

Doc. Ref.: ES01260

PART 1/PUBLIC

LONDON BOROUGH OF BROMLEY

COMMITTEE : Environmental Services Committee

DATE : 6th June 2001

SUBJECT : GROUNDWATER AND DRAINAGE PROBLEMS ARISING FROM HIGH RAINFALL IN THE AUTUMN/WINTER OF 2000/01

Chief Officer : Director of Environmental Services

Contact Officer : Bob Hetherington, Extn: 4701

Ward : Crofton, West Wickham North, West Wickham South

1. SUMMARY

1.1 This report provides an update on the continuing groundwater flooding problems at Courtfield Rise and Borkwood Court as set out at the last meeting of the Environmental Services Committee. It also proposes a way forward and considers how to tackle similar incidents in the future.

2. RECOMMENDATIONS

2.1 Members note the following action undertaken as resolved at the Environmental Services Committee on 28th March 2001: -

- a) A meeting with residents took place on 11th May.
- b) An independent study was commissioned and this confirmed that rising groundwater is the likely cause of flooding.
- c) Water is receding and pumping is unlikely to be necessary at either site beyond the end of June.

2.2 Members agree that the Council should advise residents that it is unlikely that the pumping remains necessary in July 2001 and the Council will withdraw the pumping facilities by the 14th July, but the Council assist residents as to where guidance on preventative measures and foundations can be sought. However, no

future assistance will be provided should ground water flooding return to either Borkwood Court or Courtfield Rise after July 2001.

- 2.3 Members agree to continue to lobby the Government to require the Environment Agency to lead on groundwater flooding.**
- 2.4 Members agree that the Council should reserve its position to provide emergency relief to groundwater flood incidents in the future, but that Officers should develop a procedure to strictly limit involvement.**

3. INFORMATION

3.1 Committee Meeting 28th March 2001

3.1.1 A report entitled "Groundwater & Drainage Problems arising from High Rainfall in the Autumn/Winter of 2000/01" was presented to the Environmental Services Committee on 28th March 2001. This report summarised flooding problems caused by the unusually heavy rainfall resulting in increased levels of groundwater at three sites, together with the actions taken by the Council to alleviate them. It recommended that Members endorse these actions and consider whether the Council should continue pumping at Courtfield Rise and Borkwood Court.

3.1.2 The Committee resolved that pumping at Courtfield Rise and Borkwood Court be continued by the Council for the time being, the position to be reviewed at the next meeting of the Committee. It also resolved that a survey be commissioned to confirm the causes of the flooding at Borkwood Court and the results reported to residents at a meeting, to include representatives of Thames Water, the Environment Agency and residents' insurers.

3.2 Current Situation – Sparrows Den, West Wickham

3.2.1 The water level at Sparrows Den playing fields rose continuously from early February until the end of March when the water lay only 60mm (2.5 inches) below the kerb at Corkscrew Hill. The Council placed a line of sandbags along the edge of the road as a precautionary measure to reduce the risk of flooding to the highway and the properties opposite. Since then, the water level has fallen increasingly rapidly and in early May it lay more than 300mm (12 inches) below the kerb.

3.2.2 Although the risk of flooding from Sparrows Den has now reduced, the Council remains under pressure to further reduce the level of water in Sparrows Den playing fields. Beccehamian Rugby Football Club has been unable to use its three pitches since early January, suffering financial loss as a result and it may be some time before the water level recedes sufficiently to allow the use of these pitches. However, the Environmental Services Department's role in dealing with the flooding is to prevent water from entering property and it is not anticipated that any additional work will be undertaken at Sparrows Den.

3.2.3 The Council is continuing to pump water from the springs in Courtfield Rise to prevent internal flooding to four properties. There has been a slight reduction in the flow of

water entering these gardens but the threat of flooding to dwellings remains, as evidenced on 15th May when a pump failure during dry weather caused six inches of water to enter the garage of 9 Courtfield Rise. It is anticipated that the flow of water from springs in Courtfield Rise will begin to decline shortly, since there is likely to be a time lag between a fall in the water table at Sparrows Den and that at Courtfield Rise, which is further down the valley.

