

Tarrant Crawford STW

growth scheme - additional capacity for existing sewage treatment works near Blandford Forum in Dorset

by Alex Adams

Tarrant Crawford Sewage Treatment Works is an existing Wessex Water asset located near the village of Spetisbury on the A350 in central Dorset. The works is fed by two terminal sewage pumping stations and serves a population equivalent of 19,921 including 20 (No.) trade effluent sources. Existing flow to full treatment was around 111l/s (9,590m³/day). The combined pumping stations output exceeded the existing consented FFT. This resulted in frequent operation of the storm overflow, even on dry days. Further to this, predicted growth in the catchment will increase the dry weather flows. This report explains the project designed to increase treatment capacity at the works to 168l/s (14,515m³/day).



New oxidation ditch during construction (view from man riding cage on crawler crane) - Courtesy of Wessex Water

Existing system

Influent is passed through 2 (No.) screens with a hand raked third screen as a standby. From here all flows passed through one of the 3 (No.) primary settlement tanks. A storm split chamber was downstream of the primary settlement tanks and took storm flows to the two storm tanks when required. A single oxidation ditch dosed with surplus activated sludge treated flows further, prior to three final settlement tanks and the outfall. Sludge was drained from settlement tanks and pumped to 2 (No.) glass coated steel storage tanks for off-site treatment.

Parties involved

The scheme was orchestrated through Wessex Water's internal construction and engineering business; Wessex Engineering and Construction Services (WECS), using Grontmij as the designer and Trant Construction as partners for M&E work, while WECS labour was used for the majority of civil works.

Further specialist contractors were used for various RC works, caissons and process modifications. WECS operates as a civil contractor within several of the internal workstreams that

Wessex Water uses to carry out its AMP5 workload. Using several workstreams allows the company to measure performance against other contractors and enables the business to deliver projects as efficiently as possible in line with its business ethos of safety, quality, time and cost.

Scope of work

The main elements of the scheme comprised the following:

- New crane slab and permanent sheet pile retaining wall in front of the existing building.
- New 13.7m diameter final settlement tank.
- 39.4 x 14.3 x 3.4m oxidation ditch.
- 108m³ anoxic selector.
- New storm return chambers and pumping system.
- New screens, compactors and modifications to the inlet works.
- New return activated sludge (RAS)/surplus activated sludge (SAS) pump station and 350mm connecting pipeline.
- New motor control centre, generator, transformer and high voltage electrical supply.



Completed FST 4 with retaining wall in background
Courtesy of Wessex Water



Anoxic selector during construction (aerial view)
Courtesy of Wessex Water



New oxidation ditch operating alongside existing ditch
Courtesy of Wessex Water



Completed anoxic selector and feed channels to oxidation ditches
Courtesy of Wessex Water

Construction phase

Construction began in August 2010 with WECS construction teams commencing with the construction of the 500mm thick crane slab and using the company SPI Piling to install sheet piles for the retaining wall and cofferdam for the final settlement tank. Due to the confines of the site, work was sequenced to construct the new settlement tank prior to the oxidation ditch in order to facilitate the installation and removal of the temporary works. Following bulk excavation of the cofferdam, WECS constructed the tank and connecting pipelines amidst extremely challenging winter conditions including both snow and highly variable groundwater levels that on occasion flooded the working areas overnight. Despite the adverse conditions the tank was completed in early 2011, enabling Trant access for the M&E fit out using MWH as process plant suppliers for the rotating bridge.

During this period WECS also supervised the construction of a submerged reinforced concrete caisson which formed the main structure of the new return activated sludge pumping station. Due to the groundwater levels and location of the caisson in a floodplain, it was elected to use Delta Civil Engineering for this element, owing to their expertise in this area of work. Constant on-site coordination helped to ensure that both teams could work concurrently while minimising disruption and alternating material deliveries to avoid congestion on the narrow roads leading to the site. The 350mm connecting pipelines and bypass chamber, along with a PE surplus activated sludge return pipe were installed by WECS.

The next phase of construction was the removal of temporary works from the final settlement tank and reinstallation into a new cofferdam 45m long by 20m wide to facilitate construction of the new oxidation ditch. A separate cofferdam was installed at the same time to allow for the new anoxic selector that feeds both the new and existing oxidation ditches. As is often the case on existing sites, there were many services that obstructed the proposed area of the structures, many being untraceable and unmarked. Despite these obstacles WECS worked to uncover and locate these services while Trant performed electrical diversions, liaising closely with Wessex Water operations to determine plant shutdowns with a minimum of process risk and downtime.

Concrete specialists HDG were brought in to construct the oxidation ditch and anoxic selector while WECS supplied materials, scaffold and on-site engineering controls. The ditch, once complete, holds around 1.7 million litres of partially treated effluent which is aerated by 3 (No.) MWH rotating aerator bridges prior to discharge to the final settlement tanks via a 500mm pipeline installed by WECS.

The anoxic selector was also constructed by HDG under WECS supervision. Working in this area, next to live plant, and in a restricted footprint proved challenging, however all parties were able to cooperate to ensure that safe systems of work were adhered to whilst ensuring the structure was completed to a good quality. This was facilitated through bi-weekly coordination meetings that helped all parties understand which areas were likely to need extra control.

Concurrent work included the modifications to the storm system. These included a 4m deep 450mm storm overflow pipeline across the site car park, 5m deep storm manhole, 225mm storm return system and flowmeter chamber and modifications to the inlet arrangement to enable reuse of an abandoned storm weir. All of the works were completed by WECS and enabled Trant to provide the M&E works including new flowmeters, mixer pumps for the storm chambers, return pumps and level controls.

All of the new plant is now being controlled by a new motor control centre, backed up by a new 550kVa generator and fed from a new 800kVa HV transformer and supply installed by the regional distributor SSE (Scottish and Southern Energy).



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Commissioning

Commissioning works began during the construction phase in order that new plant items could be brought on line whilst both civils and M&E contractors were on site. This approach enabled any issues to be resolved quickly and enabled a close liaison between WECS and Wessex Water commissioning staff. It also meant that stresses on the existing works were minimised by only adding new plant items to the treatment stream individually.

The first new structure to be brought on line was the new RAS/SAS pump station which was commissioned in Autumn 2011. The commissioning of the pumping station enabled the existing screw pump station to be decommissioned and made safe. The final settlement tank was also commissioned individually and following adjustments to weir levels and feed rates has been producing a high quality final effluent without malfunction since December 2011.

The modifications to the existing inlet works including the new screen had to be completed prior to commissioning the new storm line and mixer pump systems in order to reduce the carryover of rags and other debris which had historically affected the site due to inadequate screening capacity. This was performed following a successful proving period for the M&E components of the new screening system.

The final area of the new processes to be commissioned was the oxidation ditch. Following modification to minimize excessive spray and foam generation the aerators are now providing very effective treatment.

M&E

M&E modifications not previously mentioned included numerous service diversions to allow the construction of various new plant as well as new cabling to allow existing plant to be controlled from the new motor control centre. The existing site telemetry was also relocated from an existing building to the new motor control centre and upgraded to include a new marshalling point and outstation. This enables more precise control of automated machinery from remote locations.

Completion

The project was completed and formally handed over to Wessex Water operations in March 2012. All parties worked well together to deliver a complex scheme within the constraints of an operational site. The partnership between WECS and Trant has been highly successful, and many other schemes are currently being carried out on other Wessex Water sites using this partnership.

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Refurbished inlet area with new screen compactors and skip bays - Courtesy of Wessex Water