The June 2007 floods in Hull

Final Report by the Independent Review Body
21st November 2007

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Index

Executive summary:

Findings (see Chapter 9 - Page 61 - for full findings)

- Over 8600 households (20 000 people) were affected by the June 25th 2007 floods. Of these 6 300 people were forced to live in temporary accommodation with over 1 400 people in caravans.
- The people of Hull showed extraordinary levels of goodwill, comradeship and willingness to help neighbours during the floods.
- Schools were especially badly hit, with only 8 out of 99 schools unaffected. The closure of schools can have a large social and economic effect, forcing parents to take time off work, lose earnings and in some cases jobs.
- We found a series of serious issues with the design, maintenance and operation of Yorkshire Waters pumped drainage system in Hull.
- At Bransholme, where a pumping station failed, Yorkshire Water were warned in 1996 and 2001 about its poor condition. Yorkshire Water was unable to confirm that any action was taken in light of these reports.
- For East and West Hull, Yorkshire Water reports indicate that £200 million Humbercare modernisation works (2001) had significantly reduced the systems capacity from a 1 in 30 year storm event to 1 in 1 to 1 in 2 years. Permanent solutions were suggested in 2004 and 2006, but a temporary fix was implemented in 2007 based on re-instated 40 year old pumping stations. During the 2007 floods there were serious operational issues with this arrangement.
- The 2007 floods were severe, but as many properties in Hull were only flooded by a few centimetres we conclude that had the recommendations for Bransholme (1996 and 2001) and the rest of Hull (2004 and 2006) been followed, then some properties in Hull would not have flooded.
- Yorkshire Water is regulated by Ofwat and we noted concerns that Ofwat has limited powers to control water utilities over the levels of flood defence in drainage systems.

Recommendations (see chapter 10 for full recommendations)

- Mandatory standards for flood protection in drainage systems must be set
- The regulatory powers of Ofwat over drainage systems must be reviewed
- Detailed information about the performance and operation of water utilities' drainage systems should be in the public domain. Their operation and regulation must be transparent.
- The Government should consider underwriting flood risk, or seek possible alternatives to the 'statement of principles' arrangement between insurers.
- Building regulations could be changed to increase building flood resilience in flood risk areas
- Extra protection should be given to key *social* infrastructure. Schools for example could be described as 'social power stations' warranting defence.
- Emergency planning for pluvial flooding should be undertaken by all regional and local authorities
- Formal and accountable cross agency cooperation and coordination must be implemented
- An awareness campaign is required to inform residents, in flood plain areas, of the level of risks they face and the measures open to them to reduce these

1. Introduction and Context

1.1 The aims of the Independent Review

In June 2007, the city of Kingston upon Hull experienced unusually high rain fall. Subsequent flooding caused widespread disruption with damage to over 8600 residential properties and over 1300 businesses (figures collected 1st November 2007). Following the flooding, Hull City Council commissioned an Independent Review Body to examine the key factors leading to the flooding in Hull and to make recommendations for actions to improve flood prevention in the future. The Review Body's members, who are all volunteers, include representatives of the public sector, the private sector and the community sector in Hull. The members are:

- Professor Tom Coulthard, Professor of Physical Geography, University of Hull (Chair)
- Professor Lynne Frostick, Deputy Head Department of Geography, University of Hull
- Malcolm Scott, Partner, Scotts Property LLP
- Harold Hardcastle, Divisional Director, ARCO
- Kath Jones, Chief Officer, North Bank Forum
- Dave Rogers, Chief Officer, Hull Community and Voluntary Services Ltd
- Professor Greg Bankoff, Professor of Modern History, University of Hull

The aims and terms of reference for the Review Body are:

- To enquire into, examine, and form an initial view on the factors which contributed to or exacerbated the flooding of particular areas of the city on this occasion, and affected the nature and scale of the damage and disruption caused by the resulting flood waters.
- To list comprehensively and make clear recommendations on practical actions which should be taken, by each, and all, responsible agencies, to improve flood prevention and response in Hull, in any such future situation of this kind.

1.2 The scope of this report

At our first meeting in July 2007, we (the IRB) decided to split the review into two phases. In the first phase of the review, published in an interim report on the 25th August 2007, we outlined the physical nature of the floods, the levels of rainfall that fell, areas that flooded and the history and unique location of Hull. We then reviewed how the main agencies operated during the flooding (The Environment Agency, Hull City Council, Humberside Fire and Rescue Services and Yorkshire Water). The executive summary of the interim report is presented in the next section and the interim report itself is available from www.hull.ac.uk/geog.

In the second phase of this review, we have continued to address these questions but focus more on the impact of the flooding on the population of Hull and how the impacts could be mitigated and relief efforts be improved.

This report has 6 main chapters looking at the effects of the floods on the people of Hull, the Insurance industry, Yorkshire Waters role, the Government regulator Ofwat, planning and finally the role of the media.

The review body first met in July 2007. Since then we have met over 20 times, held three meetings hearing presentations from representatives from the Environment Agency, Yorkshire Water, Hull City Council (including Area teams, Housing, Schools), Voluntary organisations, Hull Community Wardens and the Emergency Services. In addition, we have met with representatives from the Association of British Insurers, Hull City Planners and Building Control. We have received information from local MP's, residents and representatives from community and residents groups. We have also visited several pumping and drainage facilities as well as visited affected areas. We have presented our interim findings to Sir Michael Pitts and the Governments Lessons Learned committee and the EFRA select committee.

This document is based upon information from the agencies involved, that volunteered by members of the public and from our own sources. We are very grateful for everyone's wholehearted co-operation in this review. We acknowledge that there may be data that we are unaware of and would like to stress that no information deemed important has been deliberately omitted. This report is based on the best information made available to us and it covers only the administrative area of Hull City Council, not the East Riding. Recommendations from the IRB are indicated in bold text coloured blue.

2. Executive Summary of the *interim* report released 25/8/2007

In June 2007, the city of Kingston upon Hull experienced unusually high rain fall. Subsequent flooding caused widespread disruption with damage to 7208 (as of August 07) residential properties and over 1300 businesses. Our key findings were:

- Hull flooded because the drainage system was overwhelmed.
- Given the magnitude of the storm (greater than 1 in 150 years) we feel it is very encouraging that key pieces of important civil infrastructure did not fail.
- Hull's trunk sewer system is modern compared to other UK historical cities.
- We have significant concerns as to whether the pumping system, that was re-evaluated for the Humbercare project (post 2000), is correctly designed to cover a 1 in 30 year storm event.
- Hull's low lying position increases its vulnerability. Therefore, we recommend that Hull should have additional levels of protection above and beyond a 1 in 30 year storm event.
- The availability of additional pumping would increase capacity, provide backup and contingency should any of the existing pumps fail.
- There were no contingency plans for the failure of Bransholme pumping station or appropriate protection from flood water.
- Blocked gullies appear not to have been a major factor in causing general flooding.
- There was no list of key strategic locations and infrastructure (e.g. pumping stations, substations etc..) agreed by the agencies
- No single agency (e.g. Yorkshire Water, Environment Agency, Hull CC) accepts responsibility for any elements outside their own terms of reference nor have they historically allowed others to influence their own obligations. This is a recurring theme - one of inadequate consultation, co-operation and unity between the agencies.
- There is presently no rainfall flash flood warning system.

Our recommendations are:

- For urban drainage, designs based on industry standards to protect from a 1 in 30 year storm event may be inadequate. Additional capacity should be factored in for climate change.
- We recommend that the EA explore expanding the Floodline system to cover all types of flood warnings (rainfall and river).
- The flooding in Hull has revealed the difficulties of having multiple agencies responsible for different areas of the drainage system. We feel it is vital that the Environment Agency, Local Authority and Water Company closely co-operate on operation, investment and design.
- Agencies should investigate whether flooding in West Hull could be reduced by diverting and pumping water through existing and new watercourses.
- We recommend the existing stormwater pumping capacity in Hull be increased.
- We recommend that an independent Drainage Board for Hull is set up.
- Agencies must agree a list of key strategic locations for protection in flooding emergencies.

3. Living with floods: The impact on people

3.1 Introduction and the impact of floods on households

A notable feature of the June 25th floods in Hull was its widespread nature: 8657 houses on more than 600 streets were flooded (or damaged by floodwater). Using the city wide average number of residents per household (2.35) we calculate that over 20,000 people were affected. This is approximately eight per cent of the population within the area of Hull City Council.

Since the floods, over 331 households have approached the Council for support with temporary accommodation, Council Tax information has identified 2681 households displaced from their homes and records indicate there are over 600 households (over 1400 people) living in caravans.

Although more than 8,600 households were affected by flooding in June, not all parts of Hull were struck with equal force (Figure 3.1). Given the nature of pluvial flooding, some wards or even roads within neighbourhoods were much more severely affected than others with Bricknell, Derringham and Boothferry in the West, Orchard Park and Greenwood and Bransholme West in the North, and Sutton in the East having the highest concentration of flooded properties. Even in wards that escaped widespread inundations, some localised flooding was severe.

3.2 Social Vulnerability and Resilience of Hull's population

The statistical profile of Hull identifies it as one of the most deprived cities in the country. Hull is the 9th most deprived area in England and the most deprived in Yorkshire and Humber. Over half the population lives in neighbourhoods amongst the 20% most deprived in England. It is the ninth most disadvantaged of the 354 English local authorities with more than half of its population living in electoral wards that are among the 20% most deprived in the country and with approximately 100,000 persons in receipt of means tested benefits. In 2003, 27 per cent of all households had annual incomes under £10,000. Other indices further suggest that the city's population is more vulnerable from sudden and unforeseen events like the June floods. Hull has more people with a long-term limiting illness, a larger number of working age population with a disability and a greater prevalence of mental illness than the national average. The birth rate is also appreciably higher and teenage conception is over sixty per cent more frequent than elsewhere in the country.

People, however, are not only vulnerable in different ways and for a variety of reasons but they are also resilient. That is both at the individual and community level, people exhibit an amazing capacity to cope with and recover from unexpected and sudden extreme events. This resilience takes many forms and can be assessed to some extent in the community's norms and values, the degree of neighbourliness exhibited, and the number and strength of informal and formal networks devoted to mutual assistance and community welfare. The capacity of a community to help itself or its resilience is often described as its *social capital*.

Figure 3.1 Flooded roads and properties (figures collated in November 2007)

The perception that Hull suffers from a 'dependency culture' borne out of the greater than national average of its residents receiving benefits is counter-balanced by the vibrancy of its social capital. Throughout the review into the June floods, witnesses appearing before the IRB repeatedly commented on the goodwill of people, how neighbours offered each other assistance and comfort, the general pro-active approach toward problem-solving and how the flood "fostered a community spirit where everyone pulled together to help one another". One of the principal regrets expressed by the Council's Area Teams was that they could not capitalise on all the offers of assistance proffered by local community and tenant associations to relieve them of some of their tasks such as surveying those households affected by flood water. In some parts of the city like Bransholme that were temporarily cut off, such associations stepped in to provide initial basic emergency assistance.

The people of Hull proved remarkably resilient when it came to coping with the severe disruption caused to their homes, lives and livelihoods by the flooding, reflecting the underlying strength of communities and the social cohesion within neighbourhoods in the city. This underlying strength needs to be more fully appreciated and better capitalised upon.

The strengths of community-based disaster management have long been recognised in other countries and we recommend that steps are taken to integrate community and tenant associations into local emergency planning and practice wherever possible.

3.3 Hull City Council's response:
Hull City Council (HCC) operates an area structure which divides the city into 7 areas (Riverside, Park, Northern, Wyke, West, North Carr and East), managed by an area Director with an area team. Each area is comprised of three or four electoral wards. The City Council has moved in recent years towards operating services at an area level. These services include housing and Streetscene services.

In order to respond to the flooding, the Council first had to determine which properties had flooded. This was carried out through door to door enquiries by a team of up to 750 surveyors, recruited from among the Council's staff that asked flooded residents to fill in a simple questionnaire. This questionnaire importantly allowed Council officials to identify vulnerable residents, or those with special needs.

Once flooded properties were identified a means of prioritising assistance and directing it toward those most in need was devised and implemented. The sheer scale of the June event meant that the HCC was unable to offer a full emergency response to every affected household. With Cabinet approval, the HCC speedily implemented a graded response that differentiated households according to their degree of vulnerability, Gold, Silver and Bronze respectively.

Table 3.1 Flooded Households by Category

Areas	Gold	Silver	Bronze
Wyke	195	89	272
West	1807	288	2028
East	493	139	467
North Carr	536	121	543
Northern	474	181	243
Park	143	15	95
Riverside	72	15	104
Outside Boundary	21	4	4
Totals	3741	852	3756

Source: HCC FLOSS database figures as of 13 November 2007

Gold households comprise residents over 60 years of age, people with disabilities and single parents with at least one child under five. Such households were allocated a personal caseworker, assisted with the replacement of essential household goods and the restoration of power and heating, received help with the initial cleaning and then the drying out of their properties, including additional electricity costs from de-humidifiers, and given priority access to the hardship fund.

Silver households include all uninsured properties that are not already covered in the Gold category. In addition to assistance with the drying out of their properties and in the restoration of power and heating, people in this category received support with furnished accommodation if it was required.

Everyone whose house was flooded and who did not fall into either of the other two categories are designated Bronze. These households were not charged for the replacement of wheeled bins and recycling boxes.

Table 3.2 Type of Household by Category

Totals	Cases	Council	Housing Association	Own Home	Private Rented	Not Known
Gold	3741	1161	425	1842	303	10
Silver	852	378	18	228	224	4
Bronze	3756	188	27	3252	272	17
Grand Total	8349	1727	470	5322	799	31

Source: HCC FLOSS database figures as of 13 November 2007

All categories benefited from the free removal of bulky damaged items. Silver and Bronze households also received advice and information on contacts with other support agencies. (Gold households with their own caseworker did not require such support.) Subsequently, the HCC made available modest

Figure 3.2 Gold, Silver and Bronze Households as of November 2007.

financial assistance in the form of £250 to all Gold and Silver households and a 25 per cent Council Tax rebate to everyone affected by the flooding.

To date of the 8,349 households affected by flooding for which details are available on the FLOSS database, Gold comprises 3,741 or 45 per cent, Silver 852 or 10 per cent and Bronze 3765 or 45 per cent. The distribution of Gold, Silver and Bronze households is shown in Figure 3.2.

3.4 Hull's Council housing stock

3.4.1 The role and responsibility of the Housing Service.

Hull's housing service is responsible for the management, maintenance and improvement of 28,000 council homes. A central Housing Investment Team manages the three area-based repairs and improvement contracts that include contractors Kier (Riverside and Park), Connaught (Northern, Wyke and West) and Kingstown Works Ltd. (North Carr and East) as well as contracts with major utility operators such as Gas servicing.

