



## Analysis and Interpretation Methodology for the Soil Investigation at Grenfell Tower

### Background

In October 2018, Government announced that additional environmental checks were to be carried out in and around the Grenfell Tower site. These proposals included a soil testing programme to check for contamination as a result of the fire.

A multiagency partnership (MAP) was formed to oversee an investigation of potential contamination of land and water as a result of the fire and to consider the potential risks to public health from the current use of the land surrounding the site (MHCLG 2018).

The investigation used the risk-based approach to the investigation of potential land contamination under *Part 2A of the Environmental Protection Act 1990 (Part 2A)* and the *Statutory Guidance* (DEFRA 2012a), which informed the approach to the collection and interpretation of information and the conclusions drawn from the data.

AECOM, an environmental consultancy, was appointed in March 2019 (from a preselected panel of environment consultants on the ESPO Framework)<sup>1</sup> to carry out Stage 1 of the investigation, which consisted of the preliminary risk assessment, exploratory sampling and a Pilot Study at Waynflete Square. The objectives of the preliminary risk assessment were to:

- Summarise the environmental setting of Grenfell Tower and the surrounding area;
- Interpret existing factual information to identify potential *contaminant linkages*;<sup>2</sup>
- Undertake exploratory sampling to further characterise the presence of potential *contaminant linkages* within the geographical area of interest; and
- Prioritise the potential *contaminant linkages* that require further investigation and identify those where there is a reasonable possibility that a *significant contaminant linkage* may exist.

In addition, the aim of the Pilot Study at Waynflete Square was to better understand spatial variability in a small area close to Grenfell Tower and to demonstrate the subsequent process of site investigation and risk assessment as part of a detailed inspection of a particular area of land under *Part 2A*.

### About this document

This document outlines the method used for the analysis and interpretation of the findings from Stage 1, in respect of human health, in accordance with *Part 2A*. However, it is important

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<sup>1</sup> Eastern Shires Purchasing Organisation (ESPO) Framework 664 – Consultancy Services Lot 8b – Environmental & Sustainability.

<sup>2</sup> Under *Part 2A*, for a relevant risk to exist there needs to be one or more contaminant-pathway-receptor linkage(s) (a *contaminant linkage*) by which a relevant person might be affected. In other words, for a risk to health to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people. See Appendix A1 for further information.

to note that the *Statutory Guidance* (DEFRA 2012a) is the definitive guide to investigation methods and the analysis and interpretation of data under *Part 2A*. References to specific paragraphs of the *Statutory Guidance* (DEFRA 2012a) are included in the text to help understanding (for example, SG 4.24, means paragraph 4.24). Although examples of the interpretation of specific *contaminant linkages* are provided throughout the text, the detailed information collected by this investigation is found in the comprehensive Technical Notes produced by AECOM for this project (see References for a list). Where legal and technical terms are not fully explained in the method statement, a definition has been included either in Appendix A or in separate Information Sheets.

### **Note about Quality Assurance and Quality Control**

There are considerable inherent uncertainties in the collection, analysis, and interpretation of environmental data including soil contaminants. Strict quality assurance and quality control is essential to reduce uncertainty during investigation. AECOM carried out Stage 1 in accordance with good practice guidance including the relevant British Standards for site investigation (BS 10175:2011+A2:2017), soil sampling (BS ISO 18400-101:2017), and for the investigation of adverse impacts from fires (BS ISO 26367-1:2017 and BS ISO 26367-2:2017). Soil samples were collected, stored, and transported to the laboratory for chemical analysis in accordance with AECOM's Field Procedures and a project specific sampling protocol. Chemical analysis was conducted by an experienced laboratory using UKAS accredited methods traceable back to national/international standards where available. AECOM's work was overseen and all draft outputs were reviewed by MAP, the Science Advisory Group, and the National Quality Mark Scheme (NQMS) Suitably Qualified Person.

### **Method Statement for Stage 1**

1. Scope set for the assessment
  - a. *Part 2A* was the legal context (see Appendix A1)
  - b. Investigation was carried out in accordance with good practice (see Information Sheet 1)
  - c. Investigation in Stage 1 included a preliminary risk assessment and an illustrative generic quantitative risk assessment (the Pilot Study)<sup>3</sup>
  - d. Investigation examined potential impact of fire emissions on land condition and potential risks to health.
2. A preliminary risk assessment was carried out (AECOM 2019k) that
  - a. Identified Chemicals of Potential Concern (COPC) from fire emissions and their behaviour in the environment through a review of previously published studies (AECOM 2019b and e)
  - b. Identified potential hazards to public health from human exposure to COPC in soil, the possible exposure pathways, and the most sensitive land-uses (AECOM 2019f)
  - c. Identified potential routes for fire emissions to soil and likely patterns of deposition (AECOM 2019c, d, and i)

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<sup>3</sup> This tiered approach to risk assessment was consistent with good practice (see Information Sheet 1) and formed part of the activities of *detailed inspection* under *Part 2A* (SG 2.9 – 2.15, SG 3.12 – 3.17).

