OUTER HOUSE, COURT OF SESSION

[2024] CSOH 56

A39/13, A63/13, A64/13, A65/13, A101/13, A102/13, A103/13, A108/13, A115/13, A120/13, A122/13

OPINION OF LORD CLARK

In the cause

SIMON PELOSI AND OTHERS

Pursuers

against

LANARKSHIRE HOUSING ASSOCIATION LTD

Defender

Pursuers: Sutherland; Allan McDougall
Defender: Johnston KC, McKinlay; Brodies LLP

5 June 2024

Introduction

[1] Thirty-six actions were raised against Lanarkshire Housing Association Ltd, by individuals who claim to have suffered personal injury caused by contaminants present in the land at a housing development. Each pursuer is, or was, a tenant in the development and the defender is the landlord. The housing, which is in Motherwell, is known as "the Watling Street development". This opinion deals with eleven of the actions, heard together, and the outcome will be binding in respect of the remaining cases. The issues to be dealt

with are: (i) whether the defender has breached its statutory duties; and (ii) if so, whether that has caused loss to the pursuers.

[2] These cases first called more than ten years ago, in early 2013. They were then sisted by judges for several years and, after a decision at an opposed motion hearing, a reclaiming motion was dealt with. Following the decision of the Inner House, when the cases called before me, parties were encouraged to have discussions about identifying the lead case or cases. It took some time for that to be sorted out, but in due course it was agreed that thirteen cases would be the lead cases, although two of these cases were later removed, leaving the current eleven cases.

[3] Thereafter, several case management hearings took place. Despite efforts to have the actions determined reasonably soon, that turned out not to be possible. Lengthy periods of adjustment were needed, along with extensive periods for the lodging of full medical records of the numerous pursuers, a number of expert reports and supplementary reports. That affected the fixing of the proof date. By way of example, three expert reports were only able to be lodged in December 2023. Motions were made to discharge the proof but the grounds were not persuasive and, having regard also to the need for a reasonably efficient disposal of the cases, the motions were refused.

[4] In due course the proof took place, over a period of just less than three weeks. Many productions were lodged and evidence was led from the thirteen pursuers and six experts. As a consequence, this opinion is more lengthy than normal, particularly because after summarising the factual and expert evidence, and parties' submissions, many contentious points have to be addressed, and that is done in my assessment of the expert evidence.

Glossary

[5] The expert reports, evidence and submissions all make reference, using acronyms or abbreviations, to types of solvent, chemicals and contaminants and to expressions used in guidance documents. While the meaning of each acronym or abbreviation is set out in the narrative of the evidence that follows, some of them are then referred to more than once, and it may help to have the meanings of those terms readily to hand in this glossary.

TCE	Trichloroethane
PCE	Tetrachloroethylene
VOCs	Volatile organic compounds
SVOCs	Semi-volatile organic compounds
PAHs	Polycyclic aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
COPC	Constituents of potential concern
MTBE	Methyl-tertiary butyl ether
UCL95	Upper confidence limit of the mean
GACs	Generic assessment criteria
SGVs	Soil guideline values
DEFRA	Department of Environment, Food and Rural Affairs

Background

The site

[6] The Watling Street development was built on a former industrial site in Motherwell. It extended to approximately 10.6 hectares, divided into four parcels of land: Plot A, Plot B1, Plot B2, and Plot C. The properties owned by the defender and tenanted by the pursuers are built wholly within Plot A of the site.

[7] The industrial site was developed from farmland at the beginning of the 20th century, becoming the location of the Motherwell Iron and Steel Works. The firm operated there until around 1940. The site was transferred to Metropolitan-Vickers in 1947. In the 1950s the site was redeveloped as an engineering works, manufacturing control mechanisms for the heating and ventilation industry. Metropolitan-Vickers was rebranded as AEI in 1960. By 1969 the site was occupied by Satchwell Sunvic (another subsidiary of AEI, which made heating controls). By the late 1970s work had ceased on the site and the buildings were, at least in part, demolished. The site was earmarked for redevelopment by the Scottish Development Agency, with planning permission granted by Motherwell District Council in May 1988.

[8] The defender is the owner and landlord of ninety-four properties on the site. The total number of residents at the site was not the subject of evidence in this case, but it is estimated that there may be around two hundred people living there. The thirteen pursuers who gave evidence lived in ten different properties on the site.

Investigations carried out

[9] Investigations that were carried out in the past are referred to and considered by expert witnesses for each side and so are now briefly summarised. In the early 1990s, the

council instructed Scott Wilson Kirkpatrick (SWK) to carry out contamination studies, in order to assess the cost of making the site ready for sale for residential use. Various investigations were conducted or supervised by SWK and remediation works were done. Put broadly, while various metals, chemicals, solvents and compounds were found, SWK concluded that the degree of risk of harm from chemical contamination had been reduced to an acceptably low-level consistent with the residential use of the site. Citylink Developments Ltd carried out the development of Plot A, with construction commencing in the late 1990s. In July 2000, the contractors and developers arranged for further testing of certain back gardens, resulting in metals and solvents being found, causing the ground in those particular back gardens to be removed and replaced with soil brought in. The houses had, by then, been constructed.

[10] Residents moved into the properties from 1999. In due course, they became concerned about health problems and around 2009-10 many were made aware of the previous industrial use of the site and the presence of potential contaminants. A resident raised these concerns with North Lanarkshire Council. The Council instructed WSP UK Ltd (WSP) to carry out investigations. WSP carried out various investigations between 2010 and 2012, including an environmental assessment, and further investigations described as Stage 1, Stage 2 and Stage 3. These included groundwater sampling and taking soil samples from 64 gardens, nominally three from each garden. WSP's assessment results, applying generic assessment criteria (GACs), concluded that two gardens (2 Tiber Avenue and 12 Romulus Court) had a "hotspot" of polycyclic aromatic hydrocarbon (PAH) concentrations which were above the residential screening criteria. One garden (18 Forum Place) had two hotspots of PAH concentrations above the criteria. Another garden (6 Forum

Place) had two hotspots of lead and nickel concentrations above the criteria. These hotspots were generally recorded at depths of 20 to 40 centimetres under the surface.

[11] Other properties were also found by WSP to have shown the presence of contaminants but these were, following analysis, found to fall below the level stated by GACs for residential use. A recommendation was made that consideration be given to the excavation and off-site disposal of the hotspot areas which had been identified, followed by replacement with inert subsoil and topsoil suitable for residential use.

[12] Solicitors for the pursuers instructed Monridge Environmental LLC, a company owned and managed by Mr Brien, one of the expert witnesses for the pursuers. Monridge carried out indoor air sampling at Cornelia Street, Empire Way, Forum Place, and Tiber Avenue and gave their results in a report in August 2011. This was reviewed by WSP. Monridge also did a report following investigations in relation to Empire Way, Forum Place, and Tiber Avenue in June 2012 and then a Site Investigation and Vapour Intrusion Assessment at 31 Empire Way in March 2012. Further investigations resulted in a report by Monridge in April 2013. Twenty five properties were investigated by Monridge in their indoor air quality investigation. IKM Consulting were also instructed by the pursuers' solicitors and did a human health risk assessment at 31 Empire Way, reported on 18 May 2012, and a further investigation reported on 17 May 2013. WSP did a further investigation at 31 Empire Way in an Indoor Air and Sub-Slab Soil Vapour Assessment, reported on 5 November 2013.

Metals, chemicals, solvents and compounds on the site

[13] The made ground on which the properties were built contained brick, ash, clinker, various metals and their derivatives, and a variety of volatile organic compounds (VOCs),

semi-volatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), and possibly polychlorinated biphenyls (PCBs). Made ground is an area where material is known to have been placed on the pre-existing land surface. The remediation of the site for residential development did not remove all made ground. In the ground and groundwater at Plot A of the site, where the pursuers' houses were constructed, there are compounds present, which include carbon tetrachloride, TCE, PCE, benzene, benzo(a)pyrene, acetone, propanol, 2-propanol, ethanol, cis-1,2 dichloroethene and toluene.

[14] As a consequence, the chemical and physical properties of the contaminants in the ground (except for metals) have the potential to evaporate. The extent to which an individual contaminant will evaporate depends on temperature and the properties of the contaminant. Chemical and physical properties of VOCs and SVOCs mean that they can break down over time to other forms of compound. The distribution of the compounds mentioned above within the site, including contamination by VOCs, SVOCs, PCBs and metals, is not uniform. Potential pathways for transmission of the compounds to the pursuers include inhalation of vapour fumes emitted by the compounds in the soil and groundwater, and from direct or dermal contact with the compounds in the soil.

Statutory provisions

[15] Section 113 of Housing (Scotland) Act 1987, and Schedule 10, paragraph 2, provide that:

> "In any contract to which this paragraph applies there shall, notwithstanding any stipulation to the contrary, be implied a condition that the house is at the commencement of the tenancy, and an undertaking that the house will be kept by the landlord during the tenancy, in all respects reasonably fit for human habitation …"

Section 27 of the Housing (Scotland) Act 2001, and Schedule 4, paragraph 1, provide that:

> "The landlord in a Scottish secure tenancy must—
>
> (a) ensure that the house is, at the commencement of the tenancy, wind and watertight and in all other respects reasonably fit for human habitation, and
>
> (b) keep the house in such condition throughout the tenancy."

The 2001 Act applied to tenancies commencing on or after 30 September 2002. Five of the pursuers were tenants prior to then, with the remaining eight moving in thereafter. However, the requirements for habitation in the provisions are almost identical.

