Tata Steel Strip Products UK
Port Talbot Steelworks

HAA Application / Derogation Update / Permit Admin – Application for Variation to Permit EPR/BL7108IM
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Queries

Questions	By	Feedback/ Answer	By

EPA Vary Application form Part F1

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Glossary

AQMA	Air quality management area, a local authority's legally designated area – covering at least the areas at which air quality objectives are predicted to not be achieved and where public exposure is likely.
BAT – AEL	Best Available Technique – Associated Emission Limits
BAT	Best Available Techniques – see IPPC A Practical Guide or the Regulations for further definition
BCR	Benefit to Cost Ratio
BOD	
BOS	Basic Oxygen Steelmaking
BREF	Best Available Techniques – see IPPC A Practical Guide or the Regulations for further definition
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
COG	Coke Oven Gas
EA	Environment Agency
EIA	Environmental Impact Assessment
EPR	Environmental Permitting Regulations
EMS	Environmental Management System
ERA	Environmental Risk Assessment
ESP	Electrostatic Precipitator
EQS	Environmental Quality Standard
FPC	Factory Production Control
H_2S	Hydrogen Sulphide
IED	Industrial Emissions Directive
IPPC	Integrated Pollution Prevention and Control
KNNR	Kenfig National Nature Reserve
LSO	Long Sea Outfall
NOx	Nitrous Oxides
NRW	Natural Resources Wales
PM	Particulate Matter
PM10	Particulate Matter 10ug in size
PPC	Pollution Prevention and Control
QP	Quality Protocol
SAC	Special Area of Conservation
SO_2	Sulphur Dioxide
SSSI	Site of Special Scientific Interest
STC	Swindon Technology Centre (Tata Steel Europe Group Environment)
TSSPUK	Tata Steel Strip Products United Kingdom
WRAP	Waste & Resources Action Programme

1 Non-Technical Summary

About the Application

Tata Steel Strip Products UK (TSSP UK) currently holds an Environmental Permit (EP) under the Environmental Permitting Regulations (England and Wales) 2010 (EPR), reference BL7108IM for the operation of Port Talbot Steelworks. Specifically permit is for the operation of an integrated iron and steelworks located at Port Talbot in South Wales.

About the Operator

The operator is Tata Steel Strip Products UK, a division of Tata Steel Europe and part of Tata Group. Tata Steel Europe has manufacturing operations in many countries, with plants in the UK, the Netherlands, Germany, France, Norway and Belgium. Carbon steel is produced at two integrated steelworks, at Port Talbot in the UK and at IJmuiden in the Netherlands. Engineering steels are produced at Rotherham, UK.

About the Variation

In line with Tata Strip Products UK philosophy of creating a sustainable steel industry in Wales, it so proposed to develop a facility to divert waste from landfill is in an area referred to as the HAA. . At the HAA one of the principle waste types, steel slag, is treated to produce aggregates. Other waste types are also accepted and mechanically treated for recovery. Tata now wishes to include the operations at the HAA under the main site Permit through a Permit Variation application.

Alongside the HAA development, this variation also requests an update in derogation requests on sinter BAT-AEL (BAT 26), coke oven gas desulphurisation (BAT 48/49) and suspended solids discharges to sea via the Long Sea outfall

The final part of this variation detail administrative changes to the permit.

2 HAA Materials Recycling Facility

2.1 Non-Technical Summary

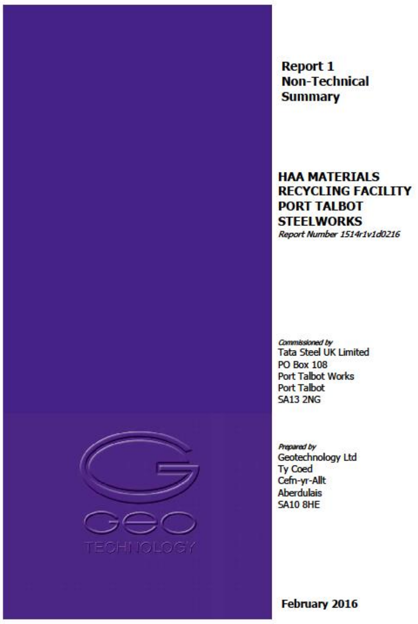
Tata Steel UK Ltd (Tata) operates a steelworks at Port Talbot. As part of the steel making process and operation of the installation, various types of waste are generated. Through development and implementation of many different measures aimed at reducing waste generation at source and recovering wastes, the amount of waste being landfilled has significantly reduced in recent years.

One of the facilities developed to divert waste from landfill is referred to as the HAA. At the HAA one of the principle waste types, steel slag, is treated to produce aggregates. Other waste types are also accepted and mechanically treated for recovery. Tata now wishes to include the operations at the HAA under the main site Permit through a Permit Variation application.

All of the wastes currently accepted at the HAA are generated at the steelworks in Port Talbot. However, similar wastes are also generated at other Tata facilities and Tata would like the Permit to offer the flexibility of accepting and treating these wastes from those other facilities. To take advantage of opportunities in the open market, Tata also requires the Permit to allow listed wastes to be accepted and treated from off-site sources and to offer aggregates for sale to the open market. Materials would also be processed to enable their recycling back into the steel making process.

This non-technical summary is intended to inform the application process.

Please click on the document below to open up the Non-Technical Summary related to the HAA operation.


Report 1
Non-Technical
Summary

HAA MATERIALS
RECYCLING FACILITY
PORT TALBOT
STEELWORKS
Report Number 1514r1v1d0216

Commissioned by
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Prepared by
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February 2016

2.2 Environmental Risk Assessment

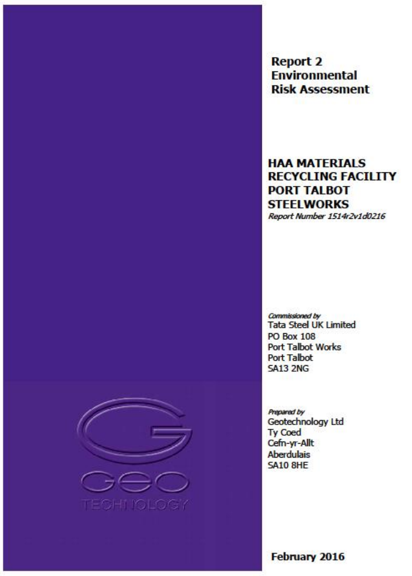
The development proposals seek to utilise previously developed land, known as the HAA, within the Steel Works installation boundary as shown on Figure 1. The proposals would enable Tata to receive and process waste on hardstanding to enable recovery and recycling.

As part of the Permit application Tata is required to describe the environmental risks posed by the proposals. The objective of this Environmental Risk Assessment (ERA) is to therefore establish the risks, if any, the proposed waste activities pose to the environment, human health or amenity issues of concern.

2.2.1 Context of Proposed Activities

This assessment adopts the principles underlying the H1 Environmental Risk Assessment approach set out by NRW. In this context, the digital H1 software tool, which has been developed to help consistently quantify the impact of proposed releases from regulated activities, has been used as a method of quantifying potential impacts on human and ecological receptors. The impacts are also described using a series of risk matrices, similar to those used by NRW for Standard Rules Permits and which form the cornerstone of ISO 14001 Environmental Management Systems. This latter approach is particularly valid at this site as the proposed operations and pollution control measures are the same as those considered acceptable by NRW under a range of Standard Rules Permits underpinned by generic risk assessments and the facility would be operated in accordance with a documented management system that will ultimately be accredited to ISO 14001. Within this context, the proposed activities could be considered conventional and the associated environmental risks familiar to NRW as they are the same as those proposed in several Standard Rules for materials recycling facilities.

Please click on the document below to open up the Environmental Risk Assessment related to the HAA operation.


Report 2
Environmental
Risk Assessment

HAA MATERIALS
RECYCLING FACILITY
PORT TALBOT
STEELWORKS
Report Number 1514r2v1d0216

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2.3 Summary Environmental Management System

Tata Steel (UK) Ltd wishes to recycle waste at the HAA Facility at their Steel Works in Port Talbot (see Figure 1 and Figure 2). The operation will principally involve the production of aggregates from steel slag and construction and demolition wastes, and the recovery of materials for recycling back into the steelmaking process. Such waste operations require a Permit from Natural Resources Wales (NRW). One of the conditions of holding such a Permit is that a written environmental management system (EMS) must be in place once the site is operational.

An Environmental Management System (EMS) is a structured system which, once implemented, helps an organisation to identify the environmental impacts resulting from its business activities. It also helps manage and reduce those impacts, so that the environmental performance of the organisation is improved. An EMS should provide a methodical approach to planning, implementing and reviewing an organisation's environmental management.

Under the Environmental Permitting Regulations, Tata is required to have an appropriate EMS in place while it is holding a Permit. The EMS must set out in detail, how all the activities relating to the Permit, and specifically waste management and pollution control will be managed.

At this stage of the application process, NRW require a summary of the management system to be in place when the site is operational. By the time the Permit is issued, NRW will expect Tata to have the management systems in place as it will be part of the first NRW site inspection.

Central to the EMS will be a set of Procedures and Standard Forms which will need to be implemented when the site is operational. In this summary EMS, the range of procedures that will be required are detailed and the type of forms that will be implemented provided.

As Tata will process waste to produce aggregates in accordance with Quality Protocols, a Factory Production Control system will also be in place when the site is operational.

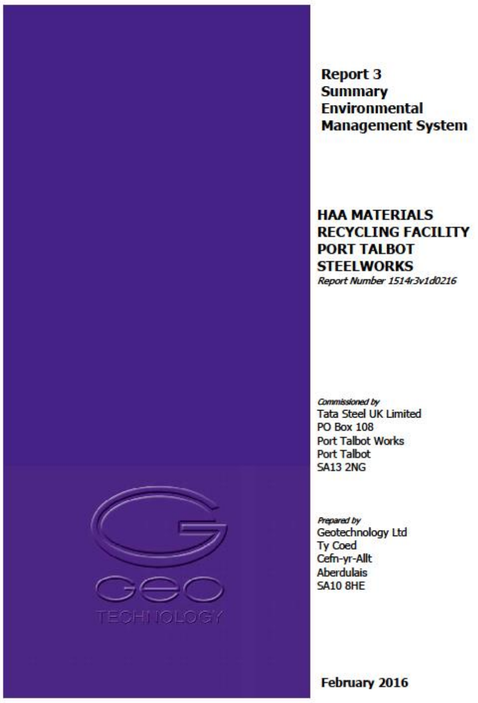
2.3.1 Objectives

Tata already successfully operates an integrated management system produced to achieve the benefits from management system standards ISO 9001:2008 and ISOO 14001:2004.

The EMS that will ultimately be in place covering the proposed operations at the HAA will be aligned with these standards. This site specific EMS does not attempt to duplicate the procedures already documented in the integrated company EMS and which will also ultimately apply at the site.

Rather, this summary EMS outlines the measures that will be adopted to ensure that the management of the waste is being controlled and risks to the environment managed.

Please click on the document below to open up the Summary Environmental Management System related to the HAA operation.



