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BRISTOL WATER PR09



# **WR3e – Holes Ash Stand Alone Treatment Scheme Preliminary Design Report**

January 2009



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## WR3e – HOLES ASH STAND ALONE TREATMENT SCHEME

### 1. INTRODUCTION

Holes Ash spring is currently out of service due to high turbidity of the water and the associated risk of cryptosporidium. It is proposed to bring the well back into service by constructing a submerged membrane treatment plant on the site. The plant will have a capacity of 2 MI/d.

#### 1.1 OS reference

Holes Ash treatment works: proposed location for submerged membrane plant:

354693, 148129

ST 5448

### 2. DRIVER FOR SCHEME

The scheme is driven by a need to increase water resources.

The driver for the scheme as listed in the scheme database is:  
SDB2 - Growth - treatment/production

### 3. OPTIONS CONSIDERED:

#### 3.1 Stand Alone Submerged Membrane Treatment Plant (selected option)

A 2MI/d capacity submerged membrane treatment plant and on site electro-chlorination (OSEC) will be installed. The existing wells are to be refurbished and well pumps replaced. Water from the works will gravitate to Milton Lane reservoir.

#### 3.2 Greater Mendip (Maesbury) Treatment Works

**Option A** : Pumping all the Mendip sources to a single greater Mendip treatment works was investigated. Honeyhurst, Charterhouse, Holes Ash, Forum, Gurney Slade and Sherborne wells would be pumped to a single treatment works located at Maesbury.

**Option B**: A further option to pump only Forum, Gurney Slade and Sherborne wells to a single smaller treatment works at Maesbury was also investigated.

Both option A and B were rejected because of high capital and operational cost.

### 4. INTERACTION WITH OTHER SCHEMES

None anticipated.

### 5. GEOTECHNICAL SUMMARY

#### 5.1 Geology

Holes Ash Treatment Works is located on the south slope of the Mendip Hills approx. 2km north of Wells. It is situated on the eastern slope of a narrow valley which leads off the top of the escarpment, just to the west of the minor road that runs up the valley. It is proposed to construct a submerged membrane treatment plant at the site.

The site lies on the Portishead Formation of the Upper Old Red Sandstone. This is overlain towards the northern end of the site by the Avon Group Limestone and Avon Group interbedded Limestone and Mudstone of the Carboniferous Limestone Series. These strata dip to the north-west at about 40°. To the west of the site is a north-south trending fault, beyond which Black Rock Limestone over Avon Group interbedded Limestone and Mudstone dips to the south-east at about 35°.

The Portishead Beds range from mudstones and clays to siltstones and lenticular hard fine-grained quartzose sandstones, with isolated lenticular masses of pebbly conglomerate.

## 5.2 Constructional aspects

The proposed plant will be housed in a new building situated to the north of the site. The ground should provide an adequate foundation.

## 5.3 Recommendations for site investigation

It is suggested that a trial pit be excavated at the site of the submerged membrane plant to confirm the ground conditions.

# 6. ENVIRONMENTAL DESK STUDY

## 6.1 Scope

This high-level environmental assessment has used the GIS data provided within the attached table. It is important to note that data is not provided for all environmental receptors that may be considered in an EIA screening. For example, information on Sites of Interest for Nature Conservation would need to be gathered following the Preliminary Environmental Assessment.

