Report to the Secretary of State for Environment, Food and Rural Affairs

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Date

23 November 2007

Environmental Protection Act 1990

Contaminated Land Remediation Notice served by the Environment Agency

Appeals by Redland Minerals Limited and Crest Nicholson Residential plc

Inquiry opened on 16 April 2007

St Leonard's Court, Sandridge, Hertfordshire

File Ref(s): APP/CL/05/01 APP/CL/05/02

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ABBREVIATIONS

A – W S Atkins
AI – HM District Alkali & Clean Air Inspector
AO – Allen & Overy (solicitors)
AP – appropriate person, as defined by EPA S.78A(9)
B or Beechgrove – Beechgrove (Sandridge) Management Ltd
BE – F W Berk & Company Ltd (pre 3.1.66) or Berk Ltd (post 3.1.66)
BGS – British Geological Society
BM – Barry Mitcheson (witness for Crest)
BPT – Best Practicable Technique
BU – Butterworth Laboratories Ltd
C or CNR or Crest – Crest Nicholson Residential plc or a predecessor company
Circular – DETR Circular 02/2000
COPA – Control of Pollution Act 1974
CU – Cranfield University
CVW – Colne Valley Water Company
CW – Cremer and Warner (consulting engineers and scientists)
DAC – Davies Arnold & Cooper (solicitors)
DO – Deployable output
DWI – Drinking Water Inspectorate
EA – Environment Agency
EHO – Environmental Health Officer
EPA – Environmental Protection Act 1990 as amended
ESI – Environmental Simulations International
F – Finlinson Construction Ltd
FAO – UN Food & Agriculture Organisation
GAC – granular activated carbon
GCMS – Gas Chromatography Mass Spectrometry
GPS – Head of GPS relationship, Barclays
H – Hammonds or Hammond Suddards & Edge (solicitors)
HCC – Hertfordshire County Council
HSE – Health & Safety Executive
IC – Imperial College of Science
ICPOES – Inductively Coupled Plasma Optical Emission Spectrometry
JT – Jenny Thomas (witness for the EA and ex-employee of TWA)
K - Komex
L – Lafarge Aggregates Ltd
mg/kg – milligrams per kilogram
Ml - megalitres
MM – Mott MacDonald
MSA – Montgomery-Smith Associates
MWB – Metropolitan Water Board
NLARS – North London Artificial Recharge Scheme
NNR – Northern New River
NR – Norton Rose
OFWAT – Water Regulation Services Authority
PINS – The Planning Inspectorate
PL – Peter Lardi & Partners
R or Redland – Redland Minerals Ltd
2000 Regulations – The Contaminated Land (England) Regulations 2000; SI 2000 No. 227

2006 Regulations – The Contaminated Land (England) Regulations 2006; SI 2006 No 1380
RF – Richard (Dick) Flavin (ex-employee of TWA)
S or Steetley – Steetley Chemicals Ltd (29.3.77-31.12.86), Steetley Berk Ltd (31.12.86-20.4.88), Steetley Minerals Ltd (20.4.88-1.11.93) or Steetley Properties Ltd
SA – The Salvation Army
SADC – St Albans City and District Council
SCA - Standing Committee of Analysts
SLC – St Leonard's Court as defined by the red line on the plan annexed to the remediation notice that is the subject of these appeals
SPC – (believed to be) Sandridge Parish Council
SPL – Significant pollutant linkage
SoS - Secretary of State for Environment Food and Rural Affairs
STATS – St Albans Testing Services Ltd
STL – Southern Testing Laboratories
THM – trihalomethane
TVW – Three Valleys Water plc
TW – Thames Water Utilities Ltd
TWA – Thames Water Authority
ug/l – micrograms per litre
UOS – University of Sheffield
V or VL – Vintec Laboratories
V Water – Veolia Water Partnership
W or Woolwich – Woolwich Homes Ltd
WFD – Water Framework Directive 2000/60/EC
WHO – World Health Organisation
WLJ – W Leslie Jones (architect)
WTW – Water treatment works
WWTW – Waste water treatment works
WU – Water UK

File Ref: APP/CL/05/01
Land known as St Leonard's Court, Sandridge, Hertfordshire

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- The appeal is made by Redland Minerals Limited.
- The notice was served pursuant to section 78E in relation to contaminated land identified by St Albans City and District Council under section 78B and designated as a special site under section 78C of the Act.
- The notice identifies the appellant as an appropriate person, by reason of having caused or knowingly permitted a substance, or substances, to be in, on or under the land.
- The notice requires the appellant to carry out assessment actions, set out in Schedule 2, in relation to the significant pollutant linkage for bromate.
- The notice indicates that the assessment actions are needed to characterise the linkage in detail and to collect data to evaluate the likely effectiveness of remedial treatment actions which can be specified in one or more subsequent notices.
- The inquiry sat for 13 days on 16-20 April, 23-27 April, 3-4 May and 8 May 2007.

Summary of Recommendation: The appeal be dismissed and the remediation notice be confirmed with modifications.

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Procedural Matters

1. On 20 June 2002, St Albans City and District Council (SADC) notified the Environment Agency (EA) that land known as St Leonard's Court (SLC) had been identified as contaminated land under S.78B(1) of the Environmental Protection Act (1990) as amended (EPA). On 8 August of that year, the EA took on the role of regulator when SLC became a special site under S.78C(1).[1] No-one at the inquiry disputes that designation.

[1] CD 13

2. Pursuant to S.78G(3) and S.78H(1), the EA undertook several rounds of consultation[2] before issuing their decision document[3] and the remediation notice[4], that is the subject of these appeals, on 8 November 2005. The notice was served on Redland and Crest, as appropriate persons, on 11 November.[5] Beechgrove, Woolwich and SADC were also sent copies at that time but, contrary to Regulation 5(1)(a), copies were not provided to the other S78G(3) parties until 28 November.[6] However, those parties had already been consulted on the draft notice and the EA suggest that no conceivable prejudice could have resulted from this 17 day delay[7]; I agree. Also, Crest and Redland have both confirmed that, in accordance with Regulation 9(2), those parties were notified of the appeals[8] and I have seen nothing to suggest that anyone has objected to the notice on procedural grounds.

3. Redland[9] and Crest[10] lodged their appeals, in 2005, under cover of letters dated 29 November and 1 December respectively.

4. Arlington Business Park GP Ltd submitted a statement of case[11] but, in the event, decided not to give evidence to the inquiry.

5. On 10 January 2007, I held a pre-inquiry meeting at the EA's Hatfield offices. This was aimed at ensuring that the inquiry proceedings would run as efficiently and fairly as possible. There was no discussion on the merits of the various parties' cases, but I outlined my preliminary view of the main issues raised by the appeals; this included the question of whether the notice should be modified to require active remediation as an interim step. I also identified certain matters that needed clarifying[12].

6. On 4 April, the appeals were recovered for determination by the SoS. Matters about which he particularly wishes to be informed are:

   a) the identification of contaminated land (S.78B EPA and the statutory guidance);

   b) the requirements for remediation set out in the remediation notice (S.78E EPA and the statutory guidance);

   c) the determination of the appropriate persons to bear responsibility for remediation (S.78F EPA and the statutory guidance); and

   d) the provisions of S.78L EPA in respect of the remediation notice.

   In my conclusions, I identify the main considerations upon which the SoS's decisions should be based.

[2] CD 7.4
[3] CD 8
[4] CD 7.1
[5] CS1
[6] CD 7.4
[7] CD 7.4, CS1
[8] CD 7.3a, CD 7.4, CS1
[9] CD 7.2
[10] CD 7.3
[11] CD 6.6
[12] CD 6.12

7. At the inquiry, Redland and Crest both confirmed that notifications of their appeals had been sent to each other, to the EA and to the parties listed in Schedule 6 of the appealed notice as persons whose consent is required under S.78G(2)[13].

8. During the proceedings, proofs of evidence were taken as read, but annotated to correct typographic errors[14]. They do not necessarily reflect the position, at the end of the inquiry, but each party is aware that its closing submissions[15] provide the basis for my summary of its case.

9. Letters and other inquiry documents are quoted extensively in those summaries. Quotations are in italics. Additions to the original are in brackets and added emphasis, where this has been given in support of a party's case, is shown through the use of bold or underlined text.

Legislation, Policy and Guidance

Part IIA of the Environmental Protection Act (1990) as amended

10. S.78A of EPA Part IIA indicates that if substances in, on or under land, cause pollution of controlled waters, that land is contaminated land. If an English local authority identifies contaminated land, in its area, it is required (S.78B) to notify the EA, the owner and occupiers of the land, and any person who appears to be an "appropriate person" (which is a person who should bear responsibility for remediating the land (S.78F)). S.78C allows for some areas of contaminated land to be designated as special sites; in such cases, and subject to the provisions of S.78H, the EA are required (S.78E) to serve a remediation notice on each appropriate person.

11. That notice should specify what the person must do by way of remediation and the period within which to do it (S.78E(1)). The requirements should be drawn up in the light of government guidance and be reasonable, bearing in mind the costs involved and the seriousness of the pollution (S.78E(4)).

12. Any person who caused or knowingly permitted the substances to be in, on or under the land, is an appropriate person, but only in relation to the remediation which is referable to that person's actions (S.78F(2-3)). Such substances include the reaction products of substances which that person caused or permitted to be present (S.78F(9)). Any thing that is required to be done, by way of remediation, may be regarded as referable "*to the presence of any substance notwithstanding that the thing in question would not have to be done –*

    (a) in consequence only of the presence of that substance in any quantity; or

    (b) in consequence only of the quantity of that substance which any particular person caused or knowingly permitted to be present." (S.78F(10))

13. S.78F(7) points out that, where two or more appropriate persons are identified in relation to a particular thing that needs to be done, by way of remediation, they will be liable for the costs of doing it in proportions determined in accordance with government guidance.

[13] CD 7.2 p45-46 & CD 7.3a
[14] EA1, 3, 4, 6, 7 & 8. TVW43-48. TW 22-27. C1, 3, 5, 6, 8, 9 & 10. R1 & 3-9.
[15] CS1-5.

14. S.78L makes provision for a person, on whom a remediation notice has been served, to appeal within 21 days. Amongst other things, it allows the SoS to confirm the notice with, or without, modification. It also allows for regulations to be made which identify possible grounds of appeal; which provide for the particulars that must accompany an appeal and the persons on whom the appeal should be served; and, which prescribe cases where the decision on appeal may be less favourable, to the appellant, than the original notice.

The Regulations

15. The relevant regulations, when the remediation notice was served and the appeals were lodged, were the Contaminated Land (England) Regulations 2000, as amended. These are hereafter referred to as the 2000 Regulations, although they were revoked on 4 August 2006 when the Contaminated Land (England) Regulations 2006 came into force. These latter regulations are hereafter referred to as the 2006 Regulations.

16. Under both sets of regulations, special sites encompass contaminated land that affects waters which are, or are intended to be, used for the supply of people's drinking water and, as a result, require those waters to be treated before they can be regarded as wholesome for the purposes of Part III of the (1991) Water Industry Act.

17. Both sets of regulations allow for a person to appeal against a notice on the basis that:

    a) the requirements of the notice either fail to respect government guidance on what should be required, or are otherwise unreasonable (Regulation 7(1)(b));

    b) that person cannot reasonably be considered to be an appropriate person who should be responsible for any thing that the notice requires to be done (Regulation 7(1)(c));

    c) some other person should also be identified as an appropriate person who should bear some responsibility (Regulation 7(1)(d));

    d) the enforcing authority failed to take proper account of government guidance on exclusion from liability (Regulation 7(1)(e));

    e) the apportionment of costs between two appropriate persons is unreasonable (Regulation 7(1)(f)); or

    f) there is some other defect in the notice (Regulation 7(1)(s)).

18. Regulation 9(1) of the 2000 Regulations prescribes the information that must accompany an appeal and 9(2) identifies the persons on whom the appeal must be served at the same time as the SoS.

19. Regulation 12 of the 2006 Regulations (Regulation 14 of the 2000 Regulations) points out that once an appeal has been duly made, and unless it is withdrawn, the remediation notice is suspended until the appeal is determined.

20. If, on appeal, the SoS decides that it would be appropriate to modify the notice in a way which would be less favourable to an appellant, than the appealed notice, he must first take certain actions. Regulation 11, of the 2006 Regulations, says that he must:

    a) notify the appellant and any persons on whom the appellant was required to serve a copy of the notice of appeal of the proposed modifications;

b) permit any persons so notified to make representations in relation to the proposed modification; and

c) permit the appellant or any other person on whom the remediation was served to be heard if any such person so requests.

Regulation 12, of the 2000 Regulations, makes the same provision.

The Circular

21. DETR Circular 02/2000 "Contaminated Land" was revoked with the (September 2006) publication of DEFRA Circular 1/2006. However the 2000 Circular (hereafter referred to as the Circular) remains the relevant source of government policy and guidance in relation to cases, such as this, where formal (EPA) Part IIA actions were underway, in September 2006, on land which had already been determined as contaminated land.

22. Annex 3 to the Circular provides statutory guidance in chapters A to E; here, the individual paragraphs are prefixed by the letters A, B, C, D or E, as appropriate. Elsewhere, the guidance is non-statutory.

23. Annex 4 to the Circular gives guidance on the 2000 Regulations; equivalent guidance on the 2006 Regulations is given in Annex 4 to Circular 1/2006. In both cases, paragraph 9(a) points out that an intention to use water for the supply of drinking water is demonstrated by the existence of (or application for) an abstraction licence for that purpose. The Circular's guidance on appeals against remediation notices is given in paragraphs 39-78 (paragraphs 39-70 of the (2006) Circular); this describes the procedures that are to be followed.

24. Paragraph A.17, of Annex 3 to the Circular, describes the relationship between a contaminant, a pathway and a receptor as a pollutant linkage. Pollution of controlled waters is defined (S.78A(9) EPA) to include the entry into controlled waters of any poisonous, noxious or polluting matter. Under the terms of Annex 3 (A.38), entry has occurred if the polluting substance is dissolved in those waters. However, land should not be designated as contaminated if that substance is already present in those waters and entry, from the land, has ceased and is likely to remain so (A.37).

25. A pollutant linkage becomes significant if it forms the basis for determining that land is contaminated (A.20). If there is imminent danger of serious pollution being caused, as a result of a significant pollutant linkage (SPL), urgent remediation may be required. In such circumstances, the normal consultation and notification procedures may be relaxed in order to allow rapid service of the remediation notice; however, other aspects of the statutory guidance continue to apply, particularly in relation to remediation requirements (Circular Annex 2 Section 5).

Remediation Requirements

26. Annex 2 to the Circular anticipates (paragraph 6.2) that remediation, required by a notice, may include assessment actions, remedial treatment actions and monitoring actions. The overall process may be phased, with different actions at different times; indeed, more than one notice may be required (paragraphs 6.4-6.5). In some cases, assessment actions may need to be carried out before the appropriate remedial treatment actions can be identified

(paragraph 6.20) and, if more than one SPL has been identified, the standard of remediation must be defined for each linkage (paragraph 6.29).

27. Remediation should result in the land being suitable for use; the aim being to ensure that it is no longer contaminated and that the effects of pollution, of controlled waters, are put right (C.17). Generally, the standard of remediation should reflect what could be achieved by the best practicable technique for putting an end to the SPL and remedying the effect of pollution caused by that SPL (C.18). However, if it is not practicable to eliminate the SPL, the measures required should seek to remedy the effects of pollution caused by that SPL in the future (C.23-24).

28. The best practicable technique must be both reasonable and have the best combination of practicability, effectiveness and durability (C.19). It will be reasonable if the costs are justified by the benefits to be achieved in terms of reducing the seriousness of pollution, rather than necessarily in financial terms (C.30-31). Practicability considerations may include the condition of the land, access to it and the presence of buildings on it (C.49).

Determining Liabilities

29. The procedure for determining liabilities involves five stages. In the first stage, the liability group for each SPL is identified; this is made up of all the appropriate persons for that SPL. In order to establish who those persons are, it is first necessary to determine who caused or knowingly permitted the presence of that (SPL) pollutant in, on or under the land (Annex 2 paragraph 9.8); these are Class A persons. Whilst it is ultimately for the courts to decide the meaning of this test, in relation to the Part IIA regime, some indication can be gleaned from judgments reached in other areas of the law where the same, or similar, terms are used (paragraph 9.15). In the government's view, those held to have "caused" the pollutant's presence would have been involved in some active operation(s) (or some failure to act), which resulted in its presence (paragraph 9.9). Those held to have "knowingly permitted" its presence would have known that the substance was there and would have had the ability and reasonable opportunity to take steps to remove, or prevent, its presence (paragraphs 9.10-9.12).

30. The second stage is concerned with characterising remediation actions. Where there are two SPLs, the remediation actions may be applicable to both; these are "shared actions". Shared actions which would have been required for each SPL, had they been considered separately, are "common actions". Shared actions which would have been in a different form, had each SPL been considered in isolation, are "collective actions". (Paragraph 9.39)

31. In stage 3, responsibility for the cost of each shared action is attributed between the liability groups involved (paragraph 9.42). Statutory guidance is provided in part 9 of chapter D.

32. Stage 4 involves consideration of whether any member, of a liability group, should be excluded from liability. Part 5 of chapter D sets out a sequence of tests, the third of which is "sold with information"; this aims to exclude a member of the group who has disposed of the land in circumstances where it is reasonable that another member, who has acquired the land, should bear the liability. Paragraph D.58 explains that this test is met, and the seller should be excluded from liability, if all the following circumstances exist:

    a) the seller has sold the land to another member of the liability group;

b) the sale took place at arm's length (it was between a willing seller and a willing buyer, on terms which might be expected on the open market);

c) before the sale became binding, the buyer had information that would reasonably allow him to be aware of the relevant pollutant's presence, on the land, and of the broad measure of that presence; and the seller did nothing material to misrepresent the implications of that presence; and

d) the seller did not retain any interest in the land, or rights to use or occupy it, after the sale.

Detailed guidance on whether these circumstances exist is provided in paragraph D.59.

33. In the fifth and final stage, costs attributed to each liability group are apportioned amongst the remaining members of that group according to the guidance given in part 6 of chapter D.

Agreed Facts concerning the Contamination from St Leonard's Court

34. There is no dispute that bromate and bromide contamination of the chalk aquifer, in the vicinity of Hatfield, originates from a former chemical works in Sandridge where various organic and inorganic bromine based substances, including bromides and bromates, were manufactured over the approximate period of 1955-1980. It is probably during this period that the chemicals entered the soil. The works were operated by companies whose interests were subsequently acquired by Redland Minerals Limited.[16]

35. On 22 September 1983, Crest completed its purchase of the works from Redland. The remaining parcel of land, which makes up the SLC site, was bought from the Salvation Army in November of that year. In 1986, planning permission and building regulations approval were given for a development of 66 dwellings on the site and, in 1987, this high density housing scheme was completed.

36. Since May 2000, following the discovery of bromate in groundwater, the Three Valleys Water (TVW) Bishops Rise (Hatfield) abstraction has not been used for public supply and restrictions have been placed on the use of three private supplies known as Nashes Farm, Cap's Cottage and the Home Office PSDB establishment[17].

37. High bromate levels have also impacted on the use of water from public supply boreholes at Essendon (TVW) and in the Middle Lee Valley, some 20km from SLC, where Thames Water Utilities Ltd (TW) abstract from the NNR wells. TVW indicate that water abstracted from Essendon has to be treated and blended with uncontaminated water in a purpose built water main to the North Mymms WTW[18]. Surface water abstractions too might be affected[19]. Since December 2003, the maximum allowable concentration of bromate, in individual samples of drinking water, has been 10 ug/l[20].

38. There is no prescribed limit for bromide, but it is a requirement that drinking water must not contain any substance at a concentration which by itself, or in conjunction with any other

[16] CD 13
[17] CD 13 Appx 4
[18] CD 13 para 9
[19] CD 13 para 53
[20] CD 9.6 The Water Supply (Water Quality) Regulations 2000 (SI 2000 No. 3184) as amended.

substance, would constitute a potential danger for health[21]. When water is treated for drinking, bromide can sometimes be converted to bromate and/or brominated trihalomethanes (THMs). Bromide is also considered harmful to health if consumed at high concentrations; consultants advising the EA have suggested that a limit of 3000 ug/l in drinking water might be appropriate, based on an acceptable daily intake identified by the (1966) Joint FAO/WHO Meeting on Pesticide Residues[22]. Average concentrations in a private supply (Nashes Farm) close to SLC exceed this guideline figure[23].

39. There is considerable agreement, between the parties, on the chronology of events from 1955 to 2007[24], on directions of groundwater flow and on the extent of the pollutant plume[25]. Data for the year leading up to September 2006 indicate that average concentrations in groundwater at Bishops Rise, more than 5km from SLC, are greater than 300 ug/l bromate and 700 ug/l bromide[26]. Bromate does not occur naturally in soil or water, whereas background concentrations of bromide in groundwater, but outside the plume, are 50-100 ug/l in the Sandridge/Hatfield area[27]. Whilst there is some uncertainty over the precise extent of the plume, measurements suggest that concentration contours of 0.5 ug/l bromate[28] and 125 ug/l bromide[29] are broadly coincident.

40. The following aspects of the local hydrogeology are also beyond dispute[30]. Beneath SLC, to a depth of 2-5m, the ground comprises sand, gravel and clay in discontinuous layers. Below this is chalk. The water table too is typically 2-5m below ground level. The top layer of chalk, which is generally 1.4-6.6m thick, is weathered to a soft clay-like consistency; this is known as putty chalk. Unlike sand and gravel, putty chalk and clay have high porosity, but low permeability. Water moves very slowly in the fine pores of chalk or clay and is held in place by capillary forces in the unsaturated zone; here, it only drains under gravity after rainfall. Below the putty chalk, and downgradient from SLC, are hard blocks of chalk which contain fine pores, but are separated by fissures through which groundwater travels with relative ease.

41. Bromate and bromide are both highly soluble in water. Recent groundwater data obtained from the site itself show (annual) average concentrations of up to more than 5,000 ug/l bromate and 250,000 ug/l bromide[31]. The presence of such highly elevated concentrations at SLC, some 26 years after the works closed, is consistent with the presumption that a large proportion of the remaining contaminants resides in pore water, but this has not been demonstrated[32].

[21] CD 9.6 Regulation 4
[22] CD 1A p243-5
[23] EA2 Fig E2A
[24] CD 13 Appx 2
[25] CD 13 Appx 3
[26] EA2 Appx 2
[27] CD 13
[28] CD 13 Appx 3
[29] EA2 Appx 2 Fig E1A
[30] CD 13
[31] EA2 Appx 2 Figs D3 & E3
[32] CD 13

The Identification of Contaminated Land and its Designation as a Special Site

42. On 11 March 2001, following the discovery of bromate contamination in private and public water supplies, the local authority (SADC) asked the EA to inspect SLC[33].

43. The EA summarised their findings in a report dated 24 May 2002 [34]. They observed that the contaminant plume had been shown to affect at least five private abstractions of groundwater (two of which were potable supplies) and two TVW abstractions for public supply. They also noted that other abstractions and supplies were potentially at risk from the migrating plume. They identified 4 significant pollutant linkages, that were believed to exist, one or more of which applied at all parts of the site. Bromate and bromide had been found in SLC land, above the water table, and modelling had shown that this source of contamination was more likely than not to cause exceedance of the impending 10 ug/l bromate standard for drinking water and of the 3000 ug/l bromide guideline value, for drinking water, that was based on expert advice[35].

44. On the basis of that report, SADC decided that pollution of controlled waters was being caused. A record of their (12 June 2002) determination, that the SLC land is contaminated land, has been provided[36].

45. On 20 June 2002, notice of SADC's determination was sent to the EA; to Redland, Crest and Woolwich Homes Ltd as appropriate persons; to Beechgrove (as owner of the land); and to the owners and occupiers of Nos 1-66 St Leonard's Court[37].

46. On 2 July 2002, the parties were notified of SADC's decision that SLC should be designated as a special site[38]. In accordance with S.78C(6), that decision took effect on 17 July 2002[39].

47. At the start of the inquiry, Redland, Crest, the EA, TVW and TW all agreed that the land had been properly identified as contaminated land and designated as a special site because it requires controlled waters, that are intended for human consumption, to be treated before use.

The Remediation Notice and the Appeals

48. The appealed notice[40] identifies SPLs, for both bromate and bromide, between the soil at SLC and the groundwater contained in, or in hydraulic continuity with, the chalk aquifer. It does not require any treatment action, but specifies a series of assessment actions that are needed to characterise the linkages in detail and to provide data that would enable treatment options to be assessed. It anticipates that the treatment requirements would then be specified in one or more subsequent notices.

[33] CD 1A p255
[34] CD 2A.23
[35] EA2 Appx 6
[36] CD 1A p273-277
[37] CD 1A p278-282
[38] CD 1A p283-4
[39] CD 1A p287
[40] CD 7.1

49. The assessment actions, numbered 1A-1D, address the bromate linkage and are all desk studies apart from 1D. Action 1A requires an estimate to be made of the bromate load held below SLC in the unsaturated zone and saturated chalk; an evaluation of the uncertainty associated with that estimate; and, design (and costing) of a site investigation to significantly reduce that uncertainty. 1B requires an estimate to be made of the groundwater bromate flux away from that area; again, with an evaluation of uncertainty and of the means to reduce that uncertainty through further investigation. Under action 1C, the scope for modelling the contaminant plume would be reviewed whilst, under 1D, monitoring data would be obtained from specified boreholes, surface waters and water supplies (both private and public). These actions were to be completed by 15 March 2006 (1A and 1B), 15 May 2006 (1C) and 14 February 2011 (1D).

50. Action 2E addresses both the bromide and bromate linkages. It requires certain boreholes and private water supplies, close to SLC, to be monitored during the period leading up to 14 February 2011.

51. Redland are identified as the appropriate person, responsible for the bromate assessment actions, by virtue of causing the pollutant to be in the land. However, they are excluded from the bromide SPL by the "sold with information" test, on the grounds that Crest bought the land with the broad measure of the pollutant's presence.

52. As it stands, the notice says that Redland should bear 50% of the costs of the bromide SPL, because assessment action 2E is a shared action. The EA confirmed, at the inquiry, that this was an error; the intention was that Redland should bear 50% of the costs of action 2E, because that action relates to both the bromide and bromate SPLs.

53. Redland's appeal[41] was based on the provisions of Regulations 7(1)(b)(i), (b)(ii), (c), (d) and (e). Crest's[42] was based on 7(1)(b)(ii), (c), (d), (f) and (s) but, at the start of the inquiry, they withdrew their 7(1)(f) based claim that the apportionment of monitoring costs failed to reflect the fact that bromate is more expensive to analyse than bromide.

54. Both appeals provided the information required by Regulation 9(1) and were served on the persons listed in Regulation 9(2).

The Case for the Environment Agency

The material points are as follows.

THE FACTS

The Steetley Chemical Factory

55. Following the grant of planning permission, to allow a change of use of existing buildings on the site[43], Steetley began to manufacture chemicals at SLC in 1955. Condition 2 of the planning permission prescribed those chemicals which could be manufactured; these included "Akyl Bromides" and "Potassium Bromate".

[41] CD 7.2
[42] CD 7.3
[43] CD 3.1

56. A statement[44], given to the EA by a former employee of Steetley, said that initially bromine was delivered to the site in 1-2 litre glass bottles. If any of these were cracked or otherwise defective they would be stood outside the buildings on a hard surface to allow the liquid to evaporate. Later, bulk supplies of bromine were brought in by tanker.

57. In describing waste handling and spillage, the employee stated that *"Each process building contained a large, brick-lined sump…these were approximately 5m x 5m x 3m deep, sunk into the floor of the building and open-topped with a cover or planks or something similar. ….The sumps received condensate from the heating coils of the reaction vessels. …….They also received any waste acid which was neutralised with soda-ash. Any spillages on the site were "mopped up" with soda ash and the resulting mixture deposited in the sumps. The sumps were intended to be sealed containers whose contents were disposed of to foul sewer, after testing with litmus paper."* The employee recalled one or two occasions when staff arriving at the factory on a Monday morning found the sumps empty, presumably because the contents had leaked away. The brickwork was re-pointed from time to time.

58. The employee confirmed the manufacture of bromide and bromate and the storage of bromine on the site. An aerial photograph taken in 1971[45] shows the broad layout of the buildings which corresponds to the earliest 1980's plan produced or used by St Albans Testing Services Ltd (STATS) in their November 1983 report. This plan was produced for the first time in Crest's evidence[46] to the inquiry; it, together with other appendices to the report, is missing from the core document version[47]. The overall layout of the site and buildings does not seem to have altered fundamentally during the period of chemical manufacture.

59. On one recorded occasion, in 1978, chemicals from the factory appear to have got into the surface water or highway drains and then into the lagoon at the Jersey Farm landfill via the "House Lane Culvert" which served the roads surrounding the site[48]. This resulted in high concentrations of both chloride and bromide in the Jersey "pond"[49].

<u>Steetley Decide to Sell</u>

60. By the early 1980s, Steetley had decided to sell the site, preferably with planning permission to allow its redevelopment.

61. Steetley were aware that the manufacture of chemicals had probably left contamination at SLC. They commissioned some soil analysis from Imperial College in London[50]. Samples, designed to be representative of a 12 inch depth, were taken in December 1981. The results, which were reported in February 1982, did not show high levels of bromide. (This was reported as total bromine, but as Crest and Redland both agreed in answer to the Inspector's questions, it would be unwise to place any reliance on bromine results obtained by the Inductively Coupled Plasma Optical Emission Spectrometry (ICPOES) technique at

[44] CD 1A p246-248
[45] EA2 Appx2 Fig H
[46] C2.3 p10
[47] CD 2A.6
[48] CD 8 para 247
[49] CD 2A p315
[50] CD 2A.1

the time.) Nevertheless, Steetley continued to be aware of the contamination issue. Indeed, they expressly considered what they could properly say about it to potential buyers[51].

62. In the autumn of 1982, they made a planning application to SADC seeking permission for redevelopment of SLC for office and commercial purposes. In February 1983, SADC asked for evidence in relation to "ground pollution"[52]. The application was registered as complete in April of that year[53].

63. SADC consulted Thames Water Authority (TWA) in respect of the Steetley planning application. This led to TWA employees (JT and RF) visiting SLC on 21 February 1983[54]. JT also followed up and took what became a familiar round of samples from local private abstraction boreholes in the area[55].

64. Following this visit, RF wrote to SADC on 8 March 1983[56]. He noted an elevated bromide reading at Nashes Farm but concluded that *"..with the limited data available it is impossible to say whether the Steetley Chemical Works has had any effect on groundwater quality".*

65. SADC drew up a planning brief for the site which was adopted by the planning committee on 24 April 1983. The brief[57] recorded that *"The factory has been used for the manufacture of chemicals and it would appear that all waste materials were properly removed from the site. Soil samples have been analyzed by the Imperial College of Science and Technology in 1982 for the present owners. A preliminary examination of these results appears to show that extensive contamination had not taken place. It is the developer's responsibility to investigate pollution factors and to assure the District Council at the time of the planning application that the site is suitable for the purpose proposed."*

66. About a month after adoption of the planning brief (which sought mixed use development, including housing) SADC refused Steetley's application for planning permission for a solely industrial/commercial redevelopment[58]. The reasons for refusal did not refer to contamination, but reason 8 suggested, in strong terms, that it would be better if a scheme, in line with the brief, were to be pursued.

<u>Crest Investigate Purchasing SLC.</u>

67. It is not clear when Crest first became potential purchasers of SLC but it was during or before the summer of 1983. By 7 July, they had instructed DAC (solicitors) to act for them in the purchase. On that day, SADC legal services replied[59] to an earlier letter from DAC; they enclosed the local authority search certificate and added "*I would point out that the previous occupant of the site was concerned in the manufacture of Bromide/Bromate products, and the possibility exists of site contamination arising therefrom. Further enquiries on this matter should be addressed to the [SADC] Chief Environmental Health Inspector."*

[51] CD 1A p26
[52] CD 1A p32-33
[53] CD 3.7
[54] EA4 p16, CD 5.2 p86
[55] CD 2A p315 and annotation of map on p320
[56] CD 1A p37
[57] CD 3.6 paras 6.7 and 6.8
[58] CD 3.7
[59] CD 1A p43

68. On 12 July, DAC wrote to SADC Environmental Health seeking information as to "possible site contamination" together with any available test results.[60] In reply, SADC gave some details of the processes carried out by Steetley, on the site, noting particularly that "*bromide aqueous waste, caustic aqueous bromide and solid bromide"* were known to have been wastes produced by the processes. This 15 July response sought to give brief details of the processes and told DAC that Steetley were concerned to leave the site "*with no hidden dangers*". It highlighted concerns that, if the site were to be redeveloped for housing, residents might come into contact with contaminated soil. The letter[61] also contained the express warning that "*If a developer is to avoid unexpected contamination and unexpected expense he should be advised to critically examine the past use of the site and if in the slightest doubt, arrange for expert survey*." It is clear, from the letter, that a chemist would be the appropriate expert to consult.

69. A few days later, on 19 July, Steetley sent to Crest "*information dealing with contamination tests on the above site*".[62] It is not clear what was sent, but the only realistic candidate materials are the (February 1982) results of the Imperial College Survey.

70. By August 1983, Crest were moving towards purchasing the site. An internal memo[63], copied to Peter Reeves (amongst others), made it clear that the state of the soil at the site was an issue Crest needed to consider. It pointed out, in relation to soils generally, (item 7) that no soils report had been taken and that "*it would be a matter for commercial assessment as to whether contracts should be exchanged prior to soils reports being available or own judgment resolved."* This comment may be related to determining the nature of the soil to assess suitability for foundations etc., but the wording relates to the soil generally rather than limiting it to this aspect.

71. The memo went on to say "*As to the contamination on the site, the Company has had a chemical analysis carried out in respect of soil contamination and the matter has been discussed with the Inspector at a meeting. The current indications are that it will not be necessary to remove as much of the top soil as had been originally anticipated, it has also been indicated on the information before him that the Inspector will not require it to be taken to a toxic tip. The current indications are therefore that a lesser amount of fill will have to be removed but this can go to a local non–toxic tip. Until a full grid survey has taken place of the soil however, the definitive requirements of the environmental officers cannot be conclusively established. We are also just currently waiting for a final clearance on organic bromides.*"

72. Elsewhere the memo noted that the planning brief had been studied and that, in order to limit liability for rates, it would be important to demolish the existing buildings on the site as soon as possible. The memo also observed that contaminants, such as asbestos, might still be found when the buildings were demolished.

73. It appears this memo came after 11 August 1983, since it referred to the Company having *"had a chemical analysis carried out in respect of soil contamination*". This chemical analysis was carried out by STATS and it is clear from their report[64] that instructions to

[60] CD 1A p44
[61] CD 1A p45-46
[62] CD 1A p47
[63] CD 5 p381-384
[64] CD 2A.2

carry out the tests were given on 10 August and that the site work took place on the following day. Authors of the report noted that *"Based on the results of this limited investigation, areas of significant contamination have been identified, and disposal of soil is recommended. Clearer boundaries of areas requiring excavation and disposal can be established by a more detailed investigation."* It is not known precisely when the results were made available to Crest, but it appears the writer of the August memo at least knew broadly what they showed. There is no dispute that Crest knew of the results of these tests by STATS prior to exchange of contracts.

74. Although we do not have a copy of the letter, it is evident[65] that Crest had written to Hertfordshire County Council Environmental Services on 23 August 1983. The reply makes it plain that, in August 1983, Crest knew that there would be contaminated soil to be considered and that the quality and quantity of that soil would determine whether it could be taken to landfill sites in Hertfordshire. It is also clear that leaching and contamination of groundwater were likely to be factors to be considered at SLC since some, perhaps rudimentary, tests had been carried out "*to determine the organic fraction of contamination capability of being leached in water."*

<u>Crest Purchase SLC; Carry out More investigations and plan Redevelopment. September 1983 – February 1984.</u>

75. Contracts whereby Crest bought SLC from Steetley were exchanged on 1 September 1983[66].

76. On 15 September 1983[67], Hertfordshire County Council replied to Crest's letter of 23 August. Again, details of the possible disposal of contaminated soil were discussed. After setting out the position based on the information then available, the letter continued "*However, further site investigation is required* ***especially in the areas of the waste sumps, storage and workshops*** *and……."*

77. There was another report from STATS, dated September 1983[68], which provided the results of further analysis of the samples taken in August. It sought additional information about samples which had previously been identified as "potential causes for concern". These included "high bromide" in boreholes 3 & 4 (out of the 5 boreholes sunk). It is not clear precisely when Crest either gave instructions for this testing to be carried out (it may be what they were "waiting" for in the August internal memo), or when they received the results of this analysis.

78. On 19 September, Crest instructed STATS to carry out the "soils grid test", which was primarily for the purpose of determining how the soil would take building foundations.

79. Whilst there is no documentary evidence to this effect, it would appear from information given to the inquiry, by Crest, that they completed the purchase of the site on 22 September 2003. However, documents from the time suggest a later date; in the planning application of 4 October, Crest are described as "prospective purchasers"[69].

[65] CD 1A p48
[66] CD 1A.41A
[67] CD 1A.42
[68] CD 2A.3
[69] CD 3.8 p39

80. On 4 October 1983, Crest submitted two planning applications. An accompanying certificate[70] indicates that the only other party with any ownership of the site, by that stage, was the Salvation Army who owned a small strip of additional land which had been leased by Steetley. This land formed part of SLC and acted as its north eastern border[71]. One of the applications sought planning permission for 30 houses[72]; the other, for 7,500 sq feet of office accommodation in a two storey building[73]. Whilst there were two separate applications, it was considered that the schemes were complimentary and that both could be brought forward on the site. After amendment and negotiation, they were both given permission on 1 February 1984[74].

81. Investigations into the state of soil, on the site, continued. Having been instructed on 19 September, STATS carried out further tests based on a grid system covering the site. The site work was "*carried out during October 1983*"[75]. The survey was based on a grid, of squares, covering the whole site; the aim was to sample from middle of each square. A 150 mm continuous flight augur was used to sample from depths of 0.75m and 1.5m[76]. The results of this investigation were reported in November 1983[77].

82. In a second investigation, at around this time, the site work took place on 25-28 October and the results were reported in November[78]. The report was sent to Peter Lardi, Crest's consulting engineers, and was concerned with the structure of the soil to determine "bearing capacities of the various strata". Five boreholes and ten trial pits were dug. No chemical analysis of the samples took place, but notes were made if the soil smelled strongly of chemicals.

83. The remaining strip of land was purchased from the Salvation Army in November 1983[79].

84. STATS reported again in December 1983[80]. This report was not based on any fresh samples, but was a more detailed consideration of the grid samples which had been taken in October. The objective was to "*analyse the soil in order to comment on the degree and type of contamination present and thereby identify areas from which contaminated soil should be removed and infilled with fresh top soil."*

85. It is clear from paragraph 7.9 of the report that, for bromide, STATS were able to assess what would be "3 or 4 times" over the background concentration and that STATS regarded this level as contaminated. This conclusion was reached without any further information on background concentrations than had been available in August; there appears to have been no need to take off-site samples, in order to determine background levels. This suggests that they were aware of the broad level of background, in any event, or could have found it out from available sources.

[70] CD 3.9 p42
[71] CD 2A p163 & CD 3 p14
[72] CD 3.8
[73] CD 3.9
[74] CD 3.10 & 3.11
[75] CD 2A p21
[76] CD 2A p21
[77] CD 2A.4
[78] CD 2A.5
[79] CD 13 Appx 2
[80] CD 2A.6

86. The report found high levels of bromide in a significant number of boreholes and often down to the full depth of the borehole. Where STATS note the level of bromide as high, it is many more than 3 or 4 times above background. The location of the grid squares is marked on a map which was then used as a base map for further information and hence has been written on and over several times. A separate plan has been prepared[81], on which the "X's" give an indication of where these first grid square samples were taken.

87. As well as having advice from their own consultants Crest were in touch with SADC, HCC and TWA. All these bodies were also in touch with each other over the contamination at SLC. Crest knew TWA thought there were problems. From a meeting with HCC, recorded in (19 January 1984) correspondence[82], Crest knew there was " *the possibility of bromide migration in ground water"* which (together with uncertainty over the analysis of organic bromides) would lead to the need for waste to be deposited in a "*hydrogeologically secure site*". In early February, TWA told Crest "*The [SLC] site is particularly sensitive since there is a high water level within the chalk aquifer and the Chalk is believed to be covered only by a thin layer of superficial deposits. There are private groundwater abstractions down hydraulic gradient from the site and a number of these are used as domestic supplies."* The letter makes it clear that TWA had received the (November 1983) STATS third report[83] and, in the context of opposition to soakaway drainage, comments *"The report confirms that a considerable proportion of the site is contaminated and whilst recommendations are made about the removal of the upper layers in some areas* ***there is no evidence to suggest that the contamination does not extend deeper into the ground.****"* Crest's technical manager understood the issue of leaching and raised it in a letter to HCC highways regarding potential drainage arrangements[84]. Also, the issues of soakaways and foundation calculations had led to an initial refusal of Building Regulation approval[85]. These issues were addressed and resolved when soakaways were avoided[86].

88. Crest's knowledge of potential groundwater issues caused them to instruct Chemfix International. By February 1984, Chemfix had produced a report advising on groundwater issues[87]. From that report, it would appear that Chemfix were instructed as hydrogeologists; indeed, the report states "*As a result of uncertainties over the effect of high levels of bromide on groundwater quality, it was decided to consult a hydrogeologist…"* Chemfix advised Crest that migration of pollutants in groundwater would be an issue and that contaminants entering the aquifer would be drawn towards local supplies[88]. The report noted that bromide would act in a similar way to chloride and would "*disperse within the water table and be diluted".* The recommendations, for further research and modelling, were made "*[where] no account has been taken of the extent or form of contamination found at the site."* Presumably this comment was meant to ensure that those reading the report would understand that it dealt simply with what could happen in hydrogeolgical terms rather than, at that stage, commenting on the scale or seriousness of any pollution or potential plume.

[81] C2 Appx 15 Fig 2
[82] CD 1A p54
[83] CD 2A.4
[84] CD 1A p58
[85] CD 1A p60
[86] CD 1A p61-65
[87] CD 2A.7
[88] CD 2A.7 p89

The Demolition of the Existing buildings, a quiet few months and the final round of modelling and analysis. March 1984 to March 1985

89. During 22-23 March 1984, STATS were back at SLC. As the May 1984 report showed, bromide was specifically within the focus of the investigation[89].

90. By February of that year, Crest knew that the chalk aquifer was exploited by TWA for public water supplies, that TWA regarded the site as particularly sensitive and that nearby private supplies were at risk from the contamination[90]. TWA advised that on-site soakaways should not be used in the redevelopment of the site; instead, surface water from the site should be encouraged to soakaway in uncontaminated areas, as had occurred whilst the chemical works was in operation. Crest also knew from their own consultants, Chemfix, that migration of mobile pollutants down towards the water table below had been slowed as a result of the extensive coverage of the site by buildings and tarmacadam areas that were served by drains to carry the water away; indeed, the report noted the risk to groundwater quality that might result from exposing areas of soil to rainfall[91]. Yet by 22-23 March, when Chemfix were back on site, *"the site was in the process of being cleared by demolition contractors".* Crest's reason for clearing the site was financial; prior to purchase they had regarded the existence of the factory buildings as a financial liability to be removed "*as quickly as possible after acquisition*"[92].

91. Although the effect of that demolition has been the subject of debate, at the inquiry, what actually happened is relatively clear. The buildings were demolished. Whether some rubble was taken off site, or not, sufficient was left to cover the site with a layer of about 0.5 m thickness. This was described by M–Scan and Chemfix, who visited the site in May and September (1984) respectively, in the following terms: "*The site was covered in bulldozed rubble and pebbles."*[93]

92. This remained the case at the end of the following winter. On 28 February and in early March 1985, Chemfix observed[94] that "*The surface of the site contains quantities of masonry debris and building rubble, including brickwork and iron which is in a state of decay. In addition, there are many pieces of tar / bitumen and tarmacadam debris as well a pieces of asbestos board / asbestos cement. Below the top layer there are three to four underlying layers, and as a general guide only these may be categorised as follows: 1. Rubble (described) 2. Bricks, stones / soil. Some dark soil / clay… etc*".

93. In addition, the sumps and preparation areas had previously been inside buildings with a roof. This was now removed and, although the sumps were probably filled with rubble and had rubble in a layer over them, this was not impervious. So, for the first time since 1955, the sumps themselves were able to act as soakaways.

94. At the same time Crest were seeking to determine what would be necessary to obtain further planning permission and were negotiating with SADC and TWA. Following the initial hydrogeological assessment from Chemfix, Crest asked them to model the effect of

[89] CD 2A.9 p139
[90] CD 1A p55 & CD2A p87
[91] CD 2A p89-91
[92] CD 5.4 p383
[93] CD 2A p166 and p181
[94] CD 2A p201

contaminants on the groundwater. This work was reported to Crest in a (8 May 1984) document[95]. The report acknowledged that there would be bromide contamination of groundwater, and the creation of a plume, but concluded that this would not reach any abstraction point. However the report also stated: "*Whilst these conclusions are encouraging from an environmental point of view, it is worth re-emphasising the limited data base on which the modelling is based. Equally it should be pointed out that the analysis does not take into account any existing pollution of the aquifer from historical releases either at the site or from other sources. It is recommended that the results of this study be brought to the attention of the appropriate Statutory Authorities for comment as the next stage in the development of [SLC]*".

95. STATS reported the results of the 22-23 March 1984 sampling from 3 boreholes at around the same time, in May 1984.[96] This report considered the contamination, by bromide, of the soil and of the groundwater. It indicated that the highest concentrations in the most affected boreholes (1&2) had been found just under the concrete floor slabs of the factory and in the putty chalk, with much lower concentrations in the sandy gravels in between[97]. The soil samples, taken from just below the floor, were described as "slightly clayey sandy gravel" (borehole 1) and "clay" (borehole 2). In order to determine the "available bromide" a sub-sample of this soil was mixed with deionised water at room temperature for 24 hours, with occasional shaking, and then the extract was analysed by ion chromatography; borehole 1 yielded the highest result.

96. Armed with these results, Chemfix arranged a meeting with TWA. TWA clearly had an interest in groundwater pollution, but they had little effective power to achieve the clean-up of contaminated sites. Whilst a power existed under S.46 of the (1974) Control of Pollution Act, to remediate and recover the costs, it was not even discussed in relation to SLC. Once a polluter had sold a site, TWA's only practical recourse was through the planning regime at the time of redevelopment and, in this respect, they were dependent upon the planning authority supporting their view that clean-up should be secured by legal agreement or through conditions attached to the planning permission[98]. In this particular case, the meeting between Chemfix and TWA took place on 11 May 1984 and was followed up by a letter on 16 July. On behalf of Crest, Chemfix asked for an early response to the letter "*As Crest are now anxious to commence development on the site as soon as possible"*[99].

97. TWA sought their own advice on the validity of the Chemfix modelling; as evidenced by the (25 July 1984) letter from RF to TWA Scientist for Catchment Quality and by the subsequent reply[100]. Then, on 17 August 1984, TWA wrote the first of a series of letter to Chemfix in which they set out their views as to the seriousness of the contamination on the site and the steps that would be needed to remediate it[101]; this letter followed a meeting and was signed by RF, but it notes that the matter was being dealt with by JT.

98. Firstly, the letter sets out the queries and criticisms that TWA wished to make in respect of the Chemfix modelling. Secondly the letter dealt with the future: "*Regarding the wider*

[95] CD 2A.8
[96] CD 2A.9
[97] CD 2A.9 para 6.1
[98] EA4 paras 86-96
[99] CD 1A p68
[100] CD 1A p69-70
[101] CD 1A p71-72

implications for groundwater resources in the area, this aspect cannot be assessed without further sampling and analysis down-stream of the site. ... Discussion of any possible remedial action can only take place after this further investigation, but the only possible options would appear to be removal of contaminated material (to a greater depth than already proposed) and/or the abstraction of groundwater at the site by means of scavenging boreholes. The former may require further treatment investigation depending on how much information has already been determined, and the latter immediately raises the problem of the disposal of contaminated water. As far as the future development of the site is concerned, provided no soakaways are used it seems unlikely that the building of houses or offices will exacerbate the groundwater problem and this Authority would not wish to object to or unduly hold up the development. The option of future groundwater monitoring and scavenging should still remain open, though clearly the amount of contaminated ground to be removed must first be resolved."

99. It is not clear how much soil Crest were proposing to remove at that stage. A letter[102] from the Colne Valley Water Company (CVW) suggests that it was 1.5 m at least in parts of the site.

100. There was further correspondence and contact between Chemfix, their analysts (M–Scan) and TWA in which technical information and queries as to analytical methods were discussed. TWA continued to take internal advice on the technical issues that arose[103].

101. Essentially, however, things went quiet over the summer and autumn of 1984. There was some further on-site and off-site sampling in September[104]; some of the off-site readings were available to TWA[105], but there was no further contact between Chemfix and TWA until the end of the year.

102. On 23 November, TWA and Chemfix met. By then, more data were available. As was usual, TWA followed this meeting up with a letter. In this (4 December 1984) correspondence[106], TWA confirmed that "*the groundwater immediately beneath the site is grossly contaminated".* As JT pointed out in evidence, TWA were concerned to protect the aquifer and the private water supplies downstream of the site. The letter recorded concern that the demolition would allow and had allowed leaching of contaminants into the aquifer. Whilst it noted that there appeared to be no evidence of SLC derived organic contaminants in the private supplies, it also highlighted the difficulty of assessing the impact of those contaminants, given their unknown behaviour in the chalk and the uncertainties surrounding their toxicity at low concentrations.

103. Dealing with remediation TWA said: "*This authority would therefore advocate the use of a groundwater scavenge system at the "downstream" end of the site to intercept polluted groundwater and prevent migration away from the site. **I would envisage that a discharge to the foul sewer would be acceptable** though this would obviously depend on the quantity and quality of the groundwater abstracted. The design of such a system would of course require some limited hydrogeological investigation to determine the hydraulic regime in the Chalk and vertical contamination profile. I would be pleased to discuss this aspect with you*

[102] CD 1A p67
[103] CD 1A p84-90
[104] CD 2A.11
[105] CD 2A p315
[106] CD 1A p91-92

at an early stage. ***Any discharge to the foul sewer would require the consent of this Authority and the initial approach should be made to ….. the Authority's Senior Trade Effluent Officer for this area (Waltham Cross Office).*** *It would also be desirable to remove from the site the most severely contaminated material.* ***The initial appraisal of this aspect, carried out by [STATS] is inadequate to define precisely the extent of such an operation,*** *but it at least pinpoints the areas most likely to be contaminated. I would have thought that it would be wise to excavate virtually down to the Chalk surface in the most contaminated areas, i.e. most of the area marked red on the STATS plan, with more limited excavation elsewhere. You may or may not feel that further investigation/analysis is required to plan this operation but the difficulties of representative sampling, cross contamination and analysis should be borne in mind. Clearly the removal operation has serious cost implications and it may be that a compromise has to be reached whereby the upper contaminated layers are removed and after replacing with clean material the development of the site is designed in such a way that high risk areas are covered with an impermeable surface. I trust that you will now be able to discuss the matter with Crest Homes Plc with a view to* ***implementing precautionary measures to alleviate the groundwater pollution risk*** *together with the successful development of the site. From the groundwater pollution point of view the longer the site remains open in its present state the greater the risk of more widespread contamination*."

104. Chemfix replied on 24 January 1985[107]. In many ways this letter was essentially holding the position. It promised further research and put off a meeting between the chemists acting for both sides. However, in respect of scavenge pumping Chemfix stated: "*We welcome the opportunity to discuss with you further any remedial measures proposed for the site.* ***Methods and options to prevent groundwater pollution are being investigated. If groundwater scavenging is used, discharge to sewer could provide a useful disposal route for polluted water. We shall contact Mr …. of the Authority if this is pursued.*"** The letter also confirmed that the process of trying to identify what soil to take from the site was continuing.

105. At this stage, things were not moving particularly quickly. The further information and research referred to by Chemfix in January 1985 became available in March 1985. This was the results of sampling from the new borehole, known as the "Chemfix" or "C1" borehole. It was close to the (March 1984) STATS borehole 1 (BH1), which existed prior to demolition.

106. The Chemfix (C1) borehole had been drilled in freezing sleet and snow on 21-22 January 1985[108]. Whilst direct comparison with the results from BH1 cannot be made, the results from C1[109] suggest that bromide contamination had moved more consistently through the strata. The phenomenon of there being relatively low readings in the gravels, which could be said to be seen in the BH1 results, was no longer true.

107. Also in March 1985, Chemfix provided a further report on modelling[110]. This took into account the "fallow field" condition of the site following demolition. In its summary and conclusions, the report indicated that there was a possible problem with contamination of

[107] CD 1A p93
[108] CD 2A p211
[109] CD 13 Appx 5
[110] CD 2A.15

the closest private abstraction boreholes from both organic and inorganic bromide. The report recommended monitoring and the sinking of an extra monitoring well downstream of the site.

108. The third strand of information available to Crest in March 1985 was the results of a further grid of hand drilled augur boreholes carried out by Southern Testing Laboratories for Chemfix[111].

109. At about that time, or shortly afterwards, Chemfix and Crest finalised their plan of action for the site. Whether there was some sort of meeting to clarify strategy or whether things evolved slowly does not matter very much. What is clear is that from now on Crest and Chemfix advocated and negotiated consistently for the same outcome. This was to remove soil and/or comply with any other measures which would be required to prevent future residents of the site coming into contact with contaminated soil and then to effectively seal into the site what contamination was left. In respect of groundwater and the aquifer, Crest would take no direct action at this stage, or perhaps at any stage, but would seek agreement to continued monitoring of the situation with the possibility of action if things were getting worse. Crest would seek endorsement of this approach from all regulatory authorities and this would allow them to either sell the site or gain a satisfactory planning permission that they could implement themselves.

<u>Crest try to start things moving again and try to persuade the relevant authorities to support their proposals - April 1985 to October 1985.</u>

110. Crest first tried to get TWA signed up to their approach in April 1985. Following contact by telephone, a Director of Crest and a representative of Chemfix were to meet RF at his offices in Reading. The letter[112] confirming arrangements stated "*The purpose of our meeting is to discuss with you the results and findings of the investigation and assessment of the site which has been carried out to date, and to review with you proposed redevelopment options for the site, which it is hoped can be quickly pursued. I enclose the relevant reports which have led to the recommendations for redevelopment in the short term.* ***These form the basis of our submission to you, seeking your views, endorsement and approval***."

111. The letter enclosed a number of reports of analysis and monitoring studies. These ended with the material, set out above, which became available to Crest in March 1985. Finally the letter set out: "*As a result it is proposed that the rehabilitation of the site is best realised by a controlled excavation and backfilling operation. A plan illustrating the areas concerned is currently in preparation and will be brought to the meeting. Development is seen as an integral part of the rehabilitation of the site*."

112. Whatever correspondence or negotiation followed, Crest in fact did nothing more than "controlled excavation and backfilling". It is also apparent that this was a measure they had anticipated may be necessary since before they bought the site. From the August 1983 internal memo it is clear that Crest had always factored in removing soil as part of the redevelopment of the site[113].

[111] CD 2A.16
[112] CD 1A p95
[113] CD 5.4 p381

113. The result of the meeting between Chemfix and the Crest Director on one side, and RF on the other, is recorded in a Chemfix (23 April 1985) letter[114]. RF was not prepared to endorse the modelling. It was further agreed that a new borehole was needed off-site; this, presumably, followed from the recommendation already made by Chemfix to Crest in any event[115]. In relation to the borehole, Chemfix stated: "*It was agreed that, to reach a conclusive phase in the site's investigation and assessment, another borehole should be established off-site, in a location to be agreed, to monitor groundwater quality of the underlying aquifer. The nature of the borehole construction, and the standards and protocols for the pumping trial and water sampling and subsequent analysis are to be agreed as soon as possible*…."

114. In that letter, Chemfix were explicit that the object of the sampling and assessment was to lead to "*to a formal statement of endorsement from the authority which would allow our clients - Crest Homes Plc – to rehabilitate the site and provide for its redevelopment for offices and residential use*."

115. A second letter of 23 April 1985[116] started arrangements for a monitoring borehole. (The second page of this letter, as provided, may in fact be the second page of a 1.5.85 letter dealing further with the arrangements; but, it probably does not matter.) Certainly, following further liaison at the start of May the new borehole was established, about 100m downstream of the site, and sampled shortly afterwards.

116. The off-site monitoring borehole was drilled and a sample taken on 17 May 1985[117]. The borehole was 13m deep; the water table was about 4m below surface level. The sample was representative of water in the aquifer, as it was taken after pumping which had not reduced the level of the water table.

117. By the time of a (14 June 1985) meeting between Chemfix and RF(TWA), the results of the off-site borehole sample analyses were available; these showed that the head of the plume was outside the site and, as JT explained in evidence, TWA were to some extent "over a barrel". Ideally they wanted scavenge pumping to catch the head, but this would require an off-site pumping arrangement which raised practical difficulties. On-site pumping would have been a good second best, but by then TWA had almost given up the idea of persuading Crest to install any kind of scavenging and, as the months went by, more and more contaminants were getting flushed into the groundwater. In the circumstances, they decided to press for action to reduce infiltration into the site and to pursue the provision of another monitoring borehole, downstream of the plume, which could be used to give advance warning of an impending threat to the quality of private supplies. Writing to Chemfix a week after the meeting, in a letter[118] (dated 21 June 1985) which featured prominently in the evidence at the inquiry, RF made a number of points.

118. Firstly, he noted that "*The groundwater quality observed at the newly drilled boreholes downstream of the site gives some cause for concern as it is now clear that the contamination is not just restricted to the drift and top part of the Chalk beneath the site*."

[114] CD 1A p97-98
[115] CD 2A.15 p219
[116] CD 1A p100
[117] CD 2A.17
[118] CD 1A p104-105

[Note: the plural "boreholes" appears to be a typographical error as there was only one "newly drilled" borehole at this time.]

119. Secondly, RF set out criticisms of the Chemfix modelling. In particular, he noted that the low bromide concentrations which were predicted did not concur with the empirical readings from the off-site borehole. He also raised the need to involve SADC: "*In view of the results obtained from the new borehole it will clearly be necessary to monitor groundwater quality downstream of the site to ensure that private well supplies remain potable.*" He then went on to say that he had written to the Chief Environmental Health Officer (EHO) for SADC and that a meeting would probably be in everyone's interests.