Report 3
Summary
Environmental
Management System

HAA MATERIALS
RECYCLING FACILITY
PORT TALBOT
STEELWORKS
Report Number 1514r3v1d0216

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February 2016

3 Derogation Update

3.1 Sinter Plant De-Dust – BAT conclusion 26. Justification of delay in achieving BAT AEL for sinter plant secondary emissions at Port Talbot integrated steelworks

The new Environmental Permit for Port Talbot steelworks issued by Natural Resources Wales (NRW) on 20th April 2015 includes a time-limited derogation from the requirement to achieve the BAT-AEL for secondary emissions from sinter strand discharge, sinter crushing, cooling, screening and conveyor transfer points (BAT 26). This derogation was granted on the basis that making improvements to the existing electrostatic precipitator to consistently achieve the BAT-AEL by the default date of March 2016 would be disproportionately costly compared to delaying the improvements to the autumn of 2016 to coincide with a planned sinter plant stoppage to refurbish the sinter cooler.

However, it is now evident that the sinter cooler requires more extensive remedial work than originally envisaged and the budget and timescale for this project have therefore increased significantly. In order to maintain the synergies and cost savings of undertaking major work on the secondary dedusting abatement and the sinter cooler during a single lengthy stoppage, it is now proposed to further delay improvements to sinter plant dedusting.

Article 15(4) of the Industrial Emissions Directive (IED) allows NRW to set Emission Limit Values that are less strict than the levels associated with the use of the Best Available Techniques (BAT-AELs) only in cases where achieving the BAT-AELs 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.

In February 2013 Defra, in conjunction with the Welsh Government, issued guidance[1] on the application of the IED and paragraph 4.41 outlines some technical characteristics that may justify a derogation, including the following that are relevant to the secondary dedusting project at Port Talbot sinter plant:

- ❑ <u>The configuration of the plant on a given site, making it more technically difficult and costly to comply</u>
    - Until the sinter cooler is operating effectively, the need to spray water onto the sinter on occasion to effect additional cooling may lead to technical difficulties with the proposed new bag filter as high humidity air is drawn into the extraction system around the cooler. If a bag filter were to be installed prior to the sinter cooler improvements, there is a significant risk that the high humidity would cause the bags to blind, reducing the efficiency of extraction, or in the worst case causing significant damage to the bag filter.
- ❑ <u>The practicability of interrupting the activity so as to install improved emission control</u>

[1] Environment Agency, "Industrial Emissions Directive EPR Guidance on Part A installations", February 2013; www.gov.uk/government/uploads/system/uploads/attachment_data/file/221044/pb13898-epr-guidance-part-a-130222.pdf

  - Interrupting sinter production on two separate occasions leads to significantly greater costs than combining the stops to undertake major work on the secondary dedusting abatement and the sinter cooler simultaneously.
- The effect of reducing the excess emissions upon other pollutant emissions
  - A positive consequence of the proposed delay is that the extra time will allow the existing electrostatic precipitator (ESP) for sinter plant secondary dedusting to be replaced by a new bag filter, rather than refurbishing the existing ESP as would be the case if the improvements had to be achieved by March 2016. In the long term this will result in more effective abatement and lower dust emissions to the environment from the installation as a whole.

The following sections demonstrate that implementation of BAT 26 by March 2016, rather than delaying to coincide with the sinter cooler scheme, would lead to disproportionately higher costs compared to the environmental benefits.

3.1.1 Best Available Techniques and associated emission levels

BAT is to prevent dust emissions and/or to achieve an efficient extraction and subsequently to reduce dust emissions by using a combination of the following techniques:

1. hooding and/or enclosure
2. an electrostatic precipitator or a bag filter.

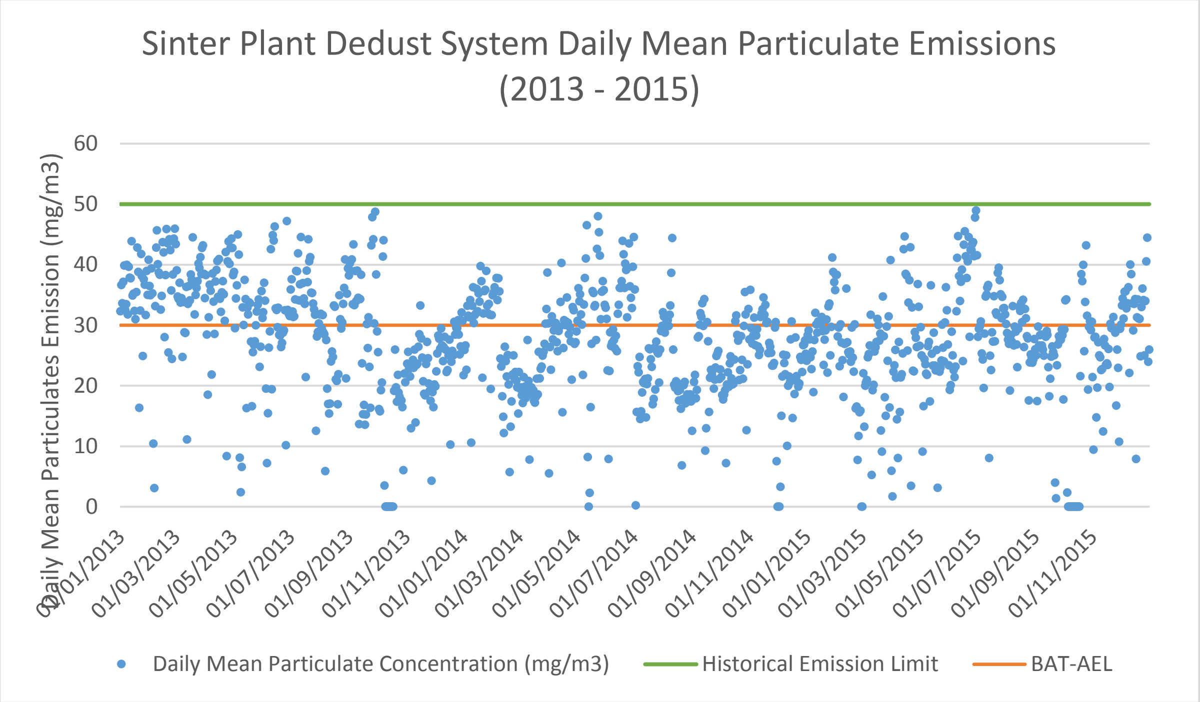
The BAT-associated emission level for dust is <10 mg/Nm³ for the bag filter and <30 mg/Nm³ for the electrostatic precipitator, both determined as a daily mean value.

3.1.2 Current techniques and emission levels

Hoods and enclosures achieve efficient extraction of secondary dust from sinter plant operations and an electrostatic precipitator is currently used to reduce dust emissions. Over the period 1st January to 31st December 2013 - 2015, the continuous emission monitor on the stack showed a maximum daily mean dust concentration of 48.7mg/Nm3 (2013), 46.5 mg/Nm³ (2014) and 48.9 mg/Nm3 (2015), which exceeds the level associated with BAT. Emissions are not continuously as high as this – the annual average concentration is below the BAT-AEL for electrostatic precipitators and the majority of the daily averages are also below the BAT-AEL, but nevertheless the monitoring results demonstrate that emission control needs to be improved. The figure overleaf shows the daily mean concentrations of total dust (calculated for days when the dedusting system was stopped for no more than three hours) for the calendar year 2014.

The volume flowrate at the sinter plant dedust stack was measured twice in 2014 (236 Nm³/s and 230 Nm³/s). Taking the mean flowrate and the annual mean dust concentration of 26.9 mg/m³, the average dust emission rate for the current electrostatic precipitator is:

$$26.9 \times 233 \times 3{,}600 \times 24 / 1{,}000{,}000 = 541 \text{ kg/day}$$



It is estimated that only 46% of the dust emitted from the stack is below 10 µm aerodynamic diameter, and hence the mean PM_{10} emission rate is 249 kg/day.

3.1.3 Potential pollution abatement through achieving BAT by March 2016

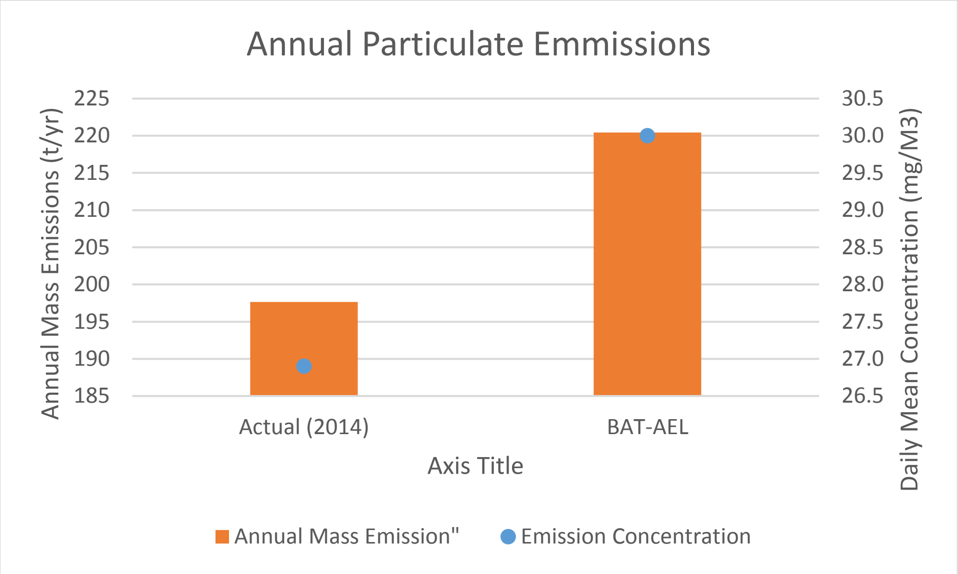
For the purposes of this assessment, it is assumed that if the BAT-AEL for sinter plant secondary dedusting were to be achieved through refurbishment of the existing electrostatic precipitator, the <u>mean</u> dust concentration in the emission would be reduced to 20 mg/Nm³. On this basis the emissions would fall to an average of 403 kg total dust/day and 185 kg PM_{10}/day.

If the plant stoppage for the sinter cooler project, during which the required improvements to emission control from secondary dedusting would also be implemented, commences at the end of June 2020, then emissions are at risk of occasionally exceeding the BAT-AEL over a period of about 51 months (1575 days) which could result in additional dust emissions (compared to achieving BAT by March 2016 through refurbishment of the existing electrostatic precipitator) as follows:

- (541 - 403) x 1575 / 1000 = 217 tonnes additional total dust
- (249 - 185) x 1575 / 1000 = 100 tonnes additional PM_{10}

It should be noted that there is no option to install a new bag filter to achieve BAT by March 2016, as the lead times for design, procurement and installation of a bag filter preclude this, and furthermore the current use of water sprays to effect additional sinter cooling would risk blinding the bags, which would reduce the efficiency of extraction, or in the worst case cause significant damage to the bag filter.

