NEP SCHEMES

CONTENTS

Water Resources AMP3 Update

Paul Crockett 23/11/00

Within the National Environment Programme (NEP) there were in the Midlands region 11 schemes were put forward to be implemented (estimated at £28m) and 14 schemes were put forward for further investigations. In the AMP3 determination for Severn Trent Water, OFWAT allowed £1.9m for the implementation engineering costs and the full costs of the investigations, £0.6m. OFWAT did not considered that consensus solutions had been agreed, and felt that the cost of changing abstraction licences should be borne by the abstraction charging scheme.

In Appendix E of the November 1999 OFWAT final price determination, the second paragraph of the section on water abstractions provided guidance on how the price determination could be changed. The section states: 'If in future, agreement on the desirability and costs of a scheme which was not allowed in price limits is reached between all of the designated parties, this will be recognised...for the purposes of logging-up or interim determinations.' The OFWAT designated parties were; Ministers, the EA, English Nature (or the Countryside Council for Wales), the affected companies, the relevant CSC(s) and OFWAT.

The government had approved the schemes by agreeing the National Environment Programme (NEP). In putting together the NEP a full cost-benefit analysis and engineering solution for the eleven schemes to be implemented had been produced. The Agency has challenged the new procedures put in place by OFWAT. No clear guidance has been given on how the consensus of parties designated by OFWAT is to be reached.

Of the eleven implementation schemes, three are associated with SSSIs; Blakedown Brook (Hurcott and Podmore Pools), Hewell Park Lake and Rainsworth Lake. In all these sites progress is being made to provide the short-term fix of flow augmentation. The longer-term solution of abstraction licence cut backs will not occur until the funding of replacement water is resolved. The River Worfe scheme and the River Noe/Ashop scheme have made significant progress, the former through licence negotiations with Severn Trent and the latter as the solution is primarily engineering costs. Some progress has been made on the, Bow Brook and the Croxden Brook schemes. Little or no progress has been made on River Sherbourne, Battlefield Brook, Burntwood Pools/River Sow and Dover Beck schemes.

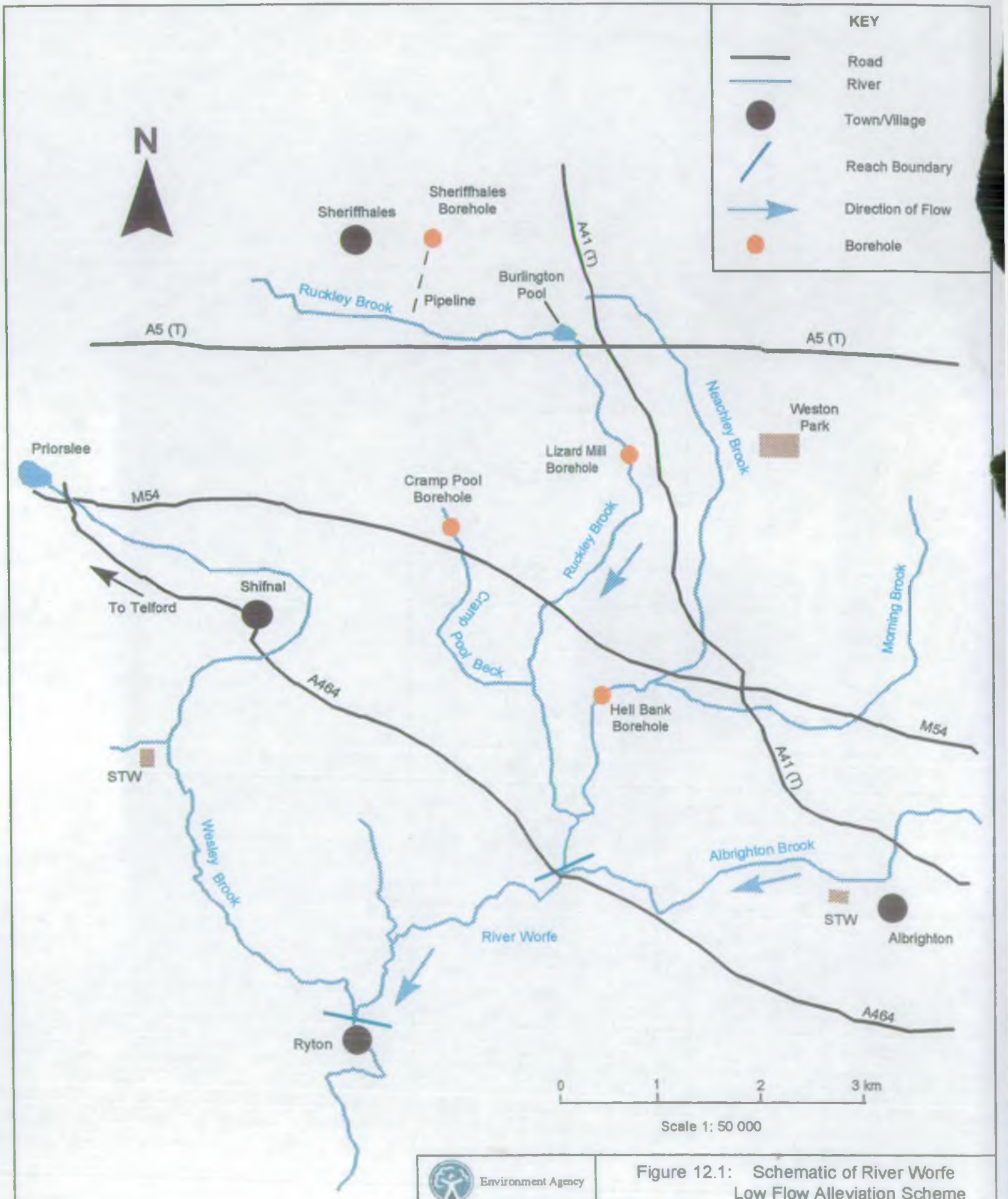
Nearly, all the NEP schemes are associated with over-abstracted groundwater units. The only long-term sustainable solution is to cut back licences to a sustainable level. Short-term alleviation of the specific surface feature issues can be provided by artificial springs (boreholes). The primary stumbling block for a sustainable long-term solution for the majority of the schemes is the funding of the licence cutbacks and replacement of public water supplies.

In response to the OFWAT determination the Agency is proposing that compensation water for artificial springs is provided by increasing the peak output from STW boreholes (total quantities abstracted would not increase). This has yet to be agreed with Severn Trent Water. This would enable the short term alleviation solutions to be put in place for the majority of the schemes.

Summary of Progress

The Table below indicated the progress made on the various NEP sites solutions that are to be implemented by 2005. There are also 14 sites for investigation. Of these 14 sites, two Puxton Marshes and Stourvale March are being resolved as part of a wider Flood Defence scheme, Rainworth Lakes is being resolved as part of the Rainworth Water /Rufford Lake solution and Aqualate Mere is being address as part of a water quality study.

Scheme	Progress	Comment
Hurcott & Podmore Pools (Blakedown Brk)		Awaiting STW agreement to MoU for 5 Ml/d reduction
Hewell Park Lake		Awaiting STW agreement for 1 Ml/d replacement Water
Rainworth Water/Rufford Lakes		Agreement on way forward, source of water to be agreed
River Worfe		Full agreement on way forward - being implemented
Bow Brook		2 Ml/d compensation flow need, new control point GS being planned
Croxden Brook		Additional resource of 1 Ml/d required
Jaggers Clough (Noe/Ashop)		Costs fully funded, details to be agreed and work undertaken
Battlefield Brook		Little progress need for additional 2 Ml/d
River Sherbourne		Little progress, scale of issue being reviewd
Burntwood Pools		Options of imported water being reviewed
Dover Beck		Some support already provided, additional support being discussed



Environment Agency

Figure 12.1: Schematic of River Worfe Low Flow Alleviation Scheme

GIBB Ltd
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Reading England

AMP 3 Benefits Assessment

SCALE 1:50 000	DATE April 1999	J98032 A

RIVER WORFE

Background

Historically, within the upper reaches of the River Worfe, there were springs, pools and water mills throughout the Ruckley, Neachley, Albrighton and Wesley Brooks. There are known to have been at least forty watermills working at one time within the catchment in the early part of the 19th century. In 1857 the first Public Water Supply intake was set up to abstract water from the River Worfe at Cosford Waterworks to feed Wolverhampton.

Following further groundwater development of the upper catchment (the Cosford Groundwater Unit) there have been reports of wells and pools drying up. Since the commissioning of boreholes at Neachley, Shifnal, Sheriffhales and Lizard Mill, abstractions in the Cosford groundwater unit have exceeded the long-term average recharge rate which has resulted in a further depletion of flows.

In 1992 the River Worfe was included as one of the original top 40 low flow alleviation sites listed by the National Rivers Authority before AMP2. Following the provision of an alternative water supply to one user for spray irrigation in 1998, the section between the confluence's with the Albrighton and Wesley Brooks has been reclassified from intermittent to low flow.

In 1998 GIBB Environmental carried out a business case assessment to target low flow alleviation on the Ruckley and Cramp Pool Brooks (tributaries of the Worfe), on behalf of the Environment Agency. Six options were considered for when the flow at Cosford gauging station is at Q20 (21.6Ml/d) or below.

The option chosen was to produce a compensation release from Sheriffhales borehole of up to 5 Ml/d, a 2Ml/d release from Lizard Mill (both to the Ruckley Brook). A further 1Ml/d output from Cramp Pool borehole could flow to Cramp Pool Brook. The option also included a longterm overall reduction in public water supply groundwater abstraction of 17 Ml/d. The compensation figures were considered 'best estimates' before the trialling was carried out, but will be altered in the light of trial operation of the schemes.

Short-term Remedy

The pipeline was constructed in 1998 from the Sheriffhales borehole to the headwaters of the River Worfe, and both this compensation release and that from Cramp Pool borehole have been trialled successfully. Operating procedures are being established and the Hell Bank borehole is also being investigated to provide an extra 1 Ml/d to the Neachley Bk. This trial work is to be undertaken in 2000-2001.

