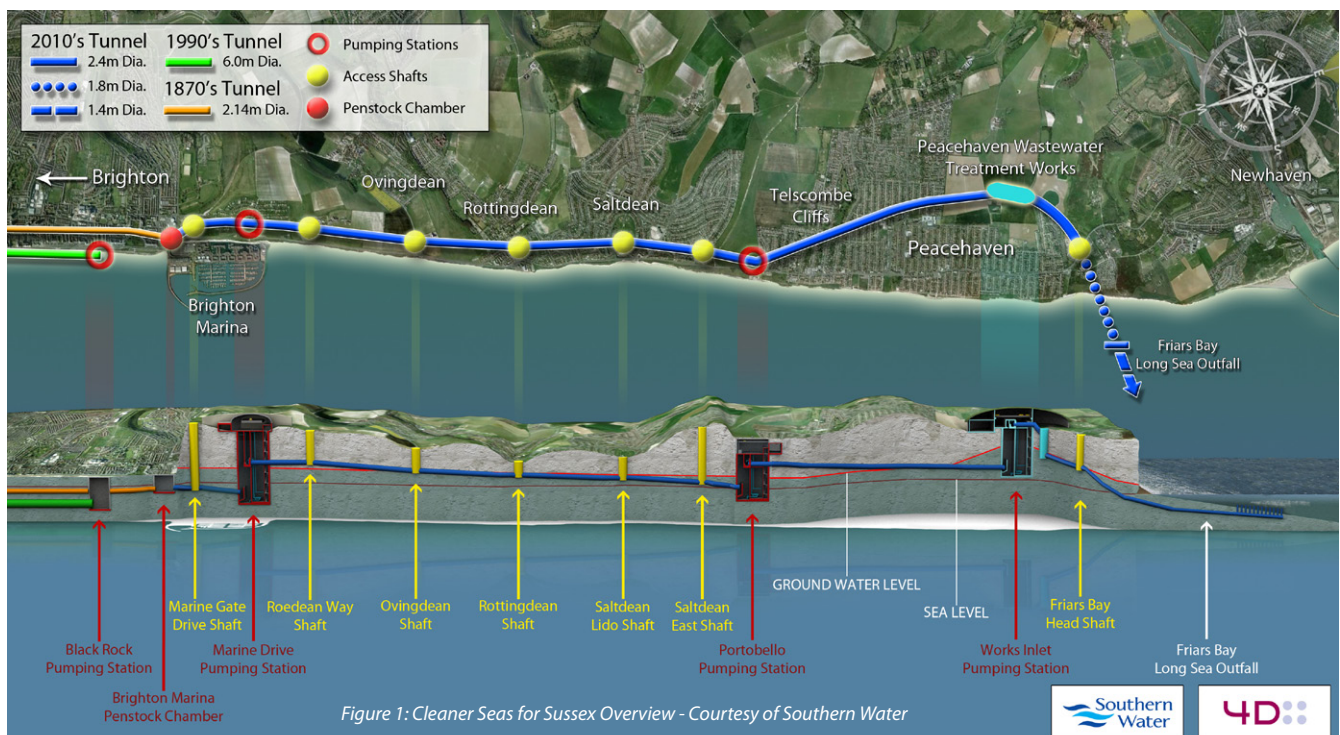


Brighton & Hove WwT Scheme

Peacehaven WwTW - commissioning to operations

by Samantha O'Hara MSc(Eng) BA (Natural Sciences)

After 12 years in the planning and four years of construction, Southern Water's £300 million wastewater treatment scheme to bring cleaner seