Environment Agency Permitting Decisions

Review of an Environmental Permit for an Installation subject to Chapter II of the Industrial Emissions Directive under the Environmental Permitting (England & Wales) Regulations 2010 (as amended)

Consultation on our decision document recording our decision-making process following review of a permit

The Permit number is:	EPR/XP3532DP
The Operator is:	Tarmac Cement and Lime Limited
The Installation is:	Tunstead Cement and Lime Works
This Variation Notice number is:	EPR/XP3532DP/V002
Consultation commences on:	02/03/2017
Consultation ends on:	30/03/2017

What this document is about

Article 21(3) of the Industrial Emissions Directive (IED) requires the Environment Agency to review conditions in permits that it has issued and to ensure that the permit delivers compliance with relevant standards, within four years of the publication by the European Commission of updated decisions on BAT conclusions.

We have reviewed the permit for this installation against the revised BAT Conclusions for the production of cement, lime and magnesium oxide industry sector published on 9 April 2013 in the Official Journal of the European Union. Where appropriate, we also considered other relevant BAT Conclusions published prior to this date but not previously included in a permit review for the Installation. In this decision document, we set out the reasoning for the draft consolidated variation notice that we are minded to issue.

It explains how we have reviewed and considered the techniques used by the Operator in the operation and control of the plant and activities of the installation. This review has been undertaken with reference to the decision made by the European Commission establishing best available techniques (BAT) conclusions (BATC) for the production of cement, lime and magnesium oxide as detailed in document reference 2013/163/EU. It is our record of our decision-making process and shows how we have taken into account all relevant factors in reaching our position. It also provides a justification for the inclusion of any specific conditions in the permit that are in addition to those included in our generic permit template.

As well as considering the review of the operating techniques used by the Operator for the operation of the plant and activities of the installation, the draft consolidated variation notice takes into account and brings together in a single document all

previous variations that relate to the original permit issue. Where this has not already been done, it also modernises the entire permit to reflect the conditions contained in our current generic permit template.

The introduction of new template conditions makes the Permit consistent with our current general approach and with other permits issued to installations in this sector. Although the wording of some conditions has changed, while others have been deleted because of the new regulatory approach, it does not reduce the level of environmental protection achieved by the Permit in any way. In this document we therefore address only our determination of substantive issues relating to the new BAT Conclusions and any changes to the operation of the installation.

The document is in draft at this stage, because we have yet to make a final decision. Because the operator has requested a relaxation of certain otherwise mandatory standards, before we make this decision the IED requires us to explain our thinking to the public and other interested parties, to give them a chance to understand that thinking and, if they wish, to make relevant representations to us. We will make our final decision only after carefully taking into account any relevant matter raised in the responses we receive. Our mind remains open at this stage: although we believe we have covered all the relevant issues and reached a reasonable conclusion, our ultimate decision could yet be affected by any information that is relevant to the issues we have to consider. However, unless we receive information that leads us to alter the conditions in the draft Consolidated Variation Notice, or to reject it altogether, we will issue the Notice in its current form with an explanation of how we have addressed consultation responses..

In this document we frequently say “we have decided”. That gives the impression that our mind is already made up; but as we have explained above, we have not yet done so. The language we use enables this document to become the final decision document in due course with no more re-drafting than is absolutely necessary.

We try to explain our decision as accurately, comprehensively and plainly as possible. Achieving all three objectives is not always easy, and we would welcome any feedback as to how we might improve our decision documents in future.

How this document is structured

1. Our proposed decision
2. How we reached our decision
3. The legal framework
4. Annex 1– Review of operating techniques within the Installation against BAT Conclusions.
5. Annex 2 – Review and assessment of derogation request(s) made by the operator in relation to BAT Conclusions which include an Associated Emission Level (AEL) value.
6. Annex 3 – Improvement Conditions
7. Annex 4 – Consultation responses
8. Annex 5 – Review and assessment of changes that are not part of the BAT Conclusions derived permit review.

1 Our proposed decision

We are minded to issue the Variation Notice to the Operator. This will allow it to continue to operate the Installation, subject to the conditions in the Consolidated Variation Notice that updates the whole permit.

As part of our proposed decision we have decided to grant the Operator's request for a derogation from the requirements of BAT Conclusions 18 and 48 as identified in the production of cement, lime and magnesium oxide BAT Conclusions document. The way we assessed the Operator's request for derogation and how we subsequently arrived at our conclusion is recorded in Annex 2 to this document.

We consider that, in reaching our decision, we have taken into account all relevant considerations and legal requirements and that the varied permit will ensure that a high level of protection is provided for the environment and human health.

The draft Consolidated Variation Notice contains many conditions taken from our standard Environmental Permit template including the relevant annexes. We developed these conditions in consultation with industry, having regard to the legal requirements of the Environmental Permitting Regulations and other relevant legislation. This document does not therefore include an explanation for these standard conditions. Where they are included in the Notice, we have considered the techniques identified by the operator for the operation of their installation, and have accepted that the details are sufficient and satisfactory to make those standard conditions appropriate. This document does, however, provide an explanation of our use of "tailor-made" or installation-specific conditions, or where our Permit template provides two or more options.

2 How we reached our draft decision

2.1 Requesting information to demonstrate compliance with BAT Conclusion techniques

We issued a Notice under regulation 60(1) of the Environmental Permitting (England and Wales) Regulations 2010 (a Regulation 60 Notice) on 25 April 2014 requiring the Operator to provide information to demonstrate where the operation of their installation currently meets, or how it will subsequently meet, the revised standards described in the relevant BAT Conclusions document.

The Notice required that where the revised standards are not currently met, the operator should provide information that

- Describes the techniques that will be implemented before 9 April 2017, which will then ensure that operations meet the revised standard, or
- justifies why standards will not be met by 9 April 2017, and confirmation of the date when the operation of those processes will cease within the installation or an explanation of why the revised BAT standard is not applicable to those processes, or
- justifies why an alternative technique will achieve the same level of environmental protection equivalent to the revised standard described in the BAT Conclusions.

Where the Operator proposed that they were not intending to meet a BAT standard that also included a BAT Associated Emission Level (BAT AEL) described in the BAT Conclusions Document, the Regulation 60 Notice required that the Operator make a formal request for derogation from compliance with that AEL (as provisioned by Article 15(4) of IED). In this circumstance, the Notice identified that any such request for derogation must be supported and justified by sufficient technical and commercial information that would enable us to determine acceptability of the derogation request.

The Regulation 60 Notice response from the Operator was received on 8 January 2015.

We considered it was in the correct form and contained sufficient information for us to begin our determination of the permit review but not that it necessarily contained all the information we would need to complete that determination.

The Operator made no claim for commercial confidentiality. We have not received any information in relation to the Regulation 60 Notice response that appears to be confidential in relation to any party.

2.2 Review of our own information in respect to the capability of the installation to meet revised standards included in the BAT Conclusions document

Based on our records and previous experience in the regulation of the installation we have no reason to consider that the operator will not be able to comply with the techniques and standards described in the BAT Conclusions.

2.3 Requests for Further Information during determination

Although we were able to consider the Regulation 60 Notice response generally satisfactory at receipt, we did in fact need more information in order to complete our permit review assessment, and issued further information requests on 22 May 2015 (response received 3 July 2015), 21 January 2016 (response received 6 June 2016) and 10 November 2016 (response received 28 November 2016). Copies of the further information requests were placed on our public register.

In addition to the responses to our further information requests, we received additional information during the determination from the operator:

- 30 October 2015
- 5 November 2015 (initially submitted 27 October 2015 and then revised and resubmitted),
- 9 December 2015
- 21 March 2016
- 30 September 2016
- 2 December 2016
- 17 February 2017

We made a copy of this information available to the public in the same way as the responses to our information requests.

Having carefully considered the Regulation 60 Notice response and all other relevant information, we are now putting our draft decision before the public and other interested parties in the form of a draft Consolidated Variation Notice, together with this explanatory document.

We are now providing the public with an opportunity to comment on our proposed decision and conclusion to the Permit Review which includes our draft Consolidated Variation Notice and this decision document. We will consider all relevant representations we receive in response to this consultation and will amend this explanatory document as appropriate to explain how we have done this, when we publish our final decision.

3 The legal framework

The Consolidated Variation Notice will be issued, if appropriate, under Regulations 18 and 20 of the EPR The Environmental Permitting regime is a legal vehicle which delivers most of the relevant legal requirements for activities falling within its scope. In particular, the regulated facility is:

- an installation as described by the IED;
- subject to aspects of other relevant legislation which also have to be addressed.

We consider that, if we issue the Consolidated Variation Notice, it will ensure that the operation of the Installation continues to comply with all relevant legal requirements and that a high level of protection will be delivered for the environment and human health.

We explain how we have addressed specific statutory requirements more fully in the rest of this document.

Annex 1: decision checklist regarding relevant BAT Conclusions

BAT Conclusions for the production of cement, lime and magnesium oxide, were published by the European Commission on 9 April 2013. There are 69 BAT Conclusions; 1 and 2 are generally applicable, 3 – 29 apply to the cement industry, 30 – 54 apply to the lime industry, and 55 – 69 apply to the production of magnesium oxide. This annex provides a record of decisions made in relation to each relevant BAT Conclusion applicable to the installation. This annex should be read in conjunction with the Consolidated Variation Notice.

Our assessment of the overall status of compliance with the BAT conclusion is indicated in the table as:

NA	Not Applicable
CC	Currently Compliant: we have reviewed the information available to us and consider that it provides sufficient evidence to show that the operator is currently compliant with the BAT conclusion, and we have no reason to believe that this will change before the implementation date.
FC	Compliant in the future (within 4 years of publication of BAT conclusions): we have reviewed the information available to us and consider that it provide sufficient evidence to show that the operator has suitable plans in place to ensure that they will be compliant with the BAT conclusion by the implementation date.
NC	Not Compliant

Explanatory Note:

Tunstead cement and lime works is the only installation in England producing both cement and lime. It comprises the following:

- cement: one operational preheater kiln ("K1")
- cement: one permitted, unbuilt preheater kiln ("K2")
- lime: five Ordinary Shaft Kilns (OSK)
- lime: one Parallel Flow Regenerative Kiln (PFRK) also known as a "Maerz" kiln

A description of the installation can be found in Annex 2 of this Decision Document and the Introductory Note of the permit.

BAT Conclusion numbers 1 – 54 apply to this installation.

BAT Conclusion No	Summary of BAT Conclusion requirement for production of cement, lime and magnesium oxide	Status NA/CC/ FC/NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
55-69	BAT Conclusions that are not applicable to this installation	**NA**	BAT Conclusions 55 – 69 inclusive are not applicable as they apply to the magnesium oxide industry only.
CEMENT PRODUCTION			
1	In order to improve the overall environmental performance of the plants/installations producing cement, lime and magnesium oxide, production BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the listed features.	**CC**	An EMS certified to ISO14001 is in place.
2	In order to reduce/minimise noise emissions during the manufacturing processes for cement, lime and magnesium oxide, BAT is to use a combination of the listed techniques.	**CC**	TCL have outlined a number of techniques that they employ to reduce/minimise noise emissions. These include enclosure of noisy operations, such as compressors, mills and the electric and diesel driven air blowers on the fine lime PFRK, sound insulation, and use of landscaping and natural noise barriers. Noise reduction measures are implemented where plant is identified as being a significant noise source.
3	In order to reduce all kiln emissions and use energy efficiently, BAT is to achieve a smooth and stable kiln process, operating close to the process parameter set points by using the listed techniques.	**CC**	The kiln is operated using a modern computer based control system and solid fuel feed systems all use modern gravimetric techniques to ensure the process is optimised, emissions are reduced and energy is used efficiently. Kiln operations are covered by site management systems and various parameters are taken into consideration, such as temperature and pressure, to monitor and maintain smooth and stable operations.
4	In order to prevent and/or reduce emissions, BAT is to carry out a careful selection and control of all substances entering the kiln.	**CC**	Natural raw materials are supplied to conform to certain specifications, including for moisture, sulphur and metallic element content. Limestone and slurry are taken from the quarry in which the plant is located. Raw materials are tested in line with permit and process requirements, and the raw mill is sampled hourly, to ensure that the process is tightly controlled. Quality management systems are in place to manage kiln inputs, and risk assessment is conducted for any new material to manage potential emissions.

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5	BAT is to carry out monitoring and measurement of process parameters and emissions on a regular basis and to monitor emissions in accordance with the relevant EN standards or, if EN standards are not available, ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality, including the following: a. Continuous measurements of process parameters demonstrating the process stability, such as temperature, O_2 content, pressure and flowrate. b. Monitoring and stabilising critical process parameters, i.e. homogenous raw material mix and fuel feed, regular dosage and excess oxygen c. Continuous measurements of NH_3 emissions when SNCR is applied d. Continuous measurements of dust, NOx , SOx , and CO emissions e. Periodic measurements of PCDD/F and metal emissions f. Continuous or periodic measurements of HCl, HF and TOC emissions. g. Continuous or periodic measurements of dust	**CC** **CC & FC**	a. all appropriate process parameters are measured and used for kiln control and to achieve stability, including temperature, pressure, oxygen, gravimetric weighfeeders and flow rate. Primary and total airflows are also monitored and checked via internal balances/audits. b. Consistent quality control procedures are applied to ensure homogenous raw material mix by the use of performance monitoring against targets for each process stage. Feed and fuels are controlled and delivered via calibrated feed devices. Raw materials and fuels are sampled and tested to ensure they meet the relevant specification. Excess oxygen is monitored and checked. c. Ammonia is continuously monitored, as a permit requirement. d. Dust, NOx, SOx, and CO emissions are all measured continuously using MCERTS-certified analysers which are calibrated to the CEN standard BS EN14181 by an accredited testing organisation. Ongoing Continuous Emissions Monitoring (CEM) quality control is provided by the plants trained and competent personnel following the QAL 3 requirements of BS EN 14181. e. PCDD/F and metal emissions are sampled 6 monthly, in accordance with permit requirements. Testing is performed by an accredited testing organisation, employing certified engineers in accordance with ISO 17025. f. TOC and HCl are continuously monitored and HF is periodically measured, in accordance with permit requirements. These are carried out as detailed above in d and e. g. Dust emissions from the clinker cooler (A21), coal mill (A22) and cement mill (A23) have, to date, been monitored continuously. We are changing the compliance monitoring requirement for dust from the cement and coal mills from continuous to periodic. **See Key Issues section 2c, for details.** The 14 cement-related dust emission points A37 – A50 (newly listed in table S3.2) are required to have an annual compliance check, to demonstrate compliance with the BAT-AEL. TCL have pointed out that the majority cannot be tested to MCERTS standards, hence we are setting an improvement condition to require an assessment of all these emission points, to produce a risk-based plan

