

The Report of the Buncefield Major Incident Investigation Board into the policy and procedures of the Health and Safety Executive's and the Environment Agency's role in regulating the activities on the Buncefield site under the COMAH Regulations

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Introduction

1 This report is made to the Health and Safety Executive (HSE) Board and the Board of the Environment Agency that together form the joint Competent Authority responsible in England and Wales for regulating the Buncefield site under the COMAH Regulations.¹ The remit for this report is in the third term of reference for the Buncefield Major Incident Investigation Board, which asks it:

To examine the Health and Safety Executive's and the Environment Agency's role in regulating the activities on this site under the COMAH regulations, considering relevant policy guidance and intervention activity.

2 Our approach from the outset was to review the regulatory role of the Competent Authority at the time of the incident (and, by our own decision, in the immediate response to the incident). We decided not to hold discussions with the Competent Authority but instead based our findings on the initial reviews and subsequent work of our own for reasons we give in paragraphs 22 and 23. We shared the findings of our initial reviews with the Competent Authority during the first half of 2007 to check for accuracy and clarity (see Chapter 4).

3 During the course of our work, the Competent Authority was developing its own responses to the incident's impact on its policies and procedures. Some of these, such as reforms to the regime for recovery of costs of regulatory functions from COMAH operators, were already underway at the time of the incident. Others have been commenced following the incident, for example in the work undertaken with industry acting as the Buncefield Standards Task Group,² and under a comprehensive change programme formally established at the beginning of 2008.³ We acknowledge this positive approach by the Competent Authority to learning its own lessons from the Buncefield incident.

4 It is important to note that the recommendations in Chapter 7 of this report are based on our findings relating to the regulatory regime of three years ago, and the subsequent learnings from the investigation. In consequence, this report does not include the changes to its policies and procedures that the Competent Authority has or intends to introduce. That said, our recommendations mostly aim for desired outcomes rather than specific measures. We understand that the

¹ The Control of Major Accident Hazards Regulations 1999. These Regulations are enforced by a joint Competent Authority comprising the Health and Safety Executive (HSE) and the Environment Agency in England and Wales and HSE and the Scottish Environment Protection Agency (SEPA) in Scotland.

² Buncefield Standards Task Group was the joint Competent Authority/industry standards working group set up to review safety and environmental protection standards at fuel storage sites following the Buncefield incident. The Task Group published its initial recommendations on 12 October 2006.

³ Known as the COMAH remodelling programme. See page 12 of the *Health and Safety Executive Business Plan 2008/09* at: www.hse.gov.uk/aboutus/strategiesandplans/bplan0809.pdf

Competent Authority may have introduced alternative measures which achieve or perhaps exceed the overall ends we recommend, and we are content with that position.

5 We recognise that, when taken all together, the recommendations in our report represent a substantial body of work. We acknowledge that the Competent Authority will need to consider how the recommendations in this report will fit with the many other Buncefield-related activities: what constitutes new and unplanned work; what aligns with work completed or underway; what are the priorities for action? Therefore we do not suggest a deadline or a timetable for delivery but instead recognise the need for the Competent Authority to determine its response, and to set an appropriate timescale.

Chapter 1 Executive Summary

6 In Chapter 2 we explain the differences between the Board's work and the criminal investigation. We were not appointed to take any decisions on criminal proceedings, nor to influence such decisions. While much of the information arising out of the criminal investigation was shared with us, we directed our own work to produce our reports and recommendations. We explain our decision to not to speak to suspects to the criminal investigation. We also explain that our review involved an examination of the wide range of the Competent Authority's policies and procedures for regulating Buncefield.

7 In Chapter 3 we briefly describe the background to the Buncefield incident and the setting up of the Board, and in Chapter 4 we explain the processes for producing our report and for verifying its integrity. An independent assessment by auditors Arthur D Little found we had met our criteria for thoroughness, objectivity and independence.

8 In Chapter 5 we describe the important contexts into which our review was set, beginning with why we believe our recommendations apply more widely than to the Buncefield site. We go on to describe the different duties of site operators and the Competent Authority which regulates industrial sites such as Buncefield. A basic principle of the legal regime is that whoever creates a risk is legally responsible for controlling that risk. The role of the regulator, on the other hand, is to monitor the measures taken by the dutyholder (the person responsible for controlling the risks) to determine if the risks are likely to be adequately controlled.

9 We comment on what is known about the mechanism that produced the violent and catastrophic explosion which, although there have been incidents overseas that appear to have similarities to Buncefield, remains largely unexplained. In line with our approach to learn as much as possible from Buncefield, we have made arrangements to continue the early research overseen by the Board to understand the explosion mechanism and hopefully develop guidance on preventive measures.

10 We go on in Chapter 5 to describe the regulatory functions under the Control of Major Accident Hazards Regulations 1999 (COMAH) which applied to Buncefield and which are enforced by the Competent Authority. We begin with the safety report compiled by the operator of the site and submitted to the Competent Authority for assessment in July 2003. The assessment procedure had not been completed at the time of the incident. We also comment on the enforcement activities of the Competent Authority at Buncefield such as inspection and investigation, noting there were a number of inspections and these were well implemented and recorded, though they did not specifically address primary containment measures. We note the hazard rating assigned to

the regulation of Buncefield was relevant to the credible hazard scenarios of the time before the Buncefield incident.

11 We comment on the effects of the system for recovering the costs of major hazards regulation at sites such as Buncefield that the Competent Authority is required to implement. We go on to comment on the key issue of resources available to the Competent Authority and conclude that in HSE (in particular) there was a shortage of specialist inspectors available for COMAH regulation.

12 We conclude Chapter 5 by commenting on the joint Competent Authority (HSE and the Environment Agency in England and Wales; HSE and the Scottish Environment Protection Agency in Scotland). We note that the Competent Authority did not operate in a recognisably joined up way in line with the Memorandum of Understanding, and in particular the most senior joint committee had never met.

13 In Chapter 6 we describe the wider aspects of the major hazards control regime, particularly its relationship to land use planning and emergency preparedness and response. We make a case that the COMAH regime should underpin the systems and measures for the protection of people and property around major hazard sites in Britain within a hierarchy of control that begins with adequate measures for controlling on-site risks.

14 We go on to describe that our report is forward looking in nature and acknowledge the great deal of work that the Competent Authority has completed, has underway or has planned in response to the Buncefield incident. We conclude by saying that where additional resources are shown to be necessary for regulating COMAH sites we hope the relevant Government departments will enter into early discussions as to how these may be provided.

15 In Chapter 7 we make a total of 38 recommendations. As we acknowledge in the introduction to this report, the Competent Authority will have already dealt with a number of the issues on which we make recommendations. Given the wide-ranging nature of our recommendations and the already significant programme of work introduced by the Competent Authority following Buncefield, our recommendations mainly describe outcomes to be achieved rather than specific measures. We do not seek to impose a timetable on the Competent Authority in the light of the progress already being made.

16 There are a number of Annexes to this report that describe the work of the Board and the review teams and explain in more detail matters of relevance to our review.

Chapter 2 Relationship between this report and any legal proceedings

17 One of the main considerations of the Buncefield Major Incident Investigation Board (the Board) throughout its spell of duty has been its relationship with the criminal investigation. The Board's first term of reference (TOR1) is:

To ensure the thorough investigation of the incident, the factors leading up to it, its impact both on and off site, and to establish its causation including root causes.

18 In practice, the TOR1 investigation and the criminal investigation are parallel activities conducted by the same core teams of inspectors and are sometimes referred to as the primary investigation. The role of the Board has been to oversee, in the public interest, the primary investigation which is managed by the Investigation Manager. Reporting to him are inspectors and forensic specialists from the Competent Authority. Their findings have informed the three published reports of the Investigation Manager to the Board and all of the Board's own published reports and recommendations. The same information has informed the decision on whether criminal proceedings are justified. The activities that go beyond the primary investigation to produce a prosecution report are supported by separate teams of experts and legal advisors and the decision on proceedings is for HSE and the Environment Agency as the Competent Authority) under the COMAH Regulations.

19 The Board directed the further work to produce its own reports under its terms of reference. The Board was not appointed to take any decisions on legal proceedings that fall to be considered under the criminal investigation. These arrangements for the independent supervision of a major incident investigation are without precedent. The arrangements have allowed the Board to conduct its business and publish timely reports without interfering with the ongoing criminal investigation by the Competent Authority.

20 On 1 December 2008, HSE and the Environment Agency announced that they were commencing criminal proceedings against five defendants relating to the causes of the explosions and fires, and to the environmental impact caused as a result of them.

21 We explain below the important issues of public interest that have arisen in conducting a policy and procedures review of the Competent Authority while the criminal investigation by the Competent Authority has been ongoing.

Decision to not speak to suspects in the criminal investigation

22 As we made clear from the publication of the first progress report, the Board was resolved to minimise the risk of prejudice to any subsequent proceedings that might arise from the Board's activities. At an early stage of our investigation, we decided not to approach the dutyholders⁴ responsible for the site and connected activities so as not to complicate the relationship between those subject to the criminal investigation and the Competent Authority conducting it. In reaching this decision, we were mindful of the duties on the investigating inspectors to follow all reasonable lines of enquiry, and investigate and record any matters that point away from, as well as support, any possible criminal charges. We also recognised that those dutyholders suspected of having committed any criminal offence would have the opportunity during the course of the criminal investigation to make observations regarding their compliance with their statutory duties under the protections guaranteed by the Police and Criminal Evidence Act 1984. Insofar as this has been relevant to the key findings of the primary investigation we have, as we say in paragraph 25, been able to take such information into account in preparing our report and recommendations.

23 In line with published guidance,⁵ the Policy and Procedures Review (PPR) will not be available for public view until after the conclusion of the criminal proceedings that have been commenced by the Competent Authority. Subsequent to the winding-up of the Board at the completion of this report and our Final Report, it remains for the Competent Authority to take account of any matters that might arise during the remainder of the criminal process, while continuing to ensure that the rights of those being prosecuted are fully protected.

Relationship between the Board's PPR and prior role of the Competent Authority at Buncefield

24 As the terms of reference of the Board⁶ make clear, its role in regard to the PPR was wider than just examining the way in which the Health and Safety Executive and the Environment Agency regulated the activities on the Buncefield site prior to the incident. The PPR involved a broad examination of the adequacy of the arrangements for dealing with all sites of this type and the relevant dutyholders. For example, the PPR has examined the resourcing of the Competent Authority; the charging regime; the adequacy of the legal duties placed on dutyholders; the strategies and standards applying to regulatory

⁴ 'Dutyholder', in the context of this report, means any person or organisation holding a legal duty – in particular those imposed by the Health and Safety at Work etc Act 1974, the Water Resources Act 1991, the Management of Health and Safety at Work Regulations 1999, the COMAH Regulations 1999 and the Pollution Prevention and Control (England and Wales) Regulations 2000.

⁵ The guidance on conducting PPR that was used in this review was on HSE's website at: <http://intranet/ogprocedures/majorincident/review.htm> (Issue date 05.09.05)

⁶ See Annex 1 for the Board's full terms of reference.

functions and the assessment of safety reports; HSE's role in land use planning; and emergency preparedness and response issues.

25 In conducting its own review, the Board was informed initially by work undertaken by two separate teams from within HSE and the Environment Agency respectively. In this report, the work of the two teams is referred to as the 'initial stages of the review', and is described more fully in Chapter 4. The initial stages of the review were managed by the Investigation Manager, reporting directly to the Board. The PPR work was undertaken independently from the criminal investigation, which sought to determine the root causes of the incident and whether there were possible breaches of relevant legislation.⁷ As we say earlier, the Board has had access to information generated by the criminal investigation wherever necessary for discharging the Board's terms of reference. However, no information from the criminal investigation was made available to those conducting the initial stages of the review for the Investigation Manager.

26 It is rightly the task of those conducting the criminal investigation to examine whether any acts or omissions of HSE and/or the Environment Agency had any bearing on the Buncefield incident. The Board has not sought to make any determination of its own in this regard.

⁷ Relevant legislation applying to high hazard industrial sites can be found at Annex 12.

Chapter 3 Background to the Buncefield Investigation

The incident

27 The Buncefield Oil Storage Depot is a large tank farm located 3 miles (5 km) from the centre of Hemel Hempstead, Hertfordshire. A tank farm is a facility for storing liquids, normally petroleum-based fuels, in tanks, and from where these substances are transported to other storage facilities, consumer outlets and airports. The products delivered to these depots are usually ready for use by customers, and therefore no additional processing occurs on the site. There are 108 oil storage depots across the UK, and Buncefield was the fifth largest.

28 The depot was an important facility for the storage and distribution of fuels to London and south-east England, including Heathrow Airport. Petrol, aviation fuel, diesel and other fuels were sent to the depot via pipeline from refineries at Humberside, Merseyside and the Thames estuary. The fuel was stored prior to distribution via pipeline and road tanker.

29 At 06:01 on Sunday 11 December 2005, a number of explosions occurred at the Buncefield depot. At least one of these was of massive proportions. These explosions caused a huge fire, which spread across 23 tanks over a large part of the site. The fire burned for five days, destroying most of the site. Large clouds of black smoke from the burning fuel spread over southern England and beyond. None of the 43 people injured were seriously hurt, but the damage to the surrounding homes and business premises is probably unprecedented in peacetime Britain.

The reasons for setting up the Board, and its aim and purpose

30 On 12 January 2006, the Health and Safety Commission⁸ appointed a six-person Buncefield Major Incident Investigation Board⁹ to oversee the formal investigation. The Board comprises an independent Chair (Lord Newton of Braintree), two independent experts (Professors Drysdale and Baxter), and three senior managers of HSE and the Environment Agency who had no prior oversight role of regulatory operations by the Competent Authority at Buncefield. One of the Competent Authority members (Taf Powell) is also the Investigation Manager. The other Competent Authority members are Dr Paul Leinster and David Ashton.

⁸ The Health and Safety Commission merged with the Health and Safety Executive on 1 April 2008. The roles and functions of the Commission have transferred to the 'new' HSE.

⁹ See Annex 1 for the Board's full terms of reference; Annex 2 shows the Board structure and its membership.

31 The purpose of the Board is to provide independent oversight to the investigation and ensure that it is independent and carried out effectively; that public confidence is maintained; that the eight terms of reference are met; and that important information is made public at the earliest opportunity, subject only to legal considerations.¹⁰

Why conduct a policy and procedures review of the Competent Authority?

32 Following a major incident, the policy of the Competent Authority is to conduct a Major Incident PPR.¹¹ A PPR is independent of the primary major incident investigation and is intended to:

- help the Competent Authority evaluate the effectiveness of intervention activity, including liaison with other enforcing authorities, and use the intelligence gathered to inform and plan strategic enforcement policy; and
- identify any shortcomings in policy, legislation or guidance, and to inform any consequential research.

¹⁰ Paragraph 19 in Chapter 2 explains the Board has no part in the decision regarding proceedings arising from the criminal investigation.

¹¹ See HSE website: <http://intranet/ogprocedures/majorincident/review.htm> (Issue date 05.09.05)

Chapter 4 Methodology and assurance of integrity

Organisation of the initial review teams from the Environment Agency and HSE

33 Two teams, one each from HSE and the Environment Agency, were appointed to gather information during the initial stages of our review. These teams reported separately to the Investigation Manager, who is himself a member of the independent Board. The Investigation Manager adapted the standing procedures of HSE to suit the implementation of the initial stages of the review, and issued common terms of reference to the two teams at the beginning of February 2006.¹²

34 Our report is informed by the initial stages of the review, and our other investigations where these were relevant. For example, our investigations into land use planning, design and operation of flammable storage sites, and emergency preparedness and response all revealed learning points to improve the regulatory efficacy at major hazard sites.

35 The draft reports from the initial stages of the review were discussed between ourselves and HSE and the Environment Agency to ensure we were aware of any areas of disagreement or lack of clarity that we needed to take into account in preparing our final PPR report.

36 In paragraph 22 of this report, we explain our decision not to speak to any person who might have owed a legal duty in connection with the incident on 11 December 2005. We also explain that we have been informed by the criminal investigation process, and that any submissions that the suspects to the investigation wish to make will have been made available to us for the purposes of this review.