In addition, a mass balance approach for the annual emission of particulates shows that the emissions released from the existing ESP system is less than that associated with the BAT-AEL.



3.1.4 Cost of achieving BAT in March 2016 rather than June 2020

The cost of an additional two-week sinter plant stoppage to refurbish the existing electrostatic precipitator to consistently achieve BAT by March 2016, rather than synchronising this with the sinter cooler scheme, comprises:

- Additional costs of sinter production to generate excess sinter to be stocked out (increased burnt lime and decreased concentrates)
- Additional costs of increased pellet consumption during the stop, since it is not possible to build up sufficient sinter stocks to fully supply the blast furnaces for the whole stop period

The overall additional cost is estimated to be just over £3M at 2015 prices.

3.1.5 Simplified cost-benefit analysis

The financial impact of implementing BAT for secondary dedusting at the sinter plant by March 2016, compared to delaying to June 2020, is additional expenditure of >£3.0M. But the environmental impact of the delay is that PM_{10} emissions to atmosphere would be around 100 tonnes greater over that period.

In order to compare these two impacts, the marginal external cost attributable to each additional tonne of pollutant emitted (the damage cost) can be used to monetise the environmental benefits. No definitive set of damage costs exists, but a number of different sources have been suggested for assessing derogation requests in the UK:

- NRW (in their decision document[2] on the review of the Tata Steel permit in 2015) suggested a value of £25,229 per tonne PM_{10} from industrial sources, based on estimates from the UK Government's Interdepartmental Group on Costs and Benefits (IGCB)
- A more recent update from the IGCB[3] suggests a central value of £30,225 at 2015 prices
- The European Environment Agency's study[4] on the costs of air pollution from industrial facilities quotes a damage cost of €24,930 per tonne PM_{10} at 2005 prices, which, adjusting for exchange rates, inflation and uplift, would be equivalent to £25,981 at 2015 prices

For the purposes of this study, the highest of these values has been used to give the most conservative assessment. On this basis, the "benefit" of implementing BAT by March 2016 is 100 x £30,225 = £3.0M.

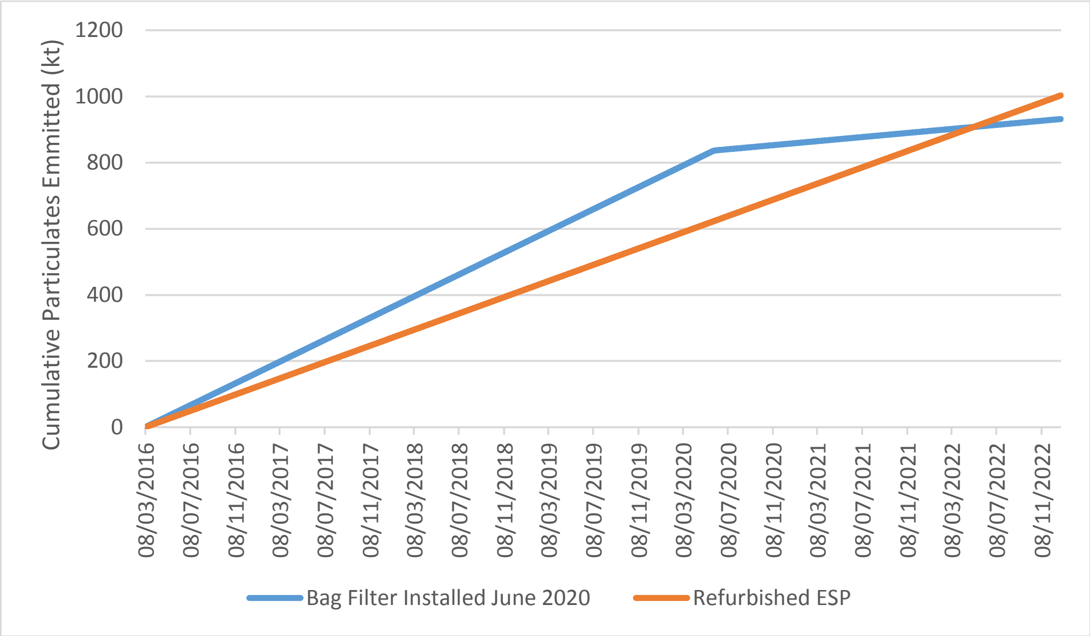
Thus the costs of implementing BAT by March 2016 is equal to the environmental benefits – the benefit to cost ratio (BCR) would be 3.00/3.00 = 1 based on the damage cost of £30,225, but would be significantly lower if a lower damage cost estimate had been used and if market raw material and operational prices considered.

3.1.6 Other factors

Delaying implementation of BAT 26 gives the opportunity of installing a new bag filter to control emissions from secondary dedusting, rather than refurbishing the existing electrostatic precipitator (ESP). Once in operation a bag filter would abate dust to a greater degree than the ESP. If it is assumed that the mean dust concentration with a bag filter would fall to 5 mg/Nm^3, then the mass released from sinter plant secondary dedusting would average 101 kg total dust/day. Making a worst-case assumption that all the dust released would be below 10 µm aerodynamic diameter, the PM_{10} emission rate would also be 101 kg/day, compared to current mean emissions of 249 kg/day and estimated mean emissions of 185 kg/day from a refurbished electrostatic precipitator.

On this basis, dust emissions would be 302 kg/day lower after installation of a bag filter compared to refurbishment of the existing ESP, and the additional dust emitted by delaying implementation of BAT 26 to June 2020 would be offset after just under two years of operating the bag filter – so by the May 2022, the cumulative dust emitted from this source since March 2016 would be lower if a bag filter were to be installed in June 2020.

[2] https://naturalresources.wales/media/4274/port-talbot-decision-document-saesneg-yn-unig.pdf
[3] www.gov.uk/guidance/air-quality-economic-analysis#damage-costs-approach
[4] "Costs of air pollution from European industrial facilities 2008–2012 – an updated assessment", European Environment Agency Technical Report No. 20/2014, November 2014; http://www.eea.europa.eu/publications/costs-of-air-pollution-2008-2012



A further consideration is that, in normal operation, the majority of the sinter produced is transported directly to the blast furnaces through a system of covered conveyors. Extra stocking of sinter prior to a stop period and reclaiming of sinter during the stop will produce additional dust from materials handling operations. The amount of dust produced from an extra stop period has not been quantified, but would further reduce the effective benefit of implementing BAT in March 2016 rather than delaying to coincide with the sinter cooler scheme.

3.1.7 Conclusions

The cost of an additional stop period to implement BAT for secondary dedusting at the sinter plant by March 2016 is £3.0M, but the environmental benefit of that option, compared to delaying until June 2018, is a reduced PM_{10} emission of around 100 tonnes, which is “worth” £3M using the highest of the three damage cost estimates considered. The Benefit Cost Ratio (BCR) is 1 and on this basis, it is considered that the costs are higher than the environmental benefits. The relevant technical characteristics giving rise to this high cost are:

- The configuration of the plant
- The practicability of interrupting the activity
- The effect of reducing the excess emissions upon other pollutant emissions

Thus, Tata Steel’s intended delay in implementation of BAT to the end of June 2020 meets the criteria for a time-limited derogation from achieving the relevant BAT-AEL.

The above analysis does not take into account;

(a) the fact that additional dust emissions would result from materials handling operations (sinter stacking and reclaiming) during an additional lengthy plant stoppage, which would further reduce the environmental benefit of implementing BAT by March 2016

(b) delaying implementation of BAT 26 gives the opportunity of installing a bag filter to control emissions from secondary dedusting and in the long term this will result in better abatement of emissions than achieving BAT by March 2016 by refurbishing the existing ESP.

3.2 Coke Oven Gas Desulphurisation – BAT conclusions 48/49 - Justification of delay in achieving the BAT-associated standard for H_2S content of Coke Oven Gas at Port Talbot integrated steelworks

The new Environmental Permit for Port Talbot steelworks issued by Natural Resources Wales (NRW) on 20th April 2015 includes a time-limited derogation from the requirement to achieve the BAT-associated standard for the H_2S content of Coke Oven Gas (BAT 48). This derogation was granted on the basis that designing and building a coke oven gas (COG) desulphurisation unit at Port Talbot (along with other improvements to the by-products plant that would be necessary for the effective operation of COG desulphurisation) was too extensive a task to be achievable before the default deadline of 8th March 2016. It was shown to be disproportionately costly to meet the standard (by suspending coke production in March 2016 and rebuilding the coke ovens to incorporate COG desulphurisation) compared to continuing to operate with H_2S levels above the standard until all the required improvements could be completed.

However, the scope, costs and timescales of the required improvement work have increased since the initial assessment and it is now proposed to further delay achievement of the BAT-associated standard.

Article 15(4) of the Industrial Emissions Directive (IED) allows NRW to set Emission Limit Values that are less strict than the emission levels associated with the use of the Best Available Techniques (BAT-AELs) only in cases where achieving the BAT-AELs 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.

In February 2013 Defra, in conjunction with the Welsh Government, issued guidance[5] on the application of the IED and paragraph 4.41 outlines some technical characteristics that may justify a derogation, including the following that are relevant to COG desulphurisation at Port Talbot's coke oven plant:

- ❑ <u>The configuration of the plant on a given site, making it more technically difficult and costly to comply</u>
  - Because the by-products plant at Port Talbot was not originally designed for coke oven gas desulphurisation, the performance of some of the other units within the plant needs to be improved to ensure that the desulphurisation unit can operate effectively. In particular, tar and ammonia levels in the coke oven gas must be reduced and primary cooling improved, necessitating additional capital expenditure and thereby making it more costly to install COG desulphurisation at Port Talbot than at a typical coke oven plant.

[5] Environment Agency, "Industrial Emissions Directive EPR Guidance on Part A installations", February 2013; www.gov.uk/government/uploads/system/uploads/attachment_data/file/221044/pb13898-epr-guidance-part-a-130222.pdf

- The practicability of interrupting the activity so as to install improved emission control
    - Coke oven batteries of the type used at Port Talbot are designed to be gas tight when carefully heated up from new and held constantly at the high temperatures required for coking. In this way, expansion of the materials of construction seals gaps between bricks to create gas-tight walls, door jambs are sealed to the walls and the structure is held rigidly by the tie bars. Mothballing the coke ovens to allow time for the construction of a COG desulphurisation plant would result in the structure cooling and losing its integrity. There are no examples world-wide of a coke oven battery of this type being brought back into operation after production has ceased. Thus if coke production were to be suspended in March 2016, the only feasible option for the continuation of cokemaking would be to completely rebuild the ovens at a cost of several hundreds of millions of pounds. This rebuild would occur earlier than in the normal investment cycle and so would represent a considerable additional cost to the business.
    - During the time when the coke ovens were being rebuilt, it would be necessary to purchase coke from external suppliers and also to significantly increase the import of natural gas onto the site to replace the energy in the coke oven gas. This would further increase costs compared to continued operation of the existing plant, which would not be sustainable for the operation.
- The effect of reducing the excess emissions upon other pollutant emissions
    - Replacing coke oven gas with natural gas whilst rebuilding the coke ovens to achieve BAT may increase carbon dioxide emissions from other processes on the integrated steelworks as the CO_2 intensity of natural gas is greater than that of COG.