Long-term Solution

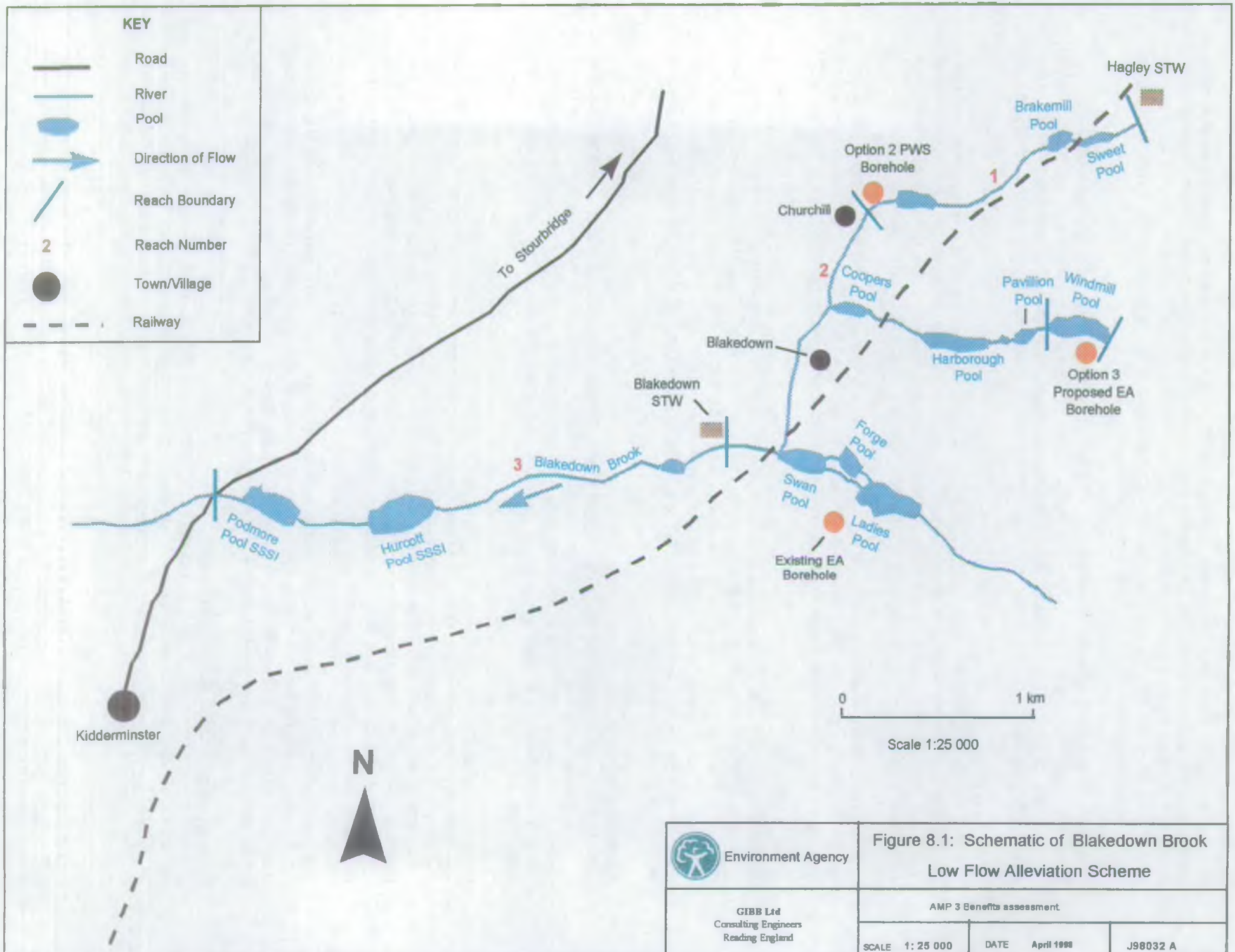
The River Worfe is part of the West Midlands Groundwater model funded by the Agency which is currently in its final phase with consultants ENTEC. It will allow Agency staff to investigate the effect abstractions on the groundwater and surfacewater. The Upper reaches of the Worfe were targeted specifically in this model in order to gain a better understanding of the system. This will link into the already targeted reduction in abstraction of 17Ml/d, which has already been offset against a new source at Uckington.

The augmentation of the river via boreholes is successful in the short term and supported the upper reaches during the summer of 1999. Following the signing of a Memorandum of Understanding for Uckington with Severn Trent Water, PWS supply will be reduced in the catchment which will allow the long term recovery in groundwater levels and remove the need for augmentation support.

Implications of OFWAT price determination.

The primary stumbling block for a sustainable long-term is the funding of the licence cutbacks (i.e. the costs of their replacement). The cost of these components was excluded from the OFWAT AMP3 price determination. In order to progress this issue it will be necessary for the Agency to consult again with Severn Trent, English Nature, OFWAT and the Customer Services Committee so that the views of all parties can be presented to the Government.

As the Uckington Memorandum of Understanding has now been signed, there should not be a problem with progressing this site to complete the short-term remedial solutions. The infrastructure for the connection of the scheme will be complete and on line by January 2001. The problem of operating cost of the scheme will be resolved in the next six months.


KEY
Road
River
Pool
Direction of Flow
Reach Boundary
2 Reach Number
Town/Village
Railway
Hagley STW
Brakemill Pool
Sweet Pool
Option 2 PWS Borehole
Churchill
1
2
Coopers Pool
Pavillion Pool
Windmill Pool
Blakedown
Harborough Pool
Option 3 Proposed EA Borehole
Blakedown STW
Forge Pool
3 Blakedown Brook
Swan Pool
Ladies Pool
Existing EA Borehole
To Stourbridge
Podmore Pool SSSI
Hurcott Pool SSSI
Kidderminster
N
0
1 km
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Environment Agency
Figure 8.1: Schematic of Blakedown Brook Low Flow Alleviation Scheme
GIBB Ltd
Consulting Engineers
Reading England
AMP 3 Benefits assessment
SCALE 1: 25 000
DATE April 1998
J98032 A

BLAKEDOWN BROOK (HURCOTT & PODMORE)

Background

Unsustainable licensed abstraction of groundwater in the Kidderminster area has resulted in low flow problems on the Blakedown Bk. and its tributaries, which flow through SSSIs (covering both Hurcott and Podmore Pools). Schemes have already been commissioned by the Agency and its predecessors, on two of the tributaries;

- A borehole to supplement flows into and to maintain levels in the Ladies, Forge and Swan Pools.
- A borehole to supplement flow into and to maintain levels in the Coopers, Harborough and Pavilion Pools.

These two boreholes are operated by the Agency and are triggered by pool levels, but licensed quantities were not calculated to provide inflow to the main stream of the Blakedown Bk.

The main stream has SSSIs downstream at Hurcott and Podmore Pools. There is a requirement to provide an inflow to these pools to maintain the SSSIs, but at present it is not known how much water is required. A large proportion of the flow in the upper reaches is derived from the old Hagley wastewater treatment works (WTW) operated by Severn Trent Water Ltd. There was a proposal to close this, which involved the effluent being transferred out of the catchment. After discussion with STW Ltd it was agreed that:

- The Hagley effluent will be transferred to Roundhill WTW for treatment and then returned to the works at Hagley for discharge into the upper reaches of the Blakedown Bk.
- The Blakedown WTW will be upgraded to provide better quality of water.

The pipeline from Roundhill WTW to the Blakedown Bk. has a capacity of 3 Ml/d, sufficient to return a flow equivalent to the Hagley effluent (1.5 Ml/d) as well as provide an additional capacity of 1.5 Ml/d. This is available to supplement the inflow to Blakedown Bk at all times. Flows have been monitored downstream to investigate how far the water travels.

GIBB Environmental consultants carried out a cost-benefit assessment for the Agency in 1998. They considered 5 options for improvement. From this it was decided that the best interim measure was to have a combined compensation of 8 Ml/d ('best endeavours' figure at this stage) released into the brook course from Roundhill Sewage Works, Churchill (or alternative new site) and a new borehole at Windmill Pool. The longer term solution is to reduce groundwater abstractions and for consequent rising groundwater levels to restore some baseflow, and therefore reduce the amount of compensation needed.

In addition to the short-term compensation flows, it has been agreed under AMP3 that both the water companies (Severn Trent Water Ltd and South Staffordshire Water) will eventually reduce their public water supply (PWS) abstractions by 5 Ml/d (10 Ml/d in total). This will affect their average abstraction and not the peak daily value.

Short-term Remedy

From March 2000, the imported water via Roundhill WTW became available. This is being monitored both at the discharge to the main brook, but in addition, just upstream of the SSSIs. This is now possible due to a new gauging station constructed by the Agency.

Currently a project to construct a third borehole is underway to supply Windmill and Broome Mill Pool. The project is commissioning a feasibility report on the condition of the pool link structures and sluices and the implications of resurrecting the connecting streams between the pools. Discussions are ongoing with the landowners. This project is being funded by SSWC from the OFWAT determination. In addition, the Agency is investigating the feasibility to increase the capacities of the existing boreholes to see if they are capable of supplying the main brook-course.

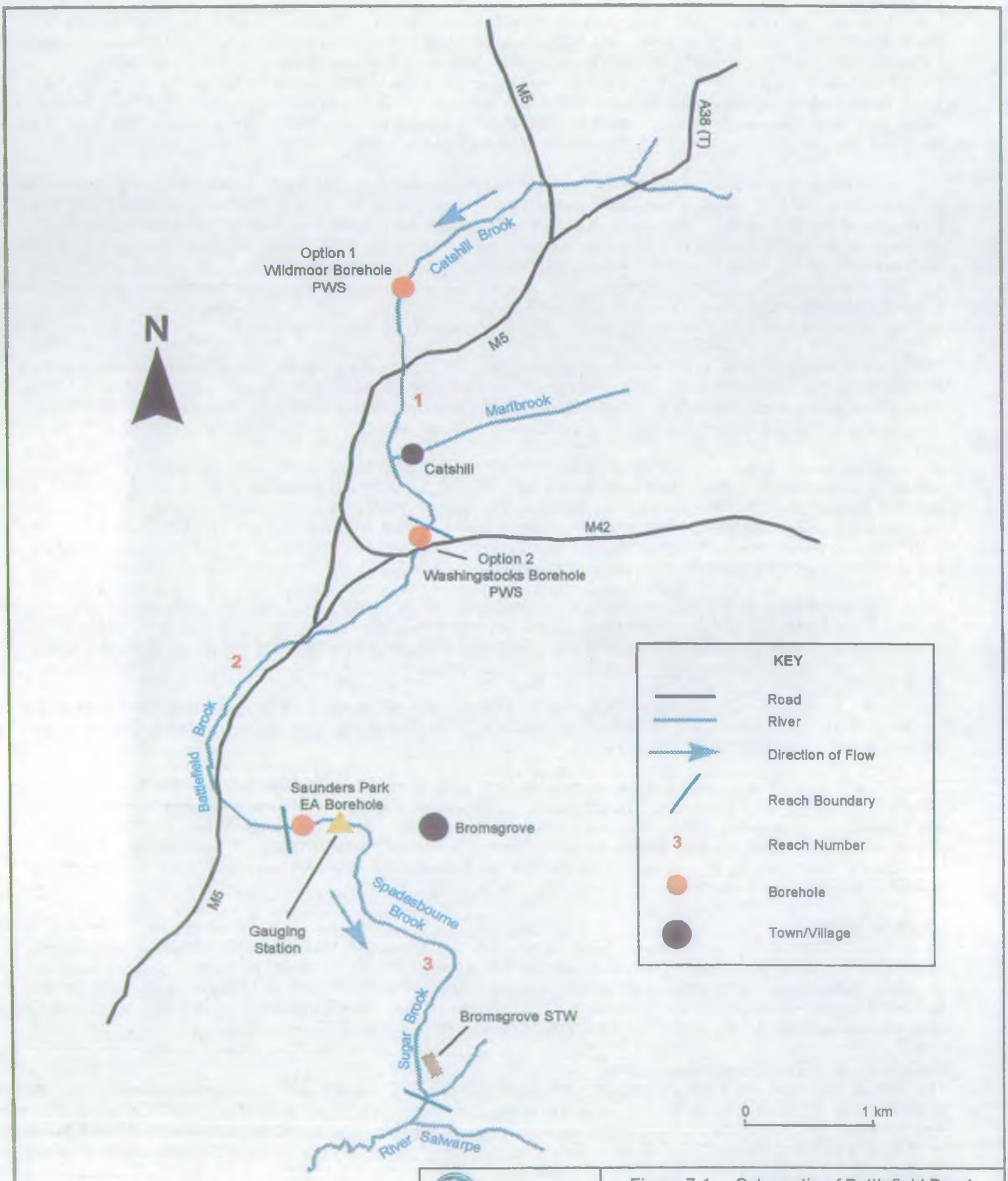
Long-term Solution

As well as the agreed reduction already being negotiated, it is envisaged that the West Midlands groundwater model currently being developed by consultants Entec (on behalf of the Agency) will be used to provide guidance on which abstractions should be reduced to provide the greatest increase in flows and benefit to the system. It is realised that as we progress in the analysis of collected data, more specific operating details will be drawn up between the involved parties, to include achievable trigger levels and limited water wastage.

Implications of OFWAT price determination.

The primary stumbling block for a sustainable long-term solution is the funding of the licence cutbacks (i.e. the costs of their replacement). The cost of these components was excluded from the OFWAT AMP3 price determination for Severn Trent's submission. In order to progress this issue it will be necessary for the Agency to consult again with Severn Trent, English Nature, OFWAT and the Customer Services Committee so that the views of all parties can be presented to the Government.

However the progress on the short-term remedies which are being funded either by AMP2 monies (Severn Trent) or AMP3 (South Staffs) is in front of the original programme. This means that any problem on OFWAT funding which only relate to Severn Trent will not affect progress on the short term, although the long-term reductions will be affected. The signing of the Memorandum of Understanding by Severn Trent for a 5 Ml/d reduction in licence has not been completed. The West Midland Groundwater Model runs may indicate that further modifications to the licence are required. The negotiation for this will be difficult until the OFWAT funding problem has been resolved.



Environment Agency

Figure 7.1: Schematic of Battlefield Brook Low Flow Alleviation Scheme

GIBB Ltd
Consulting Engineers
Reading England

AMP 3 Benefits Assessment

DATE April 1998

J98032A

BATTLEFIELD BROOK

Background

As a result of unsustainable groundwater abstraction in the Bromsgrove area, there was public concern about the low flows in the Battlefield Bk. catchment in the 1980s. The site was listed in the 'Top 40 Low Flow sites' list published by the NRA 1992. In this year the National Rivers Authority installed a new borehole upstream of Sanders Park in Bromsgrove for flow augmentation. A gauging station was installed in Sanders Park, downstream of the lake discharge outfall, for monitoring purposes.

A pumping test was carried out between September-November 1992, and showed that 80-85% of the water discharged from the borehole flowed through Sanders Park. It was decided that no additional channel lining was needed. The channel flowing through the park boundaries was lined with concrete in the 1960s.

The borehole is licensed for 1Ml/d (210Ml/a) and has been largely successful in ensuring that reasonable flow is achieved down to the confluence with Spadesbourne Bk. The trigger of the system is presently the gauge in Sanders Park. The Agency pump is switched on manually when flows are 3.6 Ml/d or lower (Q20). The scheme did not address low flows in the Catshill Brook, upstream of Sanders Park.

GIBB Environmental consultants carried out a cost-benefit assessment for the Agency in 1998. From this it was decided that the best interim measure was to have a compensation of 2 Ml/d ('best endeavours' figure at this stage) released into the brook course. This could be output from a combination of STW boreholes at Wildmoor and Washingstocks, although in the longer term reduced groundwater abstractions and rising groundwater levels should restore some baseflow, reducing the amounts of compensation needed.

It is realised that as we progress in the analysis of collected data, more specific operating details will be drawn up between the involved parties, to include achievable trigger levels and limited water wastage. Flows restored to the Battlefield Brook will benefit recreational users of Sander's Park, along with waterside property owners and the general public. Improvements to localised habitats previously damaged by continued low flows will benefit the continuity of the brook's overall linear wildlife habitat.

Short-term Remedy

There will be test releases from Wildmoor borehole of 1 Ml/d to see how far downstream the water travels before disappearing (current meter runs will be arranged). Any sandstone sections in the riverbed may need to be lined. If flows are still unacceptable Washingstocks borehole may be brought into action. Similar testing along the watercourse would then be carried out.

It is hoped that a system will be set up based on the flow at the Sanders Park weir. When a critical flow is reached, the Wildmoor release will be switched on, if flows continue to drop the Washingstocks borehole followed by the Agency borehole will be used. The trigger level may need to be adjusted if the time taken for the release at Wildmoor to reach Sanders Park causes a further drop in stream flows.

Agency are funding £10k of monitoring equipment during 2000/2001. This emphasises that the Agency want to move the scheme forward. In addition the Agency have set up a multi-skilled project group to manage the project.

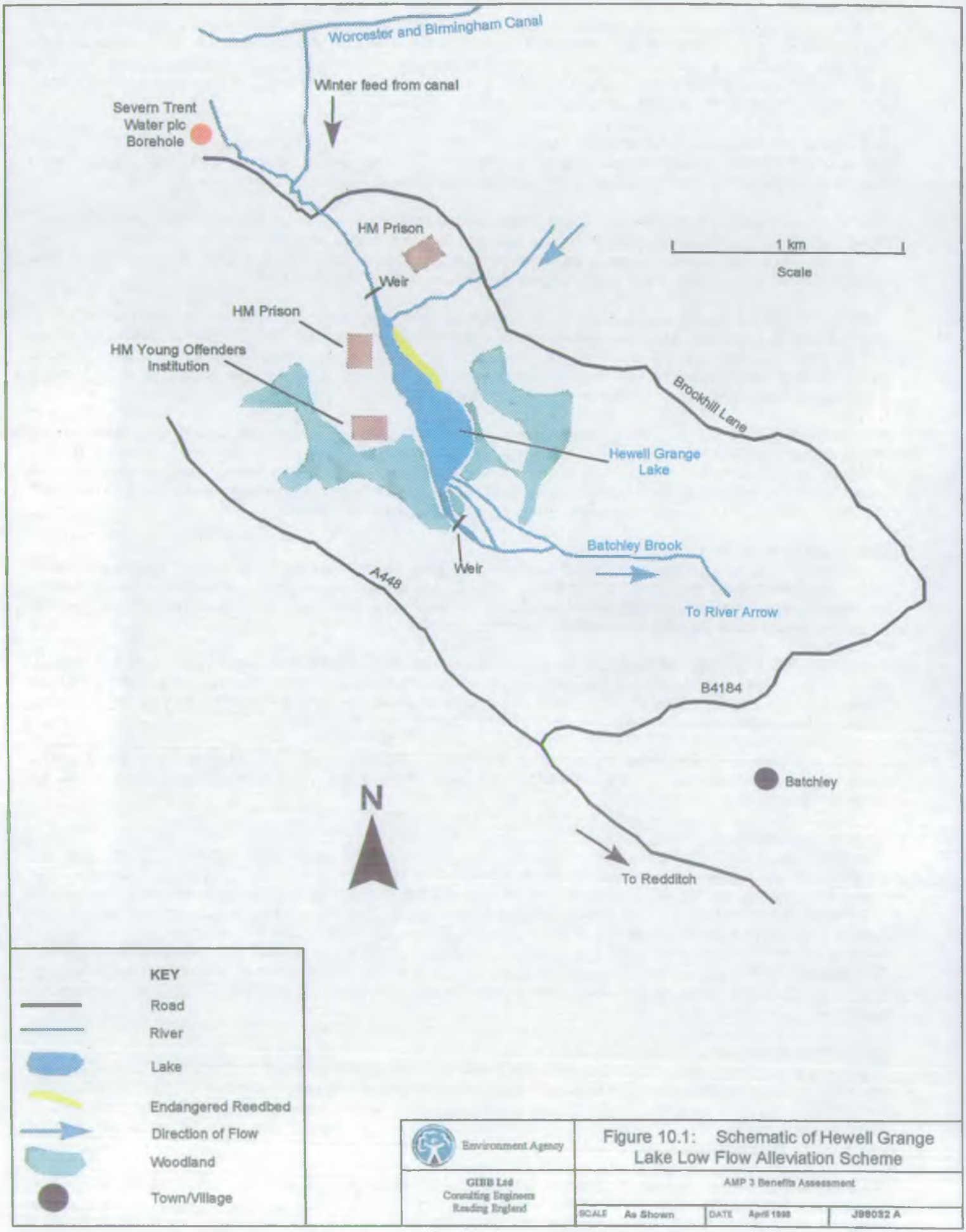
Long-term solution

The Bromsgrove aquifer is perceived to have a high environmental sensitivity, reflected by the loss of baseflow to the Battlefield and Bow Brooks from historical levels of abstraction. As a consequence, the Agency has defined the licensable resources of the unit at 65% of the long term average recharge; equivalent to 26 Ml/d. Levels of both licensed and actual abstractions exceed this figure, hence the unit is closed to any further groundwater development. In addition, further reductions in the present levels of abstraction are required to restore and enhance the aquatic environment. It is being considered whether the existing Birmingham University groundwater model (developed on the behalf of the Agency) should be reactivated so that it could provide guidance on which abstractions should be reduced to provide the greatest increase in baseflows.

Implications of OFWAT price determination.

The primary stumbling block for a sustainable long-term solution is the funding of the licence cutbacks (i.e. the costs of their replacement). The cost of these components was excluded from the OFWAT AMP3 price determination. In order to progress this issue it will be necessary for the Agency to consult again with Severn Trent, English Nature, OFWAT and the Customer Services Committee so that the views of all parties can be presented to the Government.

To allow the schemes associated with the Bromsgrove Groundwater to progress, the Agency is to put forward the following solution; the individual site peak values should be increased by the amount equal to the compensation release. In addition, the annual licence volume will be modified to the agreed reduction volume. This will operate within a five year cycle. This arrangement would be put in place until the problem of replacement water costs have been resolved between all parties.



Environment Agency

Figure 10.1: Schematic of Hewell Grange Lake Low Flow Alleviation Scheme

GIBB Ltd
Consulting Engineers
Reading England

AMP 3 Benefits Assessment

SCALE	As Shown	DATE	April 1998	J98032 A

HEWELL GRANGE LAKE

Background

Hewell Grange Lake is an artificial feature created by the construction of a dam in the late 18th century across the valley of the Batchley Brook. The lake forms part of a 140 hectare estate, which includes an English Heritage listed garden and the lake itself is an important SSSI.