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			for monitoring of the more significant emissions to be carried out. **See Key Issues section 2c and Annex 3.** We are requiring performance checks in accordance with a maintenance management system for the 'small source' emissions group, as per the BAT conclusion. TCL state that performance checks are in place for all filters (refer BATC 16), although compliance with the BAT-AEL is not confirmed. The monitoring requirements and improvement condition set in the permit will ensure that TCL are compliant with BATC 5 from the compliance date. Techniques d, e, and f are all requirements of the previous permit to ensure compliance with chapter IV of the IED.
6	In order to reduce energy consumption, BAT is to use a dry process kiln with multistage preheating and precalcination.	**NA**	This BAT conclusion is applicable to new plants and major upgrades. The kiln was installed in 2004 and has a precalciner with multistage cyclone preheater. Operations are managed to maximise heat recovery in the clinker cooler.
7	In order to reduce/minimise thermal energy consumption, BAT is to use a combination of the listed techniques.	**CC**	TCL utilise a number of the listed techniques to minimise energy consumption. Modern control systems ensure a smooth and stable kiln process, monitoring and controlling kiln inputs and emissions. Heat recovered from the clinker is used for combustion in the kiln and calciner, and for drying raw materials in the raw mill. Preheater exhaust gas is used for drying in the raw mill and coal mill. The process is optimised to ensure the meal feed into the kiln from the calciner is at the appropriate temperature. TCL specify a minimum CV of 4.5MJ/kg for fuels and these are rigorously selected to ensure they are suitable for the kiln and raw material chemistry.
8	In order to reduce primary energy consumption, BAT is to consider the reduction of the clinker content of cement and cement products.	**CC**	TCL carry out clinker substitution in line with EN 197-1.
9	In order to reduce primary energy consumption, BAT is to consider cogeneration/combined heat and power plants.	**CC**	TCL state that CHP is not suitable at Tunstead, for several reasons, including that there is no suitable use for waste heat, heat is already recovered from the kiln to dry raw materials and coal leaving gas temperatures in region of "low" grade heat, and

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			reducing the temperature of waste gases further will reduce plume buoyancy and dispersion.
10	In order to reduce/minimise electrical energy consumption, BAT is to use one or a combination of the listed techniques.	**CC**	TCL employ a number of techniques to reduce/minimise electrical energy usage, including the use of highly efficient mills for fossil fuels and raw meal grinding, continuous monitoring of power consumption with live data showing how every drive is performing and periodic checks for air leaks.
11	In order to guarantee the characteristics of the wastes to be used as fuels and/or raw materials in a cement kiln and reduce emissions, BAT is to apply the listed techniques: - Apply QA systems to guarantee the characteristics of wastes and to analyse any waste that is to be used as a raw material or fuel for constant quality, physical criteria, chemical criteria - Control the amount of relevant parameters for any waste that is to be used as raw material or fuel - Apply QA systems for each waste load.	**CC**	A Quality Management System is employed at the site and procedures are in place to ensure waste is tested before use of material commences and on an ongoing routine basis to control quality of materials coming to site and ensure they meet specification. Supplier audits are undertaken to ensure a consistent quality of supply can be provided.
12	In order to ensure appropriate treatment of the wastes used as fuel and/or raw materials in the kiln, BAT is to use the listed techniques.	**CC**	The relevant listed BAT techniques are employed by TCL. These techniques are requirements of IED ch IV and compliance is achieved through the EPR permit conditions. Note that 12 d) does not apply; TCL does not burn hazardous waste with a content >1% of halogenated organic substances. Local procedures are in place to ensure waste materials are fed consistently and the kiln is operated in such a way that gases resulting from the use of wastes are managed and controlled even during unstable kiln conditions. Specific procedures are implemented detailing actions to be taken for the start-up or shut-down of the feed of waste materials to the kiln in these conditions, during planned and unplanned kiln shut-downs and start-ups.

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13	BAT is to apply safety management for the storage, handling and feeding of hazardous waste materials, such as using a risk-based approach according to the source and type of waste, for the labelling, checking, sampling and testing of waste to be handled.	**CC**	There is currently only one hazardous waste material used at Tunstead cement plant, as a raw material; no hazardous waste is used as a fuel. The operator has now implemented the Waste Code of Practice, which ensures a thorough, risk based approach to the introduction of new wastes to site, including hazardous ones, and their storage and handling. Prior to this, wastes new to the site needed EA approval via variation (fuels) or agreement in writing (raw materials). No detail is provided about ongoing storage, checking, sampling and testing of wastes; this is covered by written procedures at site. **It is suggested that compliance with this BATC is assessed through on-site audit at a later date;** this is not a high priority aspect due to the minimal number of hazardous wastes used**.**
14	In order to minimise/prevent diffuse dust emissions from dusty operations, BAT is to use one or a combination of the listed techniques.	**CC**	TCL employ a number of BAT techniques to minimise and prevent emissions from dusty operations, including; • enclosure of significant operations and conveyors/elevators, with dust filters on material storage systems • monthly inspections to identify issues, spillages and air leaks, with problems input to the maintenance management system, • daily tracking of Key Performance Indicators • cleaning regimes, • loading of powder materials via enclosed systems.
15	In order to minimise/prevent diffuse dust emissions from bulk storage areas, BAT is to use one or a combination of the listed techniques.	**CC**	TCL use a combination of BAT techniques to minimise and prevent dust releases from bulk storage areas, such as storage of materials in buildings or bays, and main site roads are paved with daily cleaning with wetting in dry conditions.
16	In order to reduce channelled dust emissions, BAT is to apply a maintenance management system which especially addresses the performance of filters applied to dusty operations, other than those from kiln firing, cooling and main	**CC**	Fabric filters are applied to channelled dust emissions such as bag packers, powder silos, large crushers, and coal mills, and are subject to both inspection and maintenance regimes. A monthly inspection is carried out with improvements or faults identified reported back to the plant and included on the maintenance management system. The filters are not designed to conform to monitoring

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	milling processes. Taking this management system into account, BAT is to use dry flue-gas cleaning with a filter. BAT-AEL <10 mg/Nm^3		standards and therefore it is no possible to take a representative sample, however the emissions are comparable to those from kiln firing, cooling and milling operations under normal circumstances and are rarely subject to fluctuating loads, so it is assumed that they will perform to the same level. We have applied the BAT-AEL as a limit of 10mg/Nm^3 in the permit for all channelled dust emissions (**Refer Key Issues section 1b)**. This includes the 14 emissions (associated with cement production) with a volumetric flow rate >10,000 Nm^3/hr, now added to table S3.2 as emission points **A37 – A50**, and small source emissions (<10,000 Nm^3/hr) included as the group "*All other channelled dust emissions abated by filters*". **Refer to Key Issues section1e.**
17	In order to reduce dust emissions from flue-gases of kiln firing processes, BAT is to use dry flue-gas cleaning with a filter. BAT-AEL <10-20 mg/Nm^3 (daily average)	**FC**	A bag filter abates dust from the main kiln firing process (K1), emission point A20. Emissions are continuously monitored with results analysed in the daily Operator meeting. If an upward trend in dust emissions is identified, the filter bags are changed. Historic monitoring data shows that the peak emission value lies between 10 and 20 mg/m^3 when the Raw Mill is turned off for maintenance. The BAT-AEL of 10mg/Nm^3 is now included as a limit in the permit for this emission point, A20, applied from the compliance date of 9 April 2017, and the current ELV of 20mg/Nm^3 will apply until then. The Operator has confirmed that despite historic peak dust emissions being above the BAT-AEL for bag filters, they will achieve this level of emission going forward with increased maintenance. A bag filter is proposed for A24, the emission point for unbuilt cement kiln K2. As a future new development, this should comply with BAT from day 1, so the ELV for dust is reduced from 20 to 10 mg/Nm^3. Note that this bag filter will serve the new Raw Mill and clinker cooler as well as the main kiln gases.
18	In order to reduce dust emissions from the flue-gases of cooling and milling processes, BAT is to use dry flue-gas cleaning with a filter. BAT-AEL <10-20 mg/Nm^3 (daily average or periodic)	**FC**	Bag filters are installed on the clinker cooler (A21), the coal mill (A22) and the cement mill (A23). All three have had an ELV of 30mg/m^3 with which they have been compliant. Coal mill A22 and cement mill A23: the bag filters have not consistently performed to produce emissions of <10mg/Nm^3, however there have been periods of good

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		NC FC/CC	performance, and A22 can perform to <2mg/m^3 and A23 to around 5mg/m^3 of dust. TCL has stated that the plants will achieve BAT with an increased maintenance schedule. The BAT-AEL is now included as a limit in the permit for these emission points, applied from the compliance date of 9 April 2017, and the current ELV of 30 mg/Nm^3 will apply until then. Clinker cooler A21: the bag filter does not perform to reduce emissions of dust to <10mg/Nm^3 and typically achieves 10 – 20mg/Nm^3. TCL cannot comply with the BAT-AEL by the compliance date and requested a time-limited derogation from the BAT-AEL for dust at A21 until 31 May 2019. **For details, refer Annex 2, section 1: Assessment, determination and decision where an application for Derogation from BAT Conclusions with achievable emission levels (AEL) has been requested.** Bag filters are proposed for the coal mill (A25) and cement mill (A26) on the new K2 cement plant. A25 ELV is reduced from 20 to 10 mg/Nm^3, as the plant should comply with BAT from day 1. The ELV on A26 is already 10 mg/Nm^3. Note that the K2 clinker cooler air is discharged via the K2 main stack, emission point A24.
19	In order to reduce the emissions of NOx from the flue-gases of kiln firing and/or preheating/ precalcining processes, BAT is to use one or a combination of the listed techniques. BAT-AEL (preheater kilns) <200-450 mg/Nm^3 (daily ave)	CC	The following techniques are in place to reduce NOx emissions from K1: SNCR, process optimisation and staged combustion. The ELV on A20, at 450 mg/m^3, is already compliant with the BAT-AEL hence this limit will be retained. The ELV for A24, K2, is 350mg/m^3; this limit will be retained.
20	When SNCR is used, BAT is to achieve efficient NOx reduction, while keeping the ammonia slip as low as possible, by using the listed technique. Ammonia slip BAT-AEL <30-50 mg/Nm^3 (daily average)	CC	SNCR is used at Tunstead to control NOx emissions to <450mg/m^3 and is planned to be used on the K2 plant. The system uses aqueous ammonia with a backup system of dosing urea prills. ELVs are already in place, to control ammonia slip, due to potential impact on nearby Habitats sites. These are: 50 mg/m^3 hourly avg, 40 mg/m^3 daily avg and 7 mg/m^3 annual average, measured as total ammonia. Although no ammonia data was supplied in response to the Reg 60 Notice, previously submitted information indicated that ammonia background concentration in stack

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			gases is low, and minimal ammonia slip has been observed. The current ELVs are retained for both cement kilns, as these comply with the BAT-AEL and because of the sensitivity of nearby Habitats sites to ammonia emissions.
21	In order to reduce/minimise the emissions of SOx from the flue-gases of kiln firing and/or preheating/precalcining processes, BAT is to use one of the listed techniques. BAT-AEL <50-400 mg/Nm^3	**CC**	SOx emission levels are kept low, not requiring the use of an abatement technique, due to the raw materials and fuel quality. The ELV has been 100mg/m^3, and is consistently met. This ELV is compliant with the BAT-AEL and therefore retained for both K1 (A20) and K2 (A24).
22	In order to reduce SO_2 emissions from the kiln, BAT is to optimise the raw milling processes. (no BAT-AEL)	**CC**	The Raw Mill runs continuously between scheduled maintenance activities. It is not required to provide SO_2 abatement, due to the inherently low SO_2 emissions.
23	In order to minimise the frequency of CO trips and keep their total duration to below 30 minutes annually, when using electrostatic precipitators (ESPs) or hybrid filters, BAT is to use the listed techniques in combination. (no BAT-AEL)	**NA**	There are no ESPs on the cement plants (current or planned). **Refer Annex 5 for details relating to setting the CO ELV.**
24	In order to keep the emissions of TOC from the flue-gases of the kiln firing processes low, BAT is to avoid feeding raw materials with a high content of volatile organic compounds (VOC) into the kiln system via the raw material feeding route. (no BAT-AEL)	**CC**	A risk assessment process is in place to assess whether new alternative raw materials (waste derived) would affect TOC emissions, and quality procedures are in place to ensure all incoming materials conform to specification and to manage kiln inputs. There is no BAT-AEL for emissions of TOC. These are covered by IED Annex VI, which gives an ELV of 10 mg/Nm^3 and states that the competent authority may grant derogations from this ELV where TOC emissions do not result from the co-incineration of waste. This has been the case for Tunstead works, whose ELV has been 110 mg/Nm^3 since they were first permitting to burn a WDF in Aug 2006. This ELV allows generous head room and so we are reducing the ELV from data of issue of the permit to 100 mg/Nm^3. **Refer Annex 5 for more details.**

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25	In order to prevent/reduce the emissions of HCl from flue-gases of the kiln firing processes, BAT is to use one or a combination of the listed primary techniques. BAT-AEL <10 mg/Nm^3	**CC**	The raw materials mix and fuel mix are controlled through their specification to minimise the amount of contamination which may lead to emissions of HCl. The Raw Mill acts as a scrubber when operational, and there may be an increase in emissions when the raw mill is off. Emissions of HCl are continuously monitored, and TCL are compliant, on K1, with the BAT-AEL of 10mg/Nm^3, which is the current permit limit for both K1 and K2. This limit is retained for both kilns.
26	In order to prevent/reduce the emissions of HF from the flue-gases of the kiln firing processes, BAT is to use one or a combination of the listed primary techniques.	**CC**	The same controls are in place for Fluorine and HF emissions as for Chlorine and HCl – see assessment against BATC 25. Emissions of HF are periodically monitored, and TCL are compliant with the BAT-AEL of 1mg/m^3 on K1, which is the current permit limit.
27	In order to prevent emissions of PCDD/F or to keep the emissions of PCDD/F from the flue-gases of the kiln firing processes low, BAT is to use one or a combination of the listed techniques.	**CC**	General primary techniques are applied; kiln inputs, both raw materials and fuels, and notably for Cl, are monitored and controlled, chlorine cycles are monitored, and waste fuels are not burnt during start-up or shutdown. The BAT-AEL of 0.1ng/m^3 is the current permit limit for both kilns, and will be retained. Emissions from K1 are periodically sampled every 6 months and have been consistently compliant with this limit.
28	In order to minimise the emissions of metals from the flue-gases of the kiln firing processes, BAT is to use one or a combination of the listed techniques.	**CC**	Emissions of metals are minimised through several techniques; kiln inputs are monitored and controlled, and waste materials are subject to screening and monitoring of trace elements. Effective dust removal from emissions is also employed. The BAT-AELs are already in place as existing permit limits for both kilns. Although there have been very occasional exceedances of all 3 limits (no causes established) , kiln K2 is largely compliant and we have no reason to believe that the kilns cannot comply with these limits going forward; the limits are retained.