Independent assessment of the process for conducting the initial stages of the review

37 As explained above, we asked the Investigation Manager to conduct initial stage reviews of the Environment Agency and HSE largely in accordance with the existing internal HSE procedure 'Major Incident Response and Investigation & Major Incident Policy and Procedure Review'.¹³ The Board also decided to commission an assessment of the initial review stage process by independent consultants Arthur D Little (ADL) to provide assurance to stakeholders that the

¹² The PPR terms of reference are at Annex 3.

¹³ See www.hse.gov.uk/foi/internalops/og/ogprocedures/majorincident/review.htm.

initial review stages – on which we base this report – fully met the original terms of reference and used processes and procedures that met the criteria of thoroughness, objectivity and independence. The work was carried out during August and September 2007.

38 The independent assessment focused exclusively on the processes used by the HSE and Environment Agency teams, and excluded consideration of the specific conclusions or recommendations of the initial review stages. The assessment comprised formal interviews with the initial review stage team members and the Investigation Manager. ADL reviewed the draft reports to the Board, as well as correspondence, reports, notes and other documents relating to the conduct of the initial reviews; they did not hold interviews with any other parties.

39 ADL confirmed to the Board that they were satisfied that the initial reviews fully met the originally specified terms of reference, and that the processes and procedures used met the criteria of objectivity, independence and thoroughness. ADL also identified improvements that might be made to the process going forward.

Procedures for conducting the initial reviews

40 The procedures for conducting policy and procedures reviews following a major incident had been revised by HSE in 2005, but the Buncefield incident was the first time that a review of the joint Competent Authority had been undertaken on this scale and independently. Although the initial reviews met the specified terms of reference, we recommend in Chapter 7 that HSE's procedures should be updated to take into account the lessons learned in the Buncefield incident.

Chapter 5 Contextual issues in the Board's approach

Applicability of our findings to other sites

41 In this chapter, we establish the context of our recommendations, and the main findings of our review that underpin the recommendations. While neither site operators¹⁴ nor the Competent Authority had considered a violent explosion as the design event¹⁵ at COMAH sites prior to the Buncefield incident, the individual events that combined to allow a large flammable vapour cloud to form were not of themselves unprecedented. As the nature of the activities at Buncefield and the type of tanks and process equipment provided are not unique in the UK, we adopt a robust rather than a limited approach when calling for changes in the way regulation is conducted at COMAH sites: where we find changes are necessary for Buncefield-type regulation, we consider they are broadly applicable.

42 The extrapolation of our recommendations to other major hazard sites is based on cautious common sense. While a repeat of the exact circumstances of Buncefield is unlikely, the fact is that the mode of release of a relatively small proportion¹⁶ of the contents of a petrol storage tank of a type common in the UK led to the production of a vapour cloud which was able to extend well beyond the boundary of the site. As we say in our initial report:¹⁷

The occurrence of a massive fuel vapour explosion confirms the overriding need to make sure that liquid does not escape from the vessels in which it is normally meant to be confined.

43 In our previous reports on design and operation of sites¹⁸ and for emergency planning, response and recovery,¹⁹ we have called for improvements at COMAH sites in the measures used for primary containment, for limiting the escalation of incidents once primary containment is lost, and for dealing ultimately with a major incident. These recommendations are not restricted to considering the exact circumstances prevailing at Buncefield. Similarly, in this

¹⁴ 'Site operator', in the context of this report, means the entity legally responsible for operating the site under the COMAH Regulations – see also footnote 4 above.

¹⁵ A design event is one which is used as the basis of design for protective systems either in terms of engineered systems or emergency response arrangements or both.

¹⁶ It is calculated that less than 300 tonnes of unleaded petrol escaped from Tank 912 on the HOSL West site. This is less than 6% of the tank's operating inventory of 4500 tonnes.

¹⁷ *Initial Report to the Health and Safety Commission and the Environment Agency of the investigation into the explosions and fires at the Buncefield oil storage and transfer depot* Fourth report Buncefield Major Incident Investigation Board 13 July 2006

¹⁸ *Recommendations on the design and operation of fuel storage sites* Fifth report Buncefield Major Incident Investigation Board March 2007

¹⁹ *Recommendations on the emergency preparedness for, response to and recovery from incidents* Sixth report Buncefield Major Incident Investigation Board 17 July 2007

report we take the view that our recommendations apply generally to other sites regulated by the Competent Authority. It will be therefore for the Competent Authority to demonstrate for other sites under their jurisdiction where our recommendations for changes to the regulatory approach need not apply.

Responsibility of dutyholder and regulator (Annex 4)

44 COMAH imposes legal duties both on operators of COMAH sites and on the Competent Authority that is responsible for regulating those operators. However, there are important differences in the scope and application of these respective duties.²⁰ A basic principle of the legal regimes overseen by HSE and the Environment Agency is that whoever creates a risk becomes legally responsible for controlling that risk. The role of the regulator, on the other hand, is to monitor the measures taken by the dutyholder (the person responsible for controlling the risks) to determine if the risks are likely to be adequately controlled.

45 COMAH makes the operator responsible for managing and controlling the risks that arise from the conduct of its business. That duty cannot be delegated. The operator must submit to the Competent Authority a safety report confirming safety and reliability of plant and containing information about the management systems, the environment, safety equipment and measures for protection and other information. The operator must allow time for the Competent Authority to comment on the safety report before starting to construct or operate its plant. These comments do not amount to a formal approval from the Competent Authority to operate the plant or site. If the operator fails to meet its obligations under COMAH, the Competent Authority may take enforcement action, including prosecution or issuing an enforcement notice.

46 Therefore the Competent Authority must make adequate arrangements for commenting on the safety report, but is not required to formally approve it. Similarly, the Competent Authority is responsible for making adequate arrangements to enforce the law (which will typically be by inspection, investigation of incidents and enforcement where necessary), but is not responsible for the safe management of the site, which remains the operator's legal responsibility.

47 The aim of enforcement arrangements is to enable the regulator to take appropriate action so that dutyholders manage and control risks effectively, thus preventing harm.²¹ The Competent Authority is not required to take formal action

²⁰ See Annex 4 for a description of relevant and relative duties under COMAH.

²¹ See paragraph 1 of HSE's Enforcement Policy Statement: www.hse.gov.uk/pubns/hse41.pdf; and paragraph 6 of the Environment Agency's Enforcement and Prosecution Policy: www.environment-agency.gov.uk/commondata/acrobat/enforcementpolicy_112935.pdf.

in every case of a breach of the law, but should use its judgement to decide what is proportionate.

The mechanism of the violent explosion at Buncefield (Annex 5)

48 The violence of the Buncefield explosion that resulted in tremendous damage to the outlying area and the huge fires involving 23 large oil fuel tanks is, at present, only partially explained. Immediately following the incident, the Board accepted what appeared to be the view commonly held by the industry and the relevant expert community in Britain: that this was an unprecedented event. However it was soon revealed during the investigation that other incidents which had involved large clouds of petrol vapour had occurred elsewhere.²² Unfortunately, to our knowledge these events were not subjected to thorough investigation and so conclusions regarding their apparent similarities to Buncefield cannot yet be drawn.

49 In broad terms, prior to Buncefield, the worst design event associated with a tank farm was thought to be a large pool fire following the failure of a tank. The formation of a vapour cloud following a release of petrol at the gantry was considered, but the consequences of ignition were regarded as much less serious than those of a large pool fire.

50 Provided the relevant recommendations in our published reports are implemented, the probability of a large vapour cloud forming at similar UK facilities will be much lower than before Buncefield, which was of itself regarded as an extremely unlikely occurrence. However, regarding the extent of the damage at Buncefield, we believe it is essential to understand if possible why the Buncefield explosion was so violent in order to assist site operators, regulators and planners to reduce the risk anywhere of a violent explosion from a large vapour cloud. This approach is in line with our determination to learn as much as possible from the Buncefield incident. The large amount of information collected during the site investigation phase presents a unique opportunity for examining the behaviour of large flammable vapour clouds: this is a matter of worldwide interest.

51 Regarding the violence and the extent of the damage at Buncefield, it would appear that the understanding of the formation and behaviour of flammable clouds among the world's fire and explosion experts was incomplete. In the regulatory context, at the time of the Buncefield incident, a violent explosion of the vapour cloud formed from escaped petrol in the open areas around a fuel storage site was not considered credible by industry or the regulator. This would have influenced strategic decisions about the regulation of Buncefield in terms of potential for a major incident, or a MATTE²³ and,

²² Annex 5 deals further with the aspect of credibility of an explosion and lists seven incidents of some similarity to the Buncefield incident (updated from the Board's initial report).

²³ 'Major Accident to the Environment'. A defined EU term.

accordingly, the inspector resources that needed to be deployed to the site, and the priority areas for regulatory intervention at such sites.

Permissioning (Annex 6)

52 The COMAH regime is a so-called permissioning regime, ie a regulatory regime operated by HSE involving some form of permission to operate.²⁴ Permissioning regimes in the UK include offshore oil and gas, nuclear, railway safety and COMAH (which is operated by the Competent Authority). Unlike the other regimes, the COMAH Regulations do not require the regulator's specific consent or acceptance to allow the operator to continue in operation. There is no requirement for the Competent Authority to approve a safety report; its responsibility is rather to communicate the conclusions of its examination to the operator. It can, if it judges it appropriate, prohibit the operation of the relevant establishment.

53 Under the COMAH Regulations, an operator of a top-tier site must produce a safety report. This details the site inventory and substances stored and/or processed, the major accident potential they present and the equipment and procedures in place that are designed to manage the resultant risks. Its key requirement obliges dutyholders to demonstrate that they have taken all measures necessary to prevent major incidents and limit the consequences (both to people and the environment) of any that could occur.

54 The safety report should provide the regulator with a comprehensive description of the establishment, its surroundings, the associated hazards and risks and the control measures in place. The Competent Authority is required to assess the adequacy of safety reports submitted and carries out inspections and audits to verify their content and implementation. This gives the regulator a detailed insight into all facets of major accident prevention at the site. The assessment process is intended to shape the regulator's inspection programmes to ensure that resources are targeted at safety-critical areas, to the benefit of the regulator and site operator, as well as those who are subject to the major accident hazards posed by the site operations.

55 Regulation 17 of COMAH places a duty on the Competent Authority to assess each safety report and, within a reasonable time, either communicate the conclusions of its assessment to the operator or, if it identifies 'serious deficiencies', prohibit operation of the establishment in accordance with regulation 18. Guidance to regulation 17 refers to the Competent Authority manual available on HSE's website.²⁵ The manual describes the methods used by the Competent Authority to assess safety reports and the arrangements used

²⁴ The policy for permissioning regimes can be found at: www.hse.gov.uk/enforce/permissioning.pdf.

²⁵ *COMAH Safety Report Assessment Manual* HSE Feb 2003 www.hse.gov.uk.

to manage the assessment process so that it is completed on time and to the right quality. The guide time for completing the assessment of a COMAH safety report (CSR) is 52 weeks. The assessment of the HOSL CSR was not completed at the time of the incident, 123 weeks after its receipt. The environment topic assessor (located in the Environment Agency) had completed his assessment and forwarded this to the HSE assessment manager for the Hertfordshire Oil Storage Limited (HOSL) CSR on 26 November 2005. No further action on the CSR by the Competent Authority is recorded between this time and 11 December.

56 As we describe more fully in Annex 6, the main findings of our review were that HSE's policies and procedures for the handling of the HOSL safety report were not complied with as regards the excessive time taken to carry out the assessment. There were a number of requests for further information.

57 There was serious concern expressed by the Competent Authority over the structure and scope of the safety report for HOSL submitted in 2003, such as a failure by the dutyholder to identify all the potential major accident hazards. Other deficiencies in the safety report included the absence of an adequate demonstration of the dutyholder's control and instrumentation provisions for controlling major hazard risks, such as loss of primary containment.

COMAH regulation at Buncefield (Annex 7)

58 Prior to the introduction of COMAH, the site was regulated under the Control of Industrial Major Accident Hazards (CIMAH) Regulations 1984. This regime did not take into account the impact of major accidents to the environment, and the COMAH Regulations sought in part to rectify this omission.

59 When the 1999 COMAH Regulations came into force, HOSL and BP were designated as lower-tier sites; ie having an inventory of automotive petrol and other petroleum spirits greater than 5000 but less than 50 000 tonnes. The hazardous substances which are regulated under COMAH are classified under the Chemical (Hazard Information and Packaging for Supply) Regulations (CHIP). One effect of a 2002 amendment to CHIP was that the automotive petrol and other petroleum spirits category was replaced with petroleum products (gasoline, naphthas, kerosenes and gas oils), and their top-tier COMAH threshold was reduced to 25 000 tonnes. Consequently, HOSL and BP became top-tier COMAH sites and were each required to submit a safety report in July 2003.

60 The operations at the Buncefield complex were limited to storage and distribution of hydrocarbon fuels at atmospheric temperatures and pressures. This fact, and its relatively recent change from a lower-tier to a top-tier COMAH site on environmental grounds, meant that it was perceived within the Competent Authority as presenting a relatively low risk on safety grounds, although the risk

to the environment was considered to be a medium risk. In addition, although it overlay a chalk aquifer, it was not designated as a Source Protection Zone²⁶ by the Environment Agency due to the travel time from the underlying aquifer to any abstraction points and the fact the aquifer was protected by a layer of clay.

61 There were other reasons for the risk status ascribed by the Competent Authority. First, as we have previously said, the formation of a large vapour cloud with a flash fire or explosion off site had not been previously regarded as a significant hazard in the fuel storage industry, and the design event which dominated the risk scenario was catastrophic tank failure followed by an overtopping of the bund leading to a large pool fire 50 m beyond the bund wall. Second, as far as Buncefield itself was concerned, the physical control measures on the above-ground tanks to prevent such an eventuality were deemed adequate as they met industry good practice, a view based on inspection work conducted on site between 1999 and 2001, when the establishment was first notified under COMAH.

62 Regulation 19 of COMAH places a specific duty on the Competent Authority to have in place a system of inspection for COMAH establishments. The policy is to implement this requirement by following the principles set down in the European Commission's 'Guidance on Inspections Required by the Seveso II Directive'.

63 Competent Authority guidance for inspection is in the form of Inspection Manuals²⁷ and typically comprises inspections and audits – including verification to test conformity with information contained in safety reports and to monitor dutyholders' implementation of stated prevention, control and mitigation measures.

64 Our review, summarised in Annex 7, finds that the effect of extending the requirement for CSR to HOSL as a result of its reclassification as a top-tier COMAH site focused the attention of the Competent Authority on completing the assessment of the CSR. The change seems to have limited the extent of strategic, preventive inspection plans compared to the period before top-tier status. For example, the post-2002 inspection plans dealt in the main with prevention of escalation of a major hazard event, whereas earlier plans appeared more relevant to preventing loss of primary containment. A recommendation in the pre-existing intervention plan formulated in 2001 was to have the override facility on the HOSL high-high alarm system reviewed by a process specialist. This was not carried out prior to the Buncefield incident. However, within this

²⁶ A Source Protection Zone is an area in which there is a designated source (for example for drinking water or environmental conservation) that must be protected from the effects of land development or other threats.

²⁷ See for example the Hazardous Installations Directorate (HID) Chemical Industry (CI) Division Inspection Manual – Major Hazard Intervention Policy on the HSE website www.hse.gov.uk.

constraint, Competent Authority inspections were well implemented and recorded, though with limited sharing of operational intelligence.²⁸

The charging regime

65 Regulation 22 of COMAH stipulates that the operator of an establishment shall pay a fee (to HSE) for the performance of functions conferred on the Competent Authority by the COMAH Regulations. The operator shall also pay a fee for any function relating to the enforcement of the Regulations by the Competent Authority and for the performance by an inspector of any such function conferred on them by COMAH or the Health and Safety at Work etc Act 1974. The fee shall not exceed the costs reasonably incurred by the Competent Authority for the performance of the functions in relation to the establishment concerned. The method by which the costs incurred have been recovered as fees charged to the operations has become known as the charging system. Work activities have been categorised as 'chargeable' for the major hazard component of regulatory intervention. Interventions in parts of sites that are not deemed to be major hazards areas (such as offices) are deemed 'non-chargeable' activities.