3.4.2 The impact of flooding on Hull's housing services

All aspects of the service were affected by the flooding and a large number of staff are still engaged in flood-related work. Staff were drafted in to relieve rotas at Rest Centres, and Area-based housing staff also formed the core of the caseworker response. From Tuesday 26th June senior housing staff operated as part of the Recovery Team, based initially at the Riverside Area Office and later at King William House.

The key function of the housing element of the recovery team was to determine the extent to which domestic dwellings had been affected by the floods and to coordinate the response with regard to the Council's responsibilities as a landlord.

The housing service made an early decision to adopt a "tenure blind" approach. The Council's main responsibility lies with council housing, but the decision was taken to look at all houses irrespective of ownership. This resulted in surveyors and members of the Council's private sector Housing Team inspecting and giving advice and support to private tenants, landlords and owner occupiers. The co-location of Streetscene staff within the Recovery Team from day one was essential in determining the extent of the flooding and entering the data on a GIS mapping system. The visual representation of flooded homes on maps within the first week enabled the service to provide a reasonably accurate estimate of the extent of the floods and to rapidly identify any overlooked households.

3.4.3 Repairs to flood damaged council houses

In total 1986 council properties were flooded, approximately seven per cent of the entire stock. Gold households accounted for 1161 or 59 per cent of those affected. The housing department followed advice from insurance recovery specialists and adopted a graded response, with repair strategies based on advice from the CIRIA (Construction Industry Research & Information Association) www.ciria.org/flooding and the BRE (Building Research Establishment) Good Repair Guide 11 – Repairing Flood Damage.

In the first weeks, the three Council-appointed repair contractors attended daily briefings of the Recovery Team. The areas covered by the Connaught and KWL contractors had been badly affected leaving Kier's area virtually flood free. By using the civil emergency clause in the contractors' new contracts, Housing Service staff were able to capitalise on this fact to divert Kier resources to support the other two contractors. The contractors themselves provided a flexible and practical area based response.

On the basis of the BRE and CIRIA advice, a guideline for drying out and a specification for repairing council homes was devised. It was agreed that all council homes affected by flooding would be brought up to the Decent Homes Standard set by Parliament and that priority be given to ensure that all council homes that were flooded are fully habitable by December. All three contractors have brought in additional personnel to complete this programme of work.

In the first week, it was estimated that the cost to council housing stock would be around £18m. This figure has now risen to £19.1m. Some council houses that were flooded, were due to be improved under the Council's Decent Homes improvement programme (at a cost of £7.1m). Therefore, the true additional cost of flooding is an estimated £12m. However, just over 800 homes that met the decency standard before the flood now require further unplanned work. At the time of writing, of 1986 council properties needing remedial works, 240 have been completed, 191 have works underway and 1555 have yet to commence repairs.

3.4.4 Rehousing

An early decision was taken to suspend the advertising of council homes through Homesearch and to set up an emergency rehousing team along with a pool of furnished accommodation. The availability and offer of furnished accommodation by the University in the first week was invaluable and much appreciated. The availability of vacant sheltered accommodation that could be quickly furnished was also fortunate. Those most in need of appropriate accommodation were elderly people living in specially adapted bungalows that had been affected by the flooding.

The main issue faced by the emergency rehousing team was assessing likely demand. A large proportion of residents whose homes were uninhabitable made their own arrangements or their re-housing was covered by insurance. To date 331 households have approached the Council for support with temporary accommodation. Of these 258 have been temporarily re-housed, 24 have returned to their homes, and 49 are still awaiting temporary accommodation. These people include those who have grown dissatisfied with their living arrangements, having previously stayed with family and friends or partially living in their homes. Over 600 people are currently living in caravans. Council Tax information initially identified 2681 displaced households but is unable to gauge how many people have subsequently returned home.

The Council's statutory duty to rehouse homeless applicants continues and the need to provide additional temporary accommodation for those affected by flooding has reduced the number of homes available for both homeless and other applicants. At one point, all temporary rehousing options in the City were filled, though fortunately no emergency rehousing cases presented.

3.4.5 The ongoing situation for flooded houses in Hull

Information from Hull City Council, as of 06 November 2007, shows that the number of flood affected properties in Hull has recently increased. It appears that some residents in flooded areas who previously reported no flood damage have since discovered that floodwater had seeped into their house and under the floorboards even though there was no visible damage at the time. Consequently many householders did not report their house flooded nor have their property surveyed. It is only several months after the recession of floodwaters from under the floorboards that the damage from damp (e.g. mould or damp in walls) is evident and an inspector called in to assess the damage. At writing over 20 new reports of flood damage a week are being reported.

We recommend that if a house may have been subjected to flooding with no apparent damage above the floorboards then the property owner should ensure that an inspection is still made. This check will ensure that there has been no invasion of water below the floorboards and allow the property owner to take remedial action as soon as possible.

3.5 The impact on Schools

The floods caused considerable disruption to schools and contributed to substantial immediate and longer term economic and social upheaval in the city. Hull has over 36 000 children and young people under eighteen. During the 25th June flood, only eight of Hull's 99 schools remained unaffected by floodwaters, leading to the temporary closure of 65 primary schools, 13 secondary schools, ten special education units and three nurseries. Approximately 3 000 pupils were directly affected, the equivalent of one whole year cohort in the school system.

The scale of the impact on Hull's school buildings in comparison to other flood-affected parts of Yorkshire and the Humber region is shown in the table below.

Table 3.3 Flood-Affected Schools in Hull and the Yorkshire/Humber Region

Regions	Schools suffered minor damage	Schools suffered severe damage	Schools suffered severe damage and may need temporary classrooms	Pupil numbers in schools damaged
Hull	38	43	11	36 585
The rest of Yorkshire and the Humber region	133	55	10	88 632

Source: GOYH (as of 6 November 2007)

The timing was fortunate as the flood occurred toward the end of the school year after many exams had been completed. However, the extent of the disruption to families can be gauged by the fact that flooding affected 36 558 school-children and resulted in the loss of 114 400 pupil days.

Furthermore, some people with school aged-children had to find alternative childcare to account for both primary and secondary school closures. There is even anecdotal evidence that some people lost their jobs because they were unable to find timely childcare. At the time of writing, about 400 children are still being educated in alternative places.

To estimate the impact of school closure on Hull's wider economy, if we assume that one adult cannot be at work for every 2 children off school (114 400), and conservatively cost their wages at minimum wage rates (£42.80 per day) this equates to £2.4 million lost.

On the 25th June, the Children and Young Peoples Services (CYPS) directorate were contacted by schools ringing for advice and informing them of closures. Staff were sent home and permission given for schools to close early. Communications, however, were not always entirely effective, making it impossible to know what had happened and to ascertain which schools were open or closed.

The situation had improved by Tuesday when an understanding was reached with BBC Radio Humberside for checking which schools were still open. Where necessary, CYPS directorate staff drove round schools to get up-to-date numbers and check on the extent of damage. Matters continued to improve during the week with over half of the schools re-opening, allowing the directorate to focus on those schools with internal damage and to start planning repairs.

There were also transport issues, with difficulties in moving children due to flooded roads compounded by some school closures and pupils diverted to other schools.

Under Building Schools for the Future, an investigation is also taking place to ensure that all sites are adequately protected against flooding and that all future land and drainage repairs take account of flooding pressures. The importance of these measures was brought home by the example of Cleeve Primary (Bransholme), one of the few schools that did not close, that had recently had its drainage system revised. We also note that when asked to bring forward by twelve months Hull's Primary Capital Programme for schools, scheduled to come on stream in 2009, the Department for School Children and Families declined.

A small school recovery group has also been set up to assess the likely impact of the floods on schools' performance. It consists of the Council's Head of Learning, a primary head teacher, a secondary head teacher, a special school head teacher and a Chair of Governors. The group will

continue to meet each half term for up to 2 years. They feel that it is not right to adjust the school attainment targets. Additionally they will work closely with schools in identifying those pupils living in difficult circumstances and ensure that their learning needs are supported to the full.

All schools have been asked to provide information on how many pupils are living on the upper floor of flooded houses, in caravans, with relatives, in hotels or rented accommodation, as well as those having to undertake extensive commutes. This information is proving very difficult for schools to obtain.

The impact on Hull's schools should not be underestimated. Hull is trying to increase levels of educational attainment, and the damage to schools and schooling has come at a critical and inopportune moment.

We recommend that appropriate supportive measures are taken to ensure that disruption to schools caused by the floods does not have a long term impact on the education of Hull's children.

3.6 The role of Early Years

CYPS is responsible for commissioning and providing a wide range of direct services for children, young people and their families. This includes social work teams, children's and family centres, Sure Start and Early Years.

Hull has 15,402 children under the age of five. For this early years group, there are 12 Sure Start Children's Centres across the city, at least one in each of the Local Authority's seven areas. Each Children's Centre employs 12 to 15 staff and offers families services such as childcare and early years provision, childminder services, family support, education, training and employment services, as well as advising on other services.

On and immediately after 26th June, Area Teams, Children's Centres and Early Years teams cross-referenced databases of known families with children under five. Where possible, families were contacted by phone to ascertain their situation. Those not contactable by phone received visits from either family support teams, health visitors or Children's Centre staff.

Over the next eleven days, Centres remained open 24 hours providing help and support to families, making available warm dry space, washing machines, cooking facilities and play activities. Families who attended Centres were flagged for further visits. Additional childcare was also made available.

All Children's Centre staff were involved in the city-wide flood contact initiative to identify families in the Gold, Silver and Bronze categories. In conjunction with Area Teams, Gold category families with children under five were identified and Sure Start took responsibility for initial response visits to these households with a neighbourhood housing officer co-ordinating the follow up.

By the end of July, 108 families in North Hull had been visited, 71 of whom participated in the services offered. Sixty-five Gold category families with

children under five were also identified and supported in Bransholme. Existing summer and out-of-hours and play day activities were extended and information about them was distributed to all families in Gold and Silver categories. One event in North Hull attracted two hundred and fifty people, including a hundred who were under five.

A range of nursery education and childcare providers were themselves affected by flooding. Three private providers and four childminders with extensive long term damage were found alternative accommodation until their premises are restored. This continues to be the case for two of the seven, with one due to return to their original location in November. All school nursery classes were offered alternative bases in other schools or locations and some children known to have special needs were placed in local Centre nurseries with additional support.

We note that the special needs of children are often a neglected aspect of emergency management and recommend more forward planning is needed to minimise disruption to their education and families.

3.7 Hull's Community Wardens

Hull has a network of over 300 community wardens, funded largely by the Council, to provide public assurance around issues of nuisance, vandalism and antisocial behaviour. They are allocated and organised in accordance with the Council Area structure. During the floods, the Community Wardens carried out many important duties and roles as well as being important links between what was happening on the ground in flooded areas and Silver Command. Many of these duties were outside of their normal training, and they became an invaluable resource for dealing with the floods.

Community Wardens were involved in the evacuation of schools and homes, identifying hazards such as missing manholes, distributing protective equipment and emergency rations. They also gave out health and safety information to residents as well as disinfectant and cleaning equipment. They were heavily involved in polling for questionnaires to determine whether houses were flooded or not. Community wardens also distributed sandbags, operated emergency centres, supervised closed roads and also staffed the emergency phone number for flood advice. In the recovery phase they were also involved in waste management and the removal of flood damaged property.

As illustrated above, the Community Wardens proved to be an effective and flexible human resource. They were able to respond quickly and effectively and had the benefit of a large amount of local knowledge of the area and the residents where they were based. The importance of the Community Wardens is reflected in their involvement in Silver Command from the 27th June onwards.

The Community Wardens did report there were several issues that could have helped rescue and recovery operations progress more smoothly. These included the need for designated emergency centres to be in areas that did

not flood, a lack of basic protection equipment (wellington boots and gloves) and difficulties in communication with wardens reliant upon mobile phones.

3.8 Hull's Community and Voluntary sector response
Within the limited time available, the IRB also looked at the initial and emerging impact of the flood event on Hull's communities through evidence received from some VCS organisations involved in recovery by questionnaire.

Hull has a thriving voluntary and community sector (VCS) which encompasses a huge span of organisations, large and small, formal and informal, some with paid staff, others operated by volunteers, and covering all aspects of civil society. For our purposes, if there is a common defining characteristic, a VCS organisation is one in some way rooted in its local community, which can be either a community of place or a community of interest.

To canvass a snapshot of the extent and type of VCS involvement in relief and recovery, the IRB used the membership databases and websites of Hull CVS, North Bank Forum and Hull Community Network to release a questionnaire. We asked:

- Were you asked to respond, or did you offer assistance voluntarily?
- Where did you get your information about need, from members of the public, the Local Authority or other public sector body?
- How did you respond?
- How effective did you think your response was and why?
- Did you feel you were working as part of a bigger picture?
- In terms of the needs you dealt with, did any themes emerge and were they unexpected?
- What would you have done differently?
- What do you think could be done better and how can the Review Body help with that?

The IRB received returns from twenty seven VCS organisations involved in the flood recovery as support agencies. Some, by their nature, touched on multiple needs, but broadly they fall into five categories; those dealing with the elderly, with disabilities or otherwise infirm through illness, with housing particularly as Registered Social Landlords, community associations and advice agencies. As with other agencies involved in the flood event, several organisations had either their own premises affected, or members of staff who were themselves struggling with the aftermath, whilst continuing to deliver a service.

Almost all felt they responded as effectively as they could have done under the circumstances, with a general sense of 'what else could we have done?' None expressed surprise at anything unexpected that emerged, simply the scale of what was happening. One Registered Social Landlord, for example, was faced with nearly 200 flooded properties, whilst a health organisation has doubled the length of home support it offers from six to twelve weeks. This may explain why respondents felt that the only area where there could have been some improvement was to have acted earlier. The degree to which

organisations felt they were working as part of a bigger picture seemed to depend whether or not they were actively contacted by a statutory agency, or whether they were working alongside another organisation.

Most respondents' organisations swung into action voluntarily, proactively contacting a known client group, usually by phone networks. Most rapidly identified the need to which their organisation was required to respond and organised themselves quickly. For those organisations, the initial phase was providing information and signposting to practical support, then latterly offering emotional support and listening ears for their user group. "The emotional trauma of losing everything is just starting to affect people…. we will continue to provide support for as long as we are needed.''

For community groups, much early activity focussed on checking residents, in particular the elderly. In several reported instances this meant that the need for people to be placed in care facilities was avoided.

Respondents referred to 'neighbourliness,' 'comradeship' and 'resilience' which translated into practical support for neighbours. People formed work parties to clean and disinfect, move possessions and offer alternative accommodation. Community centres provided physical facilities, warmth, meals, washing, crèche and play areas and again, strong elements of emotional support.