The following sections demonstrate that the measures necessary to ensure no breach of the BAT-associated standard for the H_2S content of coke oven gas after 8th March 2016, rather than delaying achievement of the standard until all the required improvements at the coke oven by-products plant can be completed, would lead to disproportionately higher costs compared to the environmental benefits.

3.2.1 Best Available Techniques and associated emission levels

BAT is to reduce the sulphur content of the coke oven gas (COG) by using one of the following techniques:

3. desulphurisation by absorption systems
4. wet oxidative desulphurisation.

The residual hydrogen sulphide (H_2S) concentrations associated with BAT, determined as daily mean averages, are <300 – 1000 mg/Nm³ in the case of using BAT I (the higher values being associated with higher ambient temperature and the lower values being associated with lower ambient temperature) and <10 mg/Nm³ in the case of using BAT II.

3.2.2 Current techniques and emission levels

Coke oven gas is not currently desulphurised at Morfa coke ovens. Low sulphur coking coals are used to control the sulphur content of the coke oven gas, but the H_2S levels still exceed those associated with the use of BAT. The annual mean H_2S content of coke oven gas at Port Talbot in 2013 was 2.74 g/Nm³.

The annual coke oven gas production at Port Talbot is around 360 million Nm³ and hence the annual SO_2 emissions attributable to the combustion of H_2S in coke oven gas across the whole integrated site are:

$$2.74 \times 360 \times {}^{64}/_{34} = 1{,}860 \text{ tonnes}$$

This SO_2 is emitted from a number of different sources, the most significant ones being the reheating furnaces at the Hot Mill and the power plants. In addition, the ammonia incinerator emits around 570 tonnes SO_2 per annum.

It is expected that the installation of all the equipment (including modifications to other parts of the by-products plant) for the effective operation of COG desulphurisation at Morfa coke ovens will be completed in 2024. Taking as a worst case the possibility that BAT may not be achieved until the end of that year, the H_2S content of the coke oven gas may exceed the BAT-associated standard for 106 months after the default deadline of 8th March 2016. This would result in additional SO_2 emissions (compared to achieving BAT by March 2016 by suspending coke production) over the period of the derogation of:

$$(1{,}860 + 570) \times {}^{106}/_{12} = 21{,}465 \text{ tonnes}$$

3.2.3 Cost of achieving BAT in March 2016

The only means to prevent H_2S levels in coke oven gas from exceeding the BAT-associated standard after 8th March 2016 would be to suspend coke production until a COG desulphurisation plant was installed. However, it is not possible to mothball coke ovens of the type used at Port Talbot as the asset would be unrecoverable, so the only feasible option for the continuation of cokemaking would be to completely rebuild the ovens. Although the coke ovens will need to be rebuilt at some point in the future, this type of plant often has a very long service life and there are no plans for such a project in the foreseeable future. A Life-Extension project, a mix of capital expenditure and operational performance, is ongoing at Morfa Coke Ovens to extend and support the service life of the coke oven batteries. Bringing forward the rebuild to 2016 would represent a significant additional cost over replacing them at the end of the normal investment cycle.

No detailed engineering studies to specify a new coke plant at Port Talbot have been completed, but concept design investigations have highlighted that the cost would be expected to be several hundreds of millions of pounds. As a very conservative assessment, it is assumed that a new coke plant would cost £250M. Since the coke plant rebuild will be required at some point in the future anyway, this assessment uses only the financing costs, rather than the total cost of capital, in the cost-benefit analysis. Tata Steel's cost of capital, used to estimate the annual interest payments on the required capital expenditure, has been taken as 9.5% based on the figure from the last audited accounts[6] before Corus was acquired by Tata Steel. For comparison, Thyssen Krupp[7] also quotes a weighted average cost of capital (WACC) of 9.5% for their European steelmaking operations for the year ending September 2014.

Whilst the coke ovens were being rebuilt, there would be no operating costs of the coke plant but Tata Steel would instead have to purchase coke from external suppliers, as well as additional natural gas to offset the lack of coke oven gas. Due to the complexity of an integrated steelworks, and the fact that the coke plants produce not only coke, but also coke oven gas and other by-products, it is not possible to ascribe an accurate value to the cost of coke produced on site for comparison with market costs. For the purposes of this assessment it is assumed that the overall cost of purchasing coke and natural gas, rather than on-site production, is equivalent to an additional £20 per tonne coke. Coke demand is assumed to remain at 914,000 tonnes per annum.

Both the capital cost of a new coke plant and the price differential between producing coke and COG on-site compared to external purchases have a high degree of uncertainty. In addition, the availability of suitable coke for purchase on the open market is questionable, especially for a high-quality product that will ensure stable operations at Port Talbot.

3.2.4 Cost of preferred option

Engineering studies to specify a retrofitted COG desulphurisation plant and ancillary equipment for Morfa coke ovens have been completed. The total cost is estimated to be £43M and would be spread over three years.

3.2.5 Simplified cost-benefit analysis

The appraisal period for this assessment is taken as the period between 8th March 2016 and 31st December 2024, by which time it is assumed that either a retrofitted COG desulphurisation plant or a new coke plant would be in operation.

For the BAT option of rebuilding the coke ovens, it is assumed that the major capital expenditure would be in the years 2020-2022. The financing costs are estimated as:

- Expenditure in 2020 = £25M; financing costs = 9.5% x £25M x 3 = £7.1M
- Expenditure in 2021 = £100M; financing costs = 9.5% x £100M x 2 = £19M
- Expenditure in 2022 = £125M; financing costs = 9.5% x £125M x 1 = £11.9M
- Total financing cost over the appraisal period = £38M

[6] "Corus Report and Accounts 2006", page 40, www.tatasteeleurope.com/file_source/StaticFiles/Functions/Financial/2006_Annual_Report.pdf
[7] "Annual Report 2013/2014", page 51, www.thyssenkrupp.com/documents/investor/Finanzberichte/eng/ThyssenKrupp_2013_2014_AR.pdf

In addition, purchase of coke and natural gas from external sources for a period of 58 months would cost:

- 914,000 x £20 x $^{58}/_{12}$ = £88M

The total cost over the appraisal period of achieving BAT by March 2016 would therefore be £126M.

For the preferred option of retrofitting COG desulphurisation, using the same assumption that it is only the financing costs that should be considered, the costs are estimated as:

- Expenditure in 2020 = £5M; financing costs = 9.5% x £5M x 3 = £1.4M
- Expenditure in 2021 = £12M; financing costs = 9.5% x £12M x 2 = £2.3M
- Expenditure in 2022 = £26M; financing costs = 9.5% x £26M x 1 = £2.5M
- Total financing cost over the appraisal period = £6.2M

The financial impact of implementing BAT is therefore additional expenditure of £120M over the appraisal period. But the environmental impact of delaying implementation to the end of 2024 is that SO_2 emissions to atmosphere would be around 21,465 tonnes greater over the same period.

In order to compare these two impacts, the marginal external cost attributable to each additional tonne of pollutant emitted (the damage cost) can be used to monetise the environmental benefits. No definitive set of damage costs exists, but a number of different sources have been suggested for assessing derogation requests in the UK:

- The UK Government's Interdepartmental Group on Costs and Benefits (IGCB)[8] quotes a central value of £1,956 per tonne SO_2 (at 2015 prices) for use in assessing national policies, programmes and projects
- A report[9] undertaken by Eunomia consultants in 2012 recommended an SO_2 damage cost for the UK of €8,033 per tonne at 2010 prices
    - Applying an inflation factor of 1.094 to update the estimate to 2015 prices and the mean 2010 exchange rate of £1 = €1.17 gives a value of £7,511 per tonne SO_2
    - The same report also suggests that the damage cost could be refined to account for the location of the release within the UK (Wales attracts a factor of 0.8) and the type of source (industrial emissions have a factor of 0.96 for SO_2) – taking these factors into account, the relevant damage cost for this assessment would be £5,769 per tonne SO_2 (at 2015 prices)

For comparative purposes, the highest of these damage costs (Eunomia study) with no additional operational costs factored, will be considered first. Using a damage cost of £5,769 per tonne SO_2, the "benefit" of implementing BAT by March 2016 would be 21,465 x £5,769 = £124M. Thus the costs of implementing BAT by March 2016 are disproportionate to the environmental benefits – as though the benefit to cost ratio (BCR) would be £124M/£120M = 1.03.

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[8] "Air quality: economic analysis", https://www.gov.uk/guidance/air-quality-economic-analysis#damage-costs-approach
[9] "Review of the Mineral Oil and Gas Refining BREF - Proposed Approach to Using CBA to Determine BAT Conclusions and BAT-AELs", Eunomia Research and Consulting, October 2012

Taking the damage costs recommended by the UK Government's Interdepartmental Group on Costs and Benefits, the monetised benefit of implementing BAT would be 21,465 x £1,956 = £42.0M and the benefit to cost ratio would be £42.0M/£120M = 0.35.

3.2.5.1 Sensitivity analysis

As noted in section 3, both the capital cost of a new coke plant and the price differential between producing coke and COG on-site compared to external purchases have a high degree of uncertainty. The table below illustrates the sensitivity of the BCR to changes in these assumptions, using the detailed cost benefit analysis approach and the IGCB damage costs.

		Price differential between producing coke and COG on-site compared to external purchases (£/tonne)		
		10	**20**	**30**
Capital cost of new coke ovens (£M)	**200**	0.38	0.23	0.16
	250	0.34	0.21	0.16
	300	0.31	0.19	0.15

Even if a new coke plant could be built for £200M and the additional cost of purchasing external coke and natural gas in the interim was only £10/tonne greater than no-site production, the ratio of benefits to costs would be 0.38, i.e. the costs would outweigh the benefits by a factor of 2.6.

3.2.6 Other factors

If cokemaking at Port Talbot were to be suspended in March 2016, the import of natural gas onto the site would have to be increased to replace the energy in the coke oven gas whilst the ovens were rebuilt. Coke oven gas contains high levels of hydrogen (typically 60% by volume), which means that the CO_2 intensity is very low. Natural gas also has a relatively low CO_2 intensity, but still higher than for COG – the UK National Atmospheric Emissions Inventory[10] uses an emission factor of 1.1 kilotonnes CO_2 (as carbon) per Mth fuel consumed for coke oven gas compared to 1.5 kilotonnes/Mth for natural gas.

Hence replacing coke oven gas with natural gas whilst rebuilding the coke ovens to achieve BAT may increase CO_2 emissions from other processes on the integrated steelworks compared to the alternative of continuing to make coke with COG H_2S levels above the standard until all the required improvements could be completed.

3.2.7 Conclusions

The cost of rebuilding the coke ovens at Port Talbot to ensure no breach of the BAT-associated standard for the H_2S content of coke oven gas after 8th March 2016 would be £126M, taking into account only the financing costs of the required capital expenditure. The cost of retrofitting a COG desulphurisation plant would be £6.2M, again taking just the financing costs, but delaying achievement of the standard until all the required improvements at the coke oven by-products plant can be completed would lead to additional SO_2 emissions of up to 21,465 tonnes over the period to the end of 2024.

[10] "Emission factors detailed by source and fuel", http://naei.defra.gov.uk/data/ef-all

The monetised benefit of the reduction in SO_2 emissions by implementing BAT by March 2016 would be £42.0M, based on the damage costs recommended by the UK Government's Interdepartmental Group on Costs and Benefits, and so the overall costs of achieving BAT are disproportionately high compared to the environmental benefits - the Benefit Cost Ratio (BCR) is 0.35. The relevant technical characteristics giving rise to this disproportionately high cost are:

- The configuration of the plant
- The practicability of interrupting the activity
- The effect of reducing the excess emissions upon other pollutant emissions

Thus, Tata Steel's intended delay in implementation of BAT to December 2024 meets the criteria for a time-limited derogation from achieving the relevant BAT-associated standard.

3.3 Suspended Solids Long Sea Outfall - Justification of derogation from achieving the BAT-AEL for suspended solids in the combined liquid effluent discharge from Port Talbot integrated steelworks

The new Environmental Permit for Port Talbot steelworks issued by Natural Resources Wales (NRW) on 20th April 2015 set the limit for the concentration of suspended solids in the liquid effluent discharged through the Long Sea Outfall (LSO) as 20 mg/l above the background suspended solids level. An Improvement Condition in the permit required Tata Steel to propose a methodology for establishing a suitable background concentration; a response to the Improvement Condition was submitted in July 2015. In November 2015 NRW indicated that they would treat the Tata Steel submission as a request to derogate from the application of the BAT-AEL and requested further information to allow them to assess whether this was justifiable.

Article 15(4) of the Industrial Emissions Directive (IED) allows NRW to set Emission Limit Values that are less strict than the levels associated with the use of the Best Available Techniques (BAT-AELs) only in cases where achieving the BAT-AELs would lead to disproportionately higher costs compared to the environmental benefits due to:

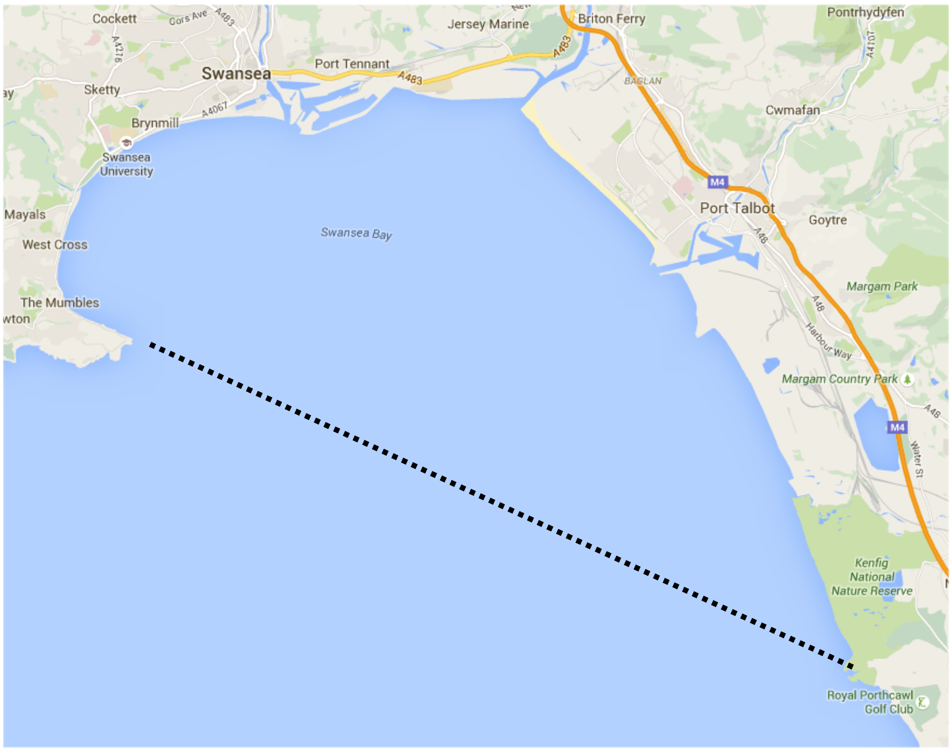
(a) the geographical location or the local environmental conditions of the installation concerned; or
(b) the technical characteristics of the installation concerned.

In this case it is the local environmental conditions that give rise to the disproportionality between the costs and the benefits of meeting the BAT-AEL. The effluent is discharged into Swansea Bay, where significant concentrations of suspended solids are naturally found, and this means that the benefit of reducing the suspended solids load in the discharge is negligible. The cost of reducing the suspended solids concentration in the Long Sea Outfall is estimated to be in excess of £20M.

3.3.1 Environmental impact of current discharges

A study undertaken on behalf of NRW[11] investigated the sources and quantities of sediments suspended in the waters of Swansea Bay – defined for this purpose by a line drawn between Mumbles Head and Sker Point, just north of Porthcawl (see Figure overleaf). Paragraph 3.4 of the report cites two different estimates of the total fluvial sediment input to Swansea Bay – 40,500 tonnes per year or 75,000 tonnes per year.

[11] Pye, K. and Blott, S., "Tidal Lagoon Swansea Bay: Sediment Sources and Depositional Processes in Swansea Bay", KPAL Report No. 16033, 4th November 2014



The suspended solids discharge from Port Talbot steelworks was 1,343 tonnes in 2015, which is therefore 2 to 3% of the total estimated input to Swansea Bay. It should, however, be noted that a proportion of the suspended solids discharged from the Long Sea Outfall has not been generated by the steelworks processes, but represents a naturally occurring load intercepted by the drainage system at Port Talbot, but which would have run off into the bay anyhow. The majority of the process water used on site is supplied from the Castell and Kenfig rivers and drainage from Margam Moors may also be used as process water or may pass directly through the site's drainage system to the LSO. The River Arnallt flows across the site, but under storm conditions a proportion of this also enters the Tata Steel effluent system. The contribution of naturally occurring sediments from these sources to the overall suspended solids load discharged from the Long Sea Outfall is likely to be significant.

A further indication that a significant proportion of the suspended solids load discharged from the Long Sea Outfall does not arise from the steelmaking process is provided by examining the discharges of iron and other metals. In 2015, 73.2 tonnes of particle-bound iron (i.e. the difference between total iron and dissolved iron) were discharged, along with 13.4 tonnes of zinc, 0.8 tonnes lead and 0.3 tonnes chromium. The total contribution of these four metals to the overall suspended solids load is therefore less than 7%. It would be expected that suspended solids arising from most of the processes on the steelworks would have a higher metals content than this, which implies that a large proportion of the solids are derived from other sources, such as sediment from rivers or rainwater run-off. As an indication, if it is assumed that water-borne particles generated within the steelworks processes and by run-off from stockyards would contain, on average, 25% metals, this implies that about 350 tonnes per year of the suspended solids discharged from the Long Sea Outfall might arise from this source and hence about 1,000 tonnes might be from natural sources.

Thus even if the discharge from the Long Sea Outfall does contribute 2 to 3% of the total estimated suspended solids input to Swansea Bay, a significant proportion of this is material that would have reached the bay naturally if it had not passed through the steelworks' drainage system. A crude estimate is that the steelworks processes may only be contributing around 350 tonnes per annum, which is less than 1% of the total suspended solids load entering the bay.

There are no Environmental Quality Standards for the concentration of suspended solids in the marine environment, so it is not possible to assess the impact of Tata Steel's releases in relation to an agreed reference level. However, the report undertaken for NRW includes the following data which will put the Tata Steel discharge into context:

- Paragraph 3.19 – typical background levels of suspended sediment in the Port Talbot Channel are 30 to 60 mg/l
- Paragraph 3.12 – suspended sediment concentrations of up to 270 mg/l have been recorded under calm weather conditions in the area of higher tidal currents near Mumbles, and occur quite frequently during relatively short periods of high wave activity
- Paragraph 3.5 – suspended solids concentrations in the Neath and Tawe rivers have mostly been recorded to be <50 mg/l but on occasions following and during floods have been recorded to exceed 1000 mg/l

The mean suspended solids concentration in the Long Sea Outfall in 2015 was 46 mg/l, which is within the range of typical background concentrations for the Port Talbot Channel quoted in Paragraph 3.19. The maximum concentration in the LSO was 274 mg/l, which is comparable to the peak concentrations measured near Mumbles and far less than would be expected from the Neath and Tawe rivers in flood.

On the basis that

5. the discharge from Port Talbot steelworks is contributing only 2 to 3% of the total suspended solids load entering Swansea Bay
6. a significant proportion of the discharge is material that would have reached the bay naturally if it had not passed through the steelworks' drainage system
7. the average and maximum suspended solids concentrations in the Long Sea Outfall are comparable to the naturally occurring levels in Swansea Bay

it is concluded that the current suspended solids discharge from the site will have a negligible impact on the environment. This would mean that the benefit of reducing the suspended solids load in the discharge would also be negligible.

3.3.2 Best Available Techniques and associated emission levels

The BAT Reference document for Iron and Steel Production (BREF) covers effluent discharges from a number of different process units on the steelworks but does not describe BAT for the treatment of mixed effluents, including site run-off. All the BAT-associated emission levels (BAT-AELs) are focussed on process effluent quality and NRW initially took a precautionary approach in applying the lowest BAT-AEL for suspended solids for any process effluent (20 mg/l in the case of continuous casting – BAT 81) to the total effluent discharge from the site through the Long Sea Outfall. In recognition of the fact that process water derived from watercourses would contain a certain level of naturally occurring suspended solids, the limit was defined as 20 mg/l above background concentration in the permit issued in April 2015.

However, this still does not address the fact that the effluent discharged from the LSO is a mixture of process effluents that may have been treated at source to reduce the suspended solids concentration and site drainage which is generally untreated. It is therefore unclear how the BAT-AELs should be applied to cases like Port Talbot with a combined liquid effluent discharge.

3.3.3 Cost of achieving BAT

Previous work by Tata Steel to map the sources of pollutants feeding into the Long Sea Outfall has indicated that there is no one dominant source of suspended solids, and hence it would be necessary to install either one large treatment plant just before the LSO, or several smaller plants across the site. No detailed engineering study has been undertaken to specify such a scheme, but some indicative costs have been derived with the following assumptions:

- A single treatment plant would be built to treat all the effluent discharged through the Long Sea Outfall
- The plant would have a design capacity of 4,000 m^3/hour
- After settling, a filter press would be required to ensure that the suspended solids concentration in the final effluent did not exceed 20 mg/l
- A filter press specified for a different scheme had a design capacity of 500 m^3/hour and a capital cost (including pumps and other ancillary equipment) of £6.3M
- The filter press for the Long Sea Outfall would therefore be larger than the one specified above – the cost would not be expected to increase in direct proportion to the volume flow and it has been assumed that it would change by a factor of $(X/Y)^P$, where X is the required capacity, Y is the capacity of the plant for which the cost is known and P is a power factor that varies with the type of equipment considered, but is generally in the range 0.5 to 0.8. In this instance, a power factor of 0.6 has been used, giving an estimated capital cost of £6.3M x $(4,000/500)^{0.6}$ = £22M

The indicative cost of £22M does not include costs of additional settling or storage tanks that may also be required.