66 The legal requirement to recover costs is clearly an important factor in drawing up plans and carrying out assessment and inspection activities. This can have an unwanted effect upon regulatory activities and the relationship between the Competent Authority and dutyholders. Because the recovery of costs is based on an hourly charge²⁹ multiplied by the time input by inspectors, operators can be critical of HSE/Environment Agency joint inspections on the grounds of multiple attendees needlessly (in the operator's view) racking up their costs. Meetings between the Competent Authority and dutyholders can have the agenda split according to chargeable and non-chargeable issues. It is understandable that industry is concerned about how much they have to pay and what they are paying for. It is fair to say that the majority of inspectors find the accounting system onerous, and that the system can induce tensions in the relationship with site operators.

67 We have been told by the Competent Authority that reforms are in train that deal with the problems we describe, and we welcome this.

²⁸ 'Operational intelligence' in this context refers to the collection of data and reports from related activities elsewhere and subsequent analysis of them to identify trends and potential improvements to standards and practices.

²⁹ For 2008/09, the hourly charge for inspectors carrying out COMAH regulation work is £155.

Resources (Annex 9)

68 As the policy statement for permissioning regimes makes clear,³⁰ such regimes are resource intensive and demanding on both the regulator and the dutyholder. There is a consistent theme of staff shortage that emerges from our review, which had a significant impact on the effectiveness of front-line activities. In HSE, the issue was mainly to do with a numerical shortage of specialists and inspectors with sufficient experience of regulating major hazard sites. In the Environment Agency, the issue was about specialist resources that are available but are not deployed to specialist issues arising from assessment or site intervention. In this latter situation, there appears to be an absence of any criteria which might trigger a call for specialist reinforcements.

69 Although the safety report process was being monitored, the HOSL CSR assessment was not completed at the time of the incident, some 123 weeks after its receipt on 31 July 2003. The main reason for this was that appropriate resources were unavailable.

70 Insufficient resources also had a similar impact on operational support activities, such as the production of operational guidance (including the operational intelligence activity that informs that guidance) and the necessary monitoring processes that confirmed that the regulatory activities were being carried out as intended.

Operation of the COMAH Joint Competent Authority (Annex 11)

71 The Seveso II Directive³¹ required Member States to 'set up or appoint the competent authority or authorities' to carry out duties set out in the Directive. Within the UK, the decision was taken to implement this aspect via a joint competent authority comprising the Environment Agency/SEPA and HSE, and to set out the principles and working arrangements governing the relationship between the two bodies in a Memorandum of Understanding (MoU).³² This is supplemented by Chapter 11 of the COMAH Manual³³ ('Agreed Competent Authority Policy and Procedures'), which includes more detailed guidance on regional and local liaison and planning:

The MoU aims to ensure the effective co-ordination of the Competent Authority's activities under the COMAH Regulations to ensure that risks to people's health and safety and the risks to the environment from major accidents are properly regulated.

³⁰ The policy for permissioning regimes can be found at: www.hse.gov.uk/enforce/permissioning.pdf.

³¹ The Seveso II Directive, Council Directive 96/82/EC 9 December 1996 European Union website – europa.eu.

³² *Memorandum of Understanding (MoU) between the Health and Safety Executive and the Environment Agency on the implementation of the Seveso II Directive* HSE website www.hse.gov.uk.

³³ HID COMAH Manual, HSE Intranet.

72 It became obvious to us at an early stage that HSE and the Environment Agency had done little to satisfy the aims of the COMAH Regulations in respect of the joint Competent Authority. While the MoU at the time of Buncefield was deficient in some respects, it did cover all aspects of the joint functions under COMAH. Even so, there was scant compliance by HSE and the Environment Agency with the arrangements specified in the MoU in respect of safety report handling, inspection planning, investigation and data sharing. Communication was more a case of 'copying in' colleagues in the other agency than proactive liaison.

73 The higher of the two joint committees had never met at the time of the Buncefield incident (it first met in the summer of 2007), and therefore the Competent Authority did not formally take joint account of the issues raised by the operational lower committee as intended under the MoU. The issues raised in the lower committee included resources difficulties and problems in completing safety report assessments.

Chapter 6 The wider aspects of the major hazards control regime

74 In addition to major hazard risks to people and the environment, Buncefield showed clearly that major hazard sites have the potential for causing damage to the social and economic system in Britain ie both regionally as in Hertfordshire, and strategically as in the loss of half of Heathrow's fuel supplies. Moreover, the emergency services had to be supplemented, drawing from many parts of the country. Therefore we make recommendations in Chapter 7 for emergency preparedness and response, reforms to COMAH, and resources. We refer to HSE's involvement in the land use planning system but detailed recommendations for this have already been made public in our eighth report.³⁴

75 Forty-three people suffered minor injuries as a result of the explosions at Buncefield on 11 December 2005, but the absence of fatal or major injuries may be explained by there being no people located within the boundary of the flammable vapour cloud at the time of the incident. This was due at least in part to the time at which the incident occurred – 06.00 hrs on a Sunday morning in midwinter. Had the fuel escaped during a busy working day, hundreds of people may have been in the area that came to be covered by the vapour cloud. It is clear to us that in formulating planning of land use, both the intensity of operations at major hazard sites and the vulnerability of the population around them need to be taken into account in a more integrated way than before.

76 We firmly believe the regulatory focus under COMAH should be revised to align with the controls and standards aiming to protect vulnerable populations in the planning system. In paragraph 103 of our eighth report, we say:

Regulation should provide adequate public assurance that initially the safety integrity levels for key safety equipment on the site have been properly assessed and the site designed and provisioned accordingly. We see the COMAH safety report as the vehicle for this. The inspection, investigation and enforcement regime should include adequate verification of the arrangements for maintaining the safety integrity levels commensurate with the risks to vulnerable populations and to the environment.

77 While it may be argued that escape of fuel or formation of a flammable cloud would have been quickly noticed during a busy working time, it must be acknowledged that had an explosion occurred on a much smaller scale but at a busier time, it would likely have resulted in many serious and probably fatal injuries. Even if the ignition of a vapour cloud had caused a flash fire rather than

³⁴ *Recommendations on land use planning and the control of societal risk around major hazard sites* Eighth report Buncefield Major Incident Investigation Board 15 July 2008

an explosion, it would have been potentially fatal to anyone caught within the cloud itself.

78 We consider that the roles of the emergency responders and resilience teams, at local, regional and national levels, need to be more integrated into the risk control arrangements for COMAH sites so that the initial emergency response, the potential acute and longer-term effects on public health, the impact on the economic well-being in the area, and the potential for social disruption all become incorporated in the regulatory activities at major hazard sites. Those responsible for the social and economic aspects of areas in the vicinity of such sites should seek, and be given, a proportionate role in the regulatory planning.

The Board's approach to the hierarchy of control of major hazard risks

79 On page 18 of our initial report, we said that our main areas of concern are:

- the design and operation of sites;
- the emergency response to incidents;
- the advice to planning authorities; and
- the policy and procedures of the regulators.

We consider that these form a hierarchy for the controls of the major hazard risks. The highest priority is to maintain primary containment, but in the event of primary containment failing, there must be adequate arrangements to prevent the incident escalating into a major off-site event as well as more effective planning for the response to a major incident, should one occur.

80 In addition, we believe the land use planning system should take account of the residual societal risks in a way that adequately protects the public without needlessly limiting economic development.

81 It follows from the above that it is necessary for the regulation of high hazard sites to ensure the strategies and intervention plans reflect the emphasis on major hazard risk controls, emergency preparedness and the maintenance of the integrity of the planning system on a site-by-site basis.

The forward-looking nature of our report

82 We regard Buncefield as a watershed event in the operation and regulation of major hazard sites in Britain. It is undoubtedly an important task for us to thoroughly examine the past regulation of the Buncefield site, including the context of the regulatory approach at a time when violent explosions and severe

multi-tank fires were not deemed credible hazards and to report on our findings. However, we see our main function as seeking improvements to the regime.

83 The new hazard scenarios of violent explosions and multi-tank fires needed an urgent response, and we have welcomed the action taken by HSE, the Environment Agency, SEPA and the Buncefield Standards Task Group³⁵ to get on quickly with implementing lessons learned. An incident on this scale is also an opportunity to embrace changes that have been delayed due to competing priorities, including several potentially worthwhile revisions to the regulatory system. We very much welcome the initiative of the Competent Authority in setting up a comprehensive programme for reviewing the COMAH regime.³⁶

84 We are therefore forward looking in our recommendations in Chapter 7, which describe the outcomes we wish to see without being too prescriptive about the means of achieving them. We have incorporated sufficient information to support each recommendation.

Responsibility for bringing this report into effect

85 In preparing this report, we recognise that the Competent Authority has already begun a number of demanding initiatives which are intended to bring into effect what we call for in many of our recommendations.

86 Costs of COMAH regulatory activity are recoverable from dutyholders, and we hope the increased running costs that may arise from implementing our recommendations can be recovered in full from the sector; it would be counter-productive for the Competent Authority to pass higher operating costs into other areas of its business.

87 Where possible, we would look to our recommendations being adopted without delay by the Competent Authority. Where new resources are required, it will clearly be for Government to consider what can and should be done. Where changes to COMAH need to be considered, we would hope that the Competent Authority, the Department for Environment, Food and Rural Affairs (Defra), Communities and Local Government (CLG), the Department for Work and Pensions (DWP), Cabinet Office and others as necessary, enter into early discussions on how these can be best achieved.

³⁵ Buncefield Standards Task Group (BSTG) was the joint Competent Authority/industry standards working group set up in July 2006 to review safety and environmental protection standards at fuel storage sites following the Buncefield incident. The Task Group published its initial recommendations on 12 October 2006.

³⁶ See page 12 of HSE Business Plan 2008/09 *Influencing Change* available at: www.hse.gov.uk/aboutus/strategiesandplans/bplan0809.pdf

Chapter 7 Recommendations

88 We start with the operational aspects in Recommendations 1–17, including the intervention strategy and the sector standards, and improvements in the effectiveness of the Competent Authority.

89 In Recommendations 18–23 (Resource issues), we call for revisions to the deployment of specialist (and therefore scarce) expertise and to the charging regime, and indicate the provisions needed for operating the revised system effectively. Recommendations 24 and 25 address improvements to the joint operation of the Competent Authority. We address the Competent Authority's role in emergency preparedness and response in Recommendations 26–30. Recommendations 31–38 are concerned with the adequacy of COMAH.

90 The incident has thrown into sharp relief the devastating consequences that an incident at a major hazard industrial site can have on the surrounding population. We have addressed HSE's role in the land use planning system and the need for incorporating societal risk in the considerations of regulators and planners, in our eighth report and no further recommendations are made here.

Operational strategy, sector standards, systems and processes

91 The principles for technical assessment of safety reports were fit for purpose, but the arrangements for their handling did not ensure timely and effective regulation of Buncefield or other major hazard sites. Excessive delays marred their completion at all three depots on site against the 12-month standard, and the assessment of the Hertfordshire Oil Storage Ltd (HOSL) safety report was still not completed more than two years after the original submission.

92 The delays were due to inadequate resources being available, and were exacerbated at the time the COMAH regime was newly introduced when two of the three Buncefield sites were re-designated as top tier (requiring submission of safety reports) following the reform of the classification of hazardous materials. Additional factors were deficiencies in the management and deployment of staff and a lack of monitoring of the progress of the safety reports.

93 Recommendation 1 calls for a fundamental review of the arrangements for handling and assessing safety reports. This must be read in the context of this report's Recommendation 32, which asks for COMAH safety reports to be formally accepted by the regulator.

Recommendation 1

The Competent Authority should review its procedures and capability for handling safety reports to ensure timely expert assessment, appropriate monitoring and reporting of progress. The overall aim is to ensure the assessment process is completed to a deadline without fail. The review should include:

- *handling backlogs of work;*
- *deployment of specialists;*
- *accountabilities of managers; and*
- *monitoring and reporting progress within the Competent Authority and with operators.*

94 The Competent Authority did not consider the HOSL safety report was fit for purpose under COMAH. We understand that it is not unusual for the Competent Authority to receive substandard safety reports, and we recommend that the Competent Authority establishes clear criteria for handling these to ensure the assessment is completed on time and that dutyholders fully understand the fundamental requirements of the COMAH regime. The Competent Authority should make it clear where strong action will be taken against seriously defective safety reports, including returning them forthwith to the dutyholder, or taking more formal enforcement on site. We ask for a review of handling policy in Recommendation 2.

95 At present it is the practice for the Competent Authority to develop intervention plans at the completion of safety report assessment. Remedial actions required of the dutyholders by the Competent Authority as a result of the assessment become incorporated into the plans. We believe that deficiencies in major hazard risk controls and other safety measures identified during the assessment should be handled more formally than this. Recommendation 3 calls on the Competent Authority to ensure that any agreed actions on the dutyholder arising out of the safety report assessment must be incorporated into an updated safety report, and placed on the record accordingly. This recommendation does not cut across the requirement for the Competent Authority to intervene promptly where there are critical deficiencies observed in the safety report (eg under regulation 18 of COMAH).

Recommendation 2

The Competent Authority should review its policy for handling COMAH safety reports where the contents do not conform to the relevant criteria in the COMAH schedules. The objective should be to attain an acceptable standard for assessment purposes commensurate with the legal requirements, as revised in line with Recommendation 34. In determining its course, the Competent Authority should consider as a minimum the following:

- *revising guidance for the contents of safety reports;*
- *setting benchmarks for completeness of critical elements for assessment purposes;*
- *establishing time limits for the Competent Authority to initially determine suitability of the safety report for assessment purposes;*
- *returning safety reports to the dutyholders;*
- *determining where the threshold for enforcement lies.*

Recommendation 3

The Competent Authority should review its policy for dealing with non-compliances in the major hazard risk controls identified during the assessment. The aim should be to formalise the remedial plan for dealing with the non-compliant aspects by incorporating it within an amendment to the safety report.

96 Recent major hazard incidents have shown a tendency for some dutyholders to regard focusing on occupational risk controls (guarding of machinery, slips and trips, wearing of personal protective equipment etc) as a hallmark of a high level of health and safety in a plant, a practice which can lead to the neglect of the crucial effective management of the major hazard risks. We believe it is vital that Competent Authority inspection of major hazard sites should enforce the primacy of process safety and containment. The inspection programme for Buncefield, including attention to the major hazard risks, was interrupted following the receipt of the safety report in 2003. Recommendation 4 calls on the Competent Authority to ensure it maintains sufficient attention on major hazard risk controls (including to the environment) when planning its inspections. Risk embraces both the likelihood and the potential harm and, as we have noted in Chapter 6 of this report, societal risk should also be taken into account when considering the control measures needed at major hazard sites. Reliable criteria for considering societal risk are not yet available. We return to this point in paragraph 131. Recommendation 5 is intended to ensure that robust inspection plans are not undermined or compromised by competition for resources during the assessment of the site safety report.

Recommendation 4

The Competent Authority should review its guidance and procedures to ensure that inspection focuses sufficiently on major hazard risk controls. The aim should be to strike an appropriate balance between the inspection of prevention, control and mitigation in primary, secondary and tertiary containment measures. Such a review should include, but not be limited to:

- *the recommendations for design and operations in the Board's fifth report;³⁷*
- *the relevant recommendations on emergency preparedness etc in the Board's sixth report;³⁸*
- *relevant management information relating to intervention for adjusting priorities and resources in intervention plans;*
- *developing effective means for ranking COMAH sites according to accepted risk criteria;*
- *taking account of control measures aimed at maintaining the integrity of HSE's land use planning advice relating to the site.*

It would be helpful for the HSE, the Environment Agency and SEPA to develop a common risk ranking system for COMAH sites.

Recommendation 5

The Competent Authority should ensure there are suitable inspection plans in place throughout the assessment process, and should see that these are adequately resourced and therefore carried out. On completion of assessment and acceptance of the report (subject to moving to a formal acceptance procedure – see Recommendation 32), intervention plans should be formally updated without delay. Revisions to plans should be subject to formal controls, and made expeditiously in response to significant changes in risk or resources.