From this ongoing activity, some underlying concerns are emerging, particularly amongst people now in temporary accommodation. Emotions are felt intensely, with high levels of dislocation also reported. This is most marked among the elderly, who have been moved away – or felt "herded" - from their social networks and are experiencing isolation. Those who have moved in with relatives are experiencing additional family pressure and tensions.

People living in caravans report a lack of privacy, a sense of 'everyone knows your business'. Where families have addressed security concerns about their houses by having fathers sleep in the main house while the family use the caravan, there are some reports of raised anxiety levels among children who are afraid he may have left home altogether.

Many organisations who responded were also involved in organising volunteers, and the problematic issue that clearly emerged here was whether volunteers had been checked by the 'Criminal Records Bureau' (CRB). In some cases lack of a check may have prevented these volunteers from being used. There was certainly some public perception of an unnecessarily bureaucratic approach to this, against a genuine, spontaneous wish to help out in extremes by individuals. There is a difficult balance to be struck in this area, where there is a very real need to ensure that those in contact with children, young people and vulnerable adults are subject to appropriate scrutiny.

The VCS organisations felt that they responded to the best of their ability. There is a clear view they can make a stronger overall contribution if there is a greater awareness of their capability and if they are engaged more systematically and through single points of contact where possible.

The VCS should be better integrated into future emergency planning. We recommend:

- **Hull CC should facilitate an audit of the physical community support infrastructure available within VCS organisations to assess, for example, the location of cooking, feeding, washing, laundry, play and activity facilities.**
- **Similarly, Hull CC should facilitate a 'soft skills' audit of VCS organisations and their workforce to compile an annually updated directory of organisations or individuals who may be able to provide recovery support services.**
- **Integration of VCS organisations into the Area emergency planning process**

3.9 Charitable donations

In the immediate aftermath of the floods, Hull City Council launched the Hull Flood Fund to receive charitable donations to help those most in need as a result of the floods. This very quickly began to attract donations of money from both members of the public and local businesses. There were also many donations in kind received, again from local and national businesses and from members of the public, including much needed white goods and furniture. There was an immediate issue of storage for these. Again the private sector was of great assistance, providing much needed warehousing space to supplement that provided by the Council in the flood damaged Woodford Leisure Centre and by the voluntary sector.

Hull City Council quickly realised that it was not the most appropriate body to administer these charitable donations and sought a local charity which could take on this role. It approached Hull Community & Voluntary Services (CVS) who agreed to take on this role. Hull CVS set up a process for applications for assistance to this hardship fund which was linked to the Council's assessment process for Gold, Silver and Bronze classifications. Applications were sent to Hull CVS by referral from a Council case worker and were assessed on the basis of need, taking into account the extent of damage suffered, numbers in the household, financial circumstances and vulnerability. Assistance was given either in the form of goods from the distribution centre or shopping vouchers where goods were not available.

The Hull Flood Fund has now been closed to new applicants and is in the process of winding up. In total the fund raised £305,000 in cash donations. No estimate is available of the value of donations in kind. The fund has received applications for assistance from 1,100 households of which around 750 have received some form of financial or in kind assistance so far. The main kinds of assistance offered have been to purchase essential household items such as

white goods, beds, sofas etc; clothing and shoes; food; and carpets or other floor coverings.

Ongoing assistance after the end of the Flood Fund is being provided in two ways. Two local charities whose main business is providing in kind assistance have taken on this role locally and referrals are being made to them where new cases arise. In addition the British Red Cross National Flood Appeal has so far donated £720,000 to Hull. Again this is being administered by Hull CVS to provide a range of advice and support services, activities within local communities and practical help and support to the most needy households. This includes decorating, gardening, removal back into properties and furnishing and carpeting flood damaged buildings.

The lessons learned from this have been firstly that the City Council is not the most appropriate body to launch such an appeal. It is not appropriate for a local authority to act as a trustee of such charitable funds. It also meant in this case, since people were donating to a local authority, that no Gift Aid could be reclaimed on those donations. It is difficult to estimate how much this would have enhanced the fund but it would certainly have made a significant difference.

Secondly, Hull CVS have commented that dealing with individual cases of hardship is not their core business. They took on this role as there was no other local charity which both constitutionally had the powers to do this, and also had the internal resources to deliver this service very quickly. In other areas Community Foundations take on this role and the ideal solution in future would be to have a local Community Foundation, a body whose role is primarily grant making to individuals and organisations.

We recommend that in terms of planning for future emergencies, there should be a pre-existing arrangement with a local charity to set up an appeal fund immediately, and the mechanisms should be put in place now so that this can happen quickly.

We also recommend that the local authority explore the possibility with the local charity sector of establishing a Community Foundation in the area which would then be an ideal vehicle through which to deal with future charitable appeals.

3.10 The role of databases in flood management and the need for information

Information is key to successful civil defence and emergency management. Knowing where flooding is likely to occur and which households are most at risk is an essential component of effective disaster preparedness and mitigation practice. Such information is vitally important in determining the deployment of personnel and equipment, in targeting home checks and in organising educational and safety campaigns. Consolidated data on more than 25,000 households now exists on HCC's FLOSS database. This database, if well maintained and cross referenced against other indices of

vulnerability, could prove an invaluable tool in preparing the city to respond to any future pluvial flooding.

In fact, a model for such a database already exists as part of the operational risk assessment process used by the Humberside Fire and Rescue Service (HFRS) that grades indices of deprivation against the history of fire in any given area of approximately 130 households or 300 people. In all, HFRS breaks down its service area into 2966 output areas that map operational risks and hazard-related information.

We recommend HCC maintain and refine the existing FLOSS database, adapting the model used by the HFRS to more effectively assess the level of risk. This data could also be used to determine operational intervention standards, the location of equipment and the deployment of operational resources. Whenever possible, such databases should be made compatible with others of a similar nature to facilitate the transfer and use of data.

3.11 Recommendations:

3.11.1 Flexible Planning

Staff at HCC including the Area Teams and personnel in related government agencies and service contractors did an exceptional job under difficult circumstances. People worked long hours, proved flexible when called upon to perform unusual duties and were generous of their time and effort. Many lessons were also learned and it is important to capitalise on this learning process to better plan for such events in the future.

Issues that have arisen involve the need for local emergency planning, the long-term release of staff for flood-related duties, and the provision of appropriate clothing and equipment.

Overall emergency planning for the city resides with the Humber Emergency Planning Service/Humber Resilience Forum as mandated under the new Civil Contingencies Act 2004. It should be noted, however, that pluvial flooding is not identified as a separate risk among the over 50 hazards considered and provided for.

We recommend that emergency planning in the event of pluvial flooding should be undertaken as a matter of urgency.

While such planning may be adequate for multi-agency coordination, precise knowledge about which households are most at risk is most often the domain of local Area service providers who are also in the best position to offer speedy and effective assistance in times of distress.

We suggest that Area-based Emergency Plans should be drawn up, based on local staff and community partners' detailed knowledge about conditions and vulnerable populations and the incorporation of such plans into the city's overall emergency planning.

HCC suspended normal business during the flood to make staff available for other duties. On the whole, people proved extremely resourceful in creatively responding to the many unusual tasks and situations they were called upon to handle. However, many of these arrangements were ad hoc and were dependant on personal networks and knowledge. There was considerable frustration, too, at the rate of staff turnover seconded for flood-related work, with many personnel loaned for only a few days at a time. There was a constant need to re-train staff leading to delays and inefficiencies.

Furthermore, the makeup of overall management rota cover at various crisis centres may need further clarification to ensure individuals with specific operational responsibilities are not subsumed into the more general management pool. Alongside this is the reality that some staffs' role has to flex to circumstances and a clear expectation that all personnel can be drawn in to assist in emergencies has to be made explicit. Some basic guidance is needed as well as protocols, with an expectations statement made within service areas and a review of the flexible deployment of staff between services and between services and the Areas.

Additional training support may be needed for staff whose day job does not routinely involve dealing with the public. Conversely, skills required by staff employed in emergencies are not necessarily being used by staff in their normal workday life, but they may well have the necessary skill the emergency situation demands. It may be possible to identify a core of 'key' staff that can be released, possibly for long periods, backfilling 'key' staff posts, identify other staff required, types of skills required, where and when they will be required.

We recommend local authority staff with the requisite skills and experience are designated for emergency duties before the fact and the necessary equipment and resources allocated for their use in case of emergencies. Regular emergency training for such staff should be built into their ongoing personal development work.

Many different community workers including Community Wardens, Community Caretakers, Streetscene personnel and Neighbourhood Housing personnel among others were called upon to undertake a variety of duties because they were on the ground and had the necessary local knowledge. Unfortunately, deployment was hampered in certain respects by a lack of appropriate clothing and equipment such as wellington boots, two-way radios and 4x4 vehicles. Council procurement procedures may need more refinement to better equip those dealing with the immediate aftermath of emergency. This should balance the greatest degree of flexible response whilst protecting probity in the disposal of public funds. In particular, many groups mentioned the lack of protective clothing and footwear. Similarly, the procurement of specialist equipment may be done more easily in-house if separate council services set up depositories and stores together.

We recommend that community workers have the appropriate levels of equipment to carry out their work during flood conditions and that

purchasing, storage and distribution of this equipment should be centrally co-ordinated.

3.11.2 Communication

Communication can always be better, within and between agencies. It was reported that one of the hardest things to manage was requests for the same information from within different parts of Hull CC as well as Government Office, or when the purpose of the request was sometimes unclear. There was also a view that there was an imbalance in the amount of information going into and coming out of the centre, with a less formal or frequent outturn, so information pathways may need examination.

A measure of confusion and some chaos is to be expected in the first 24 hours of any event. Lessons from the June event, however, indicate the need for clearer identification of which groups on the ground constituted the various levels of command, Bronze, Silver and Gold, and their respective operational responsibilities. Moreover, each level of command requires a fully equipped communications centre at its disposal from which it can properly coordinate the emergency and relief efforts. At present, only one such command centre exists in the city at Queens Gardens. During the flood, another was temporarily created at Festival House when the need for it was made apparent.

We recommend that a second command centre be designated at Festival House and that it be fully equipped and maintained for the purposes of coordinating and directing emergency management.

3.11.3 Protecting Social Infrastructure

A community's resilience depends to a large extent on its social infrastructure or social sustainability. Just as individuals have skills, health, values and leadership capabilities that contribute to their own wellbeing and the wellbeing of those around them, so the community has a framework of interconnectedness built around trust, reciprocity and relationships that enable people to go about their daily lives and that add to their quality of life.

Often a distinction is made between "hard" and "soft" social infrastructure. The former involves the provision of basic utilities such as water, gas, electricity, waste disposal and transportation, while the latter refers to more intangible aspects of a community's welfare such as local networks, skills bases, and access to community services. Somewhere in between are located the community facilities and public buildings that constitute the physical infrastructure that meets the recreational, educational and cultural needs of local people. They may be places of worship, community centres, social or recreational clubs, child care centres or local schools. In particular, it is often the school that give a community a shared reference point and that provides families with a common purpose. Schools are also vital to the day to day running of people's lives. Any disruption to their normal functioning has immediate adverse effects on families, creating problems around childcare, availability to work (especially for women), family finances and even, in the most extreme cases, employment prospects. In many cases, the disruption

caused by the suspension of normal schooling adversely affects more people's lives for much longer than the hazard itself.

Recommendation: Vital social infrastructure, such as schools, need to be retrofitted to make them flood-proof and new school buildings should be located with a view to protecting them from future inundations.

3.11.4 Living with Floods

For cities like Hull, it is no longer simply a question of taking further measures of flood prevention. It is also now a matter of learning to live with the possibility of more frequent inundations, of adaptation to flooding.

We suggest that more consideration should be given to adaptive strategies of living with the threat of flooding. This ranges from changes to infrastructure (e.g. through sustainable urban drainage systems and multi-purposes green areas designed to temporarily retain surplus water) and at the household level (through designing or retrofitting houses to better withstand periodic inundation).

Communities and individuals within them will differ widely in their capacity to act and opportunities for self help may be very limited depending on their circumstances. Hull's residents need to be able to develop contingency plans for their households. Communities need to understand the general probability of flooding and the cost effectiveness of possible flood resistance and resilience measures available to them.

Our first report recommended an awareness raising campaign, and this needs to include:

- **A general understanding of factors that determine the probability and consequences of flooding**
- **Flood probability estimates at individual property level**
- **A flood resistance and resilience "toolkit" that enables households to identify measures appropriate to their circumstances.**
- **Where it is inevitably necessary to prioritise resources, an understanding of how and why those decisions are reached needs to be in the public domain**

4. The Insurance Industry

4.1 Introduction

The reaction of the insurance industry to the floods in Hull is an issue of great importance to Hull's residents. Key concerns voiced to the IRB by members of the public included; Will premiums rise? Will we still be able to get insurance cover? What controls the cost of insurance and how are premiums calculated? To address these issues, we first of all approached individual insurance companies for confirmation of their experiences as well as channelling our enquiries through the Association of British Insurers (ABI).

A meeting with IRB and Insurance Industry representatives was held on 23rd October 2007 to discuss key questions presented by the IRB. We also wish to thank the Hull Daily Mail and its correspondents for providing its coverage of the situation in relation to the experience of its readership with insurance companies and loss adjusters.

4.2 Statement of Principles on the Provision of Flood Insurance

Much of the insurance industries response to dealing with flood risk is associated with the 'Statement of Principles'. Compared to most developed economies the UK is unusual, as the government does not underwrite damage from natural disasters such as floods. Instead, the government and the insurance industry have an agreement known as the 'Statement of Principles on the Provision of Flood Risk Insurance' (hereby referred to as the Statement of Principles). In summary, in this agreement insurance companies will agree to provide insurance against flooding in flood risk areas, as long as the government maintains a commitment to update flood defences in those areas.

In detail, the Statement of Principles states:

1. Flood insurance for existing domestic properties and small businesses should be available in a competitive market.
2. Insurance will be provided to the majority of the 2.2m properties in flood risk areas, provided they are protected from river floods to a minimum standard of 1 in 75 years. Highly populated coastal areas should be protected to a higher standard. Hull is protected to a 1 in 100 year event for river flooding and 1 in 200 for coastal flooding with existing and planned defences.
3. Insurance will be provided in areas where protection levels are less than 1 in 75 years provided there are plans for increased flood protection to come into operation within 5 years.
4. In areas where there is a significantly greater risk than 1 in 75 years insurers will consider risk on a case by case basis.
5. The provision of insurance in flood risk areas under the Statement of Principles is for renewals.
6. Insurance provided under the Statement of Principles can be transferred when the home is bought and sold.

Continued operation of the Statement will depend on Government progress on five key actions

1) Reducing the probability of flooding for a substantial number of properties.
2) At least maintaining investment in flood management each year.
3) Implementing reforms to the planning system to ensure new developments do not increase flood risk.
4) Communicating flood risk effectively.
5) Developing an integrated approach to urban drainage that alleviates the risks of sewer flooding and flash flooding.

