter control.
- Crushing on a campaign (non continuous) basis.
- The site is surrounded by a lego block wall which will be increased to a height of 7.2m following the issue of variation V002 of the permit.
- Visual monitoring by site personnel during the crushing activity to confirm that unacceptable emissions of visible dust are not being generated and to inform any additional suppression which may be required.
- Continuous monitoring at the site for Particulate Matter PM_{10} at fixed locations. As the monitoring is continuous, records can be compared to the time periods during which crushing campaigns are being undertaken and the data can be reviewed to determine whether the emissions from the crushing activity are significant in the context of the overall site operations.

12. The crushing activity will not be undertaken within building 1 or building 2 and will be undertaken outside in the yard and will be subject to the control measures and monitoring described above. To put the proposed IBA/IBAA crushing activity into context, the proposed activities (less than 30,000 tonnes of waste will be crushed on a campaign basis on no more than 52 days of the year) have been compared to the activities which are specified in Standard Rules Environmental Permit SR2009No6 inert and excavation waste transfer station with treatment. The EA developed a range of SRPs in order to simplify and streamline the Environmental Permitting process to enable operators to undertake certain simple activities (such as crushing of waste) following a set of rules subject to the site meeting certain locational and operational restrictions informed by a generic risk assessment undertaken by the EA. Numerous SR2009No6 permits have been issued by the EA across England to support waste activities which produce recycled aggregates to support the Circular Economy. SR2009No6 authorises the crushing of up to 250,000 tonnes per annum of construction and demolition waste (including concrete, which has the potential to release dust during crushing). There is no requirement under SR2009No6 for waste to be crushed within an enclosed building. The only restriction in terms of air quality is that the activity is not carried out within an Air Quality Management Area specified for PM10 and that the operator shall maintain and implement an emissions management plan (ie a Dust Management Plan). The Whittlesey site is not located within an AQMA and the site has implemented a Dust Management Plan which has been approved by the EA. Based on a comparison of the proposed activity for the crushing of less than 30,000 tonnes of IBA/IBAA on a campaign basis at the Whittlesey site with the activities that may be undertaken under a SR2009No6 permit, as assessed by the EA, it is considered that the proposed activity is suitable to be undertaken outside in the yard at the Whittlesey site and is not required to be undertaken within an enclosed building. Comments in respect of the proposed activities are presented below with reference to WT BAT 14, 17 and 18.

BAT review of the activity for the crushing of IBA/IBAA

13. The crushing of IBA/IBAA comprises a physical waste treatment process. The main WT BAT which are relevant to the crushing process (BAT 14, BAT 17 and BAT 18) are reproduced in the table below.

14. The relevance of the criteria specified in the WT BAT are related to the nature, scale and complexity of the crushing process. If any of the BAT criteria are considered not relevant this has been identified in the table. This BAT assessment should be read in conjunction with the information presented elsewhere in this document and the Dust Management Plan, Noise Impact Assessment and Noise Management Plan provided with the application to vary the Environmental Permit for the site.

15. Where text has been quoted from the WT BAT document it is provided in *blue italic font*.

WT BAT	Details to confirm that the process comprises BAT
1.3 Emissions to air	
BAT 14 Reduce diffuse emissions to air	*In order to prevent or, where that is not practicable, to reduce diffuse emissions to air, in particular of dust, organic compounds and odour, BAT is to use an appropriate combination of the techniques given below. Depending on the risk posed by the waste in terms of diffuse emissions to air, BAT 14d is especially relevant.*
14a *Minimising the number of potential diffuse emission sources* *Generally Applicable*	The following techniques specified in the WT BAT are employed at the site: • *limiting the drop height of material* • *limiting traffic speed* • *using wind barriers* Drop heights when loading the crusher are limited to a maximum of 1m. Site speed limits are enforced at the site to minimise the potential for resuspension of particulate matter from site surfacing. The concrete site surfacing will be cleaned and dampened with water when necessary to minimise the potential for dust and particulate matter to build up on the site surfacing and comprise a source of particulate matter. Areas of the site in which waste is stored and treated will be regularly cleaned, including the plant used in the crushing process. The area of the site in which the crushing will be undertaken is surrounded by a 5.6m high lego block wall which will be increased to a height of 7.2m following issue of variation V002 of the permit.
14b *Selection and use of high integrity equipment*	Although this BAT point is generally more relevant to more complex equipment, the crushers deployed at the site for the crushing activity will comprise high integrity equipment