Factual Evidence

The pursuers

[16] Evidence was led from the thirteen pursuers, in this order: Barbara Strachura, Elizabeth Butler, Marie Wilson, Donald Glen, Mary Adams, Joseph Tougher, Fiona Tougher, Kathleen MacDonald, Nicoletta Kovacs, Simon Pelosi, Theresa Ward, Lee Brannan, and Laura McCluskey. They each gave witness statements and their medical records were lodged. Eight of them had also completed an indoor air assessment survey in 2011. There were many common points in the evidence they gave and they also had to disclose information of a personal nature, so it is not necessary, or appropriate, to set out each pursuer's evidence in detail.

[17] Some of the pursuers lived on the ground floor of their building, others on the first floor and some in mid-terrace or end-terrace properties. The properties are located within the development, in Forum Place, Tiber Avenue, Cornelia Street and Empire Way. One pursuer moved into her property in 1999, four in 2001, one in 2006, four in 2008, two in 2009 and one in 2011. Six of them no longer live there.

[18] In examination-in-chief, counsel for the pursuers, Mr Sutherland, followed a similar approach with each pursuer. They each adopted their witness statements, their responses to a medical questionnaire and other documents which they had completed. The pursuers explained what they would smell within the properties and the gardens, and, in some detail, their own symptoms and ailments. Mr Sutherland then took each witness to what the expert instructed for the defender (Professor Eddleston) said about them. This included having certain of the symptoms before they moved into the house, there being symptoms now stated but which they had not mentioned to their GP or were not contained in the GP records, and symptoms they still experienced after having left the property. The pursuers were asked to comment on these points and did so. There was no cross-examination of any of the pursuers.

[19] Their references to experiencing a smell often described it as strong, unpleasant, sweet and gassy or oily. For some it occurred throughout the year, both inside and outside the house. Others spoke to it being stronger in specific parts of the house and at different times. Some said that when flooring was being replaced the smell was even stronger. A number of them had some of the symptoms they referred to before moving in, but described them as generally not as bad as what was experienced when living there. Some explained why they had not gone to their GP or had not stated certain things to the GP, largely because, as they put it, they just had to get on with it and could use over-the-counter medication. Occasionally a pursuer said they did tell their GP about symptoms, even though that was not recorded. Several pursuers explained symptoms stopping or at least improving when they moved out or were away from the property, sometimes weeks or months later. They also commented on poor soil conditions and difficulties in gardening.

[20] The key symptoms referred to were, as listed and described in the pursuers' written submissions: (a) recurring or continuing headaches; (b) lethargy, exhaustion, tiredness and, for some, depression; (c) inflammation of the eyes, ears or throat; (d) joint pain or stiffness; (e) confusion or fatigue; (f) pins and needles; (g) stomach problems; (h) rashes and dermatitis and (i) problems with the heart, lung or kidney. No-one had all of these ailments, but each had several of them. The evidence about the last one, (i), was fairly limited. A number of the pursuers mentioned other health issues, some of which are perhaps related to certain of the symptoms listed. This included eczema, UTI, IBS, blocked nose, nose bleeds, sinus problems, dizziness, bowel problems, hay fever, asthma, itchiness, vomiting and diarrhoea. One witness said that anti-depressants were taken, all to do with the property. Another one mentioned mould in the house. Family members or visitors were referred to by certain witnesses as suffering some of the symptoms. The pursuers each explained when they were first told that the land was contaminated, generally in 2010 or 2011.

Agreed evidence of other witnesses

[21] The evidence of two other witnesses was agreed by the parties. Andrew McFarlane of DM Hall was instructed for the pursuers and gave a report in 2012 in connection with a particular property (31 Empire Way) in respect of routes for potential vapour transfer, along with two short supplementary reports, one of which commented on other premises. Gavin Young, who at the time was the Technical Services Manager for the defender, gave a witness statement explaining, among other things, the checks and repairs carried out at properties on the site. The evidence of these witnesses was not relied upon by either side as being of any real significance to the key issues in the case.

Expert evidence

[22] It is convenient at this stage to briefly summarise the main points made by the experts. Further details of their opinions and reasoning, relied upon by either side, are discussed later in my assessment of their evidence.

Environmental experts

[23] Three environmental expert witnesses were led for the pursuers (Mr Brien, Mr Quint and Mr Witherington) and one expert gave evidence for the defender (Mr Firth). The central themes were looking at the types of chemicals, solvents and contaminants previously found on the site and in particular areas, and reaching a view on the level of contamination likely to have been caused. This was done principally by reviewing the historical environmental reports of WSP, Monridge and IKM and commenting on the figures identified in those investigations. Accordingly, these experts did not, for the purpose of their reports, carry out their own sampling.

Pursuers' environmental experts

Mr Brien

[24] Kevin Brien is an experienced professional environmental engineer, licensed in Pennsylvania and Delaware. In his expert report, Mr Brien gave his opinion on the reasons for the differences in results obtained by WSP, Monridge and IKM in relation to soil sampling, soil vapour and indoor air quality sampling. He commented on concerns raised by Environ, instructed on behalf of the defender, about work completed by him when he ran Monridge. Mr Brien then gave his own views on the extent of contamination in soil, soil vapour, and groundwater at the site and on the shortcomings of conceptual models used by

consultants, such as WSP, to evaluate risk. In relation to soil contamination, his view is that the groundworks have spread contaminants throughout the site. On soil vapour, his opinion is that the extent of soil vapour impacts has not been properly investigated. He also comments on the soil probes installed by WSP, saying these were not appropriate for assessing the risk associated with soil vapour throughout the site, a point now agreed between the experts

[25] In his opinion, the horizontal and vertical delineation of soil, soil vapour and groundwater at the site is incomplete and the methodologies used and errors in the investigative approach have resulted in a dataset that cannot be relied upon to properly assess the risk to residents at the development. This applied to WSP but also to the analytical models in the Quint and Firth reports.

Mr Quint

[26] Michael Quint is an expert on contaminated land risk assessment. He concluded that Mr Firth's report does not represent a full land-contamination risk assessment of the site. It is restricted to a consideration of vapour risks from a subset of the detected subsurface contaminants. Other issues relevant to the pursuers' claims, such as potential direct contact with contamination (soil ingestion and dermal absorption), have not been considered by Mr Firth. Mr Quint refers to significant limitations with the available site investigation data, and states that these have not been sufficiently recognised. While he generally agreed with Mr Firth's final opinions regarding the questions he was asked, Mr Quint felt that Mr Firth's modelling of potential indoor vapour levels in the pursuers' homes is not as health-conservative as it should have been. Taken together, the various sources of uncertainty make the results indicative only, such that they could represent over- or under-estimates of

the levels of risks encountered by the pursuers. Mr Quint also carried out his own vapour modelling exercise.

[27] He concluded that, on the basis of his updated human health risk assessment, there appear to be, and will have been historically, human health risks associated with contamination at the Watling Street site, extending over a number of years, since the tenancies started, and continuing to the present day. For him, this is supported by the following: measured levels of chemicals in soil, at certain locations, exceeding GACs and site-specific assessment criteria; measured levels of chemicals in soil, soil vapour and groundwater having been shown, by computer modelling, to be capable of causing indoor air concentrations in excess of health-based assessment values (HBAVs); chemicals associated with site-related contamination having been measured in indoor air in excess of HBAVs; and chemicals associated with site-related contamination having been detected in outdoor air.

[28] Further sources of contamination risk could, in his opinion, also exist at the site. These are undetected, due to important limitations with regard to the environmental sampling which has taken place there, to date. In his view, the identified contamination has resulted in the properties not being capable of occupation for a reasonable time without risk to the health or safety of the occupants, although whether there has been any actual harm to human health is beyond the scope of his expertise, and he defers to others. However, he also states that "the true risks will never be known, and they could be greater than those implied here, or by Mr Firth, IKM, or WSP, or they could be zero." In re-examination, Mr Quint stated that the intention of his work was to provide insight into what risks "theoretically there might have been over the years".

Mr Witherington

[29] Peter Witherington is an expert in geotechnical and environmental land related issues. On the basis of the information available, he concluded that there are two potential causes for contamination being present in the ground around properties across the site. The first is that appropriate contaminants were not tested for during the investigation phases of works and as a result the presence of residual VOCs in the ground was not considered. These substances could then pose a potential risk to the future residential properties "via direct contact exposure to shallow soils and via vapour intrusion and indoor inhalation exposure by residents". These substances have been identified in subsequent investigations carried out by WSP but he considers the sampling methods used could have resulted in under-recording of the concentrations. Furthermore, because of volatilisation and other degradation processes, concentrations may well have been higher at the time the development was completed.

[30] Secondly, across most of the site the requirement for a suitable thickness of subsoil/topsoil layer in garden areas, as recommended by SWK, appears to have been fulfilled using site-won clay containing varying quantities of ash, slag, clinker and other anthropogenic materials. This is particularly evident in the even-numbered northern properties on Forum Place. This has resulted in those hotspots identified by WSP, which they recommended be removed.

[31] In his opinion, residents at the site are more likely than not to have been exposed to higher levels of VOCs in their gardens than they would have otherwise been exposed to if adequate investigations had been undertaken prior to development and appropriate remedial works taken to resolve them.

Defender's environmental expert

Mr Firth

[32] Simon Firth is a contaminated land practitioner who specialises in human health and environmental risk assessment of subsurface contamination. He was instructed for the defender to prepare an expert technical report in relation to vapour risks from subsurface contamination. In his opinion, on the balance of probabilities, a viable pathway exists by which vapours (from the subsurface) could enter the properties and vapour intrusion has been ongoing since the buildings were constructed.

