

# Northumberland Ave. Sewage Pumping Station

## 3-channel medium pressure UV disinfection plant

by  
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**N**orthumberland Avenue Sewage Pumping Station (SPS), operated by Dwr Cymru Welsh Water is situated on the Northern side of the Loughor Estuary which is a part of the Burry Inlet, a large estuary located between the Gower Peninsula and Llanelli in South Wales. The Burry inlet has been designated a Site of Special Scientific Interest. It is also a Special Protected Area under the EC Birds Directive, a Special Area of Conservation under the EC Habitats Directive, and a RAMSAR site under the International Convention on Wetlands. The estuary includes a number of commercially harvested shellfish beds.



*The operational duty storm UV channels*

*Courtesy of Dwr Cymru Welsh Water*

The Pumping Station serves a population of approximately 40,000pe, transferring combined system flows from Burry Port, Pwll, and Llanelli (West) to the Wastewater Treatment Works (WwTW) at Bynea, Llanelli. The station provides a foul sewage pumping (pass forward flow) capacity up to 880 l/sec, and a storm sewage pumping capacity up to 3,375 l/sec, the storm overflow being discharged directly to the Loughor Estuary.

Under the EC Shellfish Waters Directive, Welsh Water are required to improve the standard of the storm overflow discharges at both Northumberland Avenue SPS and at Llanelli WwTW. The “prescriptive solution”, to reduce spills to less than 10 per annum, would have required a minimum of 25,000m<sup>3</sup> of additional storm sewage storage, with associated very high capex projection of £27m together with operational problems. However, with the benefit of experience gained from the operation of the innovative medium pressure Ultraviolet (UV) treatment process as applied to the storm sewage discharge at Cog Moors WwTW, Barry, it was decided to apply the same technique to the intermittent discharges at Northumberland Avenue SPS and at Llanelli WwTW. Thus a “water quality” approach, using sewerage network and environmental water quality modelling was adopted and agreed with Environment Agency Wales (EAW).

The modelling output demonstrated that, by disinfecting the storm sewage discharges, greater than 97%ile water quality compliance can be achieved at all locations within the Loughor Estuary which are influenced by Welsh Water assets, and the requirements of the Shellfish waters Directive are met.

### **Northumberland Avenue SPS**

At Northumberland Avenue SPS, the scheme as delivered for commissioning in March 2010, comprised the following;

- Modification of the existing storm sewage pumping station to deliver flows to new 6 x 6mm escalator screens;
- De-mothballing of 3 No. former primary settlement tanks for use as “blind storage”;
- And the provision of a 3-channel medium pressure UV disinfection plant each with a single bank of 96 No. lamps, including associated standby power generation.

The UV plant is designed to deliver a measured applied UV dose of 15 mJ/cm<sup>2</sup> to maximum storm sewage flow of 3,375 l/sec, and is based on the results of site specific pilot plant trials carried out during spring 2009.



Elevated Culvert

Courtesy of Dwr Cymru Welsh Water



Elevated Culvert

Courtesy of Dwr Cymru Welsh Water

### Llanelli WwTW

At Llanelli WwTW, the scheme as delivered for commissioning in March 2010 comprised the following;

- Provision of a new storm sewage 6 x 6 mm screen;
- And the provision of a single channel medium pressure UV disinfection plant accommodating a duty and standby bank of 66 lamps, including associated standby power generation.

The UV plant is designed to deliver a measured applied UV dose of 15mJ/cm<sup>2</sup> to a maximum storm sewage flow of 780 l/sec.

### 7 month programme

Early approval was granted in July 2009 for the procurement of the long lead Trojan UV Plant (6 months delivery) followed by final approval for detail design and the remaining works being granted in September 2009 for the total sum of £13.3m. With just 7 months to complete detail design, procurement, construction and commissioning of the project adherence to the programme in every respect was vital with no room for error or delay.

Imtech Process led the project as Principle Contractor, with Hyder Consulting the Lead Designers and Morrison Construction leading the Civil construction with the work sub-contracted to Lewis Construction.

Mechanical and Electrical Design was also provided by Imtech Process and supported by Whitland Engineering for the mechanical and structural works, General Panel Systems for the MCCs, and Zone Electrical for cabling installation works.

### Elevated culvert

Central to the success of the project within the very tight timescale was the installation of a pre-fabricated Elevated Culvert allowing the existing Storm Pumping Station of 6 No. Canister style pumps, to be utilised in delivering flow to the Screens, Blind Storage Tanks and UV Plant. Swansea based fabricators Afon Engineering were able to manufacture this culvert and its supporting structure in one piece for shipment to site and erection in just one day. This combined pre-assembled structure was designed specifically for lifting into position in one piece, thus alleviating the prolonged and very disruptive process that would have been necessary to construct a concrete culvert. This single item weighing 30 tonnes and measuring 16m long x 4.2m high x 3.0m wide.

The focus throughout the project was to meet the Environment Agency consent before the 1 April 2010. Commissioning of the works as a whole was undertaken during March 2010 and in good time for the 31 March delivery date. The plant dealt successfully with its first storm flows on the 1 April and over the Easter bank holiday weekend without issue and independent of operator or commissioning department attendance.

Storm sewage consents have been issued by EAW, varied to accommodate the requirements of UV disinfection of the intermittent discharges, and an agreed programme of efficacy testing is being carried out.

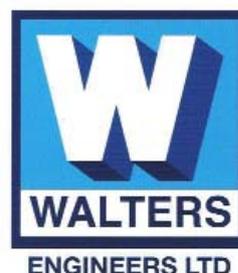
### Experience

Experience gained through the design, installation and operation of storm UV disinfection plants at Cog Moors, Northumberland Avenue SPS, and Llanelli WwTW has allowed the team to develop a number of modifications designed to optimise both capex and opex costs whilst maintaining the robustness required by plants which are called upon to operate only intermittently.

The advantages of this innovative solution, in comparison with the provision of a large storm sewage storage facility include the following;

- Viability of operation;
- Lower capital cost;
- Lower carbon footprint (10%);
- Significant reduction in land requirements.

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### Tier 1 Mechanical Contractors (AMA)

- Design, Fabrication, Installation of Pipework, Walkways and all lifting equipment inc Gantries
- Stainless steel fabrications and pipework inc Scotchkote™ coating
- Containerised UV Treatment systems
- Maintenance, Statutory Inspection and Testing of all forms of lifting equipment to LOLER and PUWER regs
- Approved Contractors to Aggregates industry