3.3 Current Situation – Borkwood Court, Orpington

- 3.3.1 Water levels at Borkwood Court have also fallen significantly since the end of April and this allowed one of the two pumps to be removed on 14th May. If the water table continues to recede at the current rate it is likely that the remaining pump could be withdrawn within the next few weeks. Thames Water is continuing to abstract water from both Tower Road and Kent Gate Pumping Stations in excess of their licence, with the Environment Agency's approval. A verbal report on the current situation will be made at the Committee meeting.
- 3.3.2 Simpson & Partners, an independent water and environmental consultant, was commissioned to undertake a hydrogeological review of the flooding at Borkwood Court. Following a site meeting, the Council provided the consultant with a level survey and photographs of the site, graphs of groundwater levels at nearby pumping stations, archive plans of the site and surrounding area, details of a sample of the flood water and a map of the local drainage systems.
- 3.3.3 The consultant has concluded that the flooding appears to be caused by groundwater that has risen to emerge at Borkwood Court, the most convenient location where the ground level is lower than the surrounding area. Borkwood Court is in a local depression on the line of a dry chalk valley, representing the course of a pre-historic river that today rises at the springs at Priory Pond and forms the source of the River Cray.
- 3.3.4 The consultant's recommendations were as follows, with officers comments in italics: -
- a) The efficacy of pumping groundwater at the site should be given careful consideration and the attendant risks to the stability of the surrounding soil should be examined.
Pumping has helped reduce the water level and prevented internal flooding to property. The water looks very clear and there are no sign of fines being pumped away from beneath the building, therefore pumping does not appear to be affecting the stability of the soil.
 - b) The owners of the site should be made aware of the changing ground conditions that may be taking place at the site and the possible risks to the foundations of the properties that are located there. Consideration should also be given to undertaking an urgent geotechnical survey of the site to determine the engineering properties of the ground.
It is possible that fine material could be removed from the subsoil when the water table lowers to its normal level and cause subsidence. It is recommended that the residents/freeholder commission a geotechnical survey once the water level has dropped.

- c) Consideration should be given to the public health risks at the site caused by the presence of ponded water and the possible ingress of chemicals and fuels and foul sewage that may take place.
The water was tested for faecal contamination on 30th April and none was found.
- d) As it appears that groundwater levels are not falling and there is a strong possibility of it remaining high for some weeks ahead, consideration should also be given to undertaking a monitoring programme of water levels at the site and at selected boreholes and springs in the area. Such a programme should be undertaken to produce regular reports to the Council from now until July.
The water level has been dropping since the end of April so this is not considered necessary.
- e) A review of existing data regarding recently collected rainfall and groundwater level data should be undertaken to assess the severity (i.e. rarity) of the present groundwater conditions and to estimate the likely duration of high water levels continuing.
Borehole information from the Environment Agency at Chelsfield Lane (approx. 2.5km away) indicates that water table is at its highest since records began there in 1968. There is no previous history of groundwater flooding at the site.
- f) Thames Water should be encouraged to continue pumping groundwater into their supply mains to reduce groundwater levels in the local area.
Thames Water is continuing to pump groundwater in excess of its licence at Tower Road Pumping Station, at the Council's request.

3.3.5 The British Geological Survey was also commissioned to carry out a desk study into the cause of the flooding. This was based on their knowledge of the hydrogeology of the area, together with a chemical analysis of the water sample, details of local groundwater levels and the quantities of water being pumped away from the site. They concluded that the timing of the onset of the flooding, the recent decline in water levels and the volume of water pumped were all consistent with a groundwater flooding event, although a more detailed analysis of the water from the site was required before they could unequivocally state that the flooding was due to groundwater.

Meeting with Residents held on 11th May

- 3.3.6 A meeting was arranged for Friday 11th May at Church of the Holy Innocents hall to allow interested parties to discuss the flooding problem. The meeting was attended by John Horam MP, Councillors Helen Rabbatts, Viv Ross and Geoff Gosst and 28 residents from Borkwood Court and the surrounding area. Representatives from Thames Water, the Environment Agency and the residents' insurance companies failed to attend.
- 3.3.7 Thames Water declined to attend on the grounds that they have no jurisdiction over flooding from groundwater, but the Managing Director pointed out that the company had accepted the pumped groundwater from Borkwood Court into its surface water sewer, although it has no duty to do so. The Environment Agency did not reply to the invitation. It is understood that the insurance companies were not interested in attending

because buildings and contents insurance are only applicable in the event of damage being caused and do not cover preventative measures.

3.3.8 At the meeting a presentation was made to the residents explaining the causes of the flooding as confirmed by the independent consultants and setting out the roles of the Council, Thames Water and the Environment Agency. Questions raised by residents in correspondence were then addressed, followed by an informal question and answer session. These questions are set out as follows, with officers' comments in italics: -

- a) What will be done to prevent a reoccurrence of the problem in future?
Residents are advised to seek guidance on preventative measures to reduce the risk of damage to their property in the event of a future flooding event. The flooding is a natural occurrence caused by the record levels of rainfall last autumn and winter.
- b) What is the risk of damage to foundations?
There is a risk of ground movement associated with the rise and fall of the water table. Residents are advised to seek advice from foundation engineering specialists.
- c) Should the Council take some responsibility for the flooding because highway run off draining to soakaways is recharging the aquifer and therefore contributing to the problem?
It is accepted that water from the highway is likely to be contributing to the flooding, but the volumes of water draining from the road are tiny in comparison to the volumes reaching the site from the natural catchment, which extends south to Biggin Hill.
- d) Is the Council legally/morally responsible for the flooding because planning permission was given for local developments that have affected the natural retention of water in the subsoil?
Most of the recent local developments are drained to soakaways so surface water run off from hard surfaces is drained down to the water table. However, water would have drained straight into the ground prior to these developments being constructed so they are unlikely to have had an effect.
- e) Could the high water table be affecting all the properties in the valley, and if so, why should the residents of Borkwood have to take sole responsibility?
The responsibility for groundwater rests with the owner of the land from which it rises.
- f) It is unreasonable to expect the landowner to deal with groundwater flooding for which he/she has no control. Should responsibility for it be passed to one of the drainage agencies, either the Council, the Environment Agency or Thames Water?
Local Members of Parliament have raised this issue with the relevant Minister.
- g) Could a scheme be funded from the energy levy to alleviate the effects of global warming?

It is likely that any funding from the energy levy will be used by the Regional Flood Defence Authorities to combat the severe and high profile flooding from rivers experienced last autumn.

- h) Is compensation payable for damage and loss of value to property?
There is no mechanism for compensation to be paid for flooding by groundwater because no agency is responsible for it.

3.4 Future Action

- 3.4.1 The role the Council has in land drainage and highway drainage matters was set out in a report to Environmental Services Committee on 8th November 2000 (minute No. 562). This position is summarised in the Legal Consideration Section of this report, together with the responsibilities of Thames Water and those of the Environment Agency.
- 3.4.2 The issue of rising ground water that causes flooding was not addressed in the November 2000 report as it was not perceived to be a problem at that time. Since then, however, it has become both a local and national issue.
- 3.4.3 The local Members of Parliament, John Horam, Jacqui Lait and Eric Forth have been kept up to date with the flooding problems. John Horam and Jacqui Lait have replied, agreeing with the Committee's views that the Government should intervene and make the Environment Agency responsible for providing temporary relief when groundwater flooding occurs. They have referred this matter to Michael Meacher and the Chief Executive of the Environment Agency. Eric Forth has not yet replied.
- 3.4.4 Further consideration needs to be given as to how the Council should respond to the current problem and possible future flooding incidents from rising groundwater.
- 3.4.5 On the two existing sites (Courtfield Rise and Borkwood Court) it is probable that pumping will not be necessary after the end of June 2001. In the unlikely event that pumping at either site is necessary to protect property, the Council should give two weeks notice to residents that it will not continue pumping after mid July 2001. The Council should make the consultant's report available to the residents of Borkwood Court and advise them where they may gain the additional information referred to in the report. The investigations in the Addington Road non-main water course should be completed as quickly as practical and a report submitted to Members in the autumn of 2001.
- 3.4.6 In the unlikely event that prolonged heavy rainfall recurs, there is a possibility that ground water flooding could return. Whilst the Council should continue to press for an "agency" to take overall responsibility, the situation with regard to known locations (Courtfield Rise and Borkwood Court) and those not yet identified should be clarified.
- It should be made clear to residents of known locations that the Council will not re-commence pumping;
 - For other locations, the Council may wish to reserve its position to provide emergency relief but should establish a procedure whereby

residents are informed of the legal position and the Council expectation that within two weeks of being notified the Council will withdraw its support.