We note that the 1 in 75 year level seems to refer to risks associated with flooding from rivers and coasts rather than rainfall events. The ABI were unsure as to how risks associated with levels of protection from urban drainage systems could be factored in.

4.3 Can you get flood insurance cover for properties in Hull?

Hull exceeds the Insurance Industry standard by having a greater than 1 in 75 year protection against river and coastal flooding with existing and planned defences. The ABI informed us that renewal insurance should be available for householders and small businesses in the City. The ABI also informed us that insurers will look objectively at new policies and assess risk based on personal and property claims histories.

It is difficult to determine an overall position for the availability of flood insurance in Hull as each company deals with the risk in different ways. Whilst some companies may be refusing to cover flood insurance in Hull, the ABI were certain that this was not the case for all companies. They therefore suggested there was no real problem. The ABI also commented that some media stories suggesting it was difficult to get flood insurance in Hull were not concerned with renewal of existing quotes but for new policies.

As the insurance sector is a combination of multiple companies all trying to develop a competitive advantage it is very hard to determine an overall position. It does however appear that insurance cover is available to most residents of Hull but this may be at elevated costs, particularly if the existing administrator has administered a claim.

4.4 How are premiums (and risks) calculated?

Insurance premiums are calculated on the risk of damage occurring. Unfortunately, there is no general model with insurers currently determining risk using individual models rather than a standard process. For example, insurers may use land topography mapping systems, EA flood risk maps, area, postcode or individual property records. To further complicate the calculation, different insurers also assess flood, fire and other risks with different weightings. However, very few companies look at properties on a road by road basis (or lower) as this raises the administrative cost in calculating premiums. Insurance is a competitive market and whilst some may decide against insuring in flood risk areas some may see this as a competitive opportunity and provide cover.

The Insurance Industry does not appear to have considered the drainage capacity of the city as a risk factor although the recent events may be taken into account in assessing risk. Again the position is unclear, as some insurance companies may use this when calculating risk and others may not. However, the ABI refers to investment in urban drainage within the Statement of Principles. Provided any deficiencies in Hull's infrastructure are addressed urgently it is anticipated that the Insurance Industry's assessment of risk to Hull property should not be compromised.

Insurers also pool information regarding individual property records on a national database, containing records of claims associated with individual properties, the scale and source of the claim, together with the claimant. All insurers should provide information to this database, but surprisingly not all check it when providing cover.

4.5 Claims Administration

Loss adjusters work on behalf of insurers in co-ordinating necessary works and ensuring the delivery of commitments made under insurance policies. Loss adjusters are generally rewarded on a negotiated remuneration based on a combination of standard fees and performance related payments. Larger insurance groups use in-house specialist loss adjusting staff on standard employment contracts.

4.6 Standard of Reinstatement

The insurance representatives we met impressed upon the IRB that insurance companies are keen to restore homes to a high standard. They regard maintaining a high level of customer service as important in a competitive market. Some concern has been expressed that the public sector approach to works to properties may not be to the same standard, and may disguise problems that will become apparent in the medium term. We note that there is no industry standard, consistent approach to flood damage to property and we address this issue further in chapter 7.

We also asked the representatives of the insurance industry about the option of re-instating properties with flood resistant materials to increase the resilience of homes. They replied that the Insurance Industry is only responsible for reinstating properties to their former condition. Should flood resilience work to individual properties increase the costs of works, this cost would be the responsibility of the policy holder. The Insurance Industry does not require flood protection works as part of any reinstatement, even if such works would potentially reduce the costs associated with any future flood event. Insurance is a competitive market, and the insurance companies were worried that spending extra on using flood resistant materials would be to a competitors advantage if the homeowner moved insurance company following rebuilding. Therefore, the Insurance Industry sees the specification of works as an issue of primary responsibility for Building Regulations with individual choice thereafter. We discuss this further in Chapter 7.

4.7 Individual Home Flood Protection
The IRB investigated whether the Insurance Industry would consider individual works into increasing property flood resilience or surveys showing individual houses were not at risk into account when considering insurance risk. The response from the insurance industry representatives was that individual property flood protection works are a secondary importance to main flood defence infrastructure works that would provide a risk environment within an area (e.g. the construction of new river flood defences).

4.8 Use of excess and capped cover methods to limit risk
The ABI and insurance representatives stated that there is little prospect of the Insurance Industry using excess arrangements or limiting the cover associated with a flood event under a policy. This would create difficulties where individuals are under insured and could cause hardship should claims be higher than the capped amount. Insurance companies use voluntary or enforced excesses to reduce the risk of small claims being made by policy holders. In light of this we are surprised to see examples of renewal quotes including £3000 and higher excesses for flood claims.

4.9 Were the floods in Hull a flood or storm event?
It has been considered whether this classification is important in relation to assessing the level of risk, premiums and the availability of insurance for households and businesses. Whilst insurers may accept that the June events were related to storm rather than river or coastal floods there is no consistent assessment of risk in this regard. Insurers will generally make an assessment on the level of risk looking retrospectively at a claims record of a location and the insured party. In this respect we are advised that the assessment of whether the event was primarily a storm or flood event is not significant to the Insurance Industry in its assessment of risk.

4.10 Responsibility for Flood Strategy
The Insurance Industry is seeking to influence government investment in flood protection works through its Statement of Principles that encourages increasing government expenditure in flood protection. The insurance industry would like to see greater co-ordination between Agencies responsible for drainage. It does not see itself as having a role in a more co-ordinated approach. It assesses risk on the basis of the circumstances at any time and does not see itself in having a strategic responsibility.

4.11 Conclusion
The UK Insurance Industry is unique in offering flood cover as a standard feature of household and most business policies.

It is a competitive market and individual companies will assess risk in different ways. The provision of insurance for Hull properties should continue under the ABI Statement of Principles and the Insurance providers work on the basis of assessing risk individually, relating to an industry database of claims histories relating to properties and individuals.

The Insurance Industry takes a broad brush approach to assessing flood risk, suggesting that the reduction of risk through effective main infrastructure will have the greatest influence on the availability of insurance and costs relating thereto. Individual and local measures to alleviate risk appear to be of limited benefit other than in peripheral risk areas. This should not influence such investment as a result of the wider advantages of limiting flooding risk.

The ABI Statement of Principles clearly places the responsibility for flood protection at the door of Government. The protocol is reviewed by the Industry annually and the continuation of the policy is dependent on the performance of Government investment. We consider as unhelpful in a time of climate change any approach that lays the responsibility for flood protection solely at the door of Government as it may discourage local level and individual household measures designed to mitigate damages arising from such an event.

The provision and cost of insurance in Hull is determined entirely by economic forces and the insurance companies assessment of risk. Aside from the statement of principles (which is a voluntary agreement) there is no other form of regulation.

We question whether in a time of increasing flood risk the statement of principles is a viable solution, and suggest the government looks into methods of underwriting flood risk as per other nations.

We also recommend that insurance companies are urged to offer lower premiums to householders who fit flood resistant measures to their properties.

Further information and references:

All available from www.abi.org.uk and www.floodforum.org.uk
Flooding – A Quick Guide to the Claims Process,
Adapting to our Changing Climate; a Manifesto for Business, Government and the Public dated June 2007
Repairing your Home or Business after Flood – How to Limit Damage and Disruption in the Future,
ABI Statement of Principles on the Provision of Flood Insurance,
Insurance Cover for Flooding – Statement of Principles Core Script
Insurance Cover for Flooding – Risk Pricing
ABI Briefing Note for the Coastal Towns Adjournment Debate, 7th June 2007.

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5 Yorkshire Water and the drainage system of Hull

5.1 Introduction

Since the publication of the Interim report we have continued to investigate the drainage system of Hull. We have had extensive technical discussions with representatives of Yorkshire Water, and Yorkshire Water in turn commissioned their own report, by the consultants Ove Arup to examine some of the findings and recommendations from our interim report.

Using evidence from a series of reports commissioned by Yorkshire Water, we have noted that over a period of 11 years, a series of clear recommendations relating to the condition, design and operation of the drainage and pumping systems of Hull were made to Yorkshire Water. For some of these recommendations Yorkshire Water was unable to produce any records of, or confirm action taken, in respect of this advice. We believe that had these recommendations been implemented the impacts of the floods in June 2007 would not have been as severe.

The report will now illustrate this with examples from two areas, Bransholme and East and West Hull. Note: throughout this section we refer to pump and pipe capacities, these are measured in the volume of water that can travel through them in cubic metres per second (m^3s^{-1}).

5.2 Bransholme and Kingswood

Bransholme and Kingswood is an area to the North East of Hull, where a major estate was constructed from 1967, housing over 35 000 people. Bransholme and Kingswood is separated from the rest of Hull's drainage system and relies upon the operation of a single pumping station for removing rain water. Bransholme differs from the rest of Hull as it has a separate surface water and foul water sewerage system. On the 25th June, the area of Bransholme and Kingswood was extensively flooded and the pumping station itself was inundated and failed on the night of the 25th to 26th. As a result the area remained flooded for significantly longer than most parts of Hull and was only cleared when temporary pumps were introduced in the days following. Extensive damage to over 1000 households was caused. The pumping station at Bransholme was constructed in 1963 by the then Hull Corporation. Records of the original design were not available. Sewer sizes and pump capacities were designed for a growing population and the planned expansion of the area into the region now known as Kingswood.

The station was fitted with one electric and three diesel pumps with a total capacity of 5.4 m^3s^{-1} and in c.1990 an additional diesel pump was added to give a total *design* pumping capacity of 7.2 m^3s^{-1}. However, Yorkshire Water have informed us that due to the configuration of the outflow pipes from these pumps, the maximum that can be pumped in any configuration is 5.4 m^3s^{-1}.

5.2.1 1996

In 1996, a report was commissioned by Yorkshire Water to consider the suitability of the station to accommodate the proposed Kingswood development to the north of Bransholme (Kingswood Development, 1996).

This report used hydraulic software to model the capability of the system to cope with rainfall events.

Two scenarios of housing and retail/industrial development were considered. Version 1 included the areas of committed development to the east of Engine drain but only to the extent of building work at March 1996. Version 2 contained all of the area committed to development East of Engine Drain as well as the Kingswood Development to the West. From the report it is not apparent how much of Kingswood phase 1 and 2 development this version includes.

For the first scenario, model results noted that the system showed no flooding with a 1 in 20 year storm event, and only a small volume of flooding with a 1 in 30 year storm event. For the second scenario (with Kingswood) there was considerable flooding with a 1 in 30 year event, with much of the flooding predicted to occur in the proposed Kingswood development.

Importantly, this modelling work was based on the assumption that the pumping capacity at Bransholme was 7.2 m^3s^{-1}, and as detailed above we have subsequently found out this was not the case. The 1996 report notes that *"the work in this study assumes a discharge capacity of 7.2 m^3s^{-1}, if this value is not achieved in pump tests some of the conclusions in this report will have to be revisited"*.

It is highly likely therefore that levels of protection for Bransholme were significantly below the 1 in 30 year level in 1996.

The study then continued to recommend that a thorough review be undertaken into the condition of the existing Bransholme S.W. Pumping Station to determine:

- The actual discharge capacity of the pumping station
- The reliability of the existing plant
- The structural integrity of its superstructure

Yorkshire Water confirmed that they have been unable to locate records of the action taken and are unaware when the reduced pump capacity was first realised.

We note with concern that despite Yorkshire Water being informed of the issues of reliability and structural integrity of its pumping operation at Bransholme in 1996, that it was unable to produce or confirm the existence of any action in may have taken in response to the report.

The 1996 report also recommended the construction of a new pumping station adjacent and linked to the existing Bransholme pumping station to cope with the increased flows caused by the Kingswood development. This additional pumping station was to have a pumping capacity of 4 m^3s^{-1}, subject to the full 7.2 m^3s^{-1} being available within the existing station.

5.2.2 September 2001

In September 2001, Yorkshire Water commissioned Ove Arup and Partners to prepare a 'notional outline study' (review) to consider options for increased pumping and drainage due to the Kingswood development. This report noted that the existing electric and diesel pumps were all in poor condition and that 7.2 m^3s^{-1} was the installed design capacity (which as previously stated is not the case). Furthermore, the report noted that there was flood risk due to the unreliable operation of the pumping station. The report considered business risk, and stated there was a *"high risk of asset failure"*.

We again note with concern that Yorkshire Water us unable to produce or confirm the existence of any records of any action it may have undertaken in respect of this report.

5.2.3 October 2001

A further report was commissioned to examine the cost implications of the September report, and considered the construction of a new pumping station to accommodate Kingswood or the upgrade of the existing facilities. This report rejected the construction of a new pumping station and on grounds of feasibility and cost recommended upgrading the existing pumping facilities.

The report makes reference to the addition of Kingswood phases 2 and 3, and states *"Our study concludes that upgrading of the existing pumping station to provide reliable pump capacity (excluding any standby) of 9 m^3s^{-1} gives an acceptable design margin to ensure no surface flooding at the 30 year event as a consequence of surcharged sewers, although 10.8 m^3s^{-1} is required to ensure that surcharge levels are not worsened in the existing system".* The report re-iterates concerns about the reliability of the existing pumping station.

For the third time, we note with concern that Yorkshire Water is unable to produce or confirm the existence of any records of any action taken it many have undertaken in respect to this report. Furthermore, in this study the pumping capacity was still being over-estimated at 6.2 m^3s^{-1}.

5.2.4 2007

August 2007, the IRB published their interim report. In light of this, Yorkshire Water again commissioned Ove Arup to conduct a review and report on some of our observations. Their report was published in November 2007. Their findings and recommendations on Bransholme were:

The Bransholme surface water pumping station operated effectively on the 15th June. During the second event on 25th June it eventually failed when the main bearings became submerged. Yorkshire Water commented that this was the first time that this has occurred in the 50 years that the station has operated.

Listed in the reports recommendation:-

- Work is required to complete an immediate repair of the pump thrust bearings at Bransholme Surface Water Pumping Station.
- Implement a scheme to provide more robust pumping facilities at Bransholme Surface Water Pumping Station which include allowances for the proposed development in the area

In response to a series of our questions, Yorkshire Water have clarified the present state of Bransholme pumping station (November 2007):

- Some temporary pumping will be left on site
- Work is being carried out to protect the thrust bearings to prevent water ingress
- Yorkshire Water are also looking at the cooling water system and starter batteries to ensure their robustness going forward
- Yorkshire Water will look at the station in the longer term with regards to pumping capacity
- In practise the actual/practical capacity was only 5.4 m^3s^{-1} due to the configuration of the outlet pipes. Action is now being taken to correct any short fall.
- The station was manned throughout the incident

The IRB were refused permission to speak directly to staff or the station operator in attendance during the flooding event.