[33] Mr Firth dealt specifically with vapour modelling, which he conducted to predict the concentrations of vapours in indoor air arising from the measured concentrations in soil, soil vapour and groundwater. His conclusions were that the predicted indoor air concentrations based on the measured soil concentrations are all below health-based screening criteria, with certain exceptions. There was disparity between the WSP results and the Monridge results, but doubt was cast on the validity of the Monridge dataset and it is possible that the indoor air concentrations of carbon tetrachloride have been over-predicted by Monridge.

[34] The indoor air concentrations predicted from the measured WSP sub-slab concentrations are all below current health-based screening concentrations. The indoor air concentrations predicted from the measured Monridge soil vapour concentrations exceed those screening concentrations for long-term exposure for TCE and carbon tetrachloride. However, the predicted concentration of TCE in indoor air (9 μg.m-3) is below the previous screening value of 18.2 μg.m-3 which would have been applicable at the commencement of the pursuers' tenancies. Furthermore, carbon tetrachloride was not detected by Monridge in indoor air samples. Groundwater vapour modelling has shown that volatilisation from groundwater is unlikely to result in indoor air concentrations exceeding health-based

screening values. Monridge used what were called "grab samples" and more detailed investigations were made by WSP.

[35] In relation to the gardens, the type of vapours present in outdoor air, arising from subsurface contamination, are likely to be the same as in indoor air arising from subsurface contamination. However, the concentrations of vapours in outdoor air are predicted to be several orders of magnitude below those in indoor air and are well below screening values that represent low/tolerable risk for long term (chronic) exposure.

Toxicology experts

[36] Expert evidence on toxicology, that is, whether chemicals or substances are toxic or harmful to humans, was given for the pursuers by Professor Douglas and for the defender by Professor Middleton.

Professor Douglas

[37] In considering the evidence of Professor Douglas, it is appropriate to note that he agreed with a number of points made by Dr Bojan Flaks, an expert previously instructed for the pursuers who is now deceased. In the opinion of Dr Flaks, it appeared that housing was built on this former industrial estate without adequate prior remediation. Environmental investigations, notably by Monridge and by IKM, have in his view shown that the ground of the site is contaminated with a variety of toxic organic solvents.

[38] The final conclusions reached by Dr Flaks can be summarised as follows. On the basis of the results of the environmental, structural and health investigations that have been carried out: if toxic solvents at the level detected by the testing that has been done are present in the soil in the vicinity of the house and there is a pathway that permits the

migration of the solvent into the house, and the solvents are present in the indoor air at the levels indicated by the investigations that have been carried out, then, on the balance of probabilities, the residents of that house will have suffered from some form of neurotoxic or other damage. For any particular individual it would be necessary to exclude alternative causes, at least by review of his or her medical history.

[39] Professor Douglas was asked to prepare an independent critical review of the report of Dr Flaks. He noted Dr Flaks as stating that it appears that solvents are able to enter the residential premises readily as vapours by diffusion, thereby exposing the occupants, and that there is also the potential for a dermal pathway from the contamination in the gardens. Professor Douglas mentions the reference by Dr Flaks to the Motherwell Health Survey from May/June 2010, a symptom questionnaire based on 99 individuals at the site. He notes that there are some clearly high values for anxiety (18%), depression (20%) and, particularly, headaches (41%), asthma (12%), other respiratory problems (15%) and that there are also some interesting low values, including stress (1%), poor concentration (1%) and disturbed sleep (1%).

[40] Professor Douglas describes two matters in Dr Flaks' report as cardinal points: firstly, that the soil contains a list of solvents at high levels (including vinyl chloride, among others); secondly, that migration of solvents into the houses is possible. He concludes that Dr Flaks has produced a thorough, comprehensive toxicological report into solvent contamination at the site. He says that, assuming Dr Flaks has accurately described the factual background and accurately summarised the investigations mentioned, he agrees with the conclusions Dr Flaks has reached. Professor Douglas also observed that as well as what Dr Flaks referred to about people having suffered symptoms, others in the future would also suffer.

[41] He goes on to discuss in some detail the risk of cancer. He concludes in his report that at the commencement of the tenancies, on the basis of the factual material described and Dr Flak's report, on the balance of probabilities, the housing association was in breach of its statutory duty.

[42] Professor Douglas then reviewed the witness statements of the residents. He mentions that some appear to have shown a degree of recovery after removal and others not. He comments on social circumstances of many of the residents and talks about historical studies showing levels of anxiety among persons living in deprived circumstances in Glasgow and low life-expectancy of working men. He says that thus, when moving further into the records provided, it is no great surprise to find extensive medical records, reflecting ill-health and adverse social circumstances as well as housing worries. He observes, as a common thread, that those person who have moved out of the properties have found an improvement in their health whilst others have noted the worsening of their health after moving in, only to resolve on moving out. He also recognises, given the amount of documentation and medical records, that it will be difficult to sort out for each individual the potential sources of ill-health, reflected in large numbers of GP visits and large quantities of medicines prescribed.

[43] He concludes that if the court accepts that environmental pollution in the form of heavy metals and solvents was present then, on the balance of probabilities, this is likely to have contributed to the ill-health of the residents, additional to that determined by the socio–economic status of many of the residents on the estate.

Professor Eddleston

[44] Professor Eddleston is a Professor of Clinical Toxicology at the University of Edinburgh and a consultant clinical toxicologist and pharmacologist. Having regard to the modelling of Simon Firth, he reached the following conclusions. On the balance of probabilities, there is no evidence from the medical records that any of the exceedances noted in Mr Firth's modelling gave rise to symptoms or harms. He refers to the pursuers' pleaded position on the workplace limits for contamination, including that chronic solvent exposure is well-recognised as being injurious to health in the workplace, and there could be harm caused by chronic exposure of occupants of residential properties at lower concentrations than has been set for workplace exposure. In his opinion, this is a theoretical position. Workplace exposure limits are set conservatively, usually 10-100 times lower than the calculated dose at which no adverse effects are observed. He was unable to find any cases in the literature where people were potentially exposed to solvent levels below the occupational or workplace limits and developed clear toxicity specific to the compounds involved, or indeed developed any disease.

[45] He was asked four questions by the instructing solicitors for the defender, based on the assumption that he is content that, if the Firth modelling is reliable, the only concerns are with 25 and 29 Empire Way and 2 Tiber Avenue on the potential risk to human health. The first question was about the levels of TCE and carbon tetrachloride from which one would expect symptoms to be present, and the symptoms that might arise. His response was that he would expect symptoms if air concentrations exceeded the long-term UK workplace exposure limits (over 8 hours) for TCE (100 ppm, 550,000 μg/m3) or carbon tetrachloride (1 ppm, 6,400 μg/m3). No exposure limits have been developed for longer duration

exposure. He felt that it is important to remember that exposure limits are set to avoid any ill-health in workers and so have a large safety margin.

[46] The second question was whether, on the balance of probabilities, the levels of TCE and carbon tetrachloride estimated above could give rise to the symptoms complained of by the tenants at the three properties he was asked to consider. His answer was, on the balance of probabilities, the modelled concentrations of TCE and carbon tetrachloride in the properties would not explain the symptoms reported. The workplace exposure limits (concentrations) are substantially higher than the values modelled in the Firth report (TCE: 4.9 μg/m3; carbon tetrachloride 14-27 μg/m3). This marked difference between modelled concentrations and workplace limits is described by him as reassuring.

[47] The third question concerned the extent to which, if any, the findings of the report by Mr Firth alter his own conclusions in relation to the tenants at these three properties. His response was that the report's findings did not alter his conclusions.

[48] The final question was whether there were any other findings in the Firth report which Professor Eddleston thinks may be relevant to the question of whether the vapours present in the properties could have resulted in the health effects alleged by the pursuers. He did not consider any other findings in the Firth report to be relevant to this question.

[49] Professor Eddleston noted that there are certain symptoms associated with what is known about exposure to solvents, but he pointed to the absence of research which establishes that there is a link between these symptoms and chronic low-level exposure. He also points out that many of the symptoms that are complained about are symptoms that people commonly suffer from, and that many of the pursuers, but not all of them, had been recorded as experiencing those types of symptoms before their tenancies began. He notes that the medical records of many of the pursuers did not record those complaints at the time.

[50] He stated in evidence that what is recorded in the medical records can be treated as a reliable account of the symptoms that people were suffering from at the time. His view was that the GP would likely have been told of all the material problems that the individual was suffering from when visiting the GP, and the GP would have recorded them. In response to a question that in the course of an assessment he cannot purely refer to GP records and ignore what the patients themselves have described, he said that all people tell stories about when they talked to doctors, whereas GP records are objective and are a concurrent or contemporaneous report. There would be no reason to think that a person would not have reported something that is viewed as particularly bad, because a person who is unwell would generally report all of the symptoms to the GP.

[51] Professor Eddleston summarised his position. Mr Firth's report, describing his modelling of potential in-house exposures to VOCs, reported four exceedances of the current long-term occupational concentrations. Review of the medical records for the inhabitants of the houses involved found no evidence to indicate any illness reported to be associated with the relevant chemicals at higher concentrations. On the balance of probabilities, in the absence of any supporting information, the illnesses reported by the pursuers did not result from low-level in-house exposure to VOCs in the Watling Street development.

Submissions

[52] The statutory provisions noted above were first introduced in similar terms by the Housing of the Working Classes Act 1890. Parties each accepted the interpretation given in certain key cases. These include the English authorities *Morgan* v *Liverpool Corporation* [1927] 2 KB 131 and *Summers* v *Salford Corporation* [1943] AC 283, the reasoning in these cases

having been followed in several cases in Scotland. Each counsel also referred to what they described as analogous statutory provisions, which I shall discuss briefly when I come to explain my decision and reasons.

[53] Counsel prepared written submissions and these were then developed in oral submissions, responding to the other side's position and offering criticisms or challenges. I have considered all of the submissions. When I come to assess the evidence I will deal with the relevant points in contention and at this stage it suffices to summarise the main points made by each side.