BAT Conclusion No	Summary of BAT Conclusion requirement for production of cement, lime and magnesium oxide	Status NA/CC/ FC/NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
29	In order to reduce solid waste from the cement manufacturing process along with raw material savings, BAT is to: - reuse collected dusts within the process, wherever practicable - utilise these dusts in other commercial products, when possible	**CC**	TCL does not produce any excess dusts from the cement plant. K1 does not have a bypass. Any material produced within the process is generally reused within the process.
LIME PRODUCTION			
30	In order to reduce all kiln emissions and use energy efficiently, BAT is to achieve a smooth and stable kiln process, operating close to the process parameter set points by using the listed techniques.	**CC**	All the kilns (shaft kilns and PFRK) are operated using a modern computer-based control system, with gas flow meters on the natural gas fuel feed, to monitor and maintain smooth and stable operations. Solid fuels are not used at Tunstead's lime plants.
31	In order to prevent and/or reduce emissions, BAT is to carry out a careful selection and control of the raw materials entering the kiln.	**CC**	The materials entering the kilns are limestone (Calcium carbonate) and natural gas only. The limestone is locally quarried and is subject to analysis and then if required blended to provide a chemical consistency for the raw material. This ensures the sulphur level in the stone is consistent to minimise the range of SO_2 emissions. Before entering the kiln fines are screened out, which reduces the amount of clay and any associated organic material, entering the kiln. This helps prevent blockages and aids a consistent flow helping process optimisation.
32	BAT is to carry out monitoring and measurements of process parameters and emissions on a regular basis and to monitor emissions in accordance with the relevant EN standards or, if EN standards are not available, ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	**CC**	BAT is in place for BAT conclusion 32 a – d, and 32 g a. all appropriate process parameters are measured on all kilns and used for kiln control and to demonstrate kiln stability b. Critical process parameters are monitored and controlled; stone is metered in via calibrated load cells and the gas fuel and air are metered, all to ensure efficient combustion in the kilns. *c.* Periodic monitoring of NOx, SOx and CO, and dust on the shaft kilns, is carried out by appropriate MCERTS analysers. Continuous monitoring of

BAT Conclusion No	Summary of BAT Conclusion requirement for production of cement, lime and magnesium oxide	Status NA/CC/ FC/NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		FC by 2017	dust is carried out on the PFRK using an MCERTS analyser, however we are changing this requirement to periodic monitoring **Refer Key issues section 2b**. d. No waste is incinerated, so HCl and HF is not measured BAT 32 e and f: Monitoring of TOC, PCDD/F and metals is not routinely undertaken as "there is no permit requirement to do so". **Refer to Key Issues, section 2b below**. g. Periodic measurements of non-kiln dust emissions, including from the lime mills and hydrators, are undertaken by an accredited testing organisation, and fulfil the BATC requirements. There is no continuous monitoring of non-kiln dust. The 7 lime-related dust emission points A30-A36 (newly listed in table S3.2) are required to have an annual compliance check, to demonstrate compliance with the BAT-AEL. TCL have pointed out that the majority cannot be tested to MCERTS standards, hence we are setting an improvement condition to require an assessment of all these emission points, to produce a risk-based plan for monitoring of the more significant emissions to be carried out. **See Key Issues section 2c and Annex 3.** We are requiring performance checks in accordance with a maintenance management system for the 'small source' emissions group, as per the BAT conclusion. TCL state that performance checks are in place for all filters (refer BATC 42), although compliance with the BAT-AEL is not confirmed. The monitoring requirements and improvement condition set in the permit will ensure that TCL are compliant with BATC 32 from the compliance date.
33	In order to reduce/minimise thermal energy consumption, BAT is to use a combination of the listed techniques.	**CC**	TCL utilise a number of techniques to minimise energy consumption and state that the thermal energy consumption is well within the BAT associated levels for all lime kilns (although achieved level not specified). Refractory thickness is monitored to identify any erosion, kiln air pressure monitored to ensure that there are no significant air leaks, specific energy consumption is monitored continually (on the PFRK), and

BAT Conclusion No	Summary of BAT Conclusion requirement for production of cement, lime and magnesium oxide	Status NA/CC/ FC/NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			the process is optimised to minimise energy use. Heat is recovered from the shaft kilns flue gases.
34	In order to minimise electrical energy consumption, BAT is to use one or a combination of the listed techniques.	**CC**	TCL use process optimisation and energy management techniques, including optimising feed stone size through crushing and screening and maintenance of the compressed air systems, to minimise electricity usage. A site energy policy is in place with continual improvement to reduce energy use. High efficiency variable speed fans are used.
35	In order to minimise limestone consumption, BAT is to use one or a combination of the listed techniques	**CC**	TCL quarry, crush and screen the limestone feed, and all is used in the process, with no waste. The PFRK is a fine lime kiln, which takes the smaller fractions of limestone; this enables better use of natural resources.
36	In order to prevent/reduce emissions, BAT is to carry out a careful selection and control of fuels entering the kiln	**CC**	TCL use only natural gas fuel in all the kilns, which is the cleanest available fuel. The process is optimised to minimise the amount of gas used.
37	In order to guarantee the characteristics of waste to be used as fuel in a lime kiln, BAT is to apply the listed techniques:	**NA**	TCL does not use waste as a fuel in the kilns and therefore this conclusion is not applicable.
38	In order to prevent/reduce emissions occurring from the use of waste fuels into the kiln, BAT is to use the listed techniques	**NA**	TCL does not use waste as a fuel in the kilns.
39	In order to prevent accidental emissions, BAT is to use safety management for the storage, handling and feeding into the kiln of hazardous waste materials	**NA**	TCL does not use waste as a fuel in the kilns.
40	In order to minimise/prevent diffuse dust emissions from dusty operations, BAT is to use one or a combination of the listed techniques	**CC**	TCL employs a number of BAT techniques to minimise and prevent dust emissions from dusty operations, including; milling operations are undertaken within a building vented via a bag filter unit, conveyors and elevators are enclosed, preventative maintenance includes cleaning, material handling within closed systems and flexible

BAT Conclusion No	Summary of BAT Conclusion requirement for production of cement, lime and magnesium oxide	Status NA/CC/ FC/NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			loading spouts employed with dust extraction system in loading areas. There is no history of dust complaints from this site.
41	In order to minimise/prevent diffuse dust emissions from bulk storage areas, BAT is to use one or a combination of the listed techniques	**CC**	TCL employs a number of BAT techniques to minimise and prevent dust emissions from bulk storage areas, including; water sprays on the external bulk limestone store, other bulk storage locations enclosed, adjustable conveyors to minimise drop heights, use of water sprays and bowser/road sweeper, good housekeeping practices and a wheel wash.
42	In order to reduce channelled dust emissions from dusty operations other than those from kiln firing processes, BAT is to use one of the listed techniques and to use a maintenance management system which specifically addresses the performance of filters BAT-AEL <10 mg/Nm^3 (fabric filters) or <10-20 mg/Nm^3 (wet scrubbers) (daily avg or periodic)	**CC** **FC** **CC**	Fabric filters are applied to channelled dust emissions such as bag packers, silos, and large grinders. They are subject to both inspection and maintenance regimes, with an internal inspection and performance report at least annually. Replacement filters are designed to perform to <10mg/Nm^3. Wet scrubbers are employed in the hydrating plant. The existing permit limit is 100mg/Nm^3, and there have been occasional exceedances. The BAT-AEL for such plant is 20mg/Nm^3. It is not possible with the current scrubber system to consistently achieve dust emissions of this level, however TCL have conducted trials and concluded that modifications will allow the BAT-AEL to be met by the compliance date. The permit will now include the BAT-AEL as the new limit for these emission points (A12 – A17). **Refer also Key issues section 1e.** We have applied the BAT-AEL as a limit of 10mg/Nm^3 in the permit for all channelled dust emissions. This includes the 7 emissions associated with lime production with a volumetric flow rate >10,000 Nm^3/hr, now added to table S3.2 as emission points **A30 – A36**, and small source emissions (<10,000 Nm^3/hr) included as the group "*All other channelled dust emissions abated by filters*". **Refer to Key Issues section 13e.**
43	In order to reduce dust emissions from the flue-gases of kiln firing processes, BAT is to use flue-gas cleaning with a filter. One or a combination of the listed techniques can be used	**CC**	The shaft and PFRK fine lime kilns are fitted with fabric filters, with 6 monthly periodic monitoring on the shaft kilns and continuous dust monitoring on the PFRK. Reported monitoring data indicates that emissions already meet the BAT-AEL of <10 mg/Nm^3 (for a fabric filter) at all 3 emission points A1, A2 and A19. The existing permit limits

BAT Conclusion No	Summary of BAT Conclusion requirement for production of cement, lime and magnesium oxide	Status NA/CC/ FC/NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	BAT-AEL <10 mg/Nm^3 for fabric filters (daily avg or periodic)		are 20 mg/m^3, which will be reduced to 10mg/Nm^3 from 9 April 2017, in accordance with the BAT-AEL for bag filters.
44	In order to reduce the emissions of gaseous compounds (i.e. NOx, SOx , HCl, CO, TOC/VOC, volatile metals) from the flue-gases of kiln firing processes, BAT is to use one or a combination of the listed techniques	**CC**	TCL analyse the quarried limestone and blend if required to ensure chemical consistency eg low sulphur level. Screening of the feed stone removes some fines and organic matter (see BATC 31). The kilns are fired on natural gas, which is very low in S and Cl. Emissions from the PFRK are inherently lower than the shaft kilns, due to kiln design which allows contact of exhaust gases with calcined lime, which allows some scrubbing.
45	In order to reduce the emissions of NOx from the flue-gases of kiln firing processes, BAT is to use one or a combination of the listed techniques BAT-AEL <100-350 mg/Nm^3 (OSK, PFRK)	**CC**	TCL use natural gas fuel, which along with process control and optimisation, minimise NOx emissions from the kilns. The current permit ELV is 150mg/m^3 for all lime kiln emission points, which is well within the BAT-AEL. The existing limits are to be retained within the permit as they are achievable. Periodic monitoring for NOx is carried out 6 monthly and results are generally <40mg/m^3 for the PFRK and <100mg/m3 for the shaft kilns.
46	When SNCR is used, BAT is to achieve efficient NOx reduction, while keeping the ammonia slip as low as possible, by using the listed technique	**N/A**	SNCR is not used – this BATC only applicable to Lepol rotary kilns.
47	In order to reduce the emissions of SOx from the flue-gases of kiln firing processes, BAT is to use one or a combination of the listed techniques BAT-AEL <50-200 mg/Nm^3	**CC**	The kilns are fired on natural gas which has a low sulphur content. Limestone is analysed and blended to ensure consistent chemistry with low sulphur levels for the raw material feed to the kilns. The current permit ELV is 50mg/m^3 for the PFRK, and this will be retained. Historical monitoring demonstrates very low SOx emissions in the flue gases, generally <1mg/m^3. This is due to the design of the kiln, whereby exhaust gases have contact with calcined stone. There has been no limit for the shaft kilns. This is now set at 200mg/Nm^3 to comply with the BAT-AEL. Emissions reported over the past 4 years have been <90mg/m^3, although one result was 123mg/m^3. **Refer Annex 5 for more detail.**

BAT Conclusion No	Summary of BAT Conclusion requirement for production of cement, lime and magnesium oxide	Status NA/CC/ FC/NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
48	In order to reduce the emissions of CO from the flue-gases of kiln firing processes, BAT is to use one or a combination of the listed techniques BAT-AEL <500 mg/Nm^3	**CC** **NC**	BAT techniques are applied to both types of lime kilns at the site; process optimisation and raw materials with a low organic matter content (c0.03%w/w). Historical monitoring demonstrates very low CO emissions from the PFRK, generally <40mg/m^3, well within the BAT-AEL range of <500mg/m^3. The permit has not included a CO limit for either kiln, so the BAT-AEL of 500mg/Nm^3 limit is set for the PFRK at this variation. Emissions of CO from the shaft kilns are significantly above the BAT-AEL due to the design of the kilns, which were originally built as Mixed Feed Shaft Kilns (MFSK). TCL cannot comply with the BAT-AEL and requested a long term derogation from the BAT-AEL for CO, until the next permit review. **For details, refer Annex 2, section 2: Assessment, determination and decision where an application for Derogation from BAT Conclusions with associated emission levels (AEL) has been requested.**
49	In order to minimise the frequency of CO trips when using electrostatic precipitators, BAT is to use the listed techniques	**NA**	Only applicable to kilns with ESPs. There are no ESPs at Tunstead.
50	In order to reduce the emissions of TOC from the flue-gases of kiln firing processes, BAT is to use one or a combination of the listed techniques BAT-AEL <30 mg/Nm^3 (PFRK)	**CC**	General primary techniques are applied; limestone feedstock is crushed, washed and screened, and contains low levels of organic matter (see also BAT 30 and 31). As emissions have not been regularly monitored for TOC, there is limited available data to assess compliance against the BAT-AEL. This BAT conclusion does not include a BAT-AEL for OSK, therefore one does not apply to the shaft kilns and a limit will not be set for A1 and A2. The permit will include a limit of 30mg/Nm^3 from 9 April 2017 for the PFRK, with a requirement for annual compliance monitoring. **Refer Key Issues section 1d below.**
51	In order to reduce the emissions of HCl and the emissions of HF from the flue-gas of kiln firing processes, when using waste, BAT is to use the listed primary techniques	**NA**	TCL does not use waste as a fuel in the kilns.

BAT Conclusion No	Summary of BAT Conclusion requirement for production of cement, lime and magnesium oxide	Status NA/CC/ FC/NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
52	In order to prevent or reduce the emissions of PCDD/F from the flue-gas of kiln firing processes, BAT is to use one or a combination of the listed primary techniques BAT-AEL <0.05 – 0.1 ng/Nm^3	**CC**	The only fuel used is natural gas, which has negligible chlorine and copper content, thereby minimising dioxin-formation conditions. The limestone feedstock is of high quality and contains typically <0.1% carbonaceous material. Inputs to the kiln will not be capable of generating significant emissions of PCDD/F emissions. As PCDD/F emissions have not been regularly monitored, there is limited available data to assess compliance against the BAT-AEL, however a previous one-off monitoring exercise in 2011 showed results within the BAT-AEL range of <0.05-0.1ng PCDD/F I-TEQ/Nm^3. The permit will include a limit of 0.1 ng/Nm^3 from 9 April 2017 for all lime kiln emission points, with the requirement for an annual compliance check. **Refer Key Issues section 1d below and Annex 3.**
53	In order to minimise the emissions of metals from the flue-gases of kiln firing processes, BAT is to use one or a combination of the listed techniques	**CC**	The only fuel used is natural gas, which has a low metal content. No waste fuels are used. Efficient bag filters provide effective dust removal. No limit for emissions of metals will be set in the permit as the relevant BAT-AELs apply only when using wastes.
54	In order to reduce the solid wastes from the lime manufacturing processes and to save raw materials, BAT is to use the listed techniques	**CC**	Dust is recovered at the site where possible, and the use of landfill is a last resort; a small amount of unusable material is disposed of. Material which is too fine for the shaft kilns is used in the fine lime PFRK kiln, and dust and other particulate matter generated from the process is recovered or used in the feed for Tunstead cement plant.

Key Issues

Where relevant and appropriate, we have incorporated the techniques described by the Operator in their Regulation 60 Notice response as specific operating techniques required by the permit, through their inclusion in Table S1.2 of the Consolidated Variation Notice.

We have reviewed the limits and monitoring requirements for all emissions at the installation to ensure that they are in accordance with the requirements of the BATCs. We considered all emission points, many fairly small and not listed in the permit.

The Operator provided a list of all channelled dust emissions, with an indication of volumetric flow rate. The general approach is that dust emissions with a volumetric flow >10,000 Nm^3/h are listed individually in permit table S3.2, have a dust limit applied (in accordance with the BAT-AEL for the type of abatement) with a monitoring requirement to demonstrate compliance. Dust emissions <10,000 Nm^3/h, which are deemed "small sources" by the BATCs, are included as a group "*all other channelled dust emissions abated by filters*".

Section 1 covers emission limits and section 2 covers monitoring.

1. Emission limit changes: BATC 16 - 28

Changes to some emission limits and the introduction of new ones are required to ensure compliance with the BAT Conclusions. All the new and revised limits apply from 9 April 2017, the compliance date.

a. New listed emission points (cement and lime) – permit table S3.2

We have reviewed the list of all channelled dust emissions provided by the Operator (28 Nov 2016 and 17 Feb 17) and determined that there are 21 additional non-kiln dust emissions with a volumetric flow rate >10,000 Nm^3/hr for which BATCs 16 and 42 prescribe a BAT-AEL of <10 mg/Nm^3 (fabric filters) and for which an annual compliance check is required in accordance with BATCs 5 and 32.