5.2.5 Summary and future issues for Bransholme and Kingswood

Bransholme pumping station failed on the night of the 25th June 2007. From 1996, Yorkshire Water has been repeatedly warned about the reliability, poor condition and design issues at the Bransholme pumping station. We believe that had they acted upon these warnings, it is very likely that the flooding in 2007 would not have been so severe in Kingswood and Bransholme.

The actual/practical pumping capacity at Bransholme was 5.4 m^3s^{-1}, a level much less than that recommended in the Ove Arup report of 2001 as being necessary to protect Bransholme and Kingswood from a 1 in 30 year event. Furthermore, it is likely that additional development since 1996 has placed increased load on the system, further decreasing its effectiveness.

Yorkshire Water were also warned to investigate what the true pumping capacity was in 1996, but appear not to have been aware of the actual capacity until 2007. As a consequence, the capability of the Bransholme pumping station may have been consistently over-estimated since 1996.

We recommend Yorkshire Water to rapidly upgrade Bransholme pumping station with reliable modern equipment and do not to rely upon temporary repairs presently being implemented.

The future situation at Bransholme and Kingswood is complex, as the pumping station discharges into the River Hull. The River Hull is tidal, and there are concerns that during high flows and/or high tides discharging large

volumes of water from Bransholme could cause the river Hull to flood. As a consequence, as part of the initial design of the pumping station a storage lagoon (akin to a small reservoir) was constructed next to the pumping station to act as a store to hold water when the river is high.

This lagoon has never been used for flood water storage. A consent agreement exists between Yorkshire Water and the EA, where Yorkshire Water can discharge into the River Hull not according to a set volume, but dependant upon the level of the river. Therefore any future arrangement or re-working of the drainage system at Bransholme and Kingswood requires Yorkshire Water, the EA and the Kingswood developers to work together. We understand that this is beginning to happen, with a joint modelling study underway.

We welcome this initiative and the recommendations of the Arup report. The protection of Kingswood and Bransholme from pluvial flooding is completely feasible and we hope for an expedient solution through this collaboration.

We recommend that a collaborative approach is continued, but are disappointed that it has taken 11 years to transpire.

We also recommend that extra pumping capacity be added to any future designs at the Bransholme pumping station to increase resilience.

5.3 East and West Hull

5.3.1 Introduction

In order to appreciate the design and operation of East and West Hull's drainage and sewerage system, it is necessary to look in considerable detail at the history, reports detailing its operation and the specific details of how it was operated during the 2007 floods.

Prior to 2001, Hull was drained by pumping stations at East and West Hull that discharged drainage water and sewage from the East and West sides directly into the Humber Estuary. In 1996, planning began upon a new system (called Humbercare) to treat sewage and drainage water from both East and West Hull at a new sewage treatment works at Saltend (East Hull). These plans involved the construction of a large (3.6m diameter 10.5 km long) transfer tunnel from West to East. Full details of the system prior to 2001 and of the Humbercare system can be found in the IRB's interim report.

5.3.2 1997

Design documents and reports for the Humbercare system, from 1997, show that water flows in the drainage system of Hull were modelled using the HYDROWORKS model. A number of different schemes for the size of the proposed transfer tunnel and location and size of pumps for the proposed system were tried. A notable feature of the design was that the addition of the Humbercare transfer tunnel introduced more storage into Hull's drainage system. The Hydroworks model indicated that if pumps to a capacity of 22m m^3s^{-1} were constructed at the new treatment works at Saltend, then when combined with this new storage, Hulls drainage system could withstand a 1 in 30 year storm event. This meant that the pumping stations at West Hull and East Hull could be de-commissioned (with the exception of the pumping station at East Hull being retained with partial capacity to pump the Holderness Drain).

5.3.3 2001

The £200 million Humbercare scheme was commissioned in 2001 to industrial and international acclaim winning the CMMA (Construction management Association of America Award) International Project of the year.

5.3.4 2001 to 2004

There are several incidents reported of sewers being unusually full despite relatively low rainfall levels. There were also reports of local flooding in areas which had not experienced flooding pre Humbercare. This was evidenced by a significant increase in the number of properties and roads included in the DG5 register. The DG5 is a register of properties at risk from flooding from sewage (see section 6.3 for a full explanation).

5.3.5 October 2004

In response to the increased incidents of flooding in West Hull, Yorkshire Water commissioned a study by the consultants MWH. This used a newer more sophisticated numerical modelling package with additional features, called INFOWORKS, to simulate the effect of different size storms on Hull's

drainage system. Their report submitted to Yorkshire Water in October 2004 revealed some serious issues with the existing Humbercare design.

The MWH 2004 report indicated that the Humbercare system was not correctly designed to accommodate some 1 in 30 year storm events stating *"The Hull catchment is now subjected to the risk of area flooding at rainfall events well below the original design criteria"*. The modelling results from the INFOWORKS package showed that for some simulations the existing Humbercare design underestimated the volume of water from a 1 in 30 year storm by 100% and the size of the peak flow by 10%. Put alternatively, the design of the Humbercare system could only accommodate half the volume of water generated by some of the 1 in 30 year storm events simulated. This effectively reduced the Humbercare systems designed capacity from a 1 in 30 year event to a 1 in 1 or 1in 2 year level. This is a significant reduction in the level of protection.

The report continues to outline 9 options, with costs, for rectifying the flooding problems in Hull. These included re-building the pumping stations in West Hull with new pumps to a capacity of 20 m^3s^{-1}, providing protection for 1 in 10 year events at a cost of c £6.5 million. Rebuilding the pumping station at West Hull with a capacity of 30 m^3s^{-1} providing protection from a 1 in 30 year event at a cost of c.£7.5 million. Other options included the construction of an additional storage tunnel parallel to the original Humbercare tunnel at a cost of c.£200 million.

In addition it noted that the actual pumping capacity at Saltend was closer to 15-18 m^3s^{-1} than the quoted 22 m^3s^{-1} due to restrictions in the screening arrangements in place to remove solids. The report specifically makes reference to the pumps only operating at 80% of capacity in reality, and that the modelling study assumes that all pumps will be readily available and that they will operate at 100% capacity.

The report also notes that there is "no provision (or very limited/dangerous apparatus) is provided to the Hull sewerage system to pump flows from the West Hull catchment, in the event of tunnel failure". We note with concern that in 2004 there was no contingency for drainage or sewage in West Hull if the Humbercare transfer tunnel had failed.

5.3.6 Jan 2006

In January 2006 Yorkshire Water received a report from Ove Arup which detailed a feasibility study into methods of creating a temporary and permanent way to bring the drainage and storm protection of East and West Hull back to the levels given by the pre Humbercare (2001) system.

We note that consistently through this 2006 report reference is made to restoring to pre Humbercare levels rather than protecting to a 1 in 30 year level.

Ove Arup subcontracted more numerical modelling work of the Hull catchment to MWH, who produced the 2004 report detailed above. This 2006 report

carried out an even more detailed modelling study, including simulating a range of storm events that was partly based on actual rainfall data from the Hull area. This 2006 study also modelled the levels of protection afforded by the pre Humbercare system and these indicated that for 1 in 30 year events there was some flooding in West Hull (up to 100 000m^3).

The report confirmed the findings of the 2004 report that the Humbercare system had reduced the effectiveness of Hulls drainage system.

The report clearly states:
"YWS are not providing the required level of protection for area/property flooding to Hull" (Ove Arup, 2006 page 6)

And continues:
"The adverse impact of PF940 (Humbercare) *results in significant liability issues for YWS* (Yorkshire Water). *Should a flooding event occur and it is established that this was a result of PF940 then YWS would be uninsured and liable"* (Ove Arup, 2006 page 7).

Whether or not this last statement refers to property in Hull or Yorkshire Water's infrastructure is not stated.

The report also carried out a detailed study as to the feasibility for various permanent solutions ranging from additional storage areas, to disconnecting the water courses and the rebuilding of East and West Hull pumping stations. Due to cost and construction issues, the permanent solution recommended was the reconstruction of West Hull and East Hull pumping stations with new combined sewage outflows. The construction of this is a major undertaking, requiring fresh planning consent and possibly land purchase. We note this is very similar to the main recommendations from the 2004 MWH report.

In the meantime a temporary solution was recommended to Yorkshire Water. This involved re-commissioning 5 of the old pumps at West Hull pumping station to a capacity of 20 m^3s^{-1} and the re commissioning of all pumps at East Hull.

We note that for this modelling study it was assumed that the pumping capacity at Saltend treatment works was 22 m^3s^{-1}. As shown by the 2004 MWH report the actual capacity was significantly lower than this (c.15-18 m^3s^{-1}).

There were also some very important considerations for *when* the pumps were operated at West Hull. The report states that it is important that the pumps at West Hull are switched on when flow levels in the West Hull sewers are low. If the sewers are allowed to fill (to become surcharged) because the pumps are not switched on soon enough, the study indicated that there could be flooding in West Hull.

In summary, to protect West Hull from significant flooding to a pre-Humbercare standard the sewers in West Hull must be kept empty for as long

as possible as the storage within the sewer network is important to reduce flooding. Specifically, the report states that the West Hull pumps should be switched on when sewer levels rise to -5m AOD, and switched off when levels fall to -6m AOD. The MWH 2006 report states clearly that simulations where the pumps were switched on at -3m AOD resulted in flooding in West Hull.

We note that none of these options include any contingency or back up capacity in the pumping system. It is assumed that all pumps operate to design capacity without any maintenance or downtime.

5.3.7 Jan 2007

By 2007, Yorkshire Water had implemented these temporary measures by re-instating 5 pumps at West Hull, and lowering weirs at the inlet to the Humbercare transfer tunnel. They also developed a full set of emergency procedures for the operation of the system. It is important to understand the procedures for the operation of the pumping stations at East and West Hull during heavy rainfall conditions.

Firstly, the operator at Saltend Treatment works can monitor in realtime flow levels in the Humbercare transfer tunnel. When these begin to rise, especially when there is a risk of heavy rain, an engineer is dispatched to monitor (visually) flow levels in the sewers at key points. If levels are high then more personnel, and back up contractors in case of electrical difficulties, are sent to East and West Hull pumping stations. If levels continue to rise they are ordered to start manually the pumps at East and West Hull. At West Hull it can take 45 min to open the necessary pen-stocks and manually start the pumps. It is hard to determine how long this chain of events takes to operate, from initial warning to switching on the pumps, but we estimate that at best 1 hour and most likely between 1 and 2 hours (allowing time for personnel to wake and get to the site etc.).

The emergency procedures also make note of what levels the pumps should be switched on. For West Hull this is -3 to -1m AOD. The pumps at West and East Hull cannot be started automatically when a set level is reached.

Here we wish to note that the levels in Yorkshire Water's procedure for switching on the pumps at West Hull (-3m to -1m) are considerably higher than those recommended by the Ove Arup 2006 report (-5m). We would also like to note that during this procedure Yorkshire Water are required to gain emergency consent from the Environment Agency to discharge directly into the Humber.

5.3.8 June 25th 2007

Hull receives an unusually high volume of rainfall (over 100mm in 24 hours). The return period is estimated at greater than 1 in 100 years. Early on Monday morning engineers were dispatched to check on sewer levels and also to West and East Hull pumping stations. By approximately 8am the pumps at West and East Hull are started. The levels of water in the sewers can be shown by the telemetry provided by Yorkshire Water (Figure 5.1). These show the water levels rapidly rising in the main mixing well that feeds

the Humbercare transfer tunnel. Between 8 and 8.15 am, the levels in the sumps for West Hull pumping station rise by 6m, indicating when water was let into the pumping station and the pumps started. Yorkshire Water inform us that their estimates are that the pumps at West Hull were started when water levels were approximately -1m AOD. It is highly likely therefore, that the sewers in West Hull were fully surcharged when the pumps in West Hull were started.

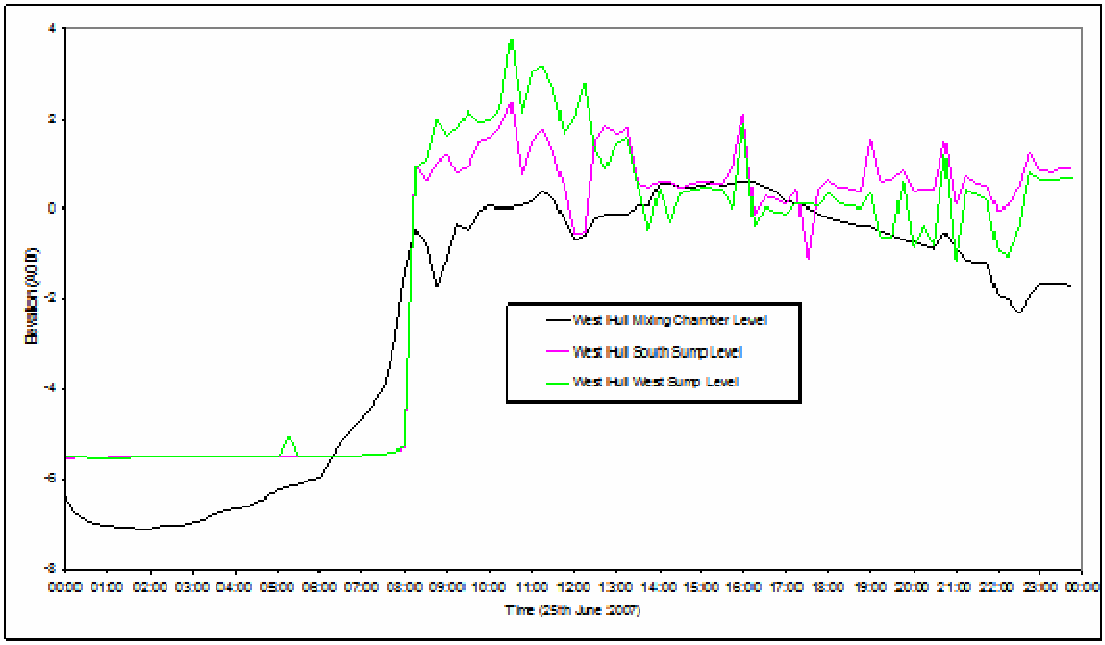

Figure 5.1. Levels in transfer tunnel sump and West Hull pumping station sumps.

During Monday 25th one of the five pumps at West hull operated intermittently, in addition each of the other pumps needed to be stopped for 5-10 minutes every hour for maintenance. This would have reduced the actual pumping capacity at West Hull from a potential maximum of 20 m^3s^{-1} to an average of c.15 m^3s^{-1}. The pumps at East Hull operated continuously from 8am at 8 m^3s^{-1}. At Saltend treatment works Yorkshire Water estimate that the actual pumping capacity was c.19 m^3s^{-1}. Fortunately, the tides were moderate on the 25th, as during high tides, the outflows of West Hull and East Hull pumping stations are restricted.