- d. Developed initial conceptual site model and identified potential *contaminant linkages* (SG 3.8 – 3.11). An example linkage is shown in Table 1.
- e. Designed and executed exploratory soil sampling to refine the conceptual site model based on initial understanding of *contaminant linkages* (AECOM 2019a, 2019j)
- f. Updated the initial conceptual site model for each potential *contaminant linkage*, identified major uncertainties, and assigned a qualitative ranking<sup>4</sup> of the likelihood that a reasonable possibility of significance exists for each *contaminant linkage* using the following factors:
  - i. Chemical analysis results (percentage of non-detects, measured soil concentrations, and any spatial patterns consistent with fire emissions)
  - ii. Generic screening criteria (GSC) including equivalent in-house values (see Information Sheet 2) for comparison with measured concentrations (AECOM 2019f)<sup>5, 6</sup>
  - iii. ‘Normal’ levels of COPC in soils (see Appendix A2) for comparison with measured concentrations (AECOM 2019g)<sup>4, 5</sup>
  - iv. Additional lines of evidence for fire as the source of contamination (for example, the use of ratio plots for profiles of polycyclic aromatic hydrocarbons).
  - v. Evidence gaps and other factors (qualitative degree of epistemic uncertainty)

**Table 1: An example of a contaminant linkage**

Linkage	Contaminant	Potential pathways	Receptor
1	Benzo[a]pyrene in ash and debris, deposited on surface soils by the fire	Ingestion of soil and soil derived indoor dust Inhalation of soil-derived dust (indoor and outdoor) Dermal contact with soil Dermal contact with soil-derived indoor dust Consumption of produce and attached soil Inhalation of vapours (indoor and outdoor)	Young female child (aged from birth – 6 years), potential resident and site user

- g. Identified reasonably possible *significant contaminant linkages* for further investigation and identified any necessary work to address evidence gaps to resolve

<sup>4</sup> A qualitative ranking of the strength of evidence for each *contaminant linkage* for the reasonable *possibility of significant harm to human health* (SG 4.10 – 4.15). It was not a quantitative assessment of risk to public health, but a comparative ranking for prioritisation purposes only.

<sup>5</sup> Due to spatial variation and exploratory soil samples being taken over a wide area, it was not appropriate to draw any robust conclusions from a single sample at a single location. However, broader conclusions were drawn from the whole data set on the impact of fire emissions on soil contamination in the vicinity of the Grenfell tower.

<sup>6</sup> See Table 3 for examples for several contaminants.

major uncertainties. An illustrative example of a prioritisation matrix using the above criteria is shown in Table 2.

- h. *Part 2A* requires the regulator to consider whether there are reasonable grounds for the existence of a *significant possibility of significant harm* before continuing with further inspection activities. Taking into account the uncertainties and gaps in the evidence, a regulator may rule out further inspection activities at this stage for contaminant linkages that it considers are unlikely to have a reasonable possibility of meeting the definition of a *significant contaminant linkage* (see Appendix A1).

**Table 2: An illustrative example of a prioritisation matrix for potentially *significant contaminant linkages* at Grenfell \*\***

<b>Soil Data</b>	<b>Generic Screening Criteria (GSC)</b>	<b>Normal background levels</b>	<b>Linkage Ranking</b>
Most if not all results at or less than suitable method detection limits (MDL) and/or sample depth and location inconsistent with potential exposure pathways	-	-	No further investigation required (evidence suggests that there is no reasonable possibility of a <i>significant contaminant linkage</i> )
Most results above MDL and sample depth and location consistent with potential exposure pathways, but no indication of spatial patterns or hot spot consistent with fire emissions	All results at or below a relevant GSC	All results considered to be within typical background levels	Low priority for further investigation (evidence suggests that there is unlikely to be a reasonable possibility of a <i>significant contaminant linkage</i> )
Most results above MDL and sample depth and location consistent with potential exposure pathways, but no indication of spatial patterns or hot spot consistent with fire emissions	Some results well-above a relevant GSC *	Some results above typical background levels	Medium priority for targeted further investigation (evidence suggests there could be a reasonable possibility of a <i>significant contaminant linkage</i> )
Results above MDL and sample depth and location consistent with potential exposure pathways. Results indicate a strong spatial pattern and/or hot spot(s) that are consistent with fire emissions	Majority of results above and many results well-above a relevant GSC *	Majority of results above typical background levels	High priority for further investigation (evidence suggests there could be a reasonable possibility of a <i>significant contaminant linkage</i> )
Results above MDL and sample depth and location consistent with potential exposure pathways. Results indicate a strong spatial pattern and/or hot spot(s) that are consistent with fire emissions	Majority of results well-above relevant GSC *	Majority of results well-above typical background levels	Highest priority for further investigation (evidence suggests there is a reasonable possibility of a <i>significant contaminant linkage</i> )