The construction of the Birmingham-Worcester Canal in the 1820's has greatly affected the surface water flow into the lake as two feeder streams which used to discharge into the Batchley Brook now feed into the canal. Abstraction from two nearby public water supply boreholes, operated by Severn Trent Water Ltd, at Brockhill and Webheath has reduced groundwater levels in the vicinity of Hewell Grange. This will have had an adverse impact on Hewell Grange Lake, especially in drought years, with a number of feeder streams completely drying out.

The loss of flow in local watercourse is perceived to be indicative of the high environmental sensitivity of the aquifer. Consequent to this the Agency has defined the licensable resource of the unit to be 65% of the long term average recharge, equivalent to 2 Ml/d. Present levels of both licensed and actual abstractions exceed this figure: the unit is subsequently closed to future groundwater developments. It is intended to reduce the volume of water abstracted by 1Ml/d to achieve a sustainable level. This reduction should, in the long term, result in local groundwater levels rising consequently re-watering the lake and the watercourses that feed it. At this point the short-term solution of compensation releases will no longer be required, representing a return to a sustainable situation.

Short Term Remedy

GIBB Environmental consultants carried out a cost-benefit based on 4 compensation release options from Brockhill to raise the lake water levels. The option with the most favourable cost benefit figures also produced the best solution for the preservation of the SSSI. This option hopes to release water to keep the lake level no less than 100mm below full capacity.

The benefit assessment was based on a 'best endeavours' compensation release figure of 0.62 Ml/d to keep the lake at or above the primarily agreed level, with a further 1 Ml/d reduction envisaged from PWS abstraction. It is realised that as we progress in the analysis of collected data, more specific operating details will be drawn up between the involved parties, to include achievable trigger levels and limited water wastage.

There has been an agreement with British Waterways to provide additional winter inflows to the lake from the canal feeder at Bridge No.58. Modifications to the control structure are being undertaken to ensure that this water is diverted to the lake. This has been incorporated into a Memorandum of Understanding between the Agency, British Waterways and HMP Hewell Grange.

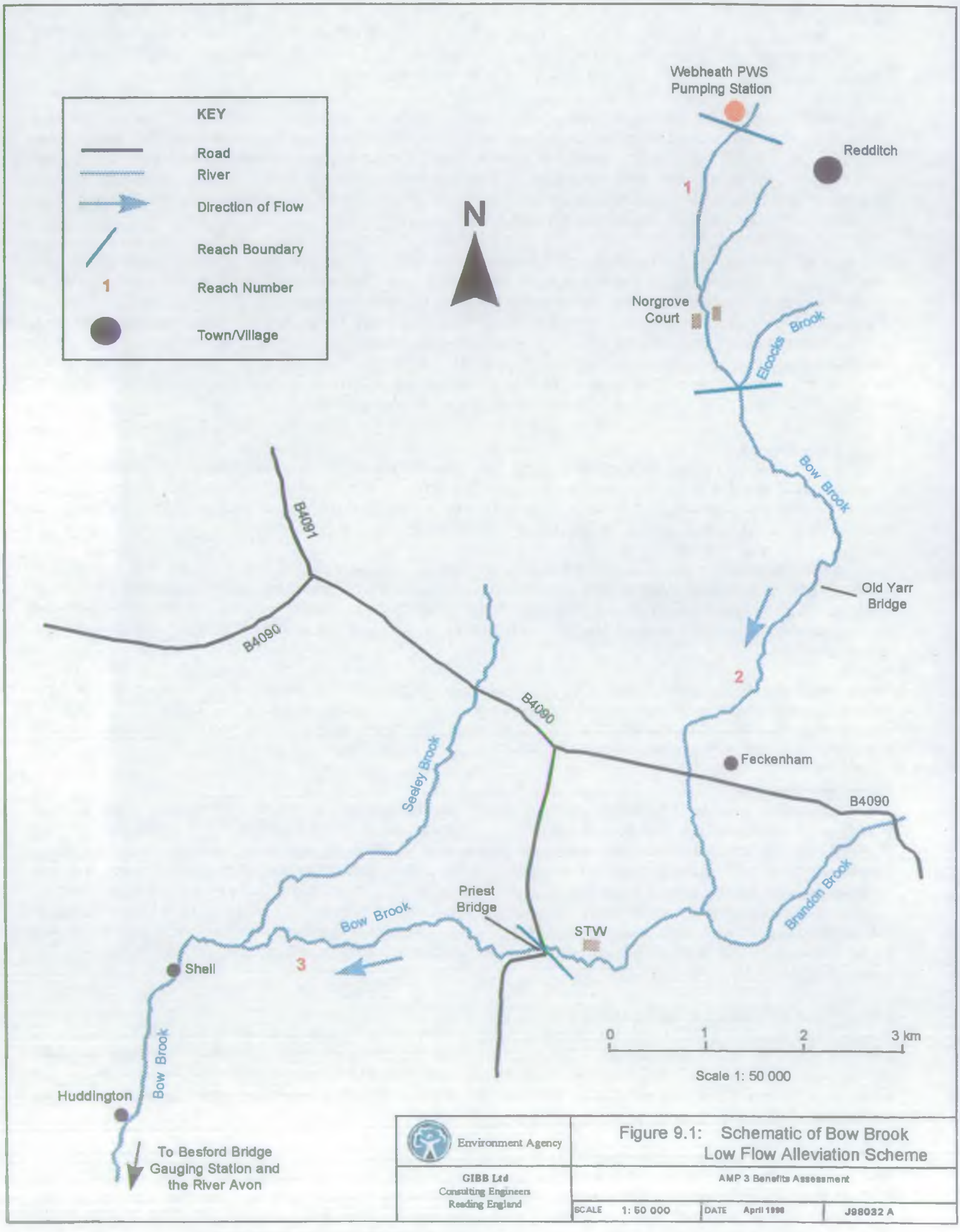
Long-Term Solution

The Bromsgrove aquifer is perceived to have a high environmental sensitivity, reflected by the loss of baseflow to the Battlefield and Bow Brooks from historical levels of abstraction. As a consequence, the Agency has defined the licensable resources of the unit at 65% of the long term average recharge; equivalent to 26 Ml/d. Levels of both licensed and actual abstractions exceed this figure, hence the unit is closed to any further groundwater development. In addition, further reductions in the present levels of abstraction are required to restore and enhance the aquatic environment. It is being considered whether the existing Birmingham University groundwater model (developed on the behalf of the Agency) should be reactivated so that it could provide guidance on which abstractions should be reduced to provide the greatest increase in baseflows.

Implications of OFWAT price determination.

The primary stumbling block for a sustainable long-term solution is the funding of the licence cutbacks (i.e. the costs of their replacement). The cost of these components was excluded from the OFWAT AMP3 price determination. In order to progress this issue it will be necessary for the Agency to consult again with Severn Trent Water, English Nature, OFWAT and the Customer Services Committee so that the views of all parties can be presented to the Government.

To allow the schemes associated with the Bromsgrove Groundwater to progress, the Agency is to put forward the following solution; the individual site peak values should be increased by the amount equal to the compensation release. In addition, the annual licence volume will be modified to the agreed reduction volume. This will operate within a five year cycle. This arrangement would be put in place until the problem of replacement water costs have been resolved between all parties.


KEY
Road
River
Direction of Flow
Reach Boundary
1
Reach Number
Town/Village
N
Webheath PWS
Pumping Station
Redditch
1
Norgrove
Court
Elocks Brook
Bow Brook
B4091
B4090
Old Yarr
Bridge
2
B4090
Seeley Brook
Feckenham
B4090
Priest
Bridge
Bow Brook
STW
Brandon Brook
3
Shell
Bow Brook
Huddington
To Besford Bridge
Gauging Station and
the River Avon
0
1
2
3 km
Scale 1: 50 000
Environment Agency
GIBB Ltd
Consulting Engineers
Reading England
Figure 9.1: Schematic of Bow Brook
Low Flow Alleviation Scheme
AMP 3 Benefits Assessment
SCALE 1: 50 000
DATE April 1998
J98032 A

BOW BROOK

Background

Low flow problems in the upper reaches (above Priest Bridge) of the Bow Brook were identified in the late 1980s when concern was expressed by the people living in the catchment. The low flows are considered to be due to the combination of the closure of a number of small sewage treatment works as well as the reduction of baseflow due to over-licensing of groundwater in the Bromsgrove Aquifer for public water supply and to urbanisation. There has been an overall reduction in licences in the Bromsgrove Aquifer during AMP2, and further reductions are being investigated.

During the late 1980s and the 1990s, several low flow gauging surveys were carried out in the catchment, but there is still a requirement for more data. There is a gauging station at Besford Bridge with a flow record since 1970, however, it is over 20km downstream of Priest Bridge and it is virtually impossible to use in correlation. A new gauging station is to be built in Feckenham in 2002, but until then, the compensation release has to be linked with Besford Bridge.

Short-Term Remedy

A cost-benefit assessment was carried out for the Agency by GIBB Environmental consultants, based on 2 Ml/d compensation being released when the flow at Besford Bridge gauging station is at Q50 or below. This figure was derived from the reduction in baseflow on the upper reaches of the Bow Brook plus the reduction in discharges from small water treatment works which were closed and their effluent transferred to Priestholme WRW. Severn Trent Water Ltd. are in agreement that a compensation release of 2 Ml/d is required from their Webheath borehole.

It is necessary to review new information now available which will enable us to calculate the number of days the compensation release will be in operation in the future, based on data from the last 10 years. It is recognised that the 2Ml/d compensation figure mentioned above represents the 'best endeavours' estimate from information presently available. As more information is collected and analysed, new operating rules will be drawn up with agreement from all involved parties which will enable more refined rules to be brought into operation.