In addition, on the 25th, Ove Arup noted that there were problems with oscillations developing in the Humbercare transfer tunnel. The tunnel is designed to transfer a large volume of water in only one direction (towards Saltend). Ove Arup advised us that during the peak of the floods, Yorkshire Water had to turn off pumps at West Hull because the flows into the tunnel (at West Hull) had significantly reduced, which in turn had caused an oscillation in the transfer tunnel. The reduction in pressure at the head of the tunnel led to oscillation back and forwards within the tunnel. Increases and decreases in pressure associated with this oscillation would place great stress upon the tunnel structure and could lead to structural damage. To stop this phenomenon it was necessary to intermittently reduce pumping at West Hull and use penstocks to control the flows into the pumping station.

We note these oscillations were unexpected and had not previously been seen in the Humbercare system. We suggest that these may be the result of a temporary solution being imposed upon a system not designed for this purpose.

5.3.9 November 2007

In late September 2007, Yorkshire Water commissioned Ove Arup for their own independent review into the findings of the IRB's interim report and on the pumping stations serving Hull. Ove Arup swiftly reported by November 2007. Many of their findings concurred with recommendations we made in our interim report (August 2007). Their key findings were that:

- A multi agency approach was required to contribute to flood defence in Hull, and that due to Hulls location, proposals should be investigated to improve levels of flood protection in Hull above that of most UK cities.
- Flow monitoring should be improved across the sewer network and in contributory streams and watercourses. This would provide early warning and help with the management of the pumping infrastructure during storm events.
- Work is needed to improve the robustness and reliability of East and West Hull pumping stations, and consideration should be given to upgrading them with new combined sewer overflows
- Work is also needed to improve the resilience of power supplies to Saltend and East Hull pumping stations.

We feel that these are positive recommendations and we largely agree with them. As previously stated many of them fall within some of our wider concerns mentioned in the interim report.

5.3.10 Summary and future issues for East and West Hull

In our previous report we were concerned that there was an urgent need to undertake a thorough modelling study of the Hull system. Since then, on the basis of reports that Yorkshire Water subsequently gave us (MWH 2004, Ove Arup 2006), we feel that there is a good background of contemporary modelling information on the system.

However, what concerns us greatly is that advice and recommendations for long term solutions have not been expediently followed up. We appreciate that the recommendations to re-build existing pumping infrastructure and construction of new combined sewage outflows generate considerable planning and consent issues. However, Yorkshire Water were first alerted to the need for new/revised pumping facilities at East and West Hull in October 2004.

On the 17/11/2007, one week before the publication of this report, Yorkshire Water forwarded to us a remit (dated 18/10/2007) for contractors and consultants to develop an increased pumping capacity at East and West Hull. We understand this instruction may be in line with recommendations for a permanent pumping solution from the 2006 report. We wholeheartedly

welcome this step. However, it has taken Yorkshire Water three years in which to act.

We question whether this lack of action is based on bad management, commercial reasons or for genuine logistical difficulties. From the range of options presented in the 2004 and 2006 reports, it would appear that Yorkshire Water have consistently taken the cheapest path available to them at the time.

Furthermore, we feel it is deeply regrettable that it has taken the events of 25th June 2007 for the deficiencies in East and West Hulls drainage system to become public knowledge. Had one of the permanent solutions recommended in 2004 and 2006 been implemented we believe the impacts of the June 2007 floods would have been less severe.

Until a permanent solution is built, Hull is served by an under capacity, sub standard modern system helped out by two 40 year old pumping stations.

5.4 Design Parameters and legislation

When reviewing the drainage and pumping system in Hull, we have found a number of important technical and design issues. Firstly, the actual pumping capacity is consistently under-estimated. Pumps may be able to pump clean water to their specification, but when pumping sewage these rates decrease due to the different viscosity and solids. Furthermore, the pumps, notably the older ones may need regular maintenance and cleaning during pumping operations, again reducing the 'effective' pumping capacity. For example, on the 25th June, the total 'potential' capacity was 50 m^3s^{-1} (22 m^3s^{-1} at Saltend, 20 m^3s^{-1} at West Hull and 8 m^3s^{-1} at East Hull), whereas the 'effective' or actual capacity can be estimated at 41 m^3s^{-1} (19 m^3s^{-1} at Saltend, c.15 m^3s^{-1} at West Hull, and c.7 m^3s^{-1} at East Hull). What concerns us greatly is that this does not appear to be accounted for in the modelling studies used to simulate Hull's drainage. We feel it is vital that the correct figures are used.

Furthermore, none of the designs we have seen are over capacity. There is no safety factor or contingency added to the designs. When designing a bridge or building, the strength of materials required to support the structure is calculated and an extra percentage is added for safety. We are very concerned that this does not appear to be the case in these designs. They are all designed exactly to the limit of a 1 in 30 event.

We recommend that when designing urban drainage systems actual pumping capacities and extra contingency is factored into the designs.

In our interim report, we noted our concerns that levels of protection from storm events for urban drainage systems were only 1 in 30. We confirm that these limits are not mandatory, they are 'industry standards'. In the document Sewers for Adoption (6th Edition) there is a section which states *"no flooding should occur for a 1 in 30 year event"*.

We are surprised that nationally there are no mandatory limits for surface water or sewage drainage and that they are only to a 1 in 30 year level, especially when compared to 1 in 100 for rivers (as practiced by the Environment Agency). The water industry is regulated for water quality and provision of service, but appears to have no regulation concerning its performance on surface water drainage. We continue to explore this by examining the relationship between the water companies and the regulator Ofwat in Chapter 6.

5.5 Conclusion

Many properties in Hull, Kingswood and Bransholme were flooded by only a few centimetres of water. One cm of water ingression can easily cause over £15 000 of damage to a property. Whilst it is almost certain that some flooding would have occurred in Hull on the 25th June 2007, we conclude that had prior warnings and advice been heeded from 1996 onwards, then some properties in Hull would not have been flooded.

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6. The role of OFWAT in urban flooding

6.1 Introduction

During our review and with the publication of our interim report, it became apparent that in urbanised areas like Hull the local water company (here Yorkshire Water) was responsible for the bulk of drainage of water from rainfall and storm events. It was also apparent from our investigations that there are no mandatory or legal standards for storm water drainage for all water companies in the UK. As outlined in chapter 5 there is an 'industry standard' of 1 in 30 years for sewage drainage. Therefore the role of the water industry regulator Ofwat (Office of Water Services) is crucial in controlling the water industry, and thus to a degree urban drainage. Many times, our enquiries led us to examine the relationship between Ofwat and the water companies. The first section of this chapter outlines the history of Ofwat and some of the economic theory behind its operation. This is important to understand how regulators operate and some of the difficulties posed by the relationship between Ofwat and the water companies. The second section looks at the implications of this for the management of Hull's drainage system and by implication all urban drainage systems in the UK.

6.2 The water monopoly

Since the 1980s Government in the UK and abroad have transferred many publicly-owned companies to the private sector (notable examples include British Telecom and British Gas). Privatisation also extended to water supply and sewerage services. The rationale behind privatization was to enhance the performance of money-losing publicly-owned utilities, however the characteristics of the water industry mean the strength of the regulatory framework adopted is the key factor in determining its efficiency.

The water supply and sewerage industry is a classic case of a natural monopoly, more so than gas or electricity. The term natural monopoly describes an industry where only one firm can survive in the long term, this is largely as a result of high fixed costs of entering the industry. In relation to its sale price, water is expensive to move around. The massive capital investment needed to provide the networks for supplying drinking water and for safe wastewater disposal means that it makes little economic sense for them to be duplicated (i.e. no competition within the market). Indeed, there is no 'national grid' for water supply or wastewater disposal. Given this, there is a need regulate the water industry as private ownership does not remove the natural monopoly and incentives to reduce costs, innovate, invest at the efficient level, and respond to consumer demands are not as strong as in competitive markets.

6.3 Regulation of the English Water Industry

The water industry is regulated under the Water Act 1989, Water Services Act 1991 and the Water Act 2003. The Office of Water Services (Ofwat) was developed as part of the 1989 Act and its governance was enhanced in 2003 and it was renamed the Water Services Regulation Authority. Its primary duty is to make sure that the functions of water and sewerage undertakers are carried out properly under the terms of their licence, and, interestingly, *"to secure that companies are able (in particular by securing reasonable returns*

on their capital) to finance the proper carrying out of their functions." This reference to reasonable returns on capital does not appear in the duties of any of the other utility regulators and reflects the importance of continuing investment in the infrastructure within the water industry.

However, the Act does not define either reasonable or capital, so wide discretion is left to the regulator to interpret these. This framework gives the regulator fairly wide discretionary power and the effectiveness of the regulatory mechanism depends on the quality of the regulator and their relationship with the water companies. Both the undertaker and the regulator have a right of appeal to the Competition Commission in the event of any dispute between them.

The primary mechanism available to the regulator is the price cap. Price increases are fixed to the increase in general prices measured by the Retail Price Index, plus a percentage determined by the regulator in the price review.The licences specify which services are included in the price cap. They provide for a regular review of the price cap, currently every five years, and they allow Ofwat to make an "interim determination" in between in the event of genuine external price increases which are beyond the control of the undertaker (known as a cost passthrough mechanism).

Within a European context, the European Commission has limited its involvement in the water industry to developing directives concerned with water and environmental quality and the broader regulation of water resource use rather than the narrower issue of water utility regulation.

External cost increases are a problem in any regulatory regime. What do you do if prices are fixed and there are genuine external cost increases? If these are not passed on to consumers there may be a genuine danger of the company going bankrupt. In industries like gas and electricity these are largely raw material costs which they are allowed to pass on to the consumer. In the water industry it is more complex. External cost increases are usually prompted by things like changes in regulations about drinking water quality or environmental regulations on sewage discharge. These require major capital investment which will be depreciated over a period long beyond the next price review. The approach adopted in practice by the regulator has been to calculate the present value of additional costs incurred by such investment up to the period of the next review and allow prices to increase so that the present value of the additional revenue exactly matches those costs. In other words, the whole cost of that investment is not loaded onto prices in that period but is spread out over future periods.

The limited powers of regulators, such as Ofwat's to set prices and provide a regulatory framework within which industry can succeed cannot force investment. One way to ensure higher profits in the short term is to cut back on investment and avoid the cost of capital that goes with it. This was a particular problem in the early days of the privatised gas industry. Consequently regulators, especially in the water industry, have monitored capital programmes and now agree investment plans as part of the five year

price setting cycle and monitor their implementation each year. Whilst this goes beyond pure price regulation it has proved necessary in practice.

Another major problem with pure price regulation is that it is possible with fixed regulated prices to maximise profits by cutting back on costs with an adverse impact on quality. This problem has also been recognised by governments and certainly in the water industry steps have been taken to ensure quality of supply. There are regulations in place about drinking water quality and about environmental impact of things like sewage discharge. Unfortunately these are regulated by different bodies (drinking water quality by the Drinking Water Inspectorate and environmental quality by the EA). Ofwat is primarily the economic regulator, and there can be conflicts of interest between for instance the EA wanting to reduce pollution and Ofwat wanting to minimise price increases for consumers.

One of the key issues within the regulation of any monopoly industry is the fact that the industry itself will have more information than the regulator, some of which they may not disclose. This asymmetric balance has a particular impact when it comes to calculating a company's asset base and the cost of capital, both of which are essential elements in the setting of a regulated price.

In the absence of a market to assess the relative performance of different companies, this role falls to a regulator. There is a complete absence of market in the water industry since it is a series of regional monopolies. The regulator can, and does, regularly compare companies against each other in terms of cost, efficiency, quality and so on. In the cases where competition in the market is not feasible it is possible to harness some of the benefits of competition through 'Yardstick competition' – this is where the price that a firm can charge is dependent on performance of other firms as well as the company's own performance.

Whilst there is no legislation governing the quality of drainage and sewerage systems, this is a performance indicator which is regularly monitored by Ofwat. Level of Service Indicator DG5 measures the number of properties at risk of flooding due to overloaded sewers once in every ten years and twice or more in ten years. Companies are expected to reach a minimum standard of 25% below the industry average. If they fall below this regulatory action will be taken against them.

6.4 Yorkshire Water's response to Ofwat regarding the Hull floods

Ofwat as regulator does not have any specified powers to demand reports on utilities' operations. However the terms of the operating licence appear to give the Regulator wide powers to demand reports into any issues which are of concern to them. In the case of the June floods in Yorkshire, Ofwat wrote on 10th September to Yorkshire Water requesting information on the following issues:

- The actions and processes put in place for reviewing the experience and identifying issues or lessons
- The extent and severity of flooding within Yorkshire Water's area
- The performance of sewerage assets and in particular whether they performed to the expected levels and whether any design faults were revealed
- Yorkshire Water's operational response and whether more could have been done to limit the extent or impact of flooding
- Description and quantification of the impact of flooding on Yorkshire Water's service provision, both on water supply and sewerage
- Any environmental impacts resulting from this.

Yorkshire Water responded on 19th October with a report detailing their answers to the questions asked. Of particular interest are the following responses:

Did sewerage assets perform to the levels expected for handling heavy rainfall..?

"Our sewerage and pumping infrastructure operated to their respective capacities. In the affected areas they were overwhelmed by the severity of the storms and the concentration of the rainfall. Our infrastructure performed as well as could be expected under the conditions. The rainfall generated run off and flows well in excess of current industry design standards. Generally assets performed as expected until totally inundated or submerged."

Were design faults revealed to any significant degree?

"We are not aware of any specific or particular design faults or issues being immediately identified by the flooding events. However it is clear that some catchments are complex with respect to inundation and overland run-off etc. The on-going reviews may yet indicate where designs could be improved at specific sites, and the investigations into all flooding events…are still to be completed."

Ofwat can, and in this case did ask Yorkshire Water to appoint an independent reporter to challenge the company's findings. The reporter in this case was Strategic Management Consultants who reported on 15th October. The reporter did challenge Yorkshire Water on their process of internal reviews and suggested these should be more formalised with 'terms of reference' and report back to Board level. Other than that the reporter effectively agreed with Yorkshire Water's assessment of the situation.

Given the information revealed in the IRB's interim report and uncovered in the Yorkshire Water section of this report, we feel it is a grave cause for concern that this was not revealed by the independent reporter.

We have a number of concerns about Ofwat's reporting process. Firstly reporters are appointed and paid by the water company. So in this case Yorkshire Water appointed their own reporter. Our understanding is that they

are appointed from a panel approved by Ofwat, but nevertheless there is a conflict of interest here, with the potential for reporters wishing for repeat business from a water company therefore not wishing to be too critical of that company.

Secondly, although Ofwat state that reporters have a primary duty of care to Ofwat, our understanding is that they are mostly previous water industry employees who have formerly worked for water companies. We understand the need for reporters to have an in depth technical knowledge of the industry but this needs to be balanced with a degree of perceived and actual independence which should be irreproachable.