\* SG 3.29 and foot notes conclude that the level of risk posed by land contamination depends on more than simply the contaminant concentration in soil. The question of how much above a GSC is no longer *Category 4* (there could still be a reasonable possibility of a *significant contaminant linkage*) depends on the specific GSC and the site circumstances built into it. The range given in the *Statutory Guidance* is from a few times higher to orders of magnitude higher.

\*\* Not shown in the above matrix is the cross-cutting assessment of uncertainty and the identification of critical information gaps for each *contaminant linkage* by the assessor. If confidence in the assignment of a priority to a *contaminant linkage* is low, this may indicate the need for further investigation.

3. A generic quantitative risk assessment for the Pilot Study at Waynflete Square was carried out to illustrate the risk assessment process and investigation at Stage 2 (AECOM 2019I)
  - a. Designed and executed soil sampling to inform a generic quantitative risk assessment for each potential *contaminant linkage* at the Pilot Study site (AECOM 2019a, 2019j)
  - b. Reviewed laboratory results and divided into additional separate populations / data sets as appropriate (such as through taking into account differences in source zones and sample depths in accordance with good practice guidance)
  - c. No clear spatial trends were observed in the data and it was possible to produce conventional statistics for several potential *contaminant linkages* in each data set including the range, the median, the mean, the 95<sup>th</sup> percentile upper confidence level of the mean (the UCL95). Results were also presented as simple box plots to aid presentation and understanding.
  - d. Where conventional statistical methods are valid then the relevant summary statistics for each potential *contaminant linkage* can be compared with relevant information on (see examples in Table 3 and also Appendix A2 and Information Sheet 2):
    - i. Generic screening criteria (GSC, AECOM 2019f)
    - ii. 'Normal' levels in soils (AECOM 2019g)
    - iii. 'Estimated' levels of exposure from other sources, for example, ambient air and diet (for example, EFSA 2008, 2010 and 2018)

The initial assessment compared the individual soil measurements for each location with the relevant information on a point-by-point basis. Subsequently, once analysis indicated that conventional statistics were valid, these were used as a secondary step to support interpretation of the findings.

- e. Where concentrations of soil contaminants measured were found at or below a GSC or within *normal levels* or where soil exposure was only a small proportion of total environmental exposure, the *contaminant linkage* was placed in *Category 4* (the *contaminant linkage* was considered not to pose a *significant possibility of significant harm* to health and was not a *significant contaminant linkage*).<sup>7</sup> Risks were also concluded to be absent if there was no longer considered to be a viable *contaminant linkage* (for example, no pathways for exposure to occur).
- f. Where the potential *contaminant linkage* could not immediately be placed in *Category 4*, it was not possible at this stage to assign it with any certainty to *Categories 1 – 4*.<sup>8</sup> If there was still a reasonable possibility that the *contaminant linkage* could be a *significant contaminant linkage* then further site investigation in the form of a detailed quantitative risk assessment will normally be undertaken to

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<sup>7</sup> See Appendix A1 for a description of *Categories 1 – 4* in respect of the *significant possibility of significant harm* to human health from the *Statutory Guidance* (SG 4.17 – 4.29)

<sup>8</sup> SG 3.29 and foot notes conclude that the level of risk posed by land contamination will depend on more than simply the amount in soil. The question of how much above a GSC is no longer *Category 4* depends on the specific GSC and the site circumstances built into it. The range given in the *Statutory Guidance* is from a few times higher to orders of magnitude higher.

refine the outcome of the risk assessment (see Information Sheet 1). However, this additional investigation was beyond the scope of the Pilot Study.

- g. In addition to any consideration of individual *contaminant linkages*, the possible combined effect of multiple *contaminant linkages* was also evaluated. In particular interactions and additive effects were considered from review of the toxicology (AECOM 2019f).<sup>9</sup> In some cases, the additivity of contaminants was considered within the derivation of the GSC (for example, benzo[a]pyrene and other carcinogenic polycyclic aromatic hydrocarbons or the combined effect of dioxins, furans and dioxin-like polychlorinated biphenyls).
- h. Public health professionals were asked to assist with risk communication.