120. The rest of the letter is worth quoting in full.

> *"The newly drilled borehole should of course be included in the monitoring network but it would appear that there is still a need for an additional borehole or boreholes even further downstream but upstream of the nearest abstraction for potable supply. What is really needed is a borehole which is now free of any contamination which can be checked for the appearance of pollution and thus serve as an early warning system to enable alternative supplies to be provided to any wells threatened. This point could be discussed further at the meeting with the Environmental Health Officer.*
>
> *Regarding the possibility of remedial measures the idea of a groundwater scavenging scheme, which I suggested in my previous letter of 4/12/1984, is one which I would still ideally like to see employed. However, I realise that such a system would have to be thoroughly researched and designed to be effective. In the light of the new borehole data it would also have to be located downstream of the site on land in someone else's ownership. There is also the awkward question of financing such a scheme with the legal complications of responsibility which could obviously involve Steetley Chemicals as the previous owner of the site. It therefore appears that such a scheme is unlikely to be practicable which leaves the choice of either continuously monitoring the pollution, or the provision of alternative water supplies to any householders whose well supplies may be threatened. Again this may be a matter for discussion with the Environmental Health Officer.*
>
> *As far as the development of the site is concerned I can only repeat my earlier comments that this Authority has no objection to its development, subject to the normal requirements on drainage etc. and indeed I would encourage its development as soon as possible to reduce the amount of infiltration entering the site. Your own modelling work has shown that if the site is left in its present condition, migration of pollutants would be enhanced and some well supplies would be threatened. If for any reason the site is not now to be developed I would like to see some sort of impermeable cover provided to prevent further leaching of contaminants.*
>
> *I understand that a scheme of excavation and removal of subsoil has been drawn up to remove the majority of the contaminated material prior to development and obviously the sooner this is carried out the better. Incidentally I do not appear to have details of this scheme though I appreciate it will be done partly on an "as encountered" basis.*

I would be interested to learn what the latest proposals are by Crest homes with regard to excavation and redevelopment. Meanwhile as far as the groundwater aspects are concerned I suggest we wait for some response from the Environmental Health Officer and meet with him in due course."

121. Three days later, a letter was sent by RF to the EHO for SADC[119]. This pointed out that water taken from the new off-site borehole was badly contaminated and that SADC were strongly advised to monitor the quality of borehole supplies to the south east, but that detailed GCMS analysis for the organic compounds could be reserved for those samples that showed high bromide concentrations. The letter explained that Crest's modelling had suggested that the private supplies downstream would not be affected provided that the site was developed and not left open to the rain. It also sought to set up the meeting with Chemfix to discuss the monitoring regime and its funding.

122. It appears that Crest felt either that they now had all they wanted from TWA or that they were not going to get any more. The next letter[120] (of which we only have the first page) appears intended to put on the record what Crest wanted, to send a drawing showing areas of excavation, but not to invite any further discussion or approval and to disagree with the Thames Water Authority's criticisms of the modelling. Relevant parts of the letter read: "*We are pleased to receive your reconfirmation that the Authority has no objection to, and encourages, the site's development subject to the normal requirements on drainage etc. as earlier agreed with the Authority. Our clients, Crest Homes plc, propose that the development should be pursued, and we enclose Drawing no STL 2199/1 indicating the extent of excavation of sub-soil to be removed off-site prior to the redevelopment commencing. All such material to be disposed of to a licenced containment landfill……. Your comments upon Groundwater quality observed at the newly drilled borehole are noted, but we would question …… In regard to our modelling work, and following our earlier agreement on the base data, we believe that we have addressed all the factors requiring investigation and feel that a definitive position has now been reached to satisfy the authority*."

123. Other than to deal with the monitoring, Chemfix did not meet with TWA again. Nor did they consult them, by letter, on the remediation measures for the site. For instance, TWA were not sent the Statement of Quality[121], even in its June 1985 form.

124. By this time, nothing had happened on site since the March 1984 demolition. SADC told TWA that Crest were being pressed to explain why building work had stopped. It appeared that things might go forward with Rialto as a new owner and with new consultants[122].

125. Also at this time, another firm of builders called Finlinson were trying to buy the site[123]. In a letter, dated 15 August 1985, they were advised by consultants Bostock Hill and Rigby. Bostock Hill and Rigby appear to have read the Crest/Chemfix June 1985 statement of quality. Nevertheless they advised Finlinsons that: "*The analytical data you provided suggests that the ground is polluted with bromides to the full depth of boreholes 1 and 2 (March/April 1984) i.e. 6-8 metres. Since the aquifer is at 4m, it is already heavily*

[119] CD 1A p106
[120] CD 1A p116
[121] CD 2A.19
[122] CD 1A p114
[123] CD 1A p117

contaminated. ……..[letter makes point contamination mostly associated with fill layers and chalk.]……. The proposal for a predominantly hard cover development to reduce infiltration recharge to a minimum does not guarantee that abstraction sources will not become contaminated at some time in the future…….. I would endorse Mr Flavin's [RF's] suggestion of a groundwater scavenging scheme as a means of complete restoration of the site although the disposal of the scavenged water would be difficult. It is essential that the high levels of bromide are eliminated from the potable water, since the potential generation of brominated haloforms is considerable. Removal of current organobromine compounds from the water would be possible by for example carbon adsorption [sic]. My conclusions therefore are slightly different to those of Chemfix international. I consider that there is an ongoing monitoring and control liability on the owners of the site, and the cost implications of the "worst case" situation i.e. contamination of an abstraction well or borehole should be fully evaluated and compared with the cost of a scavenger borehole clean – up."

126. Finlinsons took matters as far as a meeting on 4 September 1985[124]. The note of the meeting indicates that RF, from TWA, made it clear that he did not accept Chemfix modelling. Finlinsons and Crest did not agree on price and matters went no further.

127. Crest knew that TWA did not agree that there would be no problems with potable water. They probably knew from a number of sources, but they were told explicitly in a (18 November 1985) letter from SADC[125]. No immediate agreement was reached on monitoring and, despite expressions of willingness by Crest to provide some funding[126], no monitoring took place until August the following year.

128. By December 1985, Crest had not found a buyer for the site that they could reach terms with. Crest decided to continue to develop the site themselves and, in a (5 December 1985) letter[127], told SADC that they intended to move ahead in 1986. SADC replied on 19 December 1985[128], confirming their role in relation to the wholesomeness of drinking water and indicating that "*Thames Water will no doubt pursue their separate responsibilities".* SADC also made clear that, as planning authority, they would be concerned with *"decontamination of the site to protect the health and safety of residents."* The letter mentions that pollutants appear not to be held in the gravel, but the available copy is incomplete.

129. Crest made a fresh planning application[129], for 70 new dwellings, on 18 December 1985. Their approach, from now on, was to get this application (or similar) approved, to implement it, build it out and then sell the new dwellings.

1986 - Crest remove soil and prepare the site for redevelopment .

130. From autumn 1985 onwards, Crest/Chemfix's dealings with the site were based on seeking agreement from engineers advising (SADC) Environmental Health that the amount of soil Crest were prepared to remove was enough to make the site safe for future occupiers. The

[124] CD 1A p119
[125] CD 1A p121
[126] CD 1A p122
[127] CD 1A p122
[128] CD 1A p124
[129] CD 3.12

other contact with SADC was with the planning officers and committee, as Crest made an application for a total residential redevelopment of the site for 66 new housing units. This inevitably led to the concern being to prevent contamination getting back up to the surface of the site. The protection of the aquifer merited only passing references at most.

131. From June 1985, TWA really only had any input into seeking to ensure monitoring took place. Their only contact with Chemfix over this period was in relation to monitoring and analysis of samples; see, for example, their letter of 10 February 1986[130]. In any event, the lead on monitoring was being taken by SADC in their role of regulating wholesomeness of the water to the private supplies[131]. SADC did not get confirmation of funding for the monitoring until 17 April 1986[132].

132. In March 1986, Crest made a new planning application to amend slightly their December 1985 scheme; they sought permission for a mixture of 66 one bed flats and houses[133]. This was granted on 25 July 1986[134], one month after building regulations approval had been given[135].

133. Following the (March) submission of the revised planning application, Crest began to negotiate with SADC in order to get it passed and to receive building regulations approval for what was proposed. The contaminated soil on the site was relevant to both approvals. SADC appointed Butterworth Laboratories Limited to act for them in respect of the contamination on the site. From 12 June[136] to 15 October 1986[137], Butterworth liaised with Crest over soil removal. They also advised SADC that, following soil removal, there should be a barrier layer of pulverised fuel ash, or similar material, "*inserted after excavation prior to backfilling* ***to seal any residual contamination in the ground.*** *This could be beneficial in reducing the flow of water to the water beneath the site depending on the material used……..the break layer would* ***also prevent future workers readily penetrating any residual contamination****…."*[138]

134. Placement of a barrier layer became a condition of the building regulations approval[139]. The object of the excavation was to prevent future residents coming into contact with contaminated soil; Crest's (17 September 1986) letter which sought sign off stated:*"With the completion of the excavation of contaminated soil from the site, we seek your approval that this phase of redevelopment of* ***the site is satisfactory and safe for future workers and inhabitants."***[140]

135. This wording is echoed in the Butterworth (15 October 1986) sign off[141]. A dispute over the need for excavation in the eastern part of the site, where a lawn had been, was resolved

[130] CD 1A p129
[131] CD 1A p130, p134
[132] CD 1A p140
[133] CD 3.13
[134] CD 3.14
[135] CD 1A p144
[136] CD 1A p141
[137] CD 1A p176
[138] CD 1A p142
[139] CD 1A p144-145
[140] CD 1A p154
[141] CD 1A p176

partly in favour of Crest[142]. Ultimately, Crest were also permitted to use some of the material they had excavated, from the eastern part, to backfill in the centre of the site where some excavation deeper than a metre had taken place.

136. TWA were not involved with regulating or discussing the amount of soil to be removed. Indeed Butterworth and Crest were now working to a plan that was different to the one sent by Crest to RF (TWA) a year earlier. The plan that had been sent to TWA, in July 1985, was numbered STL2199/1[143]. The plan that Butterworth and Crest were working to was numbered MK 86/5/3[144]; only one corner of this plan is now available[145]. The picture is further clouded since the planning permission condition (9) refers to a different plan again, one numbered WT122 and dated February 1986[146].

137. JT (then a TWA employee) visited the site during the excavation. This was shortly before the meeting of 22 October 1986, although it may have been a month or so before that meeting, because Chemfix were suggesting[147] that the excavation was complete by 17 September 1986. When she visited, JT saw that *"Most of the excavation was shallow but at the time of my visit, in the areas of the two sumps, there was deeper excavation with exposed chalk and no evidence of substantial concrete, or similar, bases to the sumps."*[148] JT confirmed in evidence that this was her recollection. She also confirmed that she was not introduced to a chemist on the site.

The Amount of Soil removed

138. Contemporary documents circulated between Butterworth, SADC and Chemfix speak only of excavation to a metre as a consistent depth in certain areas of the site[149]. This is the depth specified by building regulations condition 1[150] (1A 145). Butterworth mention a metre again on 18 August[151].

139. It is correct that the documents (for example, last paragraph CD 1A p152) record deeper excavation "in the central part of the site" and this is consistent with JT's recollection. However there is no contemporary evidence, seen by any other party, that there was consistent excavation down to 1.5m. (The plan at CD 1A p155 does not go with the letter it follows and is dated March 1985; it is not clear where it fits in.)

140. Crest rely on a (November 1986) "Draft 1" of a Statement of Quality for the site[152]. This does not appear to have progressed beyond internal circulation and is incomplete; for example, the amount of soil removed is waiting to be inserted into the penultimate line on (CD 5.4) p388. There is evidence that excavation to a depth greater than one metre did occur in some spots. This is consistent with public documents at the time. There is no mention of large areas being excavated to 1.5m.

[142] CD 1A p152-153
[143] CD 1A p116
[144] CD 1A p152
[145] CD 1A p146
[146] CD 3.14 p75
[147] CD 1A p154
[148] EA4 para 58
[149] CD 1A p142-143
[150] CD 1A p145
[151] CD 1A p151
[152] CD 5.4 p386-391

141. This draft statement of quality also illustrates the thinking of Crest and Chemfix at the time. It makes clear that Chemfix were concentrating on "*elimination of direct contact*"; they were "*excluding the question of groundwater quality*" and recognising that contamination would persist in the underlying geology[153]. Groundwater was simply going to continue to be monitored[154].

The End of Regulation and Completion of the Development. Autumn 1986 – October 1987.

142. By 15 October 1986, Crest had completed their excavation on site[155]. They now had planning permission and building regulations approval for the 66 unit scheme. The only outstanding issue was the promise that had been made to monitor groundwater supplies. This had no statutory force and was not contained in any condition to a planning permission or building regulation approval.

143. Chemfix spoke to TWA again at a meeting on 22 October 1986. In the follow up letter[156] of 30 October, Chemfix record that the meeting had been to discuss the results of the last round of monitoring, in August 1986, and "*the site's rehabilitation*". The detailed records of the results discussed are not before the inquiry, but the bromide readings have been recorded by JT[157]. Chemfix again wanted a sign off. "*Our discussion on these results covered the possible scenarios of contaminated groundwater movement arising from the site and impact upon the existing water abstraction points. The need for a further investigatory borehole was discussed and we felt in the light of the current results, that this proposal should be held over until further results from the water quality monitoring programme is [sic] available. … You confirmed that the next round of sampling was scheduled for 19 November 1986*."

144. The letter goes on to record the soil removal that has taken place (again with no mention of the 1.5m depth of excavation) and it notes that the site is being backfilled with chalk. TWA are given a new layout plan, but no other details relating to the site. The letter ends: "*We are sure you will agree that the removal of a considerable volume of contaminated soil from the site and its revised layout and form of construction from its original state has provided a significant environmental improvement to a potential contamination situation. We would therefore be pleased to receive your views and endorsement of the remedial works undertaken and would be further grateful if you could respond either to Crest Homes Plc direct or to ourselves on this matter by 14th November 1986, with details of T.W.A.'s water quality standards you have established or are seeking to achieve*."

145. Chemfix also reported this meeting to their clients. In a letter[158] dated 4 November 1986, Chemfix explain that monitoring of the off-site boreholes should continue, but that Crest are not advised to agree to another borehole at this stage. This letter also provides further evidence for the fact that Crest knew they were leaving contamination in the ground. It states "*… if such excavation into contaminated soil underlying the site was planned or necessary*."

[153] CD 5.4 p390 section A
[154] CD 5.4 p390 section B
[155] CD 1A p176
[156] CD 1A p199
[157] CD 2A.21 entries for 19.8.86 on p315
[158] CD 1A p202-203

146. TWA (JT) did not reply to the 30 October letter in the terms Chemfix had hoped. This reply[159], dated 19 November 1986, is worth quoting at some length in order to show where things more or less ended up:

"After discussion with St Albans District Council, I confirm that the results of the first sampling round of the monitoring programme carried out in August give no immediate cause for concern with respect to the private wells. Contamination of the off-site monitoring borehole, however, remains at a high level.

The decision on whether water quality from the private wells is satisfactory as drinking water or not is the responsibility of SADC……..There is no statutory limit for inorganic bromide but any rise above background levels would be viewed with concern since it may well indicate that contamination from the site has migrated to the sampling point.

As expressed at our meeting and in previous correspondence I feel another monitoring hole further from the site would be of use since it would allow the extent of the groundwater pollution to be defined more precisely. Such a borehole, drilled outside the pollution plume would act as an early warning system and enable alternative supplies to any threatened wells to be provided. I understand you would prefer not to take up this suggestion for the time being but wait until further water quality results are available. If inorganic bromide continues to show an upward trend it is strongly recommended that a further hole should be drilled.

As an alternative [Woodcock Hill to be in monitoring programme]….

The site layout drawing WT 122/101/E shows that the total impermeable area is significantly greater than that in the original layout, particularly if the planters have impermeable bases. This represents a significant improvement in terms of a reduction of continued leaching of contaminants once the redevelopment of the site is completed.

In your letter you mention that significantly contaminated soil has been removed to a depth of 1 metre or more over a wide area of the site. This will of course reduce the pollution load, but it is difficult to judge how significant the removal undertaken is without some indication of the levels of contamination which still remain on the site. I do not know how the areas in which removal has taken place tie up with the areas of marked contamination identified in the site investigation. Remaining contaminated material may be further leached since some permeable areas of trees and grass are still shown on the revised plan.

….[services]….

As has been stated previously, once the hard surface of the old chemical site has been removed and the site disturbed, one of the best means of minimising groundwater pollution from the site is to redevelop as soon as possible with minimal disturbance of the ground which is to remain on site and to provide the maximum amount of impermeable cover. Therefore this authority has no objection to the development proceeding provided the

[159] CD 1A p206-207

current monitoring programme is continued for at least two years after the redevelopment has been completed.

Mr Moles of St Albans District Council will let you know the date of their three monthly sampling round which I believe is likely to be next week."

147. Although a further round of monitoring did take place in November, this letter from JT was never replied to by Crest or Chemfix. Nor, having initially put it off, did Crest co–operate in the next round of monitoring due for March 1987[160].

148. The figures available to TWA and SADC generally showed decreases in concentrations of contaminants at the monitored boreholes. This may have been due to a change in the laboratory employed to carry out the analysis. However, the picture was different in the results of sampling that was carried out by Vintec, but kept private to Crest. This showed an increasing trend in the concentration of contaminants from August to November 1986[161]. There was one more round of sampling carried out by SADC, in September 1987, but there are no details other than the bare analysis which TWA laboratories carried out for them[162].

149. From Autumn 1986, Crest no longer needed to obtain any consents, or to comply with any further conditions, in order to implement their planning permission and redevelop the site. On 29 October 1986, they effectively sold part of the value of the development, by entering into a joint venture agreement with Woolwich Homes Limited[163].

150. A witness (BM) for Crest agreed, under cross examination, that the Company was in total control of the site from September 1983 to 29 October 1986. He also accepted that, throughout that period, they were a regional housebuilder with the financial resources to carry out more remediation works if they had chosen to do so. (The witness was unable to confirm that they were a national housebuilder from 1983 to 1986).

151. Under the terms of a (19 June 1987) agreement[164], a management company (Beechgrove Sandridge Management) would take over the running of the site once the properties had been completed and sold. An aerial photograph taken on 11 October 1987[165], shows the scheme almost complete. The redevelopment of SLC was over.

<u>2000 onwards - The Discovery and monitoring of the pollution plume, the Determination of SLC as contaminated land and as a special site. Hatfield Pumping Trials, the issue of the Remediation notice and Appeals</u>

152. There is little dispute about the facts since 2000. TVW began monitoring boreholes for bromate in order to ensure they would meet the limits set by the Water Supply (Water Quality) Regulations 2000 (SI 2000: 3184). These provided that, from 25 December 2003, there should be no more that 10 ug/l bromate in drinking water[166].

[160] CD 1A p209
[161] C2 Appx 9 and CD2A p315
[162] CD 2A.21 p322
[163] CD 1A p177-198
[164] CD 1A p210-221
[165] CD 1A p222-223
[166] CD 13 para 35

153. Elevated levels of bromate were detected at Essendon in 1998 and then at Hatfield in 2000. Subsequent monitoring showed elevated levels of bromate and bromide both at SLC and in a plume down gradient. The levels at Hatfield led to the Bishops Rise public water supply borehole being taken out of supply on 31 May 2000[167] and restrictions placed on the use of the Essendon borehole[168]. The private boreholes at Nashes Farm, Caps Cottages and the Home Office establishment were taken out of use[169]. At the time this was because of the concentrations of bromate. JT gave evidence that, although Nashes Farm had at one time been supplied with bottled water, this was based on high levels of nitrates and was for the safety of babies only.

154. There was a further site investigation by Komex, the results of which became available in October 2000[170]. In June 2000, bromate was found in a private water supply, near Sandridge, at a level above the proposed standard. This indicated that the source of the bromate contamination was in the vicinity of Sandridge[171].

155. SLC was declared contaminated land, by SADC, on 20 June 2002[172]. The record of determination is provided[173]. After notification and consultation, SLC was designated a special site on 8 August 2002[174].

156. Detailed monitoring for bromate and bromide concentrations, in groundwater, has taken place. The average figures for the year commencing October 2005 are shown on maps to illustrate the concentrations and the plume[175].

157. Indicative estimates suggest that it would take 8-27 years for the dissolved contaminants to travel 400m from SLC, but that they would reach Bishops Rise (more than 5 km away) only 12-38 years after leaving the site[176].

158. TVW carried out scavenge pumping trials, using the Hatfield Bishops Rise borehole, from July 2005 until 20 January 2006[177] and from May 2006 to October 2006. Consent has now been obtained to continue this scavenge pumping until 2010[178].

159. Following two rounds of detailed consultation, the EA issued a remediation notice on 8 November 2005. Appeals from Crest and Redland were received on 28 November and 1 December 2005 respectively.

160. Those appeals were based on the notice as issued. In the light of the Inspector's observations at the pre-inquiry meeting, and bearing in mind the evidence which emerged in the lead up to and during the inquiry, consideration has been given to possible revisions to that notice.

[167] TVW47 para 6.2
[168] TVW47 para 6.5
[169] CD 13 para 52
[170] CD 2A.22
[171] CD 1A p273 section 2
[172] CD 1A p280
[173] CD 1A p273-276
[174] CD 1A p283-284, 287
[175] EA2 Appx2 Figs D1-D3 and E1-E3
[176] EA4 p11-12
[177] TVW43 para 9.6
[178] TVW43 paras 9.14-9.19

THE REMEDIATION NOTICE.

Formalities

161. The notice was served on Redland and Crest, as appropriate persons, on 11 November 2005. It was also served on those required by the 2000 Regulations (Regulation 5(1)(a)). Generally these parties are those who had already been consulted or those who are likely to be required to grant access to allow monitoring water samples to be taken.

162. These parties were served not "at the same time", as required by the 2000 Regulations, but 17 days later, on 28 November[179]. However no conceivable prejudice can arise from this delay. Those on the list had been consulted previously, about the draft remediation notice, and have subsequently been notified of the appeals. No party to the appeals complains about this service and the SoS is entitled to conclude that the notice was properly served and that the relevant formalities were complied with by the EA.

163. Crest and Redland have been able to confirm that they served all relevant parties with their notice of appeal in accordance with Regulation 9(2).

164. Although sharing a surname with a chemist, who is named in various scientific reports that have been submitted to the inquiry, the Inspector has confirmed that he has no links with any person featuring in the evidence.

The Designation of SLC as Contaminated Land

165. All parties accept that SLC is properly designated contaminated land. The test which applies in this case is that of pollution of controlled waters. This is set out in EPA S.78A(2)(b) which, following S.78A(5) and the last words of S.78A(2), is to be applied in the light of the Circular's statutory guidance at paragraphs A35 – A39.

166. Paragraph A 39 reads: " *Before determining that pollution of controlled waters is being, or is likely to be, caused the [decision maker] should be satisfied that a substance is continuing to enter controlled waters or is likely to enter controlled waters. For this purpose, the local authority should regard something as being "likely" when they judge it more likely than not to occur*."

167. Paragraph A 38 reads: "*Substances should be regarded as having entered controlled waters where: (a) they are dissolved or suspended in those waters….*"

168. The test remains simply whether controlled waters are being polluted. There is no requirement that there should be any consideration of whether the pollution is causing significant harm.

169. "Controlled Waters" includes "groundwaters", which are any waters contained in underground strata.

170. The EA's undisputed evidence, consistent with the conceptual model promoted by Crest, is that the bromide and bromate in strata above the groundwater, whether putty chalk or above, is migrating into the groundwater.

[179] CD 7.4

171. The record of determination by SADC[180] notes that both bromate and bromide have "been found within the land above the water table at St Leonard's Court. It [bromide/bromate] has been shown to be soluble in water and therefore to have the potential to be leached into the groundwater." This was based on the findings of the Komex report[181] and the Atkins report[182] as interpreted for SADC by the EA in their (24 May 2002) advice to SADC[183].

172. These documents make it clear that bromide and bromate have been found above background levels in the strata above the groundwaters at SLC and that these contaminants will migrate down into the groundwaters. Entry of any substance into groundwaters, at concentrations above background levels, is pollution. Indeed the Circular points out that even very small amounts of contaminant may mean that the land should be designated as contaminated; the issue of seriousness is addressed, not at this stage, but at the stage of deciding what, if any, remediation action is necessary[184].

173. The background level for bromate is zero, since it does not occur naturally in soil. Komex detected levels, in the soil at SLC, of up to 273 mg/kg; at other parts of the site, levels of up to 62 and 25.4 mg/kg were found[185].

174. Bromide is normally present in soil at concentrations below 5 mg/kg[186]. In the soil at SLC, bromide concentrations of up to 129 mg/kg were found to be present; readings of 70.4 mg/kg and 40.5 mg/kg were also detected[187]. These were found in the same boreholes as the highest bromate concentrations found.

175. Both bromide and bromate are present in the SLC soil at levels many times higher than background. They are both soluble and it is clear that any which is still under the surface of SLC, but above the water table, will eventually enter the groundwater and lead to continuing levels which are way above normal. Bromate and bromide are therefore both entering controlled waters as "polluting matter" and the definition of pollution of controlled waters in S.78A(9) is satisfied.

Jersey Farm

176. At one time Jersey Farm was put forward as an alternative source of the bromide contamination. However the EA have shown that there is no bromide contamination coming from the Jersey Farm landfill and that any bromide pollution detected in the lagoon here had, as in 1978, originated at SLC and reached the lagoon through surface water drains. The existence of Jersey Farm lagoon does not cast any doubt on the determination of SLC as contaminated land by reason of the presence of bromide[188].

[180] CD 1A.132
[181] CD 2A.22
[182] CD 2A.24
[183] CD 2A.23
[184] CD 9.5 paras 2.9, 6.30 & 6.31
[185] CD 2A.23 p360
[186] CD 2A p335
[187] CD 2A p363
[188] CD 8 section 6.1

177. This, no doubt, is why there is no dispute that SLC was properly designated contaminated land by SADC and remains properly designated in respect of both bromate and bromide today.

The Designation of SLC as a Special Site

178. S.78C(8) gives the power to prescribe land which is to be a special site for the purposes of the (2000 & 2006) Regulations. SLC was designated a special site under the 2000 Regulations, but the test is the same under the 2006 Regulations. That is, in terms of Regulation 2(1)(a), any land affecting controlled waters in the circumstances specified in Regulation 3. Regulation 3 applies to land where " *(a) controlled waters which are, or are intended to be, used for the supply of drinking water for human consumption are being affected by the land and as a result, require a treatment process or a change in such process to be applied to those waters before use so as to be regarded as wholesome within the meaning of part 3 of the Water Industry Act 1991 (water supply)*."

179. In respect of bromate, there is no dispute that the drinking water in the aquifer is being affected so as to require it to be treated before it can be "wholesome". Indeed at Bishops Rise, the contamination is such that the source has simply had to be taken out of supply. SLC was designated a Special Site by virtue of the bromate contamination[189].

180. In deciding to issue a remediation notice, and pending advice from the water industry on the effects of water treatment, the EA adopted a criterion for pollution by bromide of 3000 ug/l[190]. This was based on advice concerning the toxicology of bromide in drinking water[191]. By the time of the inquiry, the industry had advised the EA that it was unable to develop or provide a generic statement on tolerable levels of bromide in raw water; it did however note that, whilst measured concentrations were generally below 500 ug/l, there had been an incident where water containing about 700 ug/l bromide had been found and that treatment of this had resulted in exceedance of the 100 ug/l THM standard for drinking water[192]. Given their duty[193] to protect water resources, and the need for a precautionary approach, the EA decided to adopt a (revised) criterion of 500 ug/l[194].

181. The average bromide concentration at Nashes Farm, in the year beginning October 2005, was 3128.3 ug/l[195]. A Crest witness (BM) accepted in cross examination by the EA that since the borehole at Nashes Farm was intended for private potable supply and would be used as such by adults and children older than babies, and that it had bromide concentrations in excess of 3000 ug/l, then this too would be a reason for designating SLC a special site in relation to bromide alone. That witness did not accept 500 ug/l bromide as a level at which it would be necessary to treat water or alter the treatment process before it could be drunk. However if this (500 ug/l) limit were to be accepted, then it is even clearer that SLC could be a special site on the basis of bromide as well as bromate.

[189] CD 1A p283
[190] CD 8 para 265
[191] CD 1A p243-245
[192] EA2 Appx 6
[193] S.6(2) Environment Act 1995
[194] EA2 Appx 6
[195] EA2 Appx 2 Fig E2

182. The EA have accepted and continue to accept responsibility for SLC as a special site; they have not terminated the designation under S.78Q(4).

183. This, therefore, is the evidential basis for the agreement amongst all parties at the inquiry that SLC is properly designated a special site for the purposes of the Act, the 2000/2006 Regulations and the Circular.

WHO ARE THE APPROPRIATE PERSONS FOR THE BROMATE AND BROMIDE SIGNIFICANT POLLUTANT LINKAGES (SPLs) AND WHY?

184. EPA S.78F(2) states: "(2) Subject to the following provisions of this section, any person, or any persons, who **caused or knowingly permitted the substances** or any of the substances, by reason of which the contaminated land in question is such land **to be in, on or under that land** is an appropriate person."

185. This is not a subsection of the EPA (unlike subsections (6) and (7)) where the SoS is given the power to issue statutory guidance. The Circular does comment on the meaning of "causing or knowing permitting" in paragraphs 9.8 to 9.15 and the EA have considered these definitions as well as case law.

Bromate

Redland

186. There is no dispute that Redland stand in the shoes of Steetley having absorbed them and taken on their assets and liabilities[196].

187. From 1955 to about 1980, bromate was one of the products Redland manufactured at SLC. During this period it is clear that bromate was spilt onto the land surface during manufacture and drained into the sumps where, on occasion, it would drain away over a weekend.

188. Paragraph 9.9 of the Circular states that "*In the Government's view, the test of "causing" will require that the person concerned was involved in some active operation, or series of operations, to which the presence of the pollutant is attributable*."

189. This definition seems uncontroversial and there is little dispute that Redland "caused" bromate to be in and under SLC by their manufacturing activities.

Crest

190. The EA do not accept that Crest knew or should have known about bromate. Nor do they consider that, by demolishing the old factory and leaving the site open to infiltration, Crest "caused" bromate to be in or under SLC. All parties are agreed that this course of action had the potential to cause increased flushing of the pollutants deeper into the ground, or into the groundwater, but the effect of this is difficult to quantify[197]. Certainly, this may have made the presence of the bromate more harmful to the groundwater and it may have rendered the 1986 excavation and soil removal less effective but, given that the bromate was already there, this cannot amount to causing it to be in or under the land.

[196] CD 8 para 62
[197] CD 13 para 42(b)

191. Therefore the EA consider Redland to be the only appropriate person for the bromate SPL.

Bromide

Redland

192. For the same reasons as for bromate, Redland "caused" bromide to be in and under SLC through the manufacturing processes that took place between 1955 and about 1980.

Crest

193. Crest did nothing to bring the bromide onto the land nor did they "cause" it to be there in any other way. The EA's case is that Crest "knowingly permitted" bromide to stay in and under the land at SLC during the period over which they had total control of the site from 22 September 1983 to 29 October 1986. (When the EA issued their decision document, Woolwich were also identified as an appropriate person for the purposes of the bromide pollutant linkage, but were excluded from liability because of their limited responsibility[198].)

"Knowingly"

194. During their occupation of SLC, Crest were fully aware of the presence of bromide and that it was a contaminant. They knew what concentrations it was causing in the groundwater and they specifically modelled its behaviour and were prepared to have an off-site borehole dug to help determine how it was migrating off-site.

"Permitting"

195. There is no statutory guidance on the meaning of permitting in "knowingly permitting". The Circular seeks to give guidance by setting out what was said for the government as the legislation passed through parliament. One quotation is that: "The test of "knowingly permitting" would require both the knowledge that the substances in question were in, on or under the land and **the possession of the power to prevent such a substance being there**."

196. Paragraph 9.12, of the Circular, states that "*It is also relevant to consider the stage at which a person who is informed of the presence of a pollutant might be considered to have knowingly permitted that presence, where he had not done so previously.* ***In the government's view the test would only be met where the person had the ability to take steps to prevent or remove that presence and had a reasonable opportunity to do so***."

197. Paragraph 9.15 indicates that guidance can legitimately be taken from case law, under other legislation, where the same or similar terms are used. As set out in the decision document[199], the EA do consider that it is relevant to consider whether reasonable steps were open to Crest and whether they failed to take them.

Three preliminary points

198. Crest have consistently argued that the "knowingly permitting" test should be applied by judging things "as they were at the time". The EA do not necessarily agree this is the right approach. The contaminated land regime, by definition, will encompass cases where it acts

[198] CD 8 para 219
[199] CD 8 para 42

retrospectively. Further, where the statutory guidance gives any indication it does so in the section dealing with "sold with information" but in clearly wide terms. As paragraph D59(b) points out, "*the question of whether persons are members of a liability group should be decided on the circumstances as they exist at the time of the determination (and not as they might have been at the time of the sale of the land)*".

199. The EA submit that it is clear that Crest knowingly permitted bromide, even when judged by the standards of 1983 – 1986. If it comes into the balance, however, the EA do not accept that Crest can simply say we did what we were required to do at the time and that is the end of it. The test must also be "objective" (i.e. what would a reasonable person have done?) rather than "subjective" (i.e. did Crest think what they were doing was reasonable?).

200. Secondly, the test is simply whether Crest had a reasonable opportunity to remove the bromide from in or under SLC. It is not whether they were under a duty to remediate the aquifer, or to protect drinking supplies, or any other test which in reality they now put forward in the hope that they can show it does not catch them. Although not directly applicable, since it comes in at a later stage, the Circular's paragraph D78 indicates that someone could "knowingly permit" not simply because they did not take reasonable steps to remove the pollutant, but also in circumstances where they did not "*reduce the seriousness of the implications of [the presence of the pollutant]*".

201. Finally, as a preliminary point, Crest have clearly chosen not to disclose all the information available to them. They appear to have taken the view that they will deal in evidence with the case put forward by the other parties and produce documents which support their case. This has happened on a number of occasions with documents that Crest consider confirm their case coming forward at the time of the proofs, in rebuttal proofs and even in re-examination of one of their witnesses (BM). Crest may consider themselves entitled to take this line. There has been no witness summons served, requiring the production of documents, and their witnesses' proofs did not contain a declaration that as experts they believed all relevant material was before the inquiry. Further, the EA's cross examination of another Crest witness (RC) revealed that there is a Director, Mr Calcutt, who is still with Crest and who has played a part in the preparation for this inquiry and was involved with the purchase and redevelopment of SLC, but who has not given evidence.

202. Crest's case should now be assessed in the light of this stance. Any gaps in the documentation should not justify an inference in Crest's favour. Nor can it be assumed that, just because there is no direct evidence before the inquiry, Crest had not seen any particular document at any particular time. It will not lie in Crest's mouth to say "there is no direct evidence that we saw that document, therefore you must find that we did not".

203. It also reflects on the weight to be given to JT's evidence, given on behalf of the EA. She made a statement and has been cross examined. She gave evidence both as to her memory of how things were at the time and also as to how documents should now be interpreted from her knowledge of events at that time. There was no serious challenge to her evidence in cross examination by Crest. Again, it would now be improper to suggest she should be disbelieved or even (since this was not suggested in cross examination) that her memory and the general impression she gives of the period is at fault.

The Evidence

204. It is important to remember the basics. For over 3 years, from September 1983 to October 1986, Crest were the sole owners of SLC. They had the resources and the ability to carry out remediation action on the site if they wanted to do so.

205. Crest legitimately sought to implement the strategy that allowed them to develop the site for the least cost. However they knew that, in order to obtain planning permission and building regulations approval, they need only ensure that a barrier would be kept between new residents and the contaminated soil. They knew TWA had no direct control over the site. In addition they consciously "sealed" remaining contamination into the site.

206. TWA were not consulted about soil removal in the relevant period before it took place. In August 1984, they stated that the amount of soil to be removed would have to be determined after further investigation, but that excavation would have to be deeper than Crest were then proposing, if the site was to be remediated. Again, on 4 November 1984, TWA advised that research so far was inadequate to define the extent of a soil removal operation and that excavation virtually down to the chalk would be necessary. Further, on 21 June 1985, TWA noted that a scheme for excavation had been drawn up, but that RF did not know the details. Chemfix then sent him a plan, on 26 July 1985, but it was not the plan that was finally used or discussed with Butterworth a year later. TWA were not asked about soil removal again. The soil was removed with a different plan.

207. When TWA were given a chance to comment on the soil removal, they indicated that they could not judge the significance "without some indication of the levels of contamination which still remain on the site". Crest did not want to be involved in any further process to determine the significance of what remained and did not continue the monitoring; nor did they disclose the results of their own Vintec analysis.

208. Crest's current argument is that it is not possible to say how much contamination was left in the ground, therefore it is unreasonable to suggest more should have been removed. This argument can be rejected without the need for detailed analysis of the "Roberts Calculation", although that calculation does provide a broad indication of the amount of bromide left at the site by Crest. With the data from 2005 and 2006, it is clear that bromide remaining in and under SLC is giving elevated readings, orders of magnitude above background levels, which would still justify the designation of SLC as contaminated land and (even if the 3,000 ug/l bromide level is taken) as a special site.

209. Further, Crest's case on this point rests heavily on historic borehole data[200] for SLC and on seeking to show that, if the top layer were to be removed, no significant amounts of bromide would be found until the putty chalk. This is said to be demonstrated by depth profiles, obtained in March 1984[201], but this ignores the fact that the site had been left open to leaching by the time soil was removed in August 1986. Whilst there is much gravel in the subsoil, there is also much clay or material closer to clay than gravel. Further, the sumps had been able to operate as unprotected soakaways; their linings may well have been imperfect before and would not have been improved by the demolition works. There is no evidence that removing the top metre, in 1986, would have left so little bromide under SLC

[200] CD 13 Appx 5
[201] C2 Appx 15 Fig 4

that it would be unreasonable to contemplate removing more. That is even assuming that the metre removed was a metre into the site, prior to demolition, rather than including a layer of rubble. On the evidence, it is more likely that the metre included a layer of demolition debris.

210. There is evidence to suggest that excavation, to more than a metre depth, took place in key areas, which probably included ground beneath the sumps. It should not be forgotten, however, that bromide would not simply leave the sumps in a straight vertical line. In any event, there is no contemporary evidence of a methodical survey to identify areas where deeper excavation was needed or any evidence of 1.5m being removed over a wide area. Any claim that Crest treated the site with care and closely supervised operations should be treated with caution; they did not even install the impermeable layer that was required as a condition of building regulations approval.

Conclusions on removal of more soil

211. Crest removed only as much soil as they needed to, in order to gain planning permission. They could have removed more and probably would have removed more if they had been required to do so by an authority with the ability to withhold planning permission or building regulations approval. Applying the test of whether, between 1983 and 1986, Crest had "reasonable opportunity" to remove or reduce the presence of bromide beneath SLC, the answer must be "yes we did, but we managed to negotiate a position where we did not have to take that opportunity". That is not a reason to find that Crest did not "knowingly permit" bromide to be, and remain, in and under the land.

Scavenge Pumping

212. The pattern of how Crest and Chemfix dealt with scavenge pumping is similar to the issue of soil removal. Initially, they were prepared to consider it. They raised no fundamental objections. It is also clear that they were prepared to cooperate with one (and they said two) off-site boreholes for monitoring purposes.

213. Scavenge pumping was raised by TWA in their first substantive letter to Crest/Chemfix in August 1984. By 4 November, of that year, TWA had provided the name of who to contact in relation to sewerage charges; initially, Crest took this up. They also cooperated with the off-site borehole. However, by 14 June 1985, they were raising problems. This might have been because they then realised that the scale of the contamination meant that scavenge pumping would not be cheap, or it might have been for some other reason; in any event, it appears they argued against it at the meeting with RF on 14 June. RF's subsequent (21 June) letter recognised the potential for difficulties that might need to be overcome, but indicated that TWA would still (ideally) like scavenge pumping to go ahead. The difficulties noted were in fact only financial rather than difficulties in practice or in principle.

214. Scavenge pumping was not pursued again. JT gave unchallenged evidence that TWA were reluctant to drop it, but felt they had little power to enforce it. They were only a consultee on the planning applications and, even if powers under the Control of Pollution Act 1974 (COPA) were available in theory, they were not seen to work in practice. In this respect, it is important to note that Crest have not suggested to JT that TWA should have considered COPA powers.

215. Scavenge pumping may well have come back into the equation, had TWA and SADC known the figures revealed by the Vintec testing. Also, it might have been pursued if monitoring of the off-site borehole had continued, but Crest took no involvement in that after November 1986, by which time the deal with Woolwich had been done.

216. There is no evidence that scavenge pumping was not seen as a realistic option in the 1980's. Chemfix did not rule it out in principle and were prepared to go along with it for a while. Finlinsons' consultants also regarded it as a perfectly sensible suggestion and a liability that a purchaser would have to take on. There is no evidence that this consultants' report was anything other than confidential advice to the client and hence points were not being made simply to get the price down.

Conclusions on Scavenge Pumping

217. Ultimately the same analysis can be properly applied to scavenge pumping as to the removal of more soil. Crest had the chance to carry it out. It was a reasonable option, but they avoided the expense involved. Crest have made much of the difficulties raised in RF's letter of 21 June 1985, but there was not even an enquiry into whether they could be overcome.

Conclusions on Knowingly Permitting

218. Even judged on Crest's own terms, in the light of what was happening in the 1980s, Crest had a reasonable opportunity to remove or lessen the presence of bromide and they did not. They should be found to have knowingly permitted bromide to be in or under SLC and to be in the liability group for bromide.

Can Redland Remove themselves from the Bromide Liability Group by demonstrating that the "Sold with Information Test" Applies?

219. The "Sold with Information test" is covered by Statutory Guidance. The most relevant parts of paragraphs D57 and D58 are: (D57) "*The purpose of this test is to exclude from liability those who, although they have caused or knowingly permitted the presence of a significant pollutant….have disposed of that land* ***in circumstances where it is reasonable that another member of the liability group, who has acquired the land from them should bear the liability for remediation of the land***." (D58) [tests about open market etc] "*c) before the sale became binding, the buyer had* ***information that would reasonably allow that particular person to be aware of the presence on the land of the pollutant identified in the significant pollutant linkage in question, and the broad measure of that presence; and the seller did nothing material to represent the implications of that presence***,"

220. Again, this is an issue where it would be wrong to be easily persuaded that Crest had no knowledge of a document or other information, given the way they have chosen to present their case and handle the documentation.

221. Firstly, there has been no suggestion that Redland misrepresented the implications of bromide. Redland gave Crest access to the site, to carry out their own investigations before contracts were exchanged. Further, Redland made no secret of the history of the site.

222. Crest's witnesses have limited their consideration of this issue to suggesting[202] that Crest had few documents. In fact they had much more information than that.

223. The EA submit that, before 1 September 1983, when Crest say the sale became binding, Crest :

a) knew of the history of the site from letters and the planning brief;
b) knew that the site was contaminated but were prepared to continue with the sale without knowing what the final requirements for remediation would be;
c) knew that leaching would be an issue with bromide; and
d) had the report from STATS which indicated contamination, including bromide. This test also gave information which would "reasonably allow" Crest to know that bromide levels were high and a potential cause for concern. The STATS report noted that soluble bromide was high in 2 of the 5 boreholes. Although after exchange, the second STATS report was carried out with no further sampling. It noted that the bromide levels in the first report had been a potential cause for concern.

224. The test in Circular paragraph D58(c) relates to the broad measure of the presence. It is clear Crest knew before purchase of the levels of bromide on the site. STATS knew these were elevated levels above background[203].

225. Any more information would have gone beyond merely the "broad measure" of the presence.

226. In any event, paragraph D59 indicates that the test is to be applied at the time of "determination". Presumably this is either the date the land was first determined to be contaminated (June 2002), or the date of the issue of the Remediation Notice (November 2005), or the date the SoS determines the appeal. On each of these dates it was clear that levels of bromide at SLC were above 3000 ug/l. Even Crest's own witness (BM) accepts that, if this test is applied, then Redland would properly be said to have sold with information and be excluded from the group.

227. The EA's case is that Crest clearly knew enough about bromide, even before purchase, for the test to be met.

Reduction of Bromate to Bromide

228. Crest initially suggested that some account should be taken of the possibility that some of the bromide, for which they would be responsible, was formed from bromate. However Crest's witness (BM) has now accepted the EA's view that this is essentially irrelevant here, given the circumstances in which such reduction would take place.

The Environment Agency cannot say precisely how much bromide was already in the groundwater, under SLC, before Crest purchased.

229. This is true, but of no importance at this stage. Sections 78F(3) and (10) make clear that such fine distinctions are not relevant to determining who the appropriate persons should be. If remediation is to be (to any extent) attributable to an AP causing or knowingly

[202] C1 para 3.3.1
[203] CD 2A.6 para 7.9

permitting an amount of the pollutant on the site, then they are properly designated an AP. Section 78F(10)(a) may be saying the same thing, but this is not clear.

230. Indeed the issue of "Redland bromide" and "Crest bromide" would only become relevant at all if Crest and Redland were both to be liable for the bromate or bromide SPLs . In this situation, it could be argued that the length of time, that each was on the site, might be relevant to determining how much of the cost of any particular remedial action should be borne by each party. Equally, given the Circular's advice in D78, it could be said that the actions of each, such as allowing leaching, should be taken into account.

COSTS ASSOCIATED WITH THE APPEALED REMEDIATION NOTICE

231. The EA's decision document indicates that the cost of desk studies to estimate the load of bromate remaining beneath SLC and its rate of flux away from the site is approaching £10,000. A review of the scope for modelling the plume is expected to cost a similar amount. Groundwater monitoring costs of some £29,000 bring the total to just short of £50,000.[204]

THE REMEDIATION PACKAGE NOW PROPOSED

232. Given the Circular's (Chapter C) guidance on remediation requirements and following the hearing of evidence and cross examination at the inquiry and meetings between the experts representing each party, Schedule 2 of the notice served in November 2005 has been extensively redrafted[205]. It is in two versions. The difference between them is largely whether or not the APs should be required to move straight to scavenge pumping; Version B indicates that they should. However, at the end of the inquiry, even Version A anticipates that some form of intermediate treatment action could be required within 12 months, or thereabouts; this is the subject of Action F2.

In relation to the currently proposed Schedule 2.

Version A

233. Actions D1, D2 and H are "single linkage actions" (see guidance D21). D1 and H relate only to the bromate SPL, whereas D2 relates only to bromide. D1 requires consideration of plant which would reduce bromate to bromide, and of arrangements for disposing of the treated effluent; D2 is concerned only with the cost of disposal arrangements for bromide contaminated water, excluding that proportion of bromide that has been formed by reduction of the bromate. H is monitoring at locations where bromate is the only real concern; for instance the Northern New River (NNR) wells and locations which are closer to SLC, but where bromide concentrations are low, and which, therefore, would not themselves justify monitoring.

234. Actions A, B, D, D3 and G – Relate to both the bromate and bromide pollution linkages. They are "shared actions" (see guidance D21). It is also considered that they are "common" actions as defined by D22(a).

235. This is because, for A, the assessment would have to have been made for bromate if it was considered separately and equally for bromide. This reasoning applies to action B (further

[204] CD 8 para 204
[205] CD 7A

assessment), action D (even if one were assessing bromate or bromide alone, one would still carry out this exercise since it may be necessary to consider the same potential locations for bromide scavenging as for bromate, even if ultimately they were rejected), action D3 (follows from D and the trial pumping would need to produce information for both bromide and bromate) and action G (the locations in this table have been chosen because monitoring at these boreholes would be necessary for both bromide and bromate even if done alone).

236. The cost of shared common actions are to be split equally between the liability group for bromide and the liability group for bromate (guidance D99(b)).

237. Action E is not pollutant specific, but allows APs to assess other remediation methods.

238. Action C is a "shared collective action". Action C is concerned with reviewing the scope for modelling the bromide and the bromate plumes. This action comes within D22(b)(ii), since the action would not be needed to the same extent for the bromide plume as for the larger bromate plume. However it may also be more economical to model both together, where the data and plume projection coincides, rather than running or reviewing two models separately form scratch. Therefore C is also a collective action under D22(b)(iii).

239. The cost of this shared collective action has been broadly apportioned using the hypothetical estimates approach set out in paragraph D100(a) and (b) of the guidance. It is believed that the cost should be split 2:1 because the bromate plume is about twice the size of the bromide plume.

240. Action F1. This is a shared collective action because, if taken individually, the actions to be assessed for cost benefit for bromate and bromide would be different. Hence this comes under D22(ii) but also (iii), since doing the two together may well be more economical. It is only a broad hypothetical estimate, but the EA believe that the cost of considering the techniques for bromide and bromate is likely to be about the same.

241. Action F2. This is not an easy action to characterise, because it is not yet possible to tell what it will involve. It is likely that the action will not be the same for both bromate and bromide, or certainly not to the same extent. Therefore it is a shared collective action under D22(b)(i) and (ii). There may not be economies in performing the intermediate remedial treatment action together, so D22(b)(iii) may not apply.

242. In the circumstances of simply not being able to calculate the costs, or to gain the information to calculate the costs, the EA has applied the guidance in D76. Although this does not strictly apply, in place of the guidance in paragraph D100, it is felt to be appropriate in this case and hence the costs are split equally.

Version B

243. The general analysis is the same for Version B of the notices. However, Action F2 is not present and Action I is referable to bromate only.

Consultation with those who may have to grant rights for scavenge pumping.

244. In Version A, Action D3 anticipates that, after desktop analysis in action D, there would be a 3 day pumping trial at any of the boreholes identified as suitable for scavenge pumping by Action D. However the owners of these boreholes have been notified and consulted only in relation to monitoring.

245. Such notification and consultation is a statutory requirement. The answer is probably to add "At any existing abstraction borehole *where the owner consents….."* This means that the owner is not being "required" to grant rights and the need to consult under S.78G(3) would not be triggered.

THE NOTICE THE AGENCY SAY SHOULD BE UPHELD

246. In response to a request from the Inspector, the EA have prepared a series of nine remediation notices, to reflect the various possible permutations of responsibility[206]. The EA submit the notice that should be upheld is version 3 - i.e. Redland liable for bromate and Crest liable for bromide.

247. The EA's case for rejecting the alternatives is as follows:

Version 1: this ignores what the EA consider to be the correct case, that Crest knowingly permitted bromide.

Version 2: this would hold Crest liable for bromate when this was not known to be present. It also involves Redland succeeding on "sold with information" for bromate which the EA do not consider is supported by the evidence.

Version 3: the EA supports this version.

Version 4: This would involve the inherently unlikely finding that Redland succeeded with the sold with information test for bromate, but not for bromide. This would be a surprising finding on the evidence.

Version 5: The EA consider Redland should succeed in sold with information and that Crest should not be held to have knowingly permitted bromate. This means that upholding version 5 would involve rejecting 2 of the EA's key arguments.

Version 6: This is the closest to version 3, but the EA do not consider that Redland should fail on the sold with information test for bromide.

Version 7: This involves the unlikely finding of Redland succeeding on sold with information for bromate, but not bromide.

Version 8 – The EA do not see how, on the evidence, Crest could be held to have knowingly permitted bromate, but not bromide

Version 9 – This is not far from version 3, but involves the finding that Crest knowingly permitted bromate, which the EA do not accept.

248. The EA Support Notice 3, but there remains the question of whether it should be version A or version B. The essential difference between notice 3A and 3B is the inclusion of the intermediate remedial treatment action of scavenge pumping. The EA have changed their position on this issue. Whilst the EA do consider that the provision of scavenge pumping

[206] CD 7A

came onto the table at a very late stage, this has to be balanced against a number of factors. These are:

a) It is better to do something, rather than nothing;

b) The clear opportunity that the inquiry itself has provided for Crest and Redland to express their opposition to scavenge pumping and to test the evidence brought forward in support of it. This is their notification and right to be heard under Regulation 11;

c) The fact that neither the experts for Crest nor Redland have suggested that they need more time to understand the evidence being put forward by TVW or TW; and

d) The fact that it must be inherent in Regulation 11 that the SoS may vary a notice in a way which the enforcing authority has not wholly anticipated or consulted upon.

249. The EA consider that, in the light of those factors, it would be open to the SoS (after having notified those who are not at this inquiry, but who need to be notified under Regulation 11(a)) to uphold Notice 3 version B. If he did so, this would be a better notice than Notice 3 version A.

250. A copy of Notice 3 version B, with all amendments including those accepted by the EA at the notices' session, is provided[207]. This provides for interim scavenge pumping to be carried out at Bishops Rise for 10 years, or less if an equally effective technique is developed or if it can be demonstrated that pumping is not needed to keep bromate and bromide levels below 5 ug/l and 500 ug/l, respectively, at downstream abstractions.

Overall Conclusion

251. For the reasons set out above, the Inspector is asked to recommend that the SoS uphold the remediation notice, in the EA's preferred form.

The Case for Three Valleys Water

The material points are as follows.

252. Three Valleys Water PLC (TVW) are a statutory water undertaker. They have a duty, pursuant to S.37(1)(a) of the Water Industry Act 1991[208], "*to develop and maintain an efficient and economical system of water supply within its area and to ensure that all such arrangements have been made for providing supplies of water to premises in that area and for making such supplies available to persons who demand them....*". They are also legally obliged (S.52, S.68 & S.70) to provide a continuous supply of wholesome water, sufficient for domestic purpose, to their customers and to promote conservation.

253. As things stand, TVW serve a population of more than 3 million. Pressures on water supply are high and the construction of up to half a million new homes is predicted over the next 30 years. Approximately 60% of TVW's supplies come from groundwater[209].

254. TVW have found themselves obliged to participate in this public inquiry in circumstances where their ability to perform their statutory duty has already been extensively

[207] CD 7.1b(12)
[208] CD 9.10
[209] TVW48

compromised by the action and inaction of others. The impacts upon their interests and those of TW and (in consequence) upon millions of members of the public are matters to which the Inspector and SoS should attach significant weight in their deliberations.

255. The provisions of Part IIA of the EPA concerning contaminated land were brought into force on 1 April 2000, after a lengthy period of statutory gestation: see the Environment Act 1995 (Commencement No.16 and Saving Provision)(England) Order 2000.

256. By coincidence, one month later in May 2000, TVW had an unwelcome surprise at their Bishops Rise, Hatfield PWS, where significantly elevated concentrations of bromate were discovered in a routine analysis[210]. No method of treatment was known and subsequent research has shown that, whilst some forms of Granular Activated Carbon (GAC) will remove low concentrations, there is no practical way of treating the high concentrations found at Bishops Rise so that this resource can be returned to public supply[211].

257. Bromate concentrations at Essendon were an order of magnitude lower. Initially, this meant that water from this source could be fully used after blending with other supplies, before treatment. However, average concentrations in the raw water increased from about 10 ug/l to 40 ug/l during the period 2000-2005[212]. As a result, a GAC treatment stage had to be added, but this is unsustainable because of the high operational costs involved[213].

258. Contamination of the Bishops Rise and Essendon sources eliminated supplies equivalent to the demands of some 72,000 people[214]. Temporary licence variations have allowed TVW to make up some of the shortfall, from the loss of Bishops Rise, but these expire at the end of 2008[215]. Development of a new borehole is proceeding in the one uncontaminated location that is available, but the licence only allows for 6.5 Megalitres/day (Ml/day) to be abstracted[216]. Scavenge pumping from Bishops Rise now allows water from the Essendon source to be used, albeit after treatment and blending. However, this is not a sustainable long term solution; up to 9 Ml/day is pumped to the surface, dosed with ferrous salts to reduce the bromate and then passed through a purpose built sewer for further treatment at WWTWs operated by TW, before discharge to river.

259. So far, the contamination has cost TVW more than £13 million, excluding management costs. After discounting the cost of various monitoring and investigation programmes, OFWAT has allowed about £9 million of this to be passed through to TVW's customers[217]; this has added approximately £10 to every customer's bill[218].

260. Now, 7 years after the discovery of bromate at Bishops Rise and the subsequent finding of an extensive bromate/bromide pollutant plume across Hertfordshire, the identity of those with statutory responsibility for remediating the pollution has yet to be confirmed and the two candidate parties (Redland and Crest) have yet to spend a single penny in the cause of undertaking the required remediation, even on a without prejudice basis.

[210] CD 13 Appx 2
[211] TVW43
[212] TVW26
[213] TVW43 para 7.5
[214] TVW47 para 3.11
[215] TVW43 para 7.2
[216] TVW47 para 7.3.4
[217] TVW47 section 8
[218] TVW48

261. By contrast, TVW and TW have been extremely proactive in seeking to aid understanding of the nature and extent of the pollutant plume and in seeking to identify an appropriate means of remediation. TVW have, however, become increasingly frustrated by the pace of response to the pollution in question and the spiralling costs of addressing its implications, which have so far fallen exclusively upon TVW, TW and their customers.

The Statutory Regime

262. There is no dispute between the parties as to the role of the EA as enforcing authority in this matter, given the status of SLC as a special site under the provisions of Part IIA.

263. However, the EA's perspective in pursuing enforcement in this case (and that of the SoS on appeal) is not simply one of umpire or referee determining a dispute between parties. On the contrary, the broader statutory objectives set for the EA must play a powerful role in setting the context for this appeal. TVW have drawn attention to the provisions of S.4 of the Environment Act 1995[219], which established the principal aim of the EA "*...to protect or enhance the environment...*" and to the (December 2002) guidance[220] which the SoS has issued to the EA pursuant to subsection 2.

264. The guidance in relation to "water quality and water resources" requires the EA (at S.4.2(b)) "*in particular to address both point source and diffuse pollution; to implement the EC Water Framework Directive; and to ensure that all relevant quality standards are met*".

265. Article 4(1)(b)(ii) of the EC Water Framework Directive[221] requires national governments to "*protect, enhance and restore all bodies of groundwater.....with the aim of achieving good groundwater status at the latest 15 years after the date of entry into force of the Directive*" (i.e. by 23 October 2015).

266. The EA are required by S.15 of the Water Resources Act 1991[222], in exercising any of their powers under any enactment, to have particular regard to the duties imposed by virtue of the provisions of Parts II to IV of the Water Industry Act 1991 on any water undertaker which appears to the EA to be affected by the exercise of the power in question. This must encompass the exercise of the EA's powers in respect of contaminated land. Thus, parliament has expressly recognised the significance of water undertakers' duties to provide a supply of wholesome water in setting the framework for the exercise of the EA's powers. In the instant case, this plainly gives additional "statutory" weight to the cases advanced by the water companies.

267. It is unnecessary to set out at length the provisions of Part IIA or the accompanying Contaminated Land (England) Regulations, save to note that the remediation notice may be modified on appeal (S.78L(2)(b)) and that this modification may expressly be "less favourable to the appellant" than the original notice (2000 Regulation 12, 2006 Regulation 11).

268. In summary, the contaminated land regime which came into force in 2000 was intended by parliament to provide a sure and effective means to combat pollution incidents, as part of a

[219] CD 9.8
[220] CD 9.12
[221] CD 9.11
[222] CD 9.9

wider drive to protect and enhance the environment. It seems unlikely that the history of the instant case will be regarded as an exemplar of that which the legislature sought to achieve.

Justification for Interim (Phase 1) Scavenge Pumping at Bishops Rise

269. The pollution of controlled waters, which is at the heart of this case, was first identified by TVW in May 2000. By 2001, the broad extent of the pollutant plume had also been identified[223].

270. Bishops Rise was taken out of service and the focus of concern for TVW switched to Essendon, where concentrations of bromate have risen inexorably since 2000 from single figure levels (< 10 ug/l) to levels touching 60 ug/l, six times the statutory maximum for drinking water[224]. Other public water supplies have been subject to extensive "defensive monitoring". TW explain the position in respect of the Northern New River (NNR) wells.