4. WARD MEMBERS' VIEWS

- 4.1 Ward Members support the steps taken by the Council to prevent flooding to property and to keep residents informed of the situation. They have great sympathy for the residents and businesses affected and feel that groundwater should not be the sole responsibility of the landowner. Members feel that the Government should intervene, requiring the Environment Agency to take the lead on groundwater flooding at the earliest possible time.

5. POLICY/CORPORATE PLAN/SERVICE PLAN CONSIDERATIONS

- 5.1 The action taken and proposed is in support of the Committee's purpose "To protect and enhance the human, natural and built environment".

6. SUSTAINABILITY CONSIDERATIONS

- 6.1 The flooding problems that are detailed in the report result from unusually high rainfall over a prolonged period, which means that the groundwater table is exceptionally high. The action taken to mitigate the consequences of this naturally occurring event is in line with the Council's principles set out in its Local Agenda 21 document "Blueprint for a Better Bromley".

7. FINANCIAL CONSIDERATIONS

- 7.1 There is no defined budget for funding the flood prevention work that has been undertaken since January under the Council's current land drainage policy. Funding for the work undertaken in the year 2000-2001 was achieved through reductions in highway maintenance expenditure and income generated from defect correction notices issued to public utilities.
- 7.2 The cost of pumping and associated works to prevent flooding in this financial year is estimated at £46,000 to 14th July 2001, as set out in the table below. A single pump is currently in use at both sites costing £1,500 per week per pump. It is anticipated that pumping will no longer be required at Borkwood Court after 10th June, but it may be necessary to continue pumping until the end of June or beyond at Courtfield Rise to prevent flooding to dwellings.
- 7.3 The expenditure incurred during 2001-2002 will be financed from within existing Highway Maintenance Revenue Budgets.
- 7.4 Table of Estimated Costs to 14th July 2001

| | 2000/2001 | 2001/2002 |
|-----------------------|----------------|----------------|
| Wickham Bourne | | |
| Pumping | £14,000 | £21,000 |
| Other costs | £ 1,200 | £ 1,000 |
| Borkwood Court | | |
| Other | £ 1,000 | |
| Pumping | £21,000 | £24,000 |
| Total | £37,200 | £46,000 |

- 7.5 The above table summarises the Council's costs in preventing flooding to property, however the Council is also under pressure from Beccehamian Rugby Football Club to further reduce the level of water in Sparrows Den playing fields. Discussions are being held with the Leisure and Community Services Department as to how to proceed in removing the remaining water.

8. PERSONNEL CONSIDERATIONS

- 8.1 None.

9. LEGAL CONSIDERATIONS

- 9.1 The Council is using its powers under Section 14 of the Land Drainage Act 1991, which authorise a local authority to carry out works to relieve flooding in its area. Alternatively there are powers under Section 138 of the Local Government Act 1972 that enable the Council to incur expenditure to alleviate the effects of any emergency or disaster. However, the Council has no statutory duty to deal with groundwater flooding.

- 9.2 Thames Water's role is to provide and maintain a system of public sewers and to develop and maintain an efficient and economic system of water supply. It has no legal responsibilities for groundwater or the implementation of measures to prevent flooding from it.
- 9.3 The Environment Agency has powers to manage and maintain watercourses deemed to be Main River. This activity is funded through the Regional Flood Defence Committees who are the executive body responsible for determining how these funds are spent to manage flood risk. The Environment Agency also has a duty to maintain and protect the quality and yield of groundwater resources under the Water Resources Act 1991. This does not extend to preventing flooding from groundwater, although it has an overall supervisory duty regarding flooding in England and Wales.
- 9.4 The Environment Agency recently distributed an information item to all Local Authorities within the Thames Region confirming that it has no statutory duties with respect to protection from or remediation of groundwater flooding and that it is unable to provide assistance in dealing with flooding from groundwater. It also confirms that there is no mechanism by which owners of properties that have been affected by flooding can be compensated by the Environment Agency. The information item also states that no one owns groundwater and that groundwater is the responsibility of the riparian owner, i.e. the owner of the land in which the water rises to the surface.