**Table 3: Examples of relevant information used in the generic quantitative risk assessment for different contaminants**

<b>Contaminant</b>	<b>GSC (see Information Sheet 2)</b>	<b>Normal levels (see Appendix A2)</b>	<b>Estimated exposures from other sources (SG 4.21)</b>
Benzo[a]pyrene	<b>C4SL</b> 5 mg/kg (Residential) 5.7 mg/kg (Allotments) 10 mg/kg (Open space) DEFRA (2014)	<b>NBC</b> 6.9 mg/kg Greater London soils (Vane et al. 2014)	<b>Dietary</b> 0.004 µg/kg bw/day (mean) 0.007 µg/kg bw/day (high) European mean and high level consumers (EFSA 2008)
Dioxins, furans and dioxin-like PCBs	<b>SGV</b> 0.008 mg/kg (Residential) 0.008 mg/kg (Allotments) Suitability will depend on congener profile Environment Agency (2009)	<b>Descriptors</b> 0.0002 – 0.011 mg/kg (Range) 0.001 mg/kg (Median) 0.0014 mg/kg (Mean) English urban soils (Environment Agency 2007a and b)	<b>Dietary</b> 0.6 – 1.5 pg TEQ/ kg bw/day (mean, median LB and UB) 1.9 – 3.5 pg TEQ/ kg bw/day (95 <sup>th</sup> P, median LB and UB) European mean and high level consumers (EFSA 2018)
Lead	<b>C4SL</b> 200 mg/kg (Residential) 80 mg/kg (Allotments) 630 mg/kg (Open space) DEFRA (2014)	<b>NBC</b> 820 mg/kg Urban domain (DEFRA 2012b)	<b>Dietary</b> 0.8 – 3.1 µg/kg bw/day (mean, LB and UB) 1.7 - 5.5 µg/kg bw/day (high) European mean and high level child (aged 1 – 7 years) consumers (EFSA 2010)

<sup>9</sup> The Committee on Toxicity of Chemicals in Food, Consumer Products, and the Environment (COT) has previously advised that interactions in mixtures at soil concentrations leading to exposures representing minimal or negligible risk (see Information Sheet 2) are unlikely (Environment Agency 2009a). However, exposures to mixtures at higher levels of exposure require consideration.

## References

- AECOM, 2019a. Protocol for initial soil sampling exercises, Technical Note 3.
- AECOM, 2019b. Fire Chemistry Quick Scoping Evidence Review, Technical Note 4.
- AECOM, 2019c. Fate of debris – deposition, spread, clean up, Technical Note 5.
- AECOM, 2019d. Review of Met Office Air Dispersion Modelling, Technical Note 6.
- AECOM, 2019e. Review of fire effluent environmental fate and transport, Technical Note 7.
- AECOM, 2019f. COPC toxicity, Technical Note 8.
- AECOM, 2019g. Published data on national and regional urban background concentrations, Technical Note 9.
- AECOM, 2019h. Potential sources of urban soil pollution, Technical Note 13.
- AECOM, 2019i. Collated community information, Technical Note 14.
- AECOM, 2019j. Factual data from exploratory sampling and pilot study, Technical Note 15.
- AECOM, 2019k. Preliminary risk assessment, Technical Note 16.
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VANE C.H., KIM A.W., BERIRO D.J., CAVE M.R., KNIGHTS K., MOSS-HAYES V., NATHANAIL P.C., 2014. Polycyclic aromatic hydrocarbons (PAH) and polychlorinated biphenyls in urban soils of Greater London, UK. APPLIED GEOCHEMISTRY, 51, 303-314.

## **Appendix A: Definitions**

### A1: Part 2A of the Environmental Protection Act 1990 and Statutory Guidance (Defra 2012a)

Part 2A of the Environmental Protection Act 1990 defines contaminated land in S. 78A as:

*“Contaminated land” is any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that –*

- a. Significant harm is being caused or there is a significant possibility of such harm being caused; or*
- b. Significant pollution of controlled waters is being caused or there is a significant possibility of such pollution being caused.*

*and, in determining whether any land appears to be such land, a local authority shall, subject to subsection (5) below, act in accordance with guidance issued by the Secretary of State in accordance with S. 78YA below with respect to the manner in which that determination is to be made.*

Section 1 of the Statutory Guidance sets out the objectives of Part 2A:

*1.1 This Guidance should be read and applied with Part 2A and the following points in mind.*

*1.2 England has a considerable legacy of historical land contamination involving a very wide range of substances. On all land there are background levels of substances, including substances that are naturally present as a result of our varied and complex geology and substances resulting from diffuse human pollution. On some land there are greater concentrations of contaminants, often associated with industrial use and waste disposal. In a minority of cases there may be sufficient risk to health or the environment for such land to be considered contaminated land.*

*1.3 Part 2A provides a means of dealing with unacceptable risks posed by land contamination to human health and the environment, and enforcing authorities should seek to find and deal with such land. Under Part 2A the starting point should be that land is not contaminated land unless there is reason to consider otherwise. Only land where unacceptable risks are clearly identified, after a risk assessment has been undertaken in accordance with this Guidance, should be considered as meeting the Part 2A definition of contaminated land.*