The Competent Authority should ensure planned inspections are not unduly delayed or cancelled, and are not adversely affected by administrative or management issues, including awaiting meetings with dutyholders.

97 An inspection plan needs to be a living document, alive to changes in dutyholder performance, operational intelligence, and new knowledge and invention. At Buncefield, there were shortcomings in approach where the Competent Authority predominantly focused its attention on known defects rather than on more strategic surveys of the control measures.³⁹ In Recommendation 6 we call for improved strategic management of the inspection process.

³⁷ *Recommendations on the design and operation of fuel storage sites* Fifth report Buncefield Major Incident Investigation Board March 2007

³⁸ *Recommendations on the emergency preparedness for, response to and recovery from incidents* Sixth report Buncefield Major Incident Investigation Board 17 July 2007

³⁹ See Annex 7 for an overview of inspection of HOSL by the Competent Authority prior to Buncefield.

Recommendation 6

Competent Authority should review its information management and communications requirements for supporting the revised inspection procedures. The review should consider:

- *conveying clear line of sight between the inspection plans and the strategic outcomes sought by the Competent Authority for relevant sites;*
- *key topics arising from safety report assessment, particularly that remedial plans are suitably incorporated within the revised safety report (see Recommendation 3);*
- *issues identified from the previous inspection, but not pursued;*
- *follow-up to previous enforcement;*
- *ensuring planning events involve all relevant Competent Authority staff, including technical specialists, and that a single record is made.*

98 There were several missed opportunities for the Competent Authority to have taken appropriate enforcement action to achieve timely and full completion of the Safety Report and off-site plans at the HOSL site. The Competent Authority should review its stance with COMAH operators towards the handling of the sub-standard safety case. We believe this is necessary even where (as at HOSL) there is no recorded direct evidence (on site) of unacceptable risks to safety, health and the environment, since the safety report underpins the whole major hazard risk control system, including off-site emergency planning. We believe the Competent Authority should consider the circumstances of every case to ensure it is not being unduly lenient with dutyholders. Recommendation 7 addresses this issue by seeking clarification on enforcement policies and decision making with a more transparent and consistent approach.⁴⁰ We are aware of the difficulties in striking a balance between enforcement and a more cooperative approach by the regulator. Enforcement is resource intensive and, although the costs of enforcement arising out of safety report assessment would be recoverable, staff resources are finite. Assigning more of the existing resources to enforcement activities will incur lost opportunities relating to other functions of the Competent Authority unless new resources are provided to the COMAH regime.

Recommendation 7

The Competent Authority should clarify the application of its enforcement policies under the COMAH Regulations. Competent Authority should subsequently ensure that any decision for and against enforcement relating to COMAH sites is fully considered, clearly reasoned and recorded at the appropriate time. Attention should be given to, but not limited to:

- *initial handling of defective safety reports;*
- *timely completion of off-site emergency response plans;*
- *environmental protection.*

The Competent Authority should keep dutyholders fully informed of any new guidelines.

⁴⁰ See Annex 8 for an overview of enforcement by the Competent Authority at Buncefield.

99 In the case of the enforcement action that was taken with respect to Tank 12 on the BPA site, an improvement notice was served to increase the capacity of the bund (secondary containment) so as to prevent loss of containment onto Cherry Tree Lane which would be a danger to the public. It was not clear which agency felt it had lead responsibility, although HSE issued the notice as the enforcing authority. During the course of the design and construction of the bund, inspectors with relevant expertise from the Competent Authority were not asked to inspect or comment on the proposals. In the event the relevant good practice (eg the avoidance of bund penetrations) was not followed. Recommendation 8 seeks to ensure that when notices are served, there is clarity on responsibilities and relevant expertise.

Recommendation 8

The Competent Authority should ensure that where notices are issued at COMAH sites, appropriate technical advice is secured for drafting of, and monitoring of compliance with, the notice. Both agencies should be clear on their respective roles in assessing compliance with notices.

100 The legislative framework of COMAH, the Health and Safety at Work etc Act and other relevant statutory provisions establish goals for dutyholders to achieve rather than being too prescriptive, providing that it can be demonstrated that the adopted measures will reduce the risk to an acceptable level. It is therefore vital that dutyholders are clear about the standards of risk control they are required to achieve.

101 Inevitably, there is a balance to be struck between clarity of guidance and moving too far from the principles of goal setting. With respect to the activities at the Buncefield facility, limited guidance was available in the form of industry standards and HSE documentation, eg IP 19 – fire standard,⁴¹ and HSG176.⁴² Effective risk management requires both the consistent application of measures from authoritative guides to good practice and further measures derived from site risk assessments and specific assessment of ALARP.⁴³ Recommendation 9 addresses this need, including whether to prepare an ACOP⁴⁴ for COMAH, which is not a customary practice for the Environment Agency. We return to this recommendation below, in the context of adequacy of COMAH.

⁴¹ See Institute of Petroleum Model Code of Practice 19 *Fire precautions at petroleum refineries and bulk storage installations*

⁴² *The storage of flammable liquids in tanks* HSG176 HSE Books 1998 ISBN 978 0 7176 1470 7

⁴³ As Low As Reasonably Practicable: The risk level that is achieved when all safety measures have been applied where the cost of their implementation does not grossly exceed the value of the risk that is avoided by their adoption. It is not a fixed risk level because safety measures vary in their cost and effectiveness in a situation specific way.

⁴⁴ Approved Code of Practice. This is a recognised regulatory instrument under section 17 of the Health and Safety at Work etc Act 1974.

Recommendation 9

The Competent Authority should review the nature and content of existing sector-specific guidance to inspectors in order to eliminate ambiguities of interpretation of guidance, including the meaning of 'good practice'. Consideration should be given to endowing safety and environment critical measures in guidance with more authority (eg via an ACOP) to support more robust regulatory intervention in order to achieve more consistent outcomes for broadly similar risks. See also Recommendation 38.

102 The current arrangements can lead to different standards being applied in broadly similar circumstances. Given the diverse nature of COMAH sites over which the Competent Authority has regulatory control, sector-specific guidance would help to ensure that consistent standards of good or best practice are achieved.

103 Our concerns are reflected in the indefinite nature of the advice given in HSG176 *The storage of flammable liquids in tanks*. Paragraph 110 is a prime and relevant example as it is expressed in the following terms:

- the use of a high-level alarm is recommended;
- the alarm may be arranged to stop the filling pump;
- a high, high-level trip may also be fitted.

104 The lack of authority in this passage, exemplified by the use of the term 'may be' rather than 'should be', lays open the strong possibility that some parts of industry may take a less-cost option as opposed to adopting the solution that properly balances safety, environment as well as cost. HSG176 is guidance only and does not carry the authority for enforcement purposes of an Approved Code of Practice⁴⁵ (ACOP). Our concerns arise initially from a lack of specific provisions with respect to overfill protection when it became clear that the overfilling of Tank 912 at Buncefield – which led to the formation of the large flammable cloud – was at the centre of the incident.⁴⁶

105 These concerns are, however, generic and relate to a perceived, general lack of consistency in safety and environmental protection performance in the sector. We believe the Competent Authority needs the support of more specific standards and, in Recommendation 10, we call for the catalogue of existing standards and guidance to be brought into greater alignment for similar risks. This extends the application of the previous recommendation from a Competent Authority review of guidance to its inspectors to the Competent Authority and

⁴⁵ See section 17 of the Health and Safety at Work etc Act 1974.

⁴⁶ That said, at HOSL the overfill protection installed was in line with good practice except in respect of the override switch – which is not mentioned in HSG176.

industry on the broader standards and guidance available to the major hazards sector.

Recommendation 10

The Competent Authority and industry should review the standards and guidance that are either currently available or are called for in previous Board reports and in Competent Authority containment policy, with the aim of ensuring broadly similar responses to the control of broadly similar major hazard risks.

106 The safety report, which must be prepared by the operator for all upper-tier COMAH sites, should identify all possible scenarios that could lead to a major incident and assess the probability of those events occurring. Once the 'probable' scenarios have been assessed, operators have to describe the measures they will put in place to prevent a major incident, and to limit the consequences of such an incident should it occur. At fuel storage sites, preventive measures, and on-site and off-site emergency plans, are based on the most probable worst-case scenarios. The violent explosion that occurred at Buncefield as a consequence of the ignition of a large cloud of vapour that was formed during the loss of petrol from Tank 912 had not been predicted and therefore had not been accounted for in operational planning. Operational intelligence should routinely take stock of reports of major hazard incidents occurring anywhere around the world so as to inform the operation of the COMAH regime. An inbuilt capacity for continuous improvement should be a key aim for major hazard regulators. Recommendation 11 calls on the Competent Authority to adopt the practices of an effective 'learning organisation'.⁴⁷

Recommendation 11

The Competent Authority should make appropriately resourced arrangements to collect and disseminate operational intelligence related to its core regulatory functions for COMAH sites. The aim should be to evaluate the impact of knowledge from incidents and changes to international best practice, and to stimulate continuous improvement in the COMAH regime. We believe this is best done in cooperation with industry to minimise costs and maximise effectiveness.

107 In the COMAH sector, our work in a number of areas, not least in land use planning, suggests that the Competent Authority and the dutyholders have not established adequate arrangements for collecting key data on safety performance and incidents to support its COMAH regulatory functions and to give impetus to the industry to improve its performance.

⁴⁷ A learning organisation is one that places considerable emphasis on developing strategies and techniques for sharing information and creating new knowledge in order to improve its effectiveness on a continuing basis.

108 Recommendation 12 calls for the Competent Authority to be a catalyst for developing effective safety performance indicators.

109 Recommendation 13 calls on the Competent Authority to see that the COMAH sector shares incident data and new knowledge. These two recommendations reflect the intent of Recommendations 10, 23, 24 and 25 in our fifth report on design and operations.⁴⁸

110 Whereas the recommendations in our fifth report focused on the major hazard sector as a whole, here we ask the Competent Authority to act as a catalyst for the sector, otherwise we see little prospect of such arrangements coming into being and being effective. The offshore hydrocarbons database was set up on the instruction of Lord Cullen in his report into the 1988 Piper Alpha disaster. Operated by HSE and industry, it demonstrates that where there is leadership from the regulator, an industry sector can set a world benchmark in major incident reporting on a voluntary basis. Our fifth report's observation bears repeating that the contemporaneous report of the Baker Panel inquiring into the Texas City incident of March 2005 commended HSE's guidance on developing process safety indicators for adoption by US industry.

Recommendation 12

The Competent Authority should agree with the non-nuclear major hazards sector on a system of leading and lagging performance indicators for process safety performance. This system should be in line with and take forward HSE's recently published guidance on Developing process safety indicators HSG254.

Recommendation 13

The Competent Authority should take the lead with the sector to establish arrangements to collate incident data on high potential incidents, including overfilling, equipment failure, spills and alarm defects, evaluate trends and communicate information on risks, their related solutions and control measures to the industry. Every encouragement should be given to COMAH dutyholders to participate in the sharing of data.

111 We noted when reviewing documentation as part of our work on the Policy and Procedures Review that some documents had not been updated⁴⁹ and further work was also needed to incorporate certain guidance into the Competent Authority's documentation systems.⁵⁰ Recommendation 14 seeks to address this.

112 Some of the useful printed guidance produced by the Competent Authority and industry is out of print and unavailable in electronic form. These days,

⁴⁸ *Recommendations on the design and operation of fuel storage sites* Fifth report Buncefield Major Incident Investigation Board March 2007

⁴⁹ Example: COMAH Manual Ch.11 'Agreed Competent Authority Policy & Procedures'; due for review 14/07/02 but not reviewed. A review would *de minimus* allow for changes to the nomenclature.

⁵⁰ Example: COMAH Manual Ch.8 has been allocated to Emergency Planning but has not been written.

engineers and other practitioners will mostly rely on guidance that is available via electronic media, and increasingly via the internet. Inevitably some guidance is no longer readily available to regulators and dutyholders alike. In some instances, this situation appears to have created a gap between regulatory procedures and guidance to dutyholders – attention was drawn to this in paragraph 78 and Recommendation 2 of our sixth report (on emergency preparedness etc).⁵¹ Some of this guidance is entirely fit for purpose and its transfer to electronic media will be a cost-effective way of enhancing consistent and appropriate standards. Recommendations 15 and 16 address this concern in relation to both the Competent Authority and industry. In Recommendation 16, we refer to all the major hazards sectors as we believe this is an important general point that needs to be considered by the relevant trade associations and the main standards bodies.

Recommendation 14

HSE's, the Environment Agency's and the Scottish Environment Protection Agency's processes for reviewing internal documentation should be improved to ensure that documentation remains current, comprehensive and complete.

Recommendation 15

HSE, the Environment Agency and the Scottish Environment Protection Agency should review their catalogues of external printed guidance to ensure that out-of-print guidance is made available electronically to the industry and public where it remains applicable.

Recommendation 16

The Competent Authority should encourage the relevant major hazardous industries trade associations and the main standards organisations should review the printed guidance for which they have responsibility and make out-of-print material available electronically where it remains applicable.

113 There were several instances where there was a lack of effective communication between HSE and the Environment Agency on regulatory issues such as inspection plans, and outputs from inspections and investigations. In part, this was due to the information sharing systems being unfit for purpose. We have no reason to believe that this situation is restricted entirely to the regulation of Buncefield, and in Recommendation 17 we ask for an effective shared system of data management. There may be costs and risks inherent to a shared electronic system that far outweigh the benefits, and so we call only for an outcome (which may be e-mail based rather than a more sophisticated data transfer mechanism), rather than specifying the means of achieving it.

⁵¹ A specific example is the sole existing COMAH guidance on emergency planning for major accidents (HSE Books 1999), copies of which are very difficult to locate.

Recommendation 17

The Competent Authority should ensure that all the agencies involved are able to record and share information effectively with each other. This need not necessarily be through shared computer-based system; the aim should be to ensure all key relevant information is available, without fail, to all parts of the Competent Authority.

Resources, logistics and charging

114 As previously mentioned, the safety report assessment was significantly behind schedule for all parts of the Buncefield site, and regrettably the HOSL safety report was never completed. It was evident that the problem of handling safety reports in a timely manner was mainly caused by a shortage of topic specialists in HSE and, in addition, the absence of a statutory permissioning process (see para 137). From the time of receipt of the safety report by the Competent Authority, the planned strategic intervention activity became restricted to known defects (see Annex 7), with insufficient attention being paid to process safety and primary containment; this would have been remedied had more specialists been available to HSE. We found the Environment Agency did not deploy its available specialist resources in safety report assessment to any significant extent. The Competent Authority (because this cannot be ascribed to either HSE or the Environment Agency – see Recommendation 25) did not deploy technical monitoring of the construction of Bund 12 which was undertaken in response to an Improvement Notice issued by HSE. In Recommendation 18, we call on the Competent Authority to undertake a joint fundamental review of the resources needed – topic specialists and numbers of staff – to ensure that major hazard sites are adequately regulated.

115 In Recommendation 19, we ask the Competent Authority to periodically review the allocation of resources to major hazard regulation to ensure the continued fitness for purpose of the regime. We believe such reviews should be undertaken at suitable intervals in line with the Government's spending reviews, and we believe that account should be taken of major incidents elsewhere, using management information and operational intelligence relating to sector performance. (See also Recommendation 11.)

Recommendation 18

The Competent Authority should determine the resources and expert competencies required to ensure effective regulation of COMAH sites. In particular, the Competent Authority should consider the range and numbers of specialist inspectors needed to adequately carry out its regulatory functions required for:

- *COMAH safety report assessment and handling (Recommendation 1 also refers);*
- *effective joint inspection to support the remodelled COMAH regime;*
- *monitoring sector performance and securing effective operational intelligence.*

Recommendation 19

The Competent Authority should periodically review the suitability and sufficiency of regulatory resources for COMAH sites. A review should be considered in response to a significant new understanding of hazards and risks (for example arising from a relevant major incident anywhere) or where operational intelligence or management information identifies potentially inadequate regulation of major hazard sites.