10. CONCLUSION

- 10.1 Water is receding and pumping is unlikely to be necessary by the middle of June at Borkwood Court and beyond the end of June at Courtfield Rise.
- 10.2 The consultant concluded that the flooding appears to be caused by rising groundwater. As there is no other viable source to substantiate the need for continued pumping it is safe to assert that groundwater is the source. This view was endorsed by the British Geological Survey.
- 10.3 The main concerns of residents of Borkwood Court are: -
- a) A repeat of the flooding in future years
 - b) The effect of the flooding on their building foundations

It would be prudent for residents at both sites to investigate flood prevention measures and seek guidance on how best to assess and monitor the condition of their foundations.

Background papers referred to during production of this report:

- a) "Groundwater and drainage problems arising from high rainfall in the autumn/winter of 2000/01", Environmental Services Committee 28th March 2001.
- b) "Hydrogeological Review of a Flooding Event at Borkwood Court, Sevenoaks Road, Orpington", by Simpson & Partners Water and Environmental Consultants.
- c) "Borkwood Court, Orpington: NGR TQ 4567 6476", correspondence from the British Geological Survey.
- d) "Groundwater Flooding/Flooded Cellars", correspondence from the Environment Agency dated 18th April 2001.
- e) "Ground Water – Borkwood Court, Orpington", correspondence from Thames Water dated 26th April 2001.
- f) Correspondence with local Members of Parliament.
- g) Correspondence with residents.

LONDON BOROUGH OF BROMLEY

COMMITTEE: Environmental Services Committee

DATE: 28th March 2001

SUBJECT: GROUNDWATER & DRAINAGE PROBLEMS CAUSED BY
THE RECENT HIGH RAINFALL

CHIEF OFFICER: Director of Environmental Services

CONTACT OFFICER: John Peck, Ext. 4547

WARDS: Boroughwide

1. SUMMARY

- 1.1 This reports summarises problems that have been caused by the unusually heavy rainfall since last autumn resulting in increased levels of groundwater and the actions taken by the Council to alleviate them.

2. INFORMATION - A - THE WICKHAM BOURNE

- 2.1 On 15th January a resident of Courtfield Rise, West Wickham telephoned the Environmental Services Department to report that his garden had flooded over the previous weekend and asking for advice. When inspected on 17th January, it was found that his garden was flooded to a depth of approx. 1ft (300mm) and this had spread to neighbouring gardens. It was also observed that water had appeared on the surface of some rugby pitches at Sparrows Den Playing Fields.
- 2.2 It was apparent that this was possibly the first outbreak of the Wickham Bourne since 1969 and a watch was kept on the situation. By Friday 19th January at least 8 gardens were flooded and 2 rugby pitches at Sparrows Den were unusable as there was 2ins (50mm) of water standing on large parts of them.
- 2.3 Following heavy rainfall over the weekend, residents of 7 - 13 Courtfield Rise contacted the Department on Monday 22nd January as water levels had risen rapidly and their houses were in danger of flooding. Following a site meeting with the residents , pumping began the following day and has continued ever since at at rate of approximately 0.75 million gallons per day (3.4 ml/day). Whenever the pumping has been stopped for any reason the water level rises rapidly and threatens these houses.
- 2.4 In the meantime more gardens have been affected along the valley bottom and many gardens in Courtfield Rise, Addington Road and Corkscrew Hill have been flooded.

Outbreaks of the Bourne have also been seen further down the valley in the gardens of 28 – 32 Tiepigs Lane and in the service road behind 2 – 24 Addington Road which were flooded by early February.

- 2.5 Water levels in Sparrows Den have continued to rise and a large area amounting to approx. 10 acres (4hectares) is now (February 22nd) under water to a maximum depth of 2 – 3 feet (600 –900mm) which contains an estimated 3 – 4 million gallons (13.6 – 18.1 ml) of water.
- 2.6 This is the first flow of the bourne since 1969 and only the third since 1883. Bourne flows occur when rising levels of ground water following heavy rainfall break through at ground level as springs. Prior to the building of the water pumping station at Kent Gate which abstracts water from underground strata, it seems from old records that this flow was a fairly regular occurrence.
- 2.7 Thames Water Utilities, who now operate the pumping station, have confirmed to the Council that they have been abstracting water at Kent Gate at their usual rate but have observed that ground water levels in the well have been rising rapidly since November last year. In an attempt to reduce the ground water levels, meetings were arranged by my department on 9th and 12th February between representatives of the Environment Agency, who oversee the abstraction of water, Thames Water Utilities and council officers.
- 2.8 At these meetings it was agreed that Thames Water could increase the rate of short term abstraction of ground water on a temporary basis beyond the amount specified in their licence without affecting their annual license figures. It was also agreed that the Council could connect temporary drains to Thames Water's surface water sewer to control water levels. The rate of pumping has been increased by Thames Water but it is too early to say what effect, if any, this is having on the water levels.
- 2.9 Following these meetings a leaflet was delivered to the properties in the affected area, setting out the reason for the flooding, the actions the Council and other parties were taking and giving telephone numbers of officers at the Civic Centre who could be contacted for advice or information.
- 2.10 In the meantime, the Council is passing approx. 2 million gallons of water per day through the sewer from its pumping at Courtfield Rise, from temporary connections installed to control the lake at Sparrows Den and from overflow from soakaways. This is 90% of the capacity of the sewer and it will be necessary to close down the temporary connections if heavy rainfall occurs to prevent flooding caused by overloading the sewer.
- 2.10 The flooding at 28 –32 Tiepigs Lane and behind 2 –24 Addington Road has been relieved by the Council removing flow control baffles from the surface water system in