*1.4 The overarching objectives of the Government’s policy on contaminated land and the Part 2A regime are:*

- (a) To identify and remove unacceptable risks to human health and the environment.*



*(b) To seek to ensure that contaminated land is made suitable for its current use.*

*(c) To ensure that the burdens faced by individuals, companies and society as a whole are proportionate, manageable and compatible with the principles of sustainable development.*

*1.5 Enforcing authorities should seek to use Part 2A only where no appropriate alternative solution exists. The Part 2A regime is one of several ways in which land contamination can be addressed. For example, land contamination can be addressed when land is developed (or redeveloped) under the planning system, during the building control process, or where action is taken independently by landowners. Other legislative regimes may also provide a means of dealing with land contamination issues, such as building regulations; the regimes for waste, water, and environmental permitting; and the Environmental Damage (Prevention and Remediation) Regulations 2009.*

*1.6 Under Part 2A, the enforcing authority may need to decide whether and how to act in situations where such decisions are not straightforward, and where there may be unavoidable uncertainty underlying some of the facts of each case. In so doing, the authority should use its judgement to strike a reasonable balance between: (a) dealing with risks raised by contaminants in land and the benefits of remediating land to remove or reduce those risks; and (b) the potential impacts of regulatory intervention including financial costs to whoever will pay for remediation (including the taxpayer where relevant), health and environmental impacts of taking action, property blight, and burdens on affected people. The authority should take a precautionary approach to the risks raised by contamination, whilst avoiding a disproportionate approach given the circumstances of each case. The aim should be to consider the various benefits and costs of taking action, with a view to ensuring that the regime produces net benefits, taking account of local circumstances.*

Sections 3 and 4 of the Statutory Guidance set out some important definitions:

### **Current use**

*3.5 Under Part 2A, risks should be considered only in relation to the current use of the land. For the purposes of this Guidance, the “current use” means:*

*(a) The use which is being made of the land currently.*

*(b) Reasonable likely future uses of the land that would not require a new or amended grant of planning permission.*

*(c) Any temporary use to which the land is put, or is likely to be put, from time to time within the bounds of current planning permission.*

*(d) Likely informal use of the land, for example children playing on the land, whether authorised by the owners or occupiers, or not.*

*(e) In the case of agricultural land, the current agricultural use should not be taken to extend beyond the growing or rearing of the crops or animals which are habitually grown or reared on the land.*

*3.6 In assessing risks the local authority should disregard any receptors which are not likely to be present given the current use of the land or other land which might be affected. In considering the timescale over which a risk should be assessed the authority should take into account any evidence that the current use of the land will cease in the relevant foreseeable future (e.g. within the period of exposure assumed for relevant receptors in a contaminant linkage).*

### **Contaminant linkages**

3.8 Under Part 2A, for a relevant risk to exist there needs to be one or more contaminant-pathway-receptor linkages – “contaminant linkage” – by which a relevant receptor might be affected by the contaminants in question. In other words, for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters. For the purposes of this Guidance:

(a) A “contaminant” is a substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor, or to cause significant pollution of controlled waters.

(b) A “receptor” is something that could be adversely affected by a contaminant, for example a person, an organism, an ecosystem, property, or controlled waters. The various types of receptors that are relevant under the Part 2A regime are explained in later sections.

(c) A “pathway” is a route by which a receptor is or might be affected by a contaminant.

3.9 The term “contaminant linkage” means the relationship between a contaminant, a pathway and a receptor. All three elements of a contaminant linkage must exist in relation to particular land before the land can be considered potentially to be contaminated land under Part 2A, including evidence of the actual presence of contaminants. The term “significant contaminant linkage”, as used in this Guidance, means a contaminant linkage which gives rise to a level of risk sufficient to justify a piece of land being determined as contaminated land. The term “significant contaminant” means the contaminant which forms part of a significant contaminant linkage.

3.10 In some cases the local authority may encounter land where risks are presented by groups of substances which are likely to behave in the same manner, or a substantially very similar manner, in relation to the risks they may present (e.g. as may be the case with organic substances found in oils). For the purposes of identifying and assessing contaminant linkages and taking regulatory decisions in relation to such linkages, the local authority may treat such groups of contaminants as being in effect a single contaminant and multiple contaminant linkages as being in effect a single contaminant linkage. The authority should only do this if there is a scientifically robust reason for doing so, and it should state clearly why this approach has been taken in relevant documentation (including the risk summary discussed later in this Section) if the land is later determined as contaminated land.

3.11 In considering contaminant linkages, the local authority should consider whether:

(a) The existence of several different potential pathways linking one or more potential contaminants to a particular receptor, or to a particular class of receptors, may result in a significant contaminant linkage.