The 14 cement associated emissions are included in permit table S3.2 as emission references A37 – A50 and the 7 lime emissions are A30 – A36. A dust limit of 10 mg/Nm^3 has been set in accordance with the BAT-AEL as all are abated by fabric filters.

b. Overview of emission limit changes

The following tables provide a summary of changed emission limits within permit tables S3.1 and S3.2. Further detail is provided in the BAT conclusion tables above, and sections below:

Tables listing changed emission limit values:

Kiln emissions (permit table S3.1):			
Parameter	**Previous ELV: mg/Nm³**	**New Limit: mg/Nm³**	**BAT-AEL mg/Nm³**
A20 Cement kiln K1 **Dust** (fabric filter)	30	10	<10
A20 **TOC**	110	100	-
A24 Cement kiln K2 **Dust** (fabric filter)	20	10	<10
A24 **TOC**	110	100	-
A1, A2 lime shaft kilns **Dust** (fabric filter)	20	10	<10
A1, A2 **sulphur dioxide**	No previous limit	200	<50-200
A1, A2 **carbon monoxide [with derogation]**	No previous limit	9,000	<500
A1, A2 **dioxins and furans**	No previous limit	0.1ng/Nm³	<0.05-0.1 ng/Nm³
A19 lime PFRK **dust** (fabric filter)	20	10	<10
A19 **carbon monoxide**	No previous limit	500	<500
A19 **TOC**	No previous limit	30	<30
A19 **dioxins and furans**	No previous limit	0.1ng/Nm³	<0.05-0.1 ng/Nm³
BATC 16, 17, 42 Non-kiln dust emissions (permit table S3.2):			
A12 – A17 Lime hydrators (scrubbers)	100	20	<20
A21 K1 Clinker cooler (bag filter) **[with derogation]**	30	20 (daily avg)	<10 (daily avg or avg over sampling period)
A22 K1 Cement mill (bag filter)	30	10 (avg over sampling period)	<10 (daily avg or avg over sampling period)
A23 K1 coal mills A7, A8 (bag filter)	20	10 (avg over sampling period)	<10 (daily avg or avg over sampling period)
A25 K2 coal mill (bag filter)	20	10	<10
A28, A29 Lopulco mills (bag filters)	No previous limit	10	<10
A30 – A50 various emissions with vol flow rate >10,000 Nm³/hr	No previous limit	10	<10
All other channelled dust emissions abated by filters (<10,000Nm³/hr)	No previous limit	10	<10

BATCs 17 and 18 contain a composite BAT-AEL: <10 – 20 mg/Nm^3, with a footnote "when applying fabric filters or new or upgraded ESPs, the lower level is achieved". In line with this, we have applied a limit of 10 mg/Nm^3 to emissions from kilns, coolers and mills which are abated by bag filters. There are no ESPs at Tunstead cement and lime works. Note that the equivalent BATCs for lime, 42 and 43, do not contain composite limits and clearly state that the BAT-AEL for fabric filters is <10 mg/Nm^3.

c. Cement kiln limit changes

With the exception of dust, no changes to cement kiln flue gas limits are required to comply with the BAT Conclusions; all existing limits are in line with BAT-AELs. Refer to BATC 17 for details on the change to the kiln dust limit and BATC 24 and Annex 5 for details on the change to the TOC limit.

d. Lime kiln limit changes

The BAT conclusions introduce BAT-AELs for TOC (BATC 50) and dioxins/furans (BATC 52) in lime kiln emissions, despite the fact that we do not expect to find these parameters in significant quantities due to the nature of the process and fuel used. A limit for TOC of 30 mg/Nm^3 (the BAT-AEL for PFRK) is applied at A19, however as there is no BAT-AEL for Ordinary Shaft Kilns (OSK), no TOC limit is applied at A1 and A2. A dioxins/furans limit of 0.1 ng/Nm^3 is now included for each lime kiln emission point in line with the upper end of the BAT-AEL range.

Refer BATC 43 for details on the change to the kilns' dust limits, BATC 47 and Annex 5 for details on the change to the A1/A2 SO_2 limit and BATC 48 and Annex 2 (A1 and A2) for details on the change to the kilns' limits for CO.

e. Non-kiln dust limits (BATCs 16, 18, and 42):

BATC 16 and 42: the BAT-AEL of 10 mg/Nm^3 is applied to all channelled dust emissions (non-kiln related) for cement and lime production, with the exception of the lime hydrators; this includes all the newly listed emission points (A30 – A50), the lime mills (A28, A29) and the emission group for small source emissions. None of these emission points had dust limits previously.

The lime hydrators, A12 – A17, are abated by mop scrubbers and therefore the BAT-AEL is 20 mg/Nm^3 (upper end of range for wet scrubbers). The limit was previously 100 mg/m^3 and compliance has not been consistent with this limit. TCL have modified operation of the scrubbers to reduce emissions to comply with the BAT-AEL, and are confident that compliance is now achievable. **See also BATC 42.** We are also removing, with the consent of the operator, (submission 17 Feb 2017) the inherited clause from the previous variation which excludes application of the permit ELV for the first 200 hours of new mop operation. The limit will apply consistently and continuously for the scrubbers under normal operation. The limit of 20mg/m^3 is applied for hydrator emissions measured "as emitted" with no correction for temperature, pressure, oxygen or water vapour content.

BATC 18: historic reported emissions have exceeded the BAT-AEL of 10 mg/Nm^3 for the K1 clinker cooler (A21), the coal mill (A22) and the cement mill (A23), however compliance with the previous ELV of 30 mg/m^3 was consistent. The operator has stated that compliance with the new limit of 10 mg/Nm^3 will be possible for the mills with improved maintenance, however they applied for a time limited derogation from the BAT-AEL for the clinker cooler (**refer Annex 2)**. **See also BATC 18**.

Refer BATC 18 within the tables above for details of other dust emission limits.

All emission limits apply for the specified monitoring reference period – **see section 2 below,** regarding detail of monitoring of these emissions.

2. Monitoring: BATC5

The basis for choosing a frequency and method (continuous or periodic) of monitoring of emissions included reference to the BATC, an assessment of the mass of release, potential impacts, previous compliance history and process variability. The results are summarised here and reflect the permit conditions.

The length of sampling period can vary from ½ hour to 6-8 hours depending on the sampling strategy and standard used. For compliance purposes the selection of sampling period reflects the likelihood of variance, potential impacts, the frequency of sampling and the expected concentration. In general terms smaller releases with limited potential for impact have sampling frequencies as low as ½ hour. Larger releases, or where compliance is based on infrequent sampling, have a longer sampling period to allow it to be more representative.

Referring to BATC 5c-g (cement), there are some specific regulatory requirements defined for monitoring of kiln processes, which also fall under IED ch IV and Annex VI as waste is co-incinerated. For non-kiln activities, there are no specific monitoring requirements other than the statement "continuous or periodic" for dust emissions. Each emission point has been assessed to decide if it should be monitored continuously or periodically, and if the latter, the frequency of sampling has been decided based upon risks posed. We have taken into account the history of compliance as well as the scale and impact of a potential release in setting the monitoring requirements.

a. Cement kiln parameters (BATC 5c, d, e and f):

The type of monitoring (continuous/periodic), the reference period and frequency of monitoring of the cement kiln emissions are all unchanged from the previous variation for all parameters. As waste fuels are burned, the permit implements the requirements of IED Annex VI and these are in line with the requirements of BATC 5. No changes to kiln monitoring are required in order to comply with the BATCs.

b. Lime kiln parameters (BATC 32c, e and f):

Dioxin monitoring (all lime kilns): The BATC description states that for periodic measurements of dioxins and furans, TOC and metal emissions "*a frequency appropriate to the raw materials and fuels that are used in the process should be applied*". Due to the nature of the raw material (high purity, clean limestone) and fuel (natural gas), we do not expect high levels of these pollutants to be emitted. This was confirmed for dioxins and furans with a sampling exercise carried out after the last permit review.

IED article 14(d) requires a demonstration of compliance at least annually against permit conditions. As an ELV is being set for PCDD/F, an annual compliance check is required, so we are setting a compliance check at a minimum frequency – **annual**.

In the UK, dioxin monitoring trials have taken place at many different lime kilns and the highest concentration recorded was 0.017 ng I-TEQ/Nm^3, which is only 17% of the relevant BAT AEL. Most results were much lower than this. UK plants use natural gas as a fuel and do not burn any waste materials, and so the chloride input and the risk of high dioxin emissions is minimal. A risk-based approach would suggest that frequent dioxin monitoring is not required at lime kilns in the UK, unless

there is a significant change in fuel, raw materials or residence time in the critical 300°C to 400°C temperature window.

An alternative protocol for dioxin monitoring, taking into account the known risk factors leading to dioxin formation has been adopted. A dioxin and furans PCDD/F test by an approved MCERTS contractor will be carried out on one kiln of each type per site. Provided the result is well below the limit of 0.1 ng/Nm³ and the fuel type (natural gas) and stone feed type does not change and there are no significant kiln process changes (e.g. new type of burner, change in physical configuration of the kiln which affects internal kiln gas flow) then that result will stand for a maximum of four years. A report will be written confirming the "no change in operation" and issued to the Environment Agency on an annual basis. Any changes will require a new dioxin baseline year to be established.

This protocol (a combination of a baseline measurement to prove that current emissions are well below the ELV and assessment of surrogate parameters to ensure that the risk of high dioxin concentrations remains minimal) will be adequate to demonstrate compliance with the ELV, without the cost burden of annual monitoring for each kiln.

Shaft kilns (A1, A2): there is no change to the monitoring requirements for dust, NOx, SO_2 or CO. No TOC monitoring is set as there is no emission limit for this parameter (due to the type of kiln).

PFRK/Maerz kiln (A19): This release has been monitored continuously for dust since it was commissioned in 2009. From the compliance date (9 April 2017), we are removing the requirement for continuous monitoring and setting only periodic, to be consistent with all other UK Parallel Flow Regenerative Kilns (PFRKs), most of which do not have continuous dust monitors. The CEM will then be used as an indicative tool to ensure particulate emissions are controlled, and this requirement is included in the permit in table S3.6 as a process monitoring requirement. Sampling frequency is set at 6 monthly as historic monitoring indicates very low dust in the abated emissions and we do not expect any compliance issues. NOx, SO_2 and CO will continue to have 6 monthly periodic monitoring. As a limit is now included for TOC, an annual compliance check is set for this parameter (**see also Annex 3 regarding an improvement condition relating to TOC monitoring**).

We are not setting any monitoring for metals. This is not necessary as no limit is set for this parameter, which is only required if waste is being burned.

c. Non-kiln dust (BATC 5g and 32g) – permit table S3.2:
BATC 5 allows for continuous or periodic monitoring of dust from non-kiln activities. We have therefore reviewed the monitoring required for demonstration of compliance.

Cement clinker cooler (A21): We are retaining the requirement for continuous monitoring on the clinker cooler (A21) as this is continual release of a significant flow rate. This emission point is also subject to derogation (refer Annex 2). Note that there is no equivalent emission for the K2 cement plant as it is combined with the main stack release (A24).

Cement-associated milling (A22, A23, A25, A26): We are changing the monitoring on the cement and coal mills from continuous to periodic. The two coal mills (A22 and unbuilt A25) and two cement mills (A23 and unbuilt A26) are all fitted with bag filters. The volumetric releases at A22 and A23 are relatively small (and smaller in

size than the regulated lime kilns on which dust is monitored periodically), not continuously emitted, and consequently pose a lower risk. We are setting a frequency of six monthly for the existing mills, and quarterly (in the first year) then six monthly for the unbuilt mills. The continuous monitors previously used for compliance will now be used indicatively to assess performance of the abatement plant, in permit table S3.6 (see section 2d below), and establish any performance problems. Environmental protection will be maintained as this variation reduces the ELV for releases from all mills to 10mg/m^3 (from 30mg/m^3 for the operational mills). Historic monitoring data indicates that emissions are capable of meeting the new 10mg/Nm^3 limits.

Other dust emission points (cement and lime production): Monitoring for emission points A28 and A29, which previously were monitoring 6 monthly, is now set an annually, as the scale of release is not large compared to other dust releases. For the emission points A30 – A50, which weren't previously listed in the permit, the Operator has indicated that the majority of these emissions cannot be tested because there is no access or they do not meet MCERTS standards. We are setting an improvement condition to require the operator to assess emission points A30 – A50 and produce a risk-based plan for enabling extractive monitoring to be carried out, prioritising the larger scale releases (refer to Annex 3). Pending completion of this condition, we are setting monitoring as "*in accordance with a maintenance management system or other monitoring as agreed in writing by the Environment Agency*".

The other non-kiln dust emissions (emission group "*all other channelled dust emissions abated by filters"*) are "small sources" (<10,000 Nm^3/hr) for which performance checks can be based on a maintenance management system, periodic/extractive monitoring for compliance purposes is not expected.

Summary of monitoring requirements changed from previous variation:

Emission point	Parameter	Type of monitoring	Frequency		Minimum reference period	
			Old	New	Old	New
A1, A2, A19	PCDD/F	periodic	-	**annually**	-	**6-8 hours**
A19	Dust	periodic	-	**6 monthly**	continuous	30 minutes
A19	TOC	periodic	-	**annually**	-	30 minutes
A22, A23	dust	periodic	-	**6 monthly**	continuous	30 minutes
A25, A26	dust	periodic	-	**quarterly**	continuous	30 minutes
A28, A29	dust	periodic	6 monthly	**annually**	30 minutes	30 minutes
A30 – A50	dust	periodic	-	**To be confirmed**	-	**To be confirmed**
All other abated emission points	dust	-	-	Maintenance schedule		

We have set monitoring methods according to our monitoring guidance note, M2.

d. Table S3.6 Process Monitoring requirements
This table has been updated and a number of additional parameters added:

For kilns K1 and K2:

- Fuels usage, WDFs usage, relative thermal input of fuels, ammonia usage – these are all required to be reported
- Fourth stage cyclone exit temperature – condition 2.3.12(d) specifies a minimum temperature at this point in order that IED ch IV requirements are met
- Raw meal feed rate – condition 2.3.12(c) states a threshold below which WDFs cannot be burned, and is also a critical process parameter specified in BATC 5b.
- Fuels feed rate – BATC 5b specifies this as a critical process parameter for monitoring
- Monitoring of oxygen and water vapour at A20 and A24 are to standard BS EN 14181, with temperature and pressure traceable to national standards, to allow reliable correction of monitoring data to reference conditions.

Other:

- At emission points A19, A22, A23 (and the unbuilt A25 and A26), the indicative use of continuous dust monitors, previously used for compliance purposes, to reflect abatement performance and manage maintenance.

Other Monitoring aspects

Reference conditions:
The reference conditions for reporting measured emissions from non-combustion sources has been changed by the BATCs from no correction required for temperature, pressure, oxygen or water vapour content, to reporting **dry at Standard Temperature and Pressure (STP)** with no correction for oxygen. The Schedule 6 interpretation has been updated for this change.

Annex 2: Assessment, determination and decision where applications for Derogation from BAT Conclusions with associated emission levels (AEL) has been requested.