Tiepigs Lane and then pumping away the standing water. This has also improved the running of the outflow from Courtfield Rise and Sparrows Den.

- 2.11 The Council is using its powers under Section 14 of the Land Drainage Act which authorise local authorities to carry out works to relieve flooding in its area. The pumping at Courtfield Rise is costing Approx. £1500 per week.

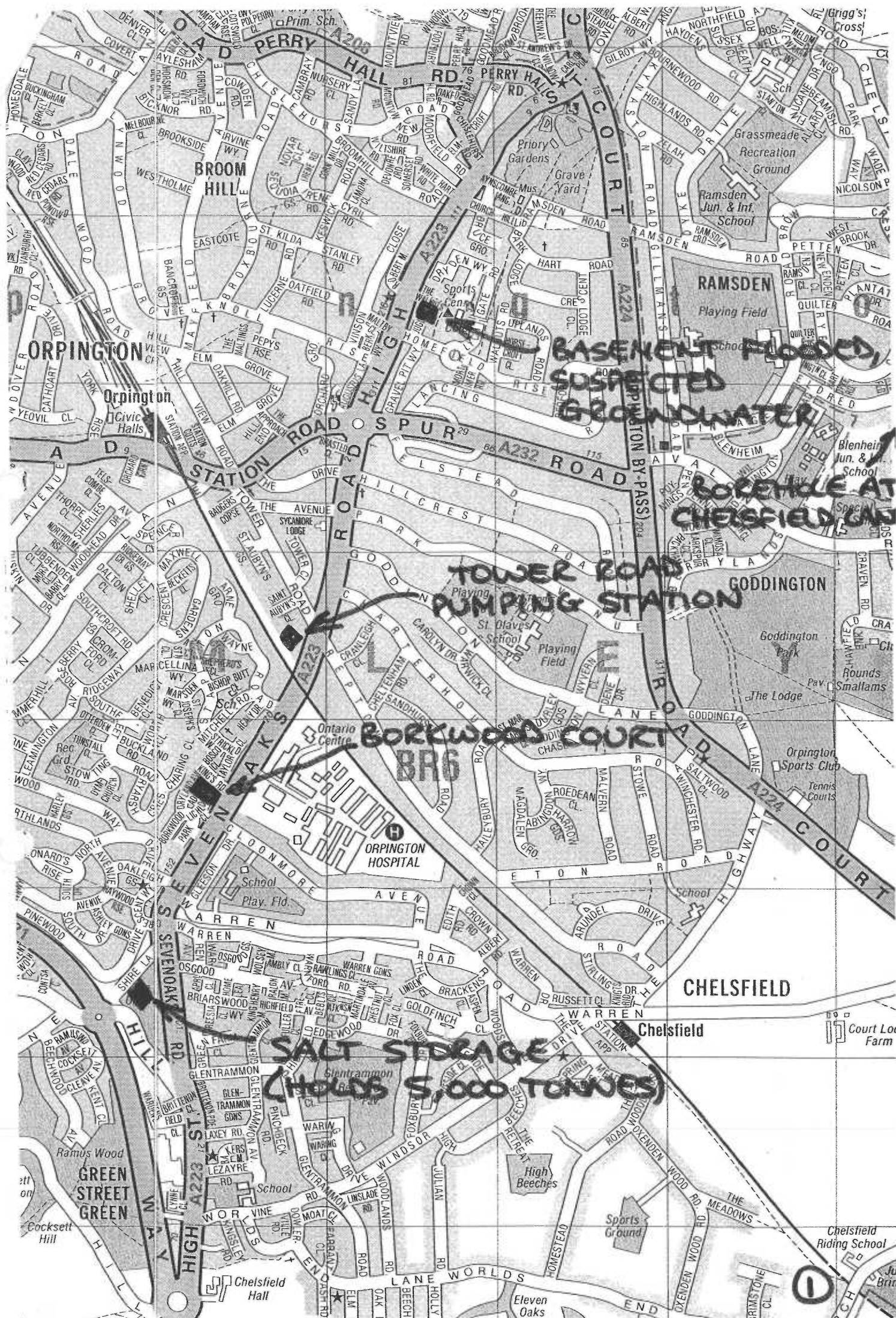
3. INFORMATION – B – BORKWOOD COURT, SEVENOAKS ROAD