(b) There is more than one significant contaminant linkage on any land. If there are, the authority should consider whether or not each should be dealt with separately, since different people may be responsible for the remediation of individual contaminant linkages.

### **Significant harm to human health**

4.3 The paragraphs below set out categories of harm that should be considered to be significant harm to human health. In all cases the harm should be directly attributable to the effects of contaminants in, on or under the land on the body(ies) of the person(s) concerned.

4.4 Conditions for determining that land is contaminated land on the basis that significant harm is being caused would exist where: (a) the local authority has carried out an appropriate, scientific and technical assessment of all the relevant and available evidence; and (b) on the basis of that

assessment, the authority is satisfied on the balance of probabilities that significant harm is being caused (i.e. that it is more likely than not that such harm is being caused) by a significant contaminant(s).

4.5 The following health effects should always be considered to constitute significant harm to human health: death; life threatening diseases (e.g. cancers); other diseases likely to have serious impacts on health; serious injury; birth defects; and impairment of reproductive functions.

4.6 Other health effects may be considered by the local authority to constitute significant harm. For example, a wide range of conditions may or may not constitute significant harm (alone or in combination) including: physical injury; gastrointestinal disturbances; respiratory tract effects; cardio-vascular effects; central nervous system effects; skin ailments; effects on organs such as the liver or kidneys; or a wide range of other health impacts. In deciding whether or not a particular form of harm is significant harm, the local authority should consider the seriousness of the harm in question: including the impact on the health, and quality of life, of any person suffering the harm; and the scale of the harm. The authority should only conclude that harm is significant if it considers that treating the land as contaminated land would be in accordance with the broad objectives of the regime as described in Section 1.

4.7 If the local authority decides that harm is occurring but it is not significant harm, it should consider whether such harm might be relevant to consideration of whether or not the land poses a significant possibility of significant harm (see sub-section 4.2 below). For example, this might be the case if there is evidence that the harm may be a precursor to, or indicative or symptomatic of, a more serious form of harm, or that repeated episodes of minor harm (e.g. repeated skin ailments) might lead to more serious harm in the longer term.

### **Possibility of significant harm to human health**

4.10 In assessing the possibility of significant harm to human health from the land and associated issues, the local authority should act in accordance with the advice on risk assessment in Section 3 and the guidance in this section.

4.11 The term “possibility of significant harm” as it applies to human health, for the purposes of this guidance, means the risk posed by one or more relevant contaminant linkage(s) relating to the land. It comprises:

(a) The estimated likelihood that significant harm might occur to an identified receptor, taking account of the current use of the land in question.

(b) The estimated impact if the significant harm did occur i.e. the nature of the harm, the seriousness of the harm to any person who might suffer it, and (where relevant) the extent of the harm in terms of how many people might suffer it.

4.12 In estimating the likelihood that a specific form of significant harm might occur the local authority should, among other things, consider:

(a) The estimated probability that the significant harm might occur: (i) if the land continues to be used as it is currently being used; and (ii) where relevant, if the land were to be used in a different way (or ways) in the future having regard to the guidance on “current use” in Section 3.

(b) The strength of evidence underlying the risk estimate. It should also consider the key assumptions on which the estimate of likelihood is based, and the level of uncertainty underlying the estimate.

4.13 In some cases the local authority’s assessment of possibility of significant harm may be based, solely or partially, on a possible risk that may exist if circumstances were to change in the future within the bounds of the current use of the land. For example, an assessment may be based on a

*possible risk if a more sensitive receptor were to move onto the land at some point in the future. In such cases the authority should ensure that the possibility of the future circumstance occurring is taken into account in estimating the overall possibility of significant harm.*

*4.14 The local authority should estimate the timescale over which the significant harm might become manifest, to the extent that this is possible and practicable (and recognising that often it may only be possible and practicable to give a broad indication of the estimated timescale).*

### **Categorisation of land for deciding whether a possibility of significant harm is significant (health)**

*4.17 In deciding whether or not land is contaminated land on grounds of significant possibility of significant harm to human health, the local authority should use the categorisations described in paragraphs 4.19 – 4.30 below. Categories 1 and 2 would encompass land which is capable of being determined as contaminated land on grounds of significant possibility of significant harm to human health. Categories 3 and 4 would encompass land which is not capable of being determined on such grounds.*

*4.18 In considering whether a significant possibility of significant harm exists, the local authority should consider the number of people who might be exposed to the risk in question and/or the number of people it estimates would be likely to suffer harm. In some cases, the authority may decide that this is not a particularly relevant consideration: it is quite possible that land could be determined as contaminated land on the basis of a significant possibility of significant harm to an individual or a small number of people. However in other cases the authority may consider that the number of people affected is an important consideration, for example if the number of people at risk substantially alters the authority's view of the likelihood of significant harm or the scale and seriousness of such harm if it did occur.*