Thirdly Ofwat state in their Information Note about Reporters, Auditors and Valuers that they carried out an external review of the reporter process in 2004. This confirmed that *"Ofwat could have confidence that the reporters' work had followed the draft business plan information requirements."* Whilst this may be the case, we have a grave concern that in scrutinising Yorkshire Water's performance through the June 2007 floods the independent reporter failed to raise any of the issues which have been raised by this Independent Review Body or by the Ove Arup November 2007 report.

We therefore recommend that Ofwat review the independence and rigour of their reporting system. One alternative may be to second staff from other agencies (e.g. the Environment Agency) to report on these issues.

A further issue for concern about the OFWAT/Utility/Reporter relationship is that of asymmetric information (as outlined in section 6.2). For the situation in Hull, this means that Yorkshire Water hold all the information about the performance and design of their drainage system, and the reporter can only base their report on information that Yorkshire Water provide. Therefore it may not be in Yorkshire Water's best interest to make all this information readily available.

We recommend that information about the strategy, performance and operation of Water Utilities operations should be in the public domain. The Utilities are private companies with commercial interests, but they are also a regulated monopoly that has a responsibility to serve the public. It is vital that this role is transparent and transparently regulated.

6.5 Summary and implications for OFWAT and Yorkshire Water

The water industry is subject to strict regulation of drinking water quality (by Drinking Water Inspectorate), to some extent of security of supply (by Ofwat) and of environmental quality (by Environment Agency). However there is no current regulation on the level of flood defence provided by drainage and sewerage systems. Numbers of properties at risk are measured as a Level of Service indicator by Ofwat, and reductions in these numbers appear as part of the assessment criteria for investment decisions in Companies' five year plans. But this is not backed up by any standards laid down in legislation or

government directives, as for instance is the EA's duty in terms of protection from coastal and river flooding.

In particular there is no regulation of protection against storms and flooding by sewerage systems. There is an "industry standard" of protection against a 1 in 30 year event for sewage systems. However, this appears to be rather vague and the regulatory team at Yorkshire Water specifically told us that *"there is a lack of consistency in design standards around the country"*. These industry standards do not take into account climate change, as is the case within the Environment Agency's investment planning decisions.

This lack of regulation provides no compulsion for water companies to invest in sewerage systems (as opposed to drinking water quality and sewage treatment).

We believe there may be significant underinvestment in surface water drainage by the water industry, due to the limited powers of the regulators appointed by the government.

Recommendation: There must be a mandatory standard for surface water drainage and sewage capacity which is regulated by Ofwat.

These standards must account for possible risks associated with climate change.

These standards must also be flexible, to account for local conditions and vulnerability.

It is important that this is policed by inspectors with unequivocal independence and that Ofwat is given the appropriate power to enforce.

Investment decisions within the water industry are made using cost benefit analysis examining the costs, benefits and risks for *only the company itself*. These risk assessments do not account for the damage that may occur to houses, businesses and infrastructure let alone to residents.

We recommend that Water utilities are forced to use a broader approach to investment analysis that accounts for the social costs and benefits of investment in sewerage infrastructure. Again this should be a responsibility of the regulator Ofwat.

We recommend that the role of the regulator and its powers are re-evaluated by the Government as a matter of urgency

7 Planning and Building in flood risk areas

7.1 Introduction

There are approximately 2.2 million properties located in flood risk areas, and there is increasing pressure to build on land within these areas. When building in flood risk areas, it is important to consider designing buildings to either resist flood waters or, where this is impractical, to mitigate the impacts of flooding and allow for a minimal recovery effort. It is also pragmatic to consider what can be done to improve the flood resilience of existing buildings.

This part of the report reviews existing planning rules and looks at how a combination of planning policy, building regulations, and education may be used to improve the flood resilience of properties.

7.2 Planning Policy

New developments in areas at risk of flooding are now only permitted after careful consideration of all the relevant facts in accordance with the governments planning guidance on development and flood risk (Planning and Policy Guidance note 25: Development and Flood Risk: PPG25) and the subsequent Planning Policy Statement 25: Development and Flood Risk (PPS 25) plus the practice guide for PPS 25 (currently out for consultation).

These documents are based on a precautionary approach, so that risk is avoided where possible and managed elsewhere. In addition there are two other policy statements that impinge significantly on flooding and its impact on the environment. These are: Planning Policy Statement 1: Delivering Sustainable Development (PPS1) and Planning and Climate Change. These point to the importance of planning in delivering sustainable development and indicate that regional and local planning authorities must undertake Regional/Strategic Flood Risk Assessments to appraise risk.

This document requires that regional and local planning agencies produce a spatial plan reflecting the levels of risk across their areas of interest. The recommendation is that they develop a risk-based sequential test that is applied at all stages of the planning process.

The starting point for this is to identify 3 categories of ‘flood zones’ based on the Environment Agency flood maps. These reflect the probability of river and coastal flooding ignoring existing and planned flood defences. Zone 1 has the lowest probability of flooding and zone 3 the highest. This information is then refined taking into account other sources of flooding, regional factors and climate change/sea level rise to produce a Strategic Flood Risk Assessment. The overall aim is to steer new developments into the lowest risk zones wherever possible and to match flood vulnerability with both the intended use and building methods (see Table 7.1).

Table 7.1

Flood Zone	Building of essential Infrastructure	Building that is water compatible	HighlyVulnerable Buildings (eg Emergency Services)	More Vulnerable Buildings (eg Hospitals, Residential)	Less Vulnerable building (eg shops, agricultural)
Zone 1	Yes	Yes	Yes	Yes	Yes
Zone 2	Yes	Yes	Exception Test Required	Yes	Yes
Zone 3a	Exception Test Required	Yes	No	Exception Test Required	Yes
Zone 3a	Exception Test Required	Yes	No	No	No

Most of Hull is within a flood risk area due to its low lying topography. This presents problems as many areas designated as having the highest risk of flooding are central to urban regeneration in the city, and the existing process does not incorporate sufficient planning flexibility. It also makes no allowance for risk mitigation, for example by building with only car parking on the ground floor and living space above.

In areas where redevelopment is advantageous but current planning guidance does not permit it, the IRB suggest a detailed site specific investigation be carried out and a risk mitigation be developed prior to planning being considered. Currently for an exception to be allowed, it must be demonstrated that the wider benefits of the planned development outweigh the flood risk. In addition, the development must be made safe and not increase the flood risk overall and will normally be on previously developed land.

We recommend that PPS25 be reviewed to account for anomalies of re-generation, for example allowing a less vulnerable development to proceed through the sequential testing by demonstrating provision for flood mitigation.

7.3 Existing building stock

The Policy documents mentioned above apply to all new developments in flood risk areas, but are not applied in the same way to changes in existing buildings. This is of concern to the IRB, because we feel that measures are necessary to ensure that existing premises in flood risk areas are upgraded and owners encouraged to take proactive measures to reduce the risks associated with flooding.

We believe this could in part be achieved via the Planning and Building Regulations applicable to modifications, extensions and material changes in use. This may require amendments to the permitted development section of

the regulations. For example, currently if planning permission is sought for an extension to a house there is no requirement that it is constructed to withstand flooding, whatever the risk and however large the extension. This presents a problem as the size of the building under threat from flooding could be allowed to increase substantially with no additional protection.

The IRB therefore suggest that this approach be reviewed and that all extensions requiring planning permission in flood risk areas should be required to have the appropriate level of flood proofing.

Other planning devices that might be used to improve the level of flood protection for existing housing stock could include, for example, an Article 4 direction prohibiting hard standing without Local Authority approval and that detailed risk assessments support all applications for alteration.

Another method for reducing flood risk is to employ Sustainable Urban Drainage (SUDS) methodologies. These include soakaways, oversized sewers, use of swales, wetlands, storage tanks and other forms of water attenuation. However, as Hull is situated on impermeable clay and is low lying, some SUDS methodologies are inapplicable and research into the benefits and longevity of SUDS solutions is imperative.

7.4 Strategic Flood Risk Assessment in Hull

A Strategic Flood Risk Assessment (SFRA) is currently being developed in Hull and a consultation document will be issued later in 2007. The process being undertaken in Hull will also take the unprecedented step of incorporating the flood risk from pluvial (rainfall) flooding.

As there is little land within the City boundary that is outside the Environment Agencies zones 2 and 3, these areas are being subdivided into areas at lower risk, particularly for more vulnerable developments such as those for residential use (Figure 7.1). The detailed zoned plan being developed will inform all future planning decisions and should feed through into recommendations on building methods and the need to flood proof new buildings to a level appropriate for the flood risk at their locations.

7.5 Building Regulations

As mentioned above, the SFRA process is applied only in the case of new developments. Even planning approvals for substantial changes to existing buildings do not specify any increase in flood protection of the property over and above that which already exists. This is not ideal as the planning permission structure, as currently applied, will only yield minor improvements in the flood-resilience of existing housing stock. An alternative more robust method for encouraging improvements in flood resilience is therefore required.

This could be offered through the use of Building Regulations and the need for approval for any material alterations to properties. Existing regulations require that such alterations are carried out to a standard outlined in the set of Approved Documents. In 2003 the building regulations were amended to

Figure 7.1 Draft map of relative flood risk in planning zones

regulate domestic electrical installations and improvements in thermal conductivity when replacing external doors and windows. Furthermore, when carrying out work there is an additional requirement to bring existing works up to standard when exceeding a fixed percentage of the house size.

A similar approach should be taken to flood risk and the IRB recommend that flood resilience be made mandatory as part of the building regulations in all high flood risk zones.

There are a number of reviews and workshops currently identifying and reporting on measures which could reasonably be applied to new and existing houses. The IRB are very disappointed to report that despite an excellent opportunity, reinstatement works to flooded properties have to the best of our knowledge missed the chance of implementing flood resilience.

7.6 Recovering from flood Damage

We are aware of considerable differences in the repair schedules drawn up for properties with similar flood damage. We are led to believe that many homes may have experienced excessive and un-necessary disruption as a result of conflicting advice.

We recommend that in order to ensure the health and safety of occupiers that insurance companies and Loss adjusters adopt a standard good repair guide using the BRE Good repair guide as a basis

We also recommend that DEFRA consider including guidance within the Building Regulations and provide regulation for reconstruction following flooding.

7.7 Informing and Influencing Businesses and Householders

Damage to property is only a small element of the true 'Human Cost' of flooding. The stress associated with losing personal belongings, having to live in temporary accommodation while repairs are undertaken and the trauma of the clean-up and restoration can be considerable. While it is not possible to eliminate the risk of flooding all together, many steps can be taken to reduce the impact on properties thereby reducing costs of repair, the stress on the individuals involved and improving recovery times. Part of this process is to ensure firstly that property owners and developers are informed about how they can improve the flood resistance of their properties and secondly that they are encouraged to make the necessary investment. These two aspects of the problem are considered separately below.

7.8 Information and Education

There are a large number of good documents describing how the flood resistance of existing properties can be improved, mostly available from the Environment Agency website (www.environment-agency.gov.uk). Most useful are 'Preparing for Floods' (ODPM document 2003) and 'Damage Limitation' which gives details of methods and materials that can be used for flood proofing. There are even documents that give advice on making the garden

more flood resistant and improving its recovery time (Flooding in Gardens:) In addition there are documents which issue post-flood advice (for example: EA document 'After a Flood'). However, most of these are only available over the internet and therefore inaccessible to most vulnerable people and many are large and unwieldy documents which would discourage all but the most literate and determined of readers.

We recommend clear written advice and information, in leaflet form, that can inform residents on the risk and enable property owners to decide the most appropriate solution for their own situation. In addition there needs to be a well planned and executed campaign to inform and educate residents. This might also include a community training event, a schools campaign integrated into the science curriculum to inform children and a business awareness campaign

7.9 Encouraging investment in flood proofing

The cost of flood proofing an existing property is a significant deterrent for many households. We believe that it is important to introduce some financial inducements to encourage people to take individual action to protect themselves.

One way of achieving this is to offer grants towards the costs of flood proofing in high flood risk areas. This approach has been effective in encouraging home insulation to reduce carbon emissions and should be similarly effective for flooding. In addition the existence of grants towards flood proofing costs would help raise awareness of the risks.

8 Public emergency information and the role of the media

8.1 Introduction

The IRB has been able to make preliminary enquiries into the role of the relevant authorities in providing information regarding emergency events and its dissemination through the media. The IRB has consulted with representatives of Humberside Police, Humberside Fire and Rescue Service, the BBC, the City Council and Mail News and Media.

It is clear that the decision making of a command structure in emergency situations can not be influenced by the immediate involvement of the media. Emergency situations can not be made with a background of concern over how difficult choices that may involve peoples' lives are made. The reporting of public information, particularly within a regular and well understood framework will support any emergency effort, improve safety and provide reassurance. The media effort should therefore be one step removed but immediately available for the command structure.

8.2 Background

The Humber Local Resilience Forum's Communications Sub Group meets regularly and includes the four local authorities, emergency services, the Primary Care Trust and other responders. The meetings are also attended by the BBC. The Group is taking forward the requirement in the Civil Contingencies Act 2004 to raise awareness of the key risks and the mechanisms for warning and informing the public during a major incident.

A Protocol, 'Communicating with the Public', has been agreed under this responsibility. This Protocol (work on which is ongoing) is for all emergency situations, defined as 'an event or situation which threatens serious damage to human welfare in a place in the UK, the environment of a place in the UK, or war or terrorism which threatens serious damage to the security of the UK'.

Aims of the protocol are to:

- Ensure that the public are made aware of the risks, are warned and advised.
- Confirm how Agencies have prepared to deal with an emergency.
- Confirm lead responsibility for warning, informing and advising the public.

8.3 Awareness, Warning, Informing and advising the Public

Local Authorities and Emergency Services are encouraged to raise public awareness through public involvement in determining policy. This includes vulnerable people and groups that are currently excluded from public policy.

Lead responders are identified to co-ordinate the media response to an emergency. In many situations it will be the police who will take an initial co-ordinating role in the early stages and initiate a media response. Under the published Protocol the severe weather section provides for the Environment Agency to be the lead organisation for a flooding incident. There is no highlighted lead organisation for storms, gales and other extreme weather incidents. Although the police service assumed the lead responder role during

the June incident the confirmation of responsibility is recommended to provide some clarity of roles.

Local radio is highlighted as a highly effective method of informing the public. The BBC is to confirm it's approach confirmed in a policy document 'Connect in a Crisis' annexed to the Protocol. This is referred to as "work in progress".

During emergency events, any contact can provide security to those in need. During the June events, information was passed by word of mouth, leafleting, use of the internet, telephone messages, radio and TV broadcasts. At each stage, one form of communication was most effective for individuals in different circumstances. Furthermore, the dissemination of information will fall into different categories of urgency, from immediate to general information and public service information.

