

ARC21 HIGHTOWN QUARRY

Response to Further Health Representations

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REPORT

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1 INTRODUCTION

1.1 Background

- 1.1.1 The RPS Health team have been involved with the Arc21 Hightown Quarry facility, hereafter referred to as the “proposed development”, since the project’s inception. In keeping with best practice, a Health Impact Assessment (HIA) was completed in 2014, a Statement of Case and associated Rebuttal was provided in 2016 to inform the hearing before the Planning Appeals Commission (PAC) and an HIA Addendum was submitted in March 2019.
- 1.1.2 During this process, the health evidence base at the time was reviewed, concluding that there is limited evidence to suggest that well managed and regulated facilities would present a significant risk to community health. Furthermore, through consultation and response to specific objections, all public health concerns (including perceived risks) were fully addressed.
- 1.1.3 Further recent health themed representations have been received, including reference to select epidemiological studies and concern regarding proximity to residential surrounding areas and the potential risk to local population health, particularly for individuals with pre-existing respiratory conditions. There is also some concern regarding electromagnetic interference (EMI). While EMI does not constitute a direct hazard to health in this instance, in certain circumstances it can pose a risk of telecommunication disruption and/or annoyance. In addition, EMI is sometimes confused with electromagnetic fields (EMF) which were previously assessed and do not present any material risk to public health. As such, this report outlines the differences between EMI and EMF, and further comments on the potential for annoyance from signal disruption. These objections have been reviewed, with the purpose of this report to provide a formal response to the residual health concerns raised.

1.2 Report Structure

- 1.2.1 The remainder of this report is structured as follows:
- Methodology – outlining what health impact assessment is and explaining the source-pathway-receptor concept (ensuring that the difference between a “hazard” and a “risk” is clearly defined) which is pertinent to providing an accurate and robust response;
 - Health evidence base – outlining the current position on municipal waste incinerators (MWIs) based on the most recently published research material pertinent to the project;
 - Key objections – outlining the main concerns associated with the proposed development that have been received and discussing these in the context of the 2014 HIA, health evidence base and source-pathway-receptor model; and
 - Conclusion – summary of key findings and concluding remarks.

2 METHODOLOGY

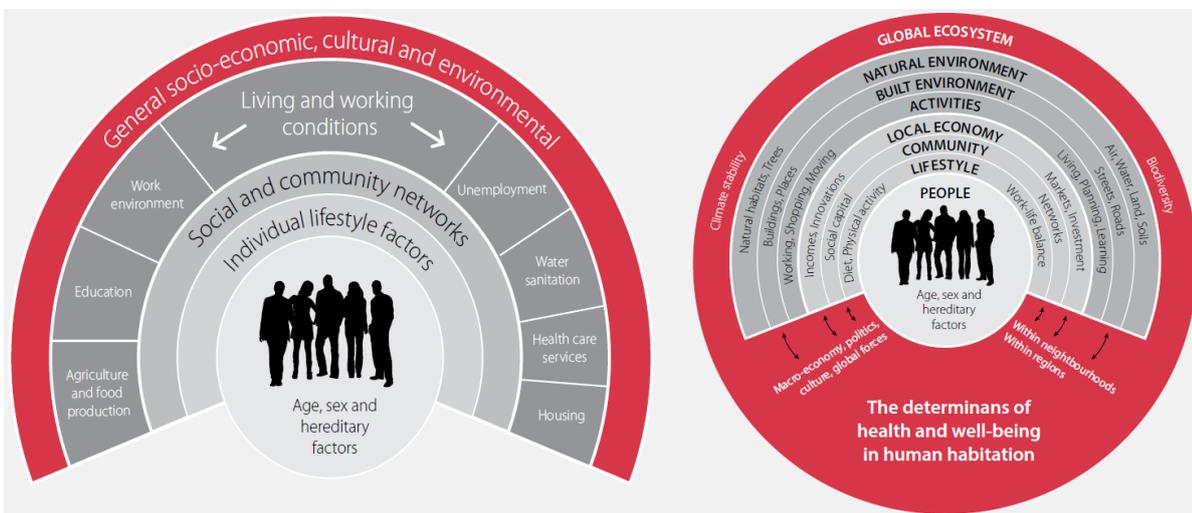
2.1 Health Impact Assessment

2.1.1 HIA is a multidisciplinary process, which typically draws from and builds upon key outputs from relevant technical disciplines (which directly relate to health and wellbeing determinants) to identify and assess the potential health outcomes (both adverse and beneficial) of a proposed project, plan or programme and to deliver evidence-based recommendations that maximise the opportunity for health gains and reduce or remove potential negative impacts on health and wellbeing.

