

Alton Pancras Elimination of Stand Alone Source

providing additional security of supply and additional strategic storage within the water distribution network in West Dorset

by Joe Edmunds BEng(Hons) ACSM

Alton Pancras is a borehole source located between Dorchester and Yeovil which historically has on average provided a public water supply (PWS) of just under 2.5MI/d. The abstraction regime at Alton Pancras has varied in recent years as the licence, operating agreement and requirements for stream support have been under review. The PWS licence is currently a simple 4.5MI/d daily licence and 890MI annual (2.44MI/d) licence. Historical production has varied between a maximum weekly supply of around 3.5MI/d when water is supplied into neighbouring distribution networks to a minimum base load supply of around 1.9MI/d needed to meet local demands. Whilst the neighbouring distribution networks can be supplied from elsewhere the local demand cannot. This paper summarises the design considerations, construction and commissioning of the Alton Pancras Elimination of Stand Alone Source (ESAS) scheme.



Forston WTW Pumping Station after installation of new St Catherines pumps and pipework - Courtesy of Wessex Water

Background

The £5m scheme to eliminate the stand alone nature of the Alton Pancras Water Treatment Works (WTW) in West Dorset will provide additional security of supply to customers in Alton Pancras and the surrounding areas for at least the next 25 years and will also provide additional strategic storage within the water distribution network in West Dorset. The scheme is situated approximately 5km north of Dorchester and extends from Forston WTW, via St Catherines Hill at Cerne Abbas to Alton Pancras Service Reservoir.

The site was first identified within the AMP5 programme of elimination of standalone sources and was included with the Wessex Water £220m Water Supply GRID programme of works. It was determined that a transfer capacity of 2.5Mld was required to fully substitute for an outage at Alton Pancras WTW with additional storage required as part of the new link to ensure minimum storage times could be provided to meet company standards.

Project delivery

Wessex Water's internal engineering and construction services business, Wessex Water Engineering & Construction Services (WECS) is responsible for managing the overall delivery of the Water Supply GRID programme of works, with both WECS, Atkins Ltd and AECOM providing engineering, design, planning and environmental services. Individual schemes within the GRID programme of works are delivered in close partnership with the scheme contractor.

For the Alton Pancras ESAS scheme, design services were provided by Atkins Ltd with CDMC, planning and environmental services provided by WECS. The scheme's civil and M&E contractor was Trant Engineering Ltd.

Design

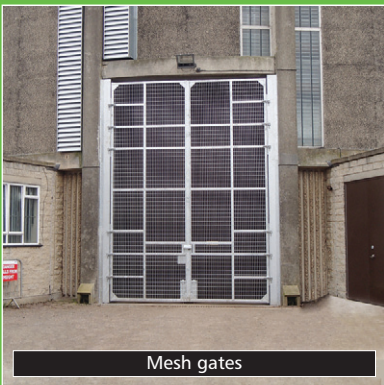
The design criteria and process performance was defined at an early stage. This being:

TECHNOCOVER

An Ensor Group Company

Physical Access Solutions for Asset Protection

Providing the widest range of third party tested and approved physical access protection solutions through continued innovation and value engineering – Increasing operational efficiency of both new and existing assets by focussing on total expenditure (TOTEX) control and whole life performance.



Technocover Total Service:

Operating a Total Service philosophy, Technocover expertise covers:

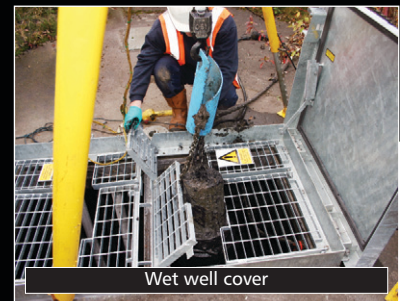
- Consultancy
- Site Surveying and Risk Assessment
- Design
- Manufacturing and Finishing
- Supply
- Installation
- Maintenance



Technocover Limited

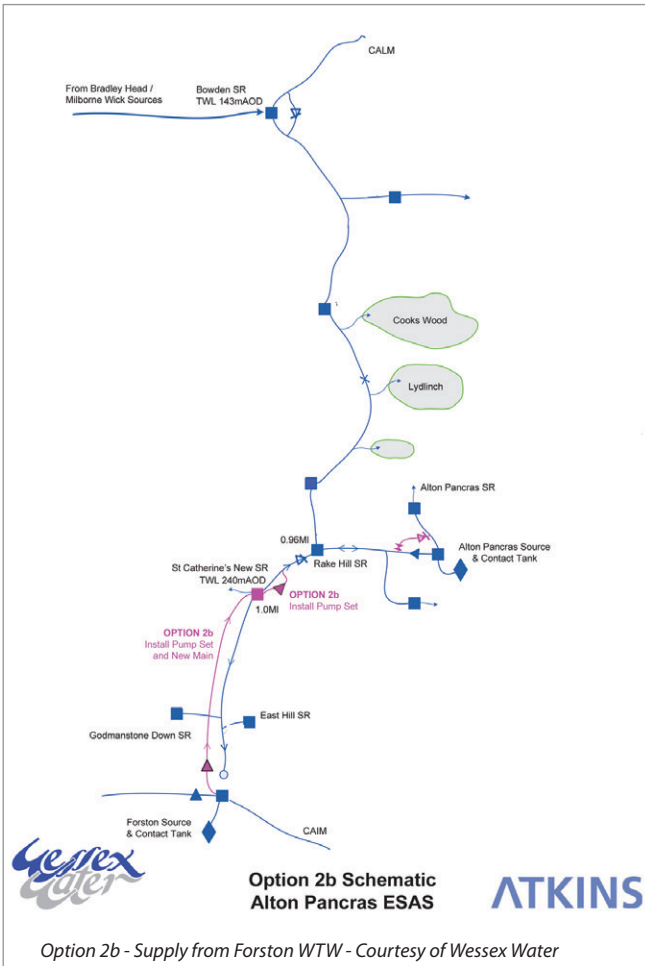
Henfaes Lane,
Welshpool,
Powys, SY21 7BE,
United Kingdom.

Telephone: +44 (0)1938 555511
Fax: +44 (0)1938 555527



For further information on products and services offered by Technocover, visit our website:

technocover.co.uk



- Provide a transfer capacity of 2.5Ml/d to the area normally supplied by Alton Pancras WTW under peak summer demand conditions.
- Transfer rates to be designed on transferring the peak daily design capacity based over 24 hours.

Four options were developed which looked at upgrades to the existing distribution network to allow import from the north, east, south or west. Considerations of these options concluded that the preferred options were:

- Option 1a: Re-supply from the north from Bowden SR.
- Option 2b: Re-supply from the south from Forston WTW to Rake Hill SR.

Whilst Option 1a provided the lowest CAPEX solution, Option 2b had the lowest overall TOTEX and this was accepted as the preferred solution.. The principle design elements were defined as follows:

Forston WTW pump room and site: Replacement and refurbishment of existing pumps feeding the existing St Catherine's service reservoir including the provision of VSDs within the existing pump house at Forston WTW and provision of surge protection for the new pump main to St Catherine's Service Reservoir.

New pumping main from Forston WTW to St Catherine's SR: A new 250mm (ID) pumping main, designed to carry 3.5Mld at a maximum working pressure of 20bar incorporating a directionally drilled twin river crossing under the Cerne River.

St Catherine's SR: A new replacement service reservoir and new pumping station at the existing St Catherine's Service Reservoir site increasing storage to 1Mld and allowing flows to be pumped to Rake Hill service reservoir. The option of adding to the existing storage was rejected due to the complexity of operating two reservoirs in parallel.

Principal elements of the reservoir:

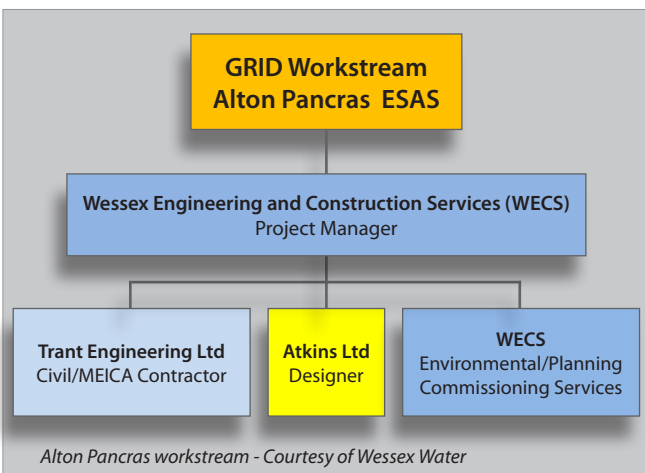
- 1Ml twin celled reservoir, each cell being 18m long x 10m wide x 3m deep, and divided by a central baffle wall. A valve chamber containing the new Rake Hill pump sets. Constructed as an in situ reinforced concrete structure to maintain consistency of design and detailing with other recently constructed service reservoirs.
- Water quality monitoring.
- An external kiosk containing a new MCC to minimise visual impact of the valve chamber.
- Reservoir designed to allow all surplus material to be reused for landscaping on site with no net export off site.
- Inlets via high level bell mouths in the outer lanes, with outlets from the central sumps to maximise submergence. Overflow pipework either side of the sumps, positioned to minimise obstruction.
- New soak away washout.
- 2 (No.) 37kW VSD duty/standby pumps to pump forward flows to Rake Hill Service Reservoir.
- 1 (No.) surge vessel LCP 2m³.

Rake Hill SR:

- Installation of pipework and control to allow filling of Rake Hill service reservoir from St Catherine's Service Reservoir.
- Relining and recommissioning of the existing Rake Hill to St Catherine's main previously disused.

Alton Pancras WTW:

- New Installations at Alton Pancras WTW to enable bypassing of Alton Pancras WTW and to provide filling and level control for Alton Pancras SR situated above the WTW.
- Water quality and flow control.



Design challenges

The design considered a number of constraints including the installation of new pumps in the existing pump station at Forston WTW. The pump station houses 8 (No.) pumps and an operational borehole. Design and construction needed to account for the restricted access and health and safety impacts of working within the pump station.

It was identified during the project inception that significant improvements would be required at Forston WTW to ensure water quality and health and safety. Rationalisation of this site is planned for a subsequent scheme.

Of concern during detail design was the complexity and operation of the existing pipework at Forston WTW and the interaction between the pumped feeds to Charminster, Grimstone and Herrison service reservoirs.

Extensive trial pitting was required to prove connections and the extent of the complex existing pipework during the design phase. At all stages the existing pumping station had to be kept operational.

The elevation difference between Forston WTW and St Catherines service reservoir is 190m and therefore special consideration needed to be made for construction of the Cerne River drilled crossing immediately adjacent to Forston WTW. The final pipeline design included DI pipework at the low elevations changing to SDR 11 PE and then SDR 17 PE pipe at the higher elevations close to St Catherine's service reservoir.

The contractor later proposed to replace the river crossing DI pipe with welded steel as this allowed greater flexibility to achieve the drilling radius required to deal with the steep topography upstream of the drilled crossing location. This proposal was accepted.

Due to the rural nature of the area the design considered alternative power supply methods as connections to the distribution network at Rake Hill Service Reservoir and Alton Pancras Service Reservoir were prohibitive. The design made use of a combination of PV panels and wind generators to power the monitoring and control installations at these sites.

The commissioning plan developed at design stage also needed to consider the methodology for ensuring supply was not interrupted to the existing St Catherines Service Reservoir or to any of the other service reservoirs fed from Forston Water Treatment Works and the change over from the existing reservoir to the new reservoir whilst maintaining a resilient distribution system and no risk to water quality.