The IED enables a competent authority to allow derogations from BAT AELs stated in BAT Conclusions under specific circumstances as detailed under Article 15(4):

'By way of derogation from paragraph 3, and without prejudice to Article 18, the competent authority may, in specific cases, set less strict emission limit values. Such a derogation may apply only where an assessment shows that the achievement of emission levels associated with the best available techniques as described in BAT conclusions would lead to disproportionately higher costs compared to the environmental benefits due to:

(a) the geographical location or the local environmental conditions of the installation concerned; or

(b) the technical characteristics of the installation concerned.

The competent authority shall document in an annex to the permit conditions the reasons for the application of the first subparagraph including the result of the assessment and the justification for the conditions imposed.'

A summary of any derogations granted is also recorded in an Annex to conditions of the Consolidated Variation Notice in accordance with the requirement of IED Article 15(4) as described above.

As part of their Regulation 60 Notice response, the operator requested derogations from compliance with the AEL values included in the following BAT Conclusions;

- BAT conclusion 18, dust emissions from cement cooling and milling processes which sets a BAT-AEL for fabric filters <10mg/Nm^3 and for ESP or other filters <20mg/Nm^3. A time limited derogation, until 31 May 2019, was requested for dust emissions from the clinker cooler, which are abated by a fabric filter, on the grounds of the technical characteristics of the installation.

- BAT conclusion 48, carbon monoxide (CO) emissions from lime kiln flue gases, which sets a BAT-AEL of <500mg/Nm^3 (daily average or periodic measurement). The request was an ongoing derogation for CO from the shaft lime kilns on the ground of the technical characteristics of the installation.

Although information was provided in their response to allow us to commence assessment of the derogation requests it was insufficient to enable us to complete the determinations and further information was requested and subsequently supplied on:

- 27 October 2015 with a revised version submitted on 5 November 2015 – consideration of an abatement option (thermal oxidiser) [BATC 48]
- 30 October 2015 and 9 December 2015 – details of lime shaft kilns gas flows and operation [BATC 48]
- 21 March 2016 – pre-submission for cement derogation request [BATC 18]
- 6 June 2016 with a revised version submitted on 30 September 2016 – derogation request report [BATC 48]
- 2 December 2016 – response to our queries regarding the derogation request [BATC 18]

On review and assessment of this information we are minded to grant the derogations requested by the operator in respect to the AEL values described in BAT Conclusions 18 and 48, but have included other Emission Limit Values in the Consolidated Variation Notice that will ensure suitable protection of the environment.

The ways in which we have considered, assessed and determined the derogation requests are detailed below; in Section 1 for the Cement derogation [BATC 18] and Section 2 for the Lime derogation [BATC48].

Section 1: determination of request for derogation from BATC 18 (cement)

As part of their response TCL stated that the reason for their derogation request was that the cooler bag filter is technically incapable of achieving the proposed ELV of 10mg/Nm^3 in its current configuration. This is due to the filter operating with a higher air to cloth ratio as a result of high air flows from the cooler in order to reduce the clinker temperature.

1.1 Overview of the installation

Permitted cement clinker production is around 2 million tonnes per annum on two kilns, however actual production is less than half of this as only one kiln is currently built and operational. A second kiln (K2) was permitted in 2010 but has yet to be built. The existing kiln was built in the early 2000s and commissioned in 2004. It is a modern, energy efficient design and is located in the bottom of the limestone quarry. In common with the other similar plants, the cement kiln operates continuously 24 hours a day, 7 days a week for 11 months a year (the operating "campaign"), with an annual 4 week shut down for extensive planned maintenance every spring.

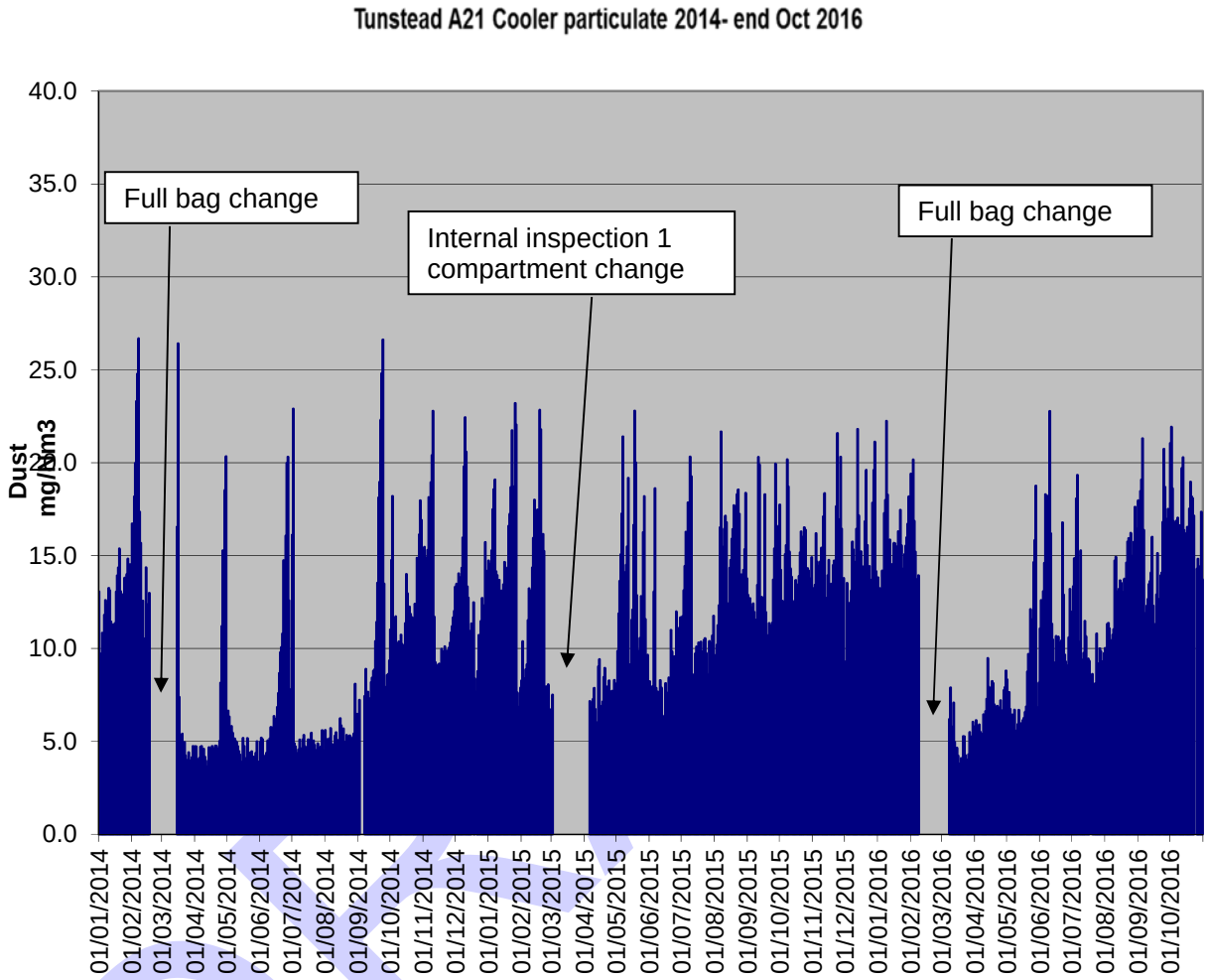
Locally extracted limestone is mixed with other raw materials imported to site and ground in a Mill to become the Raw Meal. The Raw Meal enters the kiln process at the top of the preheater system and passes down through four stages where it mixes with hot kiln exhaust gases to heat the meal, elevating the temperature to around 850^{o}C by the time it reaches the final stage. Most of the raw meal is calcined at this temperature and it then enters the back end of the rotary kiln and moves up, reaching a temperature of around 1400^{o}C, by which time clinker is formed. A range of fuels are used to heat the kiln, including coal, natural gas and petcoke (fossil fuels) and non-hazardous waste derived fuels.

The hot clinker passes from the kiln into the clinker cooler, where a number of fans are used to blow ambient air through the clinker to reduce its temperature prior to storage in silos. The heated air from the cooler is then split three ways; some is used in the Raw Mill, for drying the Raw Meal, some goes back to the kiln as preheated process air while the rest is discharged to atmosphere via a bag filter, at emission point A21.

Dust abatement at Tunstead

Tunstead is a modern cement plant, the newest of the 7 English plants, and all dust emissions are abated by bag filters; there are no Electrostatic precipitators (ESPs). As the plant is currently configured, the cooler bag filter cannot meet the BAT-AEL of 10 mg/Nm^3 as it is undersized for the duty required to meet this level of emissions; the volumetric flow rate of air to be treated is too high for the surface area of filter media (known as the Air to Cloth (AC) ratio) since production conditions were changed a few years ago. It is a harsh environment for a bag filter, removing hard, highly abrasive dust from a high temperature air flow. The unit requires considerable ongoing maintenance as the internals and filter bags are constantly worn by the

aggressive dust, exacerbated due to the higher air flow resulting in greater velocities and, consequently, abrasion. The unit has consistently met the current limit of 30mg/m^3; typical emissions are between 10 and 20 mg/m^3 and the graph below shows its recent performance:



The graph is annotated to show when full bag changes have been carried out. Annual shut downs are indicated by the lack of emissions. It can be seen that following a full bag change, there is an improvement in performance so that the emissions predominantly meet the BAT-AEL, however this level of emissions is not consistent for more than a couple of months, and there are occasional peak emissions above the BAT-AEL. Most peaks are sudden and significant (in the 15 – 25 mg/m^3 range). The deterioration in performance throughout each operating campaign is also clearly noticeable, which is due to the natural degradation of the system including filter media. Reduction in air flow through the filter should mean better performance for a longer period.

Because the cooler is integral to kiln operation, any installation work or maintenance on the filter internals has to be carried out while the kiln is shut down. It is not practicable to carry out a full change of bags and maintenance on the internals every 3 months, which is what may be required to provide for a more consistent performance with the filter in its current configuration, as it would require a full plant shut down for around a week each time, incurring significant loss of production. The cost of an unplanned kiln shutdown **is £90,000 per day**, which includes the cost of importing cement or clinker to supply customers in the absence of production.

1.2 Derogation from BAT conclusion 18

TCL requested a derogation from BATC 18, which sets a BAT-AEL for dust emissions from cooling and milling processes of <10mg/Nm^3 for fabric filters and for ESP or other filters <20mg/Nm^3, for emissions of dust from the K1 cement plant clinker cooler (emission point A21) which are abated by a fabric filter.

The request was for a time limited derogation, until 31 May 2019, to allow time for a two step approach to compliance; step 1 carry out ductwork modifications (in February 2017) followed by a year to optimise the process; step 2: a further year to allow for installation of a new bag filter should performance not consistently meet the BAT-AEL after step 1 is completed. The Operator proposed that the ELV is reduced from 30 to 20mg/Nm^3 for the derogation period.

1.3 Derogation criteria

The derogation request is based on the technical characteristics of the plant, specifically the general investment cycle for this type of installation and the practicability of interrupting the activity so as to install improved emission control. Maintenance and installation work needs to be carried out during the annual shutdown to avoid incurring the substantial costs of loss of production. Part of the operator argument is also that a complete replacement of a relatively new piece of plant (bag filter plant in its current configuration) would result in significant write-off costs. Tunstead is the newest of the 7 English cement works; the other are typically older than 30 years using electrostatic precipitators to abate cooler dust emissions.

1.4 Options considered

The operator has referred to the BAT Conclusions and addressed all reasonable options for achieving the BAT AEL.

BAT conclusion 18 identifies three techniques to reduce dust from the emissions of cooling and milling processes: Electrostatic precipitators (ESPs), Fabric filters and Hybrid filters. The associated BAT-AEL for these techniques is <10-20 mg/Nm^3 with the lower level associated with fabric filters or new or upgraded ESPs. TCL has considered all these techniques, along with some additional options to reduce emissions.

The following table presents a summary of the options considered:

No	Option	Comments	Conclusion
1	**Compliance by April 2017**	Compliance by April 2017 can only be guaranteed by installing a new, larger filter during an unplanned 4 week plant shutdown in April 17.	Included in assessment as "BAT-AEL" option
2	**Compliance by April 2018**	As option 1, except that the installation work is carried out during the next annual shutdown to avoid loss of production costs. This option would require a 1 year derogation	Compliant by April 2018 - taken forward for assessment
3	Improve performance of existing filter: by maintenance	Change filter bags more frequently to improve performance.	Not considered further – compliance not guaranteed
4	Improve performance of existing filter: upgrade bags	Upgrade the filter bags to a higher specification to obtain better performance, and optimise cleaning cycles.	Not considered further – already implemented

5	**Improve performance of existing filter: process optimisation (Operator preferred option)**	Reduce the air flow to the filter by modifying the cooler ductwork, then optimising kiln, cooler and filter air flows and filter performance, possibly with an increase in bag change frequency.	Included in assessment as "derogation" option
6	Improve performance of existing filter: extend unit	Install an additional compartment to the filter in the Spring shutdown of 2018. Timescales are the same for option 2; this would require a 1 year derogation. No costs available	Not considered further – costs not available
7	Install an ESP	Replacing the current filter with an ESP appears to be in line with BAT however an ESP as a retrofit would not guarantee compliance with the BAT-AEL (also 10mg/Nm^3)	Not considered further – compliance not guaranteed with a retrofit
8	Install a hybrid filter	As for option 7; this is BAT, however a retrofit would not guarantee compliance with the BAT-AEL.	Not considered further – not a viable option

The operator has described 8 relevant options for achieving the BAT-AEL and justified the screening out of 5 options. 3 options were taken forward to conduct a cost benefit analysis.

1.5 Environmental consequences of allowing a derogation

There are no significant negative environmental impacts of delivering the alternative versus the impacts of achieving the BAT-AEL.

The operator has demonstrated that the costs of achieving the BAT-AEL by April 2017 are disproportionate to the environmental benefits. The derogation request is to delay compliance with the BAT-AEL while the operator makes modifications to the existing plant and optimises performance to reduce particulate emissions by 31 May 2019. During this period the ELV will reduce from 30 to 20 mg/Nm^3. The environmental impacts (estimated as an additional 15 tonne of particulates over 2 years) of allowing the derogation are assessed as not significant. The derogation will not lead to any significant pollution and a high level of environmental protection is maintained.

1.6 Cost Benefit Analysis

The operator has satisfactorily demonstrated that the stated criterion would result in increased costs of achieving the BAT-AEL (as compared to the typical cost of installing the appropriate technique).

Results of the Cost Benefits Analysis (CBA). The operator's submitted CBA did not reflect the options set out in their derogation application so has not been reproduced below. Instead the data were placed into the CBA tool, which gave the results below.

Environment Agency alterations:
The Net Present Value of each option in comparison to the proposed derogation option (£millions to 1 decimal place)

	Proposed derogation: process modifications only	BAT-AEL	Process modifications and new bag filter	New bag filter in March 2018, preceded by a one year derogation
Central	**0.0**	**-12.2**	**-7.2**	**-5.6**
Sensitivity and Scenario Analysis				
Lowest NPV: High costs, low benefits	**0.0**	**-21.2**	**-12.4**	**-10.1**
Highest NPV: Low costs, high benefits	**0.0**	**-8.0**	**-4.5**	**-3.7**

The high upfront cost of the BAT-AEL option is mostly down to the write off value of the relatively new bag filter and an estimate of lost production costs.