116 There have been difficulties with a charging regime that is operated under a memorandum trading account and where all of the costs accruing to the regulator (obtained through a complicated calculation) are expressed in terms of an hourly rate for a front-line inspector. Firstly, it is difficult to explain to dutyholders. Secondly, because the rate is applied to inspector activity, it does appear to create friction between dutyholders and inspectors when site or HQ visits are conducted by a number of inspectors (as in a joint inspection) and/or where multiple visits are necessary. Thirdly, it is not possible to anticipate future cost recovery against specific dutyholders who cannot, therefore, accurately budget for the cost of regulation of their sites. In the case of COMAH sites, there was a further difficulty because only regulation of certain of the activities relating to any site was cost recoverable.

117 While we fully support the principle of cost recovery for major hazard regulation, we believe these difficulties profoundly complicate the regulation of major hazard sites. We are confident the system for cost recovery could be made much more straightforward and predictable, and at the same time relieve pressure on the relationship between the inspectors and the dutyholders. Recommendation 20 calls on the agencies to reform the system. We also suggest that costs arising from operational research to support the front line should be included in the recoverable overhead. We recognise that the costs of regulation of activities that (may) give rise to chronic pollution and are not covered by COMAH are not currently recoverable. We welcome the advice from HSE that reforms to the COMAH cost recovery system are being considered.

Recommendation 20

HSE, the Environment Agency and the Scottish Environment Protection Agency should explore alternative charging mechanisms in order to avoid the difficulties associated with the current charging regime. One aim should be to recover all costs associated with handling safety reports and interventions (inspection, investigation and enforcement) and research related to control of risks on major hazard sites in an effective and straightforward manner. A further aim is to remove inherent friction between dutyholders and regulators when carrying out field activities.

118 The Competent Authority has long experience of applying a multidisciplinary approach to the regulation of major hazard sites that is rightly in keeping with the COMAH Regulations. There is a public expectation that appropriate resources – human and financial – will be directed towards achieving the effective regulation of COMAH sites. Many, if not all, of the specialist staff needed by the Competent Authority to regulate its major hazard sectors are everywhere in short supply, and competition for staff may result in assigning generalist staff to the regulation of major hazard sites. One consequence of this in the regulation of Buncefield was a lack of empathy between specialists drafted in from other major hazard sectors and the incumbent COMAH inspectors who had not the same depth of relevant experience. We also found that HR policy in HSE encouraged certain staff to vacate critical posts for reasons of career development without adequate consideration being given by management to the impact such moves would have on the operational needs of the organisation. We believe that the Competent Authority should nurture and protect the major hazards culture, expertise and competencies throughout the COMAH regime, and ensure that a ‘major hazards focus’ is maintained throughout the Competent Authority. This is addressed in Recommendation 21. Recommendation 22 draws attention to encouraging inspectors and their managers to focus on major hazards aspects of COMAH sites. Previous major incidents around the world such as Texas City, Longford (SE Australia) and Piper Alpha remind us that the task of controlling major hazard risks can become insidiously subverted by undue attention being paid to the less organisationally demanding issues of occupational safety.

Recommendation 21

The Competent Authority should review its management and deployment of resources to ensure effective regulation of the major hazard aspects of COMAH sites. The review should include:

- *feasibility of multidisciplinary teams for safety report handling and field activities;*
- *suitability of matrix/team management arrangements (including with regard to funding) across the Competent Authority;*
- *balancing staff development and operational needs.*

Recommendation 22

The Competent Authority should ensure specific emphasis is given to the regulation of major hazard risk controls (including process safety and environmental protection) at major hazard sites. The aim should be for all regulatory and specialist staff, irrespective of professional background, to operate effectively as an integrated team in a major hazard environment. Consideration should be given in particular to:

- *effective integration of topic specialists and regulatory specialists in the regulation of COMAH sites;*
- *highlighting technical contributions necessary to deliver the key operational strategies at major hazard sites;*
- *ensuring that occupational safety and health interventions do not unduly divert attention from process safety, primary containment and asset integrity management;*
- *ensuring that regulatory interventions specifically consider protection against major accidents to the environment.*

119 It is a legitimate aim of Government in the interest of public sector funding constraints to require departments to balance priorities and seek wherever possible to subsume rising costs within current budgets. However, we believe it would undermine public confidence should resources, as a matter of policy, be taken from other parts of the major hazards regulatory regime for the purposes of strengthening COMAH regulation. In addition, as we understand Government's policy for the inspectorates, there is a cap on staff through payroll limits irrespective of the fact that major hazards inspectors recover their costs and related organisational overheads. Therefore in Recommendation 23, we call on Government to ensure adequate resources are provided for the control of major hazard risks at all high hazard sites regulated by HSE, the Environment Agency and SEPA, and not just COMAH sites.

Recommendation 23

DWP, Defra and the Scottish Executive should give urgent consideration to agreeing additional staffing to support the regulation of the COMAH regime, without creating staff shortages for the regulation of other sectors falling to the responsibility of HSE, the Environment Agency and SEPA.

Operation of the joint Competent Authority

120 The COMAH Regulations are jointly enforced by HSE and the Environment Agency in England and Wales and by HSE and SEPA in Scotland. The agencies are required to work in an integrated way, but joint working should be supported by clarity of procedures and adequate guidance, with the agencies being able to communicate, share and record information and decisions effectively.

121 The MoU existing at the time of Buncefield did not adequately cover all these aspects. The Board welcomes the recently revised MoU and notes that it has addressed some, but not all, of the main issues raised.

122 Examples of where we believe the arrangements supporting the operation of the Competent Authority need further strengthening are as follows. Firstly, the Environment Agency had no procedure for carrying out a Policy and Procedures Review and hence used a modified version of that developed by HSE. Secondly, there are no specific procedures for conducting major incident investigations jointly between the agencies. We do not suggest that the investigation into Buncefield is in any way problematic, but it makes good sense to combine the lessons learned from nearly three years of working together with existing formal guidance. This should include a formal arrangement for sharing of costs jointly between the agencies involved in joint investigations.

123 The Competent Authority also needs to provide clear guidance on aligning the enforcement policies for the component agencies under COMAH.

124 The joint information sharing system (the Major Hazard Information System (MHIS)) was unreliable and difficult to access by the Environment Agency as a result of software compatibility problems. The need remains for adequate sharing and recording of data between the parties, and so we call upon the Competent Authority to address these communication issues. We do not insist there should be a common IT system for the Competent Authority because such arrangements can be problematic and in practice may be less effective than conventional data sharing – such as e-mail notification – provided the system is reliably administered.

125 There also appears to be a lack of clarity about which agency has lead responsibility for containment of hazardous substances which, after Buncefield are clearly of critical importance. We report on this in paragraph 99 above. However, establishing topic leadership should not constrain collaborative working of the Competent Authority, particularly in priority areas such as primary and secondary containment, maintenance of process safety systems and in the control of product transfers by operations staff).

126 Recommendation 24 therefore addresses areas where the current MoU is unclear where there is a lack of appropriate instruction, and where guidance is incomplete. Recommendation 25 deals with the aspect of lead responsibility.

Recommendation 24

The Competent Authority should revise its MoU to address all aspects of Competent Authority operation in order to facilitate better integrated working. The revised MoU should be underpinned by adequate guidance, procedures and, where necessary, shared systems, to ensure that it can be effectively implemented. It should also cover all aspects relevant to efficient and effective operations, including:

- *conducting joint major incident investigations;*
- *aligning enforcement policy and practices;*
- *conducting joint PPR's;*
- *sharing of costs;*
- *sharing and recording of information;*

Recommendation 25

The Competent Authority should ensure that it has clearly identified default lead responsibilities in all areas within the regulatory framework, eg for primary, secondary and tertiary containment. Where these responsibilities are varied on a case-by-case basis, the revised arrangements should be recorded and communicated to all parties concerned.

127 From the outset, we saw that integrating the inspectorates and technical specialists of the Competent Authority would be an effective way of achieving consistency, proportionality and efficacy, as intended in the COMAH regulations. We consider this would be welcomed by site operators and other dutyholders under COMAH. Achieving the standards of the original MoU was clearly difficult for the Competent Authority. Ensuring the revised MoU is fully complied with, as well as addressing the weaknesses we ask to be addressed in Recommendations 24 and 25, would be easier to achieve in an integrated COMAH inspectorate with staff seconded from the Competent Authority. We recognise there may be some undesirable impact within the different agencies due to resourcing functions that are not shared under COMAH. Nonetheless, we believe serious consideration of the idea of integrating resources is merited in view of the potential benefits. Recommendation 26 makes this point.

Recommendation 26

HSE, the Environment Agency and SEPA should consider establishing an integrated COMAH inspectorate.

Emergency preparedness and response

128 As we said in our report addressing emergency preparedness and response,⁵² operators of top-tier COMAH sites are required by law to prepare

⁵² *Recommendations on the emergency preparedness for, response to and recovery from incidents* Sixth report Buncefield Major Incident Investigation Board 17 July 2007

adequate emergency plans to deal with the on-site consequences of possible incidents and to provide information to enable local authorities to prepare emergency plans to deal with the off-site consequences. To be effective, these plans must be based on a full appreciation of the potential for major incidents. Before Buncefield, a massive vapour cloud explosion at a tank farm was not deemed a credible major incident risk. Nor is it just a matter of vapour cloud explosions, as there is also the potential for significant fires affecting multiple storage tanks.

129 The key to both effective major hazard controls and to effective emergency arrangements is the adequacy of the operator's assessment of the major hazard potential of a site. Getting this right will be reflected in relevant documentation, such as the COMAH safety report and emergency plans, and in the arrangements themselves. Operators therefore need to take an integrated approach to assessing prevention and response needs. Recommendation 27 reflects Recommendation 1 in our sixth report on emergency preparedness etc, calling for more realistic hazard scenarios to be developed at sites where flammable clouds could form.

Recommendation 27

The Competent Authority should ensure that operators of Buncefield-type sites review their emergency arrangements to ensure they provide for all emergency scenarios arising out of credible major hazard incidents, including vapour cloud explosions and severe multi-tank fires.

130 Paragraph 78 of our initial report asked operators to review their on-site emergency plans following Buncefield, where they had not already done so. Recommendations 2 and 3 of our report on emergency preparedness etc build on this early response to the incident by asking the Competent Authority to support operators in improving the quality of their on-site plans. Currently, guidance to COMAH operators on preparing on-site emergency plans is not sufficiently aligned with the guidance to the Competent Authority for assessing the plans. Therefore, a review of the existing COMAH guidance on emergency planning is required, and then existing plans should be reviewed in the light of the revised guidance. Recommendation 28 asks the Competent Authority to develop effective arrangements to verify the quality of on-site plans. In framing this recommendation, we took account of the fact that the credible scenarios that inform on-site emergency planning also inform emergency planning for off-site major incidents.

Recommendation 28

The Competent Authority should make adequate arrangements in its guidance to inspectors for effective verification of the on-site emergency plans for COMAH sites through the mechanism of the safety report, and through site verification. The revision of arrangements should include:

- *consultation with representative dutyholders and emergency responders;*
- *coverage of situations where a number of operators share emergency arrangements for the same site, and/or where incidents arising from one operator's site potentially impact on other operators' facilities ('domino' sites);*
- *preventive arrangements against escalation of an on-site incident into an off-site major incident through failure of measures to prevent loss of secondary and tertiary containment.*

As part of this process, the Competent Authority should be alive to the relationship between the off-site emergency response plan and the on-site plan upon which it is based.

131 In paragraphs 36 and 37 of our emergency preparedness etc report, we observed that effective emergency response to an incident that has off-site consequences depends upon a clear and concise emergency and contingency plan, trained and experienced responders and a well-informed community. The primary need is for better guidance for local authorities and early responders to help them to draw up effective plans for dealing with major incidents such as large explosions and multiple tank fires. During the development of the off-site emergency plan for Buncefield, there seems to have been little practical support or guidance for the local authority to understand the safety reports for the site, or on whom to consult about important 'knock-on' effects of a major incident, such as the need for and consequences of closing schools and hospitals, threats to clean water and electricity supplies. Recommendation 14 of the emergency preparedness etc report called for improved guidance to assist local authorities draw up effective off-site emergency plans. Recommendation 15 of the same report called for measures to ensure arrangements are effective in practice. This is in line with the Competent Authority's responsibilities as the enforcing authority under COMAH.

132 At Buncefield, the local authority did not complete a final off-site emergency plan for issuing to the relevant parties. Although the draft plan that did exist (but which was not made available during the emergency) would not have addressed the scenarios of a devastating explosion and severe multi-tank fires, it should have contained at least some information of use to the emergency responders. We believe this situation of inadequate or incomplete off-site emergency response plans is likely to be found at other COMAH sites because it does not appear that the Competent Authority viewed this as a priority activity for its limited resources. Also we find there was a lack of clarity on how the Competent Authority should discharge its consultee and enforcement functions in this area. Recommendation 29 more or less repeats Recommendation 14 of our earlier report (on emergency preparedness etc) in aiming to address this issue,

recognising the shared role with the Civil Contingencies Secretariat (CCS) for non-top tier COMAH sites to which the Civil Contingencies Act otherwise applies.

Recommendation 29

The Competent Authority, working with the Civil Contingencies Secretariat, should arrange for national guidance to local authorities to be prepared to assist the preparation of off-site emergency response plans in the light of the Buncefield incident. The guidance should address as a minimum the areas covered in EPR&R Recommendation 15.

Guidance should also address the competencies required for emergency planners, and be clear on the resources that may be demanded for an effective emergency planning function. The guidance should be a living document, ie periodically updated in the light of new knowledge of handling major emergencies.

133 The impact of the domino effect between the sites at Buncefield had not been incorporated into the off-site emergency plans, nor was it clear how changes to the on-site plans would be communicated to, and taken into account by, the other parties involved. Recommendation 30 addresses this.

Recommendation 30

The Competent Authority should ensure that the domino effect between adjacent sites is incorporated into the major accident scenarios and properly addressed in the emergency on-site plans and carried forward into the off-site planning.

134 HSE is not a designated primary responder, but its inspectors performed a valuable service during the emergency that has been commented upon favourably by others at Gold Command, notably members of the Police and Fire and Rescue Services. The contribution of HSE would probably have been greater had staff been trained in such a role, but as secondary responders, there were no provisions for HSE inspectors to act in this capacity. We suggest in Recommendation 31 that HSE consult with CCS and other relevant bodies on this point. It includes reference to HSL,⁵³ which may be able to contribute valuable expertise and technical resources to support incident commanders in the early stages of an incident.

Recommendation 31

HSE should consult with CCS and other relevant agencies to determine whether it should be formally designated a primary responder for major incidents at COMAH sites.

135 In our emergency preparedness etc report, we included a section on 'Recovery of the environment' in which we said that at the onset of an incident, better co-ordination is required between operator, COMAH regulator, the

⁵³ The Health and Safety Laboratory, whose HQ is at Buxton Derbyshire, is an agency of HSE. It specialises among other things in forensic investigation of major hazards and has wide major hazards expertise and extensive technical resources.

emergency services and local authorities to understand the types and quantities of harmful products escaping from a site. These will include both the process materials normally in use and storage on site, substances brought in to deal with the emergency response, and the implications of the contaminated mixtures that might result. We also said that measures should be in place to co-ordinate the implementation of emergency plans with an assessment of the risks to the environment. This will assist provisions for giving accurate and important advice to primary responders, and for the setting up of monitoring arrangements specifically targeted at the type of emergency being dealt with.

136 We welcomed the Environment Agency's initiative to conduct a review of relevant procedures and guidance relating to the best means to assess the damage potential of worst-case emergencies, also taking into account harmful products that may be brought to the site to deal with the emergency and asked for this work to be completed quickly, including the production of suitable guidance for primary responders and planners.

