

# Huntington WTW

## £35m upgrade to address the need to reduce societal risk arising from the bulk storage of liquid chlorine, liquid sulphur dioxide and fuel oil

**H**untington WTW is designated a 'top tier' site under the Control of Major Accident Hazards (COMAH) Regulations and is one of the top three sites in the UK in terms of potential impact. As such there is a high level of intervention from the Health & Safety Executive (HSE) and Environment Agency (EA). The Huntington WTW project is made up of various improvement projects with a combined value of £35m overall and includes Huntington COMAH, pH (chemical dosing facility), intake, power upgrade and waste and site drainage improvements. The project is part of the £3.6 billion being invested by United Utilities in AMP5 across the North West to improve water quality and the environment by 2015. The project is being delivered by Galliford Try-Costain-Atkins Joint Venture (GCA JV) as main contractor for United Utilities.



### Background

The various projects at Huntington WTW all have separate target dates which are monitored and reviewed on a monthly basis to allow for accurate resource levels to be provided.

- The COMAH project aims to address the need to reduce societal risk arising from the bulk storage of liquid chlorine, liquid sulphur dioxide and fuel oil.
- The Intake project involved the installation of fish screens to provide exclusion of protected species via a passive wedge wire cylinder screen located in the River Dee connected to the existing intake inlet pipework, to comply with the Habitats Directive.
- The River Dee is classified as a SSSI (Site of Special Scientific Interest) and an SAC (Special Area of Conservation) river.

The rowing club and local residents together with the HSE, the Environment Agency and our client all have a vested interest in the success of the project.

- The River Dee is of archaeological importance and interest and as such, planning restrictions were imposed at Huntington due to its close association with Chester and Roman settlements, GCA JV employed an archaeological team to be present during excavations to ensure that any finds would be recorded and catalogued appropriately.


Other elements of the project include providing a bulk storage and dosing facility to raise the pH levels of the water leaving Huntington WTW into supply, and site drainage and waste improvements to comply with oil regulations along with a project to provide resilience to the power supply to site.

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### Huntington COMAH

The original COMAH project scope was to design and construct a new drum store to contain the chlorine to be stored on site. During the original discussions, the project team developed an innovative alternative for this process which was to replace the bulk chlorine store with an on-site electro-chlorination (OSE) process. This electro-chlorination plant, the largest of its kind in Europe, would negate the need for hazardous chlorine to be stored on site, reducing the risk to society and provide compliance with health and safety regulations and HSE guidance.

The project involved:

- Replacement of the bulk chlorine store with a new on-site electro-chlorination (OSE) plant.
- Replacement of the existing sulphur dioxide facility (bulk store and standby drum store) with a new sulphur dioxide drum store.
- Replacement of the existing emergency sodium hypochlorite dosing plant with a new one.
- Remediation work to the existing fuel oil facilities.

This work has successfully reduced the risk to society as, once complete, the site will no longer fall within the scope of the COMAH regulations and will comply with health & safety regulations and current HSE guidance (HSG40). It has also delivered improvements to disinfection dosing control.

### Raw water fish intake

Huntington WTW extracts all of its raw water from the River Dee in order to supply up to 369MI/d (270MI/d on average) to some 1.7 million customers in the Cheshire and Merseyside areas. This abstraction is under a conjunctive licence issued by the Environment Agency (EA) for abstraction at Huntington WTW, Heronbridge Intake Pumping Station (IPS) and Deeside IPS.

The existing intake at Huntington consists of coarse bar screens and band screens which provide little to no protection against the entrainment of a number of species of fish present in the River Dee, which is designated a Special Area of Conservation (SAC). Some of these fish species are annexed in the Habitats Directive as requiring strict protection and in order for the Huntington Intake to comply with this requirement, it was necessary to install fish screens that exclude these protected species. The entrained species comprise:

Salmon parr, salmon pre-smolts, salmon smolts, sea lamprey ammocoetes, river/brook lamprey ammocoetes, river lamprey transformers, river lamprey adults and a sea lamprey adult.

The solution was to install new passive wedge-wire cylinder (PWWC) screens on Huntington's intake on the River Dee and this was agreed with and confirmed as acceptable by the EA and Natural England.

Two temporary sheet piled cofferdams were constructed with the use of dewatering pumps, to allow excavation of the river bed and construction of an apron consisting of precast concrete revetment blocks. 8 (No.) Hydrok passive wedge wire cylinder raw water intake screens (8mm aperture) were installed together with two new inlet channels and 8 (No.) steel fender piles to protect the PWWC screens from river traffic.

The river bank was excavated to create a new sheet-piled river wall (80m) with trees and existing apron to the river removed. Air backwash pipework was installed and a new kiosk located within the existing bunded area was installed to house the air burst system. Finally, the inlet channels were connected to the existing intake mains.

The project scope carried out by GCA JV also included the construction of temporary and new permanent access roads.

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### Huntington waste streams

The lower River Dee catchment contains large areas of agricultural land that are used for livestock, leading to high concentrations of cryptosporidium in the river water, typical of a lowland river source. There is a constant presence of cryptosporidium in the raw water which presents a challenge to the treatment process.

Historically, all liquid wastes produced on site were piped to the sludge lagoons at Huntington. However, these wet lagoons were shown to be the major contributor of ammoniacal nitrogen pollution to the groundwater.