Submissions for the pursuers

[54] The full extent of contamination at any individual property (including the garden) is not known, but it has been there since the commencement of each tenancy. There could be other contaminants present within Plot A which were not analysed within the course of the WSP site investigations. WSP's methodology and sampling were not sufficient, including the depths at which sampling was taken. Vapour inhalation from the contaminants is considered to be a significant potential risk. Mr Brien and Mr Quint both concluded that there is a risk of undiscovered hotspots of contaminants at the site. There is no record and no evidence that the identified hotspots were excavated and disposed off-site and replaced by clean fill soil. As Mr Brien stated, there are likely to be more hotspots and contaminants at the site and the contaminants concerned are more than just the TCE which Mr Firth was focusing on. What was found elsewhere could be significant in relation to what could potentially be found at a pursuer's property if further investigation was undertaken. From WSP's methodology there isn't a clear understanding of the situation regarding groundwater.

[55] Mr Quint's modelling method was more appropriate than that of Mr Firth. In any event the modelling carried out by Mr Quint and Mr Firth is of limited value in this case. The exercise of modelling is based on estimates and assumptions and is not a science. It post-dates the commencement date of most of the tenancies and deals only with a single contaminant at a time. The data is not reliable to allow meaningful modelling. The modelling does not help in knowing the full range of potential contamination exposure at the site generally or at individual properties. It deals with the consideration of vapour concentrations found in the particular examples in comparison with GACs used in relation to site development. Part 2A of the Environmental Protection Act 1990, on which the defender places some reliance, is not relevant and it deals with different issues. Moreover, the GACs for exposure to TCE have been lowered, indicating the knowledge of a higher health risk. It is also necessary to take into account the carcogenicity of TCE.

[56] The pursuers recognise there is a lack of research to show what the effects of chronic exposure to low-level solvent fumes might be. The pursuers also recognise that it is not possible to know with any certainty what the concentration of exposure to any particular contaminant might have been. However, there are four points which show the impact on the pursuers' health. Firstly, their own individual reported experiences concerning the state of their health before they moved into the tenancy, whilst they were living there and the differences, in symptoms and health, after they moved out. Secondly, they show a collective experience of their health problems and the similarity of the symptoms. Thirdly, they mention the experience of others who lived in the house or visited the house. Fourthly, for some of the pursuers there is stronger evidence of linkage to potentially harmful levels of contaminants in the ground than for others.

[57] On that last point, WSP had identified hotspots at 18 Forum Place and 2 Tiber Avenue. On the balance of probabilities it is likely that they remain in place. The property at 31 Empire Way is a ground floor property, and 29 Empire Way is a first-floor property. Vapour fumes present in 31 Empire Way are also likely to permeate 29 Empire Way, so the findings in relation to 31 Empire Way are also indicative of contamination from the same solvent vapour fumes as 29 Empire Way. Also, certain witness suffered rashes after having planted flowers or done other gardening activities. Given the evidence of Mr Witherington and Mr Brien that contaminants are all over the site, and the figures provided by Mr Firth, on the balance of probabilities these rashes are caused by direct or dermal contact with contaminants in the ground.

[58] Professor Eddleston noted that there has never been a community affected like this, according to the literature. He does not, however, attempt to consider any commonality between the pursuers' symptoms and what that commonality indicates. He views the pursuers as not credible or reliable. Professor Eddleston attributed the linking of their health problems to the occupation of their housing as being due to health anxiety, arising from being told about contamination. However, he did not explain why tenants who had left their houses reported feeling better before the contamination of the site became common knowledge.

[59] Professor Eddleston did not consider certain relevant matters and speculated about alternative explanations. He did not take into account the potential for synergy, additionality or compound effects due to the risk of there being more than one source of contamination exposure in the properties. Professor Douglas, an expert with knowledge and experience, gave an illustration of the impact of smoking and exposure to asbestos being multiplicative. In addition to considering the medical information of each individual he

looked at the pursuers as a group and identified commonalities. He considered the overall impact of exposure upon the pursuers' health and whether it caused or exacerbated symptoms.

[60] The risk of harm requires to be considered by reference to the agreed pathways linking contamination with the pursuers, including direct contact with soil or the presence of hotspots not shown to have been removed. In relation to vapour inhalation, on the balance of probabilities the ground on which the homes and gardens have been built do contain VOCs and SVOCs. The pursuers' evidence should be accepted, showing that they have experienced harm from the contamination of the property while they have been residents.

[61] Professor Douglas's evidence and his support of the pursuers should be preferred to Professor Eddleston's evidence to the contrary. Professor Eddleston accepted that the ailments and symptoms could potentially have been caused by vapour inhalation and his issue is simply that regarding chronic exposure to multiple contaminants there is no medical evidence of a link. Professor Douglas, based on his experience, says there would be a link by analogy with other situations.

[62] The real issue is actual or potential harm to health. An increased risk of cancer is something which you can get damages for and you do not have to get cancer to suffer. On the evidence, it has been demonstrated that there was a risk to health and indeed that is referenced by Mr Firth in his report. In relation to petroleum hydrocarbons being found, it was not a credible proposition that petroleum had been brought inside the premises by the tenants. The defender's point about commonality being restricted as there are many other residents (some 200 in total) is of no significance as we do not know what symptoms the others have also suffered and there are also other litigations going on.

Submissions for the defender

[63] The point that there could be other contaminants on the site is not enough for the pursuers to prove breach of duty. It is for the pursuers to show that there are in fact other contaminants present. Also, when a case is based on harm at individual properties it would not only be useful to know, but an important thing to prove, the extent of contamination at an individual property. It is accepted that in principle the presence of contamination could be capable of rendering the subject properties unfit for human habitation. However, Part 2A of the 1990 Act should be considered and indeed it would be anomalous if the court were to hold that subjects which do not meet the threshold for contaminated land under the 1990 Act are unfit for human habitation under and in terms of the 1987 or 2001 Act.

[64] In relation to factual evidence, it is accepted that the individual pursuers were generally doing their best to assist the court in their witness statements and oral evidence. However, the evidence of Professor Eddleston about the pursuers' accounts of their ailments and symptoms is relied upon.

[65] On the environmental evidence of Mr Brien, Mr Witherington and Mr Quint the opinion evidence they gave does not support a conclusion, on the balance of probabilities, that the properties are not reasonably fit for human habitation or that there is any risk to the health of the occupants. Taken at its highest, the evidence is only capable of supporting the proposition that further investigations would be required before any conclusions could be drawn regarding those matters. Mr Brien took the view that investigations were incomplete and the dataset cannot be relied upon to properly assess the risk to residents.

Mr Witherington was not asked to address the question of risk. Mr Quint commented on

modelling and various sources of uncertainty making things incomplete and said the true risk was not known.

[66] MTBE was not detected in any of the soil samples, or soil vapour samples, of which there were over 200 taken across the site and there are no other samples exposing MTBE. This suggests that if it is in indoor air it is not coming from the ground. In relation to groundwater, WSP found that the granular horizon was not laterally continuous and shallow groundwater was likely to be discontinuous. In other words, there was no pathway for groundwater to move around the site. On the point raised about the carcogenicity of TCE, that is just another mention of a potential risk rather than an actual risk.

[67] On the hotspot point, Mr Firth gave coherent reasons to support his conclusion that there are unlikely to be any further hotspots at the site. There is no proper evidential basis from which to conclude that further hotspots exist. Even if undiscovered hotspots do exist, Mr Brien accepted that he cannot say where they would be and which of the pursuers, if any, they may affect. While the pursuers say that there is no record and no evidence that the identified hotspots were excavated and disposed off-site and replaced by clean fill soil, there is no evidence that they were not excavated and disposed.

[68] In relation to modelling, notwithstanding the uncertainties and data gaps there is sufficient data available to conduct meaningful analytical modelling. Mr Firth's approach should be preferred. He has conducted vapour modelling for the main VOC solvents detected at the site and the thresholds identified represent a minimal or low risk to health.

[69] Mr Quint's approach was not consistent with the pursuers having the burden of proof on the balance of probabilities. However, even if the figures from Mr Quint's modelling were to be adopted, the pursuers have not led evidence which would allow the

court to conclude that the properties were not reasonably fit for human habitation or that the pursuers suffered ill-health due to the presence of contamination at the site.

[70] In terms of the expert medical evidence, there are a number of problems with the evidence of Professor Douglas, including that he is not a clinician and has no experience of diagnosing patients. Professor Douglas repeatedly stated that he had focused on the pursuers' witness statements and did not appear to attach much significance to the medical records, which Professor Eddleston relied upon for the reasons given earlier.

[71] Professor Douglas's conclusions are not properly supported. His expert evidence fails to satisfy the criteria discussed in *Kennedy* v *Cordia* (Services) LLP 2016 SC (UKSC) 59.

[72] The pursuers say it is not possible to know with any certainty what exposure to contaminants might be and might have been at commencement. The pursuers make no attempt to draw any conclusions about likely levels of exposure. While occupational or workplace exposure is not directly relevant, there is an enormous disparity and several orders of magnitude between what was found here and what is referred to in the guidance on occupational exposure.

[73] Thirteen individual pursuers are not particularly significant when there could be 200 residents at the site. Dealing with a self-collective group of people who have chosen to raise proceedings is inappropriate. As to the experience of visitors, we do not have the medical records and they didn't give evidence. No weight can be placed on that matter.

[74] Professor Douglas does not offer any basis as to why rashes could be caused by personal contact. What the pursuers said about garden soil and not growing plants does not assist. The evidence does not come close to establishing any causation on the balance of probabilities. There is no information, in relation to the various other litigations referred to by Mr Sutherland, of residents or what was complained of by them.