The operator has provided a credible argument that the increased costs linked to the technical characteristics are disproportionate for achieving the BAT AEL. The costs of meeting the BAT-AEL on time are significantly higher than the environmental benefits of doing so in comparison to the proposed derogation option. There are no other options which show the benefits outweighing the costs even under sensitivity testing.

1.7 Conclusion for BAT conclusion 21 derogation assessment

The Derogation request meets the technical characteristics criterion namely *the practicability of interrupting the activity so as to install improved emission control upon the pollutant* and *the general investment cycle for a particular type of installation*.

Any installation work or plant modifications for the clinker cooler and associated abatement plant needs to be carried out during plant shut down for practical (Health & Safety) reasons. It is not practicable to interrupt the activity without incurring significant costs through loss of production and kiln lining. The cement plant has an annual 4 week shutdown every spring and all investment and maintenance is organised for this shut down. The Company's budgeting and capital approval programme runs July to September every year.

The cooler abatement plant is not capable of performing to meet the BAT-AEL as, in its current configuration, it is undersized to meet the duty required of it to meet this level of emission, and work is required to ensure compliance with the BAT-AEL. Complete replacement of the filter would result in substantial write-off costs, as the bag filter is only 13 years old, significantly short of its expected life of around 35 years. This site is the newest English cement plant, with majority of other plants older than 30 years.

The Operator proposes to carry out process modifications in February 2017, to reduce the filter duty, which will improve performance and should result in a reduction of emissions which they believe has the potential to meet the BAT-AEL levels. We accept that some additional time is required to "fine-tune" the process following the modifications; to optimise performance and maintenance of the system in order to minimise dust emissions

The Operator has committed to compliance with the BAT-AEL, and recognises that there is a possibility that the process modifications plus process optimisation may not guarantee compliance. They have proposed to implement a capital project of extending or replacing the filter should the process modifications fail to achieve the required level of emissions reduction, and hence requested a further year to allow for this work.

An appropriate range of options was reviewed and those identified as technically viable were considered further. Viable options were adequately described and taken forward for Cost Benefit Analysis (CBA). The BAT-AEL option was confirmed as disproportionate. The environmental impact of operating at an interim (reduced) emission limit was assessed and considered not significant.

The proposed derogation, timescale and associated ELVs have been accepted in principle. However, we will set an improvement condition to require the Operator to report, in early 2018 following a full operating campaign, on their assessment of compliance of emissions at A21 and their intention to make further investment.

The operator shall submit a report to the Environment Agency (for approval in writing) detailing progress towards compliance with BAT conclusion 18, which sets a BAT-AEL for dust emissions from cooling and milling processes abated by fabric filters of <10mg/Nm^3 (daily average or average over the sampling period), for which a derogation has been requested and granted at emission reference A21, the K1 clinker cooler. The report shall include, but not be limited to, the following: 1. current performance of the A21 bag filter against the BAT-AEL; 2. the intention to make further investment (if required) to achieve compliance; 3. any alterations to the initial plan, together with proposals for amended timescales;	31/03/18

It is possible that the process modifications are successful to the extent that compliance with the BAT-AEL is achieved by the compliance date of April 2017.

Section 2: determination of request for derogation from BATC 48 (lime)

As part of their response TCL stated that the reason for their derogation request was that the kiln has specific technical characteristics which mean that the costs of achieving the BAT-AEL would be disproportionately higher than the environmental benefits.

2.1 Overview of the installation

Permitted lime production is just less than 1 million tonnes per annum. There are two types of lime kiln at the site: a fine lime Parallel Flow Regenerative Kiln (PFRK), also known as a 'Maerz' kiln, and single shaft counter current kilns. Each type of kiln takes a different stone size to produce distinct lime products for different market sectors.

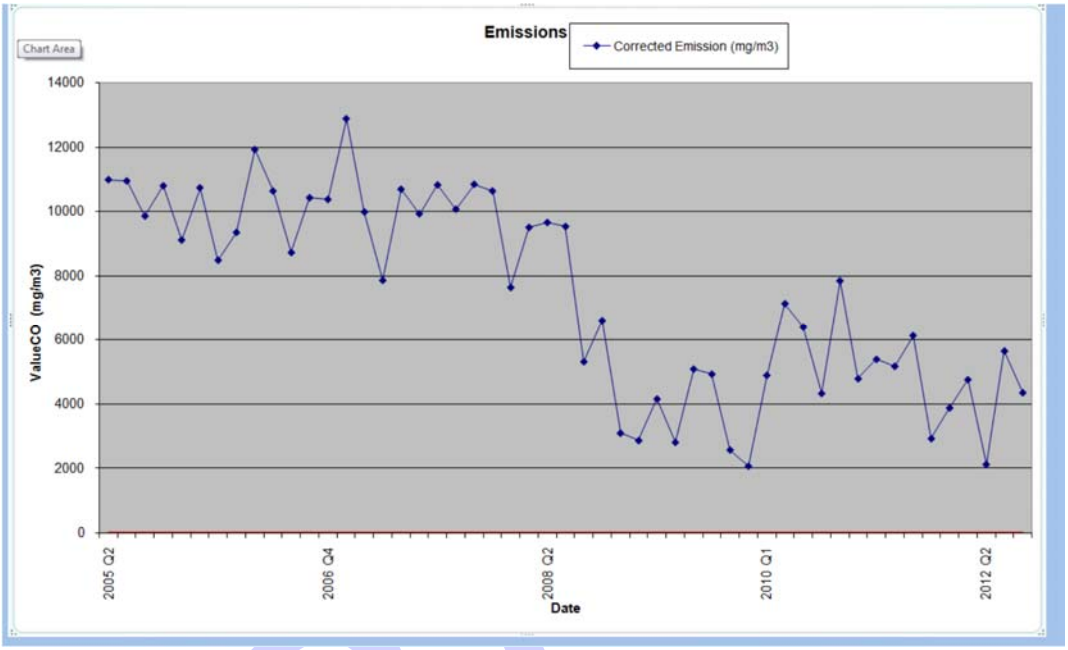
There are 8 shaft kilns, of which only five may be operational at any one time. They were originally constructed in 1935 as coal fired Mixed Feed Shaft Kilns (MFSKs) and have a large diameter of 6m. They were converted to use natural gas in the early 1970s, and now operate as side-fired single shaft counter current kilns. Waste gases vent via two bag filters to two stacks (emission points A1 and A2). These kilns take a large feed stone size (>90mm) and produce a medium/hard burned lime with a low reactivity. The product is used mainly in the building materials sector and in the hydration process at Tunstead.

The PFRK or Maerz kiln was built in 2008, is gas fired and produces a high reactivity lime from smaller stone sizes. It vents via one bag filter to a single stack (A19).

Measured emissions are very low, with reported levels of CO consistently below 50mg/m^3, and frequently less than 20mg/m^3, due to its inherently efficient design.

Shaft Lime kiln CO emissions

The permit has never included a CO limit for the shaft lime kilns, and until the 2010 permit review, CO was not required to be monitored or reported, as historically it has not been regarded as a substance requiring control. The following graph, provided by TCL, shows the CO emissions measured from the shaft kilns over the past 10 years:



The reduction in emissions in 2008 resulted from optimisation of the gas side-firing technique. Trials were carried out to establish the most efficient combustion conditions, optimise CO emissions and improve kiln efficiency.

2.2 Derogation from BAT conclusion 18

TCL requested a derogation from BATC 48 which sets a BAT-AEL for lime kiln carbon monoxide (CO) emissions of <500mg/Nm^3 (daily average or periodic measurement), for emissions from their shaft lime kilns (emission point reference A1 and A2). The request was for an ongoing derogation, until the next BREF review.

Current CO emissions from the kilns are around 5,500 mg/Nm^3 and up until this variation, there has been no CO limit in the permit for lime kiln emissions.

2.3 Derogation criteria

The derogation request is based on the technical characteristics of the lime kilns.

These lime kilns are unique in Europe. They were built in the 1930s as coal-fired Mixed Feed Shaft kilns (MFSK) but converted to natural gas in the 1970s. They do not fall under any of the BREF descriptions for specific kiln types and have therefore, by default, been categorised as “Other Shaft Kilns” (OSK) to which the BAT-AEL applies. The BREF lists six specific designs of OSK, none of which adequately describe the kilns at Tunstead, although they do meet the OSK generic description of being side-fired.

2.4 Options considered

The operator has referred to the BAT Conclusions and addressed all reasonable options for achieving the BAT AEL.

The BAT conclusions identify two techniques to reduce/minimise emissions of CO in kiln flue gases. These are: to select a suitable raw material (limestone) with low content of organic matter and to use process optimisation techniques. TCL have demonstrated that they already apply these CO minimisation techniques. They have also considered compliance with the BAT-AEL through complete replacement of the shaft kilns with new kilns of a different design and through the installation of CO abatement equipment.

2.5 Environmental consequences of allowing a derogation

TCL submitted a modelling report, dated Jan 2015, as part of their derogation request. The modelling assesses the impact of CO emissions from all relevant stacks at Tunstead Quarry, including the existing cement kiln and a second, as yet un-built, cement kiln.

We have reviewed the modelling and agree with their conclusions that the predicted maximum off-site CO concentrations will not result in the risk of an exceedance of the relevant Air Quality Standards (AQSs) for protection of human health. The emissions of carbon monoxide will not affect any sites of heritage, landscape or nature conservation, and/or protected species or habitat. There is no CO AQS or EAL for the protection of vegetation; this is not a substance of concern for such sites.

There is no predicted environmental impact from the CO emissions at the current levels, so granting the derogation will not cause a short term or long term impact on local air quality or nearby nature conservation sites.

2.6 Cost Benefit Analysis

We undertook a quantitative Cost Effectiveness Analysis using our Cost Benefit Analysis (CBA) tool. A full CBA is not possible as there are no published CO damage costs.

TCL provided detailed costs for kiln replacement and outline costs for installation of CO abatement. They calculated a Present Value (PV) and an equivalent annual cost for these two options.

We have used their costs with the CBA tool to calculate a Present Value cost of each option compared to the Business as Usual (BAU) case. We have then used these figures to estimate a cost per tonne of CO saved, using the annual CO saving.

Rank	CBA scenarios	Description	Central estimate of PV costs (range)	Equivalent damage cost £/t CO saved (range)
1	BAU/preferred case	No change to current operation **(Derogation case)**	**-£0.0M**	**-**
2	Option 2	Install CO abatement	**-£47M** (£23M - £76M)	**£5,600** (£2,700 - £9,000)
3	Option 1	Replace existing kilns	**-£61M** (£43M – 84M)	**£8,000** (£5,600 - £11,000)

These costs can also be compared to the damage costs for other pollutants, such as: NOx - £13,000/tonne; SOx - £2,200/tonne; PM10 - £35,000/tonne; ammonia - £2,900/tonne. (These damage costs, used in our CBA tool, originate from the Inter-departmental Group on Costs and Benefits (IGCB) and represent the Government's best estimate of damage costs for these parameters.) For the abatement costs in this case to be justified, the CO equivalent damage costs should be lower than those for ammonia and SOx, as it is regarded as less harmful.

It is difficult to judge damage levels in qualitative terms, but using the data and methodology in the Economics and Cross-Media Effects BREF, CO is 27 times less potent in terms of human toxicity than sulphur dioxide, half as potent with respect to photochemical ozone creation potential, and has no acidification effect at all. It is clear, therefore, that sulphur dioxide has a more serious impact on the environment and human health than CO. The central abatement costs for CO at Tunstead of £5,600 and £8,000 per tonne of CO abated appear large in comparison to a hypothetical CO damage cost, which should be below that for SOx as suggested by the cross-media effects methodology.

We can therefore conclude that the costs associated with the options of installing CO abatement and replacing the kilns are disproportionate to the environmental benefit which would be achieved. This supports the Operator's case for derogation.

2.7 Conclusion for BAT conclusion 21 derogation assessment

TCL have demonstrated that their derogation request is based on the unique technical characteristics of their shaft lime kilns, which have an inherently high level of CO emission due to their design.

TCL have worked to minimise CO emissions from these kilns over the past 8 years. The techniques listed in the BAT conclusions for reducing CO emissions are the selection of raw materials and the use of process optimisation techniques, both of which have already been fully applied. CO emissions cannot be reduced further to meet the CO BAT-AEL due to the inherent design of the shaft kilns.

Compliance with the BAT-AEL can be achieved only by installing a thermal oxidiser, (abatement equipment which is not described as a potential BAT), or by completely replacing the kilns with new ones of a different design, for which the costs would be disproportionately higher than the environmental benefits.

Air dispersion modelling has confirmed that, even if all 5 shaft kilns are operating simultaneously, there will not be any exceedances of Air Quality Standards set for the protection of human health and the environment.

CO is not a substance of major concern for the environment, because it is oxidised to form carbon dioxide within a few months of being released into the atmosphere. To date it has not been controlled by an emission limit in the permit. There are no Long or Short Term Air Quality Standards (AQSs) or Environmental Action Levels (EALs) for protection of the environment. There is minimal environmental benefit to be gained by further reducing CO emissions from the kilns.

We note the comment in the BREF, p389 "*for CO emissions, there is a lack of information regarding the types of other shaft kilns (OSK) which currently have emissions exceeding the BAT-AEL. For some of these shaft kiln types, their specific technical characteristics might prevent achieving the agreed BAT-AEL for CO. Such technical characteristics could be taken into consideration by competent authorities when setting permit conditions.*"

We propose to grant the derogation requested by the Operator in respect to the BAT AEL value described in BATC 48, subject to the following conditions in the variation:

- Set an alternative ELV of 9,000 mg/Nm^3 (to ensure that TCL continue to optimise the current process and do not introduce any changes that would substantially increase CO emissions above the current levels)

The ELV is set at a level to allow some headroom above the highest reported result over the past five years (one CO sample result at A1 was 8,347 mg/m^3 in July 2014).

We are not setting an improvement condition due to the nature of this derogation. The Operator is not required to make improvements, as these have been implemented already and we consider that the Operator has already taken all reasonable steps to reduce emissions; the new emission limit will ensure current CO emission levels are maintained.

Annex 3: Improvement Conditions

Based on the information in the Operator's Regulation 60 Notice response and our own records of the capability and performance of the installation at this site, we consider that we need to set improvement conditions so that the outcome of the techniques detailed in the BAT Conclusions are achieved by the installation. These improvement conditions are set out below - justifications for them is provided at the relevant section of the decision document (Annex 1 or Annex 2).

We also consider that we need to set improvement conditions relating to changes in the permit not arising from the review of compliance with BAT conclusions. The justifications for these are provided in Annex 5 of this decision document.

If the consolidated permit contains existing improvement conditions that are not yet complete or the opportunity has been taken to delete completed improvement conditions then the numbering in the table below will not be consecutive as these are only the improvement conditions arising from this permit variation.

Completed Improvement conditions:
The following table lists the improvements conditions deemed complete; these are being removed from the permit. The permit now contains improvement conditions commencing at number IC14, with the exception of the pre-existing ICs 6 and 7.