Adequacy of COMAH

137 COMAH is designated a 'permissioning regime', but unlike other major hazard sectors (railways, nuclear, offshore), the COMAH Regulations do not require the regulator's specific consent or acceptance to allow the dutyholder to continue in operation. The apparent shortcomings in the safety report at the HOSL site and in the handling of it by the Competent Authority (see Annex 6) have confirmed the critical importance of a satisfactory safety report in identifying major hazard potential, adequate control measures, provision for emergency response, and safety-critical features for inspection and verification on the ground. A requirement for statutory acceptance of COMAH safety reports by the Competent Authority (before and at suitable intervals and events in subsequent operations such as significant changes in inventory) would provide greater public assurance that the regime was adequate for the control of major accident hazard risks. Greater assurance would arise for example from statutory deadlines for completion – either way – of the handling process; and in the obligation which would flow from this for the regulator to assign sufficient resources to the handling process. Recommendation 32 calls on HSE, Defra and the devolved administrations to evaluate the desirability of moving to a full acceptance regime for COMAH top-tier sites. The aim is to increase public assurance that the regulatory system is robust, and that control measures described in the safety report for COMAH sites are suitable and sufficient.

Recommendation 32

HSE, devolved administrations and Defra should undertake a review of regulation 7 of COMAH with a view to introducing statutory acceptance of the safety reports for COMAH top-tier operations prior to relevant activities starting, and to enable current relevant activities at existing sites to continue.

Due to the impact of statutory acceptance, a further review will also be needed of the alignment between regulations, 7, 8, 17, and 18 of COMAH.

138 Recommendations 33 to 38 in the main arise from what has been observed of the way in which the requirements of COMAH might be interpreted. The recommendations therefore share the same objective, that of greater clarity so that dutyholders, employees and all those who might be affected by the operation of a COMAH site are clear about what is expected. Regulation 4 of COMAH requires that:

Every operator shall take all measures necessary to prevent major accidents and limit their consequences to persons and the environment.

139 The guidance to regulation 4⁵⁴ infers a test not present in the general duty prescribed by the regulation, that there must be proportionality between the risk and the measures taken to control the risk. It goes on to note that proportionality is a key element in the Competent Authority's enforcement policy and a principle underlying European Community law. The guidance concludes:

Therefore the phrase 'all measures necessary' will be interpreted to include this principle.

140 This appears to us to reduce the effectiveness of the requirement 'to take all necessary measures' through qualifying what is otherwise an absolute duty. The wording of the guidance might inhibit the Competent Authority from enforcing the stricter interpretation of regulation 4, if it were minded to do so, because the guidance would give good grounds for a legal challenge. It would seem to be more consistent with the majority of health and safety law for any reasonable and necessary qualification to be incorporated into the regulation itself. We ask HSE in Recommendation 33 to consider revising regulation 4 and the associated guidance to make the relationship between the regulation and the control of risk more transparent.

141 As Lord Cullen identified in his report into the 1988 Piper Alpha disaster,⁵⁵ the general regulations requiring the preparation and submission of an offshore safety case required further underpinning of the regulations for offshore major hazard risk control. Lord Cullen said that specific regulations related to

⁵⁴ *A guide to the Control of Major Accident Hazards Regulations 1999 (as amended). Guidance on Regulations L111 HSE Books 2006 ISBN 978 0 7176 6175 6*

⁵⁵ Lord Cullen *The Public Inquiry into the Piper Alpha Disaster* Command Paper Cm 1310 The Stationery Office 1990 ISBN 978 0 10 113102 5

construction of the installation, fire and explosion protection, and evacuation, escape and rescue were needed in goal-setting form to complement the formal safety assessment [in the safety report].⁵⁶ We observe that the more specific duties under COMAH are expressed in the Schedules, mainly in fact in Schedule 4. We believe it would be helpful to consider whether specific duties related to the operation of COMAH sites might be better expressed within the main body of the regulations, or in a supporting body of statutory provisions. In Recommendation 34 we ask HSE to consider this.

142 Recommendation 35 is also based on a reading of the specific provisions in COMAH, namely regulation 18 ('Prohibition of use')⁵⁷ and accompanying guidance. The term 'serious deficiency' is not sufficiently defined so as to provide reassurance about the consistency of enforcement decisions. There has been recent work on the HSE internal guidance which needs to be considered further, but the absence of publicly available information on when a COMAH Notice might be issued suggests in the light of Buncefield – for example, where the safety report for HOSL was seriously deficient in identifying relevant major hazard scenarios and critical process control measures – that early attention to this aspect of guidance is warranted.

Recommendation 33

HSE should consider revising the definition of the general duty under regulation 4 of COMAH in order to provide a statutory definition for the control of risk. An ACOP within the meaning of section 16 of HSWA may be one way of achieving this objective.

Recommendation 34

HSE should review the general duties under COMAH to ensure suitable alignment with the key elements of major hazard risk control which are identified in the Schedules to the COMAH regulations.

Recommendation 35

HSE should consider revising the way COMAH Notices are defined in regulation 18 in order to provide the level of protection required in the event of a serious deficiency in the prevention and mitigation of a major accident. Consideration should also be given to strengthening the accompanying guidance to the regulation.

143 It appears to be a regular feature of industrial facilities – not just COMAH facilities – that businesses may operate through companies that are not in themselves employers of the personnel at the site, including those in day-to-day control of the major hazard risks. We recognise the difficulties in trying to

⁵⁶ See the Cullen Report para 17.64 Volume 2 p.288. In para 17.63 Lord Cullen said: 'I propose that the regulation requiring the Safety Case should be complemented by other regulations dealing with specific features....These regulations would complement the Safety Case by setting intermediate goals and would give the regime a solidity which it might otherwise lack'.

⁵⁷ Paragraph 1 of regulation 18 says: 'The [Competent Authority] shall prohibit the operation or bringing into operations of any [establishment....] where the measures taken by the operator for the prevention and mitigation of major accidents are seriously deficient.'

implement health and safety requirements where those exercising significant direction or control of the facilities are not in legal terms the employers of the operational management. At present, COMAH is centred on the 'operator' and ascribes to it the key COMAH duties, including those in the Schedules to the Regulations. This suggests a hierarchy of responsibility that appears to reduce the legal status of other dutyholders involved in the operation of the site. In some cases, these 'lesser' dutyholders will be the most effective in controlling the major hazard risks present on the site because they are in direct management control of staff and at the same time are a conduit for the considerable technical resources of the employer to be brought to bear on the provisions for health, safety, and environmental protection at and around the site.

144 We believe that in situations applying to joint holdings, and other arrangements to apportion operating costs and profits, it would be preferable to extend duties to the main employer and to clarify the respective legal obligations lying between the parties in terms of their impact on the management of health, safety and environmental protection. We ask, in Recommendation 36 for the HSE to consider this in relation to COMAH.

Recommendation 36

HSE should consider whether duties under COMAH should be extended to a company whose employees are involved in the management of COMAH sites, but which is not the direct employee of the COMAH operator. Consideration should also be given to clarifying in the guidance to the Regulations the respective legal obligations between the parties involved in site management in relation to the impact on health, safety and environmental protection.

145 The COMAH regulations apply to sites which present major accident hazards as a result of the substances they process or store. Where processing takes place they are, in most cases, further regulated under the Pollution Prevention and Control (England and Wales) Regulations 2000 (PPC). However, fuel storage depots, which can of themselves present a significant environmental risk from both major incidents or chronic leakage, are not subject to PPC regulation by the Environment Agency because they do not carry out processing operations on the fuels they store. The regulation of sites (such as refineries in England and Wales) under COMAH and PPC share many common aspects for prevention of accidental release.

146 The key difference between COMAH and PPC is that COMAH is concerned solely with the prevention of major incidents, including releases to the environment (MATTE). This means in practice that relatively small unintended releases of liquid, even if they are a continuous fugitive release of substances dangerous to the environment, are not regulated under COMAH if they are only likely to cause pollution and do not constitute a COMAH major incident. (Small fugitive releases of vapour and gases may be treated differently because of their potential to cause flammable or explosive atmospheres.)

147 This suggests to us that where enforcement action might be taken were PPC to apply, such action might not be taken under COMAH in relation to defects that have a high potential for pollution. We believe this could discourage the adoption of the standards of prevention that high hazard sites should attract and which the Board emphasised in its recommendations for the design and operation of sites in its fifth report. In Recommendation 37, we ask the Competent Authority to identify where there may be gaps in enforcement powers at fuel storage sites where PPC (and the equivalent regulations for Scotland) does not apply, and to consider how such gaps in regulatory powers may be remedied. This recommendation is intended to address the type of incremental impact to the environment in a similar way to our recommendations for land use planning and societal risk which address incremental changes to land use around COMAH sites.

Recommendation 37

The Competent Authority should review the alignment of COMAH with other legislation applicable to flammable processing currently not applying at Buncefield-type sites; eg the Pollution Prevention and Control (England and Wales) Regulations 2000. The aim of the review should be to identify, and where necessary remedy, gaps in regulatory powers applying to oil fuel storage sites in the light of the Buncefield incident.

148 The issues associated with Recommendations 33–35 and 37 lead us to consider whether it might be more appropriate to gather all of the available guidance together in one document, with guidance on when and in what circumstances regulatory interventions might be taken. Such a document should have the status prescribed by section 17 of the HSW Act ('Use of approved codes of practice in criminal proceedings') to provide greater confidence to inspectors in their decision making and to allow them to rely on statutory guidance if subsequently challenged in court. We recognise that the Environment Agency (and SEPA) do not operate with ACOPs. However, it might be argued that the ACOP approach is an effective means to achieve joined-up working by the Competent Authority and deliver regulatory consistency and transparency that would be welcomed by dutyholders and inspectors and those whom the COMAH regulations are intended to protect against major accident hazards.

Recommendation 38

HSE, the Environment Agency and SEPA should consider whether an ACOP for COMAH should be introduced, in particular to clarify the functions of the Competent Authority under regulations 17–20.

Land use planning

149 By the time we made our initial report in July 2006, land use planning (LUP) had become an addition to our 'lessons learned' project under Term of Reference 5. When the workstream reports had been completed,⁵⁸ we removed from the chapter on LUP⁵⁹ the recommendations (and much of the background material). This was to avoid recommendations overlapping with our published report into LUP⁶⁰ while keeping sufficient information in the workstream report about HSE's policies and procedures relating to LUP. We note that HSE's operation of the LUP system was in line with its policies and procedures.

150 As we make clear in our LUP report, the policies and procedures are in need of reform. Our published report makes 18 recommendations which apply to the entire land use planning system around major hazard sites in the UK and we do not repeat them here.

⁵⁸ See Chapter 4 of this report.

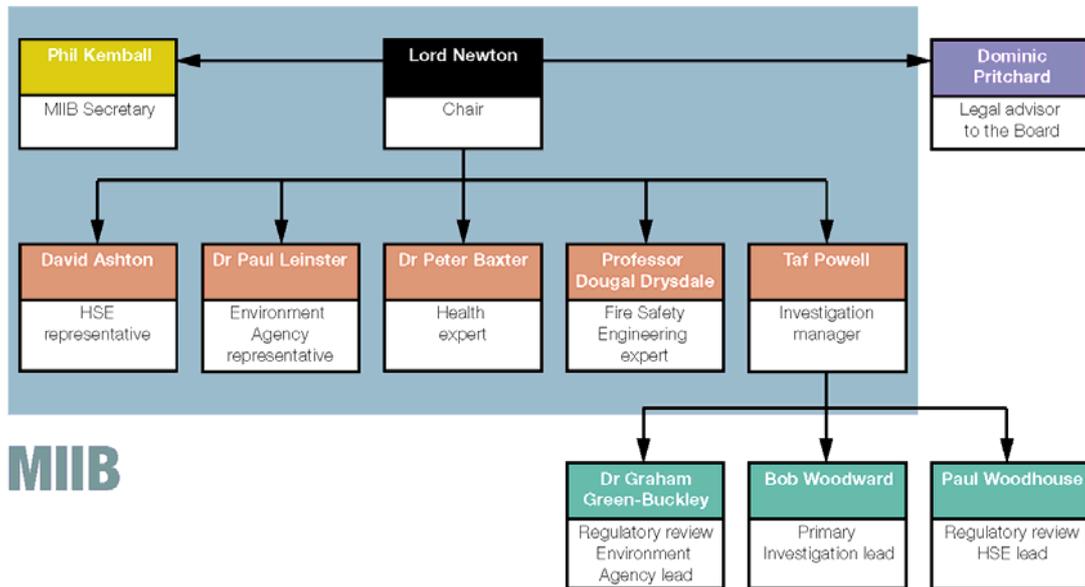
⁵⁹ This was in the HSE workstream report only (at pp. 40 et seq). There was minor involvement of the Environment Agency in the land use planning system at the time of Buncefield and it was not covered in the Environment Agency workstream report.

⁶⁰ *Recommendations on land use planning and the control of societal risk around major hazard sites* July 2008

Annex 1 Buncefield Major Incident Investigation Board terms of reference

- 1 To ensure the thorough investigation of the incident, the factors leading up to it, its impact both on and off site, and to establish its causation including root causes.
- 2 To identify and transmit without delay to dutyholders and other appropriate recipients any information requiring immediate action to further safety and/or environmental protection in relation to storage and distribution of hydrocarbon fuels.
- 3 To examine the Health and Safety Executive's and the Environment Agency's role in regulating the activities on this site under the COMAH regulations, considering relevant policy guidance and intervention activity.
- 4 To work closely with all relevant stakeholders, both to keep them informed of progress with the investigation and to contribute relevant expertise to other inquiries that may be established.
- 5 To make recommendations for future action to ensure the effective management and regulation of major accident risk at COMAH sites. This should include consideration of offsite as well as onsite risks and consider prevention of incidents, preparations for response to incidents, and mitigation of their effects.
- 6 To produce an initial report for the Health & Safety Commission and the Environment Agency as soon as the main facts have been established. Subject to legal considerations, this report will be made public.
- 7 To ensure that the relevant notifications are made to the European Commission.
- 8 To make the final report public.

Annex 2 Board structure



Annex 3 Buncefield policy and procedures review terms of reference

Background note

A Major Incident Policy and Procedure Review⁽⁶¹⁾ (PPR) is part of HSE's⁶² post incident activity following a major incident. It is HSE's policy to conduct PPRs, independent of the major incident investigation, and to report on them to the extent necessary to:

- help HSE evaluate the effectiveness of intervention activity, including liaison with other enforcing authorities, and use the intelligence gathered to inform and plan strategic enforcement policy; and
- identify any shortcomings in policy, legislation or guidance and to inform any consequential research.

The following is a letter issued by the Investigation Manager to the ppr workstream leaders appointed by HSE and the Environment Agency

To: Graham Green-Buckley, (Environment Agency workstream leader)
Paul Woodhouse, (Health & Safety Executive workstream leader)

From: Taf Powell, Buncefield Investigation Manager

Terms of Reference for policy and procedures reviews of EA and HSE

1. Point 3 of the Buncefield major incident investigation Terms of Reference requires me to examine the HSE and EA role in regulating the activities on this [Buncefield] site under the COMAH regulations, considering relevant policy, guidance, and intervention activity.

2. You have been appointed to lead the reviews and prepare reports into the specified organisations' regulation of the Buncefield site and to assist me in the production of a single final report that will be incorporated into the final report of the major investigation ordered by the Health and Safety Commission under section 14(2)(a) of the Health & Safety at Work etc Act 1974. The policy and procedures review report will be made public at a suitable interval once any legal proceedings have been determined as described in HSE's procedures for conducting such reviews.

⁶¹ On the HSE Intranet at: <http://intranet/ogprocedures/majorincident/review.htm> (Issue date 05.09.05)

⁶² The Buncefield Major Incident Investigation Board was established under s(14)(a) of the Health and Safety at Work etc Act 1974. HSE are the main enforcing authority under this Act. For consistency, the HSE PPR procedures were applied to the preparation of the Environment Agency workstream report.

3. You are therefore and in accordance with HSE's published procedures for such reviews, requested to:

- (i) review and report on compliance with HSE and EA policy and procedures for the regulation of Buncefield depot pursuant to the COMAH regulations; and
- (ii) review and report on the fitness for purpose of HSE and EA policy and procedures pursuant to the COMAH regulations in the light of the Buncefield incident.