2.2 Health Determinants

2.2.1 The 2014 HIA applied a broad socio-economic model of health that encompasses conventional health impacts such as disease, accidents and risk, along with wider health determinants vital to achieving good health and wellbeing such as employment and local amenity. It addressed both physical and mental health and wellbeing outcomes. The assessment was therefore based on both ‘social’ and ‘ecological’ (environmental) determinants of health, illustrated in Figure 2.1.

Figure 2.1: Social (Left) and Ecological (Right) Determinants of Health



Source: (Dahlgren, et al., 1991)

2.2.2 Health determinants scoped into the original HIA, which remain relevant, comprise the following:

- air quality;
- noise and vibration;
- traffic;
- direct, indirect and induced employment opportunities;
- nuisance effects;
- electromagnetic fields;
- risk perception; and
- accidents and safety.

2.3 Source-Pathway-Receptor Concept

2.3.1 The 2014 HIA methodology followed a source-pathway-receptor model to identify and assess population and human health effects that are plausible and directly attributable to the proposed development.

2.3.2 To clarify, as shown in Table 2.1, a hazard source by itself does not constitute a health risk. It is only when there is a hazard source, a sensitive receptor and a credible pathway of exposure between the two that there is any potential risk to human health. The same is true for potential health benefits where a positive influence must be present alongside a pathway of exposure and a receptor for there to be a potential health improvement.

2.3.3 Where a source-pathway-receptor linkage exists, it is then the nature of the specific hazard source or positive influence; the magnitude of impact via the pathway of exposure; and the sensitivity of the receptor that will determine what level of health risk or benefit is predicted, if any.

Table 2.1: Example of source-pathway-receptor model for health risks

Source	Pathway	Receptor	Plausible Health Risk	Explanation
x	✓	✓	No	There is not a clear source from where a potential health impact could originate.
✓	x	✓	No	The source of a potential health impact lacks a means of transmission to a population.
✓	✓	x	No	Receptors that would be sensitive or vulnerable to the health outcome are not present.
✓	✓	✓	Yes	Identifying a source, pathway and receptor does not mean a health outcome is a likely significant effect; health impacts should be assessed (describing what effect will occur and its likelihood) and likely health effects are then evaluated for significance.

3 HEALTH EVIDENCE BASE

- 3.1.1 A comprehensive health evidence base relating specifically to waste management was appended to the 2014 HIA and not updated for the 2019 HIA Addendum on the basis that while scientific research has developed during this period of time, the results only served to reinforce the health evidence base already applied. In the absence of any formal position from the Health and Social Care (HSC) and Public Health Agency (PHA) in Northern Ireland, this health evidence base included a study on the health impact of emissions to air from modern MWIs (Health Protection Agency, 2010) from the Health Protection Agency (HPA), which became Public Health England (PHE) in 2013. The health evidence base informed the 2014 HIA and 2019 HIA Addendum, which both concluded that the magnitude of change for all relevant environmental health determinants associated with the proposed development (air quality, noise and traffic) would not result in any measurable adverse health outcome across the local population.
- 3.1.2 Since the initial granting of planning permission in September 2017 and submission of the HIA Addendum in March 2019, there has been an update to PHE's statement on the modern MWIs study in October 2019 (Public Health England, 2019) to account for any particularly relevant evidence that has emerged over the years. The additional evidence reviewed focussed specifically on infant mortality and congenital anomalies in proximity to modern MWIs.
- 3.1.3 The PHE update outlines that current research found no evidence of an increased risk of infant mortality for children living close to MWIs, and no evidence of increased risk of congenital anomalies from exposure to MWI chimney emissions.
- 3.1.4 As a result, PHE's formal position remains that modern, well run and regulated MWIs are not a significant risk to public health. Recent research and the formal position of PHE (an independent authoritative expert) thereby reinforces the assessment and conclusions drawn in the original 2014 HIA.