271. Over 5 years passed before a remediation notice was issued by EA, in November 2005. However, even this did no more than provide for further assessment of the pollution, primarily desk-based, and the notice was immediately appealed by the identified appropriate persons.

272. Since 2000, TVW and TW have explored a variety of options for addressing the impacts of the SLC contamination of groundwater; these, and their related problems, were discussed in evidence to the inquiry. By July 2005, in circumstances of some desperation and after detailed research and assessment, it was considered necessary to contemplate direct intervention and a programme of scavenge or interceptor pumping trials was commenced at Bishops Rise. The results are reported in the evidence. Pumping at a variety of different volumes has been tested[225] and optimum flow rates identified.

273. TVW and TW have now satisfied themselves as to the effectiveness of pumping at Bishops Rise. It has been proved to be highly successful in two principal ways. Firstly, it has enabled a substantial mass of pollutants to be removed directly from the aquifer; recent figures suggest a rate of 600kg of bromate and 1400kg of bromide per annum. Secondly, it has reduced pollution concentrations down gradient within the aquifer by approximately 50%. TW have also given evidence as to the beneficial effects at the NNR wells.

274. This success has been confirmed by the EA's grant of an abstraction licence at Bishops Rise, expressly for the purposes of groundwater remediation[226]. This allows TVW to abstract up to 9Ml/day. In evidence to the inquiry, TVW indicated that this pumping is cost-effective and that no more practicable, effective or durable option has been identified.

275. In fact, by the end of the inquiry, a remarkable consensus had developed about the effectiveness of scavenge pumping at Bishops Rise. The EA have accepted that it has significantly reduced pollutant concentrations east of Bishops Rise and that it can be carried out without environmental harm. Indeed, they regard it as "an appropriate interim action" and would support its inclusion in the notice, if the SoS agrees that no-one would be

[223] TVW22
[224] TVW26 & TVW37
[225] TVW34
[226] CD 12.24

prejudiced by this course of action. They have also confirmed that all the information needed to inform a decision about requiring pumping, on an interim basis, is now available.

276. Crest too have praised the hydrogeological suitability of Bishops Rise, for scavenge pumping, and have not challenged the benefits set out above. They have accepted the evidence of a "pipe effect" and the "direct and rapid impact" on the NNR wells.

277. Even Redland have accepted the evidence of the "beneficial impacts" of pumping at Bishops Rise set out above, describing it as "conclusive" at Essendon and at some of the NNR wells. Under cross-examination, their witness indicated that her advice to the SoS is that scavenge pumping at Bishops Rise should continue. She did not suggest that anything else was likely to be more successful in removing the pollutants and preventing their spread within the aquifer. Also, she could think of no reason why the water companies would undertake the pumping if it was not cost-effective.

278. No witness was able to advance a reason why the water companies' customers should be obliged to pay for continued pumping at Bishops Rise. Whether or not the water companies would continue to pump is a matter of speculation and is, in any event, wholly irrelevant to the question of whether the appropriate persons should be obliged to pay for this. The principle is that "the polluter pays"; not that "the polluter pays unless some other party has been driven to commence remediation in the absence of any effective action by appropriate persons".

279. Thus, on matters of substance, all parties are agreed that scavenge pumping at Bishops Rise should continue. The question is simply one of form, namely whether the notice can be amended to oblige the appropriate persons to pay for this remediation rather than the general public.

280. Bromate data for Essendon came under intense scrutiny during the inquiry, largely as a result of Redland's early suggestion that the benefits of scavenge pumping were unproven because concentrations might have been falling in any event. On inspection, however, it can be seen that, from 2000-2004, concentrations fluctuated with aquifer recharge and that, prior to the pumping trials, concentrations would generally rise through the summer to a September peak and then fall during the winter. Against that seasonal background, the effect of pumping can be clearly identified; concentrations quickly fall after the start of each trial, firstly on 29 July 2005 and then on 2 May 2006.[227]

281. Given Redland's subsequent recommendation that pumping at Bishops Rise should continue, no significance can be attached to their claims regarding concentration trends. Nevertheless, it should be noted that the high watermark of this point appears to be their claim to have detected in the data "a flattening of the rate of increase" in pollutant concentrations at Essendon. It is disputed that this can sensibly be discerned, especially when reliance is placed upon comparing the data from January 2005 with that from January 2006, which is so clearly influenced by the preceding year's pumping trials. In any event, this point (whatever its merits) is completely irrelevant to the issue of whether scavenge pumping should continue now at Bishops Rise and into the foreseeable future. Plainly, prior to July 2005, concentrations of bromate at Essendon were continuing to rise and they are still at levels, down gradient of Bishops Rise, which amply justify pumping and will

[227] TVW26 and TVW37

continue to do so. In the circumstances, Redland's recommendation to the SoS is hardly surprising.

The Appropriate Persons' Objections to the Modification of the Notice to incorporate Interim (Phase 1) Pumping at Bishops Rise

282. From the above, it can bee seen that all parties, including both appropriate persons, support the continuation of pumping at Bishops Rise as a matter of substance. The objections raised are solely those of form.

283. Crest's objection appears to be a legal one, based upon lack of precision in the steps required to be taken and upon the discretion left to the water companies in undertaking remediation on the appropriate person's behalf.

284. This argument is rejected. Crest do not say that a requirement to "procure" an action is unlawful as a matter of principle. Given that the efficacy of pumping (as practised by TVW and TW) is not in dispute, the only issue can be one of definition and certainty. However, the draft notice (Version B) plainly sets out a ceiling beneath which pumping will be carried out, thus capping the appropriate person's liability to a theoretical maximum of 9 Ml/day, for 365 days. As for daily variations, the fact that this particular means of remediation needs to be flexible enough to take account of matters such rainfall and sewer capacity can hardly amount to an objection which defeats it altogether as a potential remediation action in a notice served pursuant to Part IIA. The complexity of the remediation of contaminated land is such that parliament has deliberately left a wide discretion to enforcing authorities as to what may be included in a remediation notice. The EA's proposed wording for interim pumping plainly passes conventional tests for certainty.

285. Redland do not take the "Crest" point and, indeed, include "procure" in their proposed version of the remediation notice[228]. Instead, they suggest a procedural obstacle on the basis that exploration of every practicable technique has not been undertaken and thus that the "best" practicable technique cannot be identified.

286. Before analysing this argument, it must be emphasised that TVW and TW are only contending that the remediation notice be prescriptive as to the interim (or phase 1) action, which needs to be carried out immediately. Their draft remediation notice provides for total flexibility in respect of subsequent remedial treatment actions.

287. Turning to the guidance in Circular 02/2000, paragraph C.17 sets out the aim of remediation. In this case, as Redland confirmed at the inquiry, the aim is "to ensure….that the effects of pollution of controlled waters which has occurred are remedied." Here, this can only mean the remediation of the aquifer and the protection of public and private water supplies. This was common ground amongst witnesses.

288. Paragraph C.19 then draws the threads together and requires examination of a series of matters, including timescale (which must include degree of urgency), reasonableness (which is defined in paragraphs C.29-C.33 to include issues of cost and seriousness of pollution), practicability, effectiveness and durability.

[228] CD 7.1b(8)

289. It is axiomatic that such guidance is only a guide and, of necessity, cannot anticipate every set of circumstances which will arise. It must be applied sensibly and flexibly.

290. On the matter of urgency, the EA have produced internal guidance[229] which is current (2006) for defining "urgent" cases. This points out that urgent actions are limited to those which can be arranged and completed quickly, without the need for trials. Furthermore, in relation to this particular case, Redland's witness agreed in cross-examination that:

a) pollution of controlled waters is already happening;

b) a major aquifer is affected;

c) there would be increased concentrations in the plume absent pumping;

d) the groundwater is otherwise in good condition;

e) large areas (TVW and TW areas) are affected;

f) the pollution makes groundwater unsuitable for drinking (unwholesome); and

g) the appropriate persons could take over responsibility for the pumping quickly.

291. It is clear from these answers that there is a case, here, for urgent action. Timescale is therefore an important factor in establishing an appropriate phase 1 remedial treatment action, which should take effect immediately.

292. Determining the best combination of practicability, effectiveness and durability, raises the philosophical question of how many possibilities and permutations it is necessary to exhaust before a choice can be made. The EA's observations on this question, at the inquiry, were instructive; their witness said "*I think there must be a degree of pragmatism about this. You could deliberate for ever. There comes a time when you have to act. The virtue of Hatfield is that it is going on, it works and you could start tomorrow*."

293. There may indeed be theoretical (and no doubt distracting) options for interim or phase 1 remedial treatment, which have yet to be developed. However the following points provide an overwhelming case for acting now:

a) all parties now agree that pumping at Bishops Rise is practicable, effective and durable;

b) although there are about 30 technical reports, presented to the inquiry, which have been written or commissioned by TVW, TW or EA (since 2000) examining various aspects of the pollution emanating from SLC, not one concludes that some other technique should be preferred over interceptor pumping at Bishops Rise;

c) Redland expressly do not suggest an alternative and preferable technique;

d) it is difficult to conceive of any alternative technique which would directly address the continued spread of the pollutant through the aquifer (bearing in mind the present extent of the plume);

e) Redland's various alternative options for the water companies to manage their supply issues - such as changing the proportions of blending, increasing GAC treatments, importing water from

[229] CD 7.5

Grafham Water, "upgrading Clay Lane", seeking to wrest water supplies from other neighbouring water undertakers - are all wholly irrelevant to the critical aim to which the "best practicable technique" will be put, which is (as set out in paragraph C.17) remediation of the pollution of controlled waters; and

f) although not directly relevant, paragraph C.22 refers to "established good practice", which in a sense scavenge pumping at Bishops Rise has become since the success of the first trials in 2005.

294. As for prejudice to the appropriate persons, none has been established:

a) no-one proposes a different approach and, whilst an alternative location for scavenge pumping might be found, this is not an argument for ceasing pumping at Bishops Rise, merely for replacing it at a later stage, which the water companies' proposed remediation notice does not prevent in any event;

b) in April 2006, the EA drew the appropriate persons' attention to remediation options under review[230] and those persons have shown no good reason why they have done nothing at all to explore options since that date;

c) details of the Bishops Rise groundwater remediation abstraction licence application were supplied to appropriate persons on 3 January 2007;

d) the water companies suggested draft notices, with interim remediation, in early February 2007, more than 2 months before the inquiry opened; and

e) the appropriate persons made no application for an adjournment, notwithstanding full knowledge of the water companies' cases.

295. The cost of operating scavenge pumping is currently shared 4:1 between TW and TVW[231]. Calculations of the annual cost that would be payable by those liable for remediation have been refined during the inquiry. The abstraction, treatment and monitoring costs associated with Bishops Rise are now reckoned to be approximately £177,000 per year, based on a rate of 6 Ml/day, or £266,000 based on 9 Ml/day. These are in addition to TW's monitoring costs of about £55,000 per annum and annual sewerage charges of some £338,000 assuming an average daily discharge of 6 Ml and a peak of 9 Ml/day. The figures have been set out both in evidence and in documents[232]; there has been no challenge to either. Indeed, Redland described the operating costs as "minor". Also, unlike any other option, the appropriate persons escape having to pay capital "set up" costs at Bishops Rise and avoid payment for pumping which has already been undertaken.

296. Whilst the benefits of remedial treatment are not in doubt here, paragraph C.30 of the Circular indicates that there is no need to ascribe a financial value to those benefits. Also, Redland have agreed that it can properly be inferred, from the last sentence of that paragraph, that a conventional accountancy based cost benefit analysis is not a precondition of specifying a remedial treatment action in a notice.

297. Redland have also agreed that:

[230] CD1A p605-610B
[231] TVW43 para 9.21
[232] TW20, TVW40 & TVW42

a) pollution of controlled waters is already being caused;

b) the chalk aquifer is an important groundwater resource;

c) the plume is accepted to be the largest recorded point source plume in the UK;

d) its spread and concentrations of pollutants in the groundwater at abstraction points can be influenced by pumping;

e) without the pollution, bromide at 50-100 ug/l and no bromate would be expected in the groundwater;

f) bromate and THMs are carcinogens;

g) TVW have already committed £13m to address the impacts of the pollution; TW have committed tens of £ms; and

h) the context is an existing serious groundwater problem and the prediction of a worsening one, with increased risk of drought, increasing demand in the south east and no available alternative resources.

298. In summary, the SoS can confidently conclude on the information available, that:

a) all parties agree that scavenge pumping should continue at Bishops Rise;

b) the need for it to continue is urgent and immediate;

c) all parties agree that it is practicable, effective and durable;

d) the cost of the interim action is not excessive; indeed it has been described as "minor"; and

e) the seriousness of the pollution cannot sensibly be in doubt.

Standards

299. The inquiry heard much evidence on the appropriateness of standards as a framework for remediation in this case. The setting of such standards, at an early stage, is a critical element in achieving remediation. Remediation in the abstract (a "suck it and see" approach) will inevitably lack focus and direction.

300. The standards promoted by TVW, TW and the EA are sensible and, in each case, health-based.

301. Given the 10 ug/l limit for bromate, the potential for bromide to bromate conversion during the treatment process and the absence of naturally occurring bromate, the standard of 5 ug/l is entirely appropriate for bromate.

302. Given the potential for THM formation and the evidence of THMs at 70 ug/l[233] in treated waters, where bromide concentrations at 300-350 ug/l were present in the influent stream, the need for "headroom" and a "precautionary approach" (all of which have now been accepted by Redland), the proposed standard of 500 ug/l for bromide is entirely appropriate. Again, this is to be contrasted with background concentrations of 50-100 ug/l.

[233] TVW16 p226

More rigorous disinfection of water supplies is likely in future and this will increase the risk of THM formation[234]. The notion of area-specific bromide standards was not pursued by Redland; indeed, these would be impractical and without evidential support.

303. TVW's water resources manager is clear that these standards are attainable and there is no evidence to the contrary.

Redland Draft Notice

304. The Redland proposal[235] gives the appropriate person 8 months in which to identify and assess options for interim treatment and a further 4 months in which to implement the one that is chosen by the EA. This is rejected. It leaves too much discretion to the appropriate persons, at a stage when there is an urgent need for the interim remedial treatment action to be implemented in the form which has already been established successfully by TVW and TW. On the basis of the Redland version, if the appropriate persons have control over the list of options, the EA will only be able to choose from a potentially deficient list. For example, options favoured by the EA and the water companies may be excluded on cost grounds.

305. Additionally, a further delay with water company customers "picking up the tab" for the appropriate persons' pollution is insupportable, albeit that Redland now propose a shorter time period for assessment than before.

Final Remediation

306. There is a general consensus that this is likely to involve scavenge pumping at a location or locations close to Nashe's Farm.

307. The water companies' draft remediation notice gives carte blanche, to the appropriate persons, to explore this and other options within an 8 year period, set by reference to the Water Framework Directive. It is commended as a sensible and appropriate framework for the appropriate persons and allows the knowledge gained from this inquiry to be used to good effect. It can also be supplemented, if necessary, by further remediation notices.

308. If the appropriate persons have done all they can reasonably be expected to do by 2015, they will have "reasonable excuse" which will give a complete defence to a prosecution under S.78M(1) of Part IIA. This is an entirely appropriate way to proceed, when it will never be possible to model accurately the amount of pollution remaining in the pore waters of the aquifer and set a standard based thereon.

Conclusion

309. The notice should therefore be amended to take the above factors into account. The focus should be on the EA's (B) Versions, which require interim remedial treatment action. Account should be taken of the TVW/TW joint response[236] and of the amendment to clause I(b) which seeks to avoid the need for continued dispute over cost recovery. The joint response recommends, amongst other things, that the public water supplies listed in Table 5 of Version B should be monitored weekly, rather than monthly. This reflects the

[234] TW16-19
[235] CD 7.1b(8)
[236] CD 7.1b(9)

companies' obligation to maintain a supply of wholesome water, in the light of experience which has shown that bromate concentrations can vary wildly in these boreholes, particularly if scavenge pumping is interrupted.

The Case for Thames Water

The material points are as follows.

Introduction

310. In essence the issue is a simple one. Who should bear the burden of "…ensur[ing] that appropriate remedial action is taken"[237]. This issue goes beyond the squabble between the appellants as to which of them (and to what extent) should be identified as an appropriate person, but extends to whether the SoS should approve a remediation notice predicated upon the basis that the customers of the water companies must continue to bear the costs of mitigating the effects of the contamination caused by the appropriate persons. TW formally endorse and adopt TVW's position, including their summary of the statutory regime.

Liability

311. TW also support the EA in their identification of Crest and Redland as appropriate persons.

312. In any event, whatever the outcome of the battle between Crest and Redland, at least one of them will be identified as an appropriate person. The issues identified by the Inspector at the outset of the inquiry (and indeed, at the pre-inquiry meeting) are predicated upon this basis. No objection to this formulation was taken by any of the parties when the Inspector invited comments upon his formulation of the issues. Furthermore, in the course of introducing permutations of the notice to cover every conceivable outcome of the appeals, the EA have on at least 2 occasions stated that the permutations have been prepared on the understanding that, whatever the outcome of the inquiry, there will be a notice issued. Again this has not been challenged. Indeed, Redland have accepted that if Crest were successful in their arguments, then Redland would carry the full liability.

Power to vary the Remediation Notice, on Appeal, to one that is less favourable to the Appellants.

313. The remediation notice sought by the water companies would certainly result in a notice less favourable to the appellants. It is worth noting that all parties support variations of the notice that are less favourable to one or other of the appellants.

314. The appellants, by seeking to transfer all liability to each other, also seek variation of the notice to the disadvantage of the other.

315. At the start of the inquiry, the EA's position was that they could not themselves require interim scavenge pumping in the present notice. However, in evidence to the inquiry, the EA said they would "welcome" such an amendment if the SoS were to make it. They also confirmed, in answer to the Inspector, their view that the forum of the public inquiry would

[237] The Parliamentary Under-Secretary of State, Office of the Deputy Prime Minister (Jim Fitzpatrick) Hansard 28 Jun 2005: Column 406WH

provide adequate consultation. The EA now recommend a remediation notice which incorporates the requirement for scavenge pumping at Bishops Rise.

316. By virtue of S.78(L) of the EPA, the SoS has a power, amongst others, to confirm a remediation notice, with or without modifications. The (2000) Regulation 12 and (2006) Regulation 11 both give the SoS a power to modify a remediation notice in a way which is less favourable to an appellant.

317. These Regulations provide for procedural safeguards which must be followed.[238] The parties in the present case have been asked on more than one occasion by the Inspector to

[238] The relevant statutory provisions dealing with this power and the procedures that must accompany its exercise are set out and explained in full below.

1. Subsection 2 of S.78L of the Act provides:

> "(2) On any appeal under subsection (1) above the appellate authority -
>
> (a) shall quash the notice, if it is satisfied that there is a material defect in the notice; but
>
> (b) subject to that, may confirm the remediation notice, with or without modification, or quash it.".

2. Subsections 4 and 5 of S.78L provide for regulations to set out the detailed grounds of appeal and for the procedure for determining appeals under S.78L. In particular, subsection 5(c) states that the regulations may:

> "prescribe the cases in which the decision on an appeal may in some respects be less favourable to the appellant than the remediation notice against which he is appealing".

3. Regulations were issued under the powers conferred by section 78L in 2000 (Contaminated Land (England) Regulations 2000 (SI 2000/227). On 4 August 2006 a new set of regulations came into force which replaced the 2000 Regulations (Contaminated Land (England) Regulations 2006 SI 2006/1380). There are no material differences between the 2000 and 2006 regulation in this respect. The 2006 Regulation 11 sets out the mandatory steps that the SoS must take if a remediation notice is to be modified in any way which would be less favourable to the appellants. Regulation 11 provides;

> "(1) Before modifying a remediation notice under subsection (2)(b) of S.78L (appeals against remediation notices) in any respect which would be less favourable to the appellant or any other person on whom the notice was served, the SoS must-
>
> (a) notify the appellant and any persons on whom the appellant was required to serve a copy of the notice of appeal of the proposed modification;
>
> (b) permit any persons so notified to make representations in relation to the proposed modification; and
>
> (c) permit the appellant or any other person on whom the remediation notice was served to be heard if any such person so requests.
>
> (2) Where, in accordance with paragraph (1), the appellant or any other person is heard, the enforcing authority is also entitled to be heard.".

confirm whether there are any procedural objections. The appellants have confirmed that they have none. Accordingly, were the SoS to agree with the water companies' version of the notice, the appropriate persons could have no grounds for legal challenge on the basis of alleged lack of fairness or defect in procedure.

The Amended Notice Sought By the Water Companies

318. In essence, the amendments comprise two elements. In phase 1, the appropriate persons are to bear the ongoing costs of scavenge pumping at Bishops Rise. That is to continue until such time as it can be demonstrated that the phase 2 standards have been achieved at the sites identified in the notice. Phase 2 requires those standards to be achieved by 2015.

319. It should be noted that these amendments are proportionate; they relate to actions for mitigation not remediation. Scavenge pumping at Hatfield will not fully remediate the aquifer. Even the phase 2 standards are not (final) remediation standards; they would allow for 5 ug/l bromate and 500 ug/l bromide. Remediation would require that there should be no bromate present in the aquifer and the background levels for bromide are in the region of 60-100 ug/l.

320. Before addressing the detailed issues arising from the proposed amendments it is worth setting the context in which the amendments are sought. It is common ground between the parties that:

a) The appeals involve an appropriately designated "special site" (S.78C EPA);

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4 The 2006 Regulation 8(4) gives the SoS the power to prevent an appellant exercising his right to abandon the appeal after the appellant has received a notice of a proposed modification under Regulation 11(1).

5 DEFRA issued statutory guidance, on the 2006 Regulations, in September 2006. Paragraph 69 of Annex 4 deals with the modifications of notices. This is set out in full below;

"**Modification of Remediation Notices**

Section 78L(2)(b) enables the Secretary of State to modify the remediation notice which is the subject of the appeal. If he proposes to do so in a way which is less favourable to the appellant, or any other appropriate person on whom the notice was served but who may not have appealed, then regulation 11 applies. The Secretary of State must notify those persons of the proposed modification, and also notify any other persons who were required to be sent a copy of the notice of appeal under regulation 8(2) (see paragraph 45 to 48 above). Any of those persons have a right to make representations. The appellant or any other appropriate person on whom the remediation notice was served has a right to be heard, and if this right to be heard is exercised, the enforcing authority (but no other person) also has the right to be heard. The Secretary of State may refuse to permit an appeal to be withdrawn if he has given notice of a proposed modification (regulation 8(4)).

b) Neither TW nor TVW are responsible for the contamination;

c) Unless active steps are taken, harm caused by the contamination of the aquifer will continue and water supplied from the affected boreholes would not be wholesome; and

d) (Not surprisingly) there is no evidence to demonstrate a lack of resources on the part of the appellants (either jointly or severally) to fund the carrying out of interim scavenge pumping works. Indeed, Redland have confirmed in writing that if their appeal is unsuccessful and they are designated as an appropriate person, then they will make financial provision for any necessary remediation costs[239].

The Position of the Parties in respect of the Principle of Scavenge Pumping

321. Evidence before the inquiry indicates that the EA would welcome an amendment to the notice, by the SoS, to include the interim scavenge pumping. The EA agree that this would be durable, practicable, and effective. All the qualified hydrogeologists, including Crest's representative, also agree that it is appropriate that the notice should be amended to include interim scavenge pumping at Bishops Rise.

322. The one voice against is Redland's witness; someone who concedes that she is not a qualified hydrogeologist or hydrologist. But "as a scientist" she concedes that scavenge pumping at Bishops Rise is durable, practicable and effective. She asserts however that more time should be given to Redland so that they could examine whether it is the best practicable technique before deciding whether they should have to pay for it.

323. Nonetheless, even she is not prepared to suggest that no pumping would be acceptable. Her advice to the SoS is that scavenge pumping at Bishops Rise should not be switched off, but that pending Redland's examination of whether it constitutes the best practicable technique, the water companies (rather than the appropriate persons) should pay for it and for any subsequent necessary water treatment at Hornsey from 2008.

324. She also argues that, because the water companies are "managing" the consequences of the pollution, there is no need for urgent action. She does however concede that, if the water companies were to cease carrying out the scavenge pumping etc, the situation would become urgent and the SoS would then be able to order the appropriate persons to carry out the scavenge pumping instead. She said that this was her interpretation of the Regulations, but conceded that, if this were so, the result would be "absurd".

325. As part of assessing whether there is substance to Redland's plea to be absolved from paying for the interim mitigation, it is necessary to examine what has happened and what could happen as a result of the pollution caused by the appropriate persons. TW endorse TVW's assessment of the impact on their water resources. What follows is concerned mainly with the impact on TW's resources.

Impact on the Northern New River (NNR) Wells

326. The consequences for TW (as for TVW) have been significant. It is not disputed that the extent of the plume of contamination is the largest point source plume in the UK[240].

[239] R11
[240] TVW44 para 5

327. The bromate contamination, originating from SLC, impacts on TW's NNR well system, which provides a significant part of the water supply to north London. Water resources in this part of the country are classified as "seriously stressed"[241] and finding alternative resources is extremely problematic.

328. Recent dry years resulted in a hosepipe ban in 2006 and the making of an application for a Drought Order. The resources provided by the NNR wells are therefore critical to meeting demand in north London. The significance of the impact, of the continuing contamination, can also be judged by TW's unchallenged evidence that the impact of the pollution at SLC may have tipped the balance in favour of TW making the application for the Drought Order.

329. The NNR wellfield comprises nine wells and one spring, which have provided a reliable source of drinking water for London for more than 100 years[242]. The combined average licence for the NNR wellfield is 100.8 Ml/day and the combined peak licence is 121.4 Ml/day[243]. All the NNR wellfield sources exploit the Chalk aquifer[244]. The regional direction of groundwater flow in the area is from SLC eastwards towards the NNR wellfield[245] and thus bromate contaminated water flows in the Chalk aquifer to the NNR wells.

330. The NNR wellfield discharges into a man-made aqueduct known as the New River where it mixes with up to 101.8 Ml/day of water abstracted from the River Lee at New Gauge[246]. The River Lee is also affected by bromate; this is believed to be the result of groundwater flow into the river[247]. Depending on water quality considerations and flow constraints, the proportion of River Lee water and NNR well water in the New River varies, but at certain times maximum usage of the NNR wells is desirable. The effect of the contamination is plainly to limit that availability of water resource.

331. Water from the New River may reach various water treatment works[248]. Hornsey WTW, which serves a population of some 340,000 people, is fed directly from the New River and currently plant is being installed to treat bromate[249]. The bromate contamination also has the potential to reach TW's Coppermills and Chingford South WTWs, via the Lee Valley reservoir chain. These WTWs are particularly sensitive to bromate contamination as they utilise ozone, which can result in bromate formation[250]; thus only very low levels of bromate in the raw water can be tolerated.

332. Bromate contamination also impacts on the River Lee and low levels of bromate have been detected at TW's New Gauge intake off the Lee.[251] This too has serious implications because the Lee is the main source of water for the Coppermills and Chingford South WTWs.

[241] TVW47 para 3.10
[242] TW22 paras 3.1.1 and 3.1.4
[243] TW22 para 3.1.5
[244] TW22 para 3.1.2
[245] TW22 para 3.1.3
[246] TW1 Fig 1 and TW25 para 4.3.10
[247] TW3 para 5.0.2
[248] TW22 paras 3.1.7 and 3.1.8
[249] TW25 section 4.4
[250] TW25 para 4.3.2
[251] CD 11A.3 Fig 1 p257

333. Bromate was first detected at some of the NNR wells in 2001[252]. This was after TW had been alerted to the potential pollution emanating from SLC. Initial concentrations measured from the wells in 2001 did not exceed the forthcoming drinking water standard of 10 μg/l, implemented on 25 December 2003[253].

334. The worst affected sources are the group 3 wells at Middlefield Road, Hoddesdon, Broxbourne and Turnford[254]. Bromate concentrations here showed a dramatic rising trend through 2002 and 2003, peaking at 67.2 μg/l at Hoddesdon in October 2003[255]. Concentrations from 2004 through to date appear more stable, although many of the worst affected wells were not sampled in late 2004 because of maintenance of the New River[256]. Concentrations in excess of 40 ug/l were recorded in the group 3 wells, during 2005 and 2006, but the relative stability during this period is attributed to the beneficial impacts of Hatfield (Bishop's Rise) scavenging[257].

335. It should also be noted the maximum concentration, rather than the average, is used to assess compliance with the statutory requirements.

Impact of Pumping at Bishops Rise, Hatfield

336. There are no measurements of bromate, for the NNR wells, prior to 2001 and so it is not possible to set this rising bromate trend in context with absolute certainty. However it is very likely that, without Hatfield scavenging, bromate concentrations at the NNR wells would have risen further, particularly in the dry years of 2005 and 2006, given the dilution afforded by rainfall recharge of the groundwater. This is consistent with a conceptual model with a relatively steady state bromate plume between SLC and the Hatfield borehole, as suggested by the EA at the inquiry. When Hatfield ceased abstraction for public water supply in 2000, control of the migration of the plume east of Hatfield ceased, resulting in the rising bromate concentrations observed at groundwater abstractions east of Hatfield[258]. Evidence from the Hatfield trials, and modelling, suggests that migration of bromate east of Hatfield is rapid and via discrete fractures.

337. A recent (March 2007) review[259], by a leading hydrogeologist, concluded that the available data show significant correlation between bromate concentrations in the NNR wells and abstraction rate at Hatfield. The study found that, when scavenge pumping is underway, concentrations in the group 3 wells are typically 10-30 ug/l lower than when the pumps are switched off. It also noted that concentrations fall, about a week after pumping commences, and rise again approximately a week after the pumps are turned off.

338. Redland suggest that the relatively stable trends in bromate concentrations, observed in 2004 at many NNR wells[260], may reflect a reduction in the rate of increase of bromate prior

[252] TW22 para 3.2.1
[253] TW25 para 4.2.6
[254] TW1 Fig 2
[255] TW22 para 3.2.2 and TW1 Figs 2 and 3. This is supported in terms by Mr Sage and Mr Cameron.
[256] TW22 para 3.2.5
[257] TW22 para 3.2.5
[258] TW22 para 3.2.7
[259] TW5
[260] TW1 Fig 2

to the scavenge pumping at Hatfield. They argue that this may undermine the conclusion as to the effectiveness of Hatfield as a scavenging borehole.[261]

339. TW take a different view. The relatively stable trends in bromate observed in 2004 are considered to reflect a lack of sampling from certain wells, in late 2004, and reflect the impacts of two wet months, late in 2004. Scavenging from Hatfield is the main reason for reduced and stabilised bromate concentrations at the affected NNR wells, in 2005 and 2006. Indeed, whilst the (February 2007) interim report, from University College London, noted that more work would be needed to separate out the effect of seasonal factors, such as soil moisture deficit, it concluded from a statistical analysis that abstraction at Hatfield appears to be the dominant influence on bromate concentrations in the group 3 wells[262].

340. This view is supported by TVW and also, in effect, by Crest. Redland's assertions are not supported by any qualified hydrogeologist. It is true that any scientist can read a graph. However, as Redland rightly conceded under cross-examination, the explanation for any trend on the graph involves matters of judgment relating to hydrogeological matters such as movement through fissures, the effect of weather and the impact of trial pumping. Whilst the Redland witness stated that she had discussed matters with hydrogeologists, employed in her own firm, she was careful not to suggest that they had endorsed the explanation that she places before the inquiry. She conceded that there was no evidence from any qualified hydrogeologist contained in her written proof of evidence supporting her views. Instead, she seeks to suggest that her views are derived from an examination of the graphs supported by the reports themselves produced by the water companies. However, nowhere in her proof of evidence does she set out the passages from the reports, upon which she relies, in support of the explanations which she now offers to the inquiry. This is something she could have done in her evidence (and at the very latest in her rebuttal) and something she recognised was her duty to do if her views (as she says they were) were based upon the expertise of others who, in this case, are those responsible for the WS Atkins Reports.

341. In any event, it is important to note the limits of the case as now presented by the witness for Redland. She conceded under cross-examination by TVW that, contrary to her previous stance[263], she now accepts that the scavenge pumping at Bishops Rise has a beneficial effect on Essendon and on some of the NNR wells. Her case is limited to an assertion that the pumping was justified on the sole basis that there was a rising increase in the level of bromate contamination. She claims that there is evidence of a levelling of the rate of increase; not that levels are not increasing, but that the rate of increase is levelling off. That is misconceived. Even if she were correct, the increase of bromate concentration would justify the scavenge pumping. The same would be true even if the actual levels of concentration were stable. She provided no support from the Circular, or from any other source, for the notion that action should be dependent upon whether or not there was a levelling out of the rate of increase.

342. To put the matter in broad context, TW estimate that the bromate contamination results in a deployable output (DO) loss of 50 Ml/d[264]. DO is an assessment of the available resource

[261] R8 para 2
[262] TW4 p16
[263] R6 paras 10 & 11
[264] TW22 para 3.3.3

under drought conditions and this estimated loss is very significant within the overall supply-demand balance for London.

343. So far, TW have met demand in North London, even with the bromate contamination of the NNR wells. However, in 2005 and 2006, emergency boreholes serving the North London Artificial Recharge Scheme (NLARS)[265] had to be used to dilute bromate concentrations in the New River, even with Hatfield scavenging, and the whole system required very careful management. Additionally, in 2006, TW had to implement a hosepipe ban to restrict demand showing the delicate balance between supply and demand in London.

344. Redland suggest that the bromate contamination is not affecting TW's current ability to meet demand. That is untrue. TW have incurred substantial costs in supporting the existing scavenge pumping operations and other management techniques. In a drought, the supply could be jeopardised by high bromate levels if Hatfield scavenging were not taking place.

345. TW manage bromate contamination from the NNR wells, on a short-term operational basis, using a mass balance spreadsheet and continuously feeding in real time data to validate the predictions[266]. To date, this has ensured compliance with the 10 μg/l standard at Hornsey, but that is with reduced NNR well availability. The predicted NNR well availability is significantly higher, in resource terms, with the scenario of Hatfield scavenging.

346. Long-term predictions (years in advance) of bromate concentrations are based on various methods developed by Atkins, including groundwater and contaminant transport modelling[267]. Together, these methods indicate that bromate concentrations at the affected NNR wells and in the River Lee are likely to increase and will peak in drought years. The "worst case" scenario suggests that the peak concentration at TW's Hoddesdon NNR well may rise from the historical maximum of 67.2 μg/l, seen in 2003, to over 148 μg/l in the future[268]; these predictions do not include the beneficial impacts of Hatfield scavenging, but indicate what concentrations could reach if no aquifer remediation occurred.

347. The uncertainties, regarding bromate predictions, have been discussed in detail in written[269] and oral evidence. They are inherent, to some degree, in any modelling exercise of this nature. The aquifer system is complex and difficult to model, but the models used are sufficiently robust for the present purposes of ascertaining whether scavenge pumping is appropriate on an interim basis. All methods predict a rise in bromate concentrations in the future and have been useful in giving "scoping" predictions. Further modelling of the system, to understand the benefits of final treatment actions, is needed to address matters of detail and further remediation. However, there is no need for more modelling in order to make the necessary scoping assessments to justify the need for interim pumping or to address the predictions of future bromate concentrations at the NNR wells.

348. The use of the Hatfield borehole, as a scavenging point, commenced in late July 2005[270]. Here, abstracted bromate-contaminated groundwater is dosed with ferrous chloride to facilitate the reduction of bromate to bromide in the receiving sewer network. The water

[265] TW3
[266] TW22 section 3.4 and TW3
[267] TW22 section 3.5
[268] CD 11A.4 p294 Table 5.4
[269] TW22 section 3.5
[270] TW22 section 3.6

ultimately reaches the River Colne via two WWTWs[271] and, by the time it is discharged to the River, there is negligible residual bromate, and bromide has been afforded significant dilution. As a result, the bromate and bromide have no impact on downstream abstractions from the Colne and Thames, and no impact on flora/fauna. The aquifer remediation thus afforded by pumping Hatfield is environmentally sustainable and there is now no dispute, by the appellants, that the pumping too is environmentally sustainable. This is supported by the environmental statement submitted by TVW in support of the abstraction licence granted for this purpose by the EA.

349. Results to date, from the Hatfield trial, clearly demonstrate a beneficial impact on the NNR wells in reducing and controlling bromate levels[272]. Concentrations at the affected NNR wells show a rapid decline when Hatfield pumping is initiated and concentrations thereafter are maintained at a lower level than would be expected without Hatfield pumping.

350. A study of the Hatfield testing has identified a statistically significant relationship between Hatfield abstraction rate and bromate concentrations at the affected NNR wells and at TVW's Essendon source; further tests would be needed to separate out the effects of parameters affecting aquifer recharge, but the dominant influence on these downstream bromate levels is the abstraction rate [273]. No countervailing statistical analysis has been produced by the appellants, in particular Redland. This study has been assessed and verified by an external expert, who concluded that maximum bromate removal (and lowest bromate concentration at the NNR wells) was achieved by pumping at the highest rate allowed by the license[274]. The fact that Hatfield has such a beneficial impact is only a surprise in respect of the rapid nature of the decrease in bromate concentrations seen; this is assumed to reflect the dominant and rapid fissure flow between Hatfield and the NNR wells. The fact that Hatfield acts as an effective scavenging point fits with a conceptual model of the bromate plume where, prior to ceasing abstraction for public water supply in 2000, Hatfield was acting to minimise the migration of bromate hydraulically downgradient. Between 2000 and 2005, when Hatfield was not pumping, more of the bromate contamination was allowed to migrate hydraulically downgradient resulting in the rising bromate concentrations seen at the NNR wells and at Essendon. On reinitiating pumping in 2005, the rising trend in concentrations downgradient was stopped. This fits with a conceptual model which has a stable steady-state plume upgradient of Hatfield and a more dynamic situation downgradient.

351. Hatfield comprises an ideal interim scavenging location. It is approximately half way between SLC and the NNR wells, with a steady state plume to the west and more dynamic plume to the east. The adit (underground tunnel) system that extends away from the borehole, allows efficient capture of part of the bromate plume and, as the EA have observed, the borehole's use for public water supply over many decades means that the abstraction will have developed the surrounding aquifer (enlarged fissures), again resulting in efficient capture of the plume.

352. Significant evidence has been given in relation to bromate trends in the plume. The consensus seems to be that west of Hatfield, between Hatfield and SLC, the plume is in a

[271] TVW29
[272] TW22 section 3.6, TW4 and TW5, CD 12.17, TVW43 section 9
[273] TW4
[274] TW5

steady state; bromate concentrations are relatively stable at the monitoring points. However, to the east of Hatfield, most parties believe that the plume is more dynamic. TW's view is that, without the remedial effect of Hatfield pumping, rising bromate concentrations would continue to be seen at the NNR wells. Even under the scenario that is most favourable to Redland's case, concentrations would remain elevated or rise further without Hatfield pumping, albeit at a reduced rate of rise compared to previous years.

353. There are broader issues, associated with Hatfield scavenging, than the immediate benefits to the water companies. Hatfield has remediated, and continues to remediate, the aquifer by removing bromate and bromide with no adverse environmental impact. TVW have given oral evidence that the total bromate and bromide masses attributable to SLC, that have been removed by Hatfield between 1 July 2005 and 26 March 2007, are 569 kg and 1262 kg respectively. To date, the water companies are the only parties that have been remediating the aquifer, and this has been at their customers' expense.

354. In accordance with the Circular, Hatfield has been shown to be a best practicable technique that is practical, effective and durable. The appropriate persons have not promoted any viable alternatives, as demonstrated in both their written and oral evidence.

355. The position of Redland is deeply unattractive. On any view, they have known about the prospect that scavenge pumping at Bishops Rise might be considered as an option under Part IIA, as early as April 2006. Indeed, they were told by the EA to take it into account in their consideration of possible remediation. However, as their witness has said, Redland decided not to devote any consideration to these matters whilst they maintained their appeal against appropriate person status. Redland have been professionally advised throughout. They knew, from the TVW statement of case and the TW response to statement of case, that the water companies were requesting active interim measures. Following the pre-inquiry meeting in February 2007, Redland were presented with a working draft notice requiring scavenge pumping. For whatever reason, Redland made a conscious decision to stick their head in the sand and, as their witness acknowledged under cross-examination, they failed to produce any evidence to suggest even the possibility of any alternative forms of mitigation or remediation. Later, that witness claimed that "evidence" meant only written evidence; this is implausible from such an experienced inquiry witness. Moreover, she had already conceded that, had any work been done on alternatives, this would have been set out in her written evidence, consistent with her duty as an expert to the inquiry. It was not.

356. In any event, Redland's suggestions about importing water and blending do nothing to remediate or mitigate the aquifer or the contamination. They are consequently outwith the scope of the options to be considered as alternatives under the statutory (best practicable technique) scheme which is concerned with the remediation/mitigation of the contamination not treatments as to the consequences of ongoing contamination.

357. It is also noted that Redland accept that the water companies would not themselves have embarked upon an option that was not cost effective in terms of protecting their water supplies. That is an obvious and significant concession.

358. Redland's suggestion, that supply has been maintained irrespective of the contamination, in order to claim that urgent remediation is not necessary to protect water supplies, was rebutted in oral evidence from the water companies on the basis that a large amount of capital expenditure has been (and continues to be) incurred. There is a loss in DO (affecting

the supply-demand balance) and the ability to meet demand has in part been due to the active remediation (Hatfield) being undertaken by the water companies. In the unlikely event that alternative sources could be found, which anyway would involve considerable expenditure, the result of ceasing abstraction from the NNR wells and Essendon would inevitably be increased bromate concentrations in the Lee as a result of increased spring discharge of bromate-contaminated groundwater. Such increases in bromate (and bromide) concentrations in the Lee could have a greater impact on operations than currently experienced, since TW's major Lee surface water abstractions feeding Coppermills and Chingford South WTWs (which both use ozone) would be affected[275].

359. Moreover, Redland's evidence fails to address the fact that aquifer remediation is needed now. Again, TW gave unchallenged evidence that the longer remediation is delayed, the more difficult and ultimately less successful it becomes[276]. This reflects the dual porosity nature of the chalk, where contaminants diffuse from fissures into (and ultimately out of) the chalk matrix.

360. In terms of costs, the appropriate persons have all the advantages of a proven system of works set up and paid for by the water companies. They also have the benefit of not having to pay for the past running costs and the extensive survey work that has been paid for by the water companies. Redland conceded in cross-examination that the costs of scavenge pumping were "minor" when compared with the overall scheme of remediation that would be required. They also conceded that, in arriving at a cost benefit analysis under the Circular, it is not expected by the SoS that there will be an accountant's spreadsheet. It is a broad analysis of the costs of the action set against the benefit in terms of mitigating the contamination. As Redland now accept, an important factor in this assessment is timing. There has already been substantial delay, since discovery of the contamination in 2000. The costs have been borne and continue to be borne by the customers of the water companies. It is common ground between all the parties that the SoS should not countenance the turning off of pumping at Bishops Rise in the interim; the sole question is whether it is reasonable to expect the appropriate persons, rather than innocent water customers, to pay for it. If the overarching principle that the polluter pays means anything, the question is an easy one to answer having regard to all the circumstances. It is plain that, even applying the guidance on the basis that this is not an urgent situation, interim treatment in the form of the continuation of the scavenge pumping is both reasonable and appropriate.

361. The Circular sets out guidance not regulations. The intention is that the guidance should promote, and not inhibit, the achievement of the statutory scheme. In the present case, the SoS should not seek to apply the guidance so as to produce the result which is advocated by Redland, but acknowledged by them to be "absurd". The overarching principle, that the polluter pays, must be made effective. The guidance, after all, is designed to deal mostly with situations where there has been no remediation treatment. It must be applied with reason to the particular circumstances of the case.

362. As it happens, the situation in the present case is an urgent situation under the Circular's terms. Indeed, it has long been an urgent situation and should have been treated as such by the EA. Section 5 of the Circular deals with urgent remedial action. Under section 5.1, urgent action should be considered when there is an imminent danger of serious harm or

[275] TW22 paras 3.1.8 and 3.1.9
[276] TW22 para 3.8.6

serious pollution of controlled waters; Redland have agreed that serious pollution is ongoing. Section 5.2 requires the enforcing authority to keep this question under review as it receives further information. It may decide that urgent remediation is needed at any stage. On any view, more information has come to light during this inquiry process. Although section 5.3 does not define imminent and serious, it requires the enforcing authority to judge each case on the normal understanding of the words and the facts of that case.

363. Sections C.39 to C.41 elaborate on "Seriousness of Harm or of Pollution of Controlled Waters". At one stage, Redland appeared to suggest that there was some burden on the water companies to apply the guidance when suggesting active remediation in the notice. As it happens, the requirements of the Circular in respect of the proposed amendments are met, but it should be noted that the requirements are addressed to the "enforcing authority" not to interested parties.

364. C.41 directs the enforcing authority to consider the following, in evaluating the seriousness of any pollution of controlled water:

a) whether the pollution of controlled waters is already being caused (Redland agree that it is);

b) the likelihood of pollution of controlled waters being caused (Redland do not dispute the potential impact on, and contamination of, other wells, including NNR wells); and

c) the nature of the pollution of controlled waters involved, with respect to the nature and importance of the controlled waters affected (it cannot and has not been disputed that it is an important part of the water companies' resource base) and the extent of the effects of the pollution (again, TW have given undisputed evidence on the need to shut down and restrict sources and on the need to install treatment to ensure compliance, for example at Hornsey WTW.)

365. In fairness, Redland do not seriously dispute that the threat of contamination to the controlled water is serious and imminent. Where the enforcing authority is satisfied that there is a need for urgent remediation, the requirement on prior consultation is disapplied. The EA could themselves have promoted the amendment of the notice, to require scavenge pumping, without concern for going through the consultation process.

366. Whilst the Circular gives authoritative guidance on this matter, the EA also have relevant internal policies and procedures[277], although it appears that these may have been ignored when they decided not to amend the notice and require scavenge pumping as an urgent matter. In this respect, it is interesting to note the EA's own internal guidance on potential indicators of the seriousness of harm and pollution of controlled waters[278]. These include:

- Large pollutant load (half a tonne per annum removed from Bishops Rise).
- Type of pollutant (as a genotoxic carcinogen, bromate puts SLC in the top category, as does the pollutant toxicity and persistence).
- Measured or predicted pollutant exposure concentration (again in the top category, because concentrations greater than 10 times the relevant standard for bromate are found at Bishops Rise).

[277] CD 7.5-7.5.2b
[278] CD 7.5.2a Box 9.4

- Scale of pollutant plume (>100m qualifies as the top category)
- Timing of pollution (current, therefore top category)
- Potable supply receptor (top category)
- Major aquifer affected (top category).

367. This internal guidance also gives an example[279] of the process of combining the assessments, of urgency and seriousness, to determine the urgency of remediation. It could almost have been written with SLC in mind.

368. In any event, as things are, there is no dispute that the inquiry process here has afforded the opportunity for consultation on amendments to the notice as issued.

Objections to the particular wording of the notice requiring Scavenge Pumping

369. The water companies sought to adopt the wording suggested by the EA. Neither appellant takes issue in principle with a notice that requires them to "procure". Whilst Redland promote an alternative version of the notice, Crest takes issue with the wording suggested by the EA. It seems that Crest's objection is that the notice is too vague, since they would not be able to control the exact amount of pumping and therefore the costs. This is misconceived. The maximum and average pumping rates are governed by the abstraction licence and therefore Crest would know the outer limits of their liability. It is no different to any other form of remediation, required under a notice, and indeed is better in some respects. Any notice that requires some form of remediation will not be able to specify the exact amounts of (say) pumping that will be carried on. That is not a requirement of law. The notice is sufficiently precise that the appropriate persons know what they must do and they know the likely extent of their liability. It is entirely reasonable, in particular having regard to all the circumstances of the case.

370. In the light of Crest's objection, the water companies also put forward a specified notice which seeks to ascribe particular costs. Redland do not take issue with the EA's wording, but do take issue with this notice. The ground, presumably, is that it is unreasonable because the amounts are specified. However the water companies gave evidence as to the amounts and Redland did not take issue with them.

371. A concern was raised later, by Redland, about possible changes in the future costs of power and ferrous chloride. These objections were not raised in evidence, but could and should have been, if they had any merit.

372. Dosing of ferrous chloride into sewers is not a major concern as iron salts can be used, at WWTWs, as part of the sewage treatment process. The amount of ferrous chloride used for scavenge pumping and treatment at Hatfield would not have any impact on the charges.

373. Evidence of the costing was presented and not challenged. Details of the costs arising from scavenge pumping, at Hatfield, have also been set out[280]; again, these have not been challenged. Despite Redland's opportunity to do so, no evidence was produced to suggest that these costs are likely to go down.

[279] CD 7.5.2a Box 9.5
[280] TW20

374. A final objection was taken by Redland in relation to the meaning of "procure" in the wording of the notice proposed by the water companies[281]. The EA suggest that the appropriate persons should procure "all costs solely attributable to …". Redland want the word "solely" to remain but, in an earlier draft proposed by them, they used the word "directly" which was suggested at one stage by the water companies. It would be quite wrong for the appropriate persons to avoid paying any of the costs arising from the pumping which is being used to combat their pollution. The fact that there might be some thing, which has a joint benefit, should not mean that the appropriate persons escape liability. It is suggested that the notice should remain simply with the words "attributable" or else replaced with the words "arising from".

TW Water Treatment

375. TW first became interested in bromate, in 1998, when preparing for the implementation of a new European Directive on Drinking Water Quality. A survey of treated water supplies demonstrated that bromate was only of concern as a result of water treatment processes. At that time, NNR wells were not sampled, because bromate contamination of raw water sources was not considered to be a risk.

376. TW first became aware of bromate contamination at TVW's Bishops Rise source in 2000, but at the time it was thought unlikely that it would be of concern to TW's sources, because of their distance from Hatfield.

377. Bromate was detected in the NNR wells in 2001 and monitoring frequencies were increased, but it was not until 2002 that concentrations started to be of real concern and measures were introduced to control use of the NNR wells so as to manage the concentration of bromate in the New River, which acts as a source of water for Hornsey WTW[282].

378. During the spring of 2003, an algal bloom in the New River was dealt with in TW's normal manner, by reducing the amount of water taken from the River Lee and increasing the amount taken from the NNR wells. This change in supply arrangements coincided with an unexpected and sharp increase in the concentration of bromate in the wells. On two occasions, the concentrations of bromate entering supply from Hornsey WTW exceeded 10 ug/l. With a health based standard of 10 ug/l, coming into force at the end of 2003, these results were of major concern.

379. In May 2003, there were three further occasions when bromate concentrations exceeded 10 ug/l, in the water from Hornsey WTW. These were the result of pumping and then sampling all the wells on the same day. Bromate concentrations in the most contaminated wells were so high that there was insufficient dilution, from less contaminated sources, to keep concentrations below 10 ug/l. TW have now modified their practices to ensure that sampling of the NNR wells is staggered (and sometimes abandoned) to take proper account of the resultant bromate concentrations in the water reaching Hornsey WTW. This has involved increased sampling and more frequent review of the water quality results. Samples from the most contaminated wells are now taken over a number of days, to reduce the peak load of bromate discharged to the New River on any one day. These are examples

[281] CD 7.1b(11)
[282] TW25

of the adverse impacts, caused by the pollution, on TW's normal operations. Crest rightly conceded, at the inquiry, that innocent parties should not be required to incur costs or make changes to their operations in order to mitigate pollution caused by third parties.

380. If the concentrations of bromate at a NNR well are extremely high, sampling may not be possible. TW have suggested that the remediation notice should avoid conflict between TW's statutory duties and the appropriate persons' obligations to monitor.

381. During 2003, TW were preparing for the water industry's (2004) five yearly review of water prices. The Company's drinking water regulation manager worked with operational and engineering colleagues to develop a treatment scheme at Hornsey that would deal with the increasing concentrations of bromate in the NNR wells[283].

382. The original treatment scheme, that was proposed, involved dissolved air floatation and rapid gravity filtration to deal with particulate matter such as algae. This would allow greater use of water from the River Lee, thereby helping to reduce dependence on the most contaminated NNR wells and increase dilution. Removal of bromate was to be achieved by the process of reverse osmosis.

383. Since 2004, TW have carried out a series of studies to refine and revise the treatment scheme. Various options have been evaluated, taking account of factors such as the efficiency of bromate removal, cost, energy use, chemical consumption and operational practicability. The detailed accountancy costing information has not been presented, but it is not necessary to do so. As indicated above, Redland accept that an accountant's cost benefit sheet is not required under the Circular. Moreover, Redland acknowledge that the water companies would not have commissioned the pumping if it was not a cost effective means of protecting their water resources. It should be noted however that TW had to seek the DWI's approval for the changes that were made. Therefore this is not a case where an interested party is proposing something which could be said to be gold plated or something which that party would not itself be prepared to undertake as something justified in cost/benefit terms.

384. The treatment process, that was eventually selected, maintains the use of dissolved air flotation and rapid gravity filters, but bromate removal will now be achieved by the use of catalytic granular activated carbon (GAC). TW are obliged, under the terms of a legal undertaking to the DWI, to commission the new treatment processes at Hornsey WTW by the end of September 2008.

385. TW have been given planning permission for the scheme; construction is underway and this is on target. The overall cost, of installing the new treatment process, is about £50 million and is being funded by increased charges to all of TW's water supply customers. It is a direct result of this contamination.

386. The operating costs, of this scheme, will largely depend on the concentration of bromate that is present in the NNR wells and the amount of water TW need to abstract from these sources. To maintain the effectiveness of the catalytic GAC, it must be regenerated periodically; this involves transporting the carbon to an industrial furnace and heating it to approximately 1000 degrees. During a "normal year", the costs of operating the GAC part of the process are estimated to be about £100,000. During a drought, however, when use of

[283] TW25 section 4.4

all the NNR wells is required, the annual operating costs could rise to £2.5 million. Reducing the amount of contamination entering the NNR system will reduce the treatment costs required when Hornsey WTW comes into operation, in about 2008.

387. In addition to the financial cost, the new treatment processes will have significant implications in terms of energy consumption and carbon dioxide emissions. Furthermore, there are implications in terms of increased heavy goods traffic to deliver and remove the GAC. There have also been impacts on the visual amenity from Alexandra Palace that overlooks Hornsey WTW.

388. In designing the new treatment process, at Hornsey WTW, no account was taken of any remediation actions that might be taken to remove bromate from the aquifer. The following are some of the reasons for this.

389. Pumping trials at Hatfield did not start until the summer of 2005 and the benefits were not confirmed until the start of 2006. The design of the treatment process at Hornsey WTW had to be finalised by the middle of 2006 to allow sufficient time to obtain planning permission and complete construction by September 2008. It was not until January 2007 that the EA granted TVW an abstraction licence that would allow scavenge pumping to be maintained.

390. Scavenge pumping at Hatfield reduces the bromate concentrations in the NNR wells, but by itself it does not ensure that TW can abstract water from the wells up to the maximum permitted by the relevant abstraction licences.

Bromate and Bromide Standards - Phase 2

391. The imposition of these standards, to be achieved by 2015, needs to be seen in context of the wider statutory duties that exist. Drinking water is, of course, subject to a number of statutory standards enforceable with penal sanctions[284] and TW is under a legal obligation to the Drinking Water Inspectorate (DWI)[285]. The government's standard, in respect of the level of remediation required, is that it should be "suitable for use" having regard, amongst other things, to the current use.[286] The suitable for use test also includes likely future use. In the present case, that requirement must be seen against the existing and historic use to which the water has been put and the required standards demanded in respect of that water and the agreed position regarding the applicability of the precautionary principle.

392. The date 2015 reflects the Water Framework Directive's (WFD's) deadline for the achievement of higher standards. Member states seeking to derogate from those standards must make out a case. In other words, the burden of showing that it is disproportionate is upon the member state seeking the derogation. Exceptions to EU environmental law obligations are also construed narrowly. Member states (and that includes the emanations of the state, such as the SoS in the present case) must do all in their power to seek compliance with EU legal obligations. The standards set in the water companies' notice make a valuable contribution towards this separate legal obligation.

[284] TW25 paras 4.2.1-4.2.9
[285] CD 11C.18 and TW25 para 4.4.6
[286] Circulars 02/2000 & 01/2006: Annex 3 paras A.26 & C.17

393. TW's drinking water regulation manager is an acknowledged leader in his field of water treatment and drinking water standards. He gave the following unchallenged evidence. Experiments on rats and mice show that bromate causes cancer of the kidneys. Bromate is classified as a probable human carcinogen. The presence of bromate, in drinking water, is normally the result of the way that drinking water is treated.

394. Concerns over bromate generally arise where water containing bromide is treated, using ozone, to deal with complex organic substances such as pesticides or to reduce the formation of byproducts such as trihalomethanes (THMs). Bromate can also be produced when hypochlorite is used to disinfect water.

395. The World Health Organisation (WHO) has proposed a guideline value for bromate in drinking water at 10 ug/l. The European Drinking Water Directive and the UK Drinking Water Quality Regulations have both adopted 10ug/l as a mandatory standard that applies to individual samples of drinking water.

396. When the 10 ug/l guideline was established, the WHO did not consider the possibility that bromate might be present in water sources prior to treatment.

397. Although the 10 ug/l standard is often stated to be "health-based", it also takes account of what is technically practicable using standard water treatment methods. In that sense, the 10 ug/l standard could be regarded as a compromise value balancing the risks from bromate against the broader benefits of water treatment.

398. According to the WHO guidelines, the standard would be in the region of 2-6 ug/l if protection of human health was the only consideration. This would be more consistent with the approach taken by WHO for other carcinogens. Accordingly, although there are no published papers on the topic, it could be argued that the 10 ug/l standard should not apply where bromate is present due to the contamination of raw water. This is relevant in deciding the standards to which the aquifer should be remediated.

399. It should be noted that the Food Standards Agency (FSA), in a 2006 consultation, proposed that the maximum acceptable concentration for bromate in natural mineral waters should be 3 ug/l.

400. In an ideal world, the concentration of bromate in water sources would be 0 ug/l. However, this would be an unrealistic objective for remediating the aquifer contaminated by historic operations at SLC.

401. The final remediation standards for bromate in water sources should take account of the basis of the 10 ug/l standard for drinking water. Factors to consider include:

a) Bromate concentrations can be increased by water treatment processes, therefore (as accepted by Redland and Crest) some "headroom" is required;

b) Analysis of bromate in drinking water is not as precise or reproducible as TW would like. A true concentration of 9.5 ug/l could be reported as a failure of >10 ug/l; and

c) The standard for bromate in drinking water applies to individual samples; it is not an average.

It is common ground that, in approaching this matter, a precautionary approach should be adopted.

402. A health based standard, for bromate in drinking water, would be less than 10 ug/l. TW believe that a concentration of 5 ug/l would be a pragmatic standard for the remediation of water resources currently used for public supply. That view was not challenged, at the inquiry, and Redland have accepted that a delay, for further research on this subject, would be unlikely to alter the position.

403. It would be for the EA to determine if more stringent standards are needed in order to protect aquatic organisms and satisfy the requirements of the WFD.

