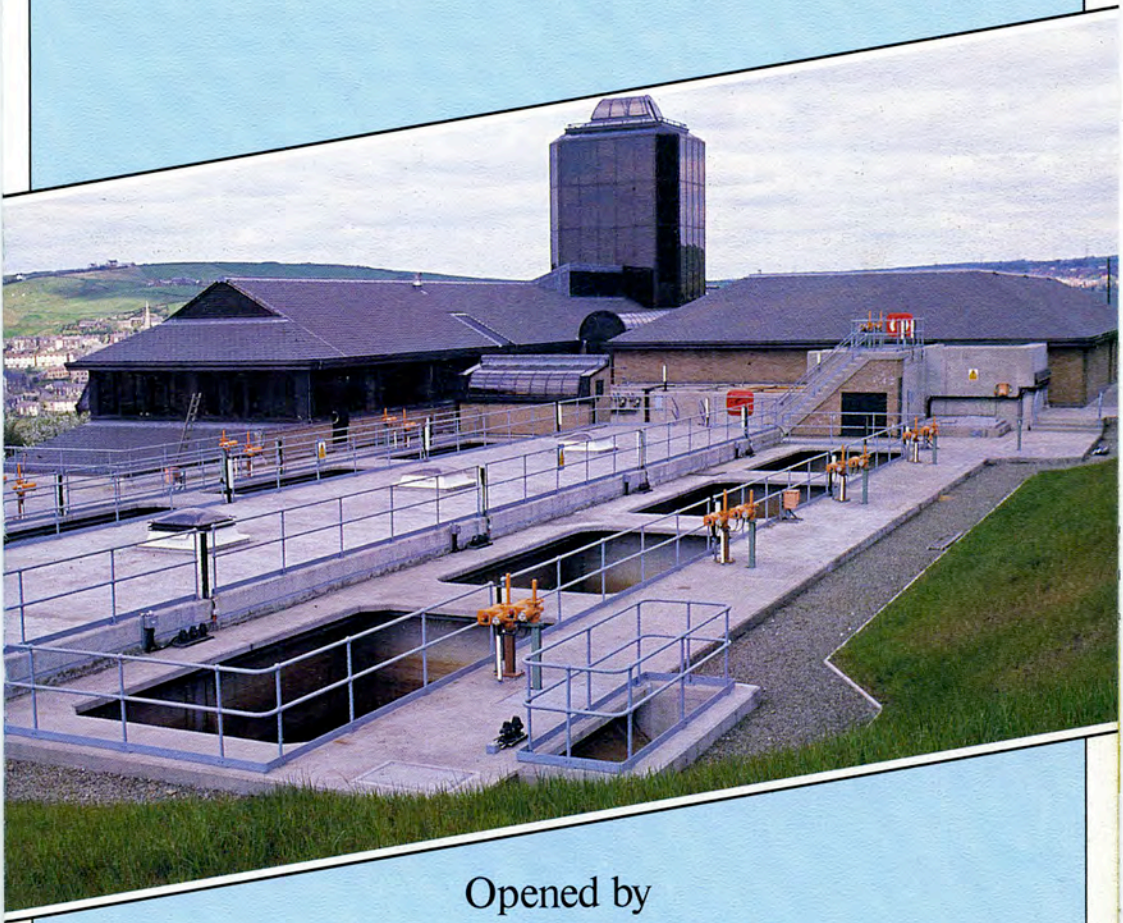
Buckton Castle
Water Treatment Works



Opened by
Michael Howard, QC, MP
Minister of State for Water and Planning
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NORTH West Water's £10-million Buckton Castle water treatment works at Mossley near Manchester and commissioned this year, is the most modern plant in the region.

It is also striking from an architectural viewpoint and has been constructed to blend in with a small community against a backdrop of moorlands. Its cathedral-like tower and dome of bronzed glass are not an architectural flourish but a functional way of housing chemical plant, including a tall lime silo.

The works is the key element of North West Water's strategy to improve water supplies to 122,500 people in the Tame Valley with construction starting five years ago. The scheme has also included 16 miles of new mains as well as major refurbishment of existing ones, constructing pumping stations and service reservoirs which, together with the treatment works, has cost about £21-million. The areas to benefit include Delph, Diggle, Dobcross, Uppermill and Greenfield in Oldham MB, and Ashton under Lyne, Mossley, Stalybridge, Dukinfield, Audenshaw and Droylsden in Tameside MB.

Buckton Castle — a highly automated plant and one of the first to be monitored by computers — will supply up to 10.5 million gallons a day (48 megalitres).

It replaces two waterworks built before the First World War — Ashway Gap in 1909 and Brushes (1912). Although both were extended in 1950 these manually operated plants had only single stage treatment and have reached the end of efficient working life. Now closed, they were unable to meet the present and new higher water quality standards required under European Community Directives.

Before Buckton Castle Ashway Gap waterworks treated water from the Greenfield, Yeoman Hey and Dove Stone reservoirs in the Greenfield Valley, while Brushes waterworks received water from Chew, Higher Swineshaw, Lower Swineshaw, Brushes and Walkerwood reservoirs in the Swineshaw Valley. The Chew reservoir could also be used to feed both plants with boreholes near Brushes supplementing supplies when the need arose.