Decision and reasons

Relevant law

[75] As noted earlier, each counsel referred to what they described as analogous statutory provisions to those in the 1987 Act and the 2001 Act. For the pursuers, these were section 2(1) of the Occupiers Liability (Scotland) Act 1960, dealing with a tenantable condition and section 1 of the Defective Premises Act 1972, about premises being fit for habitation. Mr Sutherland referred to case law, including an English case on the 1972 Act about risk to the health or safety of the occupants.

[76] For the defender, reference was made to Part 2A of the Environmental Protection Act 1990. This piece of legislation seeks to enable the identification and remediation of land in which contamination currently represents an unacceptable risk to human health. Contaminated land is defined as land which, by reason of substances in or under the land, significant harm is being caused or there is a significant possibility of such harm being caused.

[77] While some degree of analogous wording is present in these other statutes, the language used in the provisions is not identical to that in the 1987 Act and the 2001 Act (for example, there are the references to "significant" in the 1990 Act). The appropriate course is to apply the terms of the 1987 Act and the 2001 Act, as construed in the authorities.

[78] As to the case law on that legislation, in the leading authority, *Morgan* v *Liverpool Corporation*, it is stated (at 145) that:

> "If the state of repair of a house is such that by ordinary user damage may naturally be caused to the occupier, either in respect of personal injury to life or limb or injury to health, then the house is not in all respects reasonably fit for human habitation."

This accurately represents the interpretation of the relevant provisions. The approach in *Morgan* is reflected in other decisions, such as *Summers* v *Salford Corporation* and in Scottish cases such as *Haggarty (No 2)* v *Glasgow Corporation* 1964 SLT (Notes) 54, *Christian* v *Aberdeen City Council* 2006 SCLR 448 and *Todd* v *Clapperton* 2009 SLT 837. For breach of duty, it is therefore for the pursuers to prove, on the balance of probabilities, that the test in *Morgan* is met.

[79] The standard approach to proof of causation is that a pursuer needs firstly to demonstrate, on the balance of probabilities, that the event which allegedly gave rise to the pursuer's damage can ever cause that type of harm. Secondly, once it is established that the event can cause such damage the pursuer requires to prove, at the same standard, that the particular damage was caused that way (see eg *Clerk & Lindsell on Torts,* 24th ed, at paras 2-28 to 2-31). Illustrating the first point, in *Kay's Tutor* v *Ayrshire and Arran Health Board* 1987 SC (HL) 145, the House of Lords held that the law could not presume that the breach of duty was responsible if it was not proved, or an accepted fact, that the breach was capable of causing or aggravating such damage. Lord Keith referred to the absence of acceptable medical evidence on that matter.

[80] If the first point (capable of causing) is proved that can in some cases allow the second point (actually causing) to be presumed or inferred. For example, it is possible for a material increase in risk to allow the inference that it did cause or materially contribute to the harm (*McGhee* v *National Coal Board* [1973] 1 WLR 1). However, that was said in circumstances in which it was established that the exposure (in that case, to brick dust) undoubtedly caused such harm; it was a known factor that would lead to the injury and the material increase in risk resulted in the inference that it had done so.

[81] If there can be other factors which cause the harm, it would have to be shown that the harm was actually caused, or materially contributed to, by the factor concerned (*Wilsher* v *Essex AHA* [1988] AC 1074). That is also illustrated in *Petroleum Co of Trinidad and Tobago Ltd* v *Ryan* [2017] UKPC 30, which shows that where there are a number of possible causes of a disease or disability, one of which is capable of being the defender's breach of duty, the onus remains on the pursuer to show that the breach made at least a material contribution.

[82] As there are multiple potential causes of the symptoms of the pursuers, proof that a breach of duty is capable of causing them will not suffice to show it did cause them. However, if the pursuers prove that some or all of the symptoms suffered by them were in fact caused by the ordinary exposure to contaminants on the site, then the point about the breach being capable of causing them is obviously also established. Indeed, given the nature of the statutory duty, proof of actual cause of the harm will suffice for both breach of duty and causation. In reaching my views on these issues, it is appropriate to assess the two types of expert evidence in turn, taking into account all of the factual evidence.

Assessment of environmental experts' evidence

Part 2A of the 1990 Act

[83] The threshold for "contaminated land" under Part 2A will not determine whether or not there is a breach of duty. It is, however, referred to by various experts and in the parties' submissions. A brief overview of Part 2A is necessary to understand the evidence. Part 2A involves determination of the level of contamination. Statutory guidance, which applies in England, Wales and Northern Ireland, introduced a four-category system for classifying land under Part 2A to identify a Significant Possibility of Significant Harm (SPOSH) to

human health. It is a precautionary approach. In relation to the four-category system, land is determined as contaminated land under Part 2A if it falls within Categories 1 or 2. If the results are at, or above, the screening level for Category 1, then the level of risk is clearly unacceptable.

[84] The Department of Environment, Food and Rural Affairs (DEFRA) produced a table in 2011 which sets out the GACs and SGVs and Category 4 screening levels (C4SLs). If the results are below the Category 4 screening level, then the level of contamination is acceptably low. Category 4 provides a simple test for deciding when land is suitable for use and definitely not contaminated land. Such low-risk land can then be dismissed from the need for further risk assessment. In the very large majority of cases, the GACs and SGVs describe levels of contamination from which risks should be considered to be comfortably within Category 4. They are designed to estimate levels of contamination at which risks are likely to be negligible or minimal.

[85] So, these tests deal with the question of whether there is a risk to human health, albeit for the purposes of checking contaminated land in terms of Part 2A. Nonetheless, it is useful to know which Categories, 1 to 4, the risks in the present case fall within. While falling below Category 4 does not necessarily mean that there is no risk at all to health, it does point in that direction and generally does so even more strongly if the level is below the GACs or SGVs. It would, therefore, be inappropriate to reject the modelling data merely because it is linked to Part 2A.

Methods of modelling

[86] Mr Quint explained that the true mean at a contaminated site is normally unknown, given the amount of soil testing that would be involved in establishing it. It is impractical to

have hundreds of thousands of samples and the issue is therefore how to properly estimate the true mean. No specific guidance exists on how land contamination should be assessed in terms of whether a property is reasonably fit for human habitation. However, as Mr Quint explained, extensive government guidance, including that referred to above, is available for land contamination risk assessment in other circumstances.

[87] In seeking to determine the true mean for the levels of contaminants, Mr Firth and Mr Quint agreed that CLEA (Environmental Agency's Contaminated Land Exposure Assessment) and J & E (US Environmental Protection Agency's Johnson and Ettinger) models are appropriate to use for the vapour modelling assessment. The experts each considered the results from the investigations conducted by WSP, Monridge and IKM, discounting the WSP vapour probes.

[88] For the modelling, which seeks to identify the long-term average concentration of VOCs in air, they agreed on what were the key parameters. But in relation to vapour intrusion from soil concentrations they took different approaches. Their different parameters led to significantly different results. Mr Quint applied a higher test than Mr Firth, using risk analysis methods which introduce a protective or health-conservative approach. This involved what is called a 95% Upper Confidence Limit (UCL95).

[89] Using UCL95 does not seek to identify the most likely average, or mean, figure for the level of contaminant. Rather, it generates a figure which gives 95% confidence that the true average concentration will be less than or equal to that calculated figure. As Mr Quint put it, if a sampling exercise was repeated 20 times, on 19 occasions the calculated sample mean would be less than, or equal to, the UCL95 value. The details of this method of calculation do not need to be explained further, but it is a conservative approach, creating a figure which gives that very high level of confidence. Mr Quint took the view that using

UCL95, rather than a straightforward average, is appropriate for this assessment, given the data uncertainty and the fact that the data was collected at least 10 years after the site was first occupied for residential use.

[90] Mr Firth used the arithmetical mean figure. He did so because the purpose of analysis in the present case is about whether, on the balance of probabilities, there was a breach of duty by the defender. There was a relatively small amount of data and in his view this resulted in the calculations by Mr Quint, using the UCL95 approach, generating higher figures for risk assessment. Mr Firth gave an example in his evidence of the effect on results of the different approach taken by Mr Quint. At 25 Empire Way, Mr Firth was predicting, in relation to soil concentration, a figure of 4.2 μg.m-3 for TCE, whereas Mr Quint was predicting some five times higher than that, having only changed two parameters. Mr Firth described his own approach as being to use the most likely parameter values to get the most likely indoor air concentration. For him, this was more appropriate than being cautious and using a value that over-predicts the level of risk. He was looking for the most likely results rather than using figures skewed, out of caution, at a higher level.

[91] Part of Mr Quint's justification for his approach, that the concentrations of the relevant contaminants were higher at the start of the tenancies than at the date when the modelling is based, is not well-founded. The tenancies in question started on a range of dates (from December 1999 to October 2011) with roughly half of them starting from 2008 or later. So the assumed time gap between the start of the tenancy and the date of sampling is immaterial for a number of the pursuers. Moreover, it was not possible for the experts to say which concentrations will have reduced over time, with Mr Firth saying that any year-to-year concentration reductions is likely to be modest and that VOCs will take longer to break down in shallow soils.

[92] As a result, I am not persuaded that Mr Quint's more conservative approach is justified. In my view, Mr Firth took a more objective approach to modelling in light of the central point about whether or not there is a breach of duty. Mr Quint's conservative approach is more likely to result in an over-estimation of indoor air concentrations than Mr Firth's being an under-estimation.