- 3.1 Borkwood Court is a group of 6 maisonettes in Sevenoaks Road, Orpington which have been built well below the level of surrounding properties and Sevenoaks Road itself. Three of the properties are occupied by elderly residents.
- 3.2 Water was first noticed on the lawn on 5th February but was thought to to have come from a water main leak which had been repaired by Thames Water Utilities in Lichlade Close nearby. The residents called out Thames Water, but when tested it was found that the water was not mains water.
- 3.3 The drains at Borkwood Court were cleaned by a contractor and the residents hired a number of small pumps in unsuccessful attempts to clear the water. The water level continued to rise during the following week and on a visit by a council officer on Monday 12th February it was threatening to enter the lowest properties. The Council provided a pump that evening as a matter of urgency but this was also unable to reduce the water level.
- 3.4 Following further urgent requests from the residents, on 14th February the Council provided a pump capable of pumping 1000 galls. per minute (4500 litres/min), but this was unable to do much more than maintain a constant water level. As the inflow appeared to be increasing, a second pump was provided on 20th February which began slowly to reduce the water level.
- 3.5 As the second pump was noisy, it was intended to turn it off in the evening but immediately this was done the water began to rise again and it was kept running to keep the water down. However sometime during the evening the pump was turned off by an authorised person and before it could be restarted water entered four of the flats.
- 3.6 On making enquiries of Thames Water Utilities it was ascertained that they had reduced the rate of pumping at the Tower Road Pumping Station (which is about 600 yards away) by approx. 40% at the end of January in order to remain within their abstraction license. Shortly after this reduction it was seen that the level of ground water at the pumping station rose by 14 feet (4.5 metres) in a week.

- 3.7 When the situation at Borkwood Court was explained to Thames Water they agreed to resume pumping at the previous rate which it is hoped will reduce the ground water level at Borkwood Court and remove the need for pumping, which is costing the Council approximately £3000 per week.

4 INFORMATION –C - HOCKENDEN LANE, ST PAULS CRAY

- 4.1 During the current winter there have been a number of occasions when it has been necessary to close Hockenden Lane at its junction with Star Lane and Sheepcote Lane because of flooding. At first it was thought that the flooding was caused by run-off falling from all three roads towards this junction and overwhelming the limited number of gullies and soakaways at this location.
- 4.2 Because of the lack of an outfall it was necessary to tanker away the floodwaters to the nearest convenient point for disposal. However, it has been evident since early January that a spring has broken out in the field to the east of the junction which flooded the field and found its way onto the highway.
- 4.3 Local residents do not recall this spring flowing during the past 60 years, but it is apparent that there has been a spring nearby in the past as the nearest houses to the junction are known as “Hogspring Cottages”.
- 4.4 With the emergence of the spring, flooding at the junction became more persistent and deeper and it became necessary with the approval of the owner of the field on the lowest side of the junction (who also owns the field with the spring) to cut a channel through a bank into his field to dispose of the water. This has reduced the water level sufficiently to allow vehicles to drive through.
- 4.5 If the spring continues to flow, it will be necessary for the Council to consider what additional measures are needed to reduce the flooding.