4 KEY REPRESENTATIONS

4.1 Introduction

4.1.1 Relevant health-related objections received include concerns regarding the results of select epidemiological studies and literature (Cesaroni, et al., 2014; National Research Council Committee on Health Effects of Waste Incineration, 2000; Wei, et al., 2019). Another key concern is the “heavily residential nature” of the surrounding area and the consequential risk to local population health outcomes associated with chronic exposure, particularly for individuals with pre-existing respiratory conditions. These concerns are outlined in more detail below, with responses provided.

4.2 Discussion

Air quality

The relationship between outdoor Particulate Matter (PM) and adverse health effects

- 4.2.1 In relation to concerns regarding select epidemiological studies and literature, one representation (Ref. 5158) refers to the reporting of relatively consistent associations between outdoor PM and adverse health effects (National Research Council Committee on Health Effects of Waste Incineration, 2000). This representation confuses hazard with risk and fails to consider the response already provided in the 2014 HIA addressing this matter.
- 4.2.2 The health effects of air pollution are well known, understood, and inform air quality objectives (set to protect public health) and European environmental regulatory requirements (such as the Waste Incineration Directive). The evidence base for this was presented in the 2014 HIA, with widely used and accepted quantitative exposure response coefficients applied to assess the worst-case potential risk directly attributable to the proposed development.
- 4.2.3 Specifically, paragraph 5.14 of the 2014 HIA states that:
- “The Committee on the Medical Effects of Air Pollutants (COMEAP), reviewing epidemiological data regarding air pollutant exposure and health, has suggested (Ref.35) as a best estimate that there is a 6% increase in relative risk of mortality (all causes) associated with long-term exposure to a 10 µg.m³ increase in ambient PM_{2.5} concentration”.*
- 4.2.4 As referenced in paragraph 5.18 of the 2014 HIA, the increase in PM concentration predicted at the most-affected residential receptor was 0.026 µg.m³.
- 4.2.5 as stated in paragraph 5.13 of the 2014 HIA, a hypothetical worst-case assessment was undertaken to help further set potential risk into context. Within this hypothetical assessment the entire population of Antrim, Belfast and Newtownabbey (419,529 people at the time) were assumed to live in a single household that would experience the greatest increase in annual average PM₁₀ exposure directly attributed to the proposed development. Furthermore, the entire PM₁₀ fraction was then assumed to be PM_{2.5} (which is a subset of PM₁₀ and therefore always lower, but presents the greater risk to health).
- 4.2.6 Overall, even applying this hypothetical worst-case assessment, the change in air pollution and population exposure did not result in any material increase in mortality as it was concluded that the increase in PM was not sufficient to quantify any measurable annual change in health outcomes across the population. This result is to be expected for a facility that has been designed to manage known environmental hazards to prevent adverse health outcomes.
- 4.2.7 On the above basis, the 2014 HIA fully considers the relationship between PM and adverse health effects, with the air quality assessment concluding that the worst-case change in air pollutant exposure would be characterised as having only a slight deterioration upon air quality and the health assessment further concluding that there would be no measurable risk to public health as a result of this. While the evidence base has evolved, it only reinforces that the original assessment

was robust, the conclusion sound, and that modern, well run facilities and regulated facilities are not a significant risk to public health.

Heavily residential area

4.2.8 The same representation (Ref. 5158) states that the proposed development should not be built in such a heavily residential area and to do so risks the health of thousands of people living in the surrounding community. Specifically, the representation references that:

“In the Glengormley Urban DEA there is an estimated 8,359 households, and in the Airport DEA there is an estimated 7,240 households”.

4.2.9 The objection goes on to state that:

“the estimated population of the Antrim and Newtownabbey local government District has grown by 5.2% since the 2007 census and accounts for approximately 142,000 people”.

4.2.10 This representation confuses hazard with risk and fails to consider the response already provided in the 2014 HIA addressing this matter.