## 6.2 Overall assessment

- Proposed installation of a new submerged membrane treatment plant within a new building at Holes Ash Spring and installation of an on-site electro-chlorination kiosk. Works to include associated pipework replacement and small-scale works to upgrade other plant and machinery. The works do not fall within Schedule 1 and do not cover a sufficient area to exceed the indicative thresholds for Schedule 2 of the EIA Regs. '99. This would indicate that an EIA is unlikely to be required. However, as detailed below, the site is located within a sensitive area and the opinion of the local planning authority (LPA) should be sought to confirm whether they would require an EIA for this development.
- The site falls within the Mendip Hills Area of Outstanding Natural Beauty (AONB) which is a formally defined 'sensitive area' under the EIA Regs. The site is also 973m away from the North Somerset and Mendip Bats Special Area of Conservation (SAC) and the Wookey Hole Site of Special Scientific Interest (SSSI) and within 2km of the Ebbor Gorge, Sandpit Hole & Bishop's Lot and Priddy Caves SSSIs. These are all designated 'sensitive areas'.
- The below ground works are not likely to require planning permission as they should fall within Bristol Water's permitted development rights. However, the provision of a new building to house treatment plant will require planning permission, and any separate temporary works compounds, may also require planning permission and consultation should be sought with the LPA. It is assumed that any building will require architectural finishes to meet planning requirements.
- If a planning application is required, but an EIA is not required, then a supporting statement should be submitted to the LPA to outline the environmental constraints and actions taken (such as surveys).

- *It is important to note that should an EIA be required by the LPA then all permitted development rights will be lost and a planning application would need to be submitted alongside the Environment Statement (report generated by the EIA).*

### **6.3 Summary of environmental constraints**

- The nearest scheduled monument identified is Bowl Barrow 435m away. This is unlikely to be impacted upon by the Holes Ash works.
- The proposed works are located within a Source Protection Zone 1 and there is an abstraction point within 50m.

### **6.4 Recommendations for future surveys/investigations**

- Due to the proximity of the works to an SAC, consultation with Natural England should be undertaken to establish if an Appropriate Assessment should be produced. An Appendix 11 (under the Habitats Directive) may need to be produced to assist this consultation. If Natural England consider that the proposal may have an impact upon the habitats or species protected by the SAC then a full Appropriate Assessment (Appendix 12) will be required.

## **7. HYDRAULIC REVIEW**

The hydraulics of the existing pipework are to be investigated in more detail.

The means of disposal of backwash wastewater is to be investigated. To determine whether a soakaway is feasible the percolation rate must be determined by conducting a percolation test. The alternative to using a soakaway is to discharge to the nearby stream.

## **8. TECHNICAL DETAILS**

Further details of plant including supplier costs for the membranes plant, OSEC plant and micro strainer are included in the cost schedule attached in Appendix 6.

### **8.1 Process plant**

The proposed submerged membrane plant will be installed in a building with a footprint of 21m x 9m. It will contain three cells and twenty four modules per cell.

To protect the membrane fibres from damage by gross solids, a basket strainer system will be installed.

Submerged membranes are a DWI recognised barrier against cryptosporidium and there is therefore no requirement for DWI approved cryptosporidium monitoring. The membrane can also be used as a primary disinfectant meaning water requires marginal chlorination only. This is to be provided using new OSEC plant.

The membranes are backwashed with air and water at regular intervals (e.g. 30 to 45 minutes) to dislodge solids build-up on the membranes, and chemically cleaned with hypochlorite or acid on a less frequent basis (e.g. every 28 days). Chemical waste coming from cleaning by acidic, alkaline or chlorinated cleaning agents will be neutralised in a neutralisation tank before being pumped to the neutralized waste holding tank.

Backwash waste water (up to 60m<sup>3</sup>/d) is produced by the membrane plant and it will be directed either to a soakaway on the site or to a nearby stream. No chemicals will be added to the water before discharge so the discharge is unlikely to be harmful to the environment

but a discharge consent will be required. Infrastructure to store and attenuate the backwash waste water flow has been included in the scheme. Discharge of the wastewater remains a risk item that needs to be addressed in more detail. Investigations may include liaison with the EA and surrounding landholders.

At this stage a water quality sampler and flow meter is to be included to monitor the discharge to the stream.

The following process plant is proposed:

Equipment from Membrane supplier:

- Membrane cells
- Filtrate pumps
- Cleaning in place chemical tank
- Backwash water tank
- Air blower, compressor, air receiver
- CIP chemical storage (carboys) and dosing sets
- Media neutralisation unit

Additional equipment included with membrane plant

- CIP waste tank (holds untreated waste prior to treatment by the waste neutralisation unit).