Neither works, despite extensions, were able to meet the strict water quality standards of the EC directives. Various proposals were studied to overcome the problem including rebuilding both waterworks. But it was decided to centralise water treatment at one works — Buckton Castle — with water being supplied to the plant from the reservoirs in both the Greenfield and Swineshaw valleys.

Treatment at Buckton Castle is in two stages, rather than one, with both clarification and filtration. It is also able to supply more water than that provided by the two former waterworks.

A feature of the works is its high degree of automation including computer monitoring — capable of scanning 1500 sensors within the works every five seconds — alarm systems to warn of problems and the use, for the first time in the North West, of on site electrolytic chlorination for disinfection treatment.

Left: Flow meters from Brushes on display in the foyer.
Above right: The laboratory
Far right: The control room

The works

Water is supplied to Buckton Castle via mains connected to the reservoirs in Greenfield and Swineshaw valleys. They merge together in the *inlet chamber* where the two sources are blended.

The flow then goes into the *contact chamber* where it is split into two streams. This allows the water to be treated separately.

Chemicals are added to the flow within the two streams — a vital factor in achieving a satisfactory water quality. Facilities exist for adding a coagulant (ferric sulphate), lime (for pH control) potassium permanganate (for manganese removal) and sodium hypochlorite (for disinfection).

Water remains in the two streams for about 10 minutes at maximum flow to enable coagulation — this allows unwanted particles in the water to stick together — before passing into *clarification tanks.*

At Buckton Castle there are four flat bottomed sludge blanket clarification tanks with provision for the addition of polyelectrolyte. Here the unwanted particles in the water have now formed what is called a sludge blanket. The coagulation process is such that the flocs (coagulated matter) stick together to form a blanket which floats part way up the tanks. As the water passes through this blanket the impurities stick together, leaving clarified water to be decanted off via two troughs at the top of each tank.

The sludge blanket that is left is removed periodically and taken to the works sludge plant and press house.

After clarification the clear water then passes through to the *filtration unit.* Here there are eight rapid gravity filters to help with the next cleaning process. A chemical mixing section, however, allows disinfection and or the addition of lime and potassium permanganate as required for the two streams before entering the filters. The filters contain graded sand to remove any remaining solid impurities as the water passes through. Each filter is cleaned automatically, at least every 48 hours. A filter is taken out of service and water is forced back up through the sand. This is called backwashing, the upward surge producing an abrasive action among the particles to clean them. This process is

automatically controlled by the computerised system in the control room.

The sludge produced by the plant, mainly from the clarifiers, is pumped to thickening tanks. Here more polyelectrolyte is added to thicken the sludge before passing to a holding tank and then through to a hydraulic press

machine. The press has 150 plates separated by cloth. Here the water passes through the cloth under pressure leaving the dewatered sludge behind on the cloths as a solid cake. A conveyor takes the cake for disposal. Water removed from the sludge is passed back to the washwater tanks before being returned to the inlet works to be reused.

The chemical room is housed in the main building along with administration offices. The main chemicals at the works are ferric sulphate, to assist in forming floc and sludge blanket within the clarifiers, and lime to adjust the acidity of water to assist in the clarification process and in removing manganese. Water drawn from the catchment is naturally acidic and the lime reduces the risk of supplies picking up lead from pipes, particularly plumbing in older property.

The lime silo or 'tower' is one of the most striking architectural features of the works and can store up to 60 tonnes. Chemicals can be easily transported from the chemical room to the mixing units along a raised walkway.

For the first time at a water treatment works in the North West the disinfection process involves using an electrolytic chlorination plant. Originally chlorine gas was to be used but because of the close proximity of housing and a school this new method of disinfecting supplies was chosen. The disinfectant (sodium hypochlorite) is produced by electrolysis of a salt solution. This is achieved by electric currents producing a chemical reaction which in turn produces hypochlorite.

After passing through the rapid gravity filters water passes via channels to a chamber where final disinfection and lime is added. The water then enters a clean water contact tank where it takes at least 30 minutes to achieve the right disinfection. This tank is about 70 metres by 36 metres wide and six metres deep and holds up to 2.6 million gallons (13 megalitres). Water then goes into distribution, most by gravity mains although a pumphouse delivers about 8 megalitres (1.76 million) a day to Harpley and Uppermill areas.

Because of its sophisticated automation the plant only needs four operators. The *control room* incorporates a programmable logic control (PLC) system capable of scanning 1500 sensors within the works every five seconds. The system receives signals from equipment in the plant and is then able to make adjustments as and when required to ensure the works operates efficiently and safely. An IBM computer logs information and can produce printouts of the plants performance.

There is a modern *laboratory* for monitoring the water treatment process. On display in the *foyer* are clarity bowls showing raw, partially treated and fully treated water. And as a reminder of the old treatment works when everything from winding meters to turning hundreds of valves was done manually rather than at the touch of a button, the flowmeters from Brushes waterworks have been refurbished and now stand proudly as an exhibition display.

Clearly for you

North West Water

Cover picture: Outside view of Buckton Castle Waterworks.

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