[93] There is some room for concern about whether there is sufficient data to allow these modelling exercises to properly assist in determining the issues here. But as the experts agreed, there are key limitations and data gaps in the information available and in those circumstances having results from modelling can provide a degree of assistance in working out the level of risk. It is used to predict long-term average concentrations of the constituents of potential concern in indoor and outdoor air, from soil and groundwater, respectively. If the modelling had not been used at all there would have been even less information to consider in understanding the long-term levels of contamination. Analytical modelling is used on that basis and provides some meaningful information.

[94] All of that said, perhaps the key point to be taken from the evidence of the environmental experts is that even if the figures from Mr Quint's modelling were to be accepted, the pursuers still need to lead sufficient evidence which would allow the court to conclude that the properties were not reasonably fit for human habitation. As noted earlier, Mr Quint said in evidence that the true risks will never be known, his work being to provide insight into what risks "theoretically there might have been over the years". If that central requirement of sufficient evidence is not met, the basis for the modelling and the effect of its results are, in effect, academic.

Contaminants detected above screening levels, GACs or SGVs

[95] As already explained, the screening levels, while not directly applicable to the statutory test in this case, are used to show that long-term human health risks for site occupants are considered to be tolerable or minimal. Where a screening level, GAC or SGV is exceeded, the expert evidence is broadly to the effect that this does not necessarily correspond to a risk of harm to human health. GACs and SGVs are considered to be conservative criteria and results above those levels simply mean that further consideration is required, rather than that a risk of harm has occurred. The purpose of the screening levels, GACs or SGVs, is therefore to screen out contaminants from more detailed assessment, as explained in the Society of Brownfield Risk Assessment (SoBRA) guidance and in the DEFRA statutory guidance. Exceedance merely means that further assessment is needed before a proper conclusion can be reached. The existence of examples exceeding the levels does not therefore prove the case for the pursuers.

Hotspots and undiscovered hotspots

[96] The fundamental thrust of the pursuers' expert evidence on hotspots is the likelihood that there are other undiscovered hotspots on the site which might then cause a level of risk to occupants. The hotspots identified at, or near to, particular locations were found several years after certain tenants moved in. Mr Brien, for Monridge, dug at a deeper level at 31 Empire Way and found higher levels of contaminants.

[97] Mr Firth gave coherent and convincing reasons to support his conclusion that there are unlikely to be any further hotspots at the site. These included that the spatial distribution of the sampling done by WSP correlated with the spatial distribution of TCE concentrations in soil. In other words, most of the areas looked at were found to be at a low-

level of contaminants. A number of boreholes were taken across the site, at a reasonable depth, and no further hotspots have been identified. Also, brick structures present at the north west of Forum Place made it reasonable to conclude that the TCE hotspot there is likely to be associated with those bricks.

[98] I do not consider that Mr Brien or Mr Quint are able to properly infer a likelihood of further hotspots on a sound and persuasive basis, when there is no proper evidential basis for saying they exist. Moreover there is nothing to indicate where any such undiscovered hotspots would be located and therefore whether they could have affected any of the pursuers. The fact that hotspots were present when certain tenants moved in is a factor to consider, but the overall position of the pursuers' evidence is that they all suffered common symptoms, even those not living beside identified hotspots. The absence of evidence of hotspots being excavated and removed does not take us any further, because there is also no evidence showing or suggesting this was not done.

PAHs

[99] WSP's assessment was that two gardens (including 2 Tiber Avenue) had a hotspot of polycyclic aromatic hydrocarbon (PAH) concentrations above residential screening criteria and another (18 Forum Place) had two such hotspots. Monridge testing also detected concentrations above the level. There is no dispute that PAHs in direct contact with soil is a linkage of potential concern, as the detection limit exceeds GACs. However, as already noted, exceeding GACs does not of itself demonstrate risk, and requires further investigation. Mr Firth concluded that, based on Mr Quint's and WSP's risk assessments and with the possible exception of 2 Tiber Avenue and 18 Forum Place, non-vapour pathways are not of concern for any of the other properties on the site. Based on his

reasoning and analysis, including about the precautionary approach taken by Mr Quint in his modelling and Mr Firth's observations about the Monridge assessments, I accept that view. As a result, the possible exceptions remain of some potential concern, but there is no evidence taking the concern beyond that level.

Petroleum hydrocarbons

[100] Petroleum contaminants (such as benzene, toluene, ethylbenzene, xylene) have been detected by WSP in areas around and under 13 Tiber Avenue and 31 Empire Way, including in multiple samples under those homes. Petroleum compounds were found in the indoor air of certain properties on the site. In terms of the levels of concentrations, these were below GACs, other than one exceedance for benzene (based upon an IKM sample) and one exceedance, although slight, for naphthalene. Petroleum hydrocarbon VOCs have not been detected in any groundwater samples from the site. A high level of hydrocarbons was detected by Monridge in a grab sample at "property X", but it has not been made clear that it is from subsurface contamination. The soil and soil vapour readings confirm levels that are well below the level which would be required to explain Monridge's result for property X. In his evidence in court, Professor Eddleston observed that on Mr Quint's predicted concentrations of hydrocarbons in houses the maxim of benzene was 1.5mg, which is much lower than the concentration Monridge were expecting. It therefore seems clear that the concentrations measured by others are plainly not high enough to support the Monridge calculation.

[101] In the "property X" sample of indoor air, taken by Monridge, the presence of MTBE is noted. This is a substance which is an additive of unleaded petrol, introduced from around 1986. The presence of unleaded petrol would therefore post-date the time when

industrial activity is known to have been active at the site. Importantly, MTBE was not detected in any of soil samples or soil vapour samples (of which there are over 200 across the site), or groundwater samples. This strongly suggests that, even if MTBE is detected in indoor air, it is not coming from the ground, because if it is then it would be expected to be picked up in the sampling.

[102] It is true that Mr Firth's suggestion that petrol could have been brought into the properties by the inhabitants, and thus give rise to its presence in the air inside, seems conjectural. It was present in the air in several properties and there is no sensible explanation why such a number of people would bring petrol into their houses. However, it is crucial to recognise that he said this when attempting to work out how else it might have happened. His key points are that MTBE was not present in petrol in the UK until sometime after the industrial sites ceased to be used and the contaminants were there, and that in any event it was never detected in the other sampling.

[103] Taking all of the evidence into consideration, I am not satisfied that MTBE is in the ground or that the levels of petroleum hydrocarbon identified show any risk to human health.

Groundwater

[104] Groundwater containing solvents can, by migration or seepages, potentially spread around the site. WSP installed groundwater monitoring wells, including those named SBH03, CP1 and CP2. Groundwater flow can occur through gravel, as it provides spaces and thus is permeable. Mr Firth explained in evidence that the gravel lenses identified in SBH03 appeared not to extend towards the properties. WSP confirmed that view in their Stage 3 investigation, which involved drilling the two additional wells,

CP1 and CP2, between SBH03 and the properties. WSP concluded that the granular horizon was not laterally continuous and that shallow groundwater was likely to be discontinuous. Put more simply, it would not spread.

[105] Mr Brien expressed the opinion that the made ground detected in CP1 and CP2 was found to contain uncompacted materials which could conceivably create pathways just as effective (or more effective) at moving groundwater than gravel bands. Also, CP1 and CP2 were only drilled to a depth of 6 metres, rather than 10 metres which was the case with SBH03. He felt that had CP1 and CP2 been drilled deeper they could have encountered the groundwater seepages which, since chlorinated solvents are denser than water, could have contained chlorinated solvents. By deeper drilling, they would likely have encountered additional water-bearing zones. In his view, the fate and transport of the substances identified in SBH03 has not been properly investigated.

[106] In response, Mr Firth stated that the readings and groundwater concentrations in SBH03, in the clay layer below 6m depth where the seepages were observed, are significantly lower than in the overlying made ground. The data indicates that the seepages are unlikely to be associated with a migration pathway of concern.

[107] Mr Firth has qualifications and experience in hydrogeology, and I agree with his view that WSP's conclusions on the discontinuity of groundwater should be accepted. However, even if these conclusions are not accepted, this is yet another example of the pursuers' experts contending that the investigations done by WSP were in some way inadequate and that other areas of contaminants may well exist. The fact that this raised concerns with these experts is, of course, understandable but there is no further evidence to show that groundwater migration is the cause of extended or higher levels of contamination.

Rashes

[108] There was evidence from a number of the pursuers about suffering a rash after direct contact with the soil, generally when doing gardening work. Several other pursuers stated they had suffered rashes, without referring to contact with soil. There was, however, no evidence, from Professor Douglas or others, to show that rashes were actually caused by the contaminants found in the site. There was also no evidence to suggest that rashes could not be picked up when in contact with soil without contaminants of the kind known to exist here. While the direct contact point had some force in the pursuers' evidence, it has not been proved, on the balance of probabilities, that this results in the property not being reasonably fit for habitation.

Cancer risks and breach of duty

[109] Certain of the experts (including Professor Douglas and Mr Firth) made reference to the carcogenicity of TCE, that is its risk in promoting the development of cancer. For the pursuers it was submitted that Mr Firth referred to the US EPA Regional Screening Levels on the increased risk of cancer from TCE, which is at a level below what Mr Firth found to be present in the properties. It was said not to be necessary to get cancer to suffer harm; the increased risk sufficed and a pursuer could get damages for it. The defender's position is that there is no evidence of any of the pursuers having cancer, no more than a hypothetical risk that they could develop cancer in the future and no basis for damages to be awarded. I will comment later on causation in relation to the cancer issues, the present point being whether there is a cancer risk that results in a breach of the statutory duty.

[110] While it can take some years for cancer to develop, on the evidence none of the pursuers has suffered cancer over the years they have lived there. One other resident has

been diagnosed with cancer, but the cause has not been linked to the contaminants. There is a theoretical or minimal increased risk of cancer from the amounts of TCE identified and that does not show the properties to be not reasonably habitable. Inferring breach of duty from such low-levels of risk is not appropriate.