#### **Category 1: Human Health**

*4.19 The local authority should assume that a significant possibility of significant harm exists in any case where it considers there is an unacceptably high probability, supported by robust science-based evidence that significant harm would occur if no action is taken to stop it. For the purposes of this Guidance, these are referred to as "Category 1: Human Health" cases. Land should be deemed to be a Category 1: Human Health case where:*

*(a) the authority is aware that similar land or situations are known, or are strongly suspected on the basis of robust evidence, to have caused such harm before in the United Kingdom or elsewhere; or*

*(b) the authority is aware that similar degrees of exposure (via any medium) to the contaminant(s) in question are known, or strongly suspected on the basis of robust evidence, to have caused such harm before in the United Kingdom or elsewhere;*

*(c) the authority considers that significant harm may already have been caused by contaminants in, on or under the land, and that there is an unacceptable risk that it might continue or occur again if no action is taken. Among other things, the authority may decide to determine the land on these grounds if it considers that it is likely that significant harm is being caused, but it considers either: (i) that there is insufficient evidence to be sure of meeting the "balance of probability" test for demonstrating that significant harm is being caused; or (ii) that the time needed to demonstrate such a level of probability would cause unreasonable delay, cost, or disruption and stress to affected people particularly in cases involving residential properties.*

#### **Category 4: Human Health**

4.20 The local authority should not assume that land poses a significant possibility of significant harm if it considers that there is no risk or that the level of risk posed is low. For the purposes of this Guidance, such land is referred to as a “Category 4: Human Health” case. The authority may decide that the land is a Category 4: Human Health case as soon as it considers it has evidence to this effect, and this may happen at any stage during risk assessment including the early stages.

4.21 The local authority should consider that the following types of land should be placed into Category 4: Human Health:

(a) Land where no relevant contaminant linkage has been established.

(b) Land where there are only normal levels of contaminants in soil, as explained in Section 3 of this Guidance.

(c) Land that has been excluded from the need for further inspection and assessment because contaminant levels do not exceed relevant generic assessment criteria in accordance with Section 3 of this Guidance, or relevant technical tools or advice that may be developed in accordance with paragraph 3.30 of this Guidance.

(d) Land where estimated levels of exposure to contaminants in soil are likely to form only a small proportion of what a receptor might be exposed to anyway through other sources of environmental exposure (e.g. in relation to average estimated national levels of exposure to substances commonly found in the environment, to which receptors are likely to be exposed in the normal course of their lives).

4.22 The local authority may consider that land other than the types described in paragraph 4.21 should be placed into Category 4: Human Health if following a detailed quantitative risk assessment it is satisfied that the level of risk posed is sufficiently low.

4.23 Local authorities may decide that particular land apparently matching the descriptions of paragraph 4.21 (b) or (d) immediately above poses sufficient risk to human health to fall into Categories other than Category 4. However, such cases are likely to be very unusual and the authority should take particular care to explain why the decision has been taken, and to ensure that it is supported by robust evidence.

### **Categories 2 and 3: Human Health**

4.24 For land that cannot be placed into Categories 1 or 4, the local authority should decide whether the land should be placed into either: (a) Category 2: Human Health, in which case the land would be capable of being determined as contaminated land on grounds of significant possibility of significant harm to human health; or (b) Category 3: Human Health, in which case the land would not be capable of being determined on such grounds.

4.25 The local authority should consider this decision in the context of the broad objectives of the regime and of the Government’s policy as set out in Section 1. It should also be mindful of the fact that the decision is a positive legal test, meaning that the starting assumption should be that land does not pose a significant possibility of significant harm unless there is reason to consider otherwise. The authority should then, in accordance with paragraphs 4.26 to 4.29 below, decide which of the following two categories the land falls into:

(a) Category 2: Human Health. Land should be placed into Category 2 if the authority concludes, on the basis that there is a strong case for considering that the risks from the land are of sufficient concern, that the land poses a significant possibility of significant harm, with all that this might involve and having regard to Section 1. Category 2 may include land where there is little or no direct evidence that similar land, situations or levels of exposure

*have caused harm before, but nonetheless the authority considers on the basis of the available evidence, including expert opinion, that there is a strong case for taking action under Part 2A on a precautionary basis.*

*(b) Category 3: Human Health. Land should be placed into Category 3 if the authority concludes that the strong case described in 4.25(a) does not exist, and therefore the legal test for significant possibility of significant harm is not met. Category 3 may include land where the risks are not low, but nonetheless the authority considers that regulatory intervention under Part 2A is not warranted. This recognises that placing land in Category 3 would not stop others, such as the owner or occupier of the land, from taking action to reduce risks outside of the Part 2A regime if they choose. The authority should consider making available the results of its inspection and risk assessment to the owners/occupiers of Category 3 land.*

