

Truro DG5

Upsizing the existing sewer network, utilising a timber heading tunnel and auger bore to alleviate flooding in Truro

The centre of Truro is low-lying with a history of flooding from rivers, the sea and drains going back over a century. In recent years it had become very apparent that the sewerage network in parts of the city centre was no longer able to cope with the demands placed on it. Businesses in the city centre were regularly blighted by sewer flooding with nine properties suffering internal flooding and 25 properties suffering external flooding. It was clear that something had to be done.



Info Point and site team - Courtesy of H&O

Branded hoardings - Courtesy of H&O

Background

Over several years South West Water's scoping team examined many options including long tunnels beneath Lemon Quay and storage tanks near Garras Wharf. After discussions with the Environment Agency the option to relocate an existing combined sewer overflow (CSO) was devised.

The design philosophy included better utilisation of an existing storage tank and overall reduction in the number of CSOs in the area. The design was further optimised by South West Water's capital delivery alliance, H&O, after discussions with Cornwall Council and other utility companies.

Project drivers

- Enhance Truro's resilience in the face of extreme weather events.
- Protect a significant number of properties from flood risk.

Project scope

- Replace over 750m of sewer with larger diameter pipes.
- Install a new sewer system and a state of the art combined sewer overflow (CSO).

Challenges

The project involved upsizing over 450m of sewers including 155m of 225mm rider sewer in Frances Street and Little Castle Street, 225m of 525/600mm upsizing in Kenwyn Street and a 27m long 600mm diameter auger bore and 30m open cut section.

A new 285m 450/600mm diameter surface water sewer was installed in St Dominic Street to take surface water out of the network and associated work took place in Frances Street, Ferris Town and Edward Street. This was to be one of the biggest and most visible schemes delivered by H&O.

Since the need for the scheme was first identified, over 100 different options were examined and several years were spent discussing these with partners including Cornwall Council, the Environment Agency and other utility companies.

Options such as a tunnel were investigated and discounted as being unaffordable; ultimately by the project team carefully engineering the scheme to keep the project time down to 38 weeks (from originally estimate of 70 weeks), it was able to proceed.

Uncharted services

The team has overcome some challenging obstacles which were not envisaged before the project commenced, mainly in regards to the amount of uncharted services which had been encased in foam concrete by a previous contractor. The team demonstrated a simple but innovative approach to problem solving such as fitting and sealing colour coded split ducting around existing utilities to protect them before backfilling with foam concrete.

These ducts are in the recognised colour associated with the Utility (yellow = gas, blue = potable water, red = power).



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Inside the hoardings - Courtesy of H5O

The site team crossed more than 360 utilities, a third of which were uncharted, while maintaining the programme, demonstrating the benefits of good forward planning, a safe system for excavation, engaging in advance with other utility companies and using the latest RD8000 utility location equipment and suction excavator.

Timber heading

The team was faced with crossing a 22-way transatlantic BT fibre optic duct route in the market square that was laid in a flat formation and encased in concrete. The use of two timber headings were chosen due to the tight constraints of the site, and it proved flexibility on the large diameter (600mm) final connection alignment. The use of auger bore was considered but ruled out on the basis of a constrained working area. Within 5 days a timber heading team was on-site and 2 weeks later the first 12m heading was in place.

The works were carried out by Active Tunnelling Ltd who successfully completed the tunnel despite challenges from ground water and uncharted underground services. When constructing the timber heading the team had the added challenge of managing the works around the water table, which was tidal. Regular and thorough inspections of the temporary works were essential to maintain our safe system of works. The cables were crossed without the risk of any disruption to the service or the customer.

Auger bore

Secondly, in response to constructing a pipeline under buildings to connect to a storm tank a large diameter auger bore was used. A number of solutions were considered but no other method was practical; the team was restricted in the method of construction due to the access under thecroft not being of a sufficient height which meant that excavators could not be used in this area, and hand excavation of a 4.8m deep trench to lay a 525mm pipe was not cost effective. Normally, after the host steel sleeve has been installed, a carrier pipe is inserted through and connected.