404. Bromide is not normally an issue for water suppliers; where concentrations have been measured, they are usually less than 500 ug/l[287]. The main concern is that bromide can increase the formation of chemical byproducts during water treatment processes. Bromate can be formed when water is treated using ozone. The process of bromate formation is complicated and depends on a number of factors including the concentration of bromide in the water, the amount of ozone used and the time it is in contact with the water, and the amount of organic matter present in the water.

405. Bromide can also react with chlorine, used in water treatment, to form hypobromous acid. Hypobromous acid is very reactive and can interact with organic matter present in the water to form a number of different disinfection byproducts, the most important of which are THMs. The concentrations of THMs produced during treatment will depend on a number of factors.

406. Current concentrations of bromide, in raw waters used by TW, are typically below 200 ug/l. At these concentrations, the formation of THMs is not a concern. Estuarine and marine waters have much higher concentrations of bromide; work on the desalination of water, from the Thames Estuary, that has shown that treatment can produce very high concentrations of THMs. In this situation, THMs containing bromine predominate.

407. During the inquiry, TVW presented data from the water sources that supply their groundwater treatment works at North Mymms. Certainly, the THM concentrations here are highly variable[288]. Nevertheless, these data show that bromide concentrations of around 350-400 ug/l have produced THM concentrations of up to 70 ug/l[289]. This is approaching the drinking water maximum allowable value of 100 ug/l[290]. It is common ground that headroom is necessary for bromide.

408. It is also agreed that the formation of bromate and THMs during water treatment is very complicated. The amount of bromide that is acceptable, at any one water source, will depend on a number of variables. With extensive research, it might be possible to determine the maximum concentration of bromide that would be acceptable using current treatment processes at individual water treatment works, as suggested by Redland and Crest. However, it would be impracticable to use this research to derive a single standard for remediating the aquifer.

409. A further consideration is that water treatment processes may change over time. For example, changes to the processes used to disinfect water could increase the formation of

[287] EA2 Appx 6
[288] C1 p42
[289] TVW16 p226
[290] CD 9.7 p345-6

THMs. The standards for THMs, and other disinfection byproducts, may be made more stringent in the light of new toxicological information. In these circumstances it would be even more important to ensure that current and future bromide concentrations would not put compliance, with standards, at risk.

410. As evidence of these changes, TW have described two recent developments that might result in changes to the way water supplies are disinfected. The first is a report[291] produced by the DWI that raises concerns about the current disinfection practice within the water industry. The words used are open to interpretation, but it is clear that the DWI are looking for improvements in this area. Secondly, proposed amendments to the Water Supply (Water Quality) Regulations 2000 would change the definition of "disinfection"[292]. The proposed definition would oblige water companies to ensure that drinking water is safe for consumption by all individual consumers, including those with weakened immune systems. This is not the case at present. Moreover, a failure to disinfect water would become a criminal offence. In these circumstances, it is likely that water companies will want to make disinfection processes more extensive. This will increase concerns about the formation of disinfection by-products.

411. Differences in water treatment are consistent with the evidence, given by Water UK[293], that suggests 500 ug/l would be an appropriate target for the amount of bromide present in public water supply sources.

412. Turning to the question of whether these standards are achievable at the NNR wells by 2015, the bromide standard is already being achieved. As for bromate, TW have given evidence as to why they are confident that the standard is realistically achievable. Crest agree and Redland offer nothing positive to challenge the evidence produced by TVW, TW and Crest.

413. TW also share TVW's views about the draft notice produced by Redland.

Conclusion

414. The decision on these appeals will send out a signal as to whether or not the overarching principle of Part IIA, that the "polluter pays"[294], will be effectively enforced by the SoS.

415. According to the SoS, one of the main objectives of the Part IIA contaminated land regime is to provide an "improved system" for remediation of land, "where contamination is causing unacceptable risks to human health or the wider environment assessed in the context of the current use and circumstances of the land."[295]

416. The financial burden of addressing the consequences of the contamination has hitherto fallen, and continues to fall, upon the principal victims of the contamination. Those victims are TW, TVW, their customers and those who face increased water charges as a result.

[291] TW16
[292] TW17-18
[293] EA3 Appx6
[294] Circular 01/2006 Annex1 para 37
[295] Circular 01/2006 Annex1 para 24 and Circular 02/2000 Annex1 para 25

417. Unlike many other instances of contaminated land pollution, the polluting effects of the SLC contamination are ongoing. Every day that passes is another day of harm for which the person(s) responsible do(es) not pay. Just like justice, remediation delayed is remediation denied.

418. Scavenge pumping is a practicable and cost effective solution. In this case, there is also the real comfort that the scavenge pumping has been carried out; there can be no question it has been "field tested".[296]

419. Moreover, if the appropriate persons take on responsibility for the costs of maintaining the Hatfield scavenger pump, they will also (however unmeritorious it may be) benefit from the fact that the facility is already in place. Indeed, no evidence has been produced by the appellants to demonstrate that there is a better and more cost effective interim solution.

420. Should the SoS dismiss the appeals, it is likely that about 2 years will therefore have passed since the EA formally determined that the appellants were the appropriate persons in respect of this contamination; and 7 years since the problem was first identified. During that period, the burden of paying for the clean up of the contamination has fallen upon TW, TVW and their customers. That is deeply regrettable.

421. It would be inexcusable to approve a remediation notice that does nothing to deal with the pressing urgent need for scavenge pumping at Bishops Rise and which does not set standards by which the further remediation can be assessed and judged.

422. TW share TVW's view about the form of notice that should be issued. If the SoS adopts the water companies' version, with phase 2 remediation, there may need to be consequential drafting in Schedule 5.

423. It is also necessary to deal with a point of law that is raised by Redland. This concerns the question of whether the SoS can require a third party to carry out some activity; in particular, whether a water company can be required to act in a particular way. Under cross-examination, Crest agreed that the SoS has no power to require a third party to carry out a particular water treatment technique. Redland say this is wrong and rely, for this, on S.78G of the EPA. The heading of this subsection is "Grant of, and compensation for, rights of entry etc." It is concerned with rights of access to carry out things imposed upon appropriate persons by the SoS in the remediation notice; this might be, for example, to sink a borehole on someone else's land. However, it does not give the SoS power to order a third party to do something such as, for example, import water into its area or alter its treatment process at Hornsey WTW. All it does is give rights to the appropriate person to go onto a third party's land in order to carry out obligations imposed by a remediation notice.

[296] Circulars 02/2000 & 01/2006 Annex 3 para C.45

The Case for Crest

The material points are as follows

Introduction

424. In the welter of technical evidence and issues of statutory interpretation, it may be easy to lose sight of the fact that Crest owned or occupied SLC for only 4 years, between September 1983 and late 1987. This is in the context of the best part of 30 years' worth of contaminants in the soil and putty chalk caused by Redland's activities on the site. In retrospect, for example by comparison of Nashes Farm in 1983 and in 2005-6, the offsite bromide contamination was in place in the 1980s, and it can only be assumed that the bromate contamination which triggered the present investigations was also present. It is in this context that the EA's and Redland's assertions against Crest must be seen.

425. Secondly, the procedures set out in the contaminated land regime amount to a technical regime which proceeds by logical steps to arrive at findings and apportionment of liability for the clean-up of land contaminated by substances which would otherwise render it unusable. The EA, supported by Redland, seek to persuade the SoS that Crest are responsible under that regime. It is for the EA to prove that, and not for Crest to disprove it. The fact that the inquiry has involved minute consideration of a body of technical material generated by Crest's consultants in the mid-1980s, not all of it self-explanatory, should not be held against Crest; after all, it was only some 14 years after completion of the development that Crest were made aware of the present investigations into potential liability for remediation of the site. This forensic "archaeology" faces all parties when seeking to reconstruct events well in the past and it may be that, on one or more important issues, the view is taken that the EA have not made out their case simply because the precise nature of events cannot be reconstructed.

426. Thirdly, the EA allege that the new Part IIA contaminated land regime was a move away from the fault-based liability of the past towards strict statutory liability, under retrospective rules, for the presence of contamination. This is not a sufficient summary of the regime. Whilst this description broadly approximates to the regime applicable to causers, it does not describe the rules applicable to knowingly permitting.

427. Crest's underlying contention is that Redland, as the party who caused both bromate and bromide to be in, on and under SLC, and who further caused the contaminants to enter the aquifer, is liable for all consequent remediation. This liability, for each SPL, can only be shifted completely from Redland if the EA or Redland can prove (a) some level of fault or omission on the part of Crest, in order to have fixed Crest with having "*knowingly permitted*" the presence of a contaminating substance; (b) that such a fault or omission is material to SADC's identification of the land as contaminated; and (c) that Test 3 ("sold with information") is made out.

Test of Knowingly Permitting

428. Redland's approach is untenable because it would mean that any person who learnt that a site over which he had any permissive rights was contaminated to any degree, and hence who could theoretically take steps to remove the contamination, would become a knowing permitter. Hence, if Redland were right, Beechgrove (the management company which

now owns SLC) would be a knowing permitter once they learnt about the presence of the contamination and had the time to do something about it: they could dig up the site and they could scavenge-pump from the site, even though that might involve demolition of some or all of the houses now standing on site. (This is not Crest's case and in any event it would be contrary to the principle, suggested in paragraph 9.13 and 9.14 of the Circular, that an owner/occupier who only discovers the presence of contaminants as a result of the S.78B notification or S.78H consultation should not be held a knowing permitter.)

429. Similarly, the person who left contaminants in the ground, after the most careful and exhaustive risk assessment by his consultants, would be responsible as a knowing permitter if those contaminants gave rise to an SPL thereafter.

DID CREST KNOWINGLY PERMIT THE PRESENCE OF BROMIDE?

430. This issue arises under S.78F(2) of the EPA which provides: "*Subject to the following provisions of this section, any person, or any of the persons, who caused or knowingly permitted the substances, or any of the substances, by reason of which the contaminated land is such land to be in, or under that land is an appropriate person*."

431. The relevant SPL identified the source of the bromide as bromide in the soil and unsaturated zone[297]. In practice, this means any bromide in the upper natural strata (gravels/clays) and in the putty chalk immediately below the gravels/clays; it does not include bromide below the water table, including any bromide in the blocky chalk which lies beneath the putty chalk.

432. So the question becomes: did Crest "knowingly permit" bromide to remain in the soil and unsaturated zone of the putty chalk?

433. First, it is necessary to look at the meaning of the words "knowingly permit*"* in the statute as informed by case law and guidance.

Knowingly

434. Crest do not contest the fact that they became aware of bromide under SLC during their occupation of the site. It is common ground that Crest knew of the presence of bromide in soil under SLC. Crest learned about this in July 1983 (before purchasing the site) from the (1982) results of chemical testing carried out by Imperial College on behalf of Redland[298]. Crest then instituted their own pre-purchase investigations which confirmed the presence of bromide in soil[299].

435. It is also clear that Crest, during the course of their post-purchase investigations, came to know about the pollution by bromide of the groundwater receptor at SLC, from samples taken on 9 May 1984[300].

[297] CD 1A p274 and CD 7.1 p9
[298] CD 2A.1
[299] CD 2A.2
[300] CD 2A.10

Permitting

436. Hence the principal issue in dispute is whether Crest knowingly permitted the presence of bromide on the land after they had acquired such knowledge, and the dispute centres around the remediation scheme carried out by Crest during their ownership of SLC.

437. The EA put their case on (a) more soil removal, and (b) scavenge pumping. If established on the merits, (a) would amount to knowingly permitting, whereas (as will be explained) (b) would not. Scavenge pumping might have managed off-site contamination, but it would not materially have affected the contamination of the unsaturated zone.

438. In addition to (a) and (b), Redland put their case more widely, alleging that (c) removal of hardstanding (and hence infiltration), (d) inadequate block paviours, and (e) lack of a barrier layer, also amount to knowingly permitting. Leaving aside the technicalities, the short answer to Redland's case on (c), (d) and (e) is that none of these "failures" permitted the continuing presence of material in, on or under the land. Put the other way round, even absent all the failures alleged against Crest, the contaminants introduced by Redland would have remained in, on or under the land.

The meaning of permitting

Retrospectivity

439. The EA claimed, at the start of the inquiry[301], that Crest's position on knowingly permitting is in truth a challenge to the retrospective nature of the legislation. This is not the case. It is perfectly clear that S.78F(2) is retrospective in that the activities which involve causing or knowingly permitting a substance to be in, on or under the land may take place before the entry into force of the section on 1 April 2000. However, this does not mean that modern-day standards must be applied to those activities in order to determine whether there was in fact "knowing permitting" in the mid 1980s. The question is whether, at the time alleged (which can only be 1983-1987), Crest knowingly permitted the presence of bromide in, on or under SLC. Reasonability (however interpreted) can only be by reference to that period. A hypothetical example may help. Assume that nobody had ever used or heard of scavenge pumping in the 1980s, but it was established practice by the time of the EA's decision. In those circumstances, Crest could hardly be said to (i) have failed to take reasonable steps by not scavenge-pumping, or (ii) have had a reasonable opportunity to scavenge-pump, let alone any opportunity at all.

440. The EA's original position, as set in their (November 2005) decision document[302], was that Crest (a) knew about the presence of bromide; and (b) *"in the light of that knowledge, the potentially appropriate person failed to do something which they could reasonably have done to prevent the bromide….remaining under the land and in contact with the groundwater*". This was based on the government's own position[303] that "*the test would only be met where the person had the ability to take steps to prevent or remove that presence and had a reasonable opportunity to do so".*

[301] OS1
[302] CD 8 para 42
[303] Circular 2/2000 para 9.12

441. Any other approach, particularly in respect of Redland's case, is entirely in contrast with the policy background to the legislation and guidance. It is in any event contrary to the guidance, as set out above, and to the doctrine of reasonable opportunity. It is plain from this, and from the case law summarised below, that the criterion of reasonableness stands at the heart of the legislation and the guidance.

442. Moreover, the general structure of the EPA, in particular under S.78F(3), is such as to create a secondary class of liability (Class B, applicable in the absence of any Class A members) for those who did not cause or knowingly permit a substance to be in, on or under the land, but who are merely the owners or occupiers of the land, and for whom different considerations apply[304]. Whilst it is recognised that Class B liability does not exist in a case where the only reason the land is contaminated is water pollution, absent significant harm, an over-broad interpretation of knowingly permitting would render the distinction drawn between Class A and Class B liability groups pointless.

Case Law

443. Paragraphs 9.8-9.15 of Annex 2, to the Circular, consider the meaning of the "*caused or knowingly permitted*" test. Paragraph 9.15 explains that it is ultimately for the courts (and hence the inquiry) to determine its meaning; "*however, indications of how the test should be construed can be obtained from the case law under other legislation where the same or similar terms are used.*" In other words, the notion of "*knowingly permitting*", as it is addressed in S.78F(2), does not exist in a vacuum; it has legal meaning which should be applied when considering whether the test is met. Redland attempt to draw a distinction between Part IIA and other legislation which adopts the "*knowingly permitting*" test; they say that this is because of the retrospective nature of Part IIA. This is wrong, as a matter of law, and not in accordance with the guidance.

444. In their decision document, the EA refer[305] to the case[306] of *Bromsgrove District Council v Carthy [1975] 30 P &CR 34*. The offence in question, in that case, was permitting land to be used as a caravan site without a licence. In summarising earlier authority, Lord Widgery CJ, said: "*What I get from that authority is, first the proposition that "permitting", when related to a failure to take steps, must take into account the reasonable or other character of those steps. Failure to take steps by refusing to take reasonable means may amount to permitting. A failure to take steps which on the facts are unreasonable does not amount to permitting*"[307].

445. This test, in the case law, is entirely consistent with the Circular's (paragraph 9.12) "reasonable opportunity" approach, as outlined above.

446. Applying that test, the steps which the EA now contend should have been undertaken in relation to bromide on the site, between 1983 and 1987, were unreasonable when viewed from the perspective of the times. Redland refer to the judgment in *Circular Facilities (London) Limited v Sevenoaks District Council [2005] EWHC 865*.[308] Crest's position is

[304] Circular 2/2000 paras D.87-97 and E.37-49
[305] CD 8 para 42
[306] CD 4.5 p127
[307] CD 4.5 p128
[308] CS5A p30

consistent with that judgment, which is expressly framed in relation to S.78F(9), the "*changes in substances*" test.

Policy: reasonable opportunity

447. The above approach accords with the policy objectives behind Part IIA. Any developer will want to know the likely extent of his liabilities before embarking on the purchase of brownfield land; this is the very purpose of the "*sold with information*" test, which allows a purchaser to take on the risk of acquiring potentially contaminated land. It should be recalled that the contaminated land regime must apply not only to contamination which took place before the regime came into effect, but also that which will occur in the future. It would be nonsensical if a purchaser who, in good faith, does his best to remediate a site according to current environmental and scientific wisdom (which may take into account the environmental cost of remediation itself), finds himself liable at some point in the future when another remediation technique is found to remove more contamination. This would mean that the risks of undertaking the development of brownfield sites would be potentially limitless.

448. This is entirely contrary to government policy, which is based on the notion of "*unacceptable risk*" to human health and the environment, and which seeks in addition to "*bring damaged land back into beneficial use*" and "*to ensure that the cost burdens faced by individuals, companies and society as a whole are proportionate, manageable and economically sustainable*"[309]. It would be neither proportionate nor economically sustainable to place unlimited liability onto those keen to develop brownfield land.

449. This is particularly so when the government intended to reduce "*uncertainties about so-called 'residual liabilities'*"[310]. It should be recalled that, in the Circular, the government expressed its determination to "*limit the unnecessary development of greenfield areas*"[311] and that one of the objectives of the contaminated land regime is to "*improve the clarity and certainty of potential regulatory action on contamination, thereby assisting developers to make informed investment appraisals*" in order to "*overcome the potential obstacles to the redevelopment of land affected by contamination*".[312]

450. Removing any criterion of reasonableness, from the notion of "knowingly permitting", would have a chilling effect on the development of brownfield land, which would be contrary to these objectives.

451. Crest's position is consistent with this policy. Whilst it is accepted that government policy may wish to limit the occasions upon which contaminated land becomes an orphan site, there is no danger of such a thing happening here.

Effectiveness

452. Moreover, whether or not a party had the "*opportunity*" to take steps to remove the presence of a substance must mean that suggested actions would have been effective in preventing the presence of a contaminant; otherwise, no such opportunity can be held to have arisen

[309] Circular 2/2000 Annex 1 para 7
[310] Circular 2/2000 Annex 1 para 29
[311] Circular 2/2000 Annex 1 para 17
[312] Circular 2/2000 Annex 1 para 19

and that party cannot be held to have "*permitted*" its presence. Hence the importance of examining whether any given failure by Crest would have made any difference to the contamination which led to SADC's identification of the land as "contaminated".

Justification

453. Ultimately, therefore, the issue is whether there was sufficient justification, on the information known to it, for Crest to undertake the further remediation works which the EA say it ought to have done. There was no such justification.

The remediation undertaken by Crest

History of Soil Removal

454. It is necessary to summarise the complex history of the remediation of the site in order to demonstrate the following: (i) Crest's consultants proposed removal of the heavily contaminated upper layer, and there was no sustained regulatory requirement (whether from SADC or TWA) to remove the intermediate layer of gravels intermixed with clayey materials; (ii) SADC and TWA were aware that the chalk was already contaminated, and there was no suggestion that significant quantities of the chalk should be removed; (iii) Crest proposed to, and did in fact, remove specific areas of deeper contamination. The story is necessarily intertwined with the scavenge-pumping story.

Main reports

455. The site investigations directly relevant to bromide were as follows:

- STATS August 1983[313]: 5 boreholes to a maximum of 1.5m; high bromides found; further analysis carried out in September 1983 on existing samples[314];
- STATS November – December 1983: grid sampling to 1.5m[315];
- STATS May 1984, carried out in March 1984: 3 boreholes, with soil and groundwater samples[316];
- Chemfix (March 1985) report on (January 1985) borehole C1: finds bromides, excludes massive floating layer of organics[317];
- STATS March 1985: logs and plan of 51 hand-augered trial pits[318];
- Chemfix off-site borehole analysis 17 May 1985[319];
- Vintec sampling exercise (5 July 1986) on eastern part of the site[320]; and
- Vintec sampling exercise (August 1986) at formation level (1m removed)[321].

[313] CD 2A.2
[314] CD 2A.3
[315] CD 2A.4 (seemingly a draft of CD 2A.6)
[316] CD 2A.9
[317] CD 2A.14
[318] CD 2A.16
[319] CD 2A.17
[320] C7.7

The results of the above have been summarised[322].

456. In addition to this, there was Chemfix input on hydrogeological issues:

- in February 1984[323];
- in May 1984[324] (together with TWA's queries[325] and Chemfix answers[326]);
- in March 1985 (following the 1985 site investigations)[327]; and
- in June 1985, (in relation to the offsite borehole)[328].

Narrative

457. The first mention of soil removal as a remediation technique is contained within the STATS report of August 1983[329]. These consultants recommended, at paragraphs 9.1 and 9.3, that on the basis of their limited investigations, soil from the areas represented by four out of the five boreholes sampled should be removed from the site. It should be noted that, despite the bromide level in borehole 4 being considered "*high*"[330], it was not recommended that soil be removed from the area surrounding it.

458. The STATS reports of November and December 1983[331] were expressly commissioned in order to "comment on the degree and type of contamination present and thereby identify areas from which contaminated soil should be removed and infilled with fresh top-soil". Both reports concluded with a plan, Fig A1.2, showing the areas from which and the depths to which soil should (para 9.1) be removed from the site. Unfortunately, that plan has been lost, though it showed areas of the site which were to be excavated. (There have been suggestions that the plan might be extant; however, nothing in the documents indicates that this is so). However, it is clear from (7 February 1984) correspondence[332] that TWA considered that "there was no evidence [in the third report] to suggest that the contamination does not extend further into the ground".

459. Similarly, the Chemfix report of February 1984[333] recommended further investigations. These were done by Chemfix and reported in the Bromide Migration Modelling Exercise dated 8 May 1984[334]. As acknowledged by the EA (JT), such modelling was "*unusual*" at the time, and this is why it was welcomed by TWA. TWA (RF) met with Chemfix to discuss the report on 11 May 1984[335].

[321] CD 5.4 p393-402
[322] C2 Appx 15
[323] CD 2A.7
[324] CD 2A.8
[325] CD 1A p71
[326] CD 1A p85
[327] CD 2A.15
[328] CD 2A.18
[329] CD 2A.2
[330] CD 2A p8
[331] CD 2A.4 & CD 2A.6
[332] CD 1A p55
[333] CD 2A.7
[334] CD 2A.8
[335] CD 1A p68

460. At the same time (March 1984, reported in May 1984[336]), STATS sank three boreholes. Bromide soil and groundwater data from this report[337] show contamination of the chalk.

461. A further report by M-Scan for Chemfix[338], on organic bromide compounds, was completed on 23.05.84 and submitted to TWA on 16 July 1984[339].

462. Various queries were raised by TWA (JT) in a letter dated 17 August 1984[340]. The letter states "*Regarding the wider implications for groundwater resources in the areas, this aspect cannot be assessed without further sampling and analysis downstream of the site…discussion of any possible remedial action can only take place after this further investigation, but the only possible options appear to be the removal of contaminated soil (to a depth greater than that already proposed) and/or the abstraction of groundwater at the site by means of scavenging boreholes*". As JT agreed, in cross-examination, it is in the context of this awaited investigation (in the event carried out in early 1985) that we must look at the issues of scavenge pumping or removal of soil.

463. This letter goes on to state that the writer will "*endeavour to carry out the proposed groundwater sampling analysis as soon as possible*". For their part, Chemfix were asked to "*give consideration to the benefit of removing more material than originally envisaged, and at least review the data available and assess whether there is a need for additional investigation before making that decision*."

464. This sampling, as agreed by JT in cross-examination, was to be for both inorganic and organic substances at the boreholes in the area. JT collected those samples on 11 September 1984; the internal report on the organics is addressed to RF and dated 5 November 1984[341]. Its conclusion was that "*none of the compounds found at the chemical site is detected in the five private boreholes*". A list of organic chemical compounds was attached[342]. A "Historic Bromide Results" table[343] shows the inorganic bromides detected during this sampling exercise.

465. RF told Chemfix of these results in a letter dated 4 December 1984[344], focusing on the organics detected on site. In that letter, RF stated that it would be "*desirable to remove from the site the most significantly contaminated material*" and that the initial STATS report was "*inadequate to define precisely the extent of such an operation, but at least it pinpoints the areas most likely to be contaminated*". He states that he "*would think that it would be wise to excavate virtually down to the chalk surface in the most contaminated areas, i.e. most of the area marked red on the STATS plan, with more limited excavation elsewhere*". This plan is no longer available. JT agreed, in cross-examination, that at this stage the options of scavenge pumping and soil removal remained open, but that the amount of soil to be removed needed to be resolved first. She stated that TWA was "*keeping options open at this stage because of the lack of information*".

[336] CD 2A.9
[337] CD 13.5
[338] CD 2A.10
[339] CD 1A p68
[340] CD 1A p71
[341] CD 1A p88
[342] CD 1A p90
[343] CD 2A p315
[344] CD 1A p91

466. The (24 January 1985) reply from Chemfix[345] states that "*further work is being undertaken to determine the area and depth of contaminated material on site, so that proposals covering remedial or removal operations can be quantified*". The work, after it had been carried out, is described in the (12 April 1985) Chemfix letter to TWA (RF)[346]. The letter refers to a field report for the (21-22 January 1985) drilling of borehole C1 and to various other reports, including the (March 1985) collation of logs for 51 boreholes that were hand-augured during the period 28 February - 5 March 1985. The reports referred to are provided as inquiry documents[347]. The letter goes on to say "*it is proposed that the rehabilitation of the site is best realised by a controlled excavation and backfilling operation. A plan illustrating the areas concerned is being prepared, and will be brought to the meeting*".

467. At this meeting, which took place on 18 April 1985, it was agreed that in order to "*reach a conclusive phase in the site's investigation and assessment, another borehole should be established off-site*"[348]. A further meeting then took place on 14 June 1985, following which TWA (RF) stated their understanding that a "*scheme of excavation and removal of subsoil had been drawn up to remove the majority of the contaminated material before development*", and that although they did not have the details of this scheme, they appreciated that it would be done "*partly on an 'as encountered' basis*"[349]. As JT agreed, in cross-examination, this was not surprising; the general strategy was agreed, followed by a decision to extend the excavation when more contamination was found.

468. There then followed the two important June 1985 letters from TWA (RF) to Chemfix[350] and to SADC[351], which were written in the light of data which included the results from the new off-site borehole**.** These need to be read in full, but TWA's focus was primarily on monitoring downstream of that borehole. The letter to Chemfix is of importance in the context of scavenge-pumping, and hence is considered below in that context.

469. The planned excavation of the site was provided to TWA under cover of a letter, from Chemfix, dated 26 July 1985[352], although the drawing referred to is not attached. A (probably later) version of this drawing can be found elsewhere[353].

470. At this time, Crest were considering selling SLC. In that context, potential buyers Finlinsons met with SADC and TWA (RF) on 4 September 1985. The notes of the meeting[354] are important because:

a) it is evident, from the last paragraph, that SADC's concerns went beyond simply the health of workers and future residents; their responsibilities included drinking water and hence water sampling;

[345] CD 1A p93
[346] CD 1A p95
[347] CD 2A.8, CD 2A.10, CD 2A.11, CD 2A.14, CD 2A.15 & CD 2A.16
[348] CD 1A p97
[349] CD 1A p104
[350] CD 1A p104
[351] CD 1A p106
[352] CD 1A p116
[353] CD 1A p155
[354] CD 1A p119

b) TWA (RF) are plainly aware (or made aware) that the gravel layer is "clean" (2nd para), by the standards of the time (the STATS report, of May 1984, gives a graphical representation of this[355]); and

c) all appreciate (2nd para) that the chalk is contaminated (also see the 2nd para of TWA's letter of 21 June 1985[356]).

The Remediation of Summer 1986

471. The best summary of what was done is to be found in the draft November 1986 Statement of Quality[357], as supplemented by the contemporaneous plan[358], and referred to in Crest's evidence[359] and summarised[360]. One metre was removed across the area shaded blue on that plan; 1.5 metres was removed from across the shaded yellow areas; and additional excavations were driven by the Vintec formation level sampling exercise of mid-August and the 300 mg/kg criterion referred to by Chemfix. Crest also excavated down into the chalk (*"with exposed chalk")* in the area of the two sumps[361], as described in the EA's (JT's) evidence[362] and confirmed in cross-examination.

472. SADC's involvement with the proposals can be seen from the involvement of them and their chemists Butterworth[363]. SADC were given a summary of what happened[364], confirming discussions between Chemfix and SADC/Butterworth, and describing the strategy of the remediation exercise: "*by a combination of physical observation of the works and the sample results, the extent of the area originally agreed was enlarged and deepened when higher levels of contamination persisted."* SADC's response[365] confirmed that the contaminated material has been removed *"from site to the extent agreed by yourselves and my Consultant Chemist Butterworth Labs Ltd."* On 30 October 1986, Chemfix provided similar information to TWA[366].

Reasonableness

473. Turning first to the EA's case, it is noteworthy how JT addressed the question of what Crest should have done by way of further remediation. Her answers, in cross-examination, were particularly important. Faced with the pooled borehole data, that were then available[367], she could not say how much of the material shown should have been removed. She was not saying that Crest should have stripped the whole site to 8m. The exercise *"would have needed to have been done on the basis of analysis of specific areas. Question: Patch by patch? Answer: Yes, that would have been the sensible approach".* Having considered the

[355] CD 2A.9 p158
[356] CD 1a p104
[357] CD 5.4 p388-390
[358] C2.5
[359] C1 para 5.2.2(c)
[360] C2 Appx 15 Fig 3
[361] C2 Appx 15 Fig 3
[362] EA4 para 58
[363] CD 1A p147, 150 & 152
[364] CD 1A p154
[365] CD 1A p176
[366] CD 1A p200
[367] CD 13 Appx 5

lack of verification data and the inability to relate 1986 depths back to 1984 levels, she agreed it was impossible to do the specific area exercise today.

474. It is plain that these difficulties underlie the EA's inability to specify what precisely Crest should have done (despite Crest's repeated invitations during the consultation[368]).

475. The EA's case[369] on the gravel layer is "*…removal of the gravel layer was not an end in its own right but a necessary step in the removal of the underlying contaminated chalk …*". However, this still involves consideration of which areas of chalk should have been removed with the consequent effect on the gravel layers above.

476. The lack of verification data and/or any change of levels, referred to by JT in cross-examination, do not assist the EA to prove that with such extra data, or without such change of levels, Crest should have removed more material. Attempts to relate pre-hardstanding Lardi boreholes and trial pits[370], to the Chemfix (March 1985) 51 hand augured boreholes[371], should be treated with caution, given the difficulty of assessing the proximity of positions from the plans in question and the inherent variability of made ground close to buildings.

477. This material needs to be considered in the light of Crest's evidence[372] concerning the strata at the site. It can be concluded that there was no justification for any more widespread removal of material from the site, whether of the gravel/clayey strata or of the chalk beneath. Moreover, as indicated by the EA[373] and by Crest's evidence to the inquiry, there were dangers associated with the excavation of chalk at deeper levels. The putty chalk layer varies in thickness and in consistency; it is more blocky than putty in places where it is less weathered[374]. Crest did excavate into the chalk, in the region of the sumps; it is far from clear what wider chalk removal, if any, was justified on the data obtained by Crest.

478. Crest further contend that the "Roberts approach"[375], endorsed by the EA[376] and Redland[377], does not advance the EA's case and, in particular, it does not overcome the evidential difficulties which arise on consideration of the EA's (JT's) evidence. That is because the Roberts approach is flawed by the underlying assumptions which underpin its calculations. Again this was considered carefully by Crest[378]; the Roberts approach clearly has major problems. Firstly, Roberts used the 1985 data in the top 1.5m; these were soil contamination findings which helped to define the material removed by Crest in the 1986 remediation. Secondly, Roberts extrapolated the data both laterally (from the areas of the site tested, to those untested) and vertically (from the upper 1.5m down to 4m strata). In reality, if the EA are not in a position to establish either site-wide soil removal or further removal in specific areas, then the Roberts exercise cannot rescue that case. That is because

[368] CD 4.3 para 4.18a, CD 5.4 para 2.5, CD 1B p629
[369] EA1 paras 47-48
[370] C2.3
[371] CD 2A.13 & CD 2A.16
[372] C1 section 6.3
[373] EA4 para 60
[374] C3 para 4.7.4
[375] CD 2B.30
[376] EA1 para 93, EA8 para 45
[377] R1 p51
[378] C1 section 7

the same reasons which stand in the way of the former render the extrapolations in the Roberts exercise unsafe.

479. In conclusion, the removal of more soil from SLC was simply not justified. Crest therefore did not have a reasonable, or any, opportunity to prevent or remove the presence of bromide in, on or under the site. This is because: (i) Crest did do what could be reasonably expected of them, in the light of the information then available about the likely nature of the consequences of leaving such remaining contamination in situ; and, (ii) the excavation of more soil, by excavating out the gravels/clays and/or part or all of the putty chalk, would have been an inappropriate and disproportionate response to the information available.

Scavenge pumping

480. In any event, the summary of the history set out above does not establish that Crest knowingly permitted the presence of bromide in, on or under SLC.

481. The EA (JT) state[379] that the results of tests carried out during the soil removal "*would have informed discussion on the benefits of more extensive excavation and/or scavenge pumping*". It does not mean that such further action would necessarily have been recommended, or that any other action would have been taken. TWA would have taken "*further action if groundwater deterioration was shown to have occurred*"[380]; as JT explained to the Inspector, the nature of that further action "*would depend on the deterioration*". In cross-examination, JT acknowledged that there would have been "*no point in putting a [scavenging] borehole in a relatively clean area*", and that the question was "*hypothetical*".

Practicality

482. JT confirmed, in cross-examination, that what was envisaged and favoured at the time was an off-site borehole in order to "*catch the head of the plume and prevent migration downgradient*". TWA (RF) "*made it clear that [scavenge pumping] was no easy thing to undertake*"; the reasons for this are contained in RF's letter to Chemfix, dated 21 June 1985[381]. No farmer would agree lightly to the presence of a scavenge pump on his land, but the EA suggest that Crest could have bought sufficient land on which to carry out pumping. In fact, no compulsory purchase powers would have allowed Crest to do so at the time. No solutions to the practical barriers, to scavenge pumping, were ever raised by TWA; those practical problems mean that Crest never had a reasonable opportunity to address contaminants by means of scavenge pumping.

Effectiveness

483. In any event, the EA must establish that Crest *"knowingly permitted the presence"* of bromide under the site. Even assuming that the EA establish that (a) scavenging pumping could/should have been established as a result of such investigations, and (b) there were no practical objections in the way of scavenging pumping, and (c) scavenging pumping would have "hit" the plume, the evidence does not establish that scavenging pumping would have made any or any material difference to the contamination which led to SLC being identified

[379] EA4 para 59
[380] EA4 para 84
[381] CD 1A p104

as "contaminated" land. On this, the evidence[382] is essentially not in dispute, as acknowledged by the EA (JT) and Redland in cross-examination. Their gist is this: scavenging pumping may well have improved the down-catchment contamination position (i.e. waters off SLC), but it would not have removed any, or any material, contamination in the unsaturated zone under SLC. In the terminology of S.78F(2), scavenge pumping would not have prevented or removed the *"presence"* of bromide.

Infiltration by Removal of Hardstanding

484. The EA refer to this issue as context for the two allegations of knowingly permitting, but do not say that, by itself, it amounts to knowingly permitting by Crest. Redland do make that allegation, and also say that this amounts to causing. In each case, this cannot be true, given that the contamination in question was already in situ under the land. Crest's response is developed further in the context of "causing bromate" below.

485. However, there is a technical issue between Crest and Redland as to the likely effect of infiltration in any event. Crest accept that some additional infiltration will have occurred, over and above a site with intact hardstanding, and further that such additional infiltration may cause *some* change in the position of contaminants under SLC. However, there is a dispute as to the extent of this. The technical issues are set out in evidence[383] and Redland, under cross-examination, have accepted the principle of many of Crest's points, but nevertheless stand by their illustrative calculation despite the respects in which that calculation does not represent the reality of the position on site. In truth, it is not an exercise which can be done given the variables and uncertainties. The SoS should accept Crest's position that the "*the difference to contamination movement below SLC is likely to have been minimal*"[384].

Monitoring and the Installation of a Second Off-site Borehole

486. There has also been some discussion as to whether Crest undertook all monitoring obligations requested by TWA.

487. Following on from the June 1985 correspondence[385], in which scavenge-pumping was not pressed, a monitoring scheme was suggested, by TWA (RF) to SADC on 11 February 1986[386]. In this scheme, SADC would sample inorganic bromide at all boreholes within 2km of SLC and Crest would sample their two monitoring boreholes and "*three of the nearest private wells, e.g. Nashes Farm, Cap's Cottage and Woodcockhill*" for organic compounds. Crest were willing to accept such a proposition[387] and agreed to the scheme at their meeting with TWA on 21 July 1986[388]. However, according to the EA (JT) in answer to the Inspector, this was not "*finalised until the meeting on 22 October 1986*" and the samples taken on 19 August 1986 would therefore have been taken by JT and not by SADC.

488. As JT pointed out, under cross-examination, "*there was no requirement on Crest to do [sampling] for inorganics, but they wanted the option to do so*". It is clear from the Vintec

[382] C3 para 6.4, R1 paras 6.11 & 6.14
[383] R1 para 5.9, C9 paras 2.4.8-2.4.13
[384] C9 para 2.4.11
[385] CD 1A p104-107
[386] CD 1A p130
[387] CD 1A p138
[388] CD 1A p206

report dated 26 August 1986 that they did indeed do so, on 18 August and again on 19 August 1986[389].

489. On 30 October 1986, Chemfix wrote to TWA (JT)[390] confirming their (22 October 1986) exchange of data: TWA's "*reports PGWU9999 – TL181402 and those dated 25 September 1986; and passed to you M-Scan Ltd's report dated 26 September 1986 – No 1809/1807 – covering the CGMS work on the same samples*". Under cross-examination, JT thought that this paragraph only "*related to organics*". However, this does not fit with the reference above to "*those dated 25 September 1986",* which has to be a reference to the unnumbered results[391] of samples taken on 19.08.86 which were transcribed onto JT's Historic Bromide Results table[392]. As Chemfix state in their (30 October 1986) letter[393], the monitoring exercise "*subject to some minor changes in contamination levels against earlier sampling, indicated not detected or no significant contamination in waters from the abstraction points sampled*".

490. In her (19 November 1986) letter to Chemfix[394] JT agreed that the results in the private wells gave no immediate cause for concern, but that "*contamination of the off-site monitoring borehole remain[ed] at a high level*". She felt that "*another monitoring borehole further from the site would be of use. Such a borehole, drilled outside the pollution plume would act as an early warning system and enable alternative supplies to any threatened wells to be provided*". However, she did not ask that one be drilled immediately, but stated "*If inorganic bromide continues to show an upward trend it is strongly recommended that a further hole should be drilled.*" This accords with Chemfix's (30 October 1986) letter[395] to JT , which recorded their agreement that the proposal for another investigatory borehole would be held over until further results from the water quality monitoring programme were available. The sampling, due to take place by SADC, was stated in JT's (19 November 1986) letter[396] to be due in the "*next week*".

491. The results from samples taken by SADC, on 26 November 1986, are provided[397] and recorded in JT's Historic Bromide Results table[398]. They did not show an upward trend from the results of samples taken by JT on 19 August 1986.

492. The final set of samples was taken on 23 September 1987[399]**.** Again these do not show an upward trend.

493. The issue was explored by the Inspector, in questions to JT, as to whether Vintec's results of 19 August 1986 (incorrectly dated 19 September 1986)[400], followed by SADC's own results of 26 November 1986, showed an upward trend which ought to have been disclosed to TWA. On neither basis (TWA's results of 19 August 1986 and Vintec's of the same day)

[389] CD 5.4 p398
[390] CD 1A p199
[391] CD 1A p156
[392] CD 2A.21 p315
[393] CD 1A p199
[394] CD 1A p206
[395] CD 1A p199
[396] CD 1A p206
[397] CD 2A.21 p321
[398] CD 2A.21 p315
[399] CD 2A.21 p315
[400] CD 5.4 p398

is this the case. When examined from either perspective, the results taken did not "*continue to show an upward trend".* If Vintec's results were right, the pre-19 November 1986 results (with the exception of Nashes Farm, where the August 11.6 mg/l result was effectively identical to TWA's 11.63mg/l) had not started to show an upward trend by the time of JT's letter. If TWA's 19 August 1986 results were right, then the post 19 November 1986 results showed a fall since 19 August 1986, not a rise.

494. Moreover, as JT said in evidence, "*different laboratories get different results*". She added, in cross-examination by Crest, that the results are "*very jumpy; there isn't sufficient data to show a clear trend*". There was therefore no reason (on either basis) and no justification for Crest to have embarked on drilling another off-site borehole.

495. Furthermore, the proposal was for an off-site borehole "*free of contamination*"[401] and outside the plume[402]. As JT acknowledged, in answer to the Inspector's questions, "*nothing*" was known about the extent of the plume and this was "*just a theoretical comment*".

496. Whilst sampling did cease in 1987 (and there is no evidence that Crest did sample for organics), there is no evidence that had such sampling continued (whether for organics or inorganic bromide) or indeed had a further borehole been drilled, there would have been any difference in outcome. In retrospect, the evidence[403] is strongly suggestive of a stable plume – as shown by it persisting at similar concentrations in 2005-6 to those present in the mid-1980s.

Barrier layer

497. The insertion of a "*barrier layer*" of 150mm of pulverised fly ash ("PFA"), Hoggin or Terram was made a condition of the passing of the plans by SADC for Building Regulation purposes[404]. Crest accept that there is no evidence that such a layer was put in place. It is for this reason that Crest does not seek to support the first part of paragraph 2.2(6) of its Notice of Appeal[405].

498. However, the insertion of any of these materials would in any event not have been effective to prevent the downward infiltration of bromide or bromate at SLC[406]. This was agreed by the EA (JT) in cross-examination: she agreed that PFA would not have formed a significant barrier, and in any event that 150mm of it "*does seem very small*"; she agreed that Hoggin was "*not very different from the materials on site*", and that she couldn't say if Terram made an impermeable material.

499. None of these "*barriers*" would therefore have been effective to prevent the presence of contaminants in, on or under the site. Whether or not such a "barrier" layer was laid by Crest is therefore irrelevant to the question of whether they knowingly permitted the presence of contaminants at the site.

[401] CD 1A p105
[402] CD 1A p206
[403] EA2 Appx2 Fig E1A
[404] CD 1A p145
[405] CD 7.3 p54
[406] C1 section 8

Miscellaneous

Mr Calcutt

500. The EA have queried why Paul Calcutt, company solicitor for and director of Crest in the 1980s, was not called as a witness. In response, Crest simply observe that this case has been brought and defended on a technical level, based upon the various investigation reports. Precisely what contribution Mr Calcutt might be thought to bring to this debate is unclear. The EA have never before suggested that he might have knowledge of any particular matter which might assist the inquiry regarding the correspondence between the relevant authorities and the reports provided by Crest's consultants.

The Contract

501. Certain capital was sought to be made out of the production of the executed (but not dated) copy of the Crest/Redland contract[407] produced during the inquiry. Until the EA's cross-examination of a Crest witness (BM), none of the parties had suggested that the terms of the contract might have contained anything which might have allocated the risk of liability for remediation of contamination to either party, nor that the contract might have anything to bear on the "*sold with information*" test. A copy of the contract had in any event been served on Redland on 12 April 2007. More generally, Crest has at all times disclosed all relevant documentation to all parties who have requested it. It is also hardly surprising that BM should be anxious to search for additional data to assist in clarification of events, as were produced in Appendices to his proof.

Enviros in the 1980s?

502. The Inspector asked the Redland witness about paragraph 3 of her rebuttal[408] of Crest's evidence[409] regarding BM's evidence and "*the assessment of the quantity of bromide in the soil carried out in the 1980s by Enviros"*. The ambiguity in this phrasing disappears if one considers BM's corresponding account[410] of *"the assessment carried out by Enviros of the quantity of bromide in the soil in the 1980s (section 7)"*, namely his current consideration of the Roberts report and similar issues.

DID CREST KNOWINGLY PERMIT THE PRESENCE OF BROMATE?

Knowingly

503. Crest and the EA say that Crest did not knowingly permit the presence of bromate. Crest did not *know* that bromate was present, so hence no question of permitting can arise.

504. Redland contend that Crest were or should have been aware of the presence of bromate, before purchase and as a result of Crest's post-purchase investigations, and that this amounts to knowledge of the presence of bromate at SLC. This contention is untenable both on the facts and in law. The law is relevant to attempts by Redland to argue that Crest should be fixed with what it is said Crest's consultants should have appreciated.

[407] C13
[408] R5
[409] C3 para 2.2(d)
[410] C1 para 2.1(d)

The facts: What did Crest "know" about bromate?

505. Redland has failed to prove its factual case.

506. The issue can be approached at various levels of detail. Crest submit that the most important is the broader question, rather than some of the issues minutely examined in the evidence, but on whichever level one examines it, Redland's case fails.

507. There is no evidence that Crest had any actual knowledge of the presence of bromate in, on or under SLC. STATs tested for bromate and did not report finding any bromate. The reader of the STATs August 1983 report[411] (as distinct from the Appendices) would not see any reference to the finding of bromate; indeed, his reading would be confirmed by looking at the Appendices. Hence, the discomfiture of Redland's witness with the initial question put in cross-examination of her on this topic: *"Did Crest's consultants find and report any bromate at the time?"*

508. Equally STATs, as Crest's consultants, were unaware of the presence of bromate at SLC. As the EA (JT) agreed in cross-examination, all parties were in fact surprised at the continued presence of bromate at the site. What, in truth, Redland's position amounted to was that it was only the combination of the history plus the analyses which amounted to conferring knowledge; this emerged from cross-examination and from the Inspector's questions.

Consultants' knowledge: Available data / detection limits

509. In short, Crest's consultants tested for bromate in their pre-purchase site investigation and did not find any: see the bromate column marked LT 20 (less than 20 mg/kg)[412]. Redland claims that this was a finding of bromate at less than 20 mg/kg; it was not. Indeed, as Redland's witness agreed in answer to the Inspector, there is no evidence to support the notion that these results suggest that the actual concentrations are more likely to be greater than zero than not. Even on the closest analysis of the statistics underlying the Criterion of Detection and the Level of Detection[413], such a finding does not amount to a finding that bromate was *probably* there.

510. Redland also argue that testing for bromide was in fact detecting bromate[414], that Crest's consultants should have been aware of the presence of bromate[415] and that this in effect amounts to constructive knowledge on the part of Crest that bromate was present.

511. This contention fails for a combination of reasons. Firstly, on balance and for the reasons explained by Crest (BM), the analytical techniques used by Crest's consultants to detect *bromide* were not detecting *bromate;* in Crest's view, the most probable technique was ion chromatography which, it was agreed, would not detect bromate as bromide. Also, as Redland agreed in answer to the Inspector, it is entirely possible that bromate was determined using the SCA titration method, but omitting the oxidation stage, and that bromide was determined by subtracting the bromate from the total obtained when the oxidation stage was included; if that were the case, 10 mg/kg could represent the criterion

[411] CD 2A.2
[412] CD 2A.2 p12
[413] CD 2F.53
[414] R1 para 4.14
[415] R1 para 4.16

of detection[416], whereas 20 mg/kg would be the limit of detection. Secondly, given that the consultants had been trying to distinguish between bromate and bromide, the blunder suggested by Redland is highly unlikely. It is certainly not a point which would have been picked up by any ordinary reader of the reports; indeed, it does not look as if Redland's witness had picked it up until after Redland's initial submissions to the EA, to which she had had technical input: Redland's representations on the draft remediation notice are silent on this point[417].

What Crest's consultants ought to have known

512. Redland seek to say that it is the history, coupled with the analyses and the supposed understanding of competent chemists at the time, which should confer knowledge upon Crest.

513. The history, as SADC reported to Crest on 15 July 1983[418] in answer to a request for "*full details"*[419], advised Crest to proceed to investigate the site in the light of the products and the waste produced by Steetley. It did not (nor could it) say that there *was* contamination (by bromate or indeed bromide) on site – in the absence of the analysis of soil samples.

514. Then came the STATs analyses of August 1983 discussed above.

515. Redland's criticisms of STATs, for not pointing out to Crest that (despite the analyses) there was probably bromate under site, should be rejected in the light of other evidence suggesting that the detection of bromate came as a surprise to all. In addition to the EA's (JT's) evidence, Redland agreed that there was nothing in any of the post-August 1983 material produced by STATs, Chemfix, SADC or TWA which suggested that there might be a bromate problem at the site. The reason for this will be apparent from the (2000) report[420], by international environmental consultants Komex, which states *"Bromate is reactive in the natural environment, and, as such, should not be expected to survive for long periods of time before changing into a more stable form";* a view also held by Mr Roberts[421] and Crest's expert witness (BM)[422]. Indeed, this is consistent with Redland's evidence under cross-examination that there was a common misapprehension about this at the time. The attempt by Redland's witness, under re-examination, to confine her "common misapprehension" answer to non-chemists was unconvincing.

516. If her evidence were correct in this respect, it is surprising to say the least that none of STATS (at any later stage of their involvement), Chemfix, Butterworth, TWA, or SADC suggested testing for bromate. All of them were party to, or received, a report or reports giving the history of bromate use on the site: for instance, they all[423] received STATS' December 1983 report[424] referring to the past production of bromate products at the site.

[416] CD 2F.53
[417] CD 4.5 paras8-12
[418] CD 1A p45
[419] CD 1A p44
[420] CD 2A.22 p334
[421] CD 2B.30 p622
[422] C6 para 2.6.3
[423] CD 1A pages 50, 85, 125 & 141
[424] CD 2A.6

517. Crest's contentions, on bromate, are consistent with the EA's Decision Document which states[425] "*Only the STATs report of August 1983…tested for bromate and found no concentration above the detection limit. Although this limit was high compared to tests carried out recently it was reasonable according to the standards of the time."* This remains the EA's view. Indeed, JT indicated that she was not sure that the TWA laboratories even tested for bromate in those days and Redland's witness accepted, in cross-examination, that bromate analysis would have been uncommon.

Definition of knowledge

518. Even if (contrary to the above) Crest's consultants *ought* to have been aware that there probably was some bromate present, but did not report this to Crest, then this does not amount to "knowledge" by Crest for the purposes of S.78F(2). This is because: a) such "constructive knowledge" does not amount to "*knowledge*" within the meaning of the phrase "knowingly permitted"; and, b) even if it does, such constructive knowledge on the part of Crest's consultants cannot be imputed to Crest.

Constructive Knowledge

519. In their representations to the EA[426], Redland have cited various decisions of the courts, which we address as follows.

520. In *Schulmans v. National Rivers Authority [1993] Env LR D1*[427], the court found only that knowledge in the context of the offence of knowingly permitting a poisonous substance to enter controlled waters may be proved either by actual knowledge or by showing that the defendants had "*deliberately shut their eyes to the obvious, or refrained from inquiry because they suspected the truth but did not want their suspicions confirmed*." The decision does not support constructive knowledge via negligence.

521. In *Vehicle Inspectorate v. Nuttall [1999] 1 WLR 629*[428], Lord Steyn cited[429] the dictum from Devlin J in *Roper v. Taylors Central Garage [1951] WN 385* regarding three types of knowledge:

a) actual knowledge;

b) where a defendant shuts his eyes to an obvious means of knowledge; that is, where he deliberately refrains from making inquiries the result of which he might not care to have; and

c) where the defendant had in effect the means of knowledge but "*merely neglect[ed] to make such inquiries as a reasonable and prudent person would make*": in other words, negligently failing to make such inquiries.

522. Crest's submission is that, for "knowledge" to arise in the context of S.78F(2), there must be either actual knowledge (Devlin J's first category); or the person must deliberately have refrained from making enquiries the results of which he might not care to have (Devlin J's second category). This was exemplified in the *Westminster CC v. Croyalgrange [1986] 2*

[425] CD8 para 191
[426] CD 5.6
[427] CD 5.6 p461
[428] CD 4.5 p132
[429] CD 4.5 p135-6

All ER 353 case, where the state of knowledge necessary was at the most "*that the defendant had deliberately shut his eyes to the obvious or refrained from inquiry because he suspected the truth but did not want to have his suspicion confirmed*"; in other words, wilful blindness. This was the case cited by the referring justices in *Schulmans*.

523. By contrast, Devlin J's third category does not give rise to "knowledge" under the section. If the test was "negligently permitting", the section would state so in terms.

524. Moreover, the relevant question, in cases of this kind as much as in the *Vehicle Inspectorate* case[430], is what the performance of Crest's duty required them to know. The only duty which can be imputed to Crest is that retrospectively applied by the Contaminated Land regime, which only came into force in 2000, 12 or so years after the development was completed.

Imputed Knowledge

525. In order for Redland to make out their case, it must show that any knowledge which Crest's consultants ought to have had should be imputed to Crest.

526. This question was touched upon in the first reported case on the contaminated land regime in action, *Circular Facilities (London) v. Sevenoaks DC [2005] EWHC 865*[431]. In that case, Circular Facilities had been designated an appropriate person on the basis of a soil report which was on the planning register and so, the respondent council contended, was within the knowledge of Circular Facilities. The planning application had been carried out by an individual who, as found by Newman J (at paragraph 35), the evidence showed was the agent of Circular Facilities. It is clear from that case that simply saying that the consultants are Crest's agents does not automatically lead to Crest being imputed with all knowledge which their consultants ought to have known: Newman J stated only that circumstances can arise where this will be the case, but declined to find whether or not such circumstances pertained in that case.

527. It is also clear from the case law that knowledge – even if actual knowledge – on the part of an agent cannot be automatically attributed to the principal. In *Sevenoaks* the court cites *El-Ajou v. Dollar Holdings plc [1994] 2 All ER 685*[432]. In that case Hoffmann LJ (at 702ff) sets out three categories of case where an agent's knowledge may be imputed to a principal: one is where an agent is authorised to enter into a contract on behalf of a principal where that agent's own knowledge is material; one is where a principal has a statutory, contractual or tortious duty to investigate or make disclosure about something and employs an agent to discharge that duty; another is where an agent has authority to receive communications on behalf of his principal. None of those categories apply here. Hoffman LJ considers, in his analysis, the *Vigors* authority to which Redland have referred.

528. Indeed, Hoffmann LJ's decision in that case makes it clear that even where information is known to the agent, and that agent has a duty to disclose such information to his principal, but does not do so, knowledge of that information cannot without more be imputed to the principal ((iv) at page 703 of the judgment). That decision, which is the critical one here, is supported by *Bowstead* at page 445, the textbook relied upon by Redland. The point is all

[430] CD 4.5 p138
[431] CS4B
[432] CS4B

the stronger where, as in the case of Crest's consultants, the agents were not themselves aware of such information. In no case has information of which an agent *ought* to have been aware been imputed to a principal.

529. The *Sevenoaks* case reinforces the point by demonstrating that any attempt to impute knowledge to Crest via what was on the planning files at the time is misguided. Newman J (at paragraph 38) ruled that the presence of a given report on the planning register "*in itself was insufficient to impute knowledge of the contents of the report to [Circular Facilities]*".

530. In the context of remediation proposals, Crest could only sensibly rely on the reports and recommendations made to them by their consultants. Neither Crest, nor their consultants, knew of the presence of bromate. Crest cannot be imputed with anything which their consultants did not know; nor should they be imputed with any knowledge which it is said their consultants ought to have known.

531. In order to fix Crest with knowledge of bromate in, on or under SLC it is necessary for Redland to establish that (i) on the facts Crest's consultants should have been aware of the presence of bromate, (ii) the fact – if it be the case – that they should have been so aware amounts in law to "*knowledge*" within the meaning of the statute, and (iii) knowledge of whatever Crest's consultants should have been "aware" of can be imputed to Crest. This construction of the necessary knowledge on the part of Crest simply stretches the notion of "knowingly permitting" too far.

Conclusion on "Knowing" in Respect of Bromate

532. For all of the above reasons, Crest contend that they did not know of the presence of bromate in, on or under the land at any stage during their ownership or occupation of the land.

"Permitting"

533. If Crest did not "know" of the presence of bromate, then it cannot "permit" within the definition. In the alternative if, which is strenuously denied, they did "know" for any of the technical reasons advanced by Redland, they certainly did not "permit" the presence. Nothing in the history or the analyses or the alleged knowledge of chemists in 1983 identified where bromate was present on, in or under the land, and therefore any question of "permitting" does not arise.

DID CREST "CAUSE" BROMIDE AND/OR BROMATE TO BE PRESENT?

534. Redland contend that by allowing infiltration (by removing the hardstanding, or not inserting a barrier layer, or by using block paviours) Crest caused the presence of bromide or bromate to be present. The EA disagreed with this contention in their Decision Document[433], as do Crest.

535. The short answer to Redland's contention is that none of these matters caused bromide or bromate to be on, in or under the land. The bromide and bromate was already on, in or under the land when Crest purchased the land – even if the effect of infiltration occurring during its ownership was to change its position in, on or under the land.

[433] CD 8 para 190

536. Crest's response in this respect is supported by the decision of the Divisional Court in *National Rivers Authority v. Biffa Waste Services Ltd [1996] Env LR 227*[434] on a directly analogous issue. Biffa were charged, under S.85 of the Water Resources Act 1991, with causing polluting matter to enter controlled waters, by driving vehicles along the river bed, and hence stirring up the mud and silt hitherto sitting on the river bed. The justices found that Biffa were not guilty of this offence, as the alleged polluting matter (the mud and silt) was already present in the watercourse before Biffa drove its vehicles (p.3 of the report). The Divisional Court upheld this finding (p.6). The S.85 offence alleges "entry"; the present provision alleges "presence", but the underlying principle is the same.

SHOULD REDLAND BE EXCLUDED FROM THE BROMIDE LIABILITY GROUP?

Test 3: Sold with Information

537. It is agreed that bromide was in fact in the groundwater, both beneath SLC and down-catchment, before Crest's acquisition of SLC[435].

538. S.78F(3) EPA 1990 states that "*a person shall only be an appropriate person…in relation to things which are to be done by way of remediation which are to any extent referable to substances which he caused or knowingly permitted to be present in, on or under the contaminated land*".

539. D.58(c) of the Circular requires that "*before the sale became binding, the buyer had information that would reasonably allow that particular person to be aware of the presence of the land of the pollutant identified in the significant pollutant linkage in question, and the broad measure of that presence; and the seller did nothing material to misrepresent that presence*".

Meaning of "broad measure"

540. There is no definition of what constitutes the "*broad measure*" of the presence of a pollutant in the guidance or in any caselaw. However, the notion must relate to the purpose of the contaminated land regime, which is to determine liability for remediation.

541. It must be emphasised that, according to the Circular (D.57), the purpose of Test 3 is to exclude a potentially appropriate person from liability "*where it is reasonable that another member of the liability group…should bear the liability for remediation of the land*". This is because a purchaser who has had sufficient information prior to purchase will be in a position to negotiate a reduction in the price of the land in return for taking on the risks related to that contamination.