3.3.4 Other factors

A filter press to remove suspended solids from the Long Sea Outfall would produce up to 1,000 tonnes per year of filter cake to be recycled or disposed of. As discussed earlier, the concentration of metals such as iron within this material would not be expected to exceed 7%, making it unsuitable for recycling within the integrated steelworks. If no other recycling options could be identified, this material would have to be disposed of as waste.

There would also be a significant electrical energy use within any new treatment plant, mostly associated with pumping. Depending on the source of the electricity, this could therefore lead to emissions of CO_2, NO_x and SO_2 to the atmosphere. These potential emissions have not been quantified.

Thus installing a treatment plant to reduce the suspended solids concentration in the Long Sea Outfall could have detrimental impacts on other environmental media.

3.3.5 Cost-benefit analysis

In February 2013 Defra, in conjunction with the Welsh Government, issued guidance[12] on the application of the IED and paragraph 4.43 outlines the approach to quantifying the benefit:

- Although operators should attempt to place a monetary value on the environmental benefits which would result from preventing the excess emission, it is recognised that, with the exception of a small range of air pollutants, methodology for doing so is lacking. It will therefore be for operators to assess the effect of the excess emission on the levels of the pollutant already in, or discharged to, air, water and land in the locality. For air pollutants, this will involve consideration of concentrations in ambient air; for water pollutants the effect upon receiving waters – perhaps after passage through a wastewater treatment works – will need to be considered. In all cases, the results of monitoring undertaken at all relevant sites in the locality must be taken into account.

In the case of the discharge of suspended solids from Port Talbot steelworks' Long Sea Outfall into Swansea Bay, there are no recognised damage costs to refer to. The effect on receiving waters has been assessed, taking into account local monitoring data, and is negligible.

Benefits may also be monetised by considering the "cost" of ecosystems services that may be lost through pollution. No standard methodology for this currently exists, but in 2005 the United Nations published their Millennium Ecosystem Assessment and a report from the Environment Agency[13] summarised the different classifications of ecosystems services as shown below:

[12] Environment Agency, "Industrial Emissions Directive EPR Guidance on Part A installations", February 2013; www.gov.uk/government/uploads/system/uploads/attachment_data/file/221044/pb13898-epr-guidance-part-a-130222.pdf
[13] Environment Agency, "Ecosystem services case studies", 2009; www.gov.uk/government/uploads/system/uploads/attachment_data/file/291631/scho0409bpvm-e-e.pdf

Provisioning services
Fresh water
Food (e.g. crops, fruit, fish, etc.)
Fibre and fuel (e.g. timber, wool, etc.)
Genetic resources (used for crop/stock breeding and biotechnology)
Biochemicals, natural medicines, pharmaceuticals
Ornamental resources (e.g. shells, flowers, etc.)
Regulatory services
Air quality regulation
Climate regulation (local temperature/precipitation, GHG* sequestration, etc.)
Water regulation (timing and scale of run-off, flooding, etc.)
Natural hazard regulation (i.e. storm protection)
Pest regulation
Disease regulation
Erosion regulation
Water purification and waste treatment
Pollination
Cultural services
Cultural heritage
Recreation and tourism
Aesthetic value
Spiritual and religious value
Inspiration of art, folklore, architecture, etc.
Social relations (e.g. fishing, grazing or cropping communities)
Supporting services
Soil formation
Primary production
Nutrient cycling
Water recycling
Photosynthesis (production of atmospheric oxygen)
Provision of habitat

Qualitatively, there is no obvious link between a small increase in the suspended solids load entering Swansea Bay and any of the ecosystems services in the table above and this implies that this approach would not place a great value on reducing the suspended solids concentration in the Long Sea Outfall.

On this basis, the monetised benefit of any scheme to further treat the effluent to reduce suspended solids concentrations before discharge would be negligible, whereas the indicative cost of such a scheme is in excess of £20M. It is not possible to calculate the benefit to cost ratio (BCR) as the benefit is undefined, but it is judged that the costs of implementing BAT significantly outweigh the environmental benefits.

3.3.6 Conclusions

The current discharge from the Port Talbot steelworks' Long Sea Outfall contributes 2 to 3% of the total estimated suspended solids input to Swansea Bay, but a significant proportion of this is material that would have reached the bay naturally if it had not passed through the steelworks' drainage system. It is likely that the contribution of the steelworks processes is less than 1% of the total load entering the bay.

The suspended solids concentrations in the Long Sea Outfall are comparable to the naturally occurring levels in Swansea Bay.

Hence the current suspended solids discharge from the site will have a negligible impact on the environment, and the benefit of reducing the suspended solids load in the discharge would also be negligible.

Installing a treatment plant to reduce the suspended solids concentration in the Long Sea Outfall could have detrimental impacts on other environmental media – potential waste from the filter press and CO_2, NO_x and SO_2 emissions to atmosphere from electricity generation.

There are no recognised damage costs for discharges of suspended solids to the marine environment and no relevant Environmental Quality Standards. Consideration of different classifications of ecosystems services implies that the value of reducing the suspended solids concentration in the Long Sea Outfall would not be great.

An indicative cost of a scheme to reduce suspended solids discharges is in excess of £20M. It is not possible to calculate the benefit to cost ratio (BCR) as the benefit is undefined, but it is judged that the costs of implementing BAT significantly outweigh the environmental benefits.

This disproportionality arises from the local environmental conditions (the fact that the effluent is discharged into Swansea Bay, where significant concentrations of suspended solids are naturally found), and hence meets the criteria of Article 15(4) of the Industrial Emissions Directive.

4 General Permit Review

4.1 Section 1 - Management

No change

4.2 Section 2 – Operations

No Change

4.3 Section 3 – Emissions and Monitoring

No change

4.4 Section 4 – Information

No Change

4.5 Schedule 1 – Operations

No Change

4.6 Schedule 2 – Waste types, raw materials and fuels

Following a review of EWC codes, it is requested that the following EWC codes be added into the permit:

12 01 17 (MN) Shot Blast Dust
13 05 06 (AH) Oil from oil/water separators
16 05 09 (MN) ABC Powder from fire extinguishers
19 10 01 (AN) Iron and steel waste
19 10 02 (AN) Non-ferrous waste
19 12 02 (AN) Ferrous metal
19 12 03 (AN) Non-ferrous metal
20 01 40 (AN) Metals

4.7 Schedule 3 – Emissions and Monitoring

4.7.1 Table S3.1 – Sinter Plant point sources to air – emissions limits and monitoring requirements

Emission Point A1 (Sinter Main) states the limit and reference period for SO_2 as 500 mg/m^3 hourly. The BREF note states 500 mg/m^3 daily, so the permit should reflect BREF requirements.

4.7.2 Table S3.2 – Coke oven plant point sources to air – emissions limits and monitoring requirements

Emission Point A55 (Morfa main stack). Permit states SO_2 and NOx monitoring reference period as daily mean and hourly mean respectively, but method as extractive at six monthly intervals. This should be changed to reference spot monitoring hourly mean.

Emission point A56 (Ministerstain) states reference period half hourly. This should be hourly.

4.7.3 Table S3.3 – Blast Furnace point sources to air – emissions limits and monitoring requirements

Emission points A6 & A7 (Blast Furnace stoves) states quarterly monitoring but daily mean. This should be changed to hourly mean.

Emission points A35 & A36 (Process plant Dryer Stack) have been decommissioned and should be removed from the permit

Emission points A37 & A38 (Fluidised Bed Dryer) state reference period half hourly. This should be hourly.

Emission Points A42, A43 and A44 (silo vents GCI) states annual spot sampling. These vents are pressure relief vents and as such cannot be monitored during normal operation. The monitoring requirement should be removed from the permit

Emission point A65 (Ferrous stock house filter plant stack) Permit states annual monitoring frequency and no requirement for a CEM to be fitted. However, the reference period states ‘hourly mean’. This should be changed to reflect spot measurement.

Emission Point A39 (Number 1 New Mill Stack (GCI)) – Permit states reference period for SO_2, NOx and particulate matter as ‘hourly mean’. This should be changed to reflect spot measurement.

4.7.4 Table S3.4 – Basic oxygen steelmaking and casting point sources to air – emissions limits and monitoring requirements

No change

4.7.5 Table S3.5 – Hot Mill point sources to air – emissions limits and monitoring requirements

No change

4.7.6 Table S3.6 – Cold Mill point sources to air – emissions limits and monitoring requirements

The Pickle Line scrubber has been renewed and the two emission points (A21 & A22) have been combined into a single stack.

4.7.7 Table S3.7 – Energy Generation point sources to air – emissions limits and monitoring requirements

Emission Points A51 (Boiler 5) & A53 (Mitchell Boiler). Permit states continuous monitoring for gaseous emissions (SO_2 and NOx). There are no continuous monitors fitted to these emission points other than particulates. The net input into this boiler is <100MWth so CEMS should not be required. The permit should reflect spot measurements.

Emission Points A51 (Boiler 5) & A53 (Mitchell Boiler). Permit states particulate matter daily limit 121% ELV (24.2 mg/m^3). This should be monthly mean.

Emission Point A66 (Superheater). Permit states continuous monitoring requirement for SO_2. There are no CEMS in place for SO_2. The superheater is fired with BF gas and natural gas and the sulphur concentrations in these gases are negligible so the fitment of a CEM would not add value. This requirement should be removed. In addition, the exhaust stack of the superheater is located next to steam safety valve and would put any monitoring personnel at risk should any extractive monitoring take place. Given the negligible impact of this emission point, Tata request the annual requirement of particulate monitoring and vanadium monitoring be removed.

Due to the nature of fuel strategy, HFO firing is infrequent and the opportunities to measure vanadium is also infrequent. As a consequence, in order to measure vanadium, Tata would have to apply special case to fire HFO for this purpose and does not consider this adding value. It is therefore proposed that vanadium sampling requirement be removed

4.7.8 Table S3.8 – Point Source emissions to water (other than sewer) and land – emissions limits and monitoring requirements

4.7.8.1 Long Sea Outfall W1

BOD

The permit currently requires the analysis of BOD from the LSO. As BOD_5 has never been a requirement in the past, Tata Steel Port Talbot does not have the testing equipment available for use on site. The BOD_5 test costs around £10 per sample (Alcontrol) however; a minimum order clause of £100 exists meaning the cost of analysis would be £5200 per annum. Alcontrol are the preferred supplier as they offer a courier service including all sample bottles and refrigeration equipment.