4. In conducting your reviews you should exercise judgement, consulting with me as necessary, as to the extent of your interest in order to evaluate compliance with and fitness for purpose of the COMAH regulations. The reviews for EA and HSE should include *de minimus*:

- (i) the handling of COMAH safety reports
- (ii) inspections under COMAH and other relevant legislation
- (iii) investigations under COMAH and other relevant legislations
- (iv) enforcement under COMAH and other relevant legislation
- (v) operation of the MoU for the joint competent authority
- (vi) land use planning functions
- (vii) regulation of provisions for emergency response on and off site
- (viii) the response to the major incident

5. The period of your reviews should extend from receipt of the Safety Reports for the three primary dutyholders on the Buncefield site (HOSL, BPA, and BP) but should also cover the land use planning applications from the time of the amendment to the COMAH regulations that classified Buncefield as a top tier site.

6. The review for HSE should extend until the handing over of the damaged site from the emergency services to HSE's control, and for EA this should be some other later time to be agreed.

7. I would be grateful for your estimated completion of the reviews in due course, and for your project plan, which should be incorporated into the major incident investigation project plan.



3rd February 2006

TAF Powell
Buncefield Investigation Manager

Annex 4 Relevant and relative duties under COMAH

1 In its examination of the role of the Health and Safety Executive and the Environment Agency in regulating the activities on the Buncefield site and in considering the relevant policy guidance and intervention activity, the Board wished to understand the impact of the duties on the Competent Authority in the context of the duties imposed by the Control of Major Accident Hazards Regulations 1999 (as amended) (COMAH) as a whole. In considering what recommendations to make under its third term of reference, the Board was therefore made aware of the following legal distinctions in the duties imposed under COMAH.

2 The Health and Safety at Work etc Act 1974 (the HSW Act) imposes wide general duties as well as allowing for the imposition of more specific duties under regulations such as COMAH. Breaches of the duties set out in COMAH are criminal offences under section 33(1) of the HSW Act, and are interpreted in such a way as to give effect to the purposes set out in the Control of Major Accident Hazards Directive and the preventive and protective aims of the HSW Act.

3 COMAH imposes various positive duties on operators of COMAH sites, including the general duty on operators to take all measures necessary to prevent major accidents and limit their consequences to persons and the environment (regulation 4), as well as to prepare and update a major accident prevention policy (MAPP), to send a safety report to the Competent Authority demonstrating safety and reliability of plant and containing information about the management systems, the environment, safety equipment and measures for protection, and to provide other information to the Competent Authority and to the public.

4 Duties such as those imposed on an operator under COMAH differ from the civil law, and an operator will be criminally liable where the necessary conditions for liability (ie the elements required by a legal duty) are not met. That type of duty is not delegable and remains the responsibility of the dutyholder even when the dutyholder seeks assistance from other sources. The Board has not concerned itself with issues of liability, and in fulfilling its terms of reference, has taken care throughout to avoid infringing the rights of potential suspects.

5 Sections 11 to 13 and section 18 of the HSW Act create various powers of direction and delegation for the Secretary of State and HSE. Section 5 of the Environment Act 1995 sets out the principal aims and objectives of the Environment Agency. Regulation 20(3) of COMAH extends the duty to make adequate arrangements for enforcement under section 18 of the HSW Act to the Competent Authority as a whole in respect of the duties imposed by COMAH. Regulation 20(6) of COMAH states that HSE is the enforcing authority for the relevant statutory provisions (including COMAH).

6 Although the Competent Authority is obliged to make adequate arrangements for enforcement, it is not obliged to take formal action whenever information comes to its attention which indicates that an operator has not fully complied with the law. Authorities are also legally entitled to set priorities and to allocate resources as they consider best suited to the performance of their functions. Employees of the Competent Authority are required to follow these policies, and to use their judgement as to the appropriate action to take, if any.

7 The functions of the Competent Authority are defined in regulations 17 to 22 of COMAH. There is no requirement for the Competent Authority to approve a safety report; its responsibility is rather to communicate the conclusions of its examination to the operator. It can, if it judges it appropriate, prohibit the operation of the relevant establishment. The Competent Authority is not therefore a licensing authority, and the statutory regime does not create a statutory duty owed by the Competent Authority to the dutyholder or those who might be affected. The Competent Authority might be made subject to a common law duty if it assumes responsibility by its actual involvement in the management of an establishment, or exceptionally by declining to use its powers where a failure to intervene is irrational in all the circumstances. The Competent Authority has discretion to intervene which should be exercised in a manner that is consistent with the purpose of the legislation in question.

8 Regulation 20(2) specifically provides that a failure to discharge a duty placed on the Competent Authority is not an offence. As the above would suggest, an alleged failure by the Competent Authority would not give rise to a defence to a charge alleging a breach of any duty imposed on an operator or other dutyholder under health and safety or environmental legislation. Where a court considers that a dutyholder could not receive a fair trial or that it would be unfair for a dutyholder to be tried, it has the power to stay (stop) proceedings. That power is used sparingly by the courts, and only in limited circumstances.

Annex 5 Previous open flammable cloud explosions

1 A number of open flammable cloud explosions have been reported during the last few decades, but these have generally involved large releases of flammable gases such as propane.⁶³ Current understanding of the mechanism by which high overpressures are generated following the ignition of a flammable cloud is based on considerable experimental and theoretical research during the 1980s and 1990s. This has shown that a degree of confinement or congestion is required, sufficient to cause high rates of burning due to the creation of turbulence in the unburnt mixture as the flame propagates through the cloud. A very clear example of this occurred on the Piper Alpha platform, when a release of condensate (mainly propane) was ignited within one of the modules, which was open to the atmosphere at both ends. The congestion afforded by items of plant and pipework led to flame acceleration and high rates of burning, sufficient for a high overpressure to be generated which caused major initial damage, leading ultimately to the loss of the platform. In subsequent experimental studies, the phenomenon has been modelled by using arrays of pipes to represent the congestion that is typical of process plant.

2 Recent work on gas explosion modelling has shown the importance of understanding the underlying physical processes. Without this fundamental understanding, the models cannot be expected to predict the physical phenomenon with any accuracy. However, the work has been concentrated on the behaviour of flammable gas explosions within the confines of chemical and process plant (including offshore platforms) and there has been little development of models for explosions involving 'unconfined' and 'uncongested' vapour clouds.⁶⁴ This is partly due to the fact that it is difficult to control large-scale experiments in unconfined scenarios, so there are little or no experimental data against which models can be calibrated and/or verified. This situation is no longer sustainable after Buncefield, which is why we have initiated further work to be undertaken independently to understand the behaviour of fuel vapour clouds.⁶⁵ This work was commenced in 2006, and led to the initiation of a project with the objective of establishing whether our knowledge is sufficient to explain the severity of the Buncefield explosion or if further research is necessary. Phase 1 of this work is soon to be concluded.

⁶³ See for example: Burgess DS and Zabetakis MG 'Detonation of a flammable cloud following a propane pipeline break: the December 9th 1970 explosion in Port Hudson, MO' US Bureau of Mines RI 7752 1973. See also: R A Strehlow 'Unconfined vapour cloud explosions – a review' 14th Symposium (International) on Combustion, pp 1189–1200 (The Combustion Institute, Pittsburgh, 1973); Keller, Bill. '[500 on 2 Trains Reported Killed By Soviet Gas Pipeline Explosion](#)' *The New York Times* [June 5 1989](#).

⁶⁴ As explained elsewhere (our Final Report, Annex 4) these are more accurately described as 'open flammable cloud explosions' or 'OFCEs'.

⁶⁵ See the seventh Buncefield Major Incident Investigation Board report *Explosion Mechanism Advisory Group report* August 2007.

Incidents that have similarities with the Buncefield explosion (Amended from Annex 5 of the Board's initial report)

	Location	Date and time	Comments – background	Comments – explosion	Ref.
1	Houston, Texas, USA	April 1962	'Severe leak' from a gasoline tank. Almost windless conditions. Ignition near adjacent highway.	Described as a 'blast', but no details are given.	1
2	Baytown, Texas, USA	27 January 1977	Overfilling of a ship with gasoline.	Few details are given, but it is likely that there would have been congestion.	1
3	Texaco, Newark, New Jersey, USA	7 January 1983 After 00.00 hrs	Overfilling of tank containing unleaded gasoline. 114–379 m ³ (80–265 tonnes) of gasoline released. Slight wind, ignition source 300 m away.	Relatively uncongested area, high overpressures reported, but not quantified. Three minor explosions preceded the main blast.	2
4	Naples Harbour, Italy	21 December 1985	Overfilling of tank containing gasoline. 700 tonnes escaped. Low wind speed (2 m/s).	Relatively congested area. 1.5 hours before ignition. Various overpressures estimated from damage analysis, but they are minimum values (eg > 48 kPa).	3
5	St Herblain, France	7 October 1991 04:00 hours	Leak of gasoline from a transfer line into a bund. Wind < 1 m/s. 20 minutes delay, ignition in car park c 50 m away. Volume of flammable cloud est 23 000 m ³ .	Presence of parked petrol tankers may have been sufficient to generate turbulence. High overpressures produced, but not quantified.	4
6	Jacksonville, Florida, USA	2 January 1993 03:15 hours	Overfilling of tank containing unleaded gasoline. 50 000 gallons (190 m ³ , 132 tonnes) released.	High overpressure produced, but not quantified.	5

	Location	Date and time	Comments – background	Comments – explosion	Ref.
7	em Chabanla Thailand	2 December 1999 23:25 hours	Over filling of gasoline tank. Few details.	High overpressure produced, but not quantified. Relatively low congestion in the area.	6

3 Note: The root cause of each of the above incidents was the spillage (loss of containment) of a large quantity of gasoline (> 100 tonnes) due to overfilling of a tank, or failure of pipework inside a bund. In each case, the wind speed was very low or zero, and a significant vapour cloud was able to form. The feature of the Buncefield explosion that was considered unique was the high overpressure(s) generated throughout the open car park where there were very few obstacles which were capable of inducing turbulence. Unfortunately, very little information is available on the incidents listed in the above table and consequently exact comparisons with Buncefield are not possible, but clearly incidents 2, 4 and 5 did involve significant congestion and may not be relevant. As ‘lack of confinement’ or ‘lack of obstacles’ cannot be quantified, the relevance of the other incidents may only be superficial: further information would be required.

4 Regarding the Buncefield explosion, although there were very few objects in the car park capable of generating turbulence, it was pointed out in the report of the Explosion Mechanism Advisory Group⁶⁶ that the trees and shrubs alongside Buncefield Lane would have created turbulence as flame propagated through that part of the flammable cloud that engulfed the Lane. The consequences of this are under consideration.

References

- 1 Lenoir EM and Davenport JA ‘A survey of Vapor Cloud Explosions: Second Update’ pp. 12–32
- 2 Bouchard JK ‘Gasoline Storage Tank Explosion and Fire: Newark NJ January 7, 1983’
- 3 Maremonti M, Russo G, Salzano E, Tufano V ‘Post-accident Analysis of Vapour Cloud Explosions In Fuel Storage Areas’ pp. 360–365
- 4 Lechaudel JF & Mouilleau Y ‘Assessment of an accidental vapour cloud explosion’ pp. 377–388

⁶⁶ *Explosion Mechanism Advisory Group report Seventh report Buncefield Major Incident Investigation Board 16 August 2007*

5 'Covered Floater in Jacksonville: Steuart Petroleum Bulk Storage Tank Fire' pp 17–32

6 'THAI OIL Fire: A whiff of oil, then a thundering explosion' *Bangkok Post*

Annex 6 HOSL safety report assessment by the Competent Authority

1 HOSL's COMAH Safety Report (CSR) was received on 31 July 2003 and is reported to have been in need of substantial revision to meet the requirements for preparing safety reports. Assessment was not completed by the Competent Authority prior to the explosion, 28 months after receipt. The environment assessment was completed by the Environment Agency assessor just prior to the incident. This was notified to the Competent Authority assessment manager (in HSE) on 25 November 2005. No further action regarding the assessment close-out is recorded.

2 The main findings of our review were that HSE's policies and procedures for the handling of the HOSL safety report were not complied with as regards the excessive time taken to carry out the assessment and the number of requests for further information. The main reason for this was that appropriate resources for safety report assessment were unavailable. Staff at all levels sought to address the issue through implementing a number of remedial strategies, but these proved ineffective in moving the assessment process forward within the required timescale.

3 Other factors that contributed were:

- geographically dispersed team members caused operational difficulties that were not satisfactorily resolved;
- issues arose through the secondment of staff from other parts of HSE with different approaches to assessment of safety reports. This contributed to a lack of effective communication and team working within the Assessment Team;
- HSE intervention with HOSL suffered from a lack of continuity. Personnel were transferred from their COMAH teams at short notice. Apparently this was more for development needs than operational requirements;
- the manner in which the Competent Authority's Safety Report Assessment Manual (SRAM) was followed was not ideal, as the assessment of the HOSL safety report had become cumbersome with excessive requests for further information. The option of returning the safety report for revamping was not exercised.

4 The Competent Authority's policies and procedures for safety report assessment were fit for purpose. Performance standards had been set and the means of monitoring against them was stipulated. Standards for timeliness and quality were aspirational, in the sense that there is no duty on the dutyholder or regulator to enter into an acceptance arrangement limited by time. In two other sectors where acceptance within time limits of the safety case (report) is a

statutory requirement – rail safety and offshore safety – the safety case/report system appears to operate to higher standards of timeliness and completeness.

5 There were concerns expressed within the Competent Authority that the structure and scope of the safety report for HOSL submitted in 2003 was not in accordance with the requirements of COMAH Schedules 3, 4 and 5. Defects included a failure to demonstrate that all major accident hazards had been identified and a lack of clarity in the development of ALARP (as low as reasonably practicable) demonstrations. The control and instrumentation measures for controlling major hazard risks (such as loss of primary containment) were not adequately addressed. Although the safety report process was being monitored, the Competent Authority did not take action to either close out the assessment in a reasonable time, or to send back the report at an early opportunity. The main reason for this was that appropriate resources were unavailable.

6 Overall, shortcomings for the delivery of safety report assessments developed in the Competent Authority as symptoms of an under-resourced COMAH organisation. There was a failure to take remedial measures to ensure that assessment work was drawn to a conclusion in a reasonable period.

Annex 7 Site inspection at HOSL

1 The Competent Authority's procedures for inspection are fit for purpose and there was an HSE inspection plan in place for Buncefield and HOSL. More resources were deployed to the regulation of Buncefield following reclassification than prior to it being given top-tier status in 2002, at which point it attracted the full scope of COMAH, including the need to submit a safety report to the Competent Authority. However, the post-2002 inspection plans dealt in the main with prevention of escalation of a major hazard event, whereas earlier plans appeared more relevant to preventing loss of primary containment. A recommendation in the pre-existing intervention plan formulated in 2001 was to have the override facility on the HOSL high-high alarm system reviewed by a process specialist. This was not carried out.

2 As a fuel storage site, Buncefield had been designated a low-risk top-tier site by HSE for a number of reasons: the perceived low level of hazard in storing fuels at normal temperatures and pressures; the recent assignment of top-tier COMAH status to HOSL on environmental grounds when previously it was lower tier; and the lack of credibility for a large open flammable cloud explosion. Also, as far as Buncefield itself was concerned, the physical control measures on the above-ground tanks to prevent such an eventuality were deemed adequate as they met industry good practice, a view based on inspection work conducted on site between 1999 and 2001, when the establishment was first notified under COMAH.

3 However, inspection activity was curtailed compared to the time prior to the site gaining top-tier COMAH status. This was due to the emphasis HSE placed upon the safety report assessment, and appropriate resources were not fully deployed on site inspections.

4 Regulation 19 of COMAH provides for decoupling the assessment process (which at HOSL was much extended) from the preparation of a Competent Authority strategic inspection plan (referred to as an Intervention Plan). This option was not exercised and no such plan was drawn up.

5 There was also a lack of rigour throughout the operational management chain in collecting and reviewing management information relating to inspection, and a consequential lack of rigour in determining operational priorities.

6 Overall, the effect of extending the requirement for CSR to HOSL appears to have restricted the scope of strategic, preventive inspection plans pending the completion of the CSR assessment, which was seriously delayed. Within this constraint, Competent Authority inspections were well implemented and recorded, though with little apparent consistency in the sharing between the Competent Authority of operational intelligence. Site inspections during the

period of CSR assessment did address secondary containment and firefighting provisions, but did not address primary containment.