Other equipment not included with membrane plant:

- 2mm pre-filter (manual basket filter on inlet pipe - single or dual perforated basket filter)
- OSEC plant
- Modifications to pipework
- Neutralisation tank feed pumps to Neutralisation Media Unit
- Neutralised waste storage tank for tanker pickup
- Backwash wastewater storage tank
- Flow and quality meters, other instrumentation

## 8.2 OSEC Plant

It is proposed to install the OSEC plant inside the existing chlorination building above the treated water tank. Salt will be used to generate chlorine in the OSEC plant. A risk assessment must be carried out to determine whether there is a risk to water quality by storing salt above the treated water tank.

The alternative will be to extend the size of the proposed submerged membrane building so that it can also accommodate the OSEC plant.

## 8.3 Collection Chamber

The existing spring collection chamber is to be renovated. The works have been out of service for some time and the condition of the chamber is likely to be poor.

## 8.4 Modifications to Springs Sources

Both the Vigo and Rookham springs are to be refurbished. Refurbishment at Vigo spring is to include:

- Cleaning and swabbing the existing abandoned 4" main between Vigo and Rookham spring to bring it back into service.

- Installation of 100mm diameter valve.
- Refurbishment, cleaning and flushing of the existing spring chamber at Vigo spring.

Refurbishment at Rookham spring is to include:

- Installation of a new well pump with 4MI/d capacity at 15m head.
- Replacement motors and control panel.

## 8.5 Downstream Connections

The following downstream pipework modifications will be made to enable treated water from Holes Ash to gravitate to Milton Lane Reservoir:

- Cross connection at Holes Ash: 200mm diameter pipe, 15m long connected between the existing 200mm diameter AC pipe and the existing 6" CI pipe.
- New 200mm diameter electrically operated valve to be installed on the inlet to Milton Lane reservoir number 1.
- Cleaning, swabbing and final connections to bring 25m of the existing abandoned 200mm diameter pipe back into service at Milton Lane Reservoir number 1 inlet.

## 8.6 Power Supply

A new power supply will be required to the site. It is likely that this will need to be taken from Wells (some 2km away) and a transformer will be required.

## 8.7 Phosphoric Acid Dosing

To control plumbosolvency there may be a need to include phosphoric acid dosing plant in the works. An allowance for this is to be made in the risk register.

## 9. BUILDABILITY

The most significant buildability issues have been identified as follows:

- 1) The site is steeply sloping.
- 2) The site is partly wooded and located in an Area of Outstanding Natural Beauty.

## 10. RISKS AND OPPORTUNITIES

- 1) Additional retaining walls may be required to construct the proposed plant on the site.

## 11. COST INFORMATION

Costs are summarised in the table below (price base 2007/08):

Summary of Netts	£1,787,515
Summary of Contractors overheads & prelims	£702,443
Summary of design costs	£116,188
Summary of BW costs (excluding BW supervision)	£392,176
Contingency - to cover change of scope (10% of scheme total)	£299,832
BW costs	£ 98,945
<b>Scheme CAPEX Total (excl. OPEX costs)</b>	<b>£3,397,099</b>
<b>Scheme OPEX Total (pa)</b>	<b>£132,000</b>

More detailed cost information is included in the Cost schedule attached in Appendix 6.

Bringing Holes Ash back into service will offset 2 Ml/d which is currently pumped from Hillhouse to Milton reservoir. This reduced pumping cost is taken into account in the operational cost of the works. The operational cost is estimated to be £132,000 per annum.

## 12. PROGRAMME

Details of the programme are attached in Appendix 7.

## 13. CONCLUSIONS

The Water Resources Plan identifies the need to bring this source back into operation. This will require the construction of a submerged membrane plant to remove cryptosporidium oocysts from the water and deal with high turbidity. Modifications to pumping plant and the installation of an OSEC plant are also required.

## APPENDICES

Appendix 1 – General Arrangement Drawing

Appendix 2 – Environmental Constraints Map

Appendix 3 – Environmental Schedule

Appendix 4 – Geological Map

Appendix 5 – Risk Register

Appendix 6 – Cost Schedule

Appendix 7 – Outline construction programme