542. Given the above, it cannot be "*reasonable*" under Test 3 – or, indeed, in accordance with the "polluter pays" principle –for Crest to bear sole liability for remediation of contamination by bromide when a very significant part of the need for that remediation stems from the escape of pollutants from SLC before Crest's purchase of the site.

543. Analogies with this contention can be drawn from other provisions within the statute and the statutory guidance. It should be noted that S.78K(5) provides that the owner or occupier of land which becomes contaminated as a result of the escape of a substance to that land

[434] CS4B
[435] CD 13 para 8

cannot be required to carry out remediation actions in relation to that land unless he caused or knowingly permitted the escape. A parallel may be drawn with (D.65-67) Test 5 ("Escaped Substances"), which excludes from liability those whose land has been contaminated as a result of the escape of substances from other land, where another member of the liability group was actually responsible for that escape. It is indisputable that Redland were responsible for the escape of the bromide which was already in the groundwater downgradient of the site at the time of Crest's purchase of SLC, and by virtue of which SLC is designated contaminated land. These provisions demonstrate the principle of reasonableness which, in the light of S.78F(3), should apply in considering the "*broad measure*" test.

544. The question of D.59(b), of the Circular, was raised for the first time in the EA's cross-examination of Crest's witness (BM). D.59(b) reads "*(b) the question of whether persons are members of a liability group should be decided on the circumstances as they exist at the time of the determination (and not as they might have been at the time of the sale of the land*".

545. It was suggested that this meant that all the factors known by the time of the application, by the EA of Test 3, should be assumed to be known for purposes of the application of the broad measure test at the time of the sale.

546. This is not what D.59(b) says. The opening words make it clear that this provision is intended to apply solely to the decision as to whether a given party is in or out of the liability group for Test 3 purposes. It thus stops a putative knowing permitter saying: "*at the time of my purchase of the land, I had not yet become a knowing permitter, and had not yet entered the liability group; so my vendor cannot transfer his liabilities to me by me knowing the broad measure*". Instead, the EA decide who is in the liability group at the time of application of Test 3 (i.e. all the causers or knowing permitters identified by the EA in 2005), and then apply Test 3 to all those members of the group.

547. The EA's reading of D.59(b) is also inconsistent with the words of D.58(c) defining broad measure. This makes it clear that the critical time is *"before the sale became binding"*, and further that the information required must reasonably allow *"that particular person"* to be aware. Neither stipulation makes any sense if the particular person is to be imputed with all the knowledge apparent at time of determination (in the present case, 20-odd years after the sale from Redland to Crest).

Relation to Remediation (Crest's Primary Case)

(a) D.57

548. D.57 reads: "*reasonable that another member of the liability group should bear liability for remediation of the land*". Remediation of land, as defined in the statute, includes groundwater, so Crest must be aware of bromide in groundwater in order to be aware of the broad measure of its presence.

549. According to the EA's Decision Document[436], the objectives of remedial action include "*(b) ..improv[ing] the quality of localised areas of the aquifer further down-gradient…*"

[436] CD 8 para 201(b)

550. The "general thrust" of the remediation notice in relation to bromide, according to the EA[437], is to (i) "*throw light on factors affecting the shape, concentration and movement of the plume*"; and (ii) "*detect any changes in the plume that might threaten currently uncontaminated parts of the aquifer*".

551. Crest cannot therefore be an appropriate person in relation to bromide which had migrated away from SLC before Crest had acquired it. Redland is the only possible appropriate person for such bromide.

552. That context is important for the "broad measure" question, as Redland can only escape liability for bromide if they can show that, when Crest bought SLC in September 1983, Crest had the broad measure of bromide presence on the land.

553. This conclusion is irrespective of the provisions of D.43 of the Circular, which only applies once Test 3 is found to apply.

(b) Crest was not aware of bromide in groundwater

554. On 1 September 1983[438], Crest contracted to purchase SLC, as a result of which Crest became contractually obliged to complete the purchase – which they did on 22 September 1983[439]. Before exchange of contracts (and indeed before completion), Crest were not aware of the presence of bromide in the groundwater under SLC or of any bromide in the groundwater off the SLC site. Crest cannot have caused such bromide to enter the groundwater.

555. Nor, given the results of the investigations available to them, did Crest have any information which would reasonably allow them to be aware of such presence. This means that there is a significant proportion of the bromide now present in the groundwater down-gradient of the SLC site which, even on the EA's case, Crest cannot have had the ability or the opportunity to remove or prevent entering the groundwater and in relation to which they cannot therefore be considered a knowing permitter.

556. According to the conceptual model put forward by Crest's experts, a significant proportion of the bromide which is polluting the groundwater in the form of the "plume" down-gradient of SLC was no longer under SLC at the time of the purchase[440].

557. Therefore, a significant proportion of the bromide which may be detected at those monitoring locations off the SLC site which are identified in the remediation notice, and which will affect the future movement of the plume, does not and cannot relate to Crest's ownership of the site.

558. Hence, the information available at the time of sale did not reasonably allow Crest to be aware of the broad measure of bromide in the groundwater.

[437] EA1 para 23
[438] CD 1A p47A
[439] R2 AppxN
[440] C9 para 2.4.6

"Reasonably allow"

559. It is perfectly clear that, at the time of exchange of contracts on 1 September 1983, Crest were only aware and could only have been aware of a minute part of the contamination which subsequently became apparent. Therefore, they did not and cannot be deemed to have information which would reasonably have allowed them to be aware of the broad measure of the presence of bromide on SLC.

Test 3: Crest's secondary case

560. Given the manner in which D.57 of the statutory guidance is drafted, the case can be put in an alternative way, as canvassed by the Inspector in questions to the EA.

561. At D.57, the purpose of the "sold with information" test is given as determining whether it is "reasonable that another member of the liability group should bear liability for remediation of the land". The Inspector raised the issue that the phrase "remediation of land" does not include the remediation of controlled waters – which in this case is to take place off-site. On that basis, Crest were not aware of bromide off-site in the groundwater by time of their acquisition of SLC. It is not reasonable, therefore, that Crest should be held liable for remediation of that groundwater.

562. Given that the information was not available to them, Crest would not – even had such a thing been theoretically possible – have been in a position to negotiate a reduction in the contract price in return for taking on the risks of such contamination.

563. Hence, adopting the Inspector's canvassed construction of D.57, the effect would be that Crest should not bear the liability for remediation of the groundwater, because this liability had not been transferred from Redland to Crest by operation of Test 3.

"Sold with Information" and Apportionment in Respect of Bromate

564. As explained above, Crest neither "knew" nor "permitted" the presence of bromate in on or under the land. In any event, Crest did not have the broad measure of the presence of the bromate at the time of purchase and, given the technical nature of the liability (if proven), any apportionment of liability should be 100% to Redland as causer.

Conclusion on the Sold with Information Test

565. Crest were not aware of the broad measure of the presence of bromide, at the time of acquisition of SLC, nor did the information available reasonably allow them to be so aware.

566. Even if Crest are found to be a knowing permitter, in respect of the bromide pollutant linkage, that liability also remains with Redland. In that event, there will need to be apportionment of those liabilities between Crest and Redland under the provisions of Part 6 of the Circular's chapter D. This is addressed after consideration of the remediation notice.

REMEDIATION NOTICE

567. The EA have provided versions of the remediation notice for each permutation of liability arising out of the cases put by the parties to this Inquiry. Consideration is given here to the

EA's primary case on liability[441], then to the amendments proposed by the Water Companies and, finally, to Redland's suggested amendments.

Framework

Principles

568. According to C.17 to C.19 of the statutory guidance, the EA (or indeed any other party advancing a remediation scheme) must establish that any given remediation is (a) reasonable; and (b) provides the best combination of practicability, effectiveness and durability.

569. C.30 of the guidance indicates that, in order to be reasonable, the benefits of a remediation action must justify the costs incurred.

570. C.31 explains that the benefit of a remediation action is the contribution it makes to the reduction or mitigation of the seriousness of any pollution of controlled waters caused by the significant pollution linkage. C.41 states that the evaluation of seriousness of such pollution must include the consideration of (inter alia) C.41(c) "*(i) the nature and importance of the controlled waters; (ii) the extent of the effects of the actual or likely pollution on those controlled waters; (iii) whether such effects would be irreversible*".

571. It appears to be practically impossible to return the groundwater to the condition it was in before either bromate or bromide entered it. It follows that the purpose of the remediation actions included in the notices under discussion is that under S.78A(7)(b): *(i) ...preventing or minimizing, or remedying or mitigating the effects of...any significant pollution of controlled waters*".

Suitable for use

572. The guidance, at C.17, sets out that the remediation required should result in land being made "*suitable for use*". No remediation can be required for the purposes of making the land suitable for any use other than its current use (C.70). "Current use" is, according to A.26, "*any use which is currently being made or is likely to be made, of the land and which is consistent with any existing planning permission*." It seems self-evident that any remediation aimed at what is not a current use of the land will not be reasonable as the benefits of such remediation cannot be assessed.

573. The current use of the aquifer falls into two parts:

a) the public supply of water, by the interested water companies via their wells and treatment works, in what has been termed the "lower" part of the contaminant plume; and

b) the abstraction of groundwater by various private parties for their own use in the "upper" part.

574. There is no indication that any change to this use of the aquifer is likely. Accordingly, the appropriateness of any remediation action must be addressed separately for each part of the aquifer. This is the approach taken by the EA in version(s) B of the proposed notice, which proffers Interim Remedial Treatment Action I to scavenge pump and treat at Bishops Rise, in order to protect the abstraction points downstream from bromate pollution.

[441] CD 7A.5 & CD 7A.6

Precision and enforceability

575. Under S.78M EPA, it is a criminal offence to fail to comply with any requirements of a remediation notice, without reasonable excuse.

576. To this end, Annex 4 of the guidance (para 17) states, in reference to Regulation 4 of the 2000 Regulations: "*The overall intention is to make the notice informative and self-contained. There should be a clear indication of what is to be done; by whom; where; by when; in relation to what problem; the basis for the authority's actions; who else is involved; the rights of appeal; that a notice is suspended if there is an appeal; and other key information*".

The EA's Remediation Notices

Version 3A at tab 5: no interim treatment action

Timings

577. As canvassed during the inquiry session held to consider the wording of the notice, assessment action F1 requires the completion of a report based on the information gained from actions D, D1, D2 and D3, within 8 months of the date of the notice. However, the report required by D3 is to be reported to the EA 3 months after the approval of the EA of the proposals submitted under D3. Those proposals must be submitted within one month of the completed action in D, which itself has four months to be carried out. This makes a total of 8 months to complete action D3, without any time period provided for the EA to consider and approve the proposal made under D3.

578. Crest suggested additional wording to ensure that the APs are not held liable for any delay to the completion of the report, required under F1, due to delay by the EA in approving the proposed trial under D3. This provided that F1 be completed "*within eight months of the date of this notice* ***or within one month of the completion of the report required under D3, whichever is the later"*** .

Such agreement not to be unreasonably withheld

579. Again, this was considered during the session on the wording of the notice, along with Crest's other observations, including further suggestions for amendments to F1 to allow for site investigations arising from Actions A and B in Version B[442].

Version 3B[443]: Interim Treatment Action of Continued Pumping at Bishops Rise

580. In relation to remedial treatment action I, Crest does not contest the practicability, effectiveness and durability of scavenge pumping at Bishops Rise, in order to mitigate the effects of bromate in the groundwater.

Precision

581. As stated to the Inspector, during the session, interim remedial treatment action I as proposed in version B of the notice is not precise enough to be enforceable.

[442] CD 7.1b(10)
[443] CD 7A.6

582. The water companies envisage that the APs "*procure*" the continuation of scavenge pumping. TVW's evidence was that it is practically and legally unfeasible for any AP to carry out remediation by way of scavenge pumping at Bishops Rise itself, and that TVW would therefore carry out scavenge pumping on its behalf. That evidence is not challenged. (Nevertheless it should be noted that the wording of the notice is that the APs themselves "implement" the final remediation programme). The precise nature of the abstraction rates depends on operational constraints, as is contemplated in paragraph I(a)(i) of the notice. Equally, the nature and the extent of the ferrous chloride dosing and (potentially) the sampling will be at the discretion of TVW.

583. S.78E(1) EPA provides that the enforcing authority "*shall…serve on each person who is an appropriate person a notice specifying what that person is to do by way of remediation and the periods within which he is required to do each of the things so specified*." S.78G(1) permits a remediation notice to require an AP to "*do things by way of remediation, notwithstanding that he is not entitled to do those things*" and S.78G(2) requires "*any person whose consent is required before anything required by a remediation notice may be done shall grant … such rights … as will enable the AP to comply with any requirements imposed by the notice*".

584. It is clear from the scheme envisaged by the section that it is the AP who is to carry out the remediation, and that third parties are to enable it to do so. This does not, of course, preclude an AP from discharging its obligations by means of an agent or employee, and hence to that extent Crest accept that a notice may order works to be procured by others. However, if a notice of that type is under consideration, it must still have the precision which it would require if those works were ordered directly against the AP.

585. The difficulty with the notice at I (and indeed with the water companies' version) is that it fails to specify sufficiently precisely the terms of the actions to be carried out by TVW on the AP's behalf. This lack of precision is inevitable, given TVW's other constraints on defining their actions; but that does not mean that the notice has sufficient precision to be a valid notice. The notice does not specify what the water companies are to do, by way of enabling the APs to procure their obligations, with sufficient precision, but leaves the timings of sampling and pumping, and abstraction rates, up to the water companies.

"Solely attributable" in I(b)(i)1

586. This was canvassed at the session on the notice. Crest is content with this wording, which requires the water companies to establish that the costs for which they claim are attributable to the pumping and treatment in question.

The Water Companies' proposed amendments: Remedial Treatment Action J: the Required Concentration Standards

Appropriateness of the Proposed Standards

587. C.67 of the guidance sets out that a remedial treatment action should be required where it is *necessary* to achieve the standard of remediation set out, but for *no other purpose*. Any other approach means that the notice must fail as unreasonable under C.19(a).

588. The water companies and the EA claim that the levels of contaminants in the groundwater which would render it suitable for use are 5 ug/l for bromate and 500 ug/l for bromide.

Crest do not contest the standard for bromate, of 5 ug/l. They do, however, contest the appropriateness of the 500 ug/l bromide standard across the upper aquifer.

589. This 500 ug/l standard is based on the possibility that waters containing that concentration of bromide might lead to the creation of THMs (trihalomethanes) in water treatment processes at TVW's Essendon and North Mymms WTWs. There is an absolute standard for THMs in drinking water of 100 ug/l. The 500 ug/l standard for bromide is claimed to be on the basis of "*the precautionary principle*"[444] and on the basis of an incident where 700 ug/l of bromide at TW's WWTW corresponded with THM formation in Essex and Suffolk. However, the precautionary principle alleged has not been related to any concrete information regarding the aquifer and the use made of the groundwater at the treatment works or abstraction points with which this inquiry is concerned.

590. No sensible assessment of the benefits of attempting to reduce bromide concentrations in the aquifer can be made until more information is available regarding the true risk of THM formation at the particular places affected by the bromide plume. Witnesses for TW and Crest agreed that the formation of THMs is an exceedingly complex question. The evidence shows that bromide levels at Tyttenhanger and Bishops Rise have on several occasions exceeded 500 ug/l, with THMs never reaching a level anywhere near the 100 µg/l threshold at North Mymms. Moreover, TVW explained that when water from Tyttenhanger was being pumped directly to supply, and treated with GAC and chlorination, levels of over 500 ug/l[445] were reached due to bromides coming from landfill, with total THMs never reaching much above 10 ug/l[446] – i.e., no more than 10% of the THM standard of 100 ug/l.

591. In any event, the only place at which there has been a regular exceedance of the 500 ug/l standard suggested is at Nashes Farm. There is no intention, on the part of the water companies, to use any part of the aquifer above Bishops Rise for public supply. Accordingly, even if a bromide standard of 500 ug/l were appropriate for the lower part of the aquifer, it is unnecessary for such a standard to be imposed on the abstraction points in the upper part of the aquifer. The notice proposed by the water companies therefore fails as being unreasonable.

Achieving the Required Concentration Standards by 23 October 2015

592. A remediation notice should not require that the APs "*ensure*" the achievement of the required concentration standards for bromate and bromide. It is accepted that the standard for bromate may be achievable at the NNR wells, but it cannot be stated that it is achievable in TVW's wells by 2015. As Crest's evidence points out, more invasive investigation is needed in the form of the drilling of pilot boreholes to ascertain, amongst other things, whether the yield of water and contaminants from a borehole upgradient of Bishops Rise will be able to deliver such a reduction in the contaminant load. TVW could offer no data to support the contention that such a standard could be reached and, under cross-examination, their witness agreed that it is impossible to tell whether or not achievement of the standard can be guaranteed until more investigation, including drilling, has been done.

[444] CD 1B p628
[445] C1 p43
[446] TVW45 Fig 9 p11

593. There is, therefore, no basis on which the practicability, effectiveness and durability of scavenge pumping, aimed at achieving the bromide standard, may be assessed on the information that is available.

594. Moreover, the "suitable for use" approach means, according to para 10(c) of Annex 1 to the Circular, that "*any attempt to guess what might be needed at some time in the future for other uses is likely to result either in premature work (thereby risking distorting social, economic and environmental priorities) or in unnecessary work (thereby wasting resources)*".

595. In the circumstances, the requirement to achieve 500 ug/l bromide, by 2015, is unreasonable.

Redland's proposed amendments

12-month interim treatment action

596. Crest accept the practicability, effectiveness and durability of scavenge pumping at Bishops Rise, in order to remediate the effects of the bromate plume. Interim remediation treatment I is addressed to the bromate pollution linkage alone. Accordingly, Redland's proposed 12-month delay is not necessary.

REMEDIATION: APPORTIONMENT

Principles

597. Crest's case on apportionment remains the same whether the notice includes pumping at Bishop's Rise or not: that is, whether it is version A or B.

Apportionment of Responsibility between Liability Groups

598. Notices 1, 2, 3 and 4 address the case where only one AP is held liable for any one SPL, and so where apportionment must be made between two separate liability groups.

599. Part 9 of the Circular gives guidance on the attribution of responsibility between liability groups.

Remedial Treatment Action F2 of Notice 3A: Implementing the Best Practicable Technique (BPT)

600. This is a shared collective action and, as D.100 provides, liability for shared collective actions should *not* be attributed equally. Rather, the EA must estimate the hypothetical cost for each action which would be necessary under each of the SPLs, and attribute responsibility accordingly.

601. The costs of whatever action is found to be Best Practicable Technique (BPT) can be apportioned based on the findings of F1, D, D1, D2, D3 and E. It is not necessarily the case that the BPT will be the same for each SPL; it may be, for example, that monitored natural attenuation will be found to be the BPT in relation to bromide. This means that F2 will not necessarily be a shared action at all. It would, therefore, not only be outwith the scope of the guidance, but also inequitable for the party responsible for bromide to be held liable for 50% of the total cost of what may turn out to be two actions. If F2 is not to be split into two

actions, the implementation of any scheme found under F1 will necessitate the EA carrying out the apportionment exercise under cover of a new notice.

602. D.76 does not assist the EA, even by analogy. The point is that appropriate information is likely to be available once assessment action F1 has been completed.

Apportionment between members of any single Class A liability group

603. If both Crest and Redland are held liable for any one SPL, the principles set out in Part 6 of chapter D of the guidance apply. This applies to Notices 5, 6, 7, 8 and 9.

Relative responsibility

604. D.75 provides that liability for costs, between members of a Class A liability group, should be apportioned "*to reflect the relative responsibility of each of those members for creating or continuing the risk*" now caused by the SPL.

605. As submitted by the EA, D.76 provides that if sufficient information is not available to enable the Agency to make such an assessment, or such information cannot reasonably be obtained, the authority should apportion liability in equal shares.

Specific approaches

606. However, the EA should not stop there. There is specific guidance on how to approach each of the possible configurations of liability suggested by the EA's various notices. These include, as set out in the guidance:

(a) The entry of a substance vs. its continued presence

607. D.78 sets out the relative responsibility of a causer and a knowing permitter. The extent to which someone had a reasonable opportunity to "*deal with the presence of the pollutant in question*" must be considered. Even if Crest are found to have been a knowing permitter in relation to bromide, by reason of not having carried out scavenge pumping and/or removed more soil, their responsibility relative to that of Redland must be substantially reduced given the very limited, risky and contingent opportunity they had to deal with the presence of contaminants by means of either scavenge pumping or soil removal.

(b) Quantities of contaminants

608. Moreover, D.84(a) applies. It is clear that Redland, as well as causing the entry of contaminants at SLC, knowingly permitted their presence at SLC. Accordingly, wherever Crest and Redland are held jointly liable for a single SPL, the notice should apportion responsibility for that SPL in proportion to the length of time during which each AP controlled the site; that is, a ratio of 4 years of Crest's ownership/occupation and 28 years of Redland's ownership, or a ratio of 1:7, or roughly 15% to 85%.

Other Issues

609. Notice 6 applies if Redland are liable for bromate, but both Redland and Crest are liable for bromide.

610. If a proportion of the bromide does derive from bromate then, by virtue of S.78F(9) EPA, Redland are responsible for that proportion as a further consequence of their liability as the only member of the bromate liability group.

611. S.78F(9) reads: "*A person who has caused or knowingly permitted any substance ("substance A") to be in, on or under any land shall also be taken for the purposes of this section to have caused or knowingly permitted there to be in, on or under that land any substance which is there as a result of a chemical reaction or biological process affecting substance A.*"

612. Redland must remain liable for a proportion of the bromide currently identified both off- and on-site. This is because, in the view of Crest's expert witness, it derives from bromate via the chemical process known as reduction[447].

613. In evidence to the inquiry, Crest's witness accepted that the process was not significant if his views on the amount of organic material at site were correct, but pointed out that on the EA/Redland case this would probably have given rise to a proportion of the bromide deriving from bromate.

614. In other words, Redland is responsible for some of the bromide in the soil as a further consequence of their liability as the only member of the bromate liability group. This has been taken into account in assessment action D2, which excludes from the assessment action such bromide as results from the reduction of bromate.

615. It should be recalled that the guidance (D.101-102) allows for an adjustment mechanism if it seems that a liability group would have to bear a liability which is so disproportionate as to make the attribution of liability between the groups unjust, when considered as a whole. This is because the aim of the apportionment of liability is to achieve an attribution of liability which is "just and fair in all the circumstances".

616. It is not possible to ascertain the proportion of bromide which derives from bromate. D.76 should therefore apply. (This is what the EA have done, inappropriately, in the case of action F2.) Responsibility for bromide in the soil should be apportioned equally between Crest and Redland. This means that 50% of the portion of the shared common action, which applies to bromide, must also apply to Redland; in other words, Redland must bear 75% of the cost of action A in notice 6A or notice 6B.

617. The same considerations apply under action B; a proportion of the bromide now in the groundwater will have derived from bromate reduction in the soil at SLC. 50% of the proportion of this shared common action, which is attributable to bromide, should be borne by Redland. This means that Redland is liable for 75% of the cost of action B in notice 6A or 6B.

<u>The Notices</u>

618. The apportionment of liability for each action proposed by the EA is set out in tables[448] which show those parts where Crest differ from the apportionment contended for by the EA. All percentages have been rounded to the nearest 5%.

[447] C1 section 9
[448] CS4A

CONCLUSION

619. The maxim "polluter pays" was much used during the inquiry. Standing back from the long and tangled half-century of events affecting SLC, it is plain who the polluter is – Redland. Of course Crest accept that the "knowing permitter" has its role, and an important role it is, in the contaminated land regime. However, in the absence of clear evidence of responsibility (both in terms of the nature of Crest's conduct and in terms of identifying any causative effect of that conduct), the finding of knowing permitter should not be made against Crest.

620. Nor is Crest the causer in respect of the bromide or bromate SPLs.

The Case for Redland

The material points are as follows

LIABILITY FOR THE BROMIDE SPL

Redland as a Class A Appropriate Person for the Bromide SPL

621. Redland accept that, as the company (under former names) that carried out the industrial processes at St Leonard's Court (SLC), which have led to the identified bromate and bromide contamination, it is properly identified as a Class A appropriate person (AP) for each of the two significant pollutant linkages.

Crest as a Class A Appropriate Person

622. Crest's liability is as follows:

a) Crest are properly to be identified as a Class A appropriate person for the bromide SPL.

b) Crest knowingly permitted the bromide to be on the land.

c) Crest knowingly permitted the bromide to be on the land, because they knew of the bromide and had the power to remove it.

d) Alternatively, Crest did not do all that could reasonably be done to avoid bromide being on the land.

e) Alternatively, Crest caused the contamination.

Knowledge

623. Crest accept that they knew bromide was in the land[449]. They were aware of the bromide on the land in the light of the history of the uses which had previously been undertaken on the site and given the contents of numerous reports indicating elevated levels of bromide.

624. Crest's suggestion that they did not know about the existence of bromide in the groundwater, until after purchase of the land[450], is irrelevant to the knowing permitter issue.

[449] OS4 para 9
[450] OS4 paras 10-11

"Permitting"

The Meaning of "Permitting" in the Context of the Contaminated Land Legislation

625. The contaminated land legislation is, of course, a new form of environmental legislation. It retrospectively fixes persons with liability for the existence of contamination on their land during their ownership, whenever that was.

626. There is no time limit as to how far back persons may be ascribed with liability. In such circumstances, a potential AP may not have any knowledge that the substance in question was a contaminative substance and, critically, they may not know that there was anything that was required to be done about the substance at the time.

627. If, for example, land contained either asbestos or phthalates which were not thought to be contaminative at the time, then the potential AP may not, indeed probably would not, have thought it necessary to do anything about the substances. It may, in those circumstances, have been perfectly reasonable to do nothing about the substances. The point, in short, is that what is to be regarded as reasonable – if that is a criterion which can be applied in this case – is necessarily determined according to the perceived harmfulness of the substance at the time.

628. This is the crux of Crest's case on knowing permission. Crest's position is that they did what was required of them in the circumstances and in the light of the significance of the contaminant in question; as they say[451]: "*The remediation scheme Crest put in place ... must be judged by the standards of the times, and against the knowledge which Crest obtained as to the significance or otherwise of the contamination left in situ*".

629. Redland believe that Crest acted unreasonably in the present case, even if the significance was not appreciated. However, as a matter of principle, such an approach, if correct, would largely neuter the contaminated land legislation in respect of pollutants the significance of which at the time was unknown, or of pollutants, which, at the time, were largely dealt with, kept or disposed of in a particular way which was usual, but ultimately harmful to the environment; that would always, according to Crest's case, be a potentially reasonable action in respect of knowing permission.

630. That such an approach is wrong is confirmed by the judgment of Newman J in *Circular Facilities (London) Limited v Sevenoaks District Council [2005] EWHC 865*[452]. At paragraph 41, Newman J recorded the argument of the appellant that "*the court should not construe the section, in particular S.78F subsection (9), as rendering a person liable as having knowingly permitted a substance to be on the land, if the relevant person is not aware of the possibility that a chemical reaction or process could lead to the land being contaminated. He submits there must be some knowledge of the potential harm which the presence of the substance in the soil could give rise*".

631. Newman J's response to this was:

"In my judgment this argument simply cannot stand in the face of the express terms of subsection (9) of S.79F. By the terms of the section, a person needs only to have knowledge of

[451] OS4 para 22(1)
[452] CS5A p30

a substance (in this case organic material) and the statute provides that in that event, having knowingly permitted that substance, referred to as "substance A", to be in, on or under the land that person:

... shall also be taken for the purposes of this section to have caused or knowingly permitted there to be in, on or under that land any substance which is there as a result of a chemical reaction or biological process affecting substance A.

In my judgment there is no basis for limiting the ambit of the section to exclude responsibility to those who do not know of the potentiality for the chemical reaction or biological process which can affect substance A. The knowledge of the substance is taken to be the knowledge of the substance generated by the process.

632. Newman J's rejection of the argument, that a lack of knowledge of the potential harm of a contaminant which may change in the soil by reaction is an excuse for liability, applies necessarily to a contaminant which does not change in the soil, but whose harmfulness is not known.

633. If, therefore, knowledge of the harm of the substance cannot be taken into account in determining whether someone is a knowing permitter, it is difficult to see how there can be room for an argument that someone has acted reasonably given the circumstances of the time. To do so, would necessarily be looked at (as Crest do) in the context of the harm or significance of the substances in question.

634. The test of knowing permission set out in Annex 2 to the Circular is clear. The government has been specific as to what it considers should be the appropriate test. This is set out in paragraph 9.10 of the Annex, namely "*Knowledge that the substances in question were in, on or under the land and the possession of the power to prevent such a substance being there*".

635. This test is expanded upon in paragraph 9.11, where it is stated that "*the test would be met only where the person had the ability to take steps to prevent or remove that presence and had a reasonable opportunity to do so*".

636. These tests amount, essentially, to the same thing. The phrase "reasonable opportunity" refers to the reasonableness of the opportunity to do something about the contamination; essentially it is pointing to the power to do something about the contamination. Was there, in short, a reasonable opportunity (or ability) to do something about the contamination? Crest are wrong in their analysis that this should be regarded as recognition that the reasonableness of the appropriate person's actions can be taken into account.

637. While it is right that reference can be made to case law to inform the meaning of "knowingly permit" (Annex 2 para. 9.15), the Circular does not endorse an approach which simply applies the previous case law. Primarily, a decision as to the meaning of "knowing permission" is for the courts, taking into account the purpose of this legislation. The approach taken by Redland is in accord with the statute's retrospective purpose. The critical distinction between Part IIA of the EPA 1990, and other parts of the law which use the phrase "knowingly permit", is that these other parts do not apply liability retrospectively.

638. Crest seek to meet these points by raising several arguments.

639. They suggest that, if the test was only whether the potential AP has the knowledge and power to do something about the contamination, this would mean that, in the present case, Beechgrove could be liable as a knowing permitter[453]. That is a bad point. It is predicated on the basis that Beechgrove "*learnt about the presence of the contamination and had the time to do something about it*". However, this approach noticeably ignores the question of whether Beechgrove had the power to do something about the contamination, given that the site had been built upon by the time they were involved with the land. In any event, Beechgrove *may* have been potentially liable as a knowing permitter if they were able to do something about the contamination. This does not mean that there is anything incorrect about Redland's approach to the legislation.

640. Crest suggest[454] that Redland's interpretation of the phrase "knowingly permit" is wrong, because it leaves the permitter in an impossible position in the future. It is suggested that the appropriate person does not know whether to entirely clean up the site, in order to avoid a potential future liability. This is an unrealistic and exaggerated suggestion; if the site is remediated, so that it is suitable for use, this is likely to deal with the contamination. There is no real likelihood of the contamination becoming an issue in the future. If, by chance, it is discovered in the future that the contamination still presents a pollution risk, or that there is a previously unforeseen risk presented by a contamination not considered as a risk at the time of the remediation, then there may be a potential liability; that is the nature of retrospective legislation.

641. A further indicator as to why reasonableness should not be capable of being used as an excuse to liability, as a knowing permitter, is in the Circular's approach to Class B appropriate persons. The legislation fixes owners and occupiers with liability in the event that a Class A person cannot be found. These Class B persons do not have any "reasonableness" defence as a Class B AP. It would seem strange if the legislation sought to primarily fix responsibility on those who caused and knowingly permitted the contamination as Class A appropriate persons, but allowed some of this group – the knowing permitters – to have a defence based on reasonableness which was not open to owners and occupiers of the land.

642. Crest cannot excuse themselves from liability on the basis that they acted reasonably. The guidance makes plain that it is power and knowledge which fix the potential appropriate person with liability.

<u>Crest As a Knowing Permitter of the Bromide SPL Applying the Meaning Put Forward by Redland</u>

643. If Redland are correct about the test to be applied in determining Crest's status as a knowing permitter, then Crest are plainly liable. Indeed, it does not seem that Crest really dispute that proposition.

644. As to Crest's knowledge, as indicated above, they accept that they had the requisite knowledge of bromide.

[453] OS4 para 15
[454] OS4 paras 19-20

645. The primary question is whether, in respect of any the matters that could have been done to achieve remediation, Crest had the power to undertake them. Quite plainly they did, and it seems Crest do not dispute that that is so either.

Scavenge Pumping

646. Firstly, Crest accepted in cross-examination that it was possible to undertake scavenge pumping on the site and that this could have assisted in remediation. In those circumstances, there was more that Crest could have done to deal with the contamination.

647. Secondly, in any event, it was within Crest's power to undertake scavenge pumping. There can be little dispute about this issue. Crest had already sunk one borehole off-site, albeit a monitoring borehole[455]. It was possible, therefore, for Crest to have obtained a borehole. Crest also had the financial means to undertake this, as their expert witness agreed.

648. Crest suggested that there would be difficulties in obtaining the agreement of a third party, since this would mean bringing contamination onto their land. As Crest accepted, however, the borehole would be located in a place where contamination existed anyway. In truth, therefore, it is unlikely that there would have been any real difficulty with siting an off-site borehole. The only issue would have been one of cost (which would not have been an issue for Crest). While Redland pointed out that any company in the position of Crest would have resisted siting a borehole, such resistance would have been unreasonable given that there were no overriding difficulties to overcome.

Soil Removal

649. Crest do not, through their experts, suggest that further removal of contaminated soil could not have been undertaken. As one of their witnesses accepted, it was possible to remove more contaminated soil from the site during Crest's operations in 1985 – 1986. This could have been done, quite simply, with a JCB.

650. Although that witness suggested, in written evidence, that the removal of material down to the putty chalk would have led to the removal of a barrier, which protected the blocky chalk below, he pointed out that the putty chalk was about 4 metres thick and that a barrier of only 2 metres would be required. In those circumstances, significant amounts of putty chalk could have been removed without producing problems for the chalk below; the appropriate amounts could have been determined by on-site investigations, as Redland's witness explained. Even if flooding were to present an issue, this could have been prevented by control of the water table, the removal of the soil and the use of replacement material. As to the supposed issues surrounding the water table, Crest accepted in cross-examination that this could have been controlled by normal and well-known (in the 1980s) engineering means.

651. One of the most significant indications that more could have been done to remove soil on the site is that more was done at the locations of the two former sumps, as JT confirmed. It is difficult to suggest that it was not technically possible to remove the soil down to and including the putty chalk, if, as was the case, that had already been done on parts of the site.

[455] CD2A.17

652. Crest may suggest that the EA have not said how much should be removed from the land. That, with respect, misses the point. The issue is whether the bromide contamination could have been meaningfully reduced by Crest. If that was possible, the fact that more or less could have been removed is of little relevance unless it was de minimis, but this has not been suggested. It was quite plain, in the light of their own evidence, that Crest could have removed significant amounts of contamination. For the same reasons, little weight should be placed on the criticisms by Crest of Mr Roberts' analysis (albeit that this point is primarily left to the EA).

653. Finally, it is necessary to deal with Crest's suggestion that there was no point in removing only gravel, given that this soil type contained limited contamination. First, in the light of the above, it was perfectly possible to remove further soil from the land below the gravel. Second, the gravel was contaminated; it contained bromide which, as part of the remaining soil, together led to the land being contaminated land. Background levels of bromide, as reported by Crest[456], are generally lower than the levels identified in the STATs August 1983 results and the STATs December 1983 report worked on the assumption[457] that levels three or four times over background indicated that the gravel was contaminated. It was the bromide in the gravel, as much as any other bromide contamination in other parts of the land, which led to the land being identified as contaminated land. In those circumstances, it would have been just as useful to remove this soil. It would have had the effect of meaningfully reducing the contamination.

Hardstanding and Building Removal

654. The simple point regarding Crest's behaviour, in relation to the bromide linkage, is that they failed to keep the hardstanding and buildings in place and, thereby, exacerbated the levels of bromide which were in the land (and which led to its identification as contaminated land). Quite clearly it was open to Crest, as the site owner, to keep the buildings and hardstanding on the land.

655. There is an added failing in Crest's conduct at this time; having demolished the buildings and hardstanding, Crest then left the site in that state for some 2 years, a significant amount of time. Crest obviously had the power to keep these buildings and hardstanding on the site and a reasonable opportunity to do so.

Putting in a Barrier and Subsequent Building Design

656. Crest admit that they failed to construct a barrier in the soil as required under the building regulations approval. Had this been undertaken, it would have reduced the amount of contamination which would have leached through the soil.

657. In the same way, Crest's development contained a significant proportion of open areas; this led to greater migration of contamination to the groundwater than would otherwise have occurred.

[456] C1 paras 3.8.2(b), 3.9.5 and 3.9.6
[457] CD 2A p54

Summary

658. From the above, it is quite clear that Crest had the ability to deal with the contamination in a number of ways and that they failed to do so. Given their knowledge of the bromide, Crest should be regarded as having knowingly permitted the contamination.

Crest As a Knowing Permitter of the Bromide SPL Applying the Meaning Put Forward by Crest

659. If Crest's submission, as to the relevance of the reasonableness of their actions is accepted by the SoS, then they are right as to the test which must be met. They must establish, not simply that they acted reasonably, but that they "did all that they reasonably could have done"[458] to prevent the bromide being in on or under the land. That is a high test.

660. The question of reasonableness must be considered in totality; it is not enough for Crest to say that they did all that was reasonable in respect of one or, indeed, more remediation techniques. The question is whether each element of Crest's action or inaction, which would otherwise have amounted to knowing permission, is excused. If there are any techniques which could reasonably have been undertaken or reasonably avoided, and failure to do so would have maintained the bromide on the land, then Crest's behaviour cannot be regarded as the most that could reasonably have been done.

661. In fact, Crest undertook several actions which did not accord with objective good practice at the time and which would, had they been avoided, have prevented some of the contamination being on the land; these matters exacerbated the contamination problems.

662. In short, Redland say that Crest did not act reasonably because:

a) They should have removed a greater amount of contaminated soil from the land than they did;

b) They failed to scavenge pump either on or off-site;

c) They removed buildings and hardstanding between March and April 1984, leaving the site open for some 2 years;

d) The failure to put barriers in the land, as part of the development, further exacerbated this; and

e) They failed to monitor groundwater pollution after completing the development of SLC.

663. In addressing these points, Redland largely follow the EA's analysis of Crest's behaviour. Before dealing with Crest's contentions, some preliminary observations need to be made.

664. First, although details are considered when covering each of the substantive issues, as a generality many of Crest's assertions about the reasonableness of their conduct have derived from supposition and inference as to what the course of events at the time was. This is done in spite of the fact that the inquiry has learnt that one of the directors who had clear dealings with the site at the time, Mr Calcutt, is still with the company and could have been called as a witness; indeed, as Crest's witness (BM) confirmed in cross-examination, Mr Calcutt attended meetings to deal with the preparation of Crest's case. Crest's failure to call him as a witness means that Crest have not used the best evidence available to them.

[458] OS4 para 22

Their inferences and suppositions should, consequently, be treated with considerable caution.

665. This concern is strengthened by the fact, which emerged in cross-examination of Crest's witness (BM), that Crest's solicitors have compiled a "data room" from which documents have emerged throughout the inquiry process; for example the Vintec Reports, first contained in the legal submission of Crest[459], were later added to by an earlier Vintec report[460], and the witness indicated (under cross-examination by the EA) that there were further documents in the data room which had not been disclosed to the inquiry. Further, Crest have made no statement, as a result of these points, to reassure the inquiry that all relevant documentation has been disclosed.

666. In the light of the above, the following matters are relevant to the issue of reasonableness.

Soil Removal

667. Essentially, Crest suggest that the most significant contamination was in the upper layers of the soil strata, that this was removed and that it was not appropriate, in the light of the regulatory authorities' approaches to removal, to go further.

668. As to the technical ability to carry out the removal of soil to greater depths than occurred, it cannot be sensibly argued (at least on the basis of Crest's own evidence under cross-examination) that it was not possible to remove further contamination down to the putty chalk.

669. Turning to the contention that the most significant layers of contaminated soil were removed, Crest's case is largely based upon the fact that they did remove what they say were large amounts of contamination. In spite, however, of the attempts by their witness (BM) to assess what was taken from the land, his analysis is based largely upon suppositions, some of which, on further analysis, are highly suspect.

670. Two of the most significant are these. First, he supposed that the documents, which indicated that some particular removal was carried out, did in fact reflect the reality. He relied on the draft statement of quality dated November 1986[461] which indicated that, whilst contamination would continue to persist in the underlying geology, additional excavation was carried out at the surface where greater levels of contamination were found (i.e. above 300 mg/kg). However, this statement was never made public and remained in draft. It is notable that, when dealing with the excavation (p388), it said that "Excavation commenced on 19 July 1986 and m^3 was removed". The figure was never given. It is also pertinent to note that the report indicated that monitoring of the off-site effect of the contamination was continuing and would be subject to reports (p390). In fact, as was clear from JT's letters of 19 November 1986 and 26 March 1987[462], this was not happening. In short, things were professed to have happened in that document which patently did not; limited weight should therefore be put on it. The statement of quality which did go into the public arena[463] indicated only the removal of 1 metre from the site, not the deeper areas of

[459] CD 5.4 p393
[460] C7 Appx 7
[461] CD 5.4 p386-391
[462] CD 1A p206 & 209
[463] CD 2A.19

excavation identified in the draft statement of quality. There is, therefore, some significant doubt as to whether the removal in locations, where bromide concentrations were greater than 300 mg/kg, was carried out. There was an indication only that ad hoc removal of high levels would be carried out. Although a letter dated 17 September 1986[464] suggests that some works were carried out, it is not indicated at how many locations this was carried out, or at what depth.

671. The analysis[465] by that witness also relies upon the supposition that the removal was of contaminated soil, as opposed to fill from the demolished buildings and hardstanding. However Redland's witness demonstrated (in re-examination), by comparison with a number of the boreholes in the (March 1985) post-demolition Chemfix report[466], that there were greater levels of fill than shown by pre-demolition boreholes in the same locations[467]; this is particularly clear when Chemfix boreholes 16, 46 and 28 are compared with their counterparts TP5, TP10 and BH5 in the November 1983 STATs Report. This is reasonably conclusive evidence that, of the 1 metre that was said to have been removed, a considerable proportion was fill. This conclusion is strengthened by the on-site observations of M-Scan on 9 May 1984[468] and 11 September 1984[469] and then Chemfix in February and March 1985[470].

672. Consequently, Crest's assertion that they took out what they considered to be the most significant areas of contamination is not, actually, established.

673. In any event, even if Crest's case on the amount of fill they removed is accepted, it is wrong to suggest that they took the contamination from the most significant locations. The assertion largely relies upon the fact that the site was covered with a layer of clay, in accordance with their witnesses' "conceptual model". This "model" was largely discredited at the inquiry; the site is made up of varying layers and disparate soil types, that do not fit the neat categorisations of "clay" and "gravel". Consequently, significant contamination was contained in the putty chalk. There was no reason not to go into the putty chalk below the gravel and/or clay. Had Crest undertaken a full analysis of the site, rather than the ad hoc approach assumed to have been taken according to the draft statement of quality, they could quite easily have established the levels of putty chalk and removed appropriate amounts without presenting any problems to the blocky chalk below. They patently failed to do that.

674. The reason why Crest failed to undertake such a scheme is reasonably plain. Their purpose, as is apparent from their (17 September 1986) letter to SADC[471] and (30 October 1986) letter to TWA[472], was to do only so much as they needed to get the sign-off from these authorities. In short, Crest did not undertake a comprehensive and in-depth decontamination, but did the minimum possible.

[464] CD 1A p154
[465] C2.15
[466] CD 2A.16
[467] C2.3
[468] CD 2A.10 p166
[469] CD 2A.11 p181
[470] CD 2A.13 p201
[471] CD 1A p154
[472] CD 1A p199

675. Crest will no doubt seek to suggest that this approach was enough to render their actions reasonable; that all they were required to do was get the authorities' acceptance. Such a contention fails on the facts.

676. First, SADC's attention was not on groundwater contamination but was concerned, primarily, with the occupation of the site by future users; this is apparent from correspondence[473] and from their acceptance that contaminated soil could be used as back fill[474]. That, indeed was the approval sought by Crest ("*we seek your approval that this phase of the redevelopment of the site is satisfactory and safe for future workers and inhabitants*"[475]. Given that this was the Council's primary concern, it is insufficient to rely upon their approval, to justify the reasonableness of Crest's actions in relation to the contamination in question, namely, pollution of the aquifer.

677. Crest sought to rely upon the fact that SADC had approved their overall strategy for the site. Again, reliance was placed upon the draft **s**tatement of quality, dated November 1986, but it is clear that this was not seen by SADC. The only statement of quality they or their advisers had was that dated June 1985; this is clear from the Butterworth letter dated 18 August 1986[476]. This statement indicates that little was to be done by way of remediation of the aquifer. Again, the focus of the document was primarily on ensuring the safety of the site for occupiers. To the extent that SADC were concerned with anything else, this was primarily in the context of private well drinking water quality[477], not remediation of the aquifer.

678. In summary, the fact that SADC had agreed to Crest's actions cannot establish the reasonableness of their actions in relation to the contamination at issue.

679. Turning to TWA, it is plain that Crest did not obtain the Authority's endorsement. The reply[478] of JT, to the Chemfix letter of 30 October 1986, quite clearly did not amount to an acceptance of Chemfix's actions. As regards the soil taken from the land, JT said "*it is difficult to judge how significant the removal undertaken is without some indication of the levels of contamination which still remain on the site. I do not know how the areas in which the removal has taken place tie up with the areas of marked contamination identified in the site investigation*". It is noticeable that there was no reply to this point. The inference can be drawn that, when it was clear that no endorsement would be forthcoming, Crest took the matter no further. That is perhaps why no monitoring was later undertaken either.

680. Another indication as to why TWA were guarded in their response derives from RF's (4 December 1984) view[479] that he "*thought it would be wise to excavate virtually down to the chalk surface in the most contaminated areas, i.e. most of the area marked red on the STATs plan*[480]"; there is no evidence that this occurred.

[473] CD 1A p176
[474] CD 1A p152
[475] CD 1A p154
[476] CD 1A p150
[477] CD 1A p206
[478] CD 1A p206
[479] CD 1A p91
[480] CD 2A p304

681. Consequently, Crest neither undertook a comprehensive removal of the contamination, nor obtained the relevant endorsement of the regulatory authorities. Their actions cannot, in those circumstances, be regarded as reasonable.

Scavenge Pumping

682. Essentially, Crest suggest that they did not put in scavenge pumping because it was never actually sought by the authorities and was not a reasonable activity to undertake in any event.

683. As for the question of the reasonableness of undertaking scavenge pumping, on or off-site, there were no overriding reasons not to undertake it. The technology was known at the time and, as Redland have pointed out, it was also used at the time. One 1985 textbook (Groundwater Pollution Control)[481] states: "*The use of well systems is presently, and probably will continue to be, the most utilized method of ground water pollution control. This is not without good reason*". The same assessment was reached by JT. The fact that it was a known and used technology, which had the potential to be beneficial, was also acknowledged by another firm of consultants, Bostock Hill and Rigby, who, in their letter dated 15 August 1985[482] "endorsed" TWA's suggestion of a groundwater scavenging scheme.

684. There is no evidence that Crest sought to investigate the possibility of scavenge pumping, whether on or off-site, in any meaningful way. In reality, it must be accepted that Crest did not undertake any such investigations. There is no indication, for example, that they were unable to obtain a location off-site.

685. Rather, what Crest seek to do is suggest that TWA never asked for scavenge pumping and that, consequently, it was reasonable for Crest not to carry it out. This is a matter that is primarily for the EA, given JT's knowledge of the time. However, it is clear from JT's evidence to the inquiry that there was an attempt to persuade Crest to undertake scavenge pumping but, on the face of it, a refusal by Crest to undertake it. It is to be noted that Crest's expert witness accepted that JT was best placed to give evidence on this issue, given her contemporaneous knowledge.

686. TWA's suggestion of scavenging was made in August 1984[483] and advocated thereafter[484]. The response of Crest's advisers was, at best, non-committal: "*If groundwater scavenging is used, discharge to sewer could provide a useful disposal route for polluted water*". Scavenging was still what TWA primarily wanted in June 1985[485], but it is clear that at that stage, Crest were not going to carry it out.

687. It is also noticeable that in this June 1985 letter, their last that deals with scavenge pumping, TWA indicated that continuous monitoring should be carried out if scavenge pumping was not to be adopted. Crest did not carry it out.

[481] R2 p370
[482] CD 1A p117
[483] CD 1A p71
[484] CD 1A p91
[485] CD 1A p104

688. In summary, Crest's case that they did all that was reasonably possible in respect of scavenge pumping is wrong. They rejected the requests for scavenge pumping. It was a reasonable option and should have been undertaken.

Crest failed to monitor groundwater pollution after completing the development of SLC.

689. TWA sought a period of monitoring, for at least 2 years, following the completion of redevelopment[486]. In their (November 1986) draft Statement of Quality[487], Crest said they would continue monitoring and (in March 1987) TWA chased Chemfix for the results[488], but there is no evidence of any reply.

The Removal of buildings and hardstanding between March and April 1984

690. As Crest accepted, under cross-examination, the reasonableness of their approach towards the buildings and the hardstanding on the site is determined, in part, by whether they were aware of the potential effect of that approach.

691. As they also accepted, Crest were aware of the effect of removing the hardstanding and buildings, given the contents of the Chemfix report in February 1984[489]. Noticeably, this was entitled: "*An initial assessment of site hydrogeology and possible routes of migration of soil contaminants*". This indicated, before demolition took place, that an open site had the potential to result in greater rainfall infiltration to the groundwater table[490]. Crest also knew of the potential for groundwater pollution given TWA's letter of 7 February 1984[491]. Crest's own witness acknowledged that the Chemfix report indicated (to Crest) the nature of the problem and that removal, seen in this light, was bad practice and not something he would have advised an owner to carry out.

692. For Crest's part, however, it seems that they were primarily interested in removing the buildings to avoid a rating liability[492].

693. Having demolished the buildings and hardstanding, Crest did nothing to prevent the infiltration from occurring for some 2 – 2 ½ years. That was certainly bad practice, as Crest's witness accepted. It was patently unreasonable behaviour in the light of the numerous indications made by numerous parties at the time. Redland's evidence[493] deals with this, but the following is indicative of the general position:

a) "*There is the clear potential for their migration* [bromides] *through the unsaturated zone down into the underlying strata*"[494]. (Chemfix May 1984)

b) "*I am concerned that the situation* [contamination of the groundwater] *may well have been exacerbated since demolition of the site*"[495] (Thames Water to Chemfix, December 1984).

[486] CD 1A p207
[487] CD 5.4 p390
[488] CD 1A p209
[489] CD 2A.7
[490] CD 2A p91
[491] CD 1A p55
[492] CD 5 p383
[493] R1 p24-27
[494] CD 2A p112
[495] CD 1A p91

c) "*The infiltration rate of rainfall will thus be higher than was used in the data base for Report I, and the potential impact of this so-called fallow field option on the water quality has to be evaluated*"[496] (Chemfix March 1985).

d) "*I share your concern that the removal of hard cover has accelerated the escape of pollution without any guarantee that the site will be developed*"[497]. (SADC to TWA, July 1985).

e) "*It can at present be argued that by removing the hard cover and leaving the site open to rainfall in its present state you are aggravating the situation*"[498] (SADC to Crest, December 1985).

694. In addition to Crest's failure to heed the warnings of their own advisers, before removal, the constant reminders throughout the open-site period did little to cause Crest to undertake works urgently; 2 – 2 ½ years was a clearly unreasonable length of time. Indeed, it seems that one reason why nothing was done may have been because, in and around mid 1985, Crest were seeking to sell the site[499].

The failure to put barriers in the land as part of the development further exacerbated this

695. The building regulations approval, dated 24 June 1986, required a barrier to be put in place[500]. Crest have now accepted that this was not carried out. They argue, instead, that the barrier which was required would have had little benefit. As Redland have pointed out, it would have had the effect of reducing downward infiltration. It would, therefore, have had some beneficial effect on the levels of contamination entering the groundwater.

696. There can be no argument (and indeed, it seems no such argument is being made) by Crest that such behaviour was unreasonable. There is no justification, within the available documentation, as to why this barrier was not included. It simply was not done. Given that Crest place so much store on abiding by the requirements of SADC, it is somewhat surprising that they should have patently failed to comply with one of their express requirements.

697. Had they put this barrier in place, it would have had the potential to reduce the extent of the contamination plume; they allowed the contamination to be more of a problem than it would otherwise have been, and it was unreasonable. That is quite clear behaviour that amounts to knowingly permitting the contamination to be in the soil.

Summary

698. Overall, therefore, Crest's inactivity cannot be justified on the basis of reasonableness. In a number of ways, their actions were quite clearly unreasonable. Even applying their own test of the phrase "knowingly permit", Crest are liable as a Class A appropriate person.

[496] CD 2A p221
[497] CD 1A p114
[498] CD 1A p124
[499] CD 1A p114
[500] CD 1A p144-145

Other Points Raised By Crest About the Knowing Permission Test

699. Crest suggest[501] that they cannot be liable, as a knowing permitter, for pollution which had migrated off site before they took over the land. They rely upon S.78F(3) EPA which states: "*A person shall only be an appropriate person … in relation to things which are to be done by way of remediation which are to any extent referable to substances which he caused or knowingly permitted to be present in, on or under the contaminated land*."

700. Crest have misunderstood the meaning of this paragraph. This paragraph is stating that a person who has caused or knowingly permitted substances to be in the land, to any extent, can be required to remediate the land. The section is not saying, as Crest would have it, that an appropriate person cannot be required to remediate the land in respect of an element of the substances which migrated away from the land before ownership or control was acquired. This is confirmed by S.78F(10) which states that "*A thing which is to be done by way of remediation may be regarded for the purposes of this Part as referable to the presence of any substance notwithstanding that the thing in question would not have to be done - … (b) in consequence only of the quantity of that substance which any particular person caused or knowingly permitted to be present*". S.78F(3) is simply pointing out that the person cannot be required to undertake remediation for substances different from those that were knowingly permitted by the occupier.

701. Crest also seem to rely upon the suggestion that some of the contamination within the plume derived from Jersey Farm. Even if right, this point cannot prevent Crest having liability for the bromide linkage; the focus must be on what Crest did knowingly permit, whether or not other sources existed. However, it seems that the Jersey Farm contamination was not, in any event, an independent source of contamination. On Crest's own evidence to the inquiry, it seems that they accept the possibility that the contamination derived from SLC and the other potential sources of Jersey Farm contamination were insignificant.

Crest Causing the Bromide Contamination

702. Crest caused the contamination, by reason of which the land is contaminated land, to be in or under the land.

703. Crest removed the hardstanding and buildings from the land and thereafter left the land open. Had Crest not undertaken this work, a proportion of the contaminants would have remained in the upper levels of the soil and would have been dug out with the removal of the soil as part of the development of SLC. As a result, Crest can properly be said to have caused these contaminants (by reason of which the land is regarded as contaminated) to be in or under the land. In short, had Crest not undertaken these actions, a proportion of the bromide contamination would not have been in or under the land.

704. The test for liability as an appropriate person is contained in S.78F(2) which provides: "*Subject to the following provisions of this section, any person, or any of the persons, who caused or knowingly permitted the substances, or any of the substances, by reason of which the contaminated land is such land to be in, on or under that land is an appropriate person*".

[501] OS4 para 64

705. In short, the question is whether the person caused the substances, which led the land to be identified as contaminated land, to be in the land. This is quite different to the test in *National Rivers Authority v. Biffa Waste Services Ltd [1996] Env LR 227*[502], where the issue was whether Biffa had caused "entry" of the polluting matter rather than, as here, whether Crest caused the matter to be "in" the land at the time of designation. The substances which are to be identified when considering the present issue are those within the significant pollutant linkage at the time of designation. If, therefore, the actions of Crest have meant that some part of the totality of the bromide is in the land at the time of designation, when otherwise it would not have been, then, properly, they have caused substances to have been in the land.

706. Crest's witness accepted that the removal of the hardstanding and buildings has meant that greater infiltration occurred than otherwise would have done. Whilst he maintained that there were insufficient data to quantify the movement of contaminants, he agreed that Crest's actions meant that contamination would be washed further into the soil below the land than would otherwise have been the case. Although he contended that the degree of movement, in the pore spaces, would be slow, he acknowledged that this was not the case in the fissure system (except in the case of small fissures, the number of which he was unaware) or in the gravels.

707. Given that this contamination is washed downwards, it would constitute the uppermost layer, wherever it is washed down to. Consequently, to the extent that the land is now contaminated, it must derive in part, from this washed-down contamination which is the last to leave the site.

708. Had the buildings and hardstanding not been removed then, when it came to removal of the soil, this upper level of contamination would have been in greater concentrations and removed by the excavation. This was agreed by Crest's witness under cross-examination. Looked at in this way, as the witness acknowledged, it would be right to say that Crest's actions had caused contamination to be in the land that would not otherwise have been there. The EA also saw the "logic" of this analysis.

709. This is, of course, the analysis also undertaken by Redland's witness[503] and expanded upon in her evidence in chief. As a result, it is quite clear that Crest caused the land to be contaminated land.

710. It may be said, by Crest, that the extent of the contamination which they caused was only small. Even if right, the point is irrelevant. It is the substances that lead to the ascription of the land as contaminated land which are important, not the amount. So long as it is not de minimis, which Crest do not assert, the contamination caused by Crest must be taken into account. The issue of the amount of the contamination is only relevant if Crest are in the same SPL group as another Class A person.

711. Consequently, as a result of either knowingly permitting the bromide contamination or causing a part of it, Crest are part of the Class A group for the bromide significant pollutant linkage.

[502] CS4B(6)
[503] R1

The Exclusion of Redland

712. Redland should be excluded because they sold the land to Crest with information under Test 3 of the statutory guidance.

713. Of the criteria set out in D.57, of Annex 3 to the statutory guidance, the following are not at issue between the parties:

a) That Redland sold the freehold of the land to Crest;

b) That the sale took place at arms' length;

c) That, after the date of the sale, Redland did not retain any interest in the land in question or any rights to occupy or use that land; and

d) Crest have not contended that Redland misrepresented the implications of the bromide presence.

714. The only issue is whether, before the sale became binding, Crest had information that would have reasonably allowed them to be aware of the presence on the land of the bromide, and the broad measure of that presence.

715. Crest raise several points about this test. Their first point is that, because D.57 states that the purpose of the test is to ensure that another person should bear liability for the "remediation of land", this must, in a pollution context, mean that the person should bear liability for the remediation of the groundwater. Consequently, it says that the "broad measure" must include knowledge of the groundwater pollution.

716. That is wrong, for two reasons. First, the test states that what is to be known about is "*the presence on the land of the pollutant*" (D.58(c)). Land is defined in S.78A only in the context of "contaminated land"; it is clear that land is to be distinguished from controlled waters. In those circumstances, this part of the guidance should be read plainly; it is dealing with the land in question.

717. Second, D.59(b) provides that "*the question of whether persons are members of a liability group should be decided on the circumstances as they exist at the time of the determination (and not as they might have been at the time of the sale of the land)*". This part of the guidance is, read at its narrowest, indicating that the significance of the contamination need not be known when considering whether this test is satisfied, only that the land is contaminated. Crest's suggestion that there should be knowledge of groundwater contamination is effectively requiring knowledge of the significance of the substance, not simply its existence.