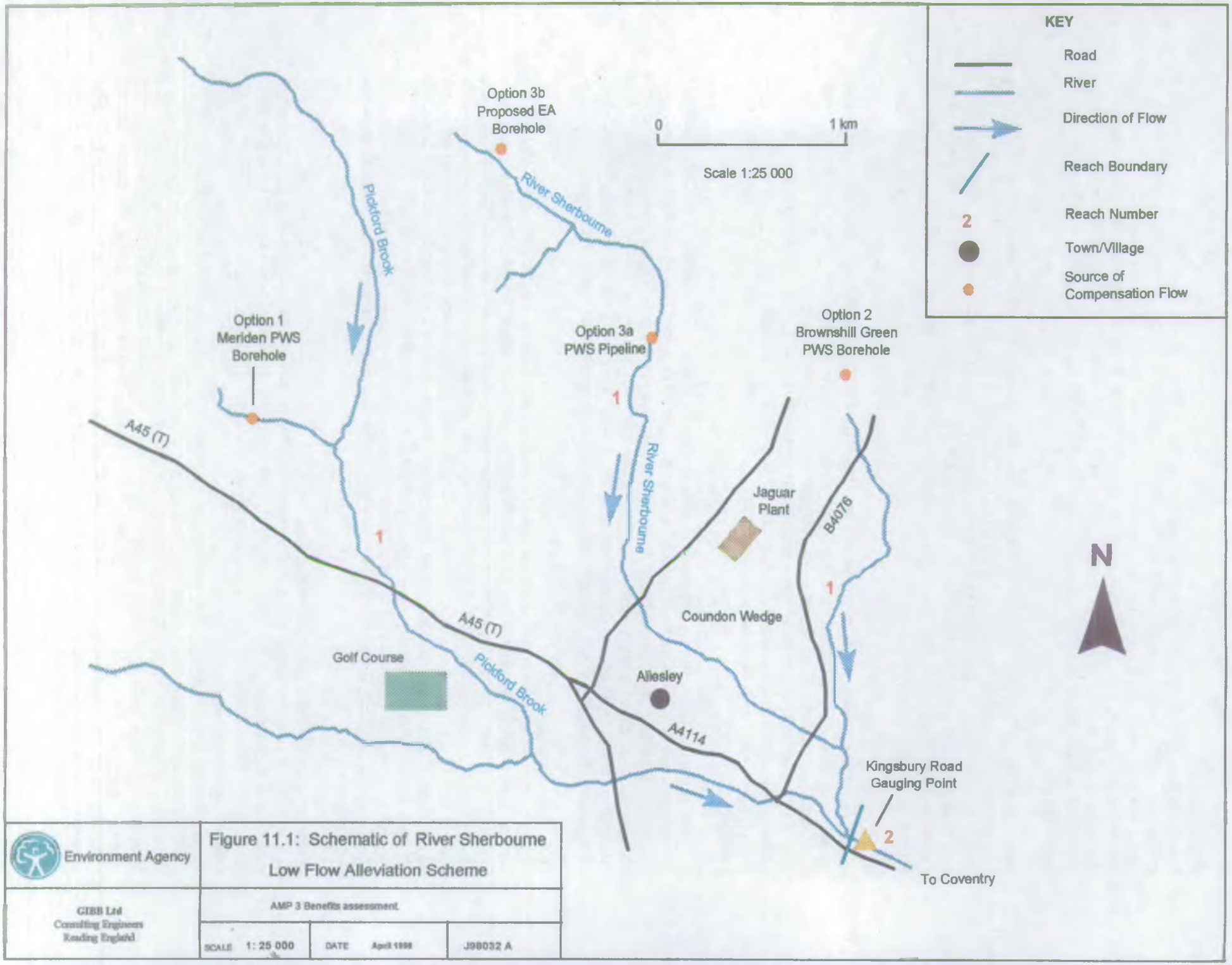
Long-Term Solution

The Bromsgrove aquifer is perceived to have a high environmental sensitivity, reflected by the loss of baseflow to the Battlefield and Bow Brooks from historical levels of abstraction. As a consequence, the Agency has defined the licensable resources of the unit at 65% of the long term average recharge; equivalent to 26 Ml/d. Levels of both licensed and actual abstractions exceed this figure, hence the unit is closed to any further groundwater development. In addition, further reductions in the present levels of abstraction are required to restore and enhance the aquatic environment. It is being considered whether the existing Birmingham University groundwater model (developed on the behalf of the Agency) should be reactivated so that it could provide guidance on which abstractions should be reduced to provide the greatest increase in baseflows.

Implications of OFWAT price determination.

The primary stumbling block for a sustainable long-term solution is the funding of the licence cutbacks (i.e. the costs of their replacement). The cost of these components was excluded from the OFWAT AMP3 price determination. In order to progress this issue it will be necessary for the Agency to consult again with Severn Trent, English Nature, OFWAT and the Customer Services Committee so that the views of all parties can be presented to the Government.

To allow the schemes associated with the Bromsgrove Groundwater to progress, the Agency is to put forward the following solution; the individual site peak values should be increased by the amount equal to the compensation release. In addition, the annual licence volume will be modified to the agreed reduction volume. This will operate within a five year cycle. This arrangement would be put in place until the problem of replacement water costs have been resolved between all parties.


KEY
Road
River
Direction of Flow
Reach Boundary
Reach Number
Town/Village
Source of Compensation Flow
0
1 km
Scale 1:25 000
Option 3b
Proposed EA
Borehole
River Sherbourne
Pickford Brook
Option 1
Meriden PWS
Borehole
Option 3a
PWS Pipeline
Option 2
Brownshill Green
PWS Borehole
A45 (T)
River Sherbourne
Jaguar
Plant
B4078
N
Coundon Wedge
Golf Course
Pickford Brook
Allesley
A4114
Kingsbury Road
Gauging Point
To Coventry
1
2
Environment Agency
Figure 11.1: Schematic of River Sherbourne
Low Flow Alleviation Scheme
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AMP 3 Benefits assessment
SCALE 1: 25 000
DATE April 1998
J98032 A

RIVER SHERBOURNE

Background

The problem of low flows in the Sherbourne catchment has been known about for some time, but it only came to prominence in the early 1990s. There are two possible reasons for this;

i) the increased abstraction from the Meriden shafts in 1990
ii) the public having a heightened awareness since the proposal of a new borehole at Pickford Green.

Although the low flows along the upper Sherbourne and its tributaries (Pickford and Guphill Brooks) are well known, there is only limited information available and therefore there is no evidence for a causal link to over-licensing of the groundwater for public water supply. Approximately 90% of the assessed licensable resource in the Coventry groundwater unit is licensed for this purpose, and this may result in the upper reaches of the river having periods of low or zero flows. Spot gaugings and local information suggest that the river and tributaries are dry for considerable periods each year, but detailed flow tests are required to gain further understanding of this complex catchment.

The Coventry aquifer unit underlying the Sherbourne catchment is considered to be over-licensed and the Meriden unit is now only open to small new proposals. In order to better understand the link between the low flows and groundwater abstractions then the streamflows in the area need to be monitored for a period of time. There have been reports of groundwater seepages at the Jaguar works in the Sherbourne catchment and at other sites within Coventry. If these reports indicate a rise in groundwater levels then the options outlined below may be modified to accommodate this fact. It is necessary to undertake current meter gauging runs throughout the range of flows in the catchment in order to be able to monitor the success of future work against a baseline flow.

Short-term Remedy

GIBB environmental consultants were asked by the Agency to carry out a benefit assessment on several different schemes. Seven options were considered, and all involved a reduction in the abstraction for public water supply (PWS) at existing PWS boreholes, and the augmentation of the river system from groundwater. In one case, the augmentation would be with treated water from an existing mains pipeline. None of these proposals were to address Guphill Bk.

The benefit assessment concluded that 2 existing PWS boreholes (Meriden and Brownshill Green) belonging to Severn Trent Water Ltd on tributaries, and a new Agency borehole on the River Sherbourne itself, should release a total compensation of 3 Ml/d.

Discussions are to be started with local industry, to see if redirection of waste water (high quality) may provide an alternative solution that will not require compensation releases from Brownhill Green borehole.

Long Term Solution

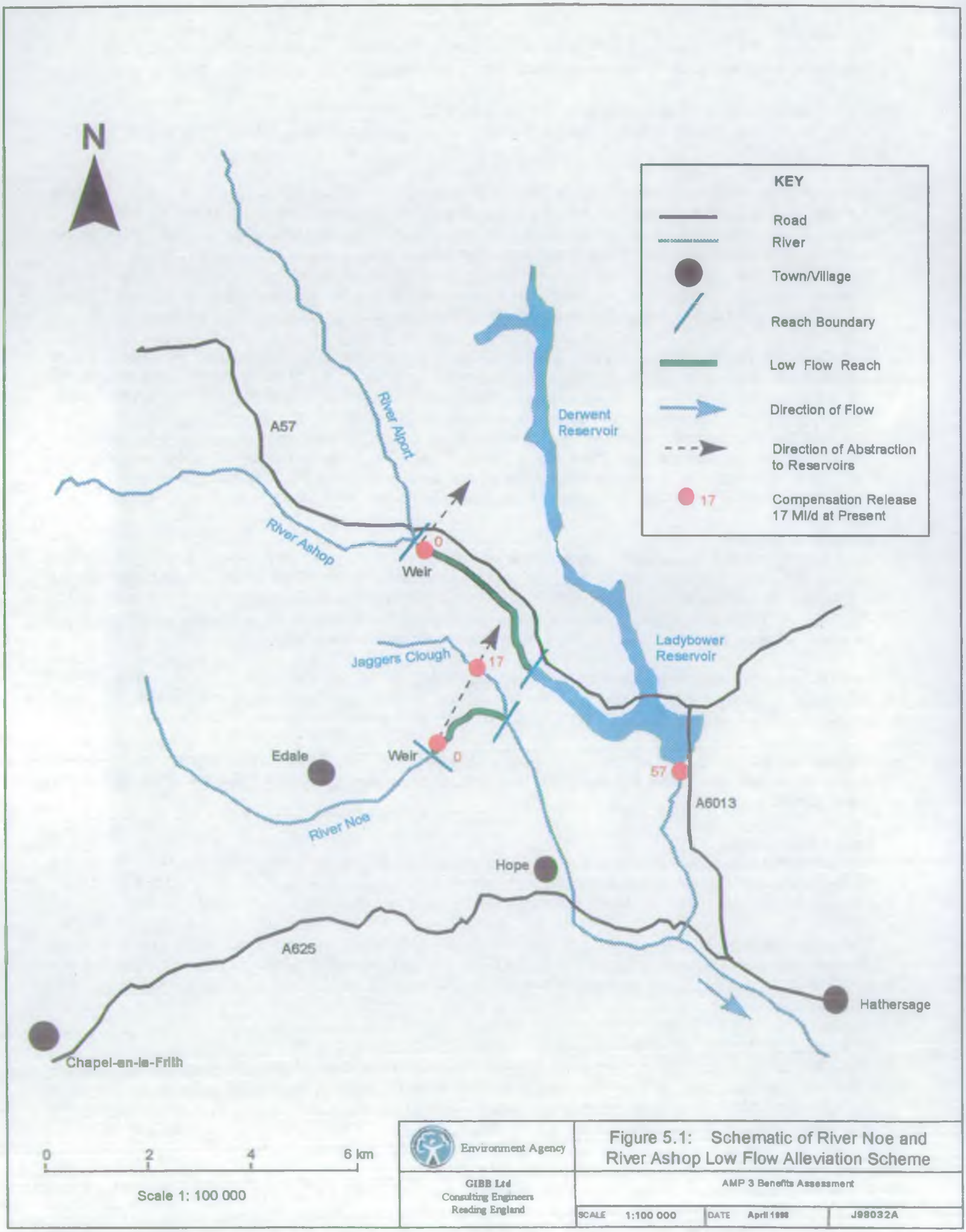
In the longer term, reductions in the PWS Licences will be considered. The compensation flows will be triggered when flows at the planned Kingsbury Road gauging station are 2 Ml/d (Q50) or below. The licence reduction will allow the natural baseflow to re-establish.

The compensation figures above and the proposed options (short and long-term), are presently 'best endeavours' estimates from the limited information currently available. As analysis of the catchment continues, more specific operating details will be drawn up and agreed between the involved parties.

Implication of OFWAT price determination.