4.2.11 As already stated above, the 2014 HIA undertook a hypothetical worst-case assessment in which the entire population of Antrim, Belfast and Newtownabbey (419,529 people at the time) were assumed to live at the location predicted to experience the greatest increase in PM₁₀ pollution directly attributed to the proposed development. To provide a further level of conservatism, the assessment assumed that the entire PM₁₀ fraction was PM_{2.5} (where PM_{2.5} is associated with a higher level or risk to health but in reality, as a subset of PM₁₀, is always of a lower concentration). As a result, the original health assessment relating to air quality took into account the potential impact on hundreds of thousands of people in the surrounding community and beyond, more than accounting for future population growth in the local area.

4.2.12 On the above basis, the representation has already been addressed through the 2014 HIA, more than accounting for “heavily residential areas” and population growth. The results confirm that the change in air pollution and population exposure was not sufficient to quantify any measurable annual change in health outcomes across this population. This conclusion is consistent with the current health evidence base, the position of PHE, and is why such facilities can and do operate within residential areas and cities with no material risk to public health, while managing municipal waste at source.

Increased susceptibility of those with pre-existing health conditions

4.2.13 The same representation (Ref. 5158) also states that there is:

“increased susceptibility of individuals [redacted] with pre-existing respiratory conditions”.

4.2.14 This increased susceptibility of individuals with pre-existing conditions is embedded in the 2014 HIA assessment approach whereby a conservative worst-case hypothetical quantitative assessment approach was applied by the RPS Health team to better capture impacts on those with pre-existing health conditions. Examples of conservative parameters of the health assessment relating to air quality (detailed within the 2014 HIA) include the following:

- Air quality modelling outputs used in quantitative health calculations are based on a worst-case scenario of the facility, treating its maximum annual waste throughput and releasing air pollutant emissions at the maximum permitted concentration under the Industrial Emissions Directive – actual emissions are likely to be considerably lower.
- Population exposure inputs to quantitative health calculations assumed that the entire population of Antrim, Belfast and Newtownabbey (419,529 people at the time) live at the location predicted to experience the greatest increase in pollution – in reality, a lower number of people would experience a lower increase in pollution.
- The local burden of poor health was overestimated by selecting the highest baseline mortality and hospital admissions data and applying these as a constant for the entire population in the quantitative health assessment calculations.

- The entire PM₁₀ fraction is assumed to be PM_{2.5} in the quantitative health calculations – this is conservative because PM_{2.5} (which has a higher risk than the PM₁₀ fraction due to its smaller size) is a subset of PM₁₀ so in reality would increase less.

4.2.15 To clarify, population number, exposure and existing burden of poor health were all grossly overestimated to better capture impacts on those with pre-existing health conditions. This highly hypothetical assessment was still not sufficient to quantify any measurable annual change in health outcomes across this population. The HIA looked at the absolute change in air pollution, regardless of whether or not that change is above or below a certain threshold.

No safe exposure level to PM

4.2.16 Another representation (Ref. 5196) notes that numerous reports have confirmed that there is no safe exposure level to PM, and that associations between exposure to air pollutants and adverse health effects have been found at concentrations below the current limits, suggesting evidence for these limits to be lowered (Cesaroni, et al., 2014). This representation confuses hazard with risk and fails to consider the response already provided in the 2014 HIA addressing this matter.

4.2.17 The potential health impact from emissions to air is well known, understood and inform air quality objectives (set to protect public health) and European environmental regulatory requirements (such as the Waste Incineration Directive). While this is sufficient for planning, the linear relationship between PM and adverse health effects was further discussed and applied within the 2014 HIA.

4.2.18 Specifically, paragraph 5.14 of the 2014 HIA states that:

“there is a 6% increase in relative risk of mortality (all causes) associated with long-term exposure to a 10 µg.m³ increase in ambient PM_{2.5} concentration, and that this scales linearly in the exposure range 7 µg.m³ to 30 µg.m³”.

4.2.19 On the above basis, this representation has already been addressed by applying the epidemiological evidence they infer. Overall, the potential hazardous nature of air pollutants associated with the proposed development were robustly assessed in the 2014 HIA, were found to comply with air quality objectives set to protect public health at all receptors, and shown not to be sufficient to quantify any measurable annual change in health outcomes across this population.

Inhalation and ingestion of chemicals

4.2.20 The same representation (Ref. 5196) states that the inhalation and/or ingestion of chemicals through contaminated air or agricultural produce are another concern. Specifically, dioxins are referenced as having the potential to cause a diverse range of toxic health effects such as cancer, birth defects, decreased fertility, asthma, diabetes and skin disorders. This representation confuses hazard with risk and fails to consider the response already provided in the 2014 HIA addressing this matter.