Table S1.3 Improvement programme requirements

Reference	Requirement	Date
IC1	The Operator shall provide and submit a project plan setting out how releases of NOx in the exhaust gases from cement kiln K1 (emission point A20, table S3.1) will be minimised and at least reduced to <450 mg/m^3 as a daily average by the target date of 30th June 2014. The project plan will be based on consideration of costs and benefits of all relevant options and using options appraisal methodology H1 or equivalent.	**Deemed complete 29 Oct 2013**
IC2	The operator shall produce and submit a project plan setting out how releases of particulates from all significant non-kiln sources will be minimised and at least reduced to <10 – 20 mg/m^3 as a daily average by the target date of 30th June 2014. The project plan will be based on consideration of costs and benefits of all relevant options and using options appraisal methodology H1 or equivalent.	**Deemed complete 29 Oct 2013**
IC3	The operator shall carry out an exercise, agreed in writing with the Environment Agency, to characterise the releases of NOx, Particulate Matter, CO and SO_2 in the exhaust gases from the shaft lime kilns and hydrators (activity references A4 – A11 and A13, table S1.1), and submit a risk-based plan describing any changes to monitoring arrangements that will be taken including consideration of installing continuous monitors, or more frequent periodic monitoring as described in the Sector Guidance Note for the Lime Sector (How to comply with your environmental permit – Additional guidance for The Lime Industry EPR 3.01b).	**Deemed complete 29 Oct 2013**
IC4	The operator shall produce and submit a project plan setting out how releases of CO in the exhaust gases from the lime kilns (emission points A1, A2 and A19, table S3.2) will be minimised and at least reduced to less than 500 mg/m^3 as a daily average by the target date of 30th June 2014. The project plan will be based on consideration of costs and benefits of all relevant options and using options appraisal methodology H1 or equivalent.	**Deemed complete 29 Oct 2013**
IC5	The operator shall submit an evaluation report to the Environment Agency on the technical evaluation programme for using Calfuel on cement kiln K1. The report shall:-	**Deemed complete 8 Nov 2013**

Table S1.3 Improvement programme requirements		
	Demonstrate that the use of Calfuel on a permanent basis (in the manner and at the levels proposed) represents the use of Best Available Techniques. Assess the environmental performance with a comparison of emissions with (and without) using Calfuel. Data obtained in previous technical evaluations of alternative fuels in the kiln may be included for comparison.	
IC9	The Operator shall submit a written report to the Environment Agency for approval. The report must contain the results of a review of the emissions of sulphur dioxide from emission points A1 and A2, and propose an emission limit which is within the BAT Associated Emission Level range of <50-200mg/Nm3. The report shall also include an impact assessment of the emissions of sulphur dioxide from the installation as a whole, demonstrating that emissions at the proposed limit will not cause significant pollution from the Installation.	**Deemed complete 27 Aug 2014**
IC10	The Operator shall submit a written plan to the Environment Agency for approval. The plan must contain proposals for minimising carbon monoxide emissions from emission point A20, table S3.1 to less than 2,200 mg/m3. A timetable for implementing such proposals shall be included within the report The notification requirements of condition 2.4.2 will be deemed to have been complied with on submission of the plan. The Operator shall implement the plan as approved, and from the date stipulated by the Environment Agency	**Deemed complete 29 Oct 2013**
IC11	The Operator shall submit a report to the Environment Agency following the commissioning and optimisation of the ammonia solution-based SNCR system at cement kiln K1. The report shall assess the environmental performance of cement kiln K1 with a comparison of emissions with (and without) SNCR. The assessment shall have specific regard to the emissions of NOx, carbon monoxide (CO) and total ammonia (NH_3) in the exhaust gases from K1 (emission point A20, Table S3.1) and how they will be minimised and at least reduced to <450mg/m^3 (NO_x) and <40-50 mg/m^3 (NH_3) as daily averages. The assessment shall also have regard to the variation in NH_3 emissions when the raw mill is not operational and how these emissions will be minimised.	**Deemed complete 19 Feb 2015**
IC13	The Operator shall carry out an assessment of the impact of emissions to air from the Installation based on actual (un-corrected) monitoring data. A report on the assessment shall be made to the Environment Agency. Emissions monitoring data obtained during operation shall be used to compare the actual emissions with those assumed in the impact assessment submitted with this application EPR/XP3534UY/V009. The assessment shall have specific regard to the impact at the Peak District SAC by comparison of process contributions with the relevant critical levels and loads. In the event that the assessment shows that critical levels and loads can be exceeded as a result of emissions from the Installation, the report shall include proposals for further investigative work.	**Deemed complete 2016**

Superseded Improvement conditions:

The following IC is removed from the permit as its requirements have been superseded by the use of the MPA Code of Practice, which was incorporated into the permit through variation EPR/XP3534UY/V010, Jan 2015:

IC12	The Operator shall submit a report to the Environment Agency following the commissioning and optimisation of WTRG in the main burner on cement kiln K1. The report shall assess the environmental performance of cement kiln K1 with a comparison of emissions (emission point A20, Table S3.1) with (and without) WTRG in the main burner.	Within 6 months of the completion of commissioning of WTRG in the main burner.

The following IC is removed as its requirements have been superseded by the implementation of IED and publication of the BAT conclusions. The IC relates to the unbuilt second cement plant and new plant is now required to meet the mandatory standards (BAT-AELs) within the BAT conclusions. An additional requirement to provide evidence of compliance with BAT-AELs is now included within retained IC6 (see below):

IC8	The Operator shall provide a report to the Environment Agency showing monitoring results for Cement Kiln K2 (following 12 months of operation) in comparison to the BAT emission level values listed within Annex 1 of 'How to comply with your environmental permit – Additional guidance for The Cement Industry (EPR 3.01a)'. Where any variances occur to BAT levels (including the lowest value where a range is specified), the Operator shall provide either :- a timetable for the implementation of improvements in order to comply with the lowest value (or value within such range) for BAT emission levels, or justification for not meeting such levels. The report shall be submitted for written approval from the Environment Agency.	Within 16 months from the commencement of cement and clinker production on cement kiln K2.

Retained Improvement conditions:

The following improvement conditions are retained within the permit as they relate to the unbuilt second cement kiln, and are still required. An additional line (shown in bold) is included to ensure that the operator demonstrates that emissions meet the required standards:

IC6	Following commissioning of cement kiln K2, the Operator shall supply a commissioning report detailing performance against the plan submitted in accordance with pre-operational measure PO3, table S1.4. The report shall include: • A demonstration that the plant complies in full with the requirements of ch IV of the IED; • Details of any abnormal waste generated as a result of commissioning; • Details of any modifications made to the process during commissioning that change the details included in the application. • A full record of monitored emissions from the installation during commissioning. Where emissions exceed stated limits, the reasons for this should be stated and what action was taken to correct matters. • **Evidence that emissions comply with all relevant BAT-AELs;** • A report on the noise assessment carried out.	Within 4 months from the end of commissioning of cement kiln K2.
IC7	The Operator shall carry out an assessment of the impact of emissions to air of Arsenic and Chromium (VI) having regard to the 2009 report of the Expert Panel on Air Quality Standards – Guidelines for Metal and Metalloids in Ambient Air for the Protection of Human Health. The assessment shall predict the impact of Arsenic and Chromium (VI) against the guidelines through the use of emissions monitoring data during the first year of operation and air dispersion modelling. A report on the assessment shall be submitted to the Environment Agency.	Within 15 months from the commencement of cement and clinker production on cement kiln K2.

New Improvement conditions:

As a result of the permit review, there are 21 dust emission points listed in permit table S3.2 which weren't previously included. These all have a volumetric emission rate of >10,000 Nm^3/hr, and are required to have an (as a minimum) annual compliance check to ensure that each comply with the BAT-AEL of <10 mg/Nm^3. The Operator has indicated¸ in a response to the draft permit, that the majority of these emission points cannot be tested because they either do not conform to the MCERTS requirements or there is no access for sampling. We are therefore setting an improvement condition to assess every new emission point for the feasibility of enabling monitoring to be carried out. The work should assess the size and nature (eg intermittent/continuous) of the dust emission and prioritise the larger releases for any modifications required to ensure MCERTS monitoring can be carried out.

The operator shall investigate the feasibility of installing monitoring access to and/or modifying the ductwork of dust emission points A30 to A50 to enable MCERTS monitoring of emissions to be carried out at each point. The operator shall assess each emission point and produce a risk-based plan of modifications with the aim of ensuring that MCERTS monitoring can be carried out. The plan shall prioritise the larger and more significant dust emission points. For any emission points where MCERTS monitoring is not proposed, the operator shall provide justification for why and propose an alternative means for demonstrating compliance with the limit of 10 mg/Nm3. A report detailing the assessment of each dust emission, the plan for modifications, timescales and any alternative compliance assessments shall be submitted to the Environment Agency for written approval. The plan shall be implemented upon approval by the Environment Agency,	4 months from permit issue

During the permit review, the operator highlighted potential issues with the monitoring of TOC from PFRKs (emission reference A19 at Tunstead) due to the cyclical nature of the process. An IC is set to allow further work by the operator to establish a reliable technique for monitoring.

The operator shall provide a report summarising an investigation into the factors affecting the uncertainty of TOC measurements from PFRK kilns. The investigation shall consider the practical application of the relevant standard when dealing with cyclical process associated with PFRK operation. Where appropriate, the operator may undertake stack sampling outside normal compliance testing to further the investigation. The final report may suggest adjustments to the method to ensure uncertainties can be minimised.	4 months from permit issue

An IC is set following the approval of the derogation request, to require the Operator to report on progress towards meeting the BAT-AEL, and specifically following the completion of step 1 as to whether the second step (extend or replace the bag filter) is planned.

The operator shall submit a report to the Environment Agency (for approval in writing) detailing progress towards compliance with BAT conclusion 18, which sets a BAT-AEL for dust emissions from cooling and milling processes abated by fabric filters of <10mg/Nm^3 (daily average or average over the sampling period), for which a derogation has been requested and granted at emission reference A21, the K1 clinker cooler. The report shall include, but not be limited to, the following: 1. current performance of the A21 bag filter against the BAT-AEL; 2. the intention to make further investment (if required) to achieve compliance; 3. any alterations to the initial plan, together with proposals for amended timescales.	31/03/18

An IC is set to require the Operator to investigate whether water infiltrating to ground from the 3 permitted release points is having an impact on groundwater. These release to underground strata as there are few above ground water bodies in this area of fissured limestone. There are two settlements lagoons, W1 and W2, and a release from the settlement tank for the vehicle wash. B Pond lagoon is used in the management of surface water at the Quarry and contains visible settled lime or limestone sediment. It appears a bright aqua colour. A one-off pH dip test indicated that the pH of the standing water was fairly high, at pH10.5. Historically, monitoring is required only if discharging for >12 hours per week, and consequently no sampling has been done for at least ten years.

The PPC application states that the settlement lagoons are designed as soakaways, therefore we assume that there will be some infiltration direct from the ponds (not via the overflow) which cannot be sampled. There have been issues with hyper-alkaline groundwater further up the valley. We wish to confirm that these discharges are not having an impact on groundwater.

Following review of the improvement condition submission, we can review the monitoring requirements within the permit. If the report concludes that there is no impact, water monitoring requirements can be removed from the permit.

The Operator shall undertake a geochemical assessment of the impacts from lagoon water infiltration at emission points W1, W2 and W3 as it infiltrates through the unsaturated zone, and any impacts / potential impacts upon the quality of underlying groundwater. The assessment shall include, but not be limited to, either of the following: • groundwater quality sampling with analysis for pH, conductivity, major ions, hardness, alkalinity and nitrate, OR • review equivalent data (not older than 2010) with a minimum of 6 samples taken over a 12 month period and including samples from each season of the calendar year, for the parameters listed above. If the assessment indicates that an impact on groundwater may occur, then the report shall propose further improvement works (such as hydrogeological risk assessments and/or a scheme to treat lagoon water) to be implemented within 12 months (or other timescale as proposed within the report). A report detailing the findings of the assessment shall be submitted to the Environment Agency for written approval.	18 months from permit issue

Pre-operational conditions:

The 3 pre-operational measures, PO1 to 3 relating to the unbuilt second cement kiln and associated plant are retained, largely unchanged. Activity references have been included so that it is clear to which measures the conditions apply.

New Pre-operational conditions:

A new pre-operational condition has been included within the permit to require the Operator to review the impact assessment and confirm that it is still appropriate for operation of two cement kilns, prior to the second cement kiln being commissioned.

The operator submitted information in relation to the BATC 18 derogation indicating that the capacity of the cement kiln K1 was to be increased. This is not of immediate concern because the latest impact assessment included emissions from the unbuilt second cement kiln, so an increase in emissions from K1 will not result in an exceedance of the modelled emissions. However, this may not be the case by the

time K2 is built, and this pre-operational condition seeks to confirm that the emissions from the site with two cement kilns operational will not exceed those modelled for impact assessment, and if they do, to undertake a further assessment of the impacts on the nearby sensitive ecological sites.

PO4	Prior to commissioning of AR2, the operator shall consider the existing impact assessment / air dispersion modelling report for the Installation, and confirm the following in writing to the Environment Agency: • That the clinker production rates, effective volumetric flow rates and emission rates used in the modelling reflect current maximum or any future planned increased clinker production, volumetric flow and emission rates. • The maximum total annual emissions of oxides of nitrogen, ammonia and sulphur dioxide modelled. • That the assessments were undertaken using uncorrected emission data (rather than emissions data calculated to standardised reference conditions and before IED chapter IV confidence correction was applied). • That the sensitive receptors and other factors such as environmental standards / targets, as included within the dispersion modelling report, remain relevant. Where any of the above identify variances to the conditions used within the impact assessment / air dispersion modelling, then the Operator shall undertake a new impact assessment / air dispersion modelling for all emissions to air from the Installation (as listed within tables S3.1 and S3.2) in order to confirm all impacts as acceptable. The Environment Agency may revise the limits within table S3.1 and/or impose annual limits following completion of this improvement condition.

Annex 4: Advertising and Consultation on the draft decision

This section reports on the outcome of the public consultation on our draft decision carried out between <insert date> and <insert date>.

The draft decision record and associated draft Consolidated Variation Notice was published and made available to view on .Gov website between the dates detailed above.

Summary of responses to consultation and the way in which we have taken these into account in the determination process.

Response received from
Brief summary of issues raised
Summary of actions taken or show how this has been covered

Annex 5: Review and assessment of changes that are not part of the BAT Conclusions derived permit review.

1. Permit transfer September 2016

During the period of the permit review, the Tunstead Quarry operator, then Tarmac Trading Limited, applied for a (limited change of management) transfer of the permit to Tarmac Cement and Lime Limited. The transfer was issued on 13 September 2016. This has also changed the permit reference number from EPR/XP3534UY to EPR/XP3532DP. The new operator submitted a letter, on 19 October 2016, taking ownership of all previous submissions in relation to the Regulation 60 Notice response and derogation requests. The following were all submitted by the previous operator and are now considered valid for the new operator:

- Regulation 60 Notice response
- Additional information in response to the Reg 60 Notice
- All information provided in relation to the Lime derogation request (BATC 48)
- The cement plant derogation request (BATC18)

Refer to the Status log table within the permit Introductory Note for specific dates of the submissions.

2. Change of Installation name

The installation name has been changed from Tunstead Quarry to **Tunstead Cement and Lime works**, in order that the name reflects the activities for which the site is permitted, as well as the location. This is in line with our approach to designating installation names.

3. Introductory Note

The installation description has been updated to a consistent format applied across the cement and lime sector. We have included additional information such as the installation NGR, kiln production capacity, details of process wastes and emissions to air and water, and local sensitive receptors.