*4.26 In making its decision on whether land falls into Category 2 or Category 3, the local authority should first consider its assessment of the possibility of significant harm to human health, including the estimated likelihood of such harm, the estimated impact if it did occur, the timescale over which it might occur, and the levels of certainty attached to these estimates. If the authority considers, on the basis of this consideration alone, that the strong case described in paragraph 4.25(a) does or does not exist, the authority should make its decision on whether the land falls into Category 2 or Category 3 on this basis regardless of the other factors discussed in paragraph 4.27.*

*4.27 If the authority considers that it cannot make a decision in line with paragraph 4.26, it should consider other factors which it considers are relevant to achieving the objectives set out in Section 1. This should include consideration of:*

*(a) The likely direct and indirect health benefits and impacts of regulatory intervention. This would include benefits of reducing or removing the risk posed by contamination. It would also include any risks from contaminants being mobilised during remediation (which would in any case have to be considered under other relevant legislation); and any indirect impacts such as stress-related health effects that may be experienced by affected people, particularly local residents. If it is not clear to the authority that the health benefits of remediation would outweigh the health impacts, the authority should presume the land falls into Category 3 unless there is strong reason to consider otherwise.*

*(b) The authority's initial estimate of what remediation would involve; how long it would take; what benefit it would be likely to bring; whether the benefits would outweigh the financial and economic costs; and any impacts on local society or the environment from taking action that the authority considers to be relevant.*

*4.28 In making its consideration in regard to paragraph 4.27(a) and (b), the local authority is not required to make a detailed assessment. For example, the consideration should not necessarily involve quantification of the impacts, particularly if the authority considers it is not possible or reasonable to do so, and the authority is not expected to produce a detailed cost-benefit or sustainability analysis. Rather it is expected to make a broad consideration of factors it considers relevant to achieving the aims of Section 1.*

*4.29 If, having taken the above factors into account, the local authority still cannot decide whether or not a significant possibility of significant harm exists, it should conclude that the legal test has not been met and the land should be placed in Category 3.*

A2: 'Normal' levels of soil contamination

SG 3.21 to 3.26 (DEFRA 2012a) explain that *Part 2A* was “...not intended to apply to land with levels of contaminants in soil that are commonplace and widespread throughout England or parts of it, and for which in the very large majority of cases there is no reason to consider that there is an unacceptable risk.” Consequently, “Normal levels of contaminants in soil should not be considered to cause land to qualify as contaminated land, unless there is a particular reason to consider otherwise.”

“Normal” levels of contaminants in soil may result from:

*(a) The natural presence of contaminants (e.g. caused by soil formation processes and underlying geology) at levels that might reasonably be considered typical in a given area and have not been shown to pose an unacceptable risk to health or the environment.*

*(b) The presence of contaminants caused by low level diffuse pollution, and common human activity other than specific industrial processes. For example, this would include diffuse pollution caused by historic use of leaded petrol and the presence of benzo(a)pyrene from vehicle exhausts, and the spreading of domestic ash in gardens at levels that might reasonably be considered typical.”*

In order to assist local authorities to determine ‘normal’ concentrations for their local area, Defra published research on normal background concentrations (NBCs) for a range of trace elements and common diffuse urban pollutants including benzo[a]pyrene (DEFRA 2012c). For each contaminant, NBCs are “*attributed to different regions of the country for each contaminant based on factors that were observed to contribute to higher concentrations in some areas, referred to as domains.*” Data outside of the domains associated with higher concentrations is assigned to the principal domain. For each domain, the NBC is defined as the upper 95% confidence limit of the 95<sup>th</sup> percentile of the contaminant concentration for that domain. Additional data using the NBC method has also been published in the scientific literature and has been summarised for this investigation (AECOM 2019g).

Soil data for each chemical was compared with the NBC where available. Where soil concentrations were lower than the NBC, it was concluded that the levels are in the range seen in the respective domain (usually this was the urban domain, but others may be more representative of the Grenfell area). On this basis, and without further characterisation of the contamination, it was not possible to conclude with any certainty whether the contamination was the result of the fire or the result of natural or historic/diffuse anthropogenic pollution.

In many cases there was insufficient data to derive an NBC. Therefore AECOM made reasonable judgements on the basis of the available information (for example, a review of the available scientific literature and levels found elsewhere in the local area). This included:

- Comparing the range of soil concentrations found at the site with the range of values found in other similar locations (either locally or regionally – such as across London) using methods such as summary statistics and box-and-whisker plots.
- Comparing the average or median concentrations found at the site with representative values from other locations using methods such as summary statistics and box-and-whisker plots.