This resulted in a 14 stage commissioning plan being developed and implemented by the WECS commissioning team.

Environmental considerations

The scheme is located within the West Dorset AONB and was recognised at an early stage to potentially have high environmental impact during construction. Whilst not located within any areas of specific importance the scheme was constructed close to the Cerne and Sydling Down Special Area of Conservation (SAC), Black Hill Down Site of Special Scientific Interest (SSSI) and Brooklands Farm SNCI/County Wildlife Site, LNR.

A number of Scheduled Ancient Monuments are close to the area of works and the remains of a Roman villa is to the south of the Forston WTW. The works are within a known area of archaeological significance and the possibility of programme delays as a result of archaeological mitigation needed to be considered.

In addition protected species known to be present in the area include water voles, Adonis blue, marsh fritillary, bullhead, great



Forston to St Catherines pipeline
Courtesy of Wessex Water



St Catherines Reservoir site - Courtesy of Wessex Water



Rake Hill pump station monitoring equipment
Courtesy of Wessex Water



Forston WTW vacuum excavation amongst existing services
03/04/2014 11:51
Courtesy of Wessex Water



St Catherines Reservoir completed roof detail - Courtesy of Wessex Water



Rake Hill Reservoir PV array - Courtesy of Wessex Water

crested newts, red kites, peregrine falcon, barn owl, kingfisher, black redstart, brambling, serotina, pipistrelle, hazel dormouse, badgers and otters.

All relevant consultees were consulted early in the programme and was submitted for EIA screening opinion. Initial response indicated that an EIA would be required, however this was mitigated by modifying the proposed Cerne River crossing. Planning was required for the new St Catherines service reservoir and this was obtained in autumn 2013.

Construction

Trant Engineering Ltd commenced work in January 2014 to establish the worksite at St Catherines Service Reservoir. Following a period of sustained poor weather at this exposed site work commenced to construct the reservoir in February. On completion of the base slab the reservoir walls and roof progressed sequentially with the main structure and valve chamber complete by July 2014 allowing the MEICA installation to commence.

On completion of the structure internal pipework was installed and following successful water testing the reservoir drainage and waterproofing was installed allowing backfilling to commence.

Pipeline construction and works at Forston WTW commenced in June and were completed concurrently with relining works to the Rake Hill to St Catherines Main and works at Rake Hill and Alton Pancras.

Specialist vacuum excavation using air lances was used at Forston WTW due to the complexity of and risk of damage to existing pipework in the ground. Limited historical information was available on the existing pipework and site services including location and condition. In the event the high risk excavation and pipe laying in this area was completed without incident.

On completion of all construction works including connections, instrumentation, sampling facilities and telemetry the reservoir was cleaned, disinfected and filled and sampled. This enabled the proving of onward pumping from St Catherines to Rake Hill and the gravity substitution of Alton Pancras WTW from Rake Hill Service Reservoir to Alton Pancras Service Reservoir.

Particular care was taken during construction of the reservoir to cleanliness to prevent any contamination of the internal surfaces. Potential contaminants were strictly controlled and not allowed within the reservoir exclusion zone. The attention to detail even extended to the type of wheels used on mobile platforms. The measures taken ensured that the reservoir passed all water quality testing at the first attempt.

The scheme was substantially complete in December 2014 and final commissioning and demolition of the old reservoir at the St Catherines reservoir site is scheduled for June 2015.

Conclusions

The construction of the Alton Pancras ESAS scheme is complete and final decommissioning of the old St Catherines reservoir will be carried out in June 2015. Completion of the scheme will ensure security of supply to Wessex Water customers in the West Dorset area.

Further works under the GRID programme of works are scheduled over the next 3 years and these will further improve security of supply in West Dorset.

The editor and publishers would like to thank Joe Edmunds, Project Manager with Wessex Engineering & Construction Services, Wessex Water, for the Water Supply GRID, for providing the above article for publication.