Greater risk in specific properties

[111] It is open to argument that there could be a higher level risk in specific properties (for example, where there were hotspots) and hence for particular pursuers. I have therefore considered the position of each individual pursuer. There was, however, no evidence identifying in these properties a sufficient level of risk to justify a breach of duty. The pursuers' case focusses largely on the properties of all of the pursuers and a general exposure to contaminants which can cause harm. If actual harm is relied upon to show breach of duty, it is noteworthy that the symptoms reported by those who lived in these specified properties were broadly the same as those in the others. When the other properties are habitable, but the tenants have the same symptoms (which are of course common symptoms for the public generally) then breach of duty is not established by actual harm only in relation to the specified properties.

Other potential contaminants

[112] It was agreed by the experts that there could be other contaminants present within Plot A which were not analysed in the WSP investigations. This identifies a possibility rather than a probability. It was not confirmed by any factual evidence that they exist, nor was there any evidence that if they do exist they would be harmful.

Conclusions on the level of contamination and whether it poses a risk to health

[113] Mr Brien described part of his remit as being to establish whether there was a problem with the conceptual site model used by WSP. He considered that there was a problem, but he did not prepare his own model. Monridge did not fully delineate the extent of contaminations. Potential risks could not be ruled out. Of itself, while critical of WSP, that does not provide evidence allowing conclusions to be drawn about the level of contaminants and the risk they could pose.

[114] Mr Quint's report makes a number of criticisms or challenges to Mr Firth's report, to which Mr Firth responds in his supplementary report. Mr Quint reached the view that there was a risk to the health or safety of the occupants, but he was unable to make any observations on the level of risk. He accepted that there could be uncertainties in using the Monridge indoor air data, which as "snapshots" did not give any assistance about long-term exposure.

[115] Mr Witherington's point, that residents at the site are more likely than not to have been exposed to higher levels of VOCs in their gardens than they would have otherwise been exposed to if adequate investigations and remediation had been done, does not assist in relation to risk. He confirmed in his oral evidence that he had not been instructed to consider risk to residents and his report does not give any opinion regarding the level of risk. He recognised that the divergence between WSP and Monridge could be caused by a deficiency in either of their approaches.

[116] Mr Firth recognised that WSP sampling is not representative of soil vapour concentrations beneath properties. It is, however, clear that Mr Firth did a detailed scientific analysis of the data, and reached an overall view about the results found by WSP and Monridge. While I do not see Mr Firth's evidence as rebutting all that has been said by the

pursuers' experts, it does nonetheless establish, on the approach he took, levels of contamination that do not show a level of risk to human health any higher than low or tolerable levels. His analysis is criticised by, for example, Mr Quint, but even if Mr Firth's analysis is wrong, we simply do not have in the pursuers' expert evidence on environmental matters sufficient material to prove the opposite. Mr Brien's and Mr Witherington's points that previous investigations had not been sufficient and more investigations would be required do not take us any further. It was agreed that the full extent of contamination at any individual property is not known and that while contamination levels are likely to have been higher in the past, they cannot say by how much.

[117] I therefore conclude from the evidence of these experts that the pursuers have not established, on the balance of probabilities, that the level of contaminants on the site posed a risk to human health making the development not reasonably fit for human habitation. It remains possible, however, that the pursuers can still prove breach of duty if the evidence as a whole shows that the harm suffered by the pursuers was caused, or materially contributed to, by the contaminants. This was a key issue for the toxicology experts.

Assessment of toxicology experts' evidence

[118] Before turning to assess the evidence of the experts on toxicology, it is worth noting three important points. Firstly, there is a lack of research, and hence no evidence, to show what the effects of chronic exposure to low-level solvent fumes from the contaminants identified may be and in particular whether it can cause the symptoms referred to by the pursuers. Secondly, it is not possible to know with any certainty the concentration of, or exposure to, any particular contaminant which was present at each property at, and since, the commencement of the tenancy. Thirdly, there was no medical evidence led that the

symptoms were as a matter of fact caused by the contamination, although equally there was also no evidence that they were actually caused by something else other than contamination, albeit there is evidence that they could have been.

Weight to be given to the pursuers' evidence

[119] While the pursuers rely on the expert evidence of Professor Douglas, it was mentioned only on a limited number of occasions in the written submissions and oral submissions. Beyond what is explained below, there is no detailed analysis in the pursuers' submissions of his reasoning or any real or convincing attempt to draw out a basis for his evidence being seen as superior to that of Professor Eddleston. In fact, the bulk of the pursuers' submissions rests on the evidence of the pursuers.

[120] It was accepted for the pursuers that Professor Douglas has acknowledged the absence of any specific study in relation to chronic low-level exposure in a residential setting. However, it was explained that he has drawn on the work of Dr Flaks and his own knowledge and experience in considering the medical records and the evidence from the pursuers. By way of example, in response to a question relating to what documents he had before him for his report on a pursuer, he said that he would have had the medical questionnaire, the medical records and statements. He said that he did not dismiss medical records, but they are incomplete and can miss common symptoms.

[121] Professor Eddleston saw the medical records as providing a more reliable source of evidence than the witness statements, although the defender accepted the generality that not all issues are reported by individuals to their GPs. Professor Douglas accepted that there could be a link between symptoms and people worrying about living on potentially contaminated land, which may explain resolution when they moved out. With the

exception of Lee Brannan, all of the pursuers were living at the site from around 2010 when the issue of possible contamination became public knowledge.

[122] It was clear from the evidence of Professor Douglas that he had focused on the pursuers' witness statements and did not appear to attach much significance to the medical records which Professor Eddleston relied upon. While he said he had looked at them, he did not seem to have appropriate regard to other potential causes for the symptoms, where there were obvious alternatives and the symptoms are extremely common. In one of his reports he drew attention to health inequalities and adverse social circumstances causing harm, but his reports on individual pursuers took no account of those factors as potentially causative. The pursuers' evidence was taken as read and Professor Douglas did not critically assess whether what was narrated in the pursuers' witness statements is accurate. In particular, he did not make much of the fact that a number of the pursuers complained of the symptoms prior to moving to the site. Moreover, as noted when summarising his evidence earlier (para [39]), in the symptom questionnaire based on 99 individuals there were some values significantly lower than what was stated in the pursuers' evidence, such as stress (1%), poor concentration (1%) and disturbed sleep (1%).

[123] Counsel for the pursuers argued that Professor Eddleston said, in effect, that each pursuer was making up a narrative. I disagree. Professor Eddleston did not actively challenge the credibility of the pursuers. His approach was much more measured. The pursuers were, as is accepted by the defender, generally doing their best to assist the court in their evidence. It is not suggested that they were not telling the truth, rather that they gave an account that was to some degree unreliable when one has regard to the full circumstances.

[124] There are certain points that affect the reliability of the pursuers' evidence. A fair number of the pursuers had some of the symptoms prior to moving in. The frequency or significance of the ailments are not the same as is recorded in the GP records. Notes taken by GPs are contemporaneous, while the pursuers' main witness statements and evidence were provided a number of years later. There are difficulties in accurately recalling the timing and severity of symptoms following a significant delay. Professor Eddleston's close examination of each person's medical history in their GP and hospital notes confirmed that many of the problems pre-existed their time at the site or occurred afterwards. He also noted that a number of pursuers saw their GPs frequently whilst living at the site but never discussed the issues which now formed the basis of the claims.

[125] It is obviously possible that symptoms which have been reported before and perhaps not resolved by the GP's assistance might not be mentioned again, so the point made by Professor Eddleston about frequency is not fully supported. Reasons were given by the pursuers for not reporting symptoms, but matters of significance should and normally would be reported to the GP when attending. However, there were also reasons given by the pursuers for not going to the GP, for example self-medicating, and these were to some extent understandable. In relation to Professor Eddleston's view that the pursuers who left their tenancy felt better because of their anxiety lessening, it was pointed out to him that some pursuers who had been elsewhere reported feeling better before contamination of the site became common knowledge. I am not persuaded that improvement of conditions after leaving can be wholly attributed to a decrease in health anxiety. Nevertheless, it is a possibility and health anxiety may be one of the reasons for the differences between the pursuers' evidence and the medical records. The main point is that a number of differences exist.

[126] Professor Eddleston's opinion, based on his expertise, was that the symptoms would have been expected to fade immediately after the exposure finished if exposure to solvents had been the cause, for example because TCE leaves the body within 10 days. The account given by the majority of the pursuers is not consistent with that expert evidence, and some of them spoke to things resolving or at least improving over months. Some force exists in the point that several pursuers spoke to not having the symptoms before or after living in the property, but that is to a degree contradicted by what is said and not said in their medical records and for at least some of them it could possibly have been affected by the anxiety consequences of having been told about the contamination.

[127] In my opinion, while the evidence given by the pursuers was credible, there are, for the reasons just explained, certain pointers towards a degree of unreliability, which results in their evidence not fully being accepted. To that extent, the heavy reliance on that evidence by Professor Douglas and counsel for the pursuers is not fully supported. References by the pursuers to visitors or family members having symptoms when at the property is noted, but these other people did not give evidence and the details of their medical histories are not known. Some pursuers refer, in their witness statements, to mould or dampness in their properties. This was not relied upon and in any event there was no real evidence about it being linked to contaminants.