WT BAT	Details to confirm that the process comprises BAT
	provided by manufacturers with a reputation for providing reliable equipment.
14c Corrosion Protection	The crushers will be maintained in accordance with the manufacturers' requirements including inspections for indication of corrosion. Parts will be replaced if necessary.
14d containment, collection and treatment of diffuse emissions	The introductory paragraph to BAT 14 states: *Depending on the risk posed by the waste in terms of diffuse emissions to air, BAT 14d is especially relevant.* Please see the details on pages 2 to 5 of this document for details of the risk posed by the waste in terms of diffuse emissions. It is concluded that the activity comprising crushing of IBA/IBAA is not required to be undertaken within an enclosed building. Details of the control measures are presented in the Dust Management Plan and earlier in this document.
14e Dampening	*Dampening potential sources of diffuse dust emissions (e.g. waste storage, traffic areas, and open handling processes) with water or fog.* As explained in the Dust Management Plan and earlier in this document, dampening of potential sources of dust emissions is undertaken at the site using dust suppression external to the crusher or via fixed spray bars on the crushers and mobile water cannons employed at the site. The water supply for dampening comprises a combination of mains water and recycled water captured at the site.
14f Maintenance	Although this BAT point is generally more relevant to preventing leaks or maintaining equipment employed for containment purposes, the crushers and associated equipment will be maintained in accordance with the manufacturers' requirements.
14g Cleaning of waste treatment and storage areas	As explained in the Dust Management Plan and earlier in this document, regular cleaning of waste treatment and storage areas is undertaken at the site.
14f Leak detection and repair programme	As this point refers to leaks of organic compounds from contained vessels it is not relevant to the crushing of IBA/IBAA.
1.4 Noise and vibrations	
BAT 17 Noise and vibration management plan	*In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to set up, implement and regularly review a noise and vibration management plan, as part of the environmental management system, that includes all of the following elements:* *I. a protocol containing appropriate actions and timelines;* *II. a protocol for conducting noise and vibration monitoring;* *III. a protocol for response to identified noise and vibration events, e.g. complaints;* *IV. a noise and vibration reduction programme designed to identify the source(s), to measure/estimate noise and*

WT BAT	Details to confirm that the process comprises BAT
	vibration exposure, to characterise the contributions of the sources and to implement prevention and/or reduction measures. The activities undertaken at the site were the subject of a Noise Impact Assessment (NIA). Based on the results of the NIA, a Noise Management Plan (NMP) was implemented at the site. The current NIA and NMP are both approved by the EA. The NMP includes details of the appropriate noise mitigation measures, noise reduction measures, actions and timelines, details of the noise monitoring undertaken at the site and a protocol for response to identified complaints. The NIA and NMP have been updated to support the application to vary the Environmental Permit including the proposed activity for the crushing of IBA/IBAA. Through the iterative process of undertaking the NIA, noise reduction measures have been implemented at the site.
BAT 18 Noise and vibration reduction	A combination of the techniques specified in BAT 18 will be employed in relation to the IBA/IBAA crushing activity to reduce noise and vibration emissions including; BAT18a – locating the equipment and operations distant from the closest residential receptors, BAT 18b - implementing operational procedures for inspection and maintenance of equipment, employing experienced, trained staff to operate the equipment, by restricting crushing operations to day time hours, and by operating of plant and machinery in a noise-sensitive manner.