We recommend reconsidering the important role of other radio and television stations as the media market becomes more saturated, together with the printed media in emergency periods.

8.4 Media and the 25th June 2007

Essential elements of the Protocol include liaison between responders, identifying potential sites for media centres, providing media training, suitable equipment, arrangements for mutual aid to be provided by neighbouring areas and for liaison with the Government news network.

Although some of these elements were clearly in place during the June event, access to the Priory Road Police Media Centre was not available through flooding and limited facilities were immediately available for Silver Command resulting in its relocation to Festival House following alternative space and equipment limitations.

Written and broadcast media have raised concerns regarding the standard and accuracy of information provided on 25th June. The Protocol recommends that an emergency media centre be considered in a prolonged incident with appropriate facilities from which a flow of credible information should be established with a media co-ordinating group. The media group works alongside the Silver Command.

On 25th June 2007, as the nature of the incident was different for the 4 local authorities, it was impractical for individual authorities to provide information through a single media centre. Humberside Fire and Rescue Service and the police provided press communications from 24th June. Initially information was available by recorded message on a dedicated number available to the media. This was regularly updated. The scale of the impact of the 25th June 2007 storm event created an unprecedented amount of information for which clear communications were difficult to maintain. Individual reporting by agencies and the scale of the incident limited the co-ordination of the content and timing of information. The City Council moved into an organised "situation reporting system" with 24 hour rotas. The Council's press office

returned to normal working practice once the incident room closed down on Monday, 1st July.

The Council recommends that the communications Protocol agreed by the partners needs to be reviewed in the light of recent experience and that key risks to the City and sub region need to be highlighted to improve preparedness and inform residents how they can protect and prepare themselves. Internally the Council should review its business continuity plan including communications staff being assigned a given role with training.

8.5 Conclusion

The Protocol can benefit from the experience of the June events. The system operated to the best of the ability and resources of all parties involved during the June events. A revisit of the unfinished Protocol appears necessary and the 'work in progress' needs completing.

Priority appears to be for secure physical space to be immediately available that is appropriately resourced and accessible.

The responsibility for the lead role for storm and other events needs to be confirmed perhaps with a presumption for the Emergency Services to take initial responsibility due to their greater resources.

The important role of printed and web based information should be reconsidered within the Protocol.

9. Overall findings

Hull has the largest number of households and people affected by the summer floods for any one area in the UK. Over 8600 households were damaged by the June floods, home to over 20 000 people. Of these, 6 300 were forced to live in alternative accommodation with over 1 400 people living in caravans. We are amazed by the incredible resilience and high levels of social capital shown by the residents of Hull. The good will, comradeship and willingness to help neighbours and strangers in times of need are extraordinary.

Schools were especially badly hit in Hull, with only 8 out of 99 schools unaffected by the flooding. In total over 114 000 pupil days were lost, though it was fortunate to be close enough to the end of term to prematurely close schools. The floods have shown the importance of schools as a social hub to the community, and how their closure can have a high social and economic cost. Parents were forced to take time off work, resulting in millions of pounds in lost earnings and this can have a greater impact on some groups, for example lone parents.

The Council's response to the floods was widespread, adopting a tenure blind approach treating all affected persons in the same way regardless of council/private home ownership. To maximise care for the vulnerable a graded response was adopted where households were classed as gold, silver and bronze and received different levels of care accordingly. There was also a significant input from the Council's 300 community wardens, both during and after the event, and the voluntary sector played a huge yet largely unseen role organising and helping many communities and groups. Hull received over £1million in charitable donations, over £300 000 from the hull flood fund and £700 000 from the British Red Cross.

Databases played a surprisingly important role. In the initial emergency they helped locate vulnerable people to be rescued or checked (e.g. the elderly and infirm) and in the recovery phase they helped in the allocation of relief funds and in maintaining contact with the vulnerable.

We continued our detailed review of Yorkshire Water's pumped drainage system in Hull and found a series of serious issues with its design, maintenance and operation. At Bransholme and Kingswood, where over 1000 homes flooded, the pumping station responsible for the areas drainage failed during the floods. Yorkshire Water reports in 1996 and 2001 raised concerns about the capacity, reliability and structural integrity of the Bransholme pumping station. Yorkshire Water was unable to confirm or produce any records of any action taken in light of these reports. We believe that had Yorkshire Water acted on some of these recommendations then the flooding in Bransholme and Kingswood would not have been so severe.

For West and East Hull, where there was extensive flooding in 2007, Yorkshire Water reports from 2004, 2006 and 2007 indicated that the new £200 million 'Humbercare' system had actually reduced the drainage and pumping capacity of Hull. Detailed Modelling in 2004 and 2006 showed that

the new Humbercare design had underestimated the volume of water from some storms by 100%. In 2004 the system was only providing protection from a 1 in 1 to 1 in 2 year flood event instead of protection from a 1 in 30 year event. Options for permanent solutions to this problem were presented to Yorkshire Water in 2004 and 2006.

In 2007, 2 ½ years after the initial report detailing these issues, Yorkshire Water implemented a temporary solution based on bolting on the de-commissioned 40 year old pumping stations at West and East Hull. During the 2007 floods there were serious operational issues with this arrangement (notably the poor reliability of old pumps and oscillations developing in the main Humbercare transfer tunnel) and we have significant concerns as to whether the system performed correctly. We understand that plans for a permanent solution are now being pursued after the June floods. We feel that had the permanent solutions suggested in 2004 and 2006 been implemented by the time of the June 2007 floods, the impact of the floods would not have been as severe.

The floods in 2007 were severe, and some flooding was perhaps inevitable. However, as many properties in Hull were only flooded by a few centimetres of water (or less), we conclude that had the recommendations offered since 1996 been followed, some properties in Hull would not have been flooded.

Yorkshire Water and other water utilities are controlled by the regulator Ofwat. We noted many concerns with the lack of regulatory powers Ofwat has over urban drainage. Ofwat has powerful rules and penalties governing price, water quality and availability but very few for the design standard and flood defence capabilities of drainage systems. The only design regulation is a non mandatory 'industry standard' of 1 in 30 year protection.

Investment decisions are also regulated by Ofwat, but the only risks considered are to the infrastructure of the water utility itself, not the risk to the households and businesses that may be affected by flooding. Furthermore, the policing of water companies is by reporters appointed by the water utility themselves (from an approved pool) and we have serious concerns about the transparency and level of investigation they are able to undertake.

In the UK there is a pressure to build new houses, and often prime locations are located on floodplains or in flood risk areas. Most of Hull lies within a flood risk area which can make planning decisions difficult. Instead of a blanket ban on development within the city a Strategic Flood Risk Assessment subdivides the flood risk areas into those where there is less risk than in others. A sequential test is then applied to establish the suitability or otherwise.

We also note that this policy only applies to new buildings and developments. Extensions are not considered; however these can significantly increase the size of a property with no added consideration for the flood risk or contribution to the drainage flows. We note that within the Building Regulations there are no specific requirements to provide additional protection for properties within flood risk areas, nor is their any direct regulation on flood recovery. This has

resulted in lost opportunities to improve standards of resilience to existing affected stock.

The UK is very unusual as flood risk is the responsibility of private insurance. In most Western nations the government underwrites flood risk. In the UK there is a ‘Statement of Principles’ between the insurers and the government that ensures that people living in flood risk areas (that are defended) can renew their insurance as long as the government promises to defend these areas. Hull is protected so insurance should continue to be available, though it is likely to increase in cost.

There are over 40 different insurance companies, all with different rules and algorithms for calculating premiums, so it is hard to determine a general method for calculating risk. Some base it on distance from river, some on a postcode basis. Details of all claims are recorded on a central data base, but not all companies access this record. The IRB asked representatives of the insurance industry whether capped cover, significant excesses or modifications to flood proof houses would be appropriate methods to reduce the cost of premiums. This was met with a mixed response.

10 Recommendations

10.1 National Recommendations

We were surprised by the lack of power the water regulator Ofwat has to control the design and performance of Water Utilities' drainage systems for flood conditions. We feel that **mandatory standards for flood protection in drainage systems must be set**. These must account for the possible impacts of climate change and be flexible enough to incorporate local vulnerabilities. **We also feel that a Government level re-evaluation of the regulatory powers of Ofwat is required in order to enforce drainage standards and ensure adequate flood protection**.

Integral to this is a more transparent, less industry based method of assessment of utility operation. **Importantly, detailed information on the performance and operation of Water Utilities' drainage systems should be in the public domain. The Utilities are private companies with commercial interests but they are also regulated monopolies that have a responsibility to serve the public and ensure adequate flood protection. It is vital that this role is transparent and transparently regulated.**

The UK has a unusual arrangement with the insurance industry and the Government should look at underwriting flood risk, or other alternatives as per other nations. Insurers should also consider offering discounts for home protection and other resilience measures

We also have recommendations regarding planning, that home extensions in flood risk areas should be required to have a level of flood proofing/flood resilience inbuilt. Furthermore, **building regulations could be changed to ensure that flood resilience measures (e.g. resistant materials, changes in wiring) are mandatory in flood risk areas**.

There is also a need to protect key parts of *social* infrastructure. **We recommend that extra protection and consideration be given to schools, which could be described as 'social power stations'**. Given the large number of working parents and lone parents, school closure has a massive impact on both the local economy and community. We need to ensure that schools - and their operation - are protected against floods or have added resilience.

As pluvial flooding is not identified as a separate risk under the new Civil Contingencies Act 2004, **we recommend that emergency planning for this eventuality should be undertaken a matter of urgency by all regional and local authorities.**

10.2 Local Recommendations

We have found significant issues with the pumping and drainage infrastructure in Hull and recommend that urgent action is taken to provide permanent solutions. This includes upgrading Bransholme pumping station with the addition of extra capacity for added resilience and the re-development of West and East Hull pumping stations. Proactive pumping in preparedness for high rainfall events may improve the effectiveness of the current system's capacity. We also hope that added capacity is incorporated to account for possible climate change and development, rather than developing to the minimum standard. We recommend that Yorkshire Water, Hull City Council and the Environment Agency continue to work together (as they have begun to).

For Hull City Council, there are clear recommendations to ensure better communications and the stockpiling of equipment (especially protective clothing) for future emergencies. There is the need for the designation of a second command centre that is fully equipped and maintained for the purposes of co-ordinating and directing emergency management. There is a need for new emergency plans to cope with the threat of pluvial flooding and regular training is essential to ensure that staff are aware of responsibilities. This is especially important in sections with high staff turnovers. In particular, the localisation of these plans is important and we recommend that each local area devises its own plan for flooding. It is also important to raise the awareness of flooding and how to deal with floods within the population of Hull. This could include the creation of leaflets of what to do in an emergency and how to protect your home and possessions. There should be a concerted effort to ensure communities have access to and understanding of information that equips them to deal with any future flood events.

Providing accurate information, both between agencies and to the public, increases the effectiveness of all emergency efforts. The Humber Local Resilience Protocol 'Communicating with the Public' should be completed, providing clarity of responsibility and widening participation with appropriate resources made available

We also recommend that a program of further research is undertaken to address some of the scientific and academic questions that have arisen from this review. These questions include research into the complex groundwater movements in East Yorkshire and Hull, the impacts of altering land drainage systems on rivers, watercourses and the habitats within them. Furthermore, there are substantial social issues that warrant research such as long term impacts of the flooding on people health, well being and prosperity.

11 Glossary

- ABI – Association of British Insurers
- AMP2 – Design reference from Yorkshire Water for Humbercare system
- AOD - Above Ordinance Datum
- Area – One of Hull City Council's seven administrative Areas (Riverside, East, Park, Northern, North Carr, Wyke and West)
- Attenuation - Storage and controlled release of water
- BRE – Building Research Establishment
- BSF – Building Schools for the Future
- CIRIA – Construction Industry Research Information Association
- CMMA – Construction Management Association of America
- Combined system of drainage - Foul and surface water mixed in the same drainage pipes
- Community Federation – Body whose primary role is grant making
- Connaught - contracted by Hull City Council to improve council housing
- CRB – Criminal Records Bureaux
- CSO - Combined Sewer Outfall
- CYPS – Children and Young Peoples' Services
- DCSF – Department for Schools, Children and Families
- EA - Environment Agency
- FLOSS – Hull City Council database regarding flood victims
- Fluvial flooding - term given to river based flooding
- GIS - Geographic Information Systems
- GOYH – Government Office Yorkshire and Humber
- HCC -Hull City Council
- HFRS – Humberside Fire and Rescue Service
- Hull Catchment - Area of land contributing water flow to the Hull sewerage systems
- Humbercare - 2001 scheme by Yorkshire Water to treat sewerage in a combined system
- Hydroworks - Early modelling software
- Infoworks - Recent modelling software
- Inlet Station - Saltend treatment works
- IRB - Independent Review Body
- Kier - contracted by Hull City Council to improve council housing
- Kingswood Development - Development to the west and North of Engine Drain
- KWL – Kingston Works Limited, contracted by Hull City Council to improve council housing
- m^3s^{-1} - metre cubed per second
- MWH – Consultants commissioned by Yorkshire Water in 2004
- Ofwat – Office of Water Regulation
- Outfall - Outlet capacity into the river
- Penstocks - Large vertical gate valves
- Pluvial flooding- Term used to describe flooding from rain water run off
- PPG25 - Planning Policy Guidance regarding flood risk
- PPS - Planning Policy Statement

- RSL – Registered social landlord
- Separate system of drainage - Separate drainage pipes for foul and surface water Sewerage Drainage infrastructure
- Sewage - Foul water
- SPS - Surface Pumping Station
- Suds - Sustainable Urban Drainage Systems
- Tidal - From the sea/tidal river
- Tunnel / Transfer Tunnel - connecting tunnel in Humbercare
- VCS – Voluntary and Community Sector
- WWTW - Waste Water Treatment Works
- YW - Yorkshire Water

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- Jack Greensides
- MWH -Mark Priestley
- Ofwat - Gordon Allan
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- Kingswood Parks Development Company Ltd
- Hull Churches Home from Hospital Service
- Hull Churches Housing Association
- Sanctuary Housing North
- Carers' Centre Hull,
- Hull & East Yorkshire Mind
- Choices and Rights Disability Coalition
- Willow-The North Hull Women's Centre
- Barnardo's Hull
- Hull Civic Society
- Auckland Avenue Neighbourhood Watch
- Parklands Neighbourhood Watch
- HICA
- Pickering and Ferens Homes
- Endyke Community Care
- KUH Gateway Club
- Longhill Link Up Trust
- Lonsdale Community Centre
- Key Churches Together
- Ella Street Residents' Association
- Community Church Hull
- Bound Together Residents Association
- Hull, Beverley and Holderness Multiple Sclerosis Society
- Mencap Advocacy Service
- Hull Independent Housing Aid Centre
- West Hull Women's Centre
- Citizens Advice Bureau
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