Other issues about the pursuers' evidence

[128] Aside from the pursuers' reliability, other difficulties in their case can be identified. Professor Eddleston explained that, had the symptoms been caused by solvent exposure when the levels were sufficient to cause symptoms, the pursuers would have been expected to present with multiple related symptoms at the same time, whereas the medical records

show different issues being presented at different times. There was no clear evidence that the level of contaminants were the same and remained the same in respect of each property, but I see force in this point because the thrust of the pursuers' case is continuing solvent exposure on the site. He also said that the description given by pursuers of their symptoms is often not consistent with solvent exposure having been the cause. For example, a number describe headaches focussed to a particular area, which is more likely to be explained by a different cause because a solvent induced headache is more likely to be general in nature. This is another example of there being other potential causes of the symptoms. In addition, he referenced the wide range of symptoms mentioned by the pursuers.

[129] He also commented on organ damage that is known to be caused by exposure to certain levels of solvents (cancer, liver, kidney or nerve damage) not being reported by any of the pursuers. In other words, things which are, on the medical literature, capable of being brought about by exposure to solvents were not mentioned here. He explained that dementia is recognised as a consequence of exposure and some of the claimants report cognitive or memory problems. However, these are common consequences of anxiety and seemed to have settled after people left the development, which would not have occurred if due to solvent-induced brain cell damage. Brain damage can be identified and measured through neurocognitive testing, but this has not been done for any of the pursuers.

[130] Professor Eddleston referred to workplace exposure limits being set to avoid any ill-health in workers and so having a large safety margin. He accepted that these are not directly applicable to the residential setting but took the view that they did provide a relevant context for the pursuers' claims. Of course, the pursuers were not subject to the same timings for workplace exposure, such as eight hours a day, when some spent more time in their houses. Nonetheless, in the absence of any literature about residential

exposure, the workplace exposure limits, and their large safety margin, provide some assistance. They deal with long-term exposure and take a conservative approach, as explained by Professor Eddleston.

[131] Much of these aspects of Professor Eddleston's reasoning have force and are not able to be discounted by the evidence of Professor Douglas or the points made in the pursuers' submissions.

Common symptoms, synergy and exacerbation

[132] It is a major feature of the basis for Professor Douglas's conclusion on causation that, in his view, the thirteen pursuers presented with a pattern of common symptoms. However, the evidence of Professor Eddleston undermines this approach to some degree, including the different timings of symptoms. There is also the absence of a control group against which to compare the common symptoms of pursuers, Professor Douglas having accepted in response to a question from Mr Johnston KC that a control group would be desirable if seeking to draw conclusions based upon the number of people with such symptoms. In reaching views on the commonality of symptoms he had regard only to the thirteen pursuers when we have no real information about the other residents on the site. There is no statistical analysis showing that the thirteen pursuers would otherwise have been unlikely to suffer from these symptoms. Professor Douglas places great strength on the commonality and he was not, in my opinion, taking a sufficiently objective or rational approach in that regard.

[133] In relation to the potential for synergy, additionality or compound effects due to the risk of there being more than one source of contamination exposure, Professor Douglas did not provide any real justification for his view that the contaminants known to be present in

the site would have a synergistic effect in relation to the impact on health. His reference to the combined effect of asbestos fibres and smoking causing cancer is merely an example of an established form of synergy. The fact that there are such established examples does not assist when no evidence was presented which would support the conclusion that the types of contaminants and substances in the present case would have any synergistic effect.

[134] The pursuers contend that Professor Eddleston did not give weight to the evidence that symptoms a pursuer had experienced before could have been exacerbated by the contaminants when in the tenancy. However, that again requires evidence of some proper medical basis for exacerbation by contaminants of symptoms which can arise from other causes, and there was none.

Cancer risks and causation

[135] There is no evidence that any of the pursuers in this case has suffered cancer, let alone whether it was caused by the contaminants. Evidence was led that another resident had been diagnosed with cancer, but again it was not linked to the contaminants, with the nature and cause of it not being the subject of any detailed evidence. Professor Eddleston explained that there is no medical literature showing that a low-level exposure to TCE or mixed solvents could cause cancer problems. While in theory it could, there is no data and no publications. The screening levels relied upon by the pursuers are set on the basis that the increase in risk is 1 in 100,000. Professor Eddleston stated that this is a lower screening level than that adopted in the UK.

[136] If there was a breach of the statutory duty, I am unable to conclude that there is a liability in damages for a limited increase in risk of this kind. The pursuers have not shown any proper legal basis for reaching that conclusion. Senior counsel for the defender gave the

valid example that while pleural plaques can give rise to damages, mere exposure to the risk caused by asbestos does not. Accordingly, on cancer risk the pursuers do not meet the requirements of a basis for damages.

[137] Counsel for the pursuers also accepts that the indication in 2011 or so that cancer could be caused is likely to have contributed to mental health and anxiety. This was accepted and indeed relied upon by Professor Eddleston.

Conclusions on assessment of toxicology experts

[138] Professor Eddleston is a clinical toxicologist and Professor Douglas accepted in cross-examination that he is not, at least strictly speaking, a toxicologist. Professor Douglas retired from his final research job in 1992 and his work since then has mainly been medical legal work. He stated that he had reviewed Dr Flaks' report but had not read through the literature cited therein and did not rely upon it in any detail in his own evidence, although he noted that he knew or had met some of the authors. The approach taken by Professor Douglas was more idiosyncratic, in that his report was much shorter than that of Dr Flaks, not founded heavily on the literature, and he commonly made anecdotal references to colleagues or historical medical professionals and quoted things they have said.

[139] Professor Douglas's evidence, while well-put, had certain shortcomings when compared to the more forensic and robust analysis undertaken by Professor Eddleston. He did not give full consideration to the actual levels or concentrations of contaminants found on the site. He also did not give any real weight to the absence of symptoms of the pursuers which would be expected from solvent exposure risks, such as cancers or damage to major

organs. He paid limited attention to the differences between the medical records and the witness statements.

[140] As said by Professor Eddleston in his oral evidence, without a control group it is very difficult to tease out the symptoms reported by the pursuers, which are common conditions, from what the general public have. On his view, on the balance of probabilities, these were common illnesses, going to happen anyway, and he considers that anxiety about being exposed to chemicals and cancer is a large part of what was reported. Even if less weight is given to the latter point, he explains the absence of any research which establishes a link between the symptoms and chronic low-level exposure. The pursuers accept that there is a lack of such research. Professor Eddleston makes the strong point that as a result there is no evidence that such exposure to solvents could cause the symptoms mentioned by the pursuers. He also explained that there was no proof of the exposure being the actual cause. He takes into account the agreed position that there are pathways that could link contamination to the pursuers.

[141] I accept that Professor Eddleston's reasoning does not completely discount certain conflicting points and I have had regard to that when assessing his evidence as a whole. But in a case of this complexity it cannot reasonably be expected that every contention raised in the evidence can fully be countered. In essence, a few points differing from his reasoning can be seen as correct, but the question is whether they undermine his general approach and conclusions. In my view, they do not. If Professor Eddleston is wrong about the pursuers' evidence to some degree, that does not militate the overall effect of his reasoning. Professor Eddleston's reliance on the GP records is no doubt a feature of his approach but I conclude that the strength of the other features in his evidence outweighs any concerns about possible erroneous points.

[142] More generally, looking at the evidence of Professor Douglas as a whole, he does not provide any medically reasoned justification which would allow the court to make findings supporting his conclusions. He relies heavily on the evidence of the pursuers and seeks to draw inferences from it. He does not explain in detail how he was able to reach his view on causation notwithstanding his acceptance that there is an absence of any published evidence of symptoms caused by low-level chronic exposure in a residential setting. Separately, while Professor Douglas saw a link between direct contact of soil and rashes, he did not offer any medical reasons as to why rashes could be caused by personal contact with the specific contaminants referred to on the site. What carries weight in expert evidence is the reasoning and not the conclusion.

[143] I do not regard the opinions expressed by Professor Douglas as an unsubstantiated *ipse dixit* account (as was submitted for the defender) and indeed I was to some extent impressed by his knowledge, presentation and articulation. Nevertheless, his reasoning did not contain sufficient objective, scientific or medical grounds supporting the conclusions he reached. When one considers the general nature and substance of Professor Douglas's reports and the fact that Professor Douglas's conclusions are not underpinned by appropriate reliance on relevant medical or scientific literature, I conclude that Professor Eddleston's evidence is of greater force. I accept the bulk of Professor Eddleston's evidence. In any event, the evidence led for the pursuers does not provide sufficient support. The pursuers' case cannot pass the threshold of the balance of probabilities.

Conclusions

[144] While each of the pursuers were doing their best to tell the truth, factors were identified by Professor Eddleston which had some impact on the reliability of their evidence.

The central theme of the environmental expert evidence for the pursuers was potential risks and the need for further investigations about those risks. For several reasons, the toxicology evidence did not provide sufficient support, including that the ailments and symptoms are common among the public and no comparison was made, with for example a control group. There is also an absence of research on the effects of chronic low-level exposure to contaminants in a residential setting. The absence of that research does not exclude the possibility of an inference that the exposure is likely to cause harm or indeed did so, but there needs to be appropriate evidence allowing any such inference to be drawn. Seeking to draw the inferences relied upon on behalf of the pursuers, based on their own evidence, the environmental experts and the toxicology experts, goes too far.

[145] The lack of sufficiently supportive evidence that the levels of contamination are capable of causing, and are likely to have caused, the ailments and symptoms suffered by the pursuers results in the pursuers' case failing on breach of duty and on causation.

Disposal

[146] In each of the actions, I shall sustain the defender's pleas-in-law (numbered differently in the various cases) in the following terms: (i) the pursuer's averments, so far as material are unfounded in fact and the defender should be assoilzied; and (ii) the pursuer not having suffered any loss, injury or damage through breach of statutory duty on the part of the defender, decree of absolvitor should be pronounced.