718. It is also noticeable that Crest accept that knowledge of the bromide, for the purposes of the "knowingly permit" criterion, did not require knowledge of contamination of the groundwater.

719. An approach towards this exclusion test, which looks only to the knowledge of the extent of the contamination on the land, is consistent with the retroactive nature of the legislation. Given that, at the time, there may be no awareness of the significance of the contaminant, the "information" which must inform the sale should properly only refer to the extent of the contaminant in the land. Again, D.59(b) reinforces this interpretation.

720. Consequently, the meaning of "broad measure" should be met when the broad extent of the physical extent of the contaminant in the land is known, rather than the extent to which it may have caused any pollution. This is consistent with the clear and express wording of the test contained in the Guidance.

721. If this interpretation is found to be wrong, and there should be some knowledge of the significance of the contaminant, whether in groundwater or otherwise, then it must be noted that all that is required is knowledge of the "broad measure" of the contamination. "Broad measure" on this interpretation cannot, in relation to pollution, mean anything more than some understanding of a risk of pollution such that the person has understood, when buying the land, that they are likely to have to deal with the contamination. To define "broad measure" to mean some detailed understanding of the pollution is wholly unrealistic.

722. In turning to the question of Crest's knowledge of the physical extent of the contamination, it is first necessary to deal with the relevant date for consideration. It is agreed by Redland that the sale of the land was completed on 22 September 1983. While there is information to suggest that contracts were exchanged on 1 September 1983, the actual contract is undated. The only documentation comprises a letter indicating when exchange occurred. It is unsigned. This is not the best evidence of the exchange date and Redland cannot assist as to whether the letter sets out the position as it actually occurred. There should, therefore, be some caution in simply accepting that the exchange did occur on that date.

723. In terms of the physical extent of bromide, it is plain, on the basis of the STATS report of August 1983[504], that Crest were aware of the broad measure of bromide contamination. They knew that the bromide existed at depth in high quantities. As they (BM) agreed at the inquiry, the STATS boreholes were spaced to cover most of the site and the report identified the highest concentrations on the site found later; the significant areas, identified in the various reports, are shown on a plan[505]. They were aware that the contamination had been on site for considerable time and they knew that the contamination was likely to have been significant. At paragraph 8.6, the report states: "*The DoE guidelines tend to support the conclusion that significant levels of contamination existed* …".

724. It is also plain that Crest took on the risks of the site. Their contract report assessment, dated August 1983, indicated[506] that they could not establish the definitive requirements of "environmental officers" (of SADC, it seems); nevertheless, they sought to continue with the purchase.

725. In terms of the potential for groundwater contamination, Crest would have been aware, through their advisers, that bromide was highly soluble; the STATS report indicated that they were analysing for "soluble bromide"[507]. Given the information available on the planning file, which should have been considered by Crest, the potential for effects on groundwater was certainly raised, as was the fact that sumps had leaked[508]. In those circumstances, and given the matters outlined above, Crest were quite clearly aware of the significance of the risk of groundwater contamination before they took on the site.

[504] CD 2A.2
[505] C2 Appx 15 Fig 2
[506] CD 5 p382
[507] CD 2A.2 para 5.1
[508] CD 1A p37

726. In those circumstances, Crest knew of the broad measure, even on their own case as to the meaning of "broad measure".

727. Given the ambiguity over the date of exchange (or in spite of it), it may be that Crest had the September 1983 report, which indicated that one of the "potential causes for concern" was "high bromide"[509]. This reiterated, but did not significantly add to, Crest's knowledge of the significance of bromide.

728. As a result of the above, Crest were aware of the broad measure of bromide, and Redland should be excluded from the Class A liability group accordingly.

729. If, however, Redland are not to be removed from liability, under this exclusion test, the appropriate share is on a 50% basis given the guidance in D.76 of the Circular regarding situations where there has been no investigation of what the relative levels of responsibility should be.

LIABILITY FOR THE BROMATE SPL

Causing

730. Crest have laid great stress on the fact that they did not knowingly permit the bromate to be in the soil. This is dealt with further below. Primarily, however, it is clear that Crest caused the bromate to be in the land, for the same reasons as given above in respect of the bromide SPL. In short, by their actions in respect of the land, they caused bromate to be in the land when, had Crest not acted as they did, it would not have been. That is sufficient to fix Crest with liability.

Knowing Permission

731. Crest knowingly permitted the bromate to be in the land. In short, Crest either knew or should have known of the existence of the bromate on the land.

732. Dealing initially with whether Crest knew of the existence of bromate on the land. They did, for two reasons. First, it is clear, from the letter of the Principal Environmental Health Inspector of SADC to DAC (Crest's Solicitors), dated 15 July 1983[510], that "Bromide/Bromate products" were produced on the site and "site contamination will relate to the products and the waste". This letter stated in terms that there would be bromate contamination on the site. Second, the STATS August 1983 report[511] identified that bromate had been tested for. It stated that bromate comprised "LT20" in the locations tested. "LT" was defined as "Less Than"[512]. From a layman's point of view, the report results indicated that what was found on the site was less than 20 mg/kg. From the analyses of the soil at the site, the general picture of bromate concentrations on the land is that they were less than 20 mg/kg[513]. Crest should have investigated the planning files, as such a significant amount of correspondence would have indicated the extent of the history of bromate production on the site. The STATS August 1983 report was, from a non-technical perspective, accurately representing the levels of bromate that were on the land.

[509] CD 2A.3 para 1.1
[510] CD 1A p45
[511] CD 2A.2
[512] CD 2A p12
[513] R1 para 7.6

733. Alternatively, Crest should be treated as having known about the existence of bromate. Redland's position on the law, as to what can be considered within the context of the meaning of "knowing permission", is set out[514]. This is, in summary, that the test for "knowing permission" should include circumstances where the potential appropriate person has "in effect, the means of knowledge", that is, that he "neglected to make such inquiries as a reasonable and prudent person would make", that is, constructive knowledge (following the third category identified in *Roper v Taylors Central Garage,* cited in *Vehicle Inspectorate v Nuttall*[515]).

734. While this category does not apply to the criminal law meaning of "knowingly permitting", there are sound reasons why it should be regarded as a category (which is known to the law - see the citation in *Nuttall*) in the contaminated land context. If this category of constructive knowledge is not applied to the meaning of "knowing permission", it would encourage owners of potentially contaminated sites to engage consultants to undertake their work in an inadequate way; it would also encourage developers not to look for contamination on the site. That cannot be in accord with the purpose of the legislation.

735. If a potential appropriate person can be held to have knowingly permitted contamination on the basis that they should have known about the contamination then, in the present case, such a failing is due to the failings of the consultants who were engaged to undertake site investigations. In short, Redland say that Crest should have known of the bromate contamination because STATS should have known. This means that Crest should be imputed with the constructive knowledge of STATS.

736. Such an imputation can be made. In *Circular Facilities (London) v Sevenoaks DC [2005] EWHC 865*[516], the Court considered whether an agent's knowledge of contamination could be imputed to a company. The Court considered that it could. It referred to this issue, at paragraph 36, in the following terms: "*In the circumstances of this case it may have been arguable, if investigated, that according to the law of agency the knowledge of [the agent], as it seems the court is likely to have concluded existed, could, as a matter of law, in certain circumstances, be imputed to [the company]*". The Court gave an example of one such situation, cited in the case of *El Ajou v Dollar Land Holdings plc [1994] 2 All ER 685*[517]. The Court did not consider the issue further but remitted the matter back to the justices to decide whether such imputation could be made. The Court was clear, however, that such was possible.

737. Crest seem to suggest[518] that *Circular Facilities* indicates that the imputation of an agent's knowledge could only be made on the basis of the categories contained in *El Ajou*. That is wrong. It is plain from the analysis of *Bowstead and Reynolds on Agency, 2001, 17th Edition*[519], that *El Ajou* was not looking at an exhaustive list of situations where the knowledge of an agent could be imputed to the principal, but considered only the examples raised by one of the parties in that case.

[514] CD 4 p119 & CD 5 p452
[515] CD4 p135
[516] CS5A p30
[517] CS5A p17
[518] OS4 para 48
[519] CS5A p1

738. More significantly, *Bowstead* also indicates that the ascription of knowledge has a wider basis than that contained in *El Ajou*, namely, that the "*law may impute to a principal knowledge relating to the subject matter of the agency which the agent requires while acting within the scope of the authority*".

739. That there are categories of case where an agent's knowledge may be ascribed to the principal, other than those contained in *El Ajou*, is established by the House of Lords case of *Blackburn, Low & Co v Vigors (1887) 12 App Cas 531, 537-8*[520], in which it was stated: "*When a person is the agent to know, his knowledge does bind the principal*" and again "*Where the employment of the agent is such that in respect of the particular matter in question he really does represent the principal, the formula that the knowledge of the agent is his knowledge is I think correct, but it is obvious that that formula can only be applied when the words "agent" and "principal" are limited in their application*".

740. In the present case, it is plain that Crest's technical experts were given the responsibility of establishing what the contamination on the site was; they were agents "to know". On this basis, the constructive knowledge of STATS should be attributed to Crest.

741. Redland's witness has identified matters that should have been considered by STATS. She points out that, given the history of the site, it would have been obvious that bromate contamination would have existed there. As she also pointed out (something accepted by JT in terms of what she would have done), the planning files should have been researched and this would have reiterated that existence of bromate; a list of letters on the planning file is provided[521]. In that regard, it is important to note that Crest themselves were told that it was necessary to "critically examine the past use of the site"[522]. There should consequently, at the least, have been a more extensive soil testing and groundwater testing in order to establish bromate contamination. As Redland's evidence[523] and witnesses for Crest and the EA pointed out, if there had been testing for groundwater contamination, bromate contamination would have been found. The imperative to reconsider the position continues when more is learnt about the site, so the failing becomes even more significant when more is learnt about the contamination generally on site.

742. It seems likely that titration was the test used for analysing for bromate in the STATS August 1983 test, given that this was the standard method for identifying bromide[524]. If so, what actually was found was total bromine compounds, not just bromide. As for the detection limits identified in the report, the results showed simply that bromate concentrations above 20 mg/kg were not found and that there may be bromate below 20 mg/kg. It would have been known that 20 mg/kg was high in comparison to other analytical method detection limits achieved at the time; for example, the STATS quoted limit for cadmium was only 1 mg/kg[525]. Also, the bromate limits quoted in later years were substantially lower[526]. Given the history of the site, not to take the matter forward by further testing was a significant failing.

[520] CS5A p6
[521] R2 AppxO
[522] CD 1A p45
[523] R1 para 4.11
[524] R1 paras 4.3-4.5
[525] CD 2A p12
[526] R1 para 7.6

743. In fact the information, as gathered by STATS at the time, should have led to the conclusion that bromate did exist on the site, given the site's history and the high detection limits. This was the view of Redland[527] and of the EA (JT) when cross-examined. Given this, Crest's consultants should be fixed with constructive knowledge and this, in turn, should be attributed to Crest.

744. As for the actions that Crest either could have undertaken or (on Crest's interpretation of the test) should have undertaken, the same failings apply equally to the bromate contamination as to the bromide. This was agreed by the EA (JT) in cross-examination. There is no need to repeat the relevant points.

Redland's Sale With Information

745. Again, the primary issue under Test 3 of the statutory guidance is whether Crest were aware of the broad measure of the contamination.

746. Given the history of the site and the STATS tests, the available information indicated that bromate was likely to be in the soil at concentrations less than 20 mg/kg. For reasons explained above, Crest's technical experts were charged with establishing what the contamination was and, in view of the high detection limits, they should have carried out further testing.

747. The question of whether the "broad measure" has been established must be looked at in the light of all the evidence, not just the scientific reports. This was the appropriate constructive knowledge to be attributed to Crest. Such knowledge of bromate as existed would, given the knowledge of its high solubility, lead to the conclusion that bromate contamination of the aquifer would have been likely (in the same way as the bromide contamination).

748. Given the later Atkins and Komex Report results, knowledge that bromate was likely to exist in levels below 20 mg/kg was accurate[528]; this is within the range of levels that led to the site being designated as contaminated. Hence Crest's constructive knowledge did amount to the broad measure of the contamination.

749. In short, Redland should be removed from the bromate pollutant linkage.

REMEDIATION

750. The primary issues for Redland are the following:

a) Whether the interim action of scavenge pumping should be required to be implemented straight away or whether a period of assessment should be undertaken before doing so;

b) Whether it is right to put in place a concentration standard at the present time or whether a period of time should be put aside to assess what the appropriate standard should be;

c) Whether it is right that any payment for a treatment action should be payable on a fixed unit cost;

d) Whether it is right to have a final remediation action requirement put in place now; and

[527] R1 para 4.16
[528] R1 para 7.6

e) If a remediation action is to be put in place, whether it should be referable to the bromide and bromate linkage.

The Interim Treatment Action

Preliminary Observations

751. The water companies have sought to suggest that an interim treatment action should be put in place.

752. They are aggrieved that the polluter is not paying for the pollution and that the water customer is. It is right that the polluter should pay for remediation of contamination which it has caused or knowingly permitted, but it should do so only after due process in accordance with the statutory guidance. Redland have done nothing that they can be criticized for in their approach to this case. They are disputing liability as they are entitled to do and were content with the EA's notice which required analysis of the best practicable technique. In those circumstances, it was not for Redland to deal with all the potential remediation techniques that could be considered as part of the remediation process. They were perfectly entitled to expect either that such measures may never apply to them or would be dealt with under a later notice.

753. The water companies, of course, did ultimately indicate that interim treatment should be undertaken. TW did not, however, specify this until December 2006 (that is, in their response to other statements of case, not sooner). TVW indicated that there should be an interim treatment action in their first statement of case[529] (which begs the question why TW did not), but did not specify what it should be. TVW did not indicate that there should be pumping at Hatfield in their later response[530]. The bulk of the water companies' cases did not emerge until early this year (2007).

754. It was perfectly appropriate for Redland, in such circumstances, to agree with the EA's position.

755. Given the presentation of the water companies' cases, at such a late stage, it is not reasonable to suggest that Redland should have reviewed all the alternatives (as well as deal with the significant points of principle between themselves, Crest and the EA) and provide in-depth evidence as to alternative remedial treatment actions. The EA, under cross-examination, thought it was probably not reasonable for Redland to have a position on pumping at Hatfield at the present time.

756. In fact, there was no need to undertake any analysis because the water companies have not, at all, provided any evidence of consideration of the alternatives, in accordance with the guidance, in order to establish that their proposed action is the best practicable one. The water companies had to establish that point in order to show that their suggested remediation action could properly be included in a notice; that is, whether the action is in accordance with the guidance. In truth, by suggesting that Redland should have asked for information on water scavenging, the water companies are seeking to overcome a patent failing in their own preparation for the inquiry.

[529] CD 6 p73
[530] CD 6 p106

757. Indeed, TW went so far as to suggest that Redland should have asked for an adjournment in order to provide evidence that the water companies' suggestion was not the best practicable technique. What such a suggestion patently fails to recognise is that there was absolutely no need for Redland to do so, because the water companies had not and have not established that their scheme amounts to the best practicable technique.

758. The EA suggest that the power of the SoS to vary the notice, under Regulation 11b, must mean that the parties should anticipate unexpected decisions by the SoS[531]. That cannot mean that a party is required to look at all the potential options which may be decided upon; it should be limited to those options which were disclosed, and within a reasonable timescale, by parties to the inquiry. Otherwise, the burden on appellants becomes impossible.

759. The water companies may suggest that Redland is seeking, by their approach at the inquiry, to delay matters in order to avoid incurring any financial liability. Such an argument might have some substance were it not for the fact that Redland accept that an interim treatment action should be put in place within 12 months from the date of the notice. Furthermore, if it were right that Redland were seeking to delay matters, such an ambition would have been best served by seeking the adjournment TW have suggested they could. Redland have, at all times, behaved in a responsible manner towards their potential liability in their dealings with the EA.

760. TVW indicate that Redland have not spent any money on remediation, even on a without prejudice basis[532]. First, as the EA accepted in cross-examination, it would be "foolish" of a company to pay before it was found liable and, second, Redland have taken advice on what financial liability it should make provision for and this could not be done until the liability has been established**;** that was the advice they received[533].

<u>*Substantive Issues*</u>

Whether Interim Action of Pumping at Hatfield Should be Undertaken Now

761. The water companies have not challenged the view that it is necessary, under the guidance, to establish that the continuation of pumping at Hatfield comprises the best practicable technique. Part 4 of chapter C in the statutory guidance makes this plain. It states (para. C.18) "*for each [SPL], the standard of remediation should be that which would be achieved by the use of a remediation package which forms the best practicable techniques for remediation*". In order to reach the conclusion as to what amounts to the best practicable technique, it is that which is "reasonable" and that which "represents the best combination" of practicability, effectiveness and durability (C.19).

762. The guidance explains that one can conclude that a remediation action is reasonable, "if an assessment of the costs likely to be involved and of the resulting benefits shows that those benefits justify incurring those costs" (C.30).

763. In short, the guidance is clear that in order to reach a conclusion as to which is the best practicable technique, a cost benefit analysis of the alternatives must be undertaken. Only

[531] CS1 para 6.3
[532] CS2 para 5
[533] R11

once this assessment has been done, can the conclusion of what amounts to the best practicable technique be reached. The purpose behind the need to undertake such a comparative assessment is plain; it would be wrong for an appropriate person to pay the costs of a remediation action - which may well be very significant - unless it is established that it is right and necessary to do so. That can only be done, having justified any particular remediation scheme against other potential alternatives.

764. The water companies were the only parties to come to the inquiry seeking a particular remediation technique. They were aware of the EA's case that a remediation measure would not be required. They were aware of Redland's case, at an earlier stage[534], that a cost benefit analysis of the options should be carried out.

765. Yet, in spite of that, and being advised (no doubt) as to what the guidance required to be established, no cost benefit analysis of each of the alternatives was set out to justify that the proposal for pumping at Hatfield should be undertaken. Indeed, it is noteworthy that TW sought particularly to establish the hydrological and hydrogeological expertise of their experts over that of Redland's expert witness. This makes it all the more surprising that, with such advisory capacity behind them, they did not undertake the assessment.

766. The inquiry was told by TW and TVW that there had been a consideration of alternatives. However, in evidence, the only document provided was a summary of options that were considered towards the end of 2000, after Bishops Rise had been taken out of supply[535]; this is not, and cannot properly be considered to be, an analysis in accordance with the guidance. Nevertheless, the fact that it was written at all suggests that the water companies accept that alternative options exist.

767. The companies are likely to seek to suggest that Redland have not put forward any realistic alternative options. Even if that were correct, this misses the point. The whole purpose of an analysis of alternatives, on a formal cost-benefit basis, is to identify which option, overall, should be chosen. This allows for the realism or, in the words of the guidance, the practicability of the option to be investigated. To suggest that there are no realistic alternatives is, in short, to put the cart before the horse and there is no evidence to support the suggestion.

768. In any event, the water companies have not come close to establishing that there are no realistic alternatives to pumping at Hatfield. None of the water companies' four experts have brought forward evidence to establish that there are no realistic alternatives. TVW refer to the fact that 30 reports have been produced and that not one "concludes that some other technique should be preferred"; this is hardly surprising, as none of these reports even consider other options.

769. Redland's witness indicated that she considered there to be realistic alternatives. Apart from the general assertion "you have no evidence at this inquiry of the alternatives", no questioning of the extent of the realism of the alternatives suggested by Redland was undertaken.

770. As she indicated, the nature of the alternative which could be considered is to be determined in part by the objective sought to be achieved.

[534] CD4 p123 para 17c)
[535] TVW8

771. It may be decided, for example, that, given that the measure in question is to be interim, that it is necessary only to seek the objective of ensuring that potable water is provided from relevant abstraction points. That was stated by TW's witness, in cross-examination, to be the purpose of TW's attendance at the inquiry. In those circumstances, alternatives which seek only to manage of the quality of water at relevant points, rather than pumping at Hatfield, may be considered a better alternative to pumping at Hatfield on a cost benefit analysis.

772. Before dealing with particular alternatives, it is appropriate to deal with some matters which indicate that Hatfield need not be the best practicable technique.

773. An overarching consideration of a comparison between pumping at Hatfield, and simple water management, is the degree of benefit that pumping at Hatfield is actually having. If pumping at Hatfield is not as significantly beneficial as the water companies suggest, the cost of carrying out the pumping weighs more heavily against this technique. As Redland's witness pointed out, the relevant evidence indicates a levelling of concentrations in the plumes (given the overall indications of a levelling in the rate of increase), in the pre-pumping phase at Hatfield before July 2005. The results for Essendon indicate such a levelling both for the bromide and bromate linkages, as do the results for Hatfield[536]. TW acknowledged that this evidence, along with other statements contained in the report accompanying the application for the abstraction licence[537], was consistent with a contention that the contaminant trend was either flattening or declining pre-pumping, as was the trend shown at Nashes Farm[538].

774. While it was suggested by TW that Redland's witness should defer explanations for such a trend to the expert hydrologists and hydrogeologists, the witness correctly pointed out, in re-examination, that there were no explanations for the trend being shown pre-pumping at Hatfield which were suggested to be conclusive. They were not indicated to be conclusive. Such an absence of comment is, given their expertise, notable indeed.

775. TW supplied reports which informed them of the risk of bromate contamination[539] but, as their witness acknowledged, these provide limited assistance. The extent of their assumptions means, in truth, that little reliance can be placed upon them and TW do not seek to do so.

776. It is also noticeable that the University College London Report[540], relied upon by both companies to establish the benefit of pumping at Hatfield, is incomplete. It raises a question about the significance of the effect of pumping, on bromate levels, and indicates that more testing should be carried out[541].

777. In the light of the above, there is significant doubt as to whether pumping at Hatfield is having, or will continue to have, the benefits which the water companies allege.

[536] TVW23-26
[537] CD 2E p1930 & 1936
[538] TVW41
[539] CD 11A.4 & CD 11B.8
[540] TW4
[541] TW4 p16

778. Turning to the position of each of the water companies and dealing first with TW, as their witness accepted in cross-examination, while there has been an exceedence of the bromate standard, TW have been able to satisfactorily manage water quality for bromate thereafter. The witness pointed out that the changes which have been undertaken mean that the current management position at Hornsey WWTW has been planned to ensure that bromate levels will not be exceeded, whether or not Hatfield is pumping. While the treatment works at Hornsey would produce bromate, which could affect Broadmills and Chingford South, this bromate had been factored into TW's calculations to protect resources. In the light of that, for TW, there are management techniques which are capable of amounting to alternatives to pumping at Hatfield or, at the least, techniques which would not require continuous pumping at Hatfield. The evidence provided by TW suggests, at the least, that the cost-benefit of undertaking management processes, which may reduce or negate the need to pump at Hatfield, should be investigated. However, no evidence was presented to the inquiry to establish the lack of viability or practicability of these options.

779. Redland's suggestion as to the potential viability of water management and blending should not be seen as a single option. In evidence, no consideration has been given to the use of a pumping regime at Hatfield, on an intermittent basis, when there is a need to reduce contamination levels. A combination of these elements has the potential to reduce cost and maintain potable supplies.

780. TW suggested to Redland's witness that her view, that management techniques could replace pumping at Hatfield, would require a third party to alter their activities. It was suggested that this could not be done under a remediation notice. That is wrong. Given the consultation of the water companies, on the requirements of the remediation notice, they are required (by S.78G) to give rights to enable appropriate persons to comply with their duties under the notice. This is a consequence of being involved in the remediation notice process. In any event, this issue need not arise. Ultimately, the best practicable technique may be the companies' existing management techniques, to which the APs would make an appropriate contribution. It would be surprising if the water companies chose not to take that route, given that it would be financial assistance to deal with the contamination.

781. Turning now to TVW, as was the case with TW, TVW's exceedences of the bromate standard were in 2003. Their evidence, like TW's, identifies water management strategies they have put in place to avoid the recurrence of this issue.

782. The water losses arising from the shutting down of Hatfield as a public water supply which, on the face of it, amount to some 4-6 Ml/d on an average basis and 9 Ml/d on a peak basis, are capable of being dealt with on a day to day basis, as their witness confirmed in cross-examination. The measures which can be used to maintain supplies include variable pumping rates at Essendon and importing water from Grafham Reservoir.

783. There is no reason why these various methods cannot continue to be used. TVW have entered into an undertaking to replace Essendon by March 2008[542]. It is clear that TVW already have strategies in place for replacing Essendon; the new borehole at Nomansland will partly do so. If another borehole is not found within TVW's area, the company is looking to site a borehole outside their area. In any event, as TVW acknowledged, it is

[542] CD 12.13

possible to obtain a revision of the undertaking. Of course this would have to be justified, but if Redland are right about the Essendon trend, this properly could be justified.

784. In short, TVW have put in place numerous measures to manage water supplies. The relative costs and benefits of management against continuous pumping at Hatfield should properly be considered through the formal processes of the statutory guidance.

785. TVW refer to Redland's acceptance, in evidence, that the Hatfield scavenger pumping costs were "minor" in comparison with the overall costs of remediation; there was no suggestion that these costs would be less costly than some other option. There has been no comparison in any comprehensive way.

786. Alternatively, it may be decided that the interim treatment action should also have the objective of remediating the aquifer.

787. In such circumstances, as Redland have pointed out, there are other alternatives; for example, the use of alternative boreholes further upstream than Hatfield, which may have a more beneficial effect than Hatfield. This option has the ability to remediate the aquifer more productively than Hatfield. The fact that, under the terms of S.78G, the notice cannot force a third party to accept the borehole, if that party has not been consulted, does not mean that this option is unrealistic. The willingness of third parties to allow a borehole to be sunk on their land would be a matter to be considered as part of the cost-benefit analysis. The reason why such an option may fare better, than Hatfield, on a cost benefit analysis is because, given the approach of the experts that a location further up the plume would be more effective, it may be decided that the final treatment action should include this pumping scheme. Consequently, if this can be put in sooner, it will prevent the APs from paying for the cost of Hatfield for, potentially, some significant period of time and ultimately shorten the amount of time that remediation needs to be undertaken. Overall, there would be a cost saving by setting up the alternative pumping scheme sooner rather than later. It should be noted, for example, that TVW's view was that the Hatfield pumping station is not in the most beneficial location for removing contamination.

788. What is noticeable is that Redland's consideration that this was a reasonable possibility, within the 12 month timescale that is now included in the EA's version A of the notice[543], was not cross-examined upon in any significant way and no other expert indicated that it was impracticable. The EA, under cross-examination, took the view that this option was possible within such a timescale.

789. As a further alternative, if it is decided that remediation of the aquifer should be undertaken, the carrying out of water management techniques does have the effect of remediating the aquifer. The act of pumping water out of the aquifer does remediate the aquifer. Although this may be less beneficial than pumping at Hatfield, it may be cheaper and, overall, lead to a decision that, on a cost-benefit analysis, this should be undertaken.

790. Plainly, it is right that there are benefits with continued pumping at Hatfield. That is not, however, of itself sufficient to reach the conclusion that there are no other practicable alternatives which may not turn out to have a better scoring on a cost benefit analysis.

[543] CD 7A

791. While it is unnecessary and, indeed, improper at the present time to reach a conclusion as to whether any particular alternatives are realistic or capable of being better than pumping at Hatfield, such alternatives do exist. They are not capable of being dismissed at the present time in any way.

792. The degree of urgency of the remediation is a factor which should be taken into account. However, in the present case, there is no urgency. It is, of course, the water companies' case that the continuation of pumping at Hatfield will have the effect of enabling the contaminant plume to be controlled, until their purported concentration standards are met in 2015. The companies' position, throughout the inquiry, was that pumping at Hatfield will continue; to suggest that this is mere speculation, is unrealistic. In those circumstances, even on their own cases, there is a period within which a proper and full assessment can be undertaken in accordance with the guidance. Redland's witness expressed the view that Hatfield pumping should not be switched off, but this was expressed in the context of a situation where no replacement provision was to be made. In truth, replacement provision would be made following the analysis required under version A of the notice. TW suggest[544] that the more remediation is delayed, the more difficult it is to remediate the aquifer. Given that pumping will continue, this point has no substance.

793. TW maintain that this leads to an absurdity because, given that there would be an urgency to do something if Hatfield was not pumping, it would be in the water companies' interests to cease pumping at Hatfield. What such a suggestion fails to acknowledge, however, is that it is the water companies' overarching duty to ensure potable water supplies. There is no absurdity in this case, given that the hypothetical situation would not arise. In any event, if it is an absurdity, it is one of the water companies' own making since, had they led the appropriate evidence at the appropriate time, they may have been in a position to establish that their current strategy was the best practicable. The basic reality is that there is not an urgency and that time can be taken to ensure that the best practicable technique, in accordance with the statutory guidance**,** is identified.

794. On the other hand, if it is decided that pumping at Hatfield should be undertaken, in accordance with Action I in version B of the EA's notice[545], the pumping would continue, potentially, for some 10 years. Although there is provision for "variation" of this requirement (Action I, line 4), there must be some significant doubt that this would allow an entirely different remediation technique to be substituted for Hatfield pumping and it certainly would, at the least, present a strong presumption against any such change.

795. At essence, the SoS must reach a judgment: should there be due process in this case, in circumstances where there is no urgency and where no admittedly proper consideration of alternatives has taken place? Clearly there should not, given the circumstances and particularly in the light of the water companies' decision to produce only limited evidence.

796. TVW suggest[546] that assessment of the best practicable technique, under version A, can be undermined by providing a "potentially deficient list" of alternatives. The proper analysis of options must be expected, particularly since the remediation notice is predicated on the production of robust analyses by experts for modelling etc.

[544] CS3 para 48
[545] CD 7A
[546] CS2 para 48

Whether it is right to put in place a concentration standard at the present time or whether a period of time should be put in place to assess what is the appropriate standard

797. It has been suggested that the "suitability for use" included current and future use. However, paragraph 10 of Annex 1 to the Circular indicates that "future uses" can only include "specific proposed uses", not general future uses.

798. Action I in the EA's version B remediation notice, and in the water companies' working draft, sets out particular concentration standards which are to be achieved at particular abstraction points. The threshold to be achieved is 5 ug/l for bromate and 500 ug/l for bromide. Version B makes achievement of these standards one of only two ways to cut short the pumping at Hatfield, which otherwise will continue for 10 years. The water companies' suggestion[547] goes still further; it requires the achievement of these thresholds by 2015.

799. In relation to the bromate linkage, there are two fundamental objections to the setting of a standard.

800. First, under the statutory guidance, any remediation measure must be reasonable. A standard which cannot be achieved, but would either (in the case of the water companies' suggestion) lead to criminal prosecution or (in the case of the EA's version B) nullify a potential cessation of the action, cannot be reasonable. It would be patently unfair for an appropriate person to have its remediation actions governed (in either of the above cases) by a standard that cannot be reached.

801. It will no doubt be suggested by the water companies that, if the standard is unachievable, this will amount to a "reasonable excuse", for the purposes of S.78M(1), so long as the APs have done what they can to achieve it. That is spurious reasoning. It cannot be right for the SoS to place a person under a responsibility to achieve some standard, with a penal sanction attached to a failure to achieve it, without some confidence that it can be achieved at specified locations (which, in this case, are listed in Table 5 of both the EA's version B and the water companies' proposed notice).

802. There has been no compelling evidence that the sought after bromate targets are achievable at the relevant abstraction points. At Essendon, for example, the levels of bromate have been generally in the range 10-40 ug/l during the pumping phases[548]. At Bishops Rise, they have been between 200–400 ug/l[549]. At the group 3 NNR wells (Hoddesdon, Middlefield Road, Broxbourne and Turnford), the predicted concentrations relied upon by TW do not drop below about 8 ug/l before 2029 (which is the end of the prediction)[550]. No in-depth analysis was provided at all by TVW's witnesses as to why this was an achievable level. Their view, in answer to the Inspector's questions, was simply that they believed that the level "should be attainable"; it is clear that the assessment was one of subjective judgment.

803. The view of a TW witness, in giving evidence, was that it would be possible to reach 5 ug/l in 2015, given that they were around that level in 2001. His view was that, since it had taken 7 years to reach the level they were at currently, it would take 7 years to bring them

[547] CD 7.1b(9)
[548] TVW26
[549] TVW24
[550] TW8 p171

down again. That was an analysis without any quantitative basis, as he subsequently accepted. It is noticeable that none of the models or predictive techniques relied upon by TW (the water level, regression and transport models), suggested this was achievable. TVW thought that the level was a "target to aim for".

804. Second, there is no compelling evidence as to why the level of 5 ug/l has been set. Redland's witness voiced a concern that there was no clear evidence that the level of 5 ug/l was technically necessary. TW pointed to the need for "headroom", in order to avoid exceedences, but there has been no clear evidence as to why it should be that figure as opposed to any other.

805. The specific bromate concentration has serious implications. Alteration of the level might significantly alter the treatment or other costs associated with a remediation technique; it might, for example, reduce the length of time that the technique must be carried on.

806. Turning to the bromide standard, the 500 ug/l level has been set in order to avoid THM formation. Redland accept that there is the potential for THM formation[551]. However, what has not been established is why the bromide threshold should be set at this specific level. The evidence on which this level has been based, is extremely scant. It is derived almost entirely from a letter of Water UK dated 5 December 2006[552]. The 500 ug/l stems from the experience of Essex and Suffolk Water Company, the details of which were not set out at the inquiry. The letter states: "*Water UK has canvassed the industry but could identify no conclusive information to confirm the risks posed by bromide and the acceptable level that could be applied*". The final paragraph states: "*In conclusion this means that we are unable to develop or provide a generic statement regarding the tolerable levels of bromide in raw water that are acceptable*". It is on this shaky basis that the standard has been set down.

807. There is no reason not to give further consideration to the appropriate standard for bromide. At the present time, the water companies accept (and the EA put forward no different position) that the 500 ug/l level is not being exceeded at Essendon or the NNR wells. Given that the EA's notice is only concerned with public wells, the exceedences of 500 ug/l at private wells is of little relevance to the question of providing potable water (albeit that it is relevant to the issue of pollution) since they are not being used. In those circumstances, further research can and should be undertaken to assess whether some other standard should be put in place. Although the EA's witness considered that there may be little more that could be discovered, he acknowledged that it would allow for analysis of the problem in other parts of the world. TVW's witness also acknowledged that further assessment would provide greater confidence that the correct standard had been chosen.

808. Again, the concentration that is chosen is significant, since it affects the extent and cost of any remediation measure. Reverting to the statutory guidance, a remediation action must be reasonable and must be established as the best practicable technique. It is difficult to see how this is the case, given that the concentration standards have not been considered on this basis; there has been no clear analysis that these standards, and no others, must be required.

809. In short, therefore, there should be assessment of the appropriate standards; it would be wrong for them to be fixed now. Redland are not saying there should be no standards.

[551] R1
[552] CD 1B p625

They are saying that there should be a proper consideration of them. There is time within the remediation process to do this.

Whether payment for treatment action should be on a fixed unit cost basis.

810. TVW have indicated that they may be seeking a fixed unit cost for the Hatfield pumping treatment action (along the lines, it seems, of that included in their working draft[553]). While the TW element is a variable element based upon the amount of water going to the sewer, along with a standard monitoring cost, the TVW unit cost is based upon an assessment of the ferrous chloride dosing that is required for the treatment plant at Hatfield and the likely power costs of the pumping station[554]. This is a costing that has the potential to change significantly and to result in charges that are unjustified by the treatment programme in question. It is to be noted that the treatment programme has the potential to change (pumping may be reduced) but the fixed unit cost (that is, in relation to TVW's charges) will stay the same.

811. It is for this reason that Redland were content with the revised definition of "procure" contained in the EA's version B, Treatment Action I(b)(i)(1)[555]. The requirement that the cost is "solely attributable" to the pumping at Hatfield has the benefit of ensuring that the costs continually relate to the actual treatment in place at the time. Redland do not complain of a unit cost (see their working draft[556]); their concern is that the unit cost must be capable of being linked with the reality of the position. The merit of this approach is that it would lead to a bill that would clearly set out what the costs relate to for each period.

Whether it is right to have a final remediation action requirement put in place now

812. The water companies wish to have a requirement, within the notice, that the final remediation action should be put in place by 2015 (that is, based on the assessment that reducing the levels of bromate and bromide to the "Required Concentration Standards" will amount to remediation of the aquifer). That is an unreasonable position to take. Since the water companies are content that the Hatfield pumping regime will lead to control of their potable supplies for an 8 year period (2007 – 2015), it is difficult to see why the final action should be put in place by that date. This is a date which is largely arbitrary, from a technical point of view. Its primary purpose seems to be to seek to hurry the matter along. That is a point of little substance in the light of the fact that either pumping at Hatfield, or some other treatment action, will be controlling bromate levels.

If a remediation action is to be put in place, whether it should be referable only to the bromate linkage.

813. Version B of the EA's proposed notice[557] makes treatment action I referable entirely to the bromate SPL. This is because the water companies and the EA take the view that the treatment process is necessary only because of the bromate linkage.

[553] CD 7.1b(11)
[554] TVW42
[555] CD 7A
[556] CD 7.1b(8)
[557] CD 7A

814. Pumping from Hatfield, if required, will be thought necessary to deal with the bromate contamination of the public water supplies. However, this looks at the pumping from only one perspective.

815. The act of pumping also results in a reduction of bromide levels within the aquifer; this will assist in its remediation for this SPL. Given that the EA consider that remediation of the bromide SPL should take place, it is difficult to see why this process of remediation should not be contributed to. Crest accepted, in cross-examination, that if the objective of pumping included remediation of the aquifer, then it was referable to both SPLs.

816. The fact that the water may be potable at certain abstraction points does not mean that there is not pollution of controlled waters; as was made clear in *R v Dovermoss* Transcript 3 February 1995[558], pollution does not mean "noxious" and, therefore, does not require harm to be established. Consequently, the fact that bromide levels do not affect potable public supplies does not undermine the purpose behind remediation of the aquifer.

817. The remediation should, in such circumstances, be either a shared action or a collective action which is attributed on a 50% basis between the bromate and bromide SPLs (see D.76 of the Circular).

Particular Wording Issues

818. Leaving aside some of the detailed wording issues that were addressed at the inquiry[559], in the notice "session", there remains the use of the phrase "solely attributable" in remedial treatment action I(b)(i)(1), which is referred to above. It has been suggested that this phrase should be altered to either "directly attributable" or simply "attributable". Given the need for clarity, because of the potential criminal enforcement of the remediation notice requirements, the phrase "solely attributable" should not be changed. As the EA point out, it is simple, clear and reasonable. Any other formulation is likely to lead to misunderstanding and dispute.

819. For all the above reasons, Redland's appeal should be allowed.

[558] CS5A p50-51
[559] CD 7.1b(8)

CONCLUSIONS

The appeal site has not always been known as St Leonard's Court (SLC), but it is referred to as this for the sake of simplicity. Similarly, the name Redland is used to include those companies whose interests were subsequently acquired by Redlands Minerals Limited.

Numbers given in square brackets refer back to earlier paragraphs in the report.

Legal Matters

820. Various matters of law arise in relation to Part IIA of the Environmental Protection Act (1990) as amended. Whilst these are for others to decide, I address them within the main body of my conclusions. To consider them separately would add unnecessary difficulty to understanding what is, in any event, a complex picture.

Main Considerations

821. Given the matters about which the Secretary of State (SoS) wishes to be informed [6], and having heard the evidence, I believe that the main considerations on which the SoS's decisions, on these appeals, should be based are:

a) Whether the appeals were properly made;

b) Whether the land, known as St Leonard's Court, was properly identified as contaminated land; and, if so

c) The seriousness of the pollution caused by the contaminated land;

d) The appropriate remediation requirements;

e) Who should be liable for remediation of the land;

f) How the costs of remediation should be apportioned; and

g) How the remediation notice should be worded.

In the event that the SoS decides to modify the notice in a way that is less favourable to one or both of the appellants, he will also want to consider the procedural implications of this. [20]

Given the chronology, I shall address matters covered by b) before turning to a).

The Identification of Contaminated Land

822. High concentrations of bromate, in groundwater, led to the (Hatfield) Bishops Rise public water supply being taken out of service on 31 May 2000; that supply was operated by Three Valleys Water (TVW). In June of that year, concentrations above the impending standard of 10 ug/l were also found in a private supply near to St Leonard's Court (SLC). This led the local authority, St Albans District Council (SADC), to ask the Environment Agency (EA) to inspect SLC. [36, 42, 152-154]

823. In the light of the EA's findings, SADC decided that pollution of controlled waters was being caused and identified four significant pollutant linkages involving bromate and bromide, both of which had been found in the land, above the water table. On that basis,

they determined, on 12 June 2002, that SLC was contaminated land. Pursuant to S. 78C(2), of the Environmental Protection Act (1990) as amended (EPA), they notified the EA, the owner of the land, the owners and occupiers of dwellings now built on that land and those parties, including the appellants (Redland and Crest), who appeared to be appropriate persons (APs) for the purposes of S.78F. [43-45]

824. In July 2002, SLC was designated as a special site. [46, 178-183]

825. There is no dispute, amongst the parties to these appeals, that the land at SLC has been properly identified as contaminated land and designated as a special site. This is because substances in, on or under the land, are polluting groundwaters that are intended for human consumption and, as a result, are requiring those waters to be treated before use. Whilst bromide and bromate are already present in these groundwaters, in dissolved form, there is no suggestion that entry has ceased or that further entry is unlikely. [1, 39, 47]

826. I conclude that the land, at St Leonard's Court, was properly identified as contaminated land.

Whether the appeals were properly made

827. The remediation notice was served by the Environment Agency (EA). In accordance with S.78L(1) of the EPA, both appeals were made to the SoS within 21 days of receiving the notice. [2, 3]

828. Redland's grounds of appeal were those described in paragraphs (b)(i), (b)(ii), (c), (d) and (e) of Regulation 7(1). Crest's were those described in paragraphs (b)(ii), (c), (d), (f) and (s) although, at the inquiry, they withdrew their appeal under 7(1)(f) regarding the apportionment of monitoring costs between bromate and bromide. [17, 53]

829. In lodging their appeals, both parties gave their name and address, their grounds of appeal, and an express wish for the appeal to proceed by way of an inquiry. They also confirmed that copies of the notice of appeal had been served on the EA and on all persons who are named in the notice either as an appropriate person or as the owner or occupier of the whole or any part of the land to which the notice relates. Each party provided the SoS with a copy of the remediation notice; with the name and address of the other party (being the only other party named as an appropriate person, whether in the notice or in the appeal); and, with the name and address of the freehold owner of the land (being the only owner/occupier named in the notice.) This accords with Regulation 9 of the 2000 Regulations. [54]

830. I am led to conclude that the appeals were properly made.

The Seriousness of the Pollution caused by the Contaminated Land

831. Leachate from SLC has resulted in the UK's largest known point source contaminant plume. Groundwater, which flows through the chalk aquifer below the site, is used for private and public water supplies across a wide area. It is a major resource in a part of the country where demand is high and growing, but supply is limited. [253, 297, 326, 327]

832. In addition to affecting Three Valleys Water (TVW) supplies at Bishops Rise (Hatfield) and Essendon, the contamination has restricted the use of Thames Water's (TW's) Northern New River wells, some 20km from the source. These wells are a significant source of supply for north London. [37, 327]

833. The groundwater is polluted by bromate and bromide, from SLC; both are highly soluble. The concentration of bromide itself is a cause for concern in a private supply close to SLC, whereas it is the by-products of water treatment that pose the risk to public supplies when raw waters contain high concentrations of bromide. Increased formation of carcinogenic trihalomethanes (THMs) is a particular issue, but treatment with ozone or hypochlorite can also oxidise bromide to bromate. As things stand, it seems that THM concentrations have remained within acceptable limits for drinking water, in areas affected by the contamination. Nevertheless, the water companies remain concerned about compliance with the relevant standards in future, particularly if disinfection requirements are made more stringent. [38, 180, 394, 404, 405, 409, 410]

834. The severity of the pollution is primarily a result of the bromate contamination. Bromate is probably carcinogenic to humans and does not occur naturally. The drinking water standard of 10 ug/l is partly health based, but is tempered by practical considerations, because its presence is normally a by-product of treatment designed to remove other harmful substances. Here, however, it is present at very high concentrations as a result of the contamination and it may also be formed by oxidation of the bromide. Average concentrations in the groundwater below SLC are greater than 5,000 ug/l and at Bishops Rise, more than 5km away, are more than 300 ug/l. Severe pollution is clearly ongoing and this (Hatfield) source of public supply remains closed, 7 years after the bromate was first discovered. Restrictions have also been placed on the use of three private supplies close to SLC. [36-39, 41, 393-397]

835. The water companies are obliged to provide wholesome water to their customers and to maintain an efficient and economical system of supply. To date, the contamination has cost TVW more than £13 million. However, there is no practical treatment solution to the high bromate concentrations found at Bishops Rise. Following trials on the efficacy of scavenge pumping[560], at this TVW borehole, water from this source of supply is now pumped to TW wastewater treatment works at a rate of up to 9 Ml/day. This scavenging helps to control contaminant concentrations in downstream supplies abstracted from Essendon and from the Northern New River wells. It also serves to partly remediate the aquifer, without apparent adverse side effects. [252, 259, 273, 274, 337, 348]

836. In the years following closure of the Bishops Rise abstraction, bromate concentrations at Essendon rose to a level where treatment costs were too high to sustain use of the supply, even after blending. The annual rate of increase in concentrations may have reduced by the time scavenge pumping started, but the pumping appears to have been effective as a means of lowering those concentrations to more acceptable levels. Certainly, with the scavenge pumping in place, it has been possible to use the Essendon source for public supply. This is of particular significance, given the loss of the Hatfield source. A new borehole is being developed, but the license for this only allows for 6.5 Ml/day to be abstracted, whereas Bishops Rise was licensed for up to 9 Ml/day. [256-258, 277-281, 773]

837. Thames Water's Northern New River (NNR) wells are a major resource that London has relied on for more than 100 years. Up to 121.4 Ml/day of water from the wells is mixed with up to 101.8 Ml/day of surface water from the River Lee to feed the New River, a man-

[560] Whilst different meanings can be attributed to terms such as "scavenge pumping" and "interceptor pumping", this report uses the term "scavenge pumping" to describe any form of pumping that is designed to abstract contaminated groundwater.

made aqueduct which serves various water treatment works (WTWs) and supplies the Lee Valley reservoir chain. However, the bromate contamination has reduced the reliance that can be placed on the wells; it has also affected the quality of the River Lee, albeit to a lesser extent. The impact of this is particularly significant during drought conditions, when the resource available to TW is likely to be 50 Ml/day less as a result of the contamination. [327-330, 342]

838. The group 3 wells, from Hoddesdon south to Turnford, are the worst affected of those that feed the New River. After 2001, measured bromate concentrations rose here and reached a peak of 67.2 ug/l, in October 2003. It is unclear whether levels would have continued to rise thereafter, because sampling was disrupted by maintenance work on the River in 2004 and rainfall was heavy towards the end of that year. In 2005 and 2006, scavenge pumping was taking place at Bishops Rise; even so, occasional concentrations of more than 40 ug/l were recorded in the group 3 wells during that time. [334]

839. Against that background, it is arguable that bromate concentrations in these TW wells are levelling off or even reducing, as the effects of SLC diminish, and that remote scavenging is having little impact. On balance however, having considered the evidence, I consider it more likely that the Hatfield pumping is responsible for lowering the levels of bromate found in the group 3 sources. Certainly, this would be consistent with the findings of statistical analysis and a hydrogeologist's view of the available data. It seems that rapid fissure flow to the east of Hatfield allows concentrations in the group 3 wells to drop by some 10-30 ug/l, within about a week after pumping starts at Bishops Rise. [337, 339, 773, 776]

840. Hornsey WTW, which serves approximately 340,000 people, is fed directly from the New River. TW manage bromate quality in the River using mass balance based predictions that are validated with real time data. This allows the 10 ug/l standard to be met at Hornsey, but high bromate levels in the wells can limit the quantity of water available to the WTW. The high levels even mean that all the wells cannot be sampled on the same day, without risking exceedance of the 10 ug/l standard in the River. [331, 345, 379]

841. Treatment at Hornsey WTW is now being uprated to cope better with the quality of New River water. This £50 million scheme, which has been approved by the Drinking Water Inspectorate and is to be completed before October 2008, includes treatment with granulated activated carbon (GAC) to remove bromate. Whilst the scheme was designed before the impact of scavenge pumping was appreciated, the operating costs and carbon dioxide emissions are largely dependent on the amount of bromate present, because this will determine the frequency at which the GAC needs to be regenerated; a process which involves heating it to approximately 1000 degrees. The estimated operating costs are about £100,000 in an ordinary year or as high as £2.5 million in a drought year. [381-389]

842. TW's Coppermills and Chingford South WTWs are also affected by the bromate contamination, but are sensitive to concentrations of less than 10 ug/l because they use ozone treatment which, itself, can produce bromate from bromide containing waters. [331, 332]

843. I am led to conclude that serious pollution has already occurred and is ongoing. Its significance is reflected by the extent and degree of bromate contamination in waters intended for potable supplies. This is very widespread and the impact is particularly severe

in Hatfield. The water companies are managing the situation, in respect of public supplies, but at considerable cost to themselves and their customers.

The Appropriate Remediation Requirements

844. There is no suggestion that the land at SLC should be remediated because of the use that land is put to. However, significant pollutant linkages have been identified for both bromate and bromide, between the soil at SLC and the groundwater contained in, or in hydraulic continuity with, the chalk aquifer. [48]

Water Quality Standards

845. Government policy, for contaminated land, is that remediation under the Part IIA regime should result in the land being suitable for use. Whilst it would appear that the Circular does not specify that this objective applies equally to water that has been polluted by contaminated land, this would seem a sensible interpretation of the statutory guidance. On that basis, the remediation scheme should ensure that the groundwater is suitable for abstraction for potable supply. [27, 391]

846. Bromate does not occur naturally in soil or water and its concentration, in drinking water, must not exceed 10 ug/l. Conventional water treatment methods do not remove bromate, but may oxidise bromide to bromate. The remediation standard for bromate should therefore make allowance for this, given the bromide that is also present. The water companies suggest a limit of 5 ug/l, but no reason other than pragmatism is given for selecting this particular figure. [37-38, 301, 401-402, 804]

847. There is no standard for bromide in drinking water. The appealed remediation notice was underpinned by a toxicity based guideline figure of 3000 ug/l. However, it is now suggested that 500 ug/l would be more appropriate. [38, 180, 302, 411]

848. Background levels of bromide in groundwater, in the Hatfield area, are 50-100 ug/l. There is some evidence to suggest that elevated concentrations in raw water can result in the formation of unacceptable quantities of THMs as by-products of disinfection. That evidence is limited, but a number of points emerge. Firstly, variable and occasionally high THM concentrations have been observed at treatment works affected by the SLC contamination, but the 100 ug/l (THM) limit for drinking water has not been exceeded. Secondly, experience across the water industry indicates that it is extremely rare for high bromide concentrations to cause exceedance of that limit, but it is unusual for raw waters to contain more than 500 ug/l bromide. Thirdly, the formation of THMs in water treatment is influenced by the disinfection process employed and by the make up of the raw water; whilst it might be possible to derive suitable bromide standards for existing treatment works, it would be difficult to justify a robust generic standard for the aquifer given the more stringent disinfection requirements that may be introduced. [38, 39, 180, 302, 407-410, 589-510, 806]

Practicability, Effectiveness and Durability of Remediation

849. The bromate and bromide contamination originates from Steetley's, Sandridge chemical works, which operated on the SLC site during the approximate period 1955-1980. It would appear that chemicals leaked into the ground, through two discrete sumps, and that soil from across wider areas of the site was contaminated as a result of activities here. The high

concentrations of contaminants that are still being found in groundwater under the site, so long after the works closed, suggests that a substantial source remains below the site's surface. However, there is currently no suggestion that it would be appropriate to excavate the site, given the high density residential development that has been here since 1987. [34, 35, 41]

850. Below made ground at the surface are 2-5m depths of fluvioglacial deposits which consist of discontinuous layers of sand, gravel and clay. Under these are chalk; a 1.4-6.6m deep top layer of soft "putty chalk" overlies hard blocks of chalk, between which are fissures through which the groundwater can flow with relative ease. [40]

851. The site has been the subject of many studies, but there is still uncertainty over how much contamination remains within and above the chalk, and over the flux of contaminants leaving the site. The flux will be affected by the height of the water table, which varies over time, but is generally found at depths of 2-5m. From the information that is available, it seems likely that a substantial proportion of the bromide and bromate is dissolved in water held in the fine pores of the chalk, above and below the water table. The migration of contaminants from these fine pores to the fissures is very slow. Estimates suggest that it takes 8-27 years for contaminated water to flow 400m beyond the site boundary, but a relatively short additional time to reach Hatfield, more than 5 km to the east. [40, 157]

852. Given the potential for diffusion in the chalk and for lateral flow through the sand and gravels, there is certainly no reason to believe that the sink of residual contaminants is confined to the area below the site. However, the significance of this is unclear. In addition to the spread of bromate and bromide, within the chalk, some drainage water will have flowed off-site before entering the putty chalk and some polluted groundwater, from below the site, will have contaminated the fine pores of block chalk in other parts of the aquifer.

853. As I have already indicated, scavenge pumping at Bishops Rise has proved beneficial in lowering concentrations of bromate and bromide in borehole sources downgradient from Hatfield. The impact of pumping has been studied and, whilst further tests would be needed to quantify seasonal influences, I am satisfied that the scavenging itself is demonstrably effective in controlling contaminant levels in these downstream abstractions. It also removes some of the overall pollutant load on the aquifer. Fortuitously, it offers an effective capture system at a point where fissures in the chalk have been enlarged by decades of abstraction for public water supply. [273, 349-351, 776-777]

854. Contaminated water from the Bishops Rise source is treated, to reduce the bromate to bromide, and pumped to two wastewater treatment works where, after further treatment, it discharges to a river system which provides sufficient dilution to protect downstream uses. After consideration of an Environmental Statement, the EA granted TVW an abstraction license for the purpose of scavenge pumping and I see no reason to believe that this is not a sustainable operation. [348]

855. Nevertheless, Bishops Rise is not necessarily the best location for scavenge pumping. It would seem preferable to pump from a location, or locations, closer to SLC where the plume is narrower and the contaminant concentrations are higher. There are some private boreholes upstream of Hatfield; the characteristics of these would need to be investigated, along with any potential alternatives, and arrangements for disposal of the pumped water would need to be explored, before the optimum location(s) could be identified. [306]

856. Furthermore, there may be other ways to break the pollutant linkages and/or mitigate their effects on groundwater quality. Scavenge pumping was the only system discussed in evidence, but the appropriate person(s) should not be denied the opportunity to consider other methods in their assessment of the best practicable technique of remediation. [237]

857. Predictive modelling is also needed to establish whether the benefits of particular remediation options would justify the costs involved, in the long term. TW have developed a groundwater flow and contaminant transport model, to predict future bromate concentrations at their NNR wells, but it is necessary to establish whether this would be a suitable tool for the purposes of developing a remediation scheme to deal with the contamination from SLC. [28, 346]

858. From this it can be seen that, despite the extensive studies that have been made of the site and of the impact of contamination, more work is needed to identify the best practicable technique for remediating the aquifer. The standard of remediation cannot properly be identified until the options for lowering bromate and bromide concentrations have been explored and evaluated. [27]

859. It is unrealistic to expect that all these contaminants will be removed, given the widespread dispersal that has occurred since they entered the soil. Also, with the current state of knowledge, I cannot be confident that the 5 ug/l bromate and 500 ug/l bromide standards are achievable by the 2015 deadline suggested by the water companies. I recognise that this timescale reflects the EC Water Framework Directive's aim of achieving good groundwater status by that date. However, failure to comply with the requirements of a remediation notice is a criminal offence and I do not accept that it would be appropriate to regard standards, that are set by such a notice, as targets. S.78M of the (EPA) Act allows for the defence of "reasonable excuse", but I believe that it would be unwise to rely on the Court's likely interpretation of that phrase. [265, 303, 318, 392, 800-803]

860. In any event, there is no need to identify a long term remediation scheme at this stage or to stipulate a date by which such a scheme should be in place. The (EPA) Part IIA regime allows for phased remediation, wherein assessment actions are required to identify treatment action(s) which would be effective, but which would be specified in subsequent notices. Nevertheless, interim treatment actions may be justified and urgent remediation may be required if there is imminent danger of serious pollution being caused. [25, 26, 307, 812]

Interim Treatment Action

861. In this case, as I have already outlined, serious pollution is being caused by bromate contamination of groundwater intended for public supply. The Bishops Rise (Hatfield) supply cannot be used and the evidence suggests that, were it not for scavenge pumping, the Essendon supply would also be lost and less water would be available to north London from the Northern New River wells. The problem would then be compounded because these boreholes are effectively scavenging whilst being used for supply. A reduction in their use would increase contaminant concentrations in the spring fed River Lee, which could have an even greater impact on supply, because this feeds the treatment works at Coppermills and Chingford South, both of which use ozone and are therefore sensitive to bromide in addition to the bromate. Also, any reduction in abstraction from established boreholes,

affected by the plume, is likely through diffusion to increase contaminant concentrations in the fine pores of the chalk, making it more difficult to remediate in the future. [358, 359]

862. It has been argued that there is no need for urgent remediation because the water companies are obliged to provide an adequate supply of water to their customers and therefore would continue scavenge pumping. I agree that this pumping is likely to continue; the water companies evidently consider it to be a cost effective way of protecting supplies. However, I do not accept that the cost of this protective action should properly be borne by the companies or their customers, as this runs contrary to the principle that the polluter should pay. [252, 357, 360, 792]

863. These considerations lead me to conclude that, pending the findings of assessment actions that will allow a suitable long term remediation strategy to be implemented, there is an urgent need for interim action to be taken by those who are liable for the remediation of pollution caused by the bromate linkage. This would relieve the water companies of the need to fund scavenge pumping in order to maintain their supplies.

864. As things stand, there are substantial other costs that these companies are having to meet in order to cope with the consequences of the bromate contamination. Scavenge pumping helps to keep this other expenditure down and the Water Services Regualtion Authority (OFWAT) evidently consider it to be justifiable, as they have allowed the cost to be recovered through customers' bills. [259]

865. The other expenditure relates to a variety of measures including the development of new supplies and of new treatment methods that will allow more use to be made of existing sources. These measures will effectively increase the available resource and therefore the flexibility of the companies to manage supplies; this is particularly important in an area such as this where demand is rising, existing resources are seriously stressed and reliance has necessarily been placed on the use of emergency boreholes. Whilst the measures have been designed to help manage the bromate contamination, the benefit of the investment should be reaped by the companies and their customers. It should not be used to compensate for the loss of supplies that would result if scavenge pumping at Hatfield were to cease. [253, 327, 343, 778, 783]

866. Nevertheless, it is necessary to consider whether continuation of this scavenge pumping represents the best practicable technique of urgent remediation that is currently available.