Annex 8 Enforcement at Buncefield

1 Our review found the Competent Authority's policy and procedures for enforcement fit for purpose in the operational sense. To this end, improvement notices in respect of fire protection and for bunding of BPA's Tank 12 (the large aviation fuel tank on the other side of Cherry Tree Lane) were issued in appropriate circumstances. The notices do not appear to have called for key design parameters to be notified to the Competent Authority, and this may have contributed to the construction standards going unchallenged by Competent Authority specialists at the pre-construction stage.

2 Potential deviations from existing standards for secondary containment were observed during inspection by the Environment Agency of the construction stage of the bunding around Tank 12. These related to pipework penetrations of the bund. An inspection by a relevant technical specialist was not requested, although it cannot be said whether such a visit may have identified any defects in the dutyholder's interpretation or application of the relevant standards.⁶⁷ The failure of the bunding around Tank 12 during the Buncefield incident was a major source of contamination of the environment in the vicinity of the site. Communications about the bunding work between HSE and the Environment Agency do not appear to have focused clearly on the issue of liquid seal performance of the bund.

3 The COMAH Regulations provide for enforcement to improve major hazard risk controls should, *inter alia*, this not be demonstrated in the CSR. The HSE's Enforcement Policy Statement also makes such provision. Notwithstanding the fact that the COMAH safety report for HOSL was reportedly far below the standard expected by the Competent Authority, this provision was not exercised, and a cooperative approach adopted instead. While it cannot be said that a cooperative approach is without merit, in this case it began a cycle of requests for further information by HSE that, by its repetition, eroded the potential for enforcement at a later stage as a means to secure the minimum standard required of the CSR in a reasonable time frame.

4 Overall, it appears there was uncertainty among operators and inspectors about where the balance lay between enforcement and cooperation following the assignment of top tier status to HOSL-type sites.

⁶⁷ CIRIA Report 164 10.3.5: 'Piercing the walls or floor of a bund, particularly for pipework, introduces a source of potential leakage, and should therefore be avoided unless there is no practical alternative. Routing pipework over the top of the bund wall is regarded as essential...'

Annex 9 Deployment of specialist resources in COMAH regulation

1 Our review found that, in terms of this sector, the Buncefield site was reasonably equipped and instrumented. Inspection of the site was diligently conducted and dealt systematically with known defects. However, following the submission of the COMAH safety report, site inspection did not focus on preventive measures for control of major hazard risks, such as the integrity of primary containment measures.

2 Some doubt appears to have existed among the Environment Agency field staff concerning standards for secondary containment. The deployment of specialist civil engineers to the problem and more generally where situations such as this arise would be helpful here. Also, the deployment of groundwater specialists should be considered as a specific component of the safety report assessment handling, rather than available on demand to the agency assessor.

3 In HSE, there appears to have been an unreconciled difference of approach between seconded staff and the existing understaffed Chemical Industries Division team. This was possibly a fundamental difference of view on the approach to major hazard regulation between the resident inspectors and the seconded specialists which appeared to marginalise some seconded specialists from the inspection process. The effect of the difference appears to have reduced the attention that might otherwise have been paid to major hazard risk controls at HOSL.

4 Overall, there was a shortage of resources in HSE available for inspection of HOSL but the effects were exacerbated by organisation issues and also the regulatory approach (which is set in context in Annex 7) that attached a low hazard potential to the site.

Annex 10 Emergency preparedness and response at Buncefield

1 Our review found the Environment Agency provided input to the preparation of the on-site plans for COMAH, although it was unable to undertake inspections of the plan provisions during the period of the CSR assessment due to competing priorities for limited resources. The input by the Environment Agency addressed *inter alia* the inadequacy of the major accident scenarios identified by the dutyholders.

2 The risks of off-site environmental impact were not adequately assessed by the Environment Agency when it considered on-site emergency plans within the context of the assessment of the CSR for the site. As a consequence, the risks of a MATTE were not adequately identified in the off-site plan. The Environment Agency did contribute to the off-site plan prepared earlier by BPA before the assignment of top-tier status to the rest of the site operators in 2003.

3 The COMAH Regulations, although providing for the 'Domino Effect'⁶⁸ that discrete parts of major hazard sites have on other parts of the site controlled by other operators, did not result in adequate consideration of the interaction of separately operated sites within a complex such as Buncefield. The regulation of Buncefield was largely effected through the discrete regulation of the three separate entities.

4 The situation with on-site plans was to some extent addressed through the inspection procedures (though this would not assist in improving the CSR which is where the emergency planning begins). There were a number of inspections pre-2005 by HSE that addressed emergency planning scenarios on the site. The off-site plan for Buncefield was drafted by the local authority but never issued. There was confusion about whether HSE and the Environment Agency needed to approve the off-site plan.⁶⁹ But it must be said the off-site plan would not have prepared the region for what actually happened. Incomplete off-site planning around COMAH sites was a recognised issue in the Competent Authority at the time of the incident.

5 In practice at COMAH sites, the off-site plan is developed by the local authority and the local resilience network from the on-site plan which is prepared by the operator but which is in effect part of the CSR for the site. Overall, it can be concluded that, given the CSR was defective for planning purposes (for example, major hazard scenarios that were credible at the time were

⁶⁸ Regulation 16.1 of COMAH. Buncefield was designated a Domino site by the Competent Authority in August 2001.

⁶⁹ Under COMAH HSE is the Enforcing Authority to ensure off-site plans are prepared. Neither part of the Competent Authority is required to approve plans. The Agency is required to give advice during the formulation of plans.

inadequately defined), emergency preparedness for some emergencies that were reasonably credible at the time of the incident would have been disadvantaged.

6 In our sixth report, making recommendations for emergency preparedness etc, we observed in paragraphs 67–69 that we had not found evidence generally of adequate guidance to Environment Agency staff for making an assessment of dangerous inventories stored on site or brought to site during an emergency and for quantifying, as far as possible, the loss to the environment and likely penetrations. We are confident this was done to an extent at Buncefield, but we believe the lesson to be learned is that even more can be done by relevant parties to plan and prepare for worst-case scenarios and for the Competent Authority to ensure this is the case.

Annex 11 Operation of the joint Competent Authority, and COMAH MoU

1 The Seveso II Directive⁷⁰ required Member States to ‘set up or appoint the competent authority or authorities’ to carry out duties set out in the Directive. Within the UK, the decision was taken to implement this aspect via a joint competent authority comprising the Environment Agency/SEPA and HSE and to set out the principles and working arrangements governing the relationship between the bodies in a Memorandum of Understanding (MoU).⁷¹ This is supplemented by Chapter 11 of the COMAH Manual⁷² (‘Agreed Competent Authority Policy and Procedures’), which includes more detailed guidance on regional and local liaison and planning:

The MoU aims to ensure the effective co-ordination of the Competent Authority’s activities under the COMAH Regulations to ensure that risks to people’s health and safety and the risks to the environment from major accidents are properly regulated.

2 The creation of a joint Competent Authority has raised a number of issues. Structurally, the Environment Agency is organised on the basis of river catchment areas, while HSE is based on local authority boundaries. This means that each HSE field team leader may be working with three or four Environment Agency team leaders who, in turn, work with two or three equivalent HSE personnel.

3 At the time of the Buncefield incident, an electronic information system, Major Hazard Information System (MHIS),⁷³ had been provided to facilitate the exchange of information. The HSE Common Information System (CIS) defaults to inputting documents placed on it into MHIS, but the Environment Agency has to manually input to MHIS and had used it very little. It is unclear whether COIN (HSE’s latest work recording system) has the same functionality as CIS and therefore whether automatic electronic data sharing is even a theoretical possibility for the future.

4 At the working level, communications between the Environment Agency and HSE have tended to be either by email or by sending ‘hard copies’ of documents. The evidence indicates that the organisations are not good at early advisory contact, and have relied on ‘copying each other in’ after operator contact.

⁷⁰ The Seveso II Directive, Council Directive 96/82/EC 9 December 1996, European Union website – europa.eu.

⁷¹ Memorandum of Understanding (MoU) between the Health and Safety Executive and the Environment Agency on the implementation of the Seveso II Directive, HSE website.

⁷² HID COMAH Manual, HSE Intranet.

⁷³ COMAH Competent Authority – Major Hazards Information System (MHIS), HSE website.

5 Both organisations have had similar issues with regard to staff turnover and it is not uncommon for individuals to be unable to conclude assessments before moving on because of secondments or other types of staff moves. Joint visiting between the Environment Agency and HSE can cause difficulties with operators over the apportionment of chargeable time. At the time of Buncefield, charging was by the hour for COMAH matters only and the operators have challenged the amount of involvement of the different inspectors' contributions to COMAH work at meetings and on site.

6 An important feature of the governance arrangements was the formation of a Joint Co-ordination Group (JCG),⁷⁴ chaired at the appropriate regional director level for the Environment Agency and at unit director level for HSE. It was intended that this body would have ownership of the MoU and meet as necessary to discuss the working of the MoU.

7 The terms of reference were to keep under review the operation of the MoU and, in particular to:

- discuss matters of common interest, and especially those raised by the Joint Steering Group (JSG);⁷⁵
- agree changes to the MoU;
- periodically review the strategic programme and the principles of resource allocation.

8 The JCG did not hold its first meeting (since the inception of the JCA) until 18 months after the Buncefield incident. In part, this may be because the view was formed that no issues of sufficient importance arose. However, a review of the minutes of the more junior committee (the JSG) suggests there were major issues raised concerning resources and progressing safety reports.

9 Overall we concluded that:

- sharing of documentation was a fundamental difficulty;
- the MoU covers all the issues relevant to the Competent Authority in the COMAH Regulations;
- the MoU did not facilitate the operation of the Competent Authority as a unified body;
- overall and despite individuals' best efforts, fully effective integrated working between HSE and the Environment Agency had not been achieved by the time of the incident;
- lack of resources had a significant impact on the effectiveness of the assessment process and the extent to which the requirements of the MoU were followed;

⁷⁴ Joint Co-ordination Group (JCG) paragraphs 10 and 11 of MoU – Reference 2.

⁷⁵ Joint Steering Group (JSG) paragraph 12 of MoU – Reference 2.

- current Intervention Plans suggest a separate planning process by HSE and the Environment Agency. This may be a response to the differing outlooks of the two bodies, but was not helpful in facilitating a single Competent Authority approach as intended under the COMAH Regulations;
- the Joint Co-ordination Group set up by the MoU had not met and could not, therefore, review the strategic programme and the principles of resource allocation.

Annex 12 Regulatory framework for high hazard sites

1 The regulatory framework for sites, such as Buncefield, which present potential major accident hazards comprises requirements imposed on the site operators under both health and safety and environmental legislation, complemented by the requirements of planning law. In particular the Control of Major Accident Hazards Regulations 1999 (COMAH) apply.

Health and safety law

2 Operators in the process industries are subject to the requirements of the Health and Safety at Work etc Act 1974 (the HSW Act) and the Management of Health and Safety at Work Regulations 1999 which require, respectively, safety policies and risk assessments covering the whole range of health and safety risks.

Control of Major Accident Hazards Regulations 1999 (COMAH)

3 COMAH's main aim is to prevent and mitigate the effects of those major accidents involving dangerous substances (such as chlorine, liquefied petroleum gas, and explosives) which can cause serious damage/harm to people and/or the environment. The COMAH Regulations treat risks to the environment as seriously as those to people. They apply where threshold quantities of dangerous substances identified in the Regulations are kept or used. There are two thresholds, known as 'lower tier' and 'top tier'. The requirements of COMAH are fully explained in *A guide to the Control of Major Accident Hazards Regulations 1999 (as amended)*. Guidance on Regulations L111 HSE Books 2006 ISBN 978 0 7176 6175 6.

4 The COMAH Regulations are enforced by a joint Competent Authority comprising the HSE and the Environment Agency in England and Wales, and the HSE and the Scottish Environment Protection Agency (SEPA) in Scotland. Operators will generally receive a single response from the Competent Authority on all matters to do with COMAH. The Competent Authority operates to a Memorandum of Understanding, which sets out arrangements for joint working. The COMAH Regulations require operators of top-tier sites to submit written safety reports to the Competent Authority with the purpose, among others, of demonstrating that major accident hazards have been identified and that the necessary measures have been taken to prevent such accidents and to limit any consequences. Operators of top-tier sites must also prepare adequate emergency plans to deal with the on-site consequences of possible major accidents and to assist with off-site mitigation. Local authorities for areas containing top-tier sites must prepare adequate emergency plans to deal with the off-site consequences of possible major accidents, based on information supplied by site operators.

5 The COMAH Regulations place duties on the Competent Authority to have in place a system of inspections for establishments subject to the Regulations and to prohibit the operation of an establishment if there is evidence that measures taken for prevention and mitigation of major accidents are seriously deficient. The Competent Authority also has to examine safety reports and inform operators about the conclusions of its examinations within a reasonable time period.

6 The inspection plan for a particular establishment is drawn up by inspectors from the Competent Authority based on previous interventions at the site and on information gained from the assessment of the safety report. The inspection programme requires input from a range of inspectors with specialist knowledge and identifies and prioritises issues. The focus of the programme is to ensure that the key risk control measures for preventing and mitigating major hazards are maintained.

7 The adequacy of this process and its application at Buncefield by HSE and Environment Agency inspectors is subject to a review under point 3 of the investigation's terms of reference.

Environmental legislation

8 Some of the establishments regulated under the COMAH Regulations are also regulated by the Environment Agency and SEPA (the Agencies) under the Pollution Prevention and Control Act 1999 (PPC) or Part I of the Environmental Protection Act 1990 (EPA 90). The EPA 90 introduced Integrated Pollution Control (IPC). Under the PPC and the Pollution Prevention and Control Regulations 2000 sites regulated under IPC moved to PPC regulation. They were then caught by the Environmental Permitting Regulations in April 2008.

9 While the purpose of the COMAH Regulations (the prevention of major accidents) differs from that of PPC (the prevention of pollution), the means to achieve them are almost identical. They require industry to have good management systems to control risk. PPC includes a specific duty to prevent and mitigate accidents to the environment which is complementary to the main COMAH duty. The Agencies manage this overlap between their different regimes following the principle that accident prevention work on COMAH sites is generally more significant because of the greater risks.

Supporting guidance and standards

10 The legal requirements are supported by a large body of guidance and standards that set out recognised good practice in the control of major accident hazards. This includes national and international standards, industry guidance and guidance published by the Competent Authority. Examples of the latter are *Reducing error and influencing behaviour* HSG48 (Second edition) HSE Books 1999 ISBN 978 0 7176 2452 2 and *Successful health and safety management* HSG65 (Second edition) HSE Books 1997 ISBN 978 0 7176 1276 5.

Land use planning

11 The land use planning aspects of the Seveso II Directive are given effect in the UK by the Planning (Hazardous Substances) Regulations 1992, as amended in 1999. Under these regulations the presence of hazardous chemicals above specified thresholds requires consent from the Hazardous Substances Authority (HSA), usually the local planning authority. HSE is a statutory consultee on such occasions. The role of HSE is to consider the hazards and risks which would be presented by the hazardous substances to people in the vicinity, and on the basis of this advise the HSA whether or not consent should be granted. HSE will also supply a consultation distance around the site. Any future developments in these zones require HSE to be consulted.

12 The aim of health and safety advice relating to land use planning is to mitigate the effects of a major accident on the population in the vicinity of hazardous installations by following a consistent and systematic approach to provide advice on applications for planning permission around such sites.

13 Historically, HSE has based its land-use planning advice on the presumption that site operators are in full compliance with the HSW Act. Section 2 of the Act places a duty on an employer to ensure, so far as is reasonably practicable, the health and safety of his employees. There is a corresponding duty in section 3 to ensure, so far as is reasonably practicable, that others (including the public) are not exposed to risks to their health and safety. These duties are goal-setting and operators are expected to determine the most appropriate means to comply with them, without the need for detailed approval from HSE.

14 Under the General Development Procedure Order 1995, both HSE and the Environment Agency are statutory consultees for:

- the development of a new major accident hazard site; or
- developments on an existing site which could have significant repercussions on major accident hazards; or
- other developments in the vicinity of existing establishments, where the siting or development is such as to increase the risk or consequences of a major accident.