It is the consensus that COD should always measure higher than BOD[14]. Out of the 28 Long Sea Outfall samples taken between February and August 2016, 40% of the results for COD have been below the limit of BOD5 (20mg/l). In addition, the highest COD result recorded was 58mg/l which if far below the limit for COD (220mg/l) and not significantly over the limit for BOD_5

BOD_5 is not suited to industrial wastewaters and does not lend itself to real time effluent management as the results are received almost a week after the sample has been taken[15]

- "…Five-day biochemical oxygen demand (BOD_5) as a measure of the organic concentration into, and through, the wastewater plant. The BOD_5 test measures the oxygen taken up by wastewater during the biological oxidation of the soluble organic matter in the wastewater. But the BOD_5 test is a highly unreliable means of determining the amount of organic matter present in water. The test measures only the approximate amount of oxygen that will be required (absorbed or consumed) by a wastewater when it is exposed to air or oxygen for an extended period of time. Toxic substances in the wastewater inhibit or even prevent bacterial growth and, therefore, oxidation of the organic matter. When this happens, the test result is lower than the actual amount of organic matter present would suggest.

- The BOD_5 test is limited in some applications such as industrial wastewaters, which often contain heavy metal ions, cyanides, and other substances toxic to microorganisms. When microorganisms become poisoned by toxic substances, they are unable to oxidize waste, in which case the BOD_5 test becomes an ineffective measure of organic pollution.

- Most industrial wastewater treatment plants use chemical oxygen demand (COD)… rather than the BOD_5 test. Due to the length of time required to complete the BOD5 test (five days), BOD results provide historical data only and do not facilitate rapid water quality assessment for optimal process control. The highly variable chemical composition and strength of industrial wastewater requires a

[14] Environmental Leverage 2016, "COD vs. BOD";
http://www.environmentalleverage.com/BOD%20vs%20COD.htm
[15] Water Facts 2016; "Treatment; Activated Sludge; BOD/COD/TOC";
http://waterfacts.net/Treatment/Activated_Sludge/BOD-COD-TOC/bod-cod-toc.html

much more rapid method for measuring the organic concentration, hence the use of the two hour COD test."

Sulphides and Chromium

The permit requires Tata to monitor for sulphides and chromium. Tata Steel has been monitoring these parameters for over a year and since then the levels have been continuously below the Limits of Detection for sulphides and generally zero for chromium

In order to reduce the administrative demands on permit reporting and analysis requirements, Tata Steel request the monitoring of sulphides and chromium be removed as a permit requirement

4.7.8.2 Abbey Beach Outfall W3

In the current issue of the permit, there is a requirement for a visual check on oil and grease, however, there is a limit set at 20mg/l. This should lab test.

Appendix A – EPR Application Forms to Varying a Bespoke Permit

Applications forms provided with the application as stand alone documents. Application forms completed:

- **A**
- **C2**
- **C3**
- **F1**

Appendix B – LSO Monitoring results for COD, Sulphides and Chromium

LSO			
	COD	**Sulphides**	**Tot Cr**
01/02/2016			0.2
02/02/2016			<0.1
03/02/2016			0.2
04/02/2016			0.1
05/02/2016			0.2
06/02/2016			
07/02/2016			
08/02/2016	25		<0.1
09/02/2016			<0.1
10/02/2016			<0.1
11/02/2016			<0.1
12/02/2016		**<0.010**	
13/02/2016		**<0.010**	
14/02/2016		**<0.010**	
15/02/2016	58	**<0.010**	<0.1
16/02/2016		**<0.010**	**<0.1**
17/02/2016		**<0.010**	**<0.1**
18/02/2016		**<0.010**	**<0.1**
19/02/2016		**<0.010**	**<0.1**
20/02/2016		**<0.010**	**<0.1**
21/02/2016		**<0.010**	**<0.1**
22/02/2016	36	**<0.010**	**<0.1**
23/02/2016		**<0.010**	**<0.1**
24/02/2016		**<0.010**	**<0.1**
25/02/2016		**<0.010**	**<0.1**
26/02/2016		**<0.010**	**<0.1**
27/02/2016		**<0.010**	**<0.1**
28/02/2016		**<0.010**	**<0.1**
29/02/2016	0		**<0.1**
LIMITS	220mg/l	0.1mg/l	0.5mg/l

01/03/2016			**<0.1**
02/03/2016			**<0.1**
03/03/2016		**<0.010**	**<0.1**
04/03/2016		**<0.010**	**<0.1**
05/03/2016			**<0.1**
06/03/2016			**<0.1**
07/03/2016	0		**<0.1**
08/03/2016		**<0.010**	**0.02**
09/03/2016		**<0.010**	**<0.1**
10/03/2016		**<0.010**	**<0.1**
11/03/2016		**<0.010**	**<0.1**
12/03/2016		**<0.010**	**<0.1**
13/03/2016		**<0.010**	**<0.1**
14/03/2016	0		**<0.1**
15/03/2016			**<0.1**
16/03/2016		**<0.010**	**<0.1**
17/03/2016		**<0.010**	**<0.1**
18/03/2016		**<0.010**	**<0.1**
19/03/2016		**<0.010**	**<0.1**
20/03/2016		**<0.010**	**0.00**
21/03/2016	12	**<0.010**	**0.00**
22/03/2016		**<0.010**	**0.00**
23/03/2016		**<0.010**	**0.00**
24/03/2016		**<0.010**	**0.00**
25/03/2016		**<0.010**	**0.0**
26/03/2016		**<0.010**	**0.1**
27/03/2016		**<0.010**	**0.0**
28/03/2016	50	**<0.010**	**0.0**
29/03/2016		**<0.010**	**0.0**
30/03/2016		**<0.010**	**0.0**
31/03/2016		**<0.010**	**0.0**
LIMITS	220mg/l	0.1mg/l	0.5mg/l
01/04/2016		**<0.010**	**0.0**
02/04/2016		**<0.010**	**0.0**
03/04/2016		**<0.010**	**0.0**
04/04/2016	0	**<0.010**	**0.0**
05/04/2016		**<0.010**	**0.0**

06/04/2016		**<0.010**	**0.0**
07/04/2016		**<0.010**	**0.0**
08/04/2016		**<0.010**	**0.0**
09/04/2016		**<0.010**	**0.0**
10/04/2016		**<0.010**	**0.0**
11/04/2016	43	**<0.010**	**0.0**
12/04/2016		**<0.010**	**0.0**
13/04/2016		**<0.010**	**0.0**
14/04/2016		**<0.010**	**0.0**
15/04/2016		**<0.010**	**0.0**
16/04/2016			**0.0**
17/04/2016			**0.0**
18/04/2016	28	**<0.010**	**0.0**
19/04/2016		**<0.010**	**0.0**
20/04/2016		**<0.010**	**0.2**
21/04/2016		**<0.010**	**0.2**
22/04/2016		**<0.010**	**0.2**
23/04/2016		**<0.010**	**0.2**
24/04/2016		**<0.010**	**0.2**
25/04/2016	29	**<0.010**	**0.2**
26/04/2016		**<0.010**	**0.0**
27/04/2016		**<0.010**	**0.0**
28/04/2016		**<0.010**	**0.0**
29/04/2016		**<0.010**	**0.0**
30/04/2016		**<0.010**	**0.0**
01/05/2016		**<0.010**	**0.0**
02/05/2016	25	**<0.010**	**0.0**
03/05/2016		**<0.010**	**0.0**
04/05/2016		**<0.010**	**0.0**
05/05/2016		**<0.010**	**0.0**
06/05/2016		**<0.010**	**0.0**
07/05/2016		**<0.010**	**0.0**
08/05/2016		**<0.010**	**0.0**
09/05/2016	0	**<0.010**	**0.0**
10/05/2016			**0.0**
11/05/2016		**<0.010**	**0.0**
12/05/2016		**<0.010**	**0.0**

13/05/2016		**<0.010**	**0.0**
14/05/2016		**<0.010**	**0.0**
15/05/2016		**<0.010**	**0.0**
16/05/2016	41	**<0.010**	**0.0**
17/05/2016		**<0.010**	**0.0**
18/05/2016		**<0.010**	**0.0**
19/05/2016		**<0.010**	**0.0**
20/05/2016		**<0.010**	**0.0**
21/05/2016		**<0.010**	**0.0**
22/05/2016		**<0.010**	**0.0**
23/05/2016	26	**<0.010**	**0.0**
24/05/2016		**<0.010**	**0.0**
25/05/2016		**<0.010**	**0.0**
26/05/2016		**<0.010**	**0.0**
27/05/2016		**<0.010**	**0.0**
28/05/2016		**<0.010**	**0.0**
29/05/2016		**<0.010**	**0.0**
30/05/2016	37	**<0.010**	**0.0**
31/05/2016		**<0.010**	**0.0**
01/06/2016		**<0.01**	**0.0**
02/06/2016		**<0.01**	**0.0**
03/06/2016		**<0.01**	**0.0**
04/06/2016		**<0.01**	**0.0**
05/06/2016		**<0.01**	**0.0**
06/06/2016	0	**<0.01**	**0.0**
07/06/2016		**<0.01**	**0.0**
08/06/2016		**<0.01**	**0.0**
09/06/2016		**<0.01**	**0.0**
10/06/2016			**0.0**
11/06/2016			**0.0**
12/06/2016		**<0.01**	**0.0**
13/06/2016	14	**<0.01**	**0.0**
14/06/2016		**<0.01**	**0.0**
15/06/2016		**<0.01**	**0.0**
16/06/2016		**<0.01**	**0.0**
17/06/2016		**<0.01**	**0.0**
18/06/2016		**<0.01**	**0.0**

19/06/2016		**<0.01**	**0.0**
20/06/2016	58	**<0.01**	**0.0**
21/06/2016		**<0.01**	**0.0**
22/06/2016		**<0.01**	**0.0**
23/06/2016		**<0.01**	**0.0**
24/06/2016		**<0.01**	**0.0**
25/06/2016		**<0.01**	**0.0**
26/06/2016		**<0.01**	**0.0**
27/06/2016	18	**<0.01**	**0.0**
28/06/2016		**<0.01**	**0.0**
29/06/2016		**<0.01**	**0.0**
30/06/2016		**<0.01**	**0.0**
01/07/2016		**<0.01**	**0.0**
02/07/2016		**<0.01**	**0.0**
03/07/2016		**<0.01**	**0.0**
04/07/2016	29	**<0.01**	**0.0**
05/07/2016		**<0.01**	**0.0**
06/07/2016		**<0.01**	**0.0**
07/07/2016		**<0.01**	**0.0**
08/07/2016		**<0.01**	**0.0**
09/07/2016		**<0.01**	**0.0**
10/07/2016		**<0.01**	**0.0**
11/07/2016	36	**<0.01**	**0.0**
12/07/2016		**<0.01**	**0.0**
13/07/2016		**<0.01**	**0.0**
14/07/2016		**<0.01**	**0.0**
15/07/2016		**<0.01**	**0.0**
16/07/2016		**<0.01**	**0.0**
17/07/2016		**<0.01**	**0.0**
18/07/2016	37	**<0.01**	**0.0**
19/07/2016		**<0.01**	**0.0**
20/07/2016		**<0.01**	**0.0**
21/07/2016		**<0.01**	**0.0**
22/07/2016		**<0.01**	**0.0**
23/07/2016		**<0.01**	**0.0**
24/07/2016		**<0.01**	**0.0**
25/07/2016	42	**<0.01**	**0.0**