GCA JV installed a new co-thickening capability for WRc thickener sludge, including pumps, transfer pipework, poly-dosing, power and control, new WRc thickener polyelectrolyte preparation and dosing installation. Construction of a new pumping station, balancing tank and rising main to return centrate and pressate to accelerator No.6 & 8 sludge house was also carried out with a new 450m<sup>3</sup> supernatant balancing tank, including power, control and ICA. GCA JV also carried out refurbishment of the Patterson Candy International thickeners, improvements to the existing temporary centrifuge and improvements to the access to the sludge lagoons.

Consequently the disposal routes selected for the wastes will minimise risk to final water quality, i.e. cryptosporidium. The washwater treatment process will treat washwater under all water quality conditions and comply with the standards for return of supernatant.

The works improved existing and created new specified routes of disposal for all liquid wastes produced on-site (thickened filter backwash sludge, clarifier cleaning waste, thickener cleaning waste, clarifier leakage, and clarifier thickened sludge). These routes of disposal will ensure that the plant is able to operate under normal conditions without requiring the use of the lagoons to store sludge.

There is also a reduced risk of groundwater contamination when using the lagoons in emergency situations with a clear strategy for usage of the lagoons.

### Huntington pH

The final pH of the water leaving Huntington needed to be adjusted to bring it as close as possible to pH 7.5 to reduce corrosivity into supply, the average pH leaving Huntington being pH 6.9.

A temporary caustic dosing rig was installed prior to the AMP3 improvements at the site. It was envisaged that upon completion of the AMP3 improvements, the final water target pH would be achieved without final water pH correction. However, analysis of the final water quality showed this not to be the case. The data showed that in order to provide plumbosolvency optimisation, it was necessary to elevate the final water pH. The temporary caustic rig was not capable of meeting the required duty as the pumps were undersized and the small storage volume resulted in an unacceptable frequency of chemical deliveries.

Therefore the requirement was to replace the temporary caustic dosing rig to enable Huntington to meet the target pH for plumbosolvency optimisation now and in the future to ensure that there is a reduced risk of lead failures. It is also thought that raising the pH will reduce the number of iron infringements found in the zones fed by Huntington WTW. The project scope, carried out by GCA JV comprised:

- New sodium hydroxide storage tanks and bunded area.
- New chemical delivery area.
- New sodium hydroxide dosing including GRP kiosk.
- New flow meters and chambers.
- Demolition of existing site vehicle fuelling area and underground storage tank.
- New site vehicle fuel delivery area.



Huntington WTW OSE plant - Courtesy of GCA JV

- Demolition of existing temporary sodium hydroxide chemical storage and containerised plant.
- Diversion of existing water main and existing foul and surface water drain.
- Landscaping of existing embankment.
- Additional security camera to comply with SEMD requirements.

### Site drainage

As environmental regulations have become more stringent at Huntington WTW since various processes on the site were built, facilities draining into the current site drainage system needed to be improved to prevent breaches of discharge consents and the pollution of the local water course which flows into the River Dee.

At Huntington WTW there is a buried drainage culvert containing two pipes, one carrying the on-site and process drainage and the

other the off-site drainage. The culvert starts at the head bay where the on-site and off-site drainage are separated into two pipes. At the outflow of the pipe that carries the on-site and process drainage is the tail bay, and at the end of this next to the site boundary is the discharge consent point. The flow passes underneath the site boundary where it joins with the off-site drainage outflow pipe in an un-named ditch. Downstream, the ditch meets Caldly Brook which feeds into the River Dee.

The solution involved a new 26m<sup>3</sup> buried blind tank, including interconnecting pipework, the replacement of the existing tarmac bulk aluminium sulphate delivery area with a new concrete hardstanding delivery area, including bunding, and a 5m<sup>3</sup> buried blind tank with a chamber for interlock valving and interconnecting pipework.

A replacement 5m<sup>3</sup> buried blind tank including interconnecting pipework for the capture of spillages from the 96% sulphuric acid delivery area, together with associated hand railing and hardstanding was also required.

The M&E Scope included a tanker emptying facility for new buried blind tanks and a Three-way interlock valve for the bulk aluminium sulphate delivery area, together with the removal of redundant electrical installation and software for the decommissioned blind tanks. Other works included modification to existing Profibus networks and existing PLC and SCADA software with modifications to control panels, instrumentation, telemetry and cabling and cable support systems.

Following the completion of the works, the project has significantly reduced the risk of failing EA discharge consents and chlorine concentrations in the tail bay are now managed effectively.

### Summary

The project team has developed and maintained excellent working relationships with their customers who include various sponsors associated with the works at Huntington and affected third parties. GCA JV worked in partnership with United Utilities to ensure that customer focus remained a priority and requirements and expectations were met. Due to the potential safety and environmental impact of the site a high level of intervention and collaboration with the HSE and EA was required.

During the life of the project, extreme weather conditions were experienced, causing a risk to the schedule. The project team developed alternative construction techniques to ensure that the schedule could be maintained.

The team at Huntington has nominated local charities and schools to benefit from donations which the site team earned following excellent safety performance.

The project team operate a 'Minimise' campaign to ensure no over ordering of materials and 'Just in time' ordering, to ensure materials are delivered when required, thus negating risk of deterioration and contamination.

The team also work in ECO cabins and use low energy LED lights in the site compound and liaise closely with design to minimise wastage.

The long term partnership arrangement between GCA JV and United Utilities has helped develop the delivery options and to value manage costs out of the project as much as possible, to ensure that the project remains on target for delivery and to realise significant savings against the original forecasts.

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pH dosing facility - Courtesy of GCA JV



Huntington WTW inlet works - Courtesy of GCA JV



Huntington WTW intake under construction - Courtesy of GCA JV