The primary stumbling block for a sustainable long-term solution is the funding of the licence cutbacks (i.e. the costs of their replacement). The cost of these components was excluded from the OFWAT AMP3 price determination. In order to progress this issue it will be necessary for the Agency to consult again with Severn Trent, English Nature, OFWAT and the Customer Services Committee so that the views of all parties can be presented to the Government.

In the next month discussions with local industry will hopefully produce a remedy for one of the three arms of the Sherbourne. At present this is the only area where progress has been made on this problem. However the monitoring which has taken place over the last 12 months is about to be reviewed and may give an indication for return of baseflow to some lengths of the River.


N
KEY
Road
River
Town/Village
Reach Boundary
Low Flow Reach
Direction of Flow
Direction of Abstraction to Reservoirs
17
Compensation Release 17 Ml/d at Present
A57
River Alport
Derwent Reservoir
River Ashop
0
Weir
Ladybower Reservoir
Jaggers Clough
17
Edale
Weir
0
57
A6013
River Noe
Hope
A625
Hathersage
Chapel-en-le-Frith
0
2
4
6 km
Scale 1: 100 000
Environment Agency
GIBB Ltd
Consulting Engineers
Reading England
Figure 5.1: Schematic of River Noe and River Ashop Low Flow Alleviation Scheme
AMP 3 Benefits Assessment
SCALE 1:100 000
DATE April 1998
J98032A

ASHOP/NOE

Situation Summary.

Due to a long standing flow diversion scheme to boost flows in the Derwent Valley Reservoirs (Howden, Derwent and Ladybower), certain lengths of both the River Ashop and River Noe are dry for long periods of time. Compensation releases of 17 Ml/d are made along a tributary of the River Noe (Jaggers Clough) and 57 Ml/d into the River Derwent downstream of Ladybower Reservoir.

There is a possibility that the existing compensations and diversions of water away from stretches of the River Ashop and River Noe could be reorganised in order to restore flows in these dry reaches. PHABSIM work carried out by Worcester University, on behalf of the Agency, shows that reducing the compensation presently released into Jaggers Clough could be detrimental to a very good brown trout fishery.

Solution.

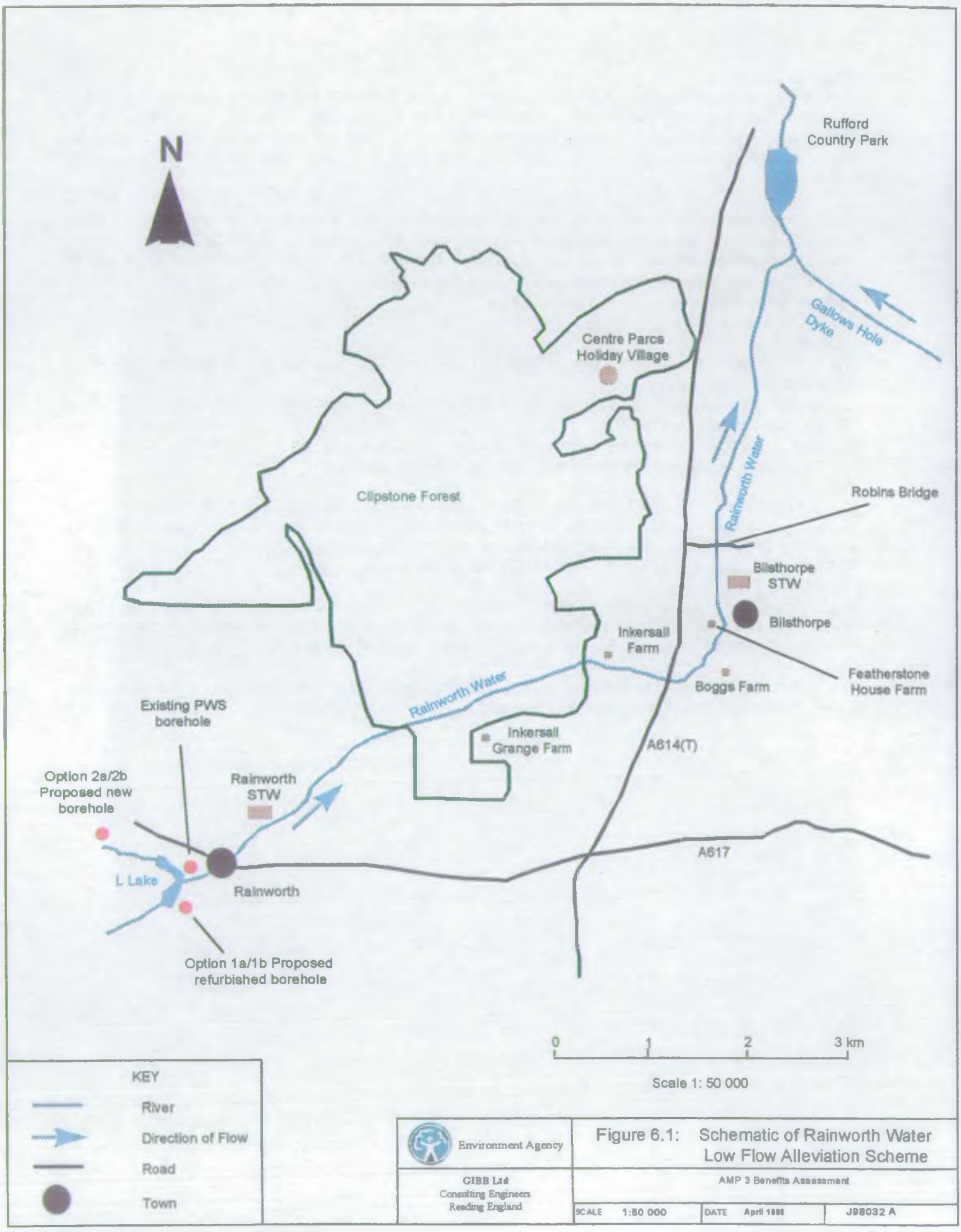
The Agency and the Water Company (Severn Trent Water Ltd) need to work together to develop a scheme that will:

- Not significantly reduce the available yield of the reservoir system
- Be operationally practical
- Not affect the trout fishery in Jaggers Clough (trials with reduced compensation needed).
- Improve flows to the dry reaches of the rivers Ashop and Noe.

Use of information gained in a Drought Order situation suggests that the River Derwent flows could be reduced by approximately 10 Ml/d which could then be used to compensate the dry stretches of the Ashop and Noe. Some water would also be made available from the Jaggers Clough allowance, but actual details are still being considered.

The channels of the two receiving rivers would benefit from being modified for best use of the water. Presently the channels are wide and shallow and work could be done to narrow them. Flow trials will also be carried out to tune the compensation to balance the whole system.

The monies for the modifications to the civil engineering works at the diversion structures on the Rivers Ashop and Noe, have been provided from the OFWAT determination.


N
Rufford
Country Park
Gallows Hole
Dyke
Centre Parcs
Holiday Village
Clipstone Forest
Rainworth Water
Robins Bridge
Bilsthorpe
STW
Bilsthorpe
Inkersall
Farm
Boggs Farm
Featherstone
House Farm
Rainworth Water
Existing PWS
borehole
Inkersall
Grange Farm
A614(T)
Option 2a/2b
Proposed new
borehole
Rainworth
STW
A617
L Lake
Rainworth
Option 1a/1b Proposed
refurbished borehole
0
1
2
3 km
Scale 1: 50 000
KEY
River
Direction of Flow
Road
Town
Environment Agency
GIBB Ltd
Consulting Engineers
Reading England
Figure 6.1: Schematic of Rainworth Water
Low Flow Alleviation Scheme
AMP 3 Benefits Assessment
SCALE 1:50 000
DATE April 1998
J98032 A

RAINWORTH LAKES

Situation Summary.

Rainworth Lakes are actually a series of three lakes in cascade, which form an 'L' shape. The Rainworth Lakes ALF scheme was driven by the need to ensure the SSSI wetland habitat at L Lake remains watered. The surrounding base-poor marsh has many plant species, and the broad-leaved woodland breeding birds.

Two short tributaries run into the lake from catchments that appear to be larger, indicating that the streams are migrating downstream from former locations (due to groundwater baseflow reduction caused by abstractions). It is thought that the L Lake itself is supported by a perched water table within the Sherwood Sandstones, but the woodland adjacent to the outfall stream could be affected by abstraction from groundwater for public water supply.

The reach of river known as *Rainworth Water* runs from L Lake to Rufford Country Park (a total length of 12 km). The existing flow in Rainworth Water comes from a number of sources:

- Overspill from L Lake which is limited to wet weather conditions
- Discharge from Rainworth STW (highly variable, between 0.5-4 Ml/d)
- Discharge from Bilsthorpe STW (mean and dry weather flow available)
- Flow from Gallowshole Dyke.

There are several problems along Rainworth Water, which are the result of fissuring and subsidence caused by coal mining. In the recent past there have been occasions on which no flow has reached Rufford Country Park as fissures have opened up and intercepted the entire flow of Rainworth Water. British Coal accepted responsibility for this in the past, and the Coal Authority has undertaken work to put the problems right when they occur, both now and in the future.

Subsidence has also caused the development of a lake on Rainworth Water at Inkersall Farm. The Coal Authority again accepted responsibility and as the landowners wished to keep the lake as a feature, they arranged to landscape it into the surrounding land and restored an outflow along Rainworth Water. Unfortunately, three years later the lake started to flood surrounding ground due to further subsidence, and this has led to a reduction in outflow.

Rainworth Lakes and Rainworth Water low flow problems started off as two separate schemes. At present it is still not entirely clear whether the schemes will be tackled separately or jointly. A Rainworth Lakes report was written by the consultants (Entec) to assess if there are any abstractions affecting the SSSI and L Lake. They confirmed that L Lake is a perched water body, although the feeder streams lie on the Ravenstead Groundwater Management Unit, which is over-abstracted and over-licensed causing the reduced size of these streams. It is probable that no action will be necessary for Rainworth Water downstream of the SSSI (SRK Feasibility Study Feb 2000 showed that there are no public concerns regarding low flows for this stretch).

Short Term Solution.

The Agency asked the consultants (GIBB Environmental) to carry out a benefit assessment. They used 2 low flow alleviation options, which would supply Rainworth Lakes with additional inflows; compensation releases of 1 or 2 Ml/d from either a new or refurbished STW borehole. It was decided that a new borehole above L Lake would supply a compensation of 1-2 Ml/d, although further investigative working would be carried out first, followed by trialling of the system. Operating rules would then be finalised and agreed by all interested parties.