4.2.21 As stated in paragraphs 5.26 to 5.34 of the 2014 HIA, results of the Human Health Risk Assessment (HHRA) were presented, exploring human exposure to pollutants via inhalation and ingestion over an entire lifetime of exposure, despite the facility operating for far less.

4.2.22 The HHRA assessed all relevant pollutants of concern and concluded that:

“the total lifetime cancer risk due to emissions from the proposed facility would be well below an annual risk rate of 1 in 100,000 at any of the residential receptor locations or at the point of maximum predicted air concentration or watershed deposition. The 1 in 100,000 criterion is a level considered to represent ‘minimal risk’”.

4.2.23 Regarding non-cancer risks, it is concluded that:

“the hazard index at these locations would be below 1.0. The hazard index is relative to a standard exposure level estimated to pose no appreciable likelihood of adverse health impacts, so an index of below 1 indicates that the hazard is below this no-appreciable-impact level”.

4.2.24 On the above basis, the potential risk directly attributable to the proposed development, including the concerns noted in the representation, have been investigated in the 2014 HIA and found to be

acceptable over a lifetime of exposure. Furthermore, to ensure continued operation of the proposed development, the facility must demonstrate compliance with the Environmental Permit issued by the Environmental Agency, of which covers the pollutants of concern this representation raises.

Perceived risk

- 4.2.25 There are some general statements within the representations which express concern regarding the facility and how it would impact health. Specifically, one representation (Ref. 5210) states that the proposed development “*will endanger lives and be detrimental to the health of all those within a 35km radius*”, referencing an epidemiological study (Wei, et al., 2019) which states that hospital admissions associated with short term exposure to PM_{2.5} occur below the current WHO guideline.
- 4.2.26 There are a number of reasons why the epidemiological study referenced is not relevant to the proposed development.
- 4.2.27 The epidemiological study referenced examines hospital admissions associated with 1 µg.m³ increases in PM_{2.5}. As our analysis found that the increase in exposure to PM concentration predicted at the most-affected residential receptor was 0.026 µg.m³, the increase studied by Wei et al. (2019) is more than 38 times the predicted increase in exposure caused by the proposed development (even in assuming a highly hypothetical scenario). Furthermore, in order to ensure a conservative assessment in the 2014 HIA, the increase in PM concentration associated with the proposed development was actually for PM₁₀ but assumed to be PM_{2.5}. However, PM_{2.5} is a subset of PM₁₀ and will therefore in reality always be lower in concentration than PM₁₀.
- 4.2.28 In addition, Wei et al. (2019) refer to a range of study limitations, stating “*some unmeasured time variant factors might have confounded this study. For example, smoking, alcohol consumption, physical activity, and drug use could trigger hospital admission and could also vary with air pollution levels, which is a concern.*”. It is noted that the authors of this study do not appear to have measured factors such as smoking, which itself is a major cause of exposure of PM_{2.5}. Furthermore, all participants in the Wei et al. (2019) study were aged 65 or older and therefore results are not representative of a wider population and a consistent relationship in younger populations cannot be inferred. For this reason, the Wei et al. (2019) study is not relevant to the proposed development.
- 4.2.29 Furthermore, this representation again confuses hazard with risk and fails to consider the response already provided in the 2014 HIA addressing this matter.
- 4.2.30 As previously stated in Section 2.3 of this report, a hazard source does not necessarily constitute a health risk. In this instance, the hazards associated with this type of facility are well known and managed through embedded mitigation measures (such as pollution abatement technology). For this hazard to constitute a plausible health risk, there would have to be a measurable annual impact, for which the 2014 HIA has shown there is not due to a lack of sufficient exposure across the local population (even when overestimating a series of parameters).
- 4.2.31 In addition, as detailed in Table 5.1 of the 2014 HIA, there are several examples where unfounded health concerns have been raised as objections to similar facilities (most notably Kidderminster and Sinfin Energy from Waste facilities). However, the perception of risk does not offer a tangible reason to refuse planning permission.
- 4.2.32 On the above basis, the results of the 2014 HIA which conclude that the change in air pollution and population exposure would not be sufficient to quantify any measurable annual change in health outcomes across the population, should be sufficient to address perceptions of risk which do not offer a tangible reason for refusal.