ANNEX A

Kiwa CMT

Client: Johnsons Aggregates and Recycling Ltd
Crompton Road
Ilkeston
Derbyshire
DE7 4BG

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Unit 5 Prime Park Way
Prime Enterprise Park
Derby
DE1 3QB

T +44 (0)1332 383333
E cmt.enquiries@kiwa.co.uk

www.kiwa.co.uk/cmt

Date: 29th January 2024

Lab Ref: 71522

Originator: Denzil Manivannan

Order Ref: 22757

Site: Whittlesey

Samples:

1No. sample weighing approximately 20kg was sampled by the client and delivered to Kiwa CMT on 29th January 2024. A sampling certificate was not provided.

Requirements:

Determine the Particle Size Distribution of 1No. sample in accordance with **BS EN 933-1:2012**.

Results:

The individual results sheets may be viewed on page 2 of this report and test results relate solely to the samples as received.

Kiwa CMT Testing

Author: L Anaz
Technical Administrator

Checked and approved by: R. Cartlidge
Department Head

Kiwa CMT

Particle Size Distribution

Client:	Johnsons Aggregates	**Sample ref:**	71522/Whittlesey 22-40mm	**Date Tested:**	13-23/02/2024	**Sampled by:**	Client
Site:	Whittlesey	**Sampling cert.:**	Not given	**Sample size:**	10kg Approx.	**Source:**	Site
		Lab ref.:	71522	**Description:**	Recycled Aggregate		

Sieve Size (mm)	% Passing
125	100
90	100
80	100
63	100
56	100
45	100
40	100
31.5	96
22.4	56
20	43
16	23
14	16
12.5	11
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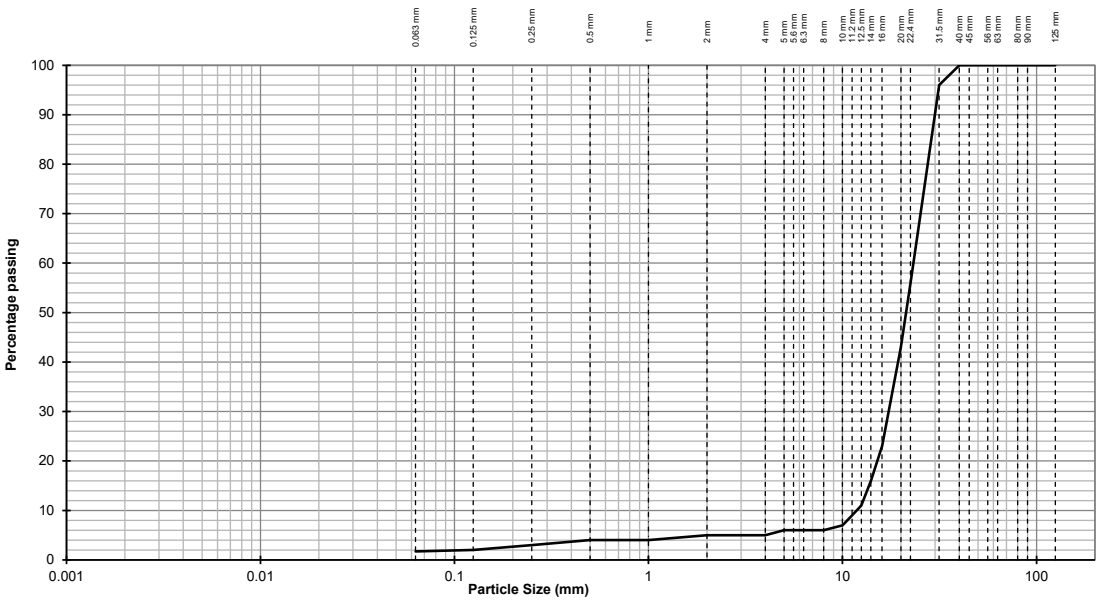

Comments: Test carried out in accordance with **BS EN 933-1: 2012**

Kiwa CMT

Authorised by: D. Newton
Laboratory Supervisor

UKAS TESTING 0529