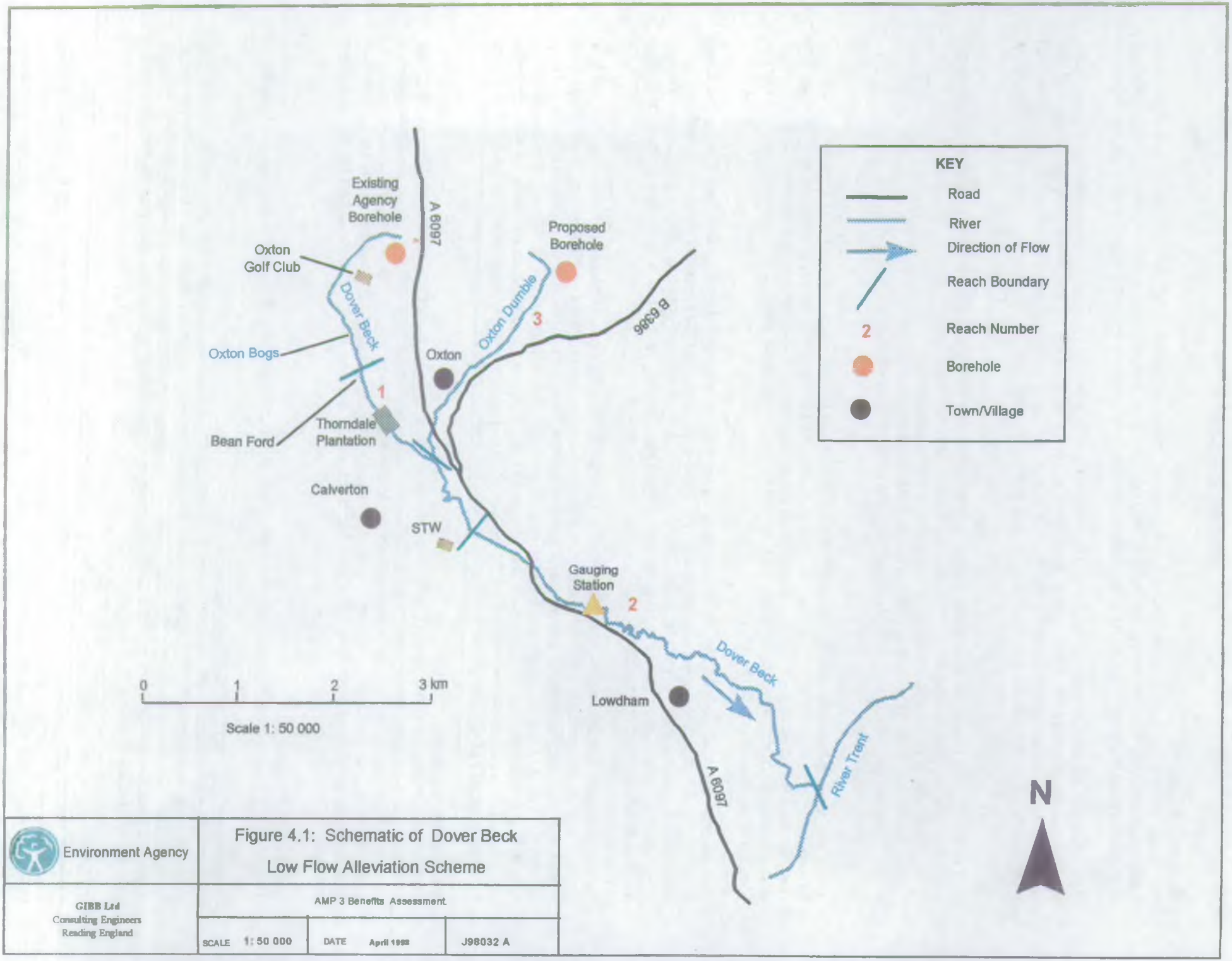
Long Term Solution.

The longer term solution will involve a phased reduction of groundwater abstraction at locally targeted sites.

Implications of OFWAT price determination.

The primary stumbling block for a sustainable long-term solution is the funding of the licence cutbacks (i.e. the costs of their replacement). The cost of these components was excluded from the OFWAT AMP3 price determination. In order to progress this issue it will be necessary for the Agency to consult again with Severn Trent, English Nature, OFWAT and the Customer Services Committee so that the views of all parties can be presented to the Government.

To allow the schemes associated with the Nottingham Groundwater to progress, the Agency is to put forward the following solution; the water requirement for compensation release should be considered as extra (the green component) to the already agreed licence variation. Therefore these compensation releases would not represent a lowering of available water to the company. This arrangement would be put in place until the problem of replacement water levels has been resolved between all parties.



Environment Agency

Figure 4.1: Schematic of Dover Beck Low Flow Alleviation Scheme

GIBB Ltd
Consulting Engineers
Reading England

AMP 3 Benefits Assessment

SCALE 1: 50 000	DATE April 1998	J98032 A

DOVER BECK

Situation Summary.

Historic over-abstraction of Triassic Sandstones underlying the Dover Beck river system, has resulted in the top 3km of the Beck being dry. Lower reaches have suffered from reduced flows and some lakes and bogs in the catchment have also been affected.

GIBB Environmental consultants carried out a cost-benefit assessment for the Agency in 1998. From this it was decided that the best interim measure was to have both a compensation of 1 Ml/d ('best endeavours' figure at this stage) released into Oxton Dumble, and bed sealing along the Dover Beck below Oxton Bogs.

Short Term Solution.

The Agency has recently commissioned a groundwater abstraction borehole at Oxton Golf Club. This has achieved rewatering of the Dover Beck from the borehole down to Bean Ford immediately downstream of Oxton Bogs. Further downstream of this point, through Middle Bogs and Thorndale Plantation, the flow continues to be lost by leakage. During 1999-2000 winter there appears to be continuous flow through this site, this will have to be investigated.

The Agency intends to identify the length of Dover Beck, which is leaking, and implement a scheme to line parts of the bed. Two options have been considered in which different lengths of the bed are lined. It has been assumed that the resulting outflow from the Oxton Bogs will continue downstream to the River Trent.

On the Oxton Dumble, a tributary of the Dover Beck, a separate augmentation release from a borehole is being considered to increase the flow. Alternatively an existing but unused borehole might be used, however this has not been yet investigated.

The gauging station at Lowdham will be used to trigger the compensation releases. This will ensure a minimum target flow at Lowdham. The Agency has stated that the target flow is 15Ml/d, which is the Q20 value (or natural flow, which is exceeded for 20% of the time). It is considered that a more sensitive trigger site needs to be found, this will be pursued over the next two years.

It is realised that as we progress in the compensation trials after bed lining has been carried out, more specific operating details will be drawn up between the involved parties.

Long Term Solution.

Reductions in groundwater abstractions to a sustainable level by the water undertakers, which will result in rising groundwater levels should restore some baseflow, reducing the amounts of compensation needed.

Implications of OFWAT price determination.

The primary stumbling block for a sustainable long-term solution is the funding of the licence cutbacks (i.e. the costs of their replacement). The cost of these components was excluded from the OFWAT AMP3 price determination. In order to progress this issue it will be necessary for the Agency to consult again with Severn Trent, English Nature, OFWAT and the Customer Services Committee so that the views of all parties can be presented to the Government.

To allow the schemes associated with the Nottingham Groundwater to progress, the Agency is to put forward the following solution; the water requirement for compensation release should be considered as extra (the green component) to the already agreed licence variation. Therefore these compensation releases would not represent a lowering of available water to the company. This arrangement would be put in place until the problem of replacement water levels has been resolved between all parties.


N
Sandy Lane
Gauging Station
Point B
Croxden Brook
Greatgate
Croxden Abbey
Winothdale Brook
1
2
Croxden
Greatgate PWS Groundwater Pumping Station
Point A
Croxden Brook
3
Hollington Road
Hollington
Nothill Brook
KEY
River
Direction of Flow
Reach Boundary
2
Reach Number
Release Points
Road
Town/Village
0
1 km
Scale 1:25 000
Environment Agency
GIBB Ltd
Consulting Engineers
Reading England
Figure 3.1: Schematic of Croxden Brook Low Flow Alleviation Scheme
AMP 3 Benefits Assessment
SCALE 1:25 000
DATE April 1998
J98032

CROXDEN BROOK

Background

During recent years there have been public complaints (particularly from Croxden Parish Council) about reaches of the Croxden and Winnothdale Brooks drying up during the summer. Analysis of the flow figures from Greatgate gauging station shows there has been a historic decline in flows. In 1992 this intermittent problem was identified as resulting principally from groundwater abstraction from Severn Trents borehole.

In 1993 a trial was undertaken to release water into the Winnothdale Brook from existing public water supply abstraction, to see how well the watercourse could transfer water to the downstream gauging station at Greatgate. This trial identified a problem with water leaking through the brook bed before it reached the gauging station. Channel lining will therefore be required.

In November 1999 another trial compensation release (from the existing PWS borehole at Greatgate) was carried out as part of a 16 day flow survey. This was to check the state of the stream bed downstream of Greatgate gauging station, and showed that there is a water loss through the brook bed and channel lining will be required along this stretch too.

Restoration of flows and pool levels within the Croxden and Winnothdale catchment will enhance the amenity and recreation value of the watercourse as well as provide further amenity value for visitors of Croxden Abbey. The restoration project will also improve the continuity of the brook's wildlife habitat, with the potential for restoration of the brown trout nursing area.

The consultants GIBB Environmental (working on behalf of the Environment Agency), carried out a benefit assessment for the Croxden Brook. They looked at several compensation release options of 1-2 Ml/d released at different locations. A 1 Ml/d release from the upper reaches of Winnothdale Brook was preferred as the 'best endeavours' figure available at present. Until further trials and bed lining have been completed, it is recognised that this figure may change. Changes in operating rules will be agreed by involved parties when more analysis has been carried out.

The total length of the Croxden Bk. and its tributaries to benefit from the improved flows is 4.4km.

Short-term Remedy

In response to the findings of the 1993 and 1999 trial releases additional gaugings were commissioned this year at new locations along the Winnothdale and Croxden Brook. The aim was to try and pinpoint the extent of the channel which requires lining in order to reduce leakage from the brook. Full analysis of the spot gauging is still in progress although initially it does seem to be giving inconclusive results.

A project initiation meeting is scheduled for 20th Nov when the project team will discuss the full results of the gauging and the way forward with Severn Trent Water in January. This will allow the revised costings for implementation of the proposed compensation releases to be completed.