Traffic

Proposed access route and traffic alleviation measures

- 4.2.33 One representation (Ref. 5158) states that:
- “The proposed access route for the site seems completely unacceptable given the increased danger posed to children and pedestrians at the three local schools”.*

- 4.2.34 The same objection goes on to state that the objector does:
“not think that enough traffic alleviation measures have been proposed to protect the health and safety of residents”.
- 4.2.35 This representation again confuses hazard with risk and fails to consider the response already provided in the 2014 HIA addressing this matter.
- 4.2.36 As stated in the 2014 HIA, any transport movements during construction would be in accordance with a Construction Management Plan and close liaison between the contractor and the local Road Service section officer. During operation, the majority of movements of vehicles in and out of the site will be undertaken outside of peak hours. Generally, this would contribute to avoiding interaction with children and pedestrians associated with any local schools along the route.
- 4.2.37 While the representation may have concerns that the traffic alleviation measures proposed are not sufficient to protect the health and safety of residents, the strategies outlined for the proposed development (including those outlined above and infrastructure improvements) are tried and tested to meet stringent requirements that ensure roads are safe for motorists and non-motorised users (pedestrians and cyclists etc.).
- 4.2.38 On the above basis, with the implementation of mitigation measures, the potential risk directly attributable to the proposed development, including the concerns noted in the representation, have been investigated in the 2014 HIA and found not to be significant.

Electromagnetic interference

- 4.2.39 The final representation (received from TLT Solicitors dated 02 June 2020) is in relation to potential EMI from tall structures and the potential disruption this might have on telecommunications. It should be noted that local telecommunication operators have been contacted, and of those who have responded, none have objected or raised any concern for any material EMI from the proposed development. In addition, while changes in EMF were addressed within the 2014 HIA, changes in EMI were not, on the basis that EMI was not raised as a concern during the formal scoping process and does not constitute a material risk to public health in this instance.
- 4.2 EMF and EMI are two different things which are often confused. EMF is a type of non-ionising radiation which is generated whenever electric power is used or transmitted; in certain circumstances, human exposure to EMF presents a direct hazard to health through interaction with the body. EMI on the other hand is a disturbance to electric circuits which, in certain circumstances, affects proper functioning of a device caused by EMF. As previously stated in Section 1.1 of this report, EMI does not constitute a material risk to public health in this instance, although it could hypothetically pose a risk of telecommunication disruption and/or annoyance which can impact wellbeing.
- 4.2.1 Potential health impacts associated with EMF generated by the operation of the underground grid connection cable are fully addressed in the 2014 HIA, which states that the electric field is fully screened by the cable sheath material and trench infill, therefore only the magnetic field has the potential to be experienced at receptors above ground level. Overall, as described in paragraphs 5.99 to 5.102 of the 2014 HIA, even with a hypothetical worst-case cable design operating at maximum load, exposure to magnetic fields would be well below the guideline limit for long-term exposure set by the DECC Code of Practice (DECC, 2012) to protect health.
- 4.2.2 To clarify, as noted in the representation, EMI can occur where tall and large-scale structures can in certain circumstances block, reflect and scatter signals. The relevance to health and wellbeing is such that while EMI does not constitute a material risk to public health in this instance, it could hypothetically pose a risk of telecommunication disruption and/or annoyance. However, the proposed development is located in a quarry, with no direct line of sight from any known telecommunication transmission source.
- 4.2.3 The potential for EMI is therefore not significant and further addressed through the networked system of telecommunications that triangulate sources and receptors to maximise coverage. On this basis, EMI is not likely to occur and does not constitute a material risk to public health.

5 CONCLUSION

- 5.1.1 Overall, despite the newly submitted representations commenting upon a select health evidence base, all but one of the health-related concerns raised have already been assessed and addressed within the 2014 HIA and 2019 HIA Addendum, and the most recent evidence only reinforces the conclusions drawn. The only new concern raised is regarding EMI, which is not relevant on the basis that EMI does not constitute a material risk to public health or pose a risk of telecommunication disruption and/or annoyance in this instance.

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