867. The water companies maintain that alternatives, to the Bishops Rise arrangement, have been looked at. However, the evidence is limited to a summary of options assessed by TVW shortly after this Hatfield borehole had been taken out of supply. This, in itself, is not persuasive; it is out of date and lacks analysis. [766]

868. Given the stage at which the companies suggested that the notice should be amended to include a requirement for scavenge pumping, it would have been helpful to have seen an assessment, by them, of the realistic alternatives that are currently available. Set against this, those opposed to the inclusion of such a requirement have identified possible alternatives in general terms, but have provided no evidence of what might be the best practicable technique despite being told, a year before the inquiry opened, that pumping at Bishops Rise was being considered as a remediation option. [294, 753, 755, 771, 779, 787, 789, 793]

869. I recognise that those persons are disputing liability, but (EPA) S.78L allows for a notice to be modified at appeal stage. An appellant has a right to be heard, under (2006) Regulation 11, if the notice is to be modified in a way that is less favourable to him. However, in this case, the appellants had forewarning of the suggested modification and the inquiry offered them the opportunity to address that suggestion; indeed, I highlighted this at the pre-inquiry meeting. In the circumstances, I am satisfied that they have been given a fair chance to challenge the water companies' proposal for interim treatment and to test the companies' evidence in support of that proposal. The EA now share that view and are proposing that the notice be modified so that suitable provision is made for this treatment to be funded by the appropriate person(s). [5, 248-250, 355, 752]

870. In the event, no party has demonstrated that a particular technique has the best combination of practicability, effectiveness and durability, because no technique has been properly assessed apart from the Bishops Rise scheme. [294]

871. Certainly, this scheme has some obvious attractions, beyond the fact that there need be no delay in implementation. Some of these are as follows. The man-made infrastructure is in place, thereby avoiding the need for capital expenditure, and the underground fissure system which feeds the borehole has been enlarged as a result of substantial abstraction over many years. Following extensive trials, the operation and impact of the scheme is reasonably well understood; both water companies are now experienced in managing their supplies with the scheme in place. The pumping appears to be rapid and effective in lowering bromate concentrations at Essendon and the Northern New River wells and it removes significant quantities of contaminants from the aquifer. Also, sustainable arrangements are in place to treat the contaminated water and return it to the aquatic environment. [273, 290, 353, 360]

872. Given the urgent need for action, it is hard to imagine a better interim measure. Nevertheless, I recognise that the annual operating costs, which are estimated to be about £570,000 - £660,000, have not been compared in any transparent and meaningful way with the costs of possible alternatives. [785]

873. Those who are most opposed to the inclusion of this as an interim treatment action, in the notice, argue that a period of 12 months should be allowed for alternatives to be assessed and the best one implemented. In my view, such a short timescale is likely to rule out an arrangement involving new borehole(s) upstream of Hatfield, given the need to develop both the abstraction(s) and the attendant systems for treating and disposing of the abstracted water. I have no doubt that the potential to change existing water management procedures, so as to reduce the amounts abstracted from Hatfield, could be investigated. However, the likelihood of this producing a significant cost saving is very small, bearing in mind that the water companies clearly considered the current arrangements to be the most cost effective and OFWAT have already decided that the costs of the existing regime can be passed through to customers. Also, as I have already observed, the scope for reducing existing groundwater abstractions is limited by the need to continue scavenging so as to protect the River Lee and the prospects for future remediation of the aquifer. [277, 304, 778-779, 782-783, 787-789]

874. On balance therefore, the continuation of scavenge pumping at Bishops Rise would appear to offer the best practicable technique for the urgently needed means of allowing public

water supplies, that have been affected by the bromate contamination, to be provided at reasonable cost whilst a strategy to remediate the aquifer is developed.

875. I am also persuaded that the amount to be pumped out from this Hatfield borehole should be maximised, within the constraints imposed by the licence and by operational considerations, as this allows greatest use to be made of downstream abstractions and is most productive in removing bromate. Taken together, these factors provide the best prospect for success in any future remediation. In my view, the cost of this is amply justified by the benefits to be accrued, given scale of the contamination and its impact on waters intended for public supply. [28, 350]

876. The effectiveness of the scavenging and treatment system is reflected in the quality of effluent discharged at the end of the process and in the quality of abstractions downstream from the borehole. It depends on careful operational management and on proper maintenance of the plant. Given the security considerations, and the skill and experience needed to carry out these monitoring and operational tasks, the work is best carried out by the water companies. The companies do not need to be consulted on such an arrangement, as they have suggested it. Also, their explicit consent is not required because S.78G makes provision for this.

877. Subject to the proviso that the obligation to fund these scavenging arrangements should cease, once long term remediation measures are in place or a reasonable level of remediation has been demonstrated, I believe that the notice should be modified to incorporate this as an interim requirement. However, given the uncertainties over progress that will be achieved towards remediation, I also consider it necessary to place a time limit on this requirement. The EA's suggestion that funding should continue for no longer than 10 years seems reasonable. By that time, the prospect of remediation will be better understood and those liable should have the opportunity to challenge a requirement for this Hatfield scavenging to continue.

878. A reasonable level at which the need to fund these arrangements could cease would be that which would allow downstream abstractions to be fully exploited, without fear of breaching the 10 ug/l bromate standard, even if pumping from Bishops Rise were to be discontinued. Those resources could then be used freely for water supply, which would also serve to continue scavenging the aquifer whilst longer term remediation measures are implemented. On the available evidence, that level would be 5 ug/l as the water companies are confident that this would be a suitably protective standard of remediation to be achieved by 2015. The EA too are evidently content that pumping could cease at this point, which suggests that such an approach would not be inconsistent with progress required under the terms of the EC Water Framework Directive. [249, 301, 318- 319, 391-392]

879. I accept that this 5 ug/l bromate level may not be achievable, within 10 years, by pumping from Bishops Rise. That is beside the point. What matters is that, if it were to be achieved, the funding should be allowed to stop. [800]

880. However, I do not consider it necessary or appropriate to link cessation of this interim pumping to achievement of a certain bromide level. Scavenge pumping is urgently required to control downstream bromate, not bromide. Water treatment methods may oxidise bromide to bromate, but a standard of 5 ug/l allows headroom for this. [250, 401-402]

881. If scavenge pumping were to cease now, future remediation of the aquifer would be made more difficult in respect of both the bromide and bromate linkages. However, there is no suggestion that pumping will cease. The prime consideration is whether the polluter(s) should now be required to pay for the operations that, to date, have been funded by the water companies. I have concluded that they should, but only because the bromate significant pollutant linkage is making the groundwater unsuitable for use in public water supplies. The bromide linkage is not having that effect and there is no evidence to show that, in the absence of scavenging from Bishops Rise, downstream levels of bromide would be sufficient to make existing sources unsuitable for supply with current treatment arrangements. It is therefore irrelevant, in this context, that the bromide is also causing "pollution" in the dictionary defined sense that was confirmed by the Court of Appeal in *R v Dovermoss Ltd [1995]*. [792, 815-816]

Assessment Actions

882. As I have already explained, the standard of remediation to be achieved in the longer term cannot be established until options to break the bromide and bromate pollutant linkages, and/or mitigate their effects on groundwater quality, have been assessed and the best practicable technique(s) has been identified. In order to do this, estimates will need to be made of how much contamination is left under the site, how it is distributed between the strata and how quickly it is migrating away. It also requires possible borehole locations to be assessed in terms of their suitability for removing the contaminated groundwater and in respect of the arrangements that would need to be made for its treatment and disposal. Coupled with this is the need to identify the modelling capability and data required to predict the effect of candidate remediation techniques on the behaviour of the contaminant plume.

883. A programme of water quality testing also needs to be established at existing boreholes and supplies, and on the River Lee. This will allow changes in the condition of the pollutant pathways to be monitored along with the impact of the linkages on affected sources of supply.

Costs and Benefits

884. These assessment actions are needed to identify the best long term approach to remediating the aquifer and protecting water supplies. That approach is likely to be very expensive; indeed, the likely (£570,000 - £660,000) annual cost of scavenging at Bishops Rise is considered minor in comparison. [360]

885. Assessment actions required by the appealed notice were estimated to cost about £50,000. Following discussion between the experts involved, these requirements have now been refined and studies to assess possible borehole locations have been included in the revised versions of the remediation notice (Schedule 2) which the EA have prepared. The cost of compliance with these newly drafted assessment actions has not been quantified, but will almost certainly be higher than £50,000. However, no-one is suggesting that this would not be justified by the benefits that these actions would bring. This is not surprising, given the scale of the contamination and the potential for sensible, but substantial, economies to be made in developing the best practicable technique for long term remediation. [48-50, 231, 232]

886. The dispute over Schedule 2 is focussed on the suggested incorporation of treatment actions. For the reasons given above, I do not consider it appropriate to specify long term remediation standards at this stage, but I do see an urgent and justified need for the appropriate person(s) to fund continuation of the scavenge pumping at Bishops Rise, on an interim basis. As I have already indicated, the benefits of pumping clearly warrant the expense.

Conclusions on Appropriate Remediation Requirements

887. These considerations lead me to conclude that Schedule 2 of the appealed notice should be revised along the lines suggested by the EA in Version B of the remediation package now proposed. This provides for continued pumping from Bishops Rise and allows for the EA to agree variations to the existing practice, if this seems reasonable. [232, 250, 794]

888. I do however accept that, in requiring the best practicable technique to be identified under proposed Assessment Action F1, flexibility should be allowed for delays in obtaining the EA's approval for borehole trials to be carried out under Action D3. I see no need though for flexibility to accommodate site investigations that might be identified by Actions A(c) and B(c); those Actions do not require investigations to be carried out and this flexibility could introduce unnecessary delay. In any event, such investigations could be completed within the available timescale, if they are simple, or could be the subject of a future notice which deals with the longer term remediation. [577-579]

889. I also agree with the water companies that, in order to check the efficacy of the interim scavenge pumping, the public water supplies listed in Table 5 should be monitored weekly, rather than monthly, given the need to maintain wholesome supplies and the risk of rapid change in bromate concentrations. This reflects existing practice, but is a consequence of the contamination and should therefore be funded by the appropriate persons(s) rather than by the companies and their customers. Nevertheless, for the purposes of the notice, the EA will need to agree a mechanism for deviating from that frequency when operational constraints, such as the need to control bromate levels in the Northern New River, prevent the wells from being sampled. [309, 379-380]

890. If the Secretary of State were to disagree with my view that a better interim scheme is unlikely to be developed within 12 months, he might prefer a revised remediation notice along the lines suggested by the EA in Version A. This would allow alternative schemes to be investigated, including the development of boreholes on private land between Hatfield and SLC. In such an event, the provisions of S.78G would need to be considered. [232, 787]

Liability for Remediation

Appropriate Persons

891. Anyone who caused or knowingly permitted the bromate or bromide to be in, on or under the land at SLC is a (Class A) appropriate person, but it is necessary to consider the question of liability separately for each of these pollutants. [29]

892. There is no doubt that Redland, as the company (under a former name) which operated a chemical works on the site for some 25 years, caused these contaminants to be present. Indeed, Redland accept that they are a Class A person for each linkage. However, they sold

the site in 1983 and argue that Crest, who purchased it, are also part of the Class A group for both bromide and bromate. [34, 186, 621, 711, 730-731]

893. The EA believe that Crest neither knew about the bromate nor caused it to be present. In respect of bromide the EA consider that, whilst Crest did not cause its presence, they did knowingly permit it to remain in and under the land during the period when they had total control of the site, which appears to have been from about 22 September 1983 to 29 October 1986. [79, 190, 193]

894. Crest, on the other hand, maintain that they did not cause either contaminant to be present. They did not know that bromate was present and, whilst they knew that bromide was there, their actions did not amount to knowingly permitting it to remain. Indeed, they argue that they did all they could reasonably have been expected to do, to remove the bromide. [479, 532, 535]

895. Woolwich, who owned the site after Crest, were identified as an appropriate person for the bromide linkage. However, they were excluded from liability because of their limited responsibility. No party appears to be suggesting that Woolwich should be held liable for any part of the remediation and I see no reason to believe that they should. [45, 193]

Did Crest cause contaminants to be present?

896. The issue is whether Crest caused bromide and/or bromate to be present in, on or under the land; not whether Crest caused these contaminants to enter the land. The test is therefore different to that under S.85(1) of the Water Resources Act (1991) which concerns the entry of matter into controlled waters. To that extent, the findings in *National Rivers Authority v. Biffa Waste Services Ltd [1996] Env LR 227* have no bearing on my considerations. [29, 536, 705]

897. As the Circular explains, the test here is whether Crest were involved in active operation(s), or failure(s) to act, to which the presence of contaminants is attributable.

898. Housebuilders Crest purchased SLC in September 1983, aware of its past use and of the local planning authority's concern that residential use of the site might expose people to contaminated soil. They had been advised that some of the soil should be removed and knew that the quantity and quality of contaminated soil would determine the likelihood of it being accepted for local landfill. [68, 74, 457]

899. In February of the following year, they were told that the site was particularly sensitive because of the risk to groundwater used for water supply. They were warned that exposing the soil to rainfall could mobilise contaminants whereas, up until that time, groundwater quality had been given some protection by roofs over the works buildings and by hardsurfaces elsewhere on the site. However, within a few weeks, they were demolishing the hardstanding and buildings, leaving the ground open to the leaching effects of infiltration. [90, 691]

900. The purpose of that early demolition appears to have been financial. However, I believe that its environmental impact would have been substantial. For the first time since 1955, rainfall was allowed to percolate down through the waste collection sumps below the chemical production areas, thereby accelerating the movement of water soluble substances from these contamination hot spots into the aquifer. [57, 72, 90, 93, 692]

901. Also, breaking up the concrete floor slabs would have let rainfall through to leach potential pollutants from the surface layers beneath. Prior to that, peak bromide levels had been found in borehole samples collected from immediately below the slabs and laboratory tests had shown that high concentrations of this water soluble ion were readily extractable, despite the clay content of the surface soils. Only bromide had been tested for, but subsequent investigations showed that the highest concentrations of bromate were in broadly the same areas of the site as the highest bromide concentrations and, given the similarity of these ions' behaviour, it is reasonable to assume that bromate too would have migrated with surface water draining down through the unsaturated zone. [95, 173-174]

902. These contaminated surface layers were left exposed to rainfall for about 2½ years and so, by the time they were excavated, some of their bromide and bromate content would have migrated down towards, and possibly into, the putty chalk. In addition, the sumps would probably have been acting as soakaways, thereby encouraging further leaching of the surrounding contaminants. It is not clear how much contamination escaped removal in this way but, whatever the amount was, it remained under the site when it would otherwise have been excavated for off-site disposal. To that extent, Crest caused some of the bromide and bromate to be present. [57, 93, 137, 471, 706-708]

903. The potential for Crest's actions to have flushed the contaminants deeper into the ground is not in dispute. Whilst I recognise that some of the assumptions underlying Redland's flux calculations may be flawed, I see no reason to believe that the amount to have escaped removal would have been minimal, given the high concentrations that were found at the surface, the accumulations that would have built up around the sumps, and the mild (??) conditions under which bromide was extracted in the laboratory tests. In any event the provisions of S.78F, and S.78F(10) in particular, would appear to indicate that the quantities involved are irrelevant to determination of who is an appropriate person. On that basis, I am led to conclude that Crest should be considered a Class A appropriate person for both bromide and bromate. [12, 95, 190, 485, 710]

The test of knowingly permit

904. The Secretary of State may not share my view on causation and it is necessary to consider whether Crest is a Class A appropriate person by virtue of having knowingly permitted bromide and/or bromate to be present. For the test to be met, Crest would have known that the contaminant in question was present at SLC and would have had the ability to take steps to remove it, together with a reasonable opportunity to do so. [29]

905. Whilst the courts may decide on the meaning of "knowingly permit", for the purpose of the Part IIA contaminated land regime and in relation to particular cases, similar terms are used elsewhere and my attention has been drawn to examples that have arisen within various legal contexts.

906. One example, which does relate to the Part IIA regime, concerns the provisions of S.78F(9). This is *Circular Facilities (London) Limited v. Sevenoaks District Council [2005] EWHC 865*. In this case, it was decided that a person does not escape liability if that person knowingly permitted a substance to be present, but was unaware of the possibility that the substance could be converted into something which was later found to be harmful. That being so, it would appear nonsensical to suggest this principle does not apply equally to the substance itself. [630-632]

907. On that basis, it would seem that lack of knowledge about a substance's harm cannot, in itself, be a defence against liability under this regime. This would be consistent with the retrospective nature of the regime. However, the absence of reasonable opportunity to do something that might lessen the impact of that substance's presence is material and, in this respect, I believe that it is necessary to consider what would have been reasonable in the particular circumstances that existed at the time. This would be in line with the judgment reached in *Bromsgrove District Council v. Carthy [1975] 30 P&CR 34*. It would also be consistent with the objective of bringing damaged land back into beneficial use whilst reducing uncertainties over residual liabilities. If no account were to be taken of the reasonableness of their actions, developers would be less likely to take on the responsibilities that might flow from redeveloping brownfield sites; this would be contrary to sustainability principles. [447-450]

908. The Circular explains, in paragraph D.59(b), that membership of a liability group should be based on circumstances that exist at the time of the determination that land is contaminated, rather than on those that existed when the land was sold. However, this is for the purpose of applying the "sold with information" test for deciding whether a party should be excluded from liability. It does not, in my view, indicate that the test of "knowingly permit" should take no account of circumstances that existed when the party concerned is alleged to have permitted the contaminant's presence. [198]

909. Nor do I believe that the guidance in paragraph D.78 has any direct bearing on the question of who belongs to a liability group. The extent to which a party "reduced the seriousness" of the contaminant's impact is a matter for apportionment of liability within such a group. [200]

910. Separately, it has been suggested that reasonableness cannot be a consideration in applying the "knowingly permit" test, because it is not available as a defence to owners or occupiers of land who have been made responsible for remediation actions as Class B appropriate persons, when no Class A persons can be found. Whilst the regime makes no provision for Class B persons in cases such as this, where the problem is solely one of water pollution, it does aim to ensure that, wherever possible, it is those responsible for the presence of contamination who should pay for the remediation. To my mind, this highlights the importance of ensuring that the meaning of "reasonable opportunity" is not interpreted too narrowly. [641]

Did Crest knowingly permit bromide to be present?

911. Crest knew that bromide was present in the ground, before they purchased SLC in September 1983, and were aware of the need to remove some contaminated soil. Then, having bought the site, they found bromide contamination in the groundwater below. The question, therefore, is whether they had the ability and reasonable opportunity to do more than they did to remove the bromide, or prevent its presence. [434-435]

912. At the time, Thames Water Authority were the main body concerned with groundwater pollution, but they had little effective power to require the clean-up of contaminated land, particularly after the polluter had sold the land. Instead, they relied on measures secured through the planning regime. [96, 214]

913. By August 1984, Crest had obtained planning permissions to redevelop SLC, but were considering making further application(s) and were in discussion with the District Council and the Water Authority. At that stage, the Authority indicated that more downstream monitoring was needed to inform potential remedial actions, but the only possible options appeared to be removal of more contaminated soil than was proposed and/or the carrying out of scavenge pumping to remove groundwater from below the site. [80, 98, 462]

914. In December of that year, the Water Authority announced that groundwater below the site was grossly contaminated and that, with the buildings and hardstandings demolished, the risk of more widespread contamination was growing. They were concerned to protect both the aquifer and the private supplies downstream of SLC which, in terms of the EC Drinking Water Directive, could be sensitive to low levels of organic contaminants whose behaviour in the chalk aquifer was not properly understood and whose detection relied on (GCMS) gas chromatography followed by mass spectrometry, which was then a sophisticated method of analysis used for screening a wide range of organic substances. [102-102, 121]

915. At that time, there was no evidence that these organic compounds had reached the private supplies. However the available information was limited; no doubt, this was due in part to the difficulty of monitoring these substances. Certainly, the Authority considered it "desirable that certain precautions should be taken". They advised Crest to install a scavenging system that would intercept the polluted water at the "downstream" end of SLC, so as to prevent migration away from the site, and they suggested a possible means of disposal with the name of a person to contact regarding the necessary consent. In relation to soil removal, they advocated excavation almost down to the chalk, in the most contaminated areas, but with more limited removal elsewhere. However, they did also acknowledge the potential cost implications and the possibility of a compromise involving replacement of the upper contaminated layers with clean fill and then covering the remaining high risk areas with an impermeable surface. [102-103, 465]

916. The Water Authority were clearly in a very difficult position. They were effectively powerless to insist that something was done, but needed the contaminated soil to be removed as quickly as possible now that it was exposed to the effects of rainfall. However, nothing was likely to be done until the site was developed and that was unlikely to happen whilst Crest were attempting to negotiate a new permission.

917. In the event, that proved to be the case; nothing was done to ameliorate the situation until the autumn of 1986, by which time Crest had explored selling the site, without success, but had been given planning permission for 66 dwellings to be erected there. [124-126, 132, 470]

918. This lack of action, to protect the groundwater, was despite the fact that Crest's own modelling had shown that leaving the site exposed would place downstream abstractions at risk. Indeed, monitoring in the first half of 1985 had suggested that contaminants were moving downwards and away from the site. The results obtained from a new borehole indicated that, by the summer of 1985, groundwater 100m downstream of the site was badly contaminated. At this point it appears that the Water Authority were almost resigned to the fact that they would not succeed in persuading Crest to install scavenge pumping and that, given the advancing plume, they would be better off pursuing the installation of another monitoring borehole further downstream. This could then be used to provide early warning of the need to abandon the private supplies. [106, 115, 117, 118, 120, 121, 468]

919. Scavenge pumping was a known technique at the time. Indeed, consultants acting for builders who were considering buying the site from Crest, endorsed the Water Authority's suggestion. Certainly, pumping from an appropriately positioned abstraction point might have controlled downstream concentrations very effectively, particularly if this had been done at an early stage. It might even have discouraged the accumulation of contaminants in some of the fine pores of chalk, within the saturated zone. However, it would not have affected the amount of bromide present in the unsaturated zone. On that basis, it could be argued that scavenge pumping would have had no effect on the contaminant's presence "in, on or under the land", if that phrase were defined to exclude anything below groundwater level; certainly, it would have had no effect on the source of the significant pollutant linkage, which is identified as the soil and unsaturated zone. [125, 431, 483, 683]

920. One technique that clearly would have affected the presence of bromide is the removal of contaminated soil from the site. It would seem that excavation was completed by October 1986, but it is not clear how much soil was removed; only part of the final plan survives and this appears to be different to the one seen by the Water Authority a year earlier and to the one referred to in the planning permission. A draft statement of quality, produced in November 1986, leaves blank the amount that was removed. [137, 140, 206, 471, 670]

921. Information has been pieced together to suggest the depths that were removed and areas where deeper localised excavation took place. Doubts remains over what actually happened, but it is clear that more could have been taken away. In most areas, the excavations were 1m or 1.5m deep, although some of this depth may have been demolition waste, rather than original ground. No putty chalk was removed, apart from in the vicinity of the two sumps. Elsewhere, the need for deeper excavations was determined by the results of monitoring at formation level. This would have provided reasonable confidence that occupants of the redeveloped site would not encounter contaminated soil, but it left deeper pockets of contamination open to the effects of leaching. Crest certainly knew that they were leaving contaminants in the ground, when the site was developed for housing, and it is accepted that sufficient bromide remained for the land now to be designated as a contaminated land "special site". [145, 146, 181, 471, 653, 670-673]

922. Furthermore, Crest had the ability to remove more; they do not suggest that to do so would have been impossible or that they did not have the necessary financial resources. Instead, they argue that the removal of more soil was not justified. However, that goes to the question of whether it would have been reasonable to expect them to do more, not whether they had reasonable opportunity to do so. [150, 479, 649-651, 673]

923. Certainly, in terms of the regulator's view, it seems that the District Council were content to endorse Crest's actions, whilst accepting that the work on site would not have removed all contaminants. Their consultants had advised them that, once the excavations were complete, a barrier layer should be inserted before backfilling, so as to seal any residual contamination in the ground. In the event that was never done, despite it being a condition of building regulations approval. Had it been done, it might have slowed the rate of subsequent infiltration into the aquifer, because the redeveloped site was not impermeable to rainfall. It would not, though, have prevented the contaminant's presence under the site. [133-134, 472, 497-499, 656-657, 695-697]

924. However, as I have already indicated, Crest knew that leaving the ground exposed to rainfall for an extended period prior to excavation would have flushed contaminants away

from the sump surroundings and down from the surface layers, that were to be removed, towards the putty chalk below. When taken together with their decision to remove only the upper layers, apart from in the vicinity of the sumps where some putty chalk was removed but the high concentrations would have been dispersed, this amounts to permitting the contaminants to remain. Having demolished the buildings, they could have removed the upper layers and sump surroundings at an early stage or, failing that, they could have covered the site with an impermeable surface; indeed, they were encouraged to do so. [103, 120]

925. In my view, Crest did have the ability and reasonable opportunity to do more than they did. As such, they knowingly permitted bromide to be present.

Did Crest knowingly permit bromate to be present?

926. Crest's failure to do more than they did, to remediate the site, also applies to bromate. If they had removed more bromide, they would have removed more bromate in the process. The issue is whether they knew, at the time of their ownership of the site, that bromate was present.

927. Certainly, they knew before purchasing the site that bromate products had been made there and that site contamination would relate to those products. However, it was commonly believed at the time that bromate would break down rapidly in the natural environment. Therefore, it would have come as no surprise when tests, commissioned by Crest, failed to detect it in the soil. I accept that a laboratory result of less than the quoted limit of detection does not necessarily mean that the substance is absent. However, it does mean that the likelihood of it being present at or above the limit concentration is small. [509, 515, 732]

928. The limit of detection quoted for bromate was high, when judged against modern standards, but it is not clear how it compared with the standards of the time. It is meaningless to compare that limit with those for parameters which were detected by different analytical techniques and the evidence suggests that bromate itself was not regularly analysed. [517, 742]

929. Whilst I recognise that bromate levels of less than that limit of detection, have since been found at SLC, it would certainly not have been reasonable to infer, from the results available at the time, that bromate probably was present. No doubt, if such an inference could have been drawn, one of the many organisations involved would have suggested further tests. However, they did not. [509, 516, 748]

930. Also, I see no reason to believe that the consultants, who tested the soils for bromate, were in fact testing for bromide and bromate together. Those consultants clearly set out to report the two parameters separately and the analytical techniques existed which allowed such a distinction to be made. [511, 742]

931. Nevertheless, Redland argue that Crest ought to have known that bromate was present. For this, it is necessary to consider the matter of constructive knowledge.

Constructive knowledge

932. Redland claim that, in relation to the presence of bromate, Crest neglected to make such inquiries as a reasonable and prudent person would make. As was pointed out in *Roper v.*

Taylors Central Garage [1951] WN 385, this category of knowledge is distinct from actual knowledge and from the situation where a person deliberately refrains from making inquiries, the result of which he might not care to have. [521, 733]

933. Redland maintain that this category of constructive knowledge must be included within the meaning of knowingly permitting, for the purposes of the Part IIA contaminated land regime, because potential Class A appropriate persons would otherwise be encouraged not to look for contaminants. I have considerable sympathy with that view, given the underlying principle that it is only as a last resort that responsibility for cleaning up a site should fall to those who merely own or occupy the land. Clearly, it would be unreasonable to expect a site to be screened for the presence of anything and everything, but it is appropriate that persons who intend to redevelop a site should investigate the presence of contaminants that might reasonably be expected to be there, given the site's history. This is a more demanding test than that in *Schulmans v. National Rivers Authority [1993] Env LR D1* where it was held that the offence of knowingly permitting a poisonous substance to enter controlled waters could be proved by showing that the person had deliberately shut their eyes to the obvious, or refrained from such inquiry as might confirm their suspicions. [520, 734]

934. In order to determine whether someone has been simply negligent in their inquiries, it is necessary to look at how far those inquiries should have gone. This was considered, albeit in an entirely different legal context, in the case of *Vehicle Inspectorate v. Nuttall [1999] 1 WLR 629*. There, it was concluded that no offence would have been committed unless the defendant had taken a reckless view of the need to comply with the relevant regulations. On that basis, Crest cannot be held to have missed a reasonable opportunity to look for bromate; they were not required, by any authority, to do so. [524, 733]

935. Indeed, I see no reason to describe Crest's approach as knowingly reckless, in relation to their investigation of bromate. They knew it had been produced on the site and tested for it, but found no indication of its presence. This would have been explained by the belief that it would have degraded. They might have looked further, but no-one suggested that they should and there was no reason at the time to believe that it was likely to be a particular cause for concern, even if it was found.

936. Redland maintain that Crest's consultants (STATS), who carried out those tests, should have known of the bromate contamination and that Crest should be imputed with that constructive knowledge. Leaving aside considerations of case law which looks at the scope of imputed knowledge, I am not persuaded that Crest's consultants should have known that bromate remained in the ground. This is because the belief that bromate would not survive in the natural environment evidently persisted for a long time, even among some specialist environmental consultants, and, for the reasons I have given, there would have been no reason to question the failure to detect bromate in the soil. [511, 515, 526-529, 736-739, 742]

Conclusions on Appropriate Persons

937. In summary, I am not persuaded that Crest either did know or should have known, when they were in control of the site, that bromate was present. I am however satisfied that they knowingly permitted bromide to be present and, as I have already explained, I also believe that they and Redland caused both substances to be present.

938. On that basis, and at this stage in the process of determining liabilities, the liability groups for both significant pollutant linkages would consist of Redland and Crest. If the Secretary of State does not consider that Crest caused bromate to be present, the liability group for that linkage would consist of Redland alone.

Characterising the Remediation Actions and Attributing Responsibility to Liability Groups

939. The interim treatment action, of continuing to pump, treat and dispose of water from Bishops Rise, is a single-linkage action; as things stand, it is urgently needed to control bromate not bromide.

940. The assessment actions are mostly shared actions; they are needed to assess the condition of groundwater affected by the contamination and to investigate longer term treatment actions, for both bromate and bromide. Exceptions to this are Actions D1 and D2 in the remediation packages now drafted by the EA; these address pollutant specific arrangements for the treatment and disposal of contaminated water from boreholes. Action H is also a single-linkage action, because it identifies monitoring requirements for locations where bromate is the only real concern. [233]

941. Another exception is assessment Action E. This is not pollutant specific, but allows both Redland and Crest to identify possible alternatives to the treatment actions covered by Actions D1 and D2. It is for them to decide whether they wish to make such assessments, but the inclusion of this Action provides a means by which alternatives could be considered in deciding the best practicable technique.

942. I accept that actions A, B, D, D3 and G should be characterised as shared common actions, because they would be needed for both linkages, even if bromate and bromide were to be considered separately. [234-235]

943. The scope for modelling the contaminant plume also needs to be considered for both linkages, but the area of concern regarding bromate is larger than that for bromide. Action C is therefore a shared collective action. All parties appear to accept that Action F1 too is a shared collective action, because an assessment of the best practicable technique needs to be undertaken for each linkage, but these will not be identical. [238, 240]

944. If the Secretary of State were to prefer the Version A approach in which the notice makes no immediate provision for continuation of the Bishops Rise arrangements, but allows a period of 12 months for alternatives to be considered and the best one implemented, the purpose of Action F1 would be to identify the most suitable scheme. Further action(s) would then be needed to put this scheme in place; the EA identify this as Action F2.

945. However, it is not clear whether this further action would necessarily be shared. If it were to be shared, it would almost certainly be a collective action, because it is unlikely that the action would need to be carried out to the same extent for bromide and bromate. [241, 601]

946. The costs of shared common actions are borne equally by the two liability groups. For shared collective actions, the proportion of the costs that each group is to bear should reflect the hypothetical cost of carrying out the action for each linkage separately.

947. At this stage, however, it is not possible to estimate the hypothetical cost of treatment actions that would be defined by assessment Action F1 and it would be unreasonable to assume that, given this difficulty, the costs should be shared equally; paragraph D.76 of the Circular does not apply. I therefore consider it more appropriate that, if the Secretary of State were to opt for the Version A approach, this further action should be made specific to each linkage. In practice, this need not rule out a shared approach to treatment, if this is more economic; indeed, shared action F1 could identify such an approach. [242, 600-602]

948. In other respects, I mostly accept the EA's suggestions on attribution of responsibility; this is for the following reasons. The bromate liability group should carry two thirds of the cost of Action C, because the bromate plume is about twice the size of the bromide plume. The cost of Action F1 should be shared equally, because there is unlikely to be a significant difference between the cost of assessing the best practicable technique of remediation for bromide and that for bromate. Action E is optional and there is no need to attribute responsibility between the liability groups. [239-240]

Exclusion from Liability

949. Redland argue that they should be excluded from liability, for both bromide and bromate, because they sold the land "with information" to Crest. [32]

950. Paragraph D.57 of the Circular's statutory guidance points out that the context for such an exclusion is a situation where it is reasonable that the purchaser should bear the liability for remediation of the land. "Remediation of land" is not defined, but S.78A(7) of the EPA explains that "remediation" can include actions which relate both to the contaminated land and to the waters that are affected by that land.

951. Given the thrust of the legislation, it seems to me that the "sold with information" test must have the potential to transfer liability for remediation of both land and water. If it were otherwise, a situation could arise in which the seller is excluded from liability, but the buyer takes on liability for remediating only the land, leaving no-one with liability for remediation of the water.

952. In itself, D.57 makes no provision for partial exclusion. This would suggest that, if the seller has been excluded from liability by having "sold with information", the buyer must inherit all of the seller's remediation liabilities in relation to that particular pollutant linkage. Arguably, that would be consistent with S.78F(3) and S.78F(10) of the EPA. However, as is clear from D.40, the purpose of an exclusion test is to establish whether it would be fair that the seller should bear any part of the responsibility. This is reinforced by D.77 which gives guidance on the apportionment of liability in circumstances where the test is partly met, but not to the extent that the seller should be excluded from all responsibility. [12, 538, 699-700]

953. The "sold with information" test has several strands. One of these is that it only applies in a situation where one member of a liability group has sold the land to a second member of that group. Paragraph D.59(b) of the Circular indicates that this should be based on circumstances that exist at the time of determination, not at the time of sale.

954. Another strand is that, before the sale became binding, the buyer needs to have had information that would reasonably allow him to be aware of the broad measure of the contaminant's presence. This is what is at issue here, but I do not accept that the D.59(b)

guidance has any bearing on it; the circumstances referred to in D.59(b) appear to be wholly concerned with membership of the liability group. [226, 544-547, 717, 719]

955. It seems that the sale of SLC became binding when Crest exchanged contracts with Redland on 1 September 1983, although that date is not confirmed. About 6 weeks earlier, Crest had been told that, if they were to avoid unexpected contamination, they would be well advised to carefully examine the past use of the land and, if in the slightest doubt, arrange for an expert survey. [68, 554]

956. By 1 September, Crest knew that bromide and bromate products had been manufactured on the site and that, from a limited study in August, areas of significant contamination had been identified in the soil; high levels of soluble bromide had been found in two out of five boreholes and Crest were advised that more detailed investigations would be needed to establish the extent of the contamination. In such circumstances, and in making their decision to proceed with the purchase without more detailed knowledge, it would have been prudent to assume that high bromide levels existed at depth across a substantial proportion of the site. [71, 73, 223, 554, 722-724]

957. On that basis, I am satisfied that Crest had information that would reasonably allow them to be aware of the broad measure of bromide's presence. They also knew that this bromide was soluble and had access to information, on the planning file, which suggested that there was a risk of groundwater contamination. I consider it reasonable that Crest should bear the liability for remediation in respect of bromide which was present on 1 September 1983. [725]

958. However, I do not consider it reasonable that Crest should be held responsible for remediating the effects of bromide which had already leached into the groundwater by that date. This is because they did not know that the groundwater was contaminated. Thames Water Authority had recorded one high bromide result in a nearby borehole but, at that time, did not attribute it to activities at SLC. [64]

959. In respect of bromate, as I have already indicated, I do not believe that when Crest controlled the site, they either knew or should have known that it was present. It follows from this that, by the time of buying SLC, they did not have information that would reasonably allow them to be aware of the broad measure of its presence.

960. I am led to conclude that Redland should be excluded from liability with respect to the bromide linkage, but only in part. I shall therefore deal with this in considering the apportionment of costs between them and Crest.

Apportioning the Costs of Remediation

961. The guiding principle here is that, for each pollutant linkage, apportionment should reflect Crest's and Redland's relative responsibilities for creating or continuing the pollution caused. The statutory guidance identifies some possible approaches, in Part 6 of Chapter D, but acknowledges that these will not cover all situations. One approach is to consider the relative quantities of pollutants that are referable to these Class A appropriate persons.

Bromate

962. If the Secretary of State were to agree that both Redland and Crest caused bromate to be in, on or under the land at SLC, it would be necessary to apportion the costs of any bromate related remedial action between the two. Whilst there is no direct evidence of the relative quantities of bromate that are referable to them, Redland and Crest carried out very different operations on the land and controlled it for significantly different periods of time. In the circumstances, it would be unfair to apportion the costs of remediation equally and, in the absence of a more appropriate suggestion, Crest's proposal that the costs should be split 85% (Redland) to 15% (Crest) seems reasonable, as this broadly reflects the relative duration of periods when the site was under their control. In this respect, Crest's rounding up to the nearest 5% is favourable to Redland. [608]

963. If, contrary to my belief, the Secretary of State were to decide that Crest did not cause bromate to be present, but did knowingly permit it to remain, it would be necessary to consider the extent to which they could have reduced the seriousness of the implications of its presence. Certainly it would have been reasonable to have left the buildings and hardstanding areas intact for as long as possible, prior to excavating the surface layers of soil and the areas around the sumps. This is because, as I have already indicated, Crest knew that these parts of the site were highly contaminated and that water soluble pollutants would have been readily leached out by exposure to rainfall. Even so, this would only have facilitated the removal of bromate that had been held close to the sumps and in surface layers such as those immediately beneath the concrete.

964. Crest also had the opportunity to excavate deeper, but it is not known how much on-site contamination they did actually remove, how much remained and how much had already infiltrated through to the aquifer. Downstream scavenge pumping would have reduced the impact of contaminated groundwater, although it is not clear how much of the pollutant load this would have removed. Similarly, the installation of a barrier layer below the excavated soil and the provision of more impermeable surfaces across the redeveloped site would have slowed the rate of downwards infiltration, but the overall impact of these measures cannot be quantified sensibly.

965. Set against this, if Crest did knowingly permit bromate to be present on the site, it would be unreasonable to conclude that Redland did not. This was not explored at the inquiry. Nevertheless, it seems to me that if Crest should have known that bromate would have persisted, rather than degrade, the same could reasonably be said of Redland who, at the time, were operating and responsible for a chemical works where bromine compounds, including bromates, were being produced. Redland would have known that bromate had entered the soil, by spillage and leakage, and they had 28 years during which they could have removed it. In the circumstances I again consider the 85:15 Redland to Crest ratio to be the fairest apportionment of responsibility, for costs related to this pollutant linkage, if it is decided that Crest knowingly permitted bromate to be present.

Bromide

966. Apart from the issue of degradation, which does not arise, the arguments above also apply to bromide and, on that basis, the cost of any bromide related remediation action should be apportioned 85:15.

967. However I have concluded that, by selling the land "with information", Redland should be partly excluded from those liabilities which flow from their responsibility for causing bromide to be present at SLC, but only in respect of that proportion of the bromide which remained there on 1 September 1983.

968. Crest argue that, by then, a significant proportion of the bromide would have migrated away from below the site; certainly, the one downstream result available from Nashes Farm is consistent with such a contention. Even so, it is not possible to determine what that proportion would have been. Diffusion into and out of the putty chalk is a slow process; the thickness and consistency of that chalk varies; and, despite expert criticism of the conceptual models that have been suggested, there are no reliable means of quantifying the movement of contaminants below ground level. [40, 64, 477, 542, 556, 706]

969. Given the hydrogeology, it would not be rational to assume that the proportion of bromide which had migrated away from the site, by September 1983, is reflected in the duration of Redland's ownership relative to that of Crest. Bearing in mind the guidance in D.76 and D.77, I believe that Redland's liability for bromide related remediation should be halved by virtue of the circumstances surrounding the sale of the site. [729]

970. I also recognise the possibility that some of the bromate, introduced by Redland, would have since been reduced to bromide. However there is nothing to indicate that the amounts involved are likely to have been material; even Redland's expert witness was not persuaded of the importance of this process here. Certainly, the concentrations of bromate that remain in the soil and water suggest that if reduction is occurring, it is very slow under those conditions. This is quite unlike the situation anticipated by Assessment Action D2 where a controlled chemical treatment process, such as that employed at Bishops Rise, is used to reduce bromate to bromide prior to disposal. Reduction in the natural environment might account for some of the bromide that is currently present, but there is insufficient evidence available for me to ascribe fairly any significance to the effect. [348, 610-617]

971. If the Secretary of State agrees with this analysis, and that Crest caused or knowingly permitted bromide to be present, Redland's 85% liability for bromide remediation costs should be halved to 42.5%. This would leave Crest responsible for 57.5%. In fairness to Crest, these figures should now be rounded in their favour. On that basis, Crest's liability stands at 55% and Redland's at 45%.

972. Clearly, Redland's share would not be halved if it is decided that they did not sell the site with information.

Conclusions on Apportionment

973. Whilst I do not intend to go through all the other possible permutations of relative responsibility, my conclusions have led me to believe that Redland's liability in relation to the pollutant linkages should be 85% for bromate and 45% for bromide. Crest's liability should be 15% for bromate and 55% for bromide. These therefore represent the proportions of the costs of single linkage actions that each party should bear.

974. For the shared common Actions A, B, D, D3 and G, where the costs are borne equally by the two liability groups, Redland should therefore be responsible for 85% of 50% plus 45% of 50%; this amounts to 65%. Crest should be responsible for the remaining 35%.

975. The same proportions apply for shared collective Action F1.

976. However, for Action C, Redland's responsibility should be for 85% of 66.7% plus 45% of 33.3%. When rounded to the nearest percent, Redland's share of Action C should therefore be 72% and Crest's should be 28%.

Wording of the Remediation Notice

977. Action D3 makes provision for pumping trials to take place on land between SLC and Bishops Rise. The owners of such land are required, under S.78G(2), to give permission for the trials, but S.78G(3) may indicate that they should be consulted before the modified notice is issued. In order to avoid possible delay, the EA have changed the wording of D3 to provide for trials only where the land owners give their consent. [245]

978. The water companies do not need to be consulted, because of their involvement with the inquiry. Action I requires the appropriate persons to "procure" the continuation of the companies' Bishops Rise scavenge pumping arrangements. The notice, as drafted by the EA, defines "procure" to mean payment of all costs "solely attributable" to the pumping, treatment and disposal of bromate-contaminated groundwater, and associated costs of monitoring and management. To my mind, this is clear and reasonable. However, following comments made by Crest, the water companies are worried that the use of this wording might require them to demonstrate that the pumping is needed to deal with the contamination, thereby risking reopening some of the matters covered by the inquiry. Crest however maintain that the companies will simply need to show that the costs are attributable to the activities concerned. [369, 374]

979. By the close of the inquiry, the appellants declared themselves content with the EA's drafting in this respect, but TW suggested that replacing "solely attributable" by "attributable" or "arising from" might be safer in terms of securing payments for all parts of the scavenging operations. To my mind, however, these terms are open to considerable interpretation and are unnecessarily imprecise; the EA's wording is preferable. [374, 586, 818]

980. The water companies also provided an alternative definition of "procure" which is based on a unit cost approach. The inquiry was provided with evidence of those costs and, whilst this was not challenged, there is concern about the inflexibility of such an approach to future changes in the amounts involved. I share that concern and, as I have indicated, I do not consider it necessary to depart from the EA's draft, in this respect. Nevertheless, a replacement wording for paragraph (b) of Action I, that is based on a unit cost approach, is available if the Secretary of State considers this to be more appropriate. [309, 370-373, 810-811]

981. I am however concerned that the EA's version refers to costs that are solely attributable to disposal of "treated effluent". I believe that the definition would be clearer, and more precise, if the reference was to "the treated groundwater".

982. I accept that Action I does not state precisely what is required by way of the scavenge pumping arrangements, but I do not regard this as fatal. Nor do I consider it unusual, in controls such as these, where actions need to be taken in order to protect the environment, but the extent of those actions cannot be defined accurately in advance. For the reasons I have already given, I believe that the amount to be pumped should be maximised within the

terms of the abstraction licence and any operational constraints; this limits the potential liability, for appropriate persons, and therefore is not unreasonable in that respect. I am also satisfied that Action I, as worded, allows flexibility to vary the scavenge pumping arrangements with the EA's agreement. [369, 585]

983. Turning to other aspects of the notice, I believe that, as drafted by the EA, the first sentence of each action is unnecessary. It repeats the points made in Schedule 5 and in the preamble to Schedule 2; it should therefore be deleted. Also, the water companies are agreed that Table 5 should be amended to show that payments for monitoring the River Colne, at Green Bridge, should be made to TVW, not TW.

984. During the inquiry, the EA produced nine permutations of the notice to reflect possible scenarios of responsibility. Each of these has a Version A and a Version B to represent exclusion/inclusion of an immediate requirement for interim treatment at Bishops Rise. Then, following discussion of the detailed wording, they produced a revised version of their preferred notice; one in which Redland is liable for bromate, Crest is liable for bromide and interim treatment is required to address the bromate linkage. [246, 250]

985. I have amended that revised version to reflect my own findings, as outlined above, and to incorporate minor changes that were agreed during the inquiry session on the notice. However, I see no need to require that, where the EA's approval is needed for a particular course of action, such approval should not be unreasonably withheld; the EA are open to judicial review if they act unreasonably. I have also considered the various other amendments that have been suggested, to both Version A and B, but see no good reason to support them. [309, 579, 818]

986. The modified notice that I shall recommend to the Secretary of State is attached as an Annex to this report.

987. If, however, the Secretary of State were to prefer a notice which makes no immediate provision for continued scavenge pumping from Bishops Rise, he would need to consider Action F2 in the EA's Version A of the notice. As drafted, this relates to both pollutant linkages. In my view, as I have already indicated, this should be replaced by 2 actions, similarly worded to F2 but each made specific to one linkage or the other.

Procedural Considerations

988. The Regulations indicate that, before the notice can be modified in a way that is less favourable to the appellants, the Secretary of State must notify anyone who should have been served with a copy of the notice of appeal and must allow them to make representations in relation to the proposed modifications. [15, 317]

989. Apart from the appellants and the EA, those who were notified of the appeal are listed in Schedule 6 of the appealed notice, which is reproduced as Schedule 6 of the revised notice in the Annex to this report. Beechgrove, the freehold owner of SLC, is listed along with other S.78G(2) parties who are required to give their consent for actions, specified in the notice, to be carried out; these include TVW and TW, who have already made representations, but also the owners of land and of private boreholes downstream from SLC, who have not been involved in the inquiry process. [7]

990. Those S.78G(2) parties are already aware, from the appealed notice, of the need for groundwater monitoring in these boreholes. The revised notice requires pumping trials to be carried out, but only if the owner gives consent. In the circumstances, the Secretary of State may decide that there is no need to consult these parties on the modifications. [245]

991. Unlike serving a remediation notice, modification of an existing notice may not be subject to requirements under S.78G(3) and S.78H(3) to consult the owners of those boreholes and of SLC. A further consideration is that, if such a requirement existed, the urgent need for interim treatment action at Bishops Rise would appear to obviate it. Whilst these are matters of law, and therefore for others to decide, this latter interpretation of the statute does not appear to be entirely satisfactory, because the interim treatment is independent of newly specified actions that require the involvement of Beechgrove and the other S.78G(2) parties, apart from TVW and TW. Nevertheless, that involvement is discretionary, given the wording of Action D3. Common sense would therefore suggest that no party would be unfairly prejudiced if the revised notice were to be issued without further notifications. [25]

992. If, however, the Secretary of State were to decide that those listed in Schedule 6 should be given the opportunity to make representations on the modified notice, before it is issued, he can be reassured that it seems unlikely that TVW or TW would cease their scavenging or treatment operations whilst that consultation takes place. The main disadvantage of this approach is simply that the water companies and their customers, rather than Redland and/or Crest, would continue to pay the costs associated with Bishops Rise, at least until that consultation is completed.

Overall Conclusions

993. I am led to conclude that the appeals were properly made and that the land, at St Leonard's Court, was properly identified as contaminated land. In my view, the serious ongoing pollution of public water supplies, across a wide area, warrants urgent remediation action and the development of a longer term remediation strategy. The revised remediation notice that I recommend makes provision for both; in this, the appropriate persons are required to pay for the water companies' existing scavenge pumping operations, based around Hatfield, whilst investigating arrangements that would represent the best practicable technique(s) for the future.

994. I believe that both appellants caused or knowingly permitted bromate and bromide to be present, but to different extents. During the 28 years that Redland controlled the site, they introduced the contaminants and allowed them to remain in the ground. By the time Crest bought the site, the groundwater was already polluted, but considerable quantities of contaminants remained in the soil. Crest only controlled the site for a relatively brief period but, during that time, their actions prevented the clean up operations from being as effective as they otherwise would have been.

995. In my opinion, neither party could reasonably be expected to have known that bromate would have persisted in the soil, but responsibility for the remediation that is now required should be split to reflect the relative periods of ownership and the fact that Crest bought the site knowing that bromide was present. Redland should escape liability for the bromide which remained on site, at the time of sale, but not for the proportion that had already migrated away. On that basis, Redland would be liable for 85% of the costs associated with

the bromate pollutant linkage and for 45% of the bromide related costs. Crest would be responsible for the remainder.

996. There are many possible permutations of responsibility, each of which could be overlaid by different apportionments of liability. The remediation notice that I consider to be the most appropriate reflects the conclusions I have reached and my interpretation of the (Environmental Protection Act 1990) Part IIA contaminated land regime. However, if the Secretary of State were to form a different view, the wording of that notice could be adapted accordingly.

997. I also believe that, given the urgency of funding the Hatfield scavenging operations, the appealed notice could be modified without the need to consult statutory parties on the modifications. Again the Secretary of State may take a different view and, if so, the delay in issuing a modified notice is unlikely to aggravate existing conditions in the aquifer.

Recommendation

998. I recommend that the appeals are dismissed and that the Secretary of State confirms the remediation notice in the modified form that is set out in the Annex to this report.

Rupert Grantham

INSPECTOR

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DOCUMENTS

ENVIRONMENT AGENCY PROOFS, APPENDICES AND OTHER DOCUMENTS

EA1 Jon Newton's proof of evidence
EA2 Appendices 1-7 to Mr Newton's proof
EA3 Summary of Mr Newton's proof
EA4 Jenny Thomas's proof of evidence
EA5 Appendices 1-11 to Ms Thomas's proof
EA6 Summary of Ms Thomas's proof
EA7 Ms Thomas's rebuttal of other parties' proofs
EA8 Mr Newton's rebuttal of other parties' proofs

THREE VALLEYS WATER PROOFS, APPENDICES AND OTHER DOCUMENTS

TVW1 Map of Three Valleys Water's (TVW's) water supply area
TVW2 Documentation regarding population increase in the TVW area
TVW3 TVW location plan
TVW4 Extracts from the TVW water resources plan
TVW5 Extract from the (January 2007) EA consultation on areas of relative water stress
TVW6 OFWAT security of supply index – Note RD 03/02 dated 8 March 2002
TVW7 Advice (dated 24 May 2002) from the EA to St Albans District

	Council, Appendix B
TVW8	Remediation options table (December 2000) prepared by TVW
TVW9	Bundle of correspondence between TVW, DEFRA and EA regarding the significance of bromate/bromide issue
TVW10	Bromate/bromide: TVW time and costs to date
TVW11	TVW (6.6.00) notification to EA of elevated bromate levels
TVW12	TVW (21.2.01) report to Drinking Water Inspectorate (DWI)
TVW13	DWI (31.1.01) letter to TVW
TVW14	DWI (9.5.05) notice of enforcement
TVW15	TVW version of proposed modifications to schedule 2 of the remediation notice
TVW16	Trihalomethane (THM) data for Hatfield
TVW17	Drilling reports for installation of new monitoring boreholes
TVW18	Hatfield construction
TVW19	Hatfield supply 1997-2000
TVW20	Changes to Hatfield supply pattern
TVW21	Plan of Essendon adit system and boreholes
TVW22	2001 map showing extent of plume
TVW23	Hatfield bromide data
TVW24	Hatfield bromate data
TVW25	Essendon bromide concentrations
TVW26	Essendon bromate concentrations
TVW27	Plan of location observation boreholes at Sleapshyde, Park Street and Hill End Farm
TVW28	Soil moisture deficit diagram
TVW29	Schematic of Hatfield pumping trial
TVW30	Hatfield daily abstraction
TVW31	Hatfield and Essendon bromate/bromide ratios
TVW32	Bromate and bromide removal plan diagram
TVW33	Bromate and bromide concentration in relation to flow
TVW34	Interim report by UCL reviewing Hatfield pumping trials
TVW35	Revised version of TVW proposed modifications to schedule 2 of the remediation notice
TVW36	Bromate and bromide data (May ’05 to March ’07) for the R Colne at Green Bridge
TVW37	Monthly averaged annual (2000-6) concentrations for bromate at Essendon
TVW38	Letter (11.10.00) from St Albans City and District Council (SADC) to DWI
TVW39	DWI letter (31.10.00) to SADC
TVW40	Costs of abstraction, treatment and monitoring associated with the Bishops Rise interception pumping
TVW41	TVW response to points raised under cross examination of Mr Sage
TVW42	Costs of abstraction, treatment and monitoring associated with the Bishops Rise interception pumping (8.5.07)
TVW43	Mr Robert Sage’s proof of evidence
TVW44	Mr Sage’s summary proof
TVW45	Mr Sage’s rebuttal of other parties’ proofs

TVW46 Mr Sage's response to Ms Heasman's rebuttal
TVW47 Dr Richard Burns' proof of evidence
TVW48 Dr Burns' summary proof

THAMES WATER PROOFS, APPENDICES AND OTHER DOCUMENTS

TW1 Figures 1-5
TW2 Bromate data set for the New North River (NNR) wells
TW3 NNR wells' operating strategy for bromate mitigation at Hornsey – a (February 2007) report by Dr Paula Agutter
TW4 Ciara Fitzpatrick's interim UCL report (February 2007) on Hatfield pumping test, together with update report (no numbered pages) provided shortly before the inquiry
TW5 Review of scavenge pumping at Hatfield – a (March 2007) report by Jane Dottridge of ESI
TW6 Proposed schedule to remediation notice
TW7 Bromate inquiry Gannt chart
TW8 Letter (19.9.96) from Atkins to Dr Bishop
TW9 Thames Water sewage and clean water boundary map
TW10 Schematic of the Lee Valley system
TW11 Graph showing bromate concentration in the NNR at Hornsey and Hornsey WTW
TW12 Drinking Water Inspectorate's (DWI's) acceptance of revised undertaking letter dated 14.2.07 (corrected 5.3.07)
TW13 (7.2.07) Request from DWI and Thames Water's (12.2.07) response
TW14 Correspondence between Thames Water and the Drinking Water Inspectorate regarding bromide concentrations in water for potable supplies
TW15 Photographs of the NNR and wells
TW16 Extract from Part 2 (Drinking Water Safety) of Drinking Water 2005 – a report by the DWI Chief Inspector
TW17 DEFRA consultation on amendment of the Water Supply (Water Quality) Regulations 2000 and the Water Supply (Water Quality) Regulations 2001
TW18 The Water Supply (Water Quality) Regulations 2000 (Amendment) Regulations 2007
TW19 SI 2000 No. 3184 The Water Supply (Water Quality) Regulations 2000
TW20 Details of Thames Water's sewerage charges arising from a discharge of treated groundwater at Bishops Rise and from other activities relating to scavenge pumping here
TW21 Dr Bishop's note regarding oral evidence on CD 11A p294 Table 5.4
TW22 Dr Philip Bishop's proof of evidence
TW23 Dr Bishop's summary proof
TW24 Dr Bishop's supplemental proof
TW25 Dr Stephen White's proof of evidence
TW26 Dr White's summary proof
TW27 Dr White's supplemental proof

CREST PROOFS, APPENDICES AND OTHER DOCUMENTS

C1 Barry Mitcheson's proof of evidence
C2 Appendices 1-15 to Mr Mitcheson's proof
C3 Roderic Cameron's proof of evidence
C4 Appendices 1-5 to Mr Cameron's proof
C5 Summary of Mr Mitcheson's and Mr Cameron's proofs
C6 Mr Mitcheson's rebuttal of other parties' proofs
C7 Appendices 1-8 to Mr Mitcheson's rebuttal
C8 Summary of Mr Mitcheson's rebuttals
C9 Mr Cameron's rebuttal of other parties' proofs
C10 Appendix to Mr Cameron's rebuttal
C11 Summary of Mr Cameron's rebuttals
C12 Mr Mitcheson's note on oxidising agents as Cl
C13 Extract from 1983 (but otherwise undated) contract for sale of SLC

REDLAND PROOFS, APPENDICES AND OTHER DOCUMENTS

R1 Lesley Heasman's proof of evidence
R2 Appendices A-WX to Ms Heasman's proof
R3 Summary of Ms Heasman's proof
R4 Ms Heasman's rebuttal of Mr Mitcheson's proof
R5 Ms Heasman's rebuttal of Mr Cameron's proof
R6 Ms Heasman's rebuttal of Mr Sage's proof
R7 Ms Heasman's rebuttal of Dr Burns' proof
R8 Ms Heasman's rebuttal of Dr Bishop's proof
R9 Ms Heasman's rebuttal of Dr White's proof
R10 Ms Heasman's note on analytical methods used as part of the site investigations in 1983 to 1986
R11 Redland's accounting provision for St Leonard's Court

CORE DOCUMENTS (all numbers are prefixed by CD)

BUNDLE 1A
Relevant Documents

		DATE	PAGE NUMBER
1	Schedule of proposed use	04.02.55	1
2	Letter HCC to SADC	10.02.55	2
3	Letter HCC to SADC (incomplete)	15.04.55	3
4	Letter BE to SADC	05.04.56	4
5	Letter SADC to WLJ	09.09.57	5
6	Letter WLJ to SADC	10.09.57	6
7	Letter WLJ to SADC	12.09.57	7
8	Letter WLJ to unknown (incomplete)	28.02.58	8
9	Letter Ranger Burton & Frost to SADC	23.10.61	9

10	Letter SPC to SADC	30.10.61	10
11	Letter SADC to SPC	10.11.61	11
12	File note (unnamed)	1961	12
13	Letter BE to SADC	08.12.67	13
14	Letter SADC to BE	31.01.68	14
15	Letter SADC to BE	14.05.68	15
16	Letter BE to SADC	27.09.68	16
17	Letter SADC to BE	02.10.68	17
18	Letter BE to SADC	25.10.68	18
19	SADC note of meeting held in Oct 1970	26.10.70	19
20	SADC report	13.10.70	20
21	Letter HCC to SADC	18.05.71	21
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24	A report "Environmental site investigation and quantitative pollutant linkage assessment". Reference 4092395/2001297/slc003.Rev.1	12.02	368 – 446
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28	MSc thesis: "Bacterial reduction of bromate in natural & laboratory environments".	08.02	448 – 519
29	MM Report "Bromate contamination study-review and hydrological interpretation of data". Reference 56550/01/13/21 Dec 00	21.12.00	520 - 605
30	Malcolm Roberts' report "The Sandridge/Hatfield bromate pollution investigation".	11.04.01	606 - 709
31	A Report "Sandridge, St Albans area, bromate plume, groundwater monitoring, well installation final report". Reference 4092395/gtg.2001297/corres/004ea.doc	03.03	710 – 806
32	UOS: "Review of physical and chemical properties of bromate with respect to its potential to undergo natural attenuation in groundwater".	03.02	807 – 822
33	Email on Consultation with TVW and TW on remediation actions	24.07.03	823 – 839
34	CD of groundwater contour maps for Colne and Lee catchments.	undated	Not included in bundle
35	V Report : "Concentration and dilution of bromate in the River Colne and Ellenbrook during pumping to waste of the Hatfield source". Reference TVR054	03.02	840 – 865
36	CU Report: "Toxicological impact of the use of bromate loaded water. CU, S.F. Tyrrel; N.L. Turner; C D Brown & J W Knox,	06.02	866 – 894
37	David Buckle Report: "Bromate risk assessment (Roestock, Tyttenhanger and other Colne valley sources)".	03.02	895 - 913