4. Permit conditions

Condition 2.1.2 AR13 Gas Engines

Four 8MWe gas engines are permitted as part of the second cement kiln plans. As these have an aggregated thermal input >50MWth, they fall under chapter III of IED. Operators of unbuilt large combustion plant were given the option of deferring the ChIII IED permit review (which was completed for all operational Large Combustion Plants by 31 December 2014), and Tarmac chose this option (confirmed by email on 12 January 2015). Condition 2.1.2 has been included in the permit to ensure that, should the gas engines be built, the operator obtains a permit which complies with the requirements of IED chapter III prior to commissioning of the plant.

Condition 2.3.4(c) and 2.3.16

These are new standard template conditions for all sites using waste.

Section 3.6 Fire Prevention conditions

Conditions 3.6.1 & 2 are now standard template conditions for all installations that store combustible wastes. New installations storing combustible wastes are required to have an FPP in place. For existing installations, there is no automatic requirement to submit an FPP when a permit is varied or as a result of a permit review, however an FPP will be required under certain conditions, eg if there is a fire at the installation, or a change on site which increases the risk of a fire.

5. Schedule 1

Changes to Table S1.1

We have reviewed Table S1.1 for all CLM sector permits, to ensure these accurately reflect the activities on each site.

We have reviewed and revised the Tunstead permit Table S1.1, specifically:

- Amended the kiln activity description to reflect EPR Sch 1 activity wording,
- Revised the listed activities, to include additional part A(2) and (B) activities,
- Added Directly Associated Activities (DAAs) to ensure that all activities (listed and non-listed) at the installation are included,
- Amended the Limits of Specified Activity for all activities to ensure they are clearly defined,
- Re-assigned Activity Reference numbers, now "ARnn" to listed and directly associated activities,
- Due to the number of listed activities, these are now grouped and labelled as "Cement-related", "lime-related" or "Other".

The amended Table S1.1 is reproduced below with new and revised text identified by shaded sections:

Table S1.1 activities			
Activity ref	**Activity listed in Schedule 1 of the EP Regulations**	**Description of specified activity**	**Limits of specified activity**
Cement-related activities:			
AR1, AR2	Section 3.1 Part A(1)(a)	Producing cement clinker in rotary kilns with a production capacity exceeding 500 tonnes per day or in other kilns with a production capacity exceeding 50 tonnes per day.	Kilns K1 and K2 From the transport of raw materials and fuels from bulk storage, the preparation (including blending of raw materials listed in table S2.1, in order to produce raw meal) and feeding of all materials into the kiln systems K1 and K2, through to discharge of cooled clinker to clinker storage. Includes emissions to air from the main stack and other process vents and associated abatement.
AR3	Section 3.1 Part A(2)(a)	Grinding cement clinker	The transport of clinker, including imported clinker, from clinker storage and handling of raw materials from bulk storage, through milling and blending to storage of cement, including emissions to air from the mill stacks and other process vents and associated abatement.
AR4	Section 3.1 Part B(a)	Storing, loading or unloading cement or cement clinker in bulk prior to further transportation in bulk.	Storage and dispatch of cement clinker and cement in bulk by road or rail.
AR5	Section 3.1 Part B(b)	Blending cement in bulk or using cement in bulk other than at a construction site, including the bagging of cement and cement mixtures, the batching of ready-mixed concrete and the manufacture of concrete blocks and other cement products.	Blending and bagging of cement, through to storage and loading for dispatch by road, including associated releases to air.
Lime-related activities:			
AR6 – AR10	Section 3.1 Part A(1)(b)	Producing lime in shaft kilns 1 – 8 with a production	From bulk storage of lime kiln feed stone, any preparation then feed of limestone and fuel

Table S1.1 activities			
Activity ref	**Activity listed in Schedule 1 of the EP Regulations**	**Description of specified activity**	**Limits of specified activity**
		capacity of more than 50 tonnes per day. Maximum of five kilns permitted to operate at any one time.	into the kilns, through to intermediate storage of lime product prior to further processing or dispatch by road. Includes releases to air from stack and process vents and associated abatement
AR11	Section 3.1 Part A(1)(b)	Producing lime in the parallel flow regenerative (PFRK) kiln with a production capacity of more than 50 tonnes per day	From bulk storage of lime kiln feed stone, screening, washing and feed of limestone and fuel into the kiln, through to intermediate storage of lime product prior to further processing or dispatch by road. Includes associated releases to air from the main stack and other process vents and abatement.
A12	Section 3.1 Part B(c)	Slaking lime for the purposes of making calcium hydroxide.	From lime storage to the production of dry calcium hydroxide and milk of lime by hydration (including the addition of any additives), and the associated releases to air from the stacks and other process vents.
Other activities:			
AR13	Section 1.1 Part A(1)(a)	Burning any fuel in an appliance with a rated thermal input of 50 or more MW	From the receipt of natural gas to the generation of electrical power in four 8MWe gas engines (with an aggregated thermal input greater than 50MWth) for use on-site.
	Directly Associated Activity		
AR14	Raw materials storage and handling	Raw materials receipt, transport, preliminary preparation and bulk storage	From the recovery of limestone from the quarry floors, the crushing, washing and screening, and the receipt on site of other raw materials including alternative raw materials, through to bulk storage.
AR15	Fuels storage and handling	Delivery and bulk storage of fuels	Offloading of waste-derived and fossil fuels, and transfer to bulk storage
AR16	Clinker and lime import	Bulk import of cement clinker by road and rail, and lime by road	Offloading of cement clinker and lime imported to site by road and rail and transfer to storage.
AR17	Waste storage and handling	Waste storage and handling	From waste generation arising from cement and lime processes, handling, storage and monitoring through to dispatch off site.
AR18	Lime storage and milling	Lime product handling, storage and milling	Milling of lime, including addition of grinding aids, and associated releases to air.
A19	Lime products handling, storage, packing and dispatch	All lime, hydrated lime and milk of lime blending, packing and loading.	From receipt of lime products from the kilns, mills and hydrators through storage, bagging and loading to the dispatch offsite by road, including associated air releases.
AR20	Water discharge to controlled water	Discharge of site drainage and process water from settlement lagoons	Collection and treatment of surface water drainage and process water, including reuse in site activities, through to discharge to groundwater by infiltration from settlement lagoons.

Listed Activities – producing cement clinker and grinding cement clinker:
Until this review, Cement and Lime permits listed the activity Section 3.1 Part A(1)(a) as ***producing and grinding cement clinker*** in accordance with the Environmental Permitting Regulations **2010**, which stated the following:

Part A(1) *(a) Producing cement clinker or producing and grinding cement clinker.*

(b) Producing lime—

(i) in kilns or other furnaces with a production capacity of more than 50 tonnes per day;

or

(ii) if the activity is likely to involve the heating in any 12-month period of 5,000 or more tonnes of calcium carbonate or calcium magnesium carbonate or both in aggregate.

Part A(2) *(a) Unless falling with Part A(1) of this Section, grinding cement clinker.*

(b) Unless falling within Part A(1) of Section 2.1 or 2.2, grinding metallurgical slag in plant with a grinding capacity of more than 250,000 tonnes in any 12-month period.

Part B *(a) Storing, loading or unloading cement or cement clinker in bulk prior to further transportation in bulk.*

(b) Blending cement in bulk or using cement in bulk other than at a construction site, including the bagging of cement and cement mixtures, the batching of ready-mixed concrete and the manufacture of concrete blocks and other cement products.

Under the EPR 2010, the activity 3.1 **A(2)(a)** covers only the grinding of cement clinker where this is undertaken at a different location from that of clinker production. In 2013, the Regulations were amended and moved the activity of grinding cement clinker to Section 3.1 Part **A(2)(a)** regardless of where the grinding takes place; .

Part A(1) *(a) Producing cement clinker in rotary kilns with a production capacity exceeding 500 tonnes per day or in other kilns with a production capacity exceeding 50 tonnes per day.*

(b) Producing lime or magnesium oxide in kilns with a production capacity of more than 50 tonnes per day.

Part A(2) *(a) Grinding cement clinker*

(b) Activities deleted by EPR amendment SI 2013 No. 390.

Part B *(a) Storing, loading or unloading cement or cement clinker in bulk prior to further transportation in bulk.*

(b) Blending cement in bulk or using cement in bulk other than at a construction site, including the bagging of cement and cement mixtures, the batching of ready-mixed concrete and the manufacture of concrete blocks and other cement products.

In Tunstead's previous permit, cement grinding was included as part of the listed activity S3.1 A(1)(a). Table S1.1 has now been revised to reflect the legislative changes; the 3.1A(1)(a) activity covers producing cement clinker only and an additional activity 3.1A(2)(a) has been included to cover all grinding activities.

We are assigning **one** A(2) activity (reference AR3), for clinker grinding at this installation, to cover all cement mills processing clinker manufactured on site and imported. The Regulations do not define capacity or aggregation rules for 3.1A(2)(a) and having consulted EA permitting guidance, including RGN2 Appendix 2, we consider that multiple cement mills do not operate entirely independently and we can therefore regard them as one activity, incurring one part A(2) fee. Regarding each mill as a separate A(2) activity would increase charges per site in a manner disproportionate with the regulatory effort required.

There is however, one 3.1A(1)(a) activity for each kiln with a production capacity above the listed threshold of 500 t/d, which for Tunstead works is two (activity ref AR1 and AR2).

An additional part B activity is now included (activity AR4) for Storing, loading or unloading cement in bulk following the Regulations' amendment. This covers bulk storage of clinker and cement and loading into road and rail tankers (bulk transport). This activity is not covered by any other activity (listed or directly associated) following amendments to the Regs and is listed as a part B in its own right.

Other changes to Table S1.1:
Previously Tbl S1.1 contained only three DAAs; for cement storage, blending, packing & loading (now a part B activity), for lime storage and milling, and for lime blending, packing and loading. In line with our RGN2 guidance, the following activities have been included as DAAs, in order to ensure all appropriate activities at the installation are covered:

- Raw materials storage and handling (AR14),
- Fuels storage and handling (fossil and Waste derived) (AR15),
- Clinker and lime import (AR16),
- Waste storage and handling (AR17)
- Discharge to controlled waters (AR20).

We have revised the Limits of Specified Activity descriptions, to ensure that the activities are clearly defined.

Changes to Table S1.2 Operating Techniques:
Some "Date Received" dates have been changed to reflect when documents were received, rather than the variation duly made date.

6. Schedule 3 Emissions

Table S3.1 has been extended to include emissions from the lime kilns, A1, A2 and A19. In the previous permit, these were listed in Table S3.2 (non-kiln point source emissions).

Table S3.1 Cement kiln CO ELV c/f BATC 23
The BAT conclusions do not prescribe a BAT-AEL for CO emissions, neither does IED Annex VI, which states that "*The competent authority may set emission limit values for CO"*. Tunstead's cement plants have had CO limits of 3,000mg/m^3 (K1) and 2,200mg/m^3 (K2). The limit for K1 was due to be reviewed following submission of IC11 (Dec 14) in line with footnote 2 in Variation V010. We have reviewed the IC11 submission and reported CO emissions (confidence corrected) since 2014, and concluded that there is not excessive headroom with the current limit of 3,000 mg/m^3 at A20; CO emissions in early 2015 peaked at >2,000mg/m^3. The existing CO limits will be retained for both A20 and A24.

Table S3.1 Cement kiln TOC ELV (c/f BATC 24)
The BAT conclusions do not prescribe a BAT-AEL for TOC emissions, instead Annex VI of IED applies. This gives a limit of 10 mg/Nm^3 and a derogation can be granted where TOC emissions do not result from the co-incineration of waste. Tunstead's ELV has been 110 mg/m^3 since the kiln was permitted to take the first Waste Derived Fuel (tyre chips) in Aug 2006. Reported emissions (confidence corrected) are typically between 10 and 20 mg/m^3 (daily average), with peaks of up to 30 mg/m^3. We are reducing the ELV to 100 mg/Nm3 to remove excessive head room. A review of reported TOC emission data over the past 4 years indicates that a limit of 100 mg/Nm^3 retains satisfactory headroom without jeopardising compliance.

Table S3.2 Lime shaft kilns SO_2 ELV (c/f BATC 47)
In recent permit variations, there has not been an SO_2 ELV for the shaft kilns. A limit was set in the 2010 permit review, however there were compliance issues and it was later removed, with an improvement condition set to conduct monitoring and propose a new limit. This IC was duly completed and assessed by the EA; we concluded that an SO_2 limit of 200mg/Nm^3 would be set during this permit review. This limit is in line with the upper end of the BAT-AEL range of <50-200 mg/Nm^3, and should not pose

any compliance issues as periodic monitoring results submitted since 2010 are below this level. SO_2 emissions are higher from the shaft kilns than the PFRK due to the design of the kiln process; there is no contact between the stack gases and calcined stone.

Table S3.3 Emissions to water:
Grid references of the emission points to water are now included. The monitoring requirements in Table S3.3 should be reviewed following improvement condition IC16.

Table S3.4 Annual Limits:
Table S3.4 is retained within the permit although no limits are set. Due to the location of Tunstead works, with numerous sensitive ecological receptors nearby, it is likely that annual emission limits will be imposed at a later date, to control total emissions and prevent a creeping increase of emissions beyond the level modelled for impact assessment. This is not an issue while cement kiln K2 remains unbuilt, however it will be an issue once this is brought into operation, hence we have set a pre-operational condition, PO4, to require the Operator to confirm that the impact assessment is still valid for maximum production capacity prior to K2 being brought into operation, and it is recommended that total annual emission limits are set on completion of this condition.

Table S3.6 Process Monitoring requirements
Some changes have been made to this table. Refer Key Issues section 2d for details.

7. <u>Schedule 6 Interpretation</u>
Schedule 6 has been revised to remove interpretations which are no longer relevant, amend existing and introduce new ones, such as definitions relating to use of waste. The monitoring reference conditions are updated in line with the BAT conclusions (refer Key Issues section)

Chapter IV abnormal operating conditions: "abnormal operating conditions" has been prefixed with "chapter IV" to emphasise that these conditions relate to specific circumstances outlined in IED ch IV, for plants burning waste derived fuels. Prior to IED, this was termed "WID abnormal operating conditions".

Chipped tyres: included to clarify that this type of WDF includes shredded rubber conveyor belts.

Kiln start up: this is revised in line with the current definition for start up of cement kilns. We are now allowing an option to calculate the first daily average emission value using the 24 hour period after the end of kiln start up (ie when the kiln reaches a pre-determined feed rate). This is to avoid the anomaly which allowed for a daily average emission to be calculated from only a few hours of data if start up was achieved late in a 24 hour period, when emissions may still be higher than typical. Emissions may take a while to stabilise as feeding of WDFs can only commence after start up is complete. Higher emissions initially are compensated for over a 24 hour period, with lower emissions once kiln stability is established, however this cannot be the case if only a few hours are used to derive a 24 hour period, leading to possible compliance issues.

Lime product definitions: the interpretation now includes definitions for Lime, Lime products and Slaked Lime.

The following interpretations have been removed:

- “extended start up period”
- “operation at reduced feed”

This is following the introduction of the revised Kiln Start-up definition, and to ensure compliance with IED ch IV.

8. Site condition and IED compliance

Question 4 of the Regulation 60 Notice requested provision of information relating to site condition, to ensure that the requirements of IED article 22(2) are fulfilled.

The Operator provided a summary report as part of their response to the Notice, submitted 8 January 2015, which referred to an original site condition report (dated August 2000) submitted to the EA in August 2001 as part of the PPC application to provide a characterisation of site condition.

We have assessed the summary report, along with the original data and reports, and are satisfied that this information fulfils IED requirements for Tunstead Cement and Lime Works by providing an adequate baseline report.