26/07/2016		**<0.01**	**0.0**
27/07/2016		**<0.01**	**0.0**
28/07/2016		**<0.01**	**0.0**
29/07/2016		**<0.01**	**0.0**
30/07/2016		**<0.01**	**0.0**
31/07/2016		**<0.01**	**0.0**
01/08/2016	21	**<0.01**	**0.0**
02/08/2016		**<0.01**	**0.0**
03/08/2016		**<0.01**	**0.0**
04/08/2016		**<0.01**	**0.0**
05/08/2016		**<0.01**	**0.0**
06/08/2016		**<0.01**	**0.0**
07/08/2016		**<0.01**	**0.2**
08/08/2016	5	**<0.01**	**0.0**
09/08/2016		**<0.01**	**0.0**
10/08/2016		**<0.01**	**0.0**
11/08/2016		**<0.01**	**0.0**
12/08/2016			**0.0**
13/08/2016		**<0.01**	**0.0**
14/08/2016			**0.0**
15/08/2016	14	**<0.01**	**0.0**
16/08/2016		**<0.01**	**0.0**
17/08/2016		**<0.01**	**0.0**
18/08/2016		**<0.01**	**0.0**
19/08/2016		**<0.01**	**0.0**
20/08/2016		**<0.01**	**0.0**
21/08/2016		**<0.01**	**0.0**
22/08/2016	23	**<0.01**	**0.0**
23/08/2016		**<0.01**	**0.0**
24/08/2016		**<0.01**	**0.0**
25/08/2016		**<0.01**	**0.0**
26/08/2016		**<0.01**	**0.0**
27/08/2016		**<0.01**	**0.2**
28/08/2016		**<0.01**	**0.0**
29/08/2016	32	**<0.01**	**0.0**
30/08/2016		**<0.01**	**0.0**
31/08/2016		**<0.01**	**0.0**

01/09/2016			**0.0**
02/09/2016		**<0.01**	**0.0**
03/09/2016		**<0.01**	**0.0**
04/09/2016		**<0.01**	**0.0**
05/09/2016	3	**<0.01**	**0.0**
06/09/2016		**<0.01**	**0.0**
07/09/2016		**<0.01**	**0.0**
08/09/2016		**<0.01**	**0.0**
09/09/2016			**0.0**
10/09/2016		**<0.01**	**0.0**
11/09/2016		**<0.01**	**0.0**
12/09/2016	30	**<0.01**	**0.0**
13/09/2016		**<0.01**	**0.0**
14/09/2016		**<0.01**	**0.0**
15/09/2016		**<0.01**	**0.0**
16/09/2016		**<0.01**	**0.0**
17/09/2016		**<0.01**	**0.0**
18/09/2016		**<0.01**	**0.0**
19/09/2016	18	**<0.01**	**0.0**
20/09/2016		**<0.01**	**0.0**
21/09/2016		**<0.01**	**0.0**
22/09/2016		**<0.01**	**0.0**
23/09/2016		**<0.01**	**0.0**
24/09/2016		**<0.01**	**0.0**
25/09/2016		**<0.01**	**0.0**
26/09/2016	0	**<0.01**	**0.0**
27/09/2016		**<0.01**	**0.0**
28/09/2016		**<0.01**	**0.0**
29/09/2016		**<0.01**	**0.1**
30/09/2016		**<0.01**	**0.0**
01/10/2016			**0.0**
02/10/2016		**<0.01**	**0.0**
03/10/2016	57	**<0.01**	**0.1**
04/10/2016		**<0.01**	**0.1**
05/10/2016		**<0.01**	**0.0**
06/10/2016		**<0.01**	**0.1**
07/10/2016		**<0.01**	**0.0**

08/10/2016		**<0.01**	**0.0**
09/10/2016		**<0.01**	**0.0**
10/10/2016	66	**<0.01**	**0.0**
11/10/2016		**<0.01**	**0.0**
12/10/2016		**<0.01**	**0.0**
13/10/2016		**<0.01**	**0.0**
14/10/2016		**<0.01**	**0.0**
15/10/2016		**<0.01**	**0.0**
16/10/2016		**<0.01**	**0.0**
17/10/2016	34	**<0.01**	**0.0**
18/10/2016		**<0.01**	**0.0**
19/10/2016		**<0.01**	**0.0**
20/10/2016		**<0.01**	**0.0**
21/10/2016		**<0.01**	**0.0**
22/10/2016		**<0.01**	**0.0**
23/10/2016		**<0.01**	**0.0**
24/10/2016	31	**<0.01**	**0.0**
25/10/2016		**<0.01**	**0.0**
26/10/2016		**<0.01**	**0.0**
27/10/2016		**<0.01**	**0.0**
28/10/2016		**<0.01**	**0.0**
29/10/2016		**<0.01**	**0.0**
30/10/2016		**<0.01**	**0.0**
31/10/2016	61	**<0.01**	**0.4**
01/11/2016		**<0.01**	**0.0**
02/11/2016		**<0.01**	**0.0**
03/11/2016		**<0.01**	**0.0**
04/11/2016		**<0.01**	**0.0**
05/11/2016		**<0.01**	**0.0**
06/11/2016		**<0.01**	**0.0**
07/11/2016	10	**<0.01**	**0.0**
08/11/2016		**<0.01**	**0.0**
09/11/2016		**<0.01**	**0.0**
10/11/2016		**<0.01**	**0.0**
11/11/2016		**<0.01**	**0.0**
12/11/2016		**<0.01**	**0.0**
13/11/2016		**<0.01**	**0.0**

14/11/2016	26	**<0.01**	**0.0**
15/11/2016		**<0.01**	**0.0**
16/11/2016		**<0.01**	**0.0**
17/11/2016		**<0.01**	**0.0**
18/11/2016			**0.0**
19/11/2016			**0.0**
20/11/2016		**<0.01**	**0.0**
21/11/2016	47	**<0.01**	**0.0**
22/11/2016		**<0.01**	**0.0**
23/11/2016		**<0.01**	**0.0**
24/11/2016		**<0.01**	**0.0**
25/11/2016		**<0.01**	**0.0**
26/11/2016		**<0.01**	**0.0**
27/11/2016		**<0.01**	**0.0**
28/11/2016	84	**<0.01**	**0.0**
29/11/2016		**<0.01**	**0.0**
30/11/2016		**<0.01**	**0.0**
01/12/2016		**<0.01**	**0.1**
02/12/2016		**<0.01**	**0.0**
03/12/2016		**<0.01**	**0.0**
04/12/2016		**<0.01**	**0.0**
05/12/2016	77		**0.0**
06/12/2016		**<0.01**	**0.0**
07/12/2016		**<0.01**	**0.0**
08/12/2016		**<0.01**	**0.0**
09/12/2016		**<0.01**	**0.0**
10/12/2016		**<0.01**	**0.0**
11/12/2016			**0.0**
12/12/2016	59	**<0.01**	**0.0**
13/12/2016			**0.0**
14/12/2016		**<0.01**	**0.0**
15/12/2016		**<0.01**	**0.0**
16/12/2016		**<0.01**	**0.1**
17/12/2016		**<0.01**	**0.0**
18/12/2016		**<0.01**	**0**
19/12/2016	26	**<0.01**	**0**
20/12/2016		**<0.01**	**0**

21/12/2016		**<0.01**	**0**
22/12/2016		**<0.01**	**0**
23/12/2016		**<0.01**	**0**
24/12/2016			**0**
25/12/2016		**<0.01**	**0.1**
26/12/2016	36	**<0.01**	**0**
27/12/2016		**<0.01**	**0**
28/12/2016		**<0.01**	**0**
29/12/2016		**<0.01**	**0**
30/12/2016		**<0.01**	**0**
31/12/2016		**<0.01**	**0**
01/01/2017		**<0.01**	**0**
02/01/2017	48	**<0.01**	**0**
03/01/2017		**<0.01**	**0**
04/01/2017		**<0.01**	**0**
05/01/2017		**<0.01**	**0**
06/01/2017		**<0.01**	**0**
07/01/2017		**<0.01**	**0**
08/01/2017		**<0.01**	**0**
09/01/2017	15	**<0.01**	0
10/01/2017		**<0.01**	**0**
11/01/2017		**<0.01**	**0**
12/01/2017		**<0.01**	**0**
13/01/2017		**<0.01**	**0.1**
14/01/2017		**<0.01**	**0.1**
15/01/2017		**<0.01**	**0**
16/01/2017	50	**<0.01**	**0**
17/01/2017		**<0.01**	**0**
18/01/2017		**<0.01**	0.0
19/01/2017		**<0.01**	0.0
20/01/2017		**<0.01**	**0.0**
21/01/2017		**<0.01**	**0.0**
22/01/2017		**<0.01**	0.0
23/01/2017	17	**<0.01**	0.00
24/01/2017		**<0.01**	0.00
25/01/2017		**<0.01**	0.00
26/01/2017		**<0.01**	0.00

27/01/2017		**<0.01**	0.00
28/01/2017		**<0.01**	0.00
29/01/2017		**<0.01**	0.00
30/01/2017	38	**<0.01**	0.00
31/01/2017		**<0.01**	0.00
01/02/2017		<0.01	0.00
02/02/2017		<0.01	0.00
03/02/2017		<0.01	0.00
04/02/2017		<0.01	0.00
05/02/2017		<0.01	0.00
06/02/2017	44	<0.01	0.00
07/02/2017		<0.01	0.00
08/02/2017		<0.01	0.00
09/02/2017		<0.01	0.00
10/02/2017		<0.01	0.00
11/02/2017		<0.01	0.00
12/02/2017		<0.01	0.00
13/02/2017	####	<0.01	0.00
14/02/2017		<0.01	0.00
15/02/2017		<0.01	0.00
16/02/2017		<0.01	0.10
17/02/2017		<0.01	0.00
18/02/2017		<0.01	0.00
19/02/2017		<0.01	0.00
20/02/2017	####	<0.01	0.00
21/02/2017		<0.01	0.00
22/02/2017		<0.01	0.00
23/02/2017		<0.01	0.00
24/02/2017		<0.01	0.00
25/02/2017		<0.01	0.00
26/02/2017		<0.01	0.00
27/02/2017	####	<0.01	0.00
28/02/2017		<0.01	0.00
01/03/2017			0.00
02/03/2017			0.00
03/03/2017			0.00
04/03/2017			0.00

05/03/2017			0.00
06/03/2017	####		0.00
07/03/2017			0.00
08/03/2017			0.00
09/03/2017			0.00
10/03/2017			0.00
11/03/2017			0.00
12/03/2017			0.00
13/03/2017	####		0.00
14/03/2017			0.00
15/03/2017			0.00
16/03/2017			0.00
17/03/2017			0.10
18/03/2017			0.30
19/03/2017			0.00
20/03/2017			
21/03/2017			
22/03/2017			
23/03/2017			
24/03/2017			
25/03/2017			
LIMITS	220mg/l	0.1mg/l	0.5mg/l
(Weekly Av)			