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38	V Report: "Bromate groundwater flow study Phase 1 (conceptual understanding) Report and Appendices". References PO12990.	02.02	914 - 1297

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39	A Report: "Jersey Farm Landfill, House Lane, Sandridge – Collation and assessment of documentary information." Reference 5014299	05.03	1298 – 1448
40	Wembley Laboratories, site investigation report. Reference 1005/KB	01.75	1449 – 1516
41	Correspondence between J Newton and J Stringer	01.03	1517 – 1521
42	HCC file on Jersey Farm	1959-1989	1522 – 1603
43	V Report: "Bromate Groundwater Flow Study Phase 2". Reference P012990	09.03	1604 – 1765

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44	WRc Plc Report "Laboratory Study of concomitant anoxic biological removal of bromate and nitrate from groundwater". Reference number: UC 6368	22.10.03	1766 – 1824
45	WRc Plc Report "Bromate contaminated groundwater bioremediation: Phase 2 enrichment of high rate bromate degrading microbes". Reference EA16702	17.09.04	1825 – 1853
46	WRc Plc Report "Bromate contaminated bioremediation: Phase III characterisation of high rate bromate degrading microbial culture". Reference EA6883	Undated. Presumed 05.05	1854 - 1892
47	V Water "Application for an abstraction licence at Hatfield (Bishops Rise)" Environmental Statement	09.10.06	1893 – 1940
48	MWB Report on "the results of the chemical and bacteriological examination of the London waters for the twelve months ended 31 December 1937	1937	1941 - 1955
49	MWB Report: "the results of the chemical and bacteriological examination of the London waters for the years 1965 – 1966	1966	1956 – 1961
50	BGS: "Highway damage to the chalk acquifer: the movement of groundwater in the chalk near Bricket Wood, Hertfordshire, and its possible pollution by drainage from the M25 motorway".	1989	1962 – 1969

	Partial document		
51	Trihalomethanes data for Hatfield, Essendon and North Mymms sources. Reference WD/89/3	undated	1970 – 1987
52	A Report "Bromate monitoring data review" Draft Report . *Appendices to this report are continued in Bundle 2F.*	May 2006.	1988 - 2116

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52	A Report "Bromate monitoring data review" Draft Report Appendices .	May 2006.	2117 - 2445
53	Water Research Centre Technical Report TR66 "Manual on analytical quality-control for the water industry". January 1978	January 1978	2446 - 2456

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1b(1)	EA draft Remediation Notice assuming Crest and Redland Liable (Versions with and without track changes)	20.04.07	
1b(2)	EA Remediation Notice assuming either only Crest or Redland is Liable (Versions with and without track changes)	20.04.0 7	
1b(3)	TVW and TW Working draft of Remediation Notice	20.04.07	
1b(4)	Redland first working draft of actions for insertion into the EA's Remediation Notice	24.04.07	
1b(5)	EA draft remediation notice without scavenge pumping	03.05.07	
1b(6)	EA draft remediation notice with scavenge pumping.	03.05.07	
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1b(8)	Redland version 2, amended version of 25.4.07 draft.	04.05.07	
1b(9)	TVW and TW joint response to final draft EA notices.	04.05.07	
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1b(11)	Water companies' amendments to remedial treatment action 1	08.05.07	
1b(12)	EA's preferred version of the remediation notice at the close of the inquiry	08.05.07	
2	Appeal by Redland	29.11.05	21 - 47
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5	EA Policy on urgent remediation and consultation.	27.04.07	
5.1a	EA guidance on urgency and prioritisation under Part IIA EPA 1990		
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	requirements under Part IIA EPA	
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6	Significant points of disagreement following consultation with the EA , AP's and Water Companies on revised remediation notices as at 1715 hours 3.5.07	03.05.07

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1	Version 1 Redland wholly responsible for Bromide and Bromate without scavenge Pumping	04.04.07
2	Redland wholly responsible for Bromide and Bromate with scavenge Pumping	04.04.07
3	Version 2 Crest wholly liable for both bromide and bromate without scavenge pumping	04.04.07
4	Crest wholly liable for both bromide and bromate with scavenge pumping	04.04.07
5	Version 3 Crest liable for Bromide and Redland liable for Bromate without scavenge pumping	04.04.07
6	Crest liable for Bromide and Redland liable for Bromate with scavenge pumping	04.04.07
7	Version 4 Redland liable for Bromide and Crest Liable for Bromate without scavenge Pumping	04.04.07
8	Redland liable for Bromide and Crest Liable for Bromate with scavenge Pumping	04.04.07
9	Version 5 Redland and Crest both liable for bromate and bromide without scavenge pumping	04.04.07
10	Redland and Crest both liable for bromate and bromide with scavenge pumping	04.04.07
11	Version 6 Redland liable for Bromate and Bromide and Crest Liable for Bromide only without scavenge pumping	04.04.07
12	Redland liable for Bromate and Bromide and Crest Liable for Bromide only with scavenge pumping	04.04.07
13	Version 7 Crest for Bromate and Bromide and Redland liable for Bromide only without scavenge pumping	04.04.07
14	Crest for Bromate and Bromide and Redland liable for Bromide only with scavenge	04.04.07

	pumping	
15	Version 8 Redland responsible for Bromide and Redland and Crest jointly responsible for Bromate without scavenge Pumping	04.04.07
16	Redland responsible for Bromide and Redland and Crest jointly responsible for Bromate with scavenge Pumping	04.04.07
17	Version 9 Crest responsible for Bromide and Crest and Redland jointly responsible for Bromate without scavenge pumping	04.04.07
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2	The contaminated Land (England) Regulations 2000	50 – 67
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4	Contaminated Land (England) Regulations 2006	70 – 92
5	DETR Circular 02/2000 Environmental Protection Act 1990: Part 11A Contaminated land	93 – 255
6	Water Industry Act 1991	256 – 285
7	Water Supply (Water Quality) Regulations 2000	286 - 359
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12	Statutory Guidance (2002) on the Environment Agency's Objectives and Contributions to Sustainable Development	

BUNDLE 10
Documents relied upon by Redland

1	Agency Guidance on monitoring of landfill leachate, groundwater and surface water. LFTGN02	2003	1 – 2
2	Agency Guidance on the assessment and monitoring of natural attenuation of contaminant in groundwater R&D P95	2000	3 – 143
3	Investigation of potentially contaminated sites Code of Practice BS10175:2001	15.01.01	144 - 255

BUNDLE 11A
Documents relied upon by Thames Water Utilities Limited

1	A Report: Bromate contamination in the Lee Valley. Phase 2: Model Progress and Predication update Note: Interim report. Reference	03.05	1 – 158
2	A Report: Bromate contamination in the Lee Valley. Phase 2: Feasibility study for collection of field data: Draft Report. 5026834/2004104/r002_Phase2_Feasability	09.04	159 – 238
3	A Report: Bromate contamination in the Lee Valley. Phase 2: Bromate predictions for new gauge. Final Report. Reference 5026834/2004104/R006_Phase 2-New Gauge	07.05	239 – 264
4	A Report: Bromate contamination in the Lee Valley. Phase 2: prediction summary Note; Final Report. Reference 5026834/2004104/r005_Phase 2-Predictions	06.05	265 - 320
5	A Report: Bromate contamination in the Lee Valley. Phase 1: Data collation and conceptualisation. Final Report. Reference 5026834/2004104/r001_Phase 1_Final.doc	07.04	321 - 502

BUNDLE 11B
Documents relied upon by Thames Water Utilities Limited

6	A Report: Bromate contamination in the Lee Valley. Phase 2: Field Activities Final Report	02.07	503 – 625
7	A Report: Bromate contamination in the Lee Valley. Phase 2: Model technical note	12.05	626 – 655
8	A Report: Bromate contamination in the Lee	02.07	656 - 845

	Valley. Phase 2: Modelling report Final draft		
9	BGS: Structural Interpretation of the Chalk of the Hertford District based on slope aspect mapping.	2004	846 - 892
10	Birmingham University Bromate Contamination	09.04	893 - 967

BUNDLE 11C
Documents relied upon by Thames Water Utilities Limited

11	C Report: "Abstract of relevant site investigation data prepared for prospective purchasers	08.85	Not included in bundle
12	CU Report: "In-sewer transformations and the fate of Bromate"	2004	968 – 1067
13	Documents from Agency Old files on Steetley Chemicals site, Sandridge	unknown	Not included in bundle
14	Agency reports on site investigations groundwater sampling and groundwater modelling at the Steetley chemicals site, Sandridge	12.83 - 06.85	Not included in bundle
15.	SADC planning department file records	27.10.00	Not included in bundle
16.	TW & Agency Geophysical logging report for Middlefield Road PS	2005	1068 – 1103
17.	Additional Information contained in SADC planning files	unknown	Not included in bundle
18	TW undertaking for the purposes of s.19 of the Water Industry Act 1991 and schedule	19.05.05	1104 – 1110
19	DWI letter of support with enclosure	15.12.03	1111 – 1113
20	TW undertaking for the purpose of s. 19 of the Water Industry Act 1991 and Schedule.	18.01.07	1114 – 1120
21	Abstraction licence No. 29/38/0734, Amwell End	20.09.66	1121 - 1125
22	Abstraction licence No. 29/38/0735, Amwell Hill	20.09.66	1126 – 1130
23	Abstraction licence No. 29/38/07/36, Amwell Marsh	20.09.66	1131 – 1135
24	Abstraction licence No. 29/38/0737, Broadmead	20.09.66	1136 – 1140
25	Abstraction licence No. 29/38/07/170 St Catherines Road, Broxbourne	20.09.66	1141 – 1145
26	Abstraction licence No. 29/38/07/38, Chadwell Spring	20.09.66	1146 – 1150
27	Abstraction licence No. 29/38/07/173, Essex Road, Hoddesdon	20.09.66	1151 – 1155
28	Abstraction licence No. 29/38/07/178, Turnford	20.09.66	1156 – 1162

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29	Abstraction licence No. 29/38/07/39, New Gauge	05.12.95	1163 – 1172
30	Abstraction licence No. 29/38/07/157, North London Artificial Recharge	21.03.03	1173 – 1182
31	Abstraction licence No. 29/38/07/43, Rye common well	20.09.66	1183 – 1191
32	Abstraction licence No. 29/38/07/42, Middlesfield Row	22.08.06	1192 - 1196

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Documents relied upon by Three Valleys Water

1	Abstraction Licence No 29/38/1/61 – Hatfield	20.09.66	1 – 4
2	Abstraction Licence No 29/38/1/60 – Essendon	20.09.66	5 – 15
3	Abstraction Licence No 28/39/28/225 – North Mymms	14.11.66	16 – 20
4	Abstraction Licence No 28/39/28/226 – Tyttenhanger	14.11.66	21 – 24
5	Abstraction Licence No 28/39/28/336 – Clay Lane Group	12.06.67	25 – 40
6	Abstraction Licence No 28/39/28/336 – Clay Lane Group	16.12.03	41 – 57
7	Abstraction Licence No 28/39/28/339 – Bushey Hall	12.06.67	58 – 66
8	Abstraction Licence No 29/38/1/41 – East Hyde	20.08.66	67 – 70
9	Abstraction Licence No 29/38/1/41 – East Hyde	16.12.03	71 – 75
10	Abstraction Licence No 29/38/1/40 – Wheathampstead	20.08.66	76 – 80
11	Abstraction Licence No 29/38/1/40 – Wheathampstead	22.10.04	81 - 85
12	Abstraction Licence No 28/39/28/607 – Nomansland	13.12.06	86 – 91
13	Section 19 Undertaking to the Secretary of State in respect of water supplied from North Mymms water treatment works	09.06.05	92 – 96
14	Notice of Acceptance of Undertaking by Secretary of State (DWI)	26.07.05	97 – 100
15	Public Announcement of Undertaking (DWI)	23.11.05	101 – 102
16	EA Consent for Test Pumping at Hatfield	18.03.05	103 – 105
17	Hatfield Pumping Trial – Interim Report	02. 2006	106 – 122
18	EA Consent for Test Pumping at Hatfield	01.04.06	123 – 133
19	EA Consent for Test Pumping at Hatfield	11.10.06	134 - 144

20	Hatfield Scavenge Pumping Abstraction Licence Application	11.10.06	145 – 156
21	Environmental Statement accompanying Hatfield scavenge pumping abstraction licence application	09.10.06	Not included in the bundle.
22	Letter TVW to EA – Additional Information for Hatfield scavenge pumping abstraction licence application	20.12.06	157 - 159
23	CD containing data relating to groundwater at public water supply boreholes operated by TVW and monitoring boreholes monitored by TVW	Undated	Not included in the bundle.
24	Abstraction licence for Three Valleys Water: Bishops Rise		160 - 166

BUNDLE 13
Statement of Common Ground

1	Statement of Common Ground with (Appendix 1) list of core documents submitted prior to the inquiry
2	Appendix 2 – Chronology of events
3	Appendix 3 – Plan showing groundwater flow directions, general geography and significant locations in and around the area ins which groundwater is affected by bromate and/or bromide
4	Appendix 4 – Plan showing locations of abstractions affected
5	Appendix 5 – Summary of historic borehole information
6	Appendix 6 – Remediation Notice with amendments agreed between the Environment Agency and Redland prior to the inquiry

BUNDLE 14A
Figures to CD bundle 2A No. 24

1	Figures to Report entitled "Environmental Site Investigation and Quantitative Pollutant Linkage Assessment" located at (CD Bundle 2A No.24)	December 2002	1-50

BUNDLE 14B
Appendices to CD bundle 2A No. 24

1	Appendices to report entitled "Environmental Site Investigation and Quantitative Pollutant Linkage Assessment" located at (CD Bundle 2A No.24)	December 2002	1-567

SUBMISSIONS

Opening Submissions

OS1	Opening Submission on behalf of the Environment Agency	16.04.07	1-12
OS2	Opening Submission on behalf of Three Valleys Water	16.04.07	13-20
OS3	Opening Submission on behalf of Thames Water Utilities Limited	16.04.07	21-30
OS4	Opening submission on behalf of Crest	16.04.07	31-57
OS5	Opening Submission on behalf of Redland.	16.04.07	58-63

Closing Submissions

CS1	Closing Submission on behalf of the Environment Agency	08.05.07
CS2	Closing Submission on behalf of Three Valleys Water	08.05.07
CS3	Closing Submission on behalf of Thames Water Utilities Limited	08.05.07
CS4	Closing submission on behalf of Crest	08.05.07
4A	Appendix 1: Apportionment Tables	
4B	Appendix 2: Legal authorities	
4C	Note explaining deletion of paragraph 182	
CS5	Closing Submission on behalf of Redland.	08.05.07
5A	Appendix: Legal authorities	

Annex

ENVIRONMENTAL PROTECTION ACT 1990, SECTION 78E(1)

THE CONTAMINATED LAND (ENGLAND) REGULATIONS 2000 (SI 2000 NO: 227)

THE CONTAMINATED LAND (ENGLAND) (AMENDMENT) REGULATIONS 2001 (SI 2001 NO: 663)

REMEDIATION NOTICE – St. Leonards Court

TO:
1. Redland Minerals Limited of Granite House, Granite Way, Syston, Leicester LE7 1PL
2. Crest Nicholson Residential plc of Crest House, 39 Thames Street, Weybridge, Surrey KT13 8JL

This notice is served on you by the Environment Agency ("the Agency") pursuant to s. 78E of the Environmental Protection Act 1990 ("the 1990 Act") in relation to contaminated land identified by St Albans City and District Council under s. 78B EPA and designated as a special site under s. 78C of the 1990 Act.

A notice of identification of contaminated land dated 20th June 2002 was given to you by St Albans City and District Council of St Peter's Street, St Albans, Hertfordshire AL1 3JE in accordance with s. 78B of the 1990 Act that St Leonard's Court, Sandridge ("SLC") is contaminated land.

The location and extent of the contaminated land to which this notice relates is shown edged red on the plan annexed to this notice.

The Environment Agency considers that you are an appropriate person within the meaning of the 1990 Act, by reason of having caused or knowingly permitted the substance, or any of the substances, by reason of which the contaminated land to which this notice relates is contaminated land, to be in, on or under that land.

The things that you are required to do by way of remediation and the period within which you are required to do each of these things are set out in Schedule 2.

The further matters required to be stated in this notice are set out in Schedules 3 to 7.

……
John Collins
Acting North East Area Manager of the Thames Region of the Environment Agency
DATE: 8th November 2005

The Agency's address for the purposes of this notice is:

Environment Agency
Kings Meadow House
Kings Meadow Road
Reading
Tel: 0118 953 5175
Fax: 0118 950 9440
Ref: Legal/PC/KM/SLC

The contact name for the purposes of this part of the Notice is Pete Carty

[Note to recipient (this note does not form part of the Notice): Part IIA of the Environmental Protection Act 1990, which was inserted by section 57 of the Environment Act 1995, establishes a framework for the identification and remediation of contaminated land. Part IIA came into force in England on 1st April 2000. Part IIA contains the structure and main provisions of the regime. The Contaminated Land (England) Regulations 2000 (SI 2000/227) and the Contaminated Land (England)(Amendment) Regulations 2001 (SI 2001/663) set out detailed provisions on parts of the regime which Part IIA leaves to be specified in secondary legislation, including provisions relating to Remediation Notices and appeals. DETR Circular 02/2000 contains the statutory guidance which provides the detailed framework for the various key elements of the regime. The DETR Circular also sets out the way in which the regime is expected to work in England, by providing an explanation of government policy (Annex 1), a description of the regime (Annex 2) and a guide to the Regulations (Annex 4). Copies of the DETR Circular can be obtained from The Stationery Office, PO Box 29, Norwich NR3 1GN (www.itsofficial.net)]

SCHEDULE 1

(Location and extent of contaminated land to which this notice relates (Reg 4(1)(b))

The contaminated land is marked by the area edged red shown on the plan annexed hereto and centred on grid reference TL 17086 10460.

SCHEDULE 2

(Remediation requirements and periods (Section 78E(1) of the 1990 Act)

The final Remedial Treatment Actions which will enable the land and controlled waters to be effectively remediated, to the required standards, cannot yet be identified. This is because specific Assessment Actions are needed to characterise in detail the SPLs and to collect data to evaluate the likely effectiveness of Remedial Treatment Actions. Schedule 2 identifies a series of Assessment Actions that will enable Remedial Treatment Actions to be specified in one or more subsequent Remediation Notices. However pollution of controlled waters is continuing. Schedule 2 therefore also includes an interim Remedial Treatment Action which is required to be implemented in a timescale and in a form set out in Schedule 2

Before carrying out the Actions below the Agency shall be informed, in writing, of the person(s) who will do the work, and of their qualifications and experience. The work shall be done only by persons who have been approved by the Agency, in writing, on the basis of such information, such approval not to be unreasonably withheld.

NOTE: Assessment actions A – F1 are desk studies, except for action D3.

A. **An Assessment Action must be undertaken as below.**

(a) Make an estimate using all reasonable endeavours, based on the data available at that time, of the loads of bromate and bromide held in the: (i) made ground: (ii) fluvioglacial deposits; (iii) putty chalk; and (iv) blocky chalk, beneath the area edged red on the plan attached to this Notice, taking account of the data reported in the site investigations carried out by consultants, Komex, in August 2000 and Atkins in November 2001.
(b) Indicate the areas and extent of uncertainty in this estimate and the reasons for this uncertainty.
(c) Design and cost a site investigation to significantly reduce this uncertainty, or demonstrate that such significant reduction cannot reasonably be achieved.
(d) Report the outcome of (a)-(c) above to the Agency in writing.

This action must be completed within four months of the date of this notice.

B. **An Assessment Action must be undertaken as below**

(a) Make an estimate using all reasonable endeavours, based on the data available at that time, of the mass flux of bromate and bromide being transported in groundwater away from the area edged red in the plan attached to this Notice, taking account of the data reported in the site investigations carried out by consultants, Komex, in August 2000 and Atkins in November 2001 and of trials, studies and modelling undertaken on behalf of the Agency and/or the Three Valleys Water plc and/or Thames Water Utilities Ltd.
(b) Indicate the areas and extent of the uncertainty in this estimate and the reasons for this uncertainty.

(c) Design and cost a site investigation to significantly reduce this uncertainty or demonstrate that such significant reduction cannot reasonably be achieved.
(d) Report the outcome of (a)-(c) above to the Agency in writing.

This action must be completed within four months of the date of this notice.

C. An Assessment Action must be undertaken as below.

(a) Review the scope for modelling (i) the bromate plume; (ii) the bromide plume. The review must include:
  (i) Possible types of models;
  (ii) The data requirements of each type;
  (iii) The extent to which the necessary data already exists;
  (iv) The work that would be required to obtain data which does not exist at present;
  (v) The capacity of each type of model to predict how the plume will behave under present conditions and, in particular, how this capacity compares to that of the existing Thames Water Utilities Ltd model, as reported in Atkins, Bromate contamination in the Lee Valley. Phase 2: modelling report, final draft, February 2007.
  (vi) The capacity of each type of model to predict the likely effect on the bromate and bromide plumes of scavenge pumping from different locations and at different rates, the effect of any other action which appears to be a potential Remedial Treatment Action and, in particular, how this capacity compares to that of the existing Thames Water Utilities Ltd model.
(b) Report the outcome to the Agency in writing.

This action must be completed within six months of the date of this notice.

D. **An Assessment Action must be undertaken as below:**

(a) Identify locations at which abstraction of contaminated groundwater from the plume and its subsequent disposal might be undertaken, at St Leonards Court and between St Leonards Court and the borehole of Three Valleys Water at Bishops Rise, Hatfield.
(b) Assess, for each location, options for disposal of the abstracted water by discharge to foul sewer or by other means, and any constraints on the flow rate, overall volume or contaminant loading.
(c) For each location estimate the costs of:
  (i) Acquiring legal rights to carry out the operation at that location;
  (ii) Installing a suitable borehole and pump, or adapting an existing borehole and pump;
  (iii) Providing a pipeline connection to enable disposal of the abstracted water;
  (iv) Recurring annual operating and other costs, excluding any costs related to treatment of the water to reduce bromate to bromide, and the chemical loading element of any trade effluent other charges.
(d) For each location estimate the maximum rate of abstraction that could be achieved within the constraints above, and assess whether this is likely to be the optimal rate to maximise removal of contaminants from the aquifer.

(e) Identify any alternatives to the arrangements outlined in (a)-(d) above that might achieve the same objective of removing contaminants from the aquifer.
(f) Report the outcome of (a)-(e) above to the Agency in writing.

This action must be completed within four months of the date of this notice.

D1. **An Assessment Action must be undertaken as below:**

(a) In relation to action D above for each location estimate the costs of:
    (i) Installing treatment plant to reduce bromate to bromide;
    (ii) Annual operating costs associated with the treatment plant, including any fee for renewal of an associated mobile treatment licence;
    (iii) Annual trade effluent charges relating to discharge of the products of treatment to reduce bromate to bromide.
(b) Report the outcome to the Agency in writing.

This action must be completed within four months of the date of this notice.

D2. **An Assessment Action must be undertaken as below:**

(a) In relation to action D above, for each location estimate the cost of annual charges relating to disposal of bromide-contaminated water to the foul sewer, or by some other means, excluding bromide resulting from the reduction of bromate.
(b) Report the outcome to the Agency in writing.

This action must be completed within four months of the date of this notice.

D3. **An Assessment Action must be undertaken as below:**

(a) At any existing abstraction boreholes identified under action D above and where the owner gives their consent, carry out a three-day pumping trial at the maximum feasible rate consistent with any abstraction licence (or a consent under section 32 of the Water Resources Act 1991, in the absence of an abstraction licence) and the need to dispose of the pumped water without adverse environmental effects.
(b) The trial shall be conducted in accordance with BS ISO 1486:2003 (incorporating Amendment No 1), 'Hydrometric determinations- pumping tests for water wells. Considerations and guidelines for design, performance and use' with the following minimum requirements at each test borehole, unless otherwise agreed in writing by the Agency.
    (i) Before the test obtain and record details of the borehole construction and pump.
    (ii) Identify any existing boreholes within 500m of the test borehole which are suitable for use as observation boreholes.
    (iii) Monitor groundwater levels hourly for three days prior to commencing the test, at the test borehole and any associated observation boreholes.

(iv) Pump the test borehole at a constant rate of discharge for at least 72 hours, making water level measurement at the test borehole and observation boreholes at the intervals specified in accordance with BS ISO 1486:2003 (incorporating Amendment No 1).
(v) Take samples of the abstracted water for analysis in accordance with the specification in action G below at the start of the pumping and then at intervals of 15 minutes for the first two hours, 30 minutes for the next two hours, hourly for a further six hours; two-hourly for the following 14 hours, and six hourly thereafter.
(vi) On cessation of pumping measure groundwater levels at the same intervals as in (iv) above until groundwater levels are stable and consistent with those measured before the start of the test. In any event levels are to be measured for at least 72 hours.
(vii) Analyse the test data in accordance with BS ISO 1486:2003.

Proposals for such trials shall be submitted to the Agency in writing, for approval in writing, within one month of the completion of action D above. The trial shall be carried out and reported to the Agency in writing within three months of approval by the Agency under this provision.

E. **An Assessment Action must be undertaken as below.**

(a) Review any additional actions, which each Appropriate Person considers, in relation to the Significant Pollutant Linkage(s) for which it is responsible, could break the pollutant linkage and/or mitigate its effects on groundwater quality. The review must include:
(i) The principle of the action and the way in which it will break the Significant Pollutant Linkage or mitigate effects on groundwater quality;
(ii) The requirements for further information before the action can be fully costed and implemented;
(iii) The range of possible costs;
(iv) The possible timescale for implementing the action;
(v) The potential risks and benefits associated with the action.
(b) Report the outcome to the Agency in writing.

This action must be completed within six months of the date of this notice.

F1. **An Assessment Action must be undertaken as below:**

(a) Using the information gained from actions D, D1, D2, D3 and E above:
(i) Assess the practicality, effectiveness and durability of each option;
(ii) Evaluate including by comparison of the cost benefit analysis for each, which option amounts to the best practicable technique and provide the reasons for that assessment.
(b) Report the outcome to the Agency in writing.

This action must be completed within eight months of the date of this notice or within one month of the completion of the report required under D3, whichever is the later.

G. **An Assessment Action must be undertaken as below**.

(a) Provide quality-assured monitoring data at the locations identified in Table 1 below for the parameters, and at the frequencies, listed in Table 2 below, to the detection limits, precision and bias in Table 3 below, unless otherwise agreed in writing with the Agency.

Table 1. Locations to be monitored under Assessment Action G

Loc ref	Site name	Type	NGR	Ownership
080	MW2, St Leonards Court	M	TL517070 210455	Beechgrove (Sandridge) Management Ltd
223	SLC10, St Leonard's Court	M	TL 17134 10440	Beechgrove (Sandridge) Management Ltd
082	MW4, St Leonard's Court	M	TL 17121 10427	Beechgrove (Sandridge) Management Ltd
081	MW3, St Leonards Court	M	TL 17096 10435	Beechgrove (Sandridge) Management Ltd
083	MW5, St Leonards Court	M	TL 17074 10411	Beechgrove (Sandridge) Management Ltd
216	SLC03, St Leonards Court	M	TL 17080 10475	Beechgrove (Sandridge) Management Ltd
028	Orchard Garage	P	TL 17523 10286	Orchard Garage
225	GW12, top of House Lane	M	TL 17152 10365	Hertfordshire County Council
226	GW13, Harefield House	M	TL 17748 10035	Borehole site and access route leased to Agency by Beaufort Trust Corporation Ltd and Lady Mary June Meaney
227	GW14, beside Jersey Farm pond	M	TL 17754 09706	Public access land owned by St Albans District Council
019	Nashes Farm	P	TL 17958 09626	Mr Adrian Sheriff
166	Hatfield Quarry, WPG16	M	TL 20241 09741	Cemex UK
162	Hatfield Quarry WM3B	M	TL 19283 08858	Cemex UK
061	Hatfield Quarry WM4	M	TL 19661 09103	Cemex UK
062	Hatfield Quarry WM5	M	TL 20175 09499	Cemex UK
402	Comet Way BH5	M	TL 521760 208911	Public access
002	Hatfield Business Park	P	TL521350 209795	Arlington
001	Hatfield PWS BH	PWS	TL 22000 07700	Three Valleys Water plc
M = monitoring borehole, P = private water supply, S = surface water, PWS = public water supply				

(b) Methods of borehole purging, sampling, sample handling and analysis are to be detailed in a method statement submitted to the Agency for approval prior to sampling commencing, and are to be in accordance with relevant Agency guidance and practice, including paragraph (c) below, unless otherwise agreed in writing by the Agency.

(c)Analysis of samples is to be carried out by a laboratory accredited to ISO 17025 and using United Kingdom Accreditation Service accredited methods, performance-tested in accordance with Water Research Centre plc (WRc) publication NS30, 'Analytical Quality Control in the Water Industry' (WRc Report NS30, June 1989, ISBN 0902156853). The laboratory will operate a system of routine analytical quality control, preferably based on the use of control

charts (see WRc Report Ref: Co4239 'Quality Control Charts in Routine Analysis'). Samples must be analysed within 72 hours of collection.
(d) Results are to be reported to the Agency no more than 4 weeks after sampling or measurement, in a summarised format to be agreed in writing by the Agency, accompanied, where relevant, by laboratory certificates of analysis, which must state the associated measurement uncertainty.

Table 2. Parameters to be measured and frequency of measurement

Controlled waters	Frequency	Monitoring interval	Parameters to be measured (see Table 3 for abbreviations & symbols)
Groundwater in, or in continuity with, the Chalk aquifer	8 times per calendar year*	40-50 days	Water level AOD. Depth to base of borehole where feasible
Groundwater in, or in continuity with, the Chalk aquifer	4 times per calendar year* in January, April, July, & October		Ph, EC, Cl, Na, TON, BrO_3, Br, temperature, DO, redox potential
Surface waters	12 times per calendar year*	25-35 days	Ph, EC, Cl, Na, TON, BrO_3, Br

NOTE * = or pro-rata per part of calendar year

Table 3. Precision, bias and limit of detection for each quantity measured

Determinand or measurement	Symbol or abbreviation	Limit of detection (See note A)	Precision (See note A)	Bias (See note A)	Comments
Water level above Ordnance Datum	Water level AOD	Not applicable	To nearest 10mm	See note B	Datum points and levels will be supplied. Measurement not feasible at location 028
Depth to base of borehole	None	Not applicable	To nearest 200mm	See note B	Datum points and levels will be supplied. Measurement not feasible in all boreholes.
Temperature	None	Not applicable	To nearest 0.5°C	See note B	Measured in-situ
Dissolved oxygen	DO	Not applicable	See note B	See note B	Measured in-situ
Log hydrogen ion concentration	pH	Not applicable	See note B	See note B	Measured in-situ
Electrical conductivity	EC	Not applicable	See note B	See note B	Measured in-situ
Redox potential		Not applicable	See note B	See note B	Measured in-situ
Chloride	Cl	1mg/l	5%	10%	
Sodium	Na	2mg/l	7%	10%	
Total oxidised nitrogen	TON	0.3mg/l	9%	10%	
Bromate as BrO_3	BrO_3	0.002mg/l	11%	10%	
Bromide	Br	0.005mg/l	16%	10%	

Notes to Table 3:
A. As defined in WRc report NS30.
B. Field instrument to be calibrated in accordance with manufacturer's instructions.

This action must be started within three months of the date of this notice and continued for five years.

H. **An Assessment Action must be undertaken as below**.

(a) Provide quality-assured monitoring data and report it to the Agency quarterly in January, April, July and October at the locations identified in Table 4 below for the parameters, and at the frequencies, in Table 2 above and to the detection limits, precision and bias in Table 3 above, unless otherwise agreed in writing with the Agency.
(b) Procedures for sampling, sample handling and sample analysis are to be as specified for Action F above

Table 4. Locations to be monitored under Assessment Action H

Loc ref	Site name	Type	NGR	Ownership
020	Cap's Cottages	P	TL 18377 09920	Mr A Sheriff, Nashes Farm
018	Fairfolds Farm	P	TL 18852 10141	Mr A Sheriff, Nashes Farm
059	Hatfield Quarry, WM1	M	TL 18800 08395	Cemex UK
375	Symonshyde Quarry, W29	M	TL 2129010670	Cemex UK
378	Symonshyde Quarry, W35	M	TL 20370 10445	Cemex UK
379	Symonshyde Quarry, W36	M	TL 21100 10500	Cemex UK
167	The Old Cottage, new bh	P	TL 21868 10722	Mr & Mrs N Redfern
191	M7, Mill Green Borehole	M	TL 23716 09780	Installed by Three Valleys on public access land.
005	Hatfield and London Country Club Workshop	P	TL 28234 08457	Hatfield & London Country Club
265	Park Street, Old Hatfield	M	TL 23410 08778	Installed by Three Valleys on verge of public highway.
195	M10, Sleapshyde OBH	M	TL 20251 06887	Installed by Three Valleys on public access land.
010b	BH by Block 3 (northernmost) Glinwell's Nursery	P	TL 19458 07443	Glinwell plc
041	Ellenbrook @ North Orbital Road (A414)	M	TL 20882 07164	Access from public highway
292	R Lee, Water Hall gauging station	S	TL 29967 09978	Access from public bridle path
101	River Lee downstream from Essendon Pumping Station (Holwell Bridge)	S	TL 27641 09814	Access from public highway
142	Roestock P.S. (raw water sampling point)	PWS	TL 21000 05900	Three Valleys Water plc
141	Tyttenhanger P.S. (raw water sampling point	PWS	TL 19820 05720	Three Valleys Water plc
143	Essendon P.S. (raw water sampling point)	PWS	TL 27330 09820	Three Valleys Water plc
144	Waterhall P.S. (raw water sampling point)	PWS	TL 29400 09500	Three Valleys Water plc

298	Broadmeads PWS	PWS	TL 35310 13960	Thames Water Utilities Ltd
295	Amwell End PWS	PWS	TL 35880 13990	Thames Water Utilities Ltd
296	Amwell Hill PWS	PWS	TL 36750 12760	Thames Water Utilities Ltd
297	Amwell Marsh PWS	PWS	TL 37620 12340	Thames Water Utilities Ltd
301	Rye Common PWS	PWS	TL 37950 11130	Thames Water Utilities Ltd
	Middlefield Road PWS	PWS	TL 37400 09500	Thames Water Utilities Ltd
300	Hoddesdon PWS	PWS	TL 37840 08980	Thames Water Utilities Ltd
299	Broxbourne PWS	PWS	TL 37300 07500	Thames Water Utilities Ltd
135	Turnford PWS	PWS	TL 36000 04440	Thames Water Utilities Ltd
M = monitoring borehole, P = private water supply, S = surface water, PWS = public water supply				

This action must be started within three months of the date of this notice and continued for five years.

I. **A Remedial Treatment Action must be undertaken in accordance with the requirements set out below unless varied in writing by the Environment Agency.**

(a) Procure the continuation of the existing scavenge pumping and treatment programme being carried out from the Three Valleys Water existing abstraction borehole at Bishops Rise, Hatfield (Bishops Rise). For the purposes of this action the material features of the existing scavenge pumping and treatment programme are as follows:
   (i) Maintaining abstraction from Bishops Rise source. Actual abstraction rates are maximised on a day by day basis, taking into account constraints imposed by the treatment process, operational considerations and the capacity of the receiving sewer system. Rainfall events have an impact on the attainable flows. Maximum rates of abstraction are 9 Ml/d (the licensed amount), with an average annual daily target of 6 Ml/d.
   (ii) Dosing the abstracted water with ferrous chloride to reduce the bromate in the water to bromide.
   (iii) Using a dedicated pipeline to remove the abstracted water to a trunk sewer system managed by Thames Water Utilities Ltd.
   (iv) Monitoring water levels in the receiving sewer manhole and ensure that the discharge has no detrimental impacts on the sewer network.
   (v) Monitoring at the locations and frequencies in Table 5 below for the parameters in Table 2 above and to the detection limits, precision and bias in Table 3 above, unless otherwise agreed in writing by the Agency.
   (vi) Monitoring of bromate and bromide weekly, or at such other frequency as may be agreed in writing by the Agency, in the final effluent at the receiving sewage treatment works, Blackbirds and Maple Lodge.
   (vii) Reporting the results of monitoring, under (iv) to (vi) above, to the Agency and in accordance with a scheme of reporting that has been agreed in writing by the Agency.

(b) In connection with this action the following definitions shall apply:
   (i) "Procure" shall mean payment quarterly in arrears as follows:
      1. To Three Valleys Water PLC, all costs solely attributable to pumping and treatment of bromate-contaminated groundwater, and associated costs of monitoring (at the

locations and frequencies designated for Three Valleys Water in Table 5 below) and management.

2. To Thames Water Utilities Limited, all costs solely attributable to disposal of the treated groundwater by foul sewer and associated costs of monitoring ((at the locations and frequencies designated for Thames Water Utilities Ltd in Table 5 below) and management.

(ii) "Water Companies" shall mean Three Valleys Water PLC and Thames Water Utilities Limited or any successor(s) to their respective water undertakings.

(iii) "Required Concentration Standards" shall (other than those relating to sewage effluent, and unless otherwise agreed by the Agency) mean, in relation to each location in Table 5 below:

1. For bromate less than or equal to 5ug/l.
2. For bromide less than or equal to 500ug/l.

(iv) "Relevant Abstraction Points" shall mean the public water supply sources and associated monitoring points, other than those relating to sewage effluent, listed in Table 5 below.

This action must be commenced within one month of the date of this notice. It must be continued for the period defined by whichever is the shortest of (a) or (b) or (c) below:

(a) Until a long-term Remedial Treatment Action has been identified and implemented and shown to be at least as effective as action I in controlling concentrations of bromate at the Relevant Abstraction Points without any associated adverse environmental consequences;

(b) Until the Appropriate Person(s) demonstrate that the Required Concentration Standards have been achieved and can be maintained in the raw water abstracted from all the Relevant Abstraction Points, with the exception of Bishops Rise, without the continuation of such pumping at Bishops Rise;

(c) Ten years, or such shorter period as may be agreed in writing by the Agency.

Table 5. Locations to be monitored in connection with remedial treatment action I

Loc ref	Site name	Type	NGR	Designation (1) in relation to payments for monitoring	Frequency
143	Essendon PWS.	PWS	TL 27330 09820	TVW	Weekly
001	Bishops Rise PWS	PWS	TL 22000 07700	TVW	Weekly
298	Broadmeads PWS	PWS	TL 35310 13960	TWUL	Weekly
295	Amwell End PWS	PWS	TL 35880 13990	TWUL	Weekly
296	Amwell Hill PWS	PWS	TL 36750 12760	TWUL	Weekly
297	Amwell Marsh PWS	PWS	TL 37620 12340	TWUL	Weekly
301	Rye Common PWS	PWS	TL 37950 11130	TWUL	Weekly
	Middlefield Road PWS	PWS	TL 37400 09500	TWUL	Weekly
300	Hoddesdon PWS	PWS	TL 37840 08980	TWUL	Weekly
299	Broxbourne PWS	PWS	TL 37300 07500	TWUL	Weekly
135	Turnford PWS	PWS	TL 36000 04440	TWUL	Weekly
103	Chadwell Spring	PWS	TL 34997 13683	TWUL	Weekly
382	Lynch Mill Spring	S	TL 37711 08519	TWUL	Monthly

288	Stream from Arkley Hole spring, upstream of confluence with Lee	S	TL 28976 10021	TVW	Monthly
	River Colne at Green Bridge	S		TVW	Monthly
	Maple Lodge sewage treatment works final effluent	E		TWUL	Weekly
	Blackbirds sewage treatment works final effluent	E		TWUL	Weekly
S = surface water, PWS = public water supply, E = sewage effluent					

Note to Table 5.

(1) TVW = Three Valleys Water PLC, TWUL = Thames Water Utilities Ltd

SCHEDULE 3

(Particulars of the significant harm/pollution of controlled waters and particulars of substances (Regulation 4(1)(e) and (f))

The particulars of the pollutant linkages that form the basis of the determination of land as Contaminated Land and to which this Notice relate are set out below:

Pollutant linkage number	**Pollutant**	**Source location**	**Pathway**	**Receptor**	**Pollution of controlled waters**
1	Bromate	Soil at land identified in Schedule 1	Unsaturated zone and groundwater contained in, or in hydraulic continuity with the Chalk aquifer	Controlled waters: Groundwater contained in, or in hydraulic continuity with the Chalk aquifer.	Pollution of controlled waters is being caused.
2	Bromide	Soil at land identified in Schedule 1.	Unsaturated zone and groundwater contained in, or in hydraulic continuity with the Chalk aquifer	Controlled waters: Groundwater contained in, or in hydraulic continuity with the Chalk aquifer.	Pollution of controlled waters is being caused.

SCHEDULE 4

(Reasons for enforcing authority's decision on remediation requirements (Regulation 4(1)(g))

The final Remedial Treatment Actions which will enable the land and controlled waters to be effectively remediated, to the required standards, cannot yet be identified. This is because specific Assessment Actions are needed to characterise in detail the SPLs and to collect data to evaluate the likely effectiveness of Remedial Treatment Actions. Schedule 2 identifies a series of Assessment Actions that will enable Remedial Treatment Actions to be specified in one or more subsequent Remediation Notices. However pollution of controlled waters is continuing. Schedule 2 therefore also includes an interim Remedial Treatment Action which is required to be implemented in a timescale and in a form set out in Schedule 2

SCHEDULE 5

(other appropriate persons (Section 78E(3) of the 1990 Act and Regulation 4(1)(h), (i) and (j))

The following are the appropriate persons responsible for all of the assessment actions described in Schedule 2 of this Notice for the following reasons

1. **Redland Minerals Limited of Granite House, Granite Way, Syston, Leicester, LE 7 1PL**

   Although they caused and knowingly permitted bromide to be in the land and are thereby responsible for the bromide SPL, at least in part, they are partly excluded from the bromide SPL by exclusion test 3, "sold with information" because Crest Nicholson Residential plc bought the land with the broad measure of the presence of the pollutant at that time.

   They are also partly responsible for the bromate SPL by virtue of causing the pollutant to be in the land.

2. **Crest Nicholson Residential plc of Crest House, 39 Thames Street, Weybridge, Surrey, KT13 8JL.**

   They are partly responsible for the bromide SPL by virtue of :

   a) Causing and knowingly permitting bromide to be in the land; and

   b) The other member of the liability group for this SPL, namely Redland Minerals Limited, are partly excluded by virtue of exclusion test 3 "sold with information" because Crest Nicholson Residential plc bought the land when they were in possession of information that would reasonably allow them to be aware of the presence on and in the land of bromide and the broad measure of that presence, at that time, and Redland Minerals Limited did nothing material to misrepresent the implications of that presence.

   They are also partly responsible for the bromate SPL by virtue of causing the pollutant to be in the land.

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Proportion of Overall Costs to be borne:

Redland Minerals Limited:

Redland Minerals Limited bear 85% of costs associated with the bromate significant pollutant linkage (SPL) and 45% of costs associated with the bromide SPL that is:

Schedule 2 Actions D1, H and I – 85% of costs of these Single Linkage Actions as they are associated with the bromate SPL only.

Schedule 2 Action D2 – 45% of costs of this Single Linkage Action as this is associated with the bromide SPL only.

Schedule 2 Actions A, B, D, D3, G – - 65% of the costs of these Shared Common Actions. The Actions are referable to both bromide and bromate and are Actions which would have been part of the remediation package for each of the bromide and the bromate SPLs had they been addressed separately. The cost is therefore shared equally between the bromate and bromide SPLs.

Schedule 2 Action C –72% of the cost of this Shared Collective Action**.** Action C is referable to both bromide and bromate; however, if taken individually, the actions for each SPL would not be identical. In particular the scope of bromate modelling would have to cover double the area of the bromide modelling. It is therefore considered that the cost of the bromate modelling,

which is subsumed within Schedule 2 Action C, would be 66.7% of the cost of the Action as a whole and that the cost of bromide modelling would take up the remaining 33.3%. Therefore Redland Minerals Limited are responsible for 85% of 66.7% of the cost and for 45% of 33.3% of the cost.

Schedule 2 Action F1, – 65% of the cost of this Shared Collective Action**.** Action F1 is referable to both bromide and bromate; however, if taken individually, the actions for each SPL would not be identical. In particular some locations may be referable to bromate only and some to bromide only. The hypothetical costs of each are likely to be the same. It is therefore considered that Redland Minerals Limited are responsible for 85% of 50% and for 45% of 50% of the cost of the Action as a whole.

Crest Nicholson Residential plc:

Crest Nicholson Residential plc bear 15% of costs associated with the bromate SPL and 55% of costs associated with the bromide SPL that is:

Schedule 2 Actions D1, H and I – 15% of costs of these Single Linkage Actions as they are associated with the bromate SPL only.

Schedule 2 Action D2 – 55% of costs of this Single Linkage Action as it is associated with the bromide SPL only.

Schedule 2 Actions A, B, D, D3, G – 35% of the costs of these Shared Common Actions. The Actions are referable to both bromide and bromate and are actions which would have been part of the remediation package for each of the bromide and the bromate SPLs had they been addressed separately. The cost is therefore shared equally between the bromate and bromide SPLs.

Schedule 2 Action C – 28% of the cost of this Shared Collective Action**.** Action C is referable to both bromide and bromate; however, if taken individually, the actions for each SPL would not be identical. In particular, the scope of bromide modelling would have to cover only half the area of the bromate modelling. It is therefore considered that the cost of the bromide modelling, which is subsumed within Schedule 2 Action C, would be 33.3% of the cost of the Action as a whole and that the cost of bromate modelling would take up the remaining 66.7%. Therefore Crest Nicholson Residential plc are responsible for 55% of 33.3% of the cost and for 15% of 66.7% of the cost.

Schedule 2 Action F1, – 35% of the costs of this Shared Collective Action**.** Action F1 is referable to both bromide and bromate; however, if taken individually, the actions for each SPL would not be identical. In particular some locations may be referable to bromate only and some to bromide only. The hypothetical costs of each are likely to be the same. It is therefore considered that Crest Nicholson Residential plc are responsible for 15% of 50% and for 55% of 50% of the cost of the Action as a whole.

SCHEDULE 6
(Names and addresses of owners and occupiers of the contaminated land to which this notice relates and persons whose consent is required for remediation purposes (Regulation 4(1)(k) and (l)))

The owners and occupiers of the contaminated land are:

Freehold owner of land: Beechgrove (Sandridge) Management Limited

The names and addresses of persons whose consent is required under section 78G(2) of the 1990 Act are:

Mr P Hyde (Director), Beechgrove (Sandridge) Management Ltd, 18 St Leonards Court, House Lane, Sandridge, St Albans, Herts AL4 9UY
Beaufort Trust Corporation Ltd and Lady Mary June Meaney, 11 Church End, Sandridge, St Albans, Herts AL4 9DL
Territorial Property Director, Salvation Army Trustee Company. 101 Newington Causeway, London SE1 6BN
Mr R Irving, Orchard Garage, Woodcock Hill, Sandridge, St Albans, Herts AL4 9EE
Mr C H Franklin, Principal Land Agent, Hertfordshire County Council, County Hall, Pegs Lane, Hertford SG13 8DN
Mr A Sheriff, Nashes Farm House, Sandridge, St Albans, Herts AL4 9HF
Mr & Mrs N Redfern, Old Cottage, Green Lanes, Hatfield, Herts AL10 9BH
Mr J Takeda (fao Mr Peter Creary), Hatfield and London Country Club, Bedwell Park, Essendon, Hatfield, Herts AL9 6HN
Mr P Clegg, Chief Executive, Estate Office, Hatfield Park , , Hatfield, Herts AL9 5NQ
Mr S Redwood, Estates and Development Manager, RMC Materials Ltd, Cemex UK Operations, Cemex House, Evreux Way, Rugby, Warwickshire CV21 2DT
Mr M Simon, Glinwell plc, Hatfield Road, Smallford, nr St Albans, Herts AL4 0HD
Mr J Godbold (fao Mr Neil Agnew), Woolmers Park, Letty Green, Herts SG14 2NX
Mr A Hodson, Solicitor, Three Valleys Water plc, PO Box 48, Bishops Rise, Hatfield, Herts AL10 9HL
Mr B Connorton, Raw & Waste Water Manager, Thames Water Utilities Ltd, Clearwater Court, Vastern Road, Reading, Berks RG1 8DB

SCHEDULE 7
(Offences, penalties and Appeals)

Offences, Penalties and Appeals (Regulation 4(1),(n) and (o), Regulation 4(2)(a), (b) and (c))

Offences and Penalties (section 78M of the 1990 Act)

- Under section 78M of the 1990 Act, it is an offence to fail, without reasonable excuse, to comply with any of the requirements of this Notice.

- A person who commits such an offence is liable to the following penalties:

– Where the contaminated land to which the notice relates is "industrial, trade or business premises" as defined in section 78M(6) of the 1990 Act, on summary conviction, to a fine not exceeding £20,000 or such greater sum as the Secretary of State or National Assembly of Wales, may from time to time by order substitute and to a further fine of an amount equal to one-tenth of that sum for each day on which the failure continues after conviction of the offence and before the enforcing authority has begun to exercise its powers by virtue of section 78N(3)(c) of the 1990 Act.
– Where the contaminated land to which the notice relates is not "industrial, trade or business premises", on summary conviction, to a fine not exceeding level 5 on the standard scale and to a further fine of an amount equal to one-tenth of level 5 on the standard scale for each day on which the failure continues after conviction of the offence and before the enforcing authority has begun to exercise its powers by virtue of section 78N(3)(c).

Right of Appeal (section 78L of the 1990 Act)

You have a right of appeal against this Notice, under section 78L of the 1990 Act. If you wish to appeal you must do so, within the period of twenty-one days beginning with the day on which the notice is served:
(a) if it was served by a local authority, to a magistrates' court; or
(b) if it was served by the Environment Agency, to the Secretary of State or National Assembly for Wales.

Appeals to a Magistrates' Court (Regulation 8)

- Regulation 8 states the following:

(1) An appeal under section 78L(1) to a magistrates' court against a remediation notice shall be by way of compliant for an order and, subject to section 78L(2) and (3) and regulations 7(3), 12 and 13, the Magistrates' Courts Act 1980 shall apply to the proceedings.
(2) An appellant shall, at the same time as he makes a compliant,-
  (a) file a notice ("notice of appeal") and serve a copy of it on –
    (i) the enforcing authority;
    (ii) any person named in the remediation notice as an appropriate person;
    (iii) any person named in the notice of appeal as an appropriate person;

(iv) any person named in the remediation notice as the owner or occupier of the whole or any part of the land to which the notice relates;

(b) file a copy of the remediation notice to which the appeal relates and serve a copy of it on any person named in the notice of appeal as an appropriate person who was not so named in the remediation notice; and

(c) file a statement of the names and addresses of any persons falling within paragraph (ii), (iii) or (iv) of sub-paragraph (a) above.

(3) The notice of appeal shall state the appellant's name and address and the grounds on which the appeal is made.

[Note: "file" means deposit with the justices' chief executive in England or Justices clerk in Wales]

- Further information relating to appeals to a magistrates' court is given in Circular 02/2000, Annex 4 "Guide to the Contaminated Land (England) Regulations 2000" or relevant National Assembly for Wales Guidance.

Appeals to the Secretary of State (Regulation 9)

- Regulation 9 states the following:

(1) An appeal to the Secretary of State (or National Assembly for Wales) against a remediation notice shall be made to him by a notice ("notice of appeal") which shall state –

(a) the name and address of the appellant;

(b) the grounds on which the appeal is made; and

(c)whether the appellant wishes the appeal to be in the form of a hearing or to be disposed of on the basis of written representations.

(2) The appellant shall, at the same time as he serves a notice of appeal on the Secretary of State (or National Assembly for Wales),-

(a) serve a copy of it on –

(i) the Environment Agency;

(ii) any person named in the remediation notice as an appropriate person;

(iii) any person named in the notice of appeal as an appropriate person; and

(iv) any person named in the remediation notice as the owner or occupier of the whole or any part of the land to which the notice relates;

and serve on the Secretary of State (or National Assembly for Wales) a statement of the names and addresses of any persons falling within paragraph (ii), (iii) or (iv) above; and

(b) serve a copy of the remediation notice to which the appeal relates on the Secretary of State (or National Assembly for Wales) and on any person named in the notice of appeal as an appropriate person who is not so named in the remediation notice.

- Appeals to the Secretary of State (England) should be submitted to the Planning Inspectorate. Their current address and telephone number are as follows: The Planning Inspectorate, Room 4/19, Eagle Wing, Temple Quay House, 2 The Square, Temple Quay, Bristol, BS1 SPN. Tel: 0117 372 6372. Appeals to the Secretary of State (Wales) should be submitted to the National Assembly for Wales, Environment Division, Cathays Park, Cardiff CF10 3NQ Tel: 029 2082 5546.

Grounds of Appeal (Section 78L of the 1990 Act and Regulation 7)

(1) The grounds of appeal against a remediation notice pursuant to section 78L of the 1990 Act are any of the following:-

(a) that, in determining whether any land to which the notice relates appears to be contaminated land, the local authority-
(i) failed to act in accordance with guidance issued by the Secretary of State (or National Assembly for Wales) under section 78A(2), (5) or (6); or
(ii) whether by reason of such a failure or otherwise, unreasonably identified all or any of the land to which the notice relates as contaminated land;

(b) that, in determining a requirement of the notice, the enforcing authority-
(i) failed to have regard to guidance issued by the Secretary of State (or National Assembly for Wales) under section 78E(5); or
(ii) whether by reason of such a failure or otherwise, unreasonably required the appellant to do any thing by way of remediation;

(c) that the enforcing authority unreasonably determined the appellant to be the appropriate person who is to bear responsibility for any thing required by the notice to be done by way of remediation;

(d) subject to paragraph (2) below, that the enforcing authority unreasonably failed to determine that some person in addition to the appellant is an appropriate person in relation to any thing required by the notice to be done by way of remediation;

(e) that, in respect of any thing required by the notice to be done by way of remediation, the enforcing authority failed to act in accordance with guidance issued by the Secretary of State (or National Assembly for Wales) under section 78F(6);

(f) that, where two or more persons are appropriate persons in relation to any thing required by the notice to be done by way of remediation, the enforcing authority-

(i) failed to determine the proportion of the cost stated in the notice to be the liability of the appellant in accordance with guidance issued by the Secretary of State (or National Assembly for Wales) under section 78F(7); or
(ii) whether, by reason of such a failure or otherwise, unreasonably determined the proportion of the cost that the appellant is to bear;

(g) that service of the notice contravened a provision of subsection (1) or (3) of section 78H (restrictions and prohibitions on serving remediation notices) other than in circumstances where section 78H(4) applies;

(h) that, where the notice was served in reliance on section 78H(4) without compliance with section 78H(1) or (3), the enforcing authority could not reasonably have taken the view that the contaminated land in question was in such a condition by reason of substances in, on or

under the land, that there was imminent danger of serious harm, or serious pollution of controlled waters, being caused;

(i) that the enforcing authority has unreasonably failed to be satisfied, in accordance with section 78H(5)(b), that appropriate things are being, or will be, done by way of remediation without service of a notice;

(j) that any thing required by the notice to be done by way of remediation was required in contravention of a provision of section 78J (restrictions on liability relating to the pollution of controlled waters);

(k) that any thing required by the notice to be done by way of remediation was required in contravention of a provision of section 78K (liability in respect of contaminating substances which escape to other land);

(l) that the enforcing authority itself has power, in a case falling within section 78N(3)(b), to do what is appropriate by way of remediation;

(m) that the enforcing authority itself has power, in a case falling within section 78N(3)(e), to do what is appropriate by way of remediation;

(n) that the enforcing authority, in considering for the purposes of section 78N(3)(e), whether it would seek to recover all or a portion of the cost incurred by it in doing some particular thing by way of remediation-

(i) failed to have regard to any hardship which the recovery may cause to the person from whom the cost is recoverable or to any guidance issued by the Secretary of State (or National Assembly for Wales) for the purposes of section 78P(2); or
(ii) whether by reason of such a failure or otherwise, unreasonably determined that it would decide to seek to recover all of the cost;

(o) that, in determining a requirement of the notice, the enforcing authority failed to have regard to guidance issued by the Environment Agency under Section 78V(1);

(p) that a period specified in the notice within which the appellant is required to do anything is not reasonably sufficient for the purpose;

(q) that the notice provides for a person acting in a relevant capacity to be personally liable to bear the whole or part of the cost of doing any thing by way of remediation, contrary to the provisions of section 78X(3)(a);

(r) that service of the notice contravened a provision of section 78YB (interaction of Part IIA of the 1990 Act with other enactments), and-

(i) in a case where subsection (1) of that section is relied on, that it ought reasonably to have appeared to the enforcing authority that the powers of the Environment Agency under section 27 might be exercised;

(ii) in a case where subsection (3) of section 78YB is relied on, that it ought reasonably to have appeared to the enforcing authority that the powers of a waste regulation authority or waste collection authority under section 59 might be exercised; or

(s) that there has been some informality, defect or error in, or in connection with, the notice, in respect of which there is no right of appeal under the grounds set out in sub-paragraphs (a) to (r) above.

(2) A person may only appeal on the ground specified in paragraph (1)(d) above in a case where-

(a) the enforcing authority has determined that he is an appropriate person by virtue of subsection (2) of section 78F and he claims to have found some other person who is an appropriate person by virtue of that subsection;

(b) the notice is served on him as the owner or occupier for the time being of the contaminated land in question and he claims to have found some other person who is an appropriate person by virtue of that subsection; or

(c) the notice is served on him as the owner or occupier for the time being of the contaminated land in question, and he claims that some other person is also an owner or occupier for the time being of the whole or part of that land.

(3) If and in so far as an appeal against a remediation notice is based on the ground of some informality, defect or error in, or in connection with, the notice, the appellate authority shall dismiss the appeal if it is satisfied that the informality, defect or error was not a material one.

Suspension of Remediation Notice Upon Appeal (Regulation 14)

Once an appeal has been duly made, the relevant remediation notice is suspended until the appeal is finally determined or is withdrawn (abandoned) by you. "Duly made" for this purpose means that an appeal must be made within the time limit, and in accordance with the Regulations.