The team requested a redesign to reduce the diameter of the sleeve to improve the success rate, reduce any impact on the building and to line it with a non structural epoxy pipe lining system as a substitute for the carrier pipe. The guided auger bore was 26m long and 4.8m deep, and crossed an undercroft vehicle access which is attached to a 19th century house.

The use of the auger bore also minimised disruption to the residents of a Care of the Elderly Residence and access was provided early to pensioner's home parking. By completing the auger bore, the pipe route was considerably shortened; it eliminated the need for disruptive open cut excavation works and there was no settlement recorded on the surrounding buildings.

Off-site fabrication

By building a 6,000kg stainless steel CSO off site for installation in the key Market Square area, the team was able to complete the works ahead of the festive season when a series of popular street markets are held annually by the traders. The reduced build time on site was a significant benefit to customers and stakeholders who were able to have this area returned in time and in turn the project had reduced compensation claims. Constructing the CSO off site significantly reduced the personal risks associated with normal concrete works; rebar installation and shuttering and shoring, and the innovative approach allowed installation despite the ground being in a tidal zone. Reuse of spoil was maximised to avoid transfer of material off-site.

Ingenuity

Further evidence of excellent workmanship was provided by *The Considerate Contractors* scores in the *Environment and Safety* section being deemed as 'exceptional' and the use of an innovative photo logging system provided an invaluable 'real time' link to the



Technical challenges - Courtesy of H5O

Communication team in Exeter of site construction activity, thus facilitating media releases. As part of the construction, the team worked in an area which was surrounded by pensioners' houses on all four sides including flats. To reduce noise, the team built a system using Heras panels and noise deadening materials that could be fitted to a much higher level which reduced the noise pollution to a manageable level.

Community engagement

Quite apart from the challenge of devising an effective and robust engineering solution for the narrow, cobbled streets in the medieval heart of this ancient city was the need to win over the local community. With many small independent shops and busy roads including major bus routes in the improvement area, some disruption and inconvenience would be unavoidable.

Local traders, even some of those who would directly benefit from the scheme, were initially aghast when they learned that the work could take 60 weeks to complete. However, working with the local MP Sarah Newton, Cornwall Council, Truro City Council, Totally Truro, local traders and bus companies, we were able to engineer the scheme down to 38 weeks and plan the project so that key events in the city's calendar, such as the City of Lights Festival, were unaffected.

Meanwhile, a Truro-based marketing agency was commissioned to promote the 'business as usual' message on behalf of traders worried about road closures, hoardings and noisy work in close proximity to their premises. An eye-catching 'Truro works' logo was produced for use on all customer literature, hoardings around working areas and in regular adverts booked in the local newspaper and a free community magazine.

High-specification mobile hoardings were used around the working areas, with signage keeping customers informed about

the progress of the scheme while at the same time suppressing noise and dust.

A dedicated customer liaison officer visited local businesses individually to understand and address any concerns. A vacant shop in the affected area was converted into an Info Point, which was used as a base by the site team who were then on hand to answer any questions from members of the public dropping in.

Completion

The scheme was due to be completed in June 2014 but was delayed by some very wet winter weather, sometimes even the deepest excavations filled with more rain than the pumps could cope with, and the need to divert other underground utilities in St Dominic Street and Upper Kenwyn Street to finish the project safely. But by the end of September 2014, the project was successfully completed.

Investment in this important Cornish city continues. To further increase the resilience of the renewed sewerage network in Truro, a sustainable drainage (SuDS) project has begun to remove surface water higher up in the catchment. South West Water is currently working with residents on a two-stage project to disconnect downpipes at selected properties and to build a swale in the local park.

A new surface water sewer will direct surface water into the swale where it should infiltrate the ground within six hours. The swale will be engineered with an inlet pipe and an overflow into the combined network. We are working with the community to ensure the project enhances the area, the park and the overall amenity for residents as well as reducing overflows and pollution into the Truro River and the sensitive shellfisheries of the River Fal beyond.

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