Long-term Solution

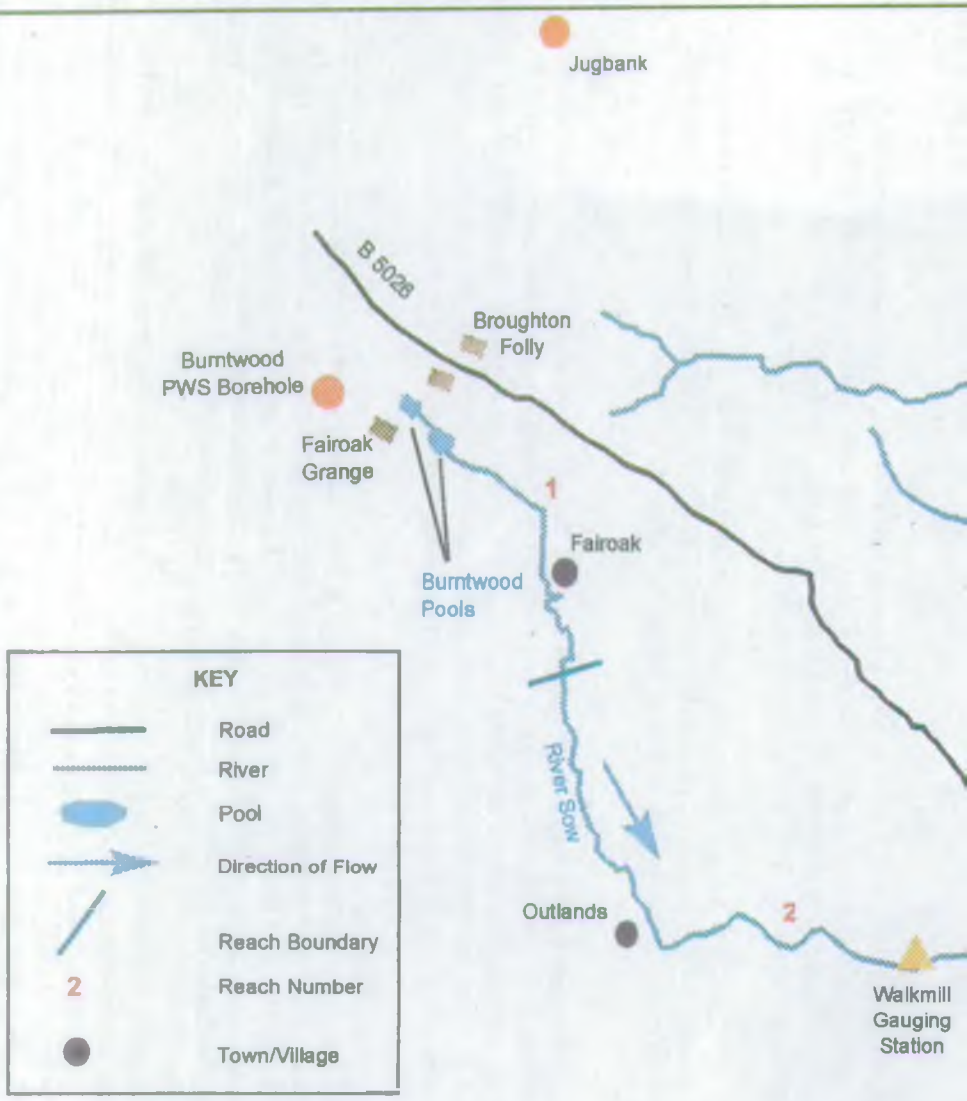
Reduction of the licence for Greatgates borehole is required. This is a supply area that only has one source of supply, and there are difficulties in providing alternative sources, so demand management options are to be considered. A combination of higher levels of demand management (such as leakage control) and water conservation measures (with local householders, business and especially farming) may reduce water requirements. This may well provide a sustainable answer to the problem of low flows in the brook.

Implication of OFWAT price determination

The primary stumbling block for a sustainable long-term solution is the funding of the licence cutbacks (i.e. the costs of their replacement). The cost of these components was excluded from the OFWAT AMP3 price determination. In order to progress this issue it will be necessary for the Agency to consult again with Severn Trent, English Nature, OFWAT and the Customer Services Committee so that the views of all parties can be presented to the Government.

To try and implement the agreed solution the existing licence at Greatgates is being reviewed. It maybe possible to maintain the peaks required for supply plus the brook compensation release within the terms of the existing licence. This would mean that there would be no replacement water cost involved at this site allowing Severn Trent to fund the remedial scheme. However trials will be required to test the effects on the brook if Greatgates is used at this high rate of abstraction. It will also help to establish lengths of the brook course which need lining.

In the long term, alternative supplies or high levels of demand management will be required to produce a sustainable solution for this site.



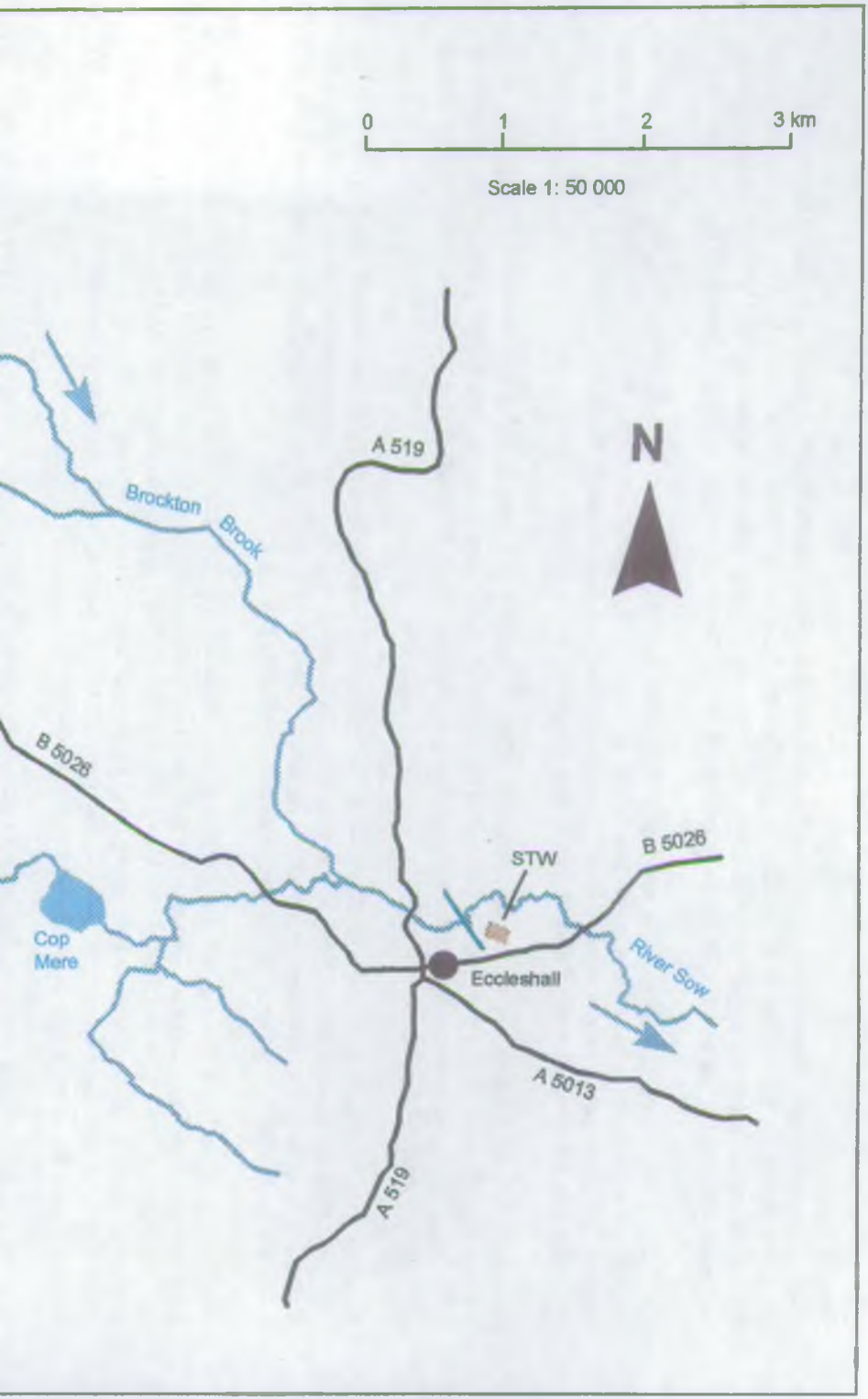
Environment Agency

Figure 2.1: Schematic of Burntwood Pools Low Flow Alleviation Scheme

GIBB Ltd
Consulting Engineers
Reading England

AMP 3 Benefits Assessment

SCALE 1: 50 000 | DATE April 1998 | J98032 A


0
1
2
3 km
Scale 1: 50 000
N
A 519
Brockton
Brook
B 5026
STW
B 5026
Cop
Mere
Eccleshall
River Sow
A 5013
A 519

BURNTWOOD POOLS

Background

During the early 1980s, problems with low flows were identified on the upper reaches of the River Sow in the vicinity of Burntwood Pools. The reduction in flow is thought to be due to a reduction in base flows as a result of over-abstraction of groundwater, particularly from the Burntwood borehole, which is used for public water supply.

Two options were originally considered for enhancing flows on the upper reaches of the River Sow. In both cases the compensation release (either 1 or 2 Ml/d) would be made from the existing borehole and would discharge to the river upstream of the fishing pool adjacent to Fairoak Grange. The schemes considered also involve a reduction in the abstraction for public water supply at the existing Burntwood groundwater pumping station.

As well as ecological benefits along the watercourse (and specifically Copmere, the SSSI), there would be additional improvements in amenity and recreational value of the area surrounding the watercourse, and to the water quality due to the dilution of the effluent from the sewage treatment works in Eccleshall.

Eventually the reductions in the public water supply abstraction will provide more baseflow to the brook (as the aquifer levels rise), which will reduce the amount of flow augmentation necessary.

Our consultants (GIBB Environmental) carried out a benefit assessment for the options above, and it was decided that a release of 1Ml/d should be used as it was expected to re-water 3km of the River Sow and significantly increase flows over 11km. The increased flow length includes the SSSI site at Cop Mere.

It is planned that the gauging weir at Walkmill will be used to trigger the compensation when Q50 (4.06Ml/d) has been reached and a second trigger will be used to stop the release at 5.06Ml/d. These figures were calculated as 'best endeavours' estimates. Severn Trent Water Ltd. investigated replacement water for the Burntwood sources, which has been re-costed at £4.5M.

Short-term Remedy

The existing borehole at Jugbank (in a different groundwater unit) is now being considered, with a pipeline to transport the compensation water. This adjacent groundwater unit has a different water quality, which is a problem to be considered. The reason for this change is that the water requirement for the supply area can at present only be met from Burntwood borehole. Therefore there is no water surplus that could be used for compensation release from that source.

A revised cost benefit assessment will be necessary to provide an alternative Business Case using a pipeline from the existing borehole at Jugbank. As further analysis and the revised benefit assessment are carried out, it is recognised that figures may change and operating rules may need to be altered and agreed by the parties involved.

Long-term Solution

It is considered that having a supply area dependent on a single source supply is not good practice. Therefore an additional supply source needs to be located to provide water to the supply area. This should ensure that the licence for Burntwood can be reduced to a sustainable level.

Implications of OFWAT price determination

The primary stumbling block for a sustainable long-term solution is the funding of the licence cutbacks (i.e. the costs of their replacement). The cost of these components was excluded from the OFWAT AMP3 price determination. In order to progress this issue it will be necessary for the Agency to consult again with Severn Trent, English Nature, OFWAT and the Customer Services Committee so that the views of all parties can be presented to the Government.

If investigation by Severn Trent shows that the site at Jugbank is capable of supplying the needs of the Burntwood Pools and River Sow then this scheme will be able to progress as there are no replacement costs involved.