**BASEMENT FLOODED,
SUSPECTED
GROUNDWATER**

**BORKHOLE AT
CHEISFIELD GAS**

**TOWER ROAD
PUMPING STATION**

**BORKWOOD COURT
BRG**

**SALT STORAGE
(HOODS 5,000 TONNES)**

ORPINGTON

RAMSDEN

GODDINGTON

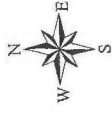
CHELSEFIELD

GREEN STREET GREEN

Chelsfield Hall

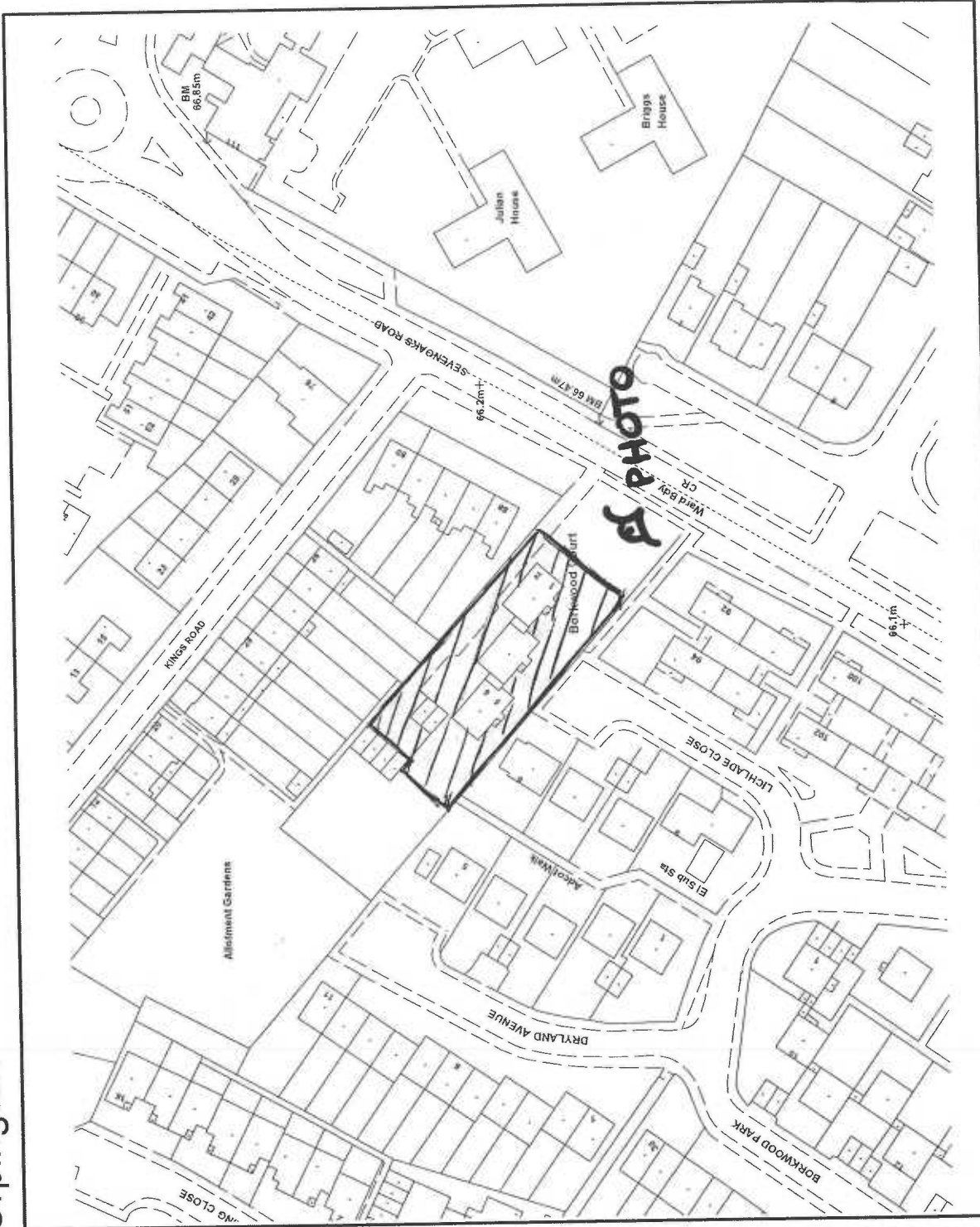
Chelsfield Riding School

Borkwood Court Orpington



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 **FLOODED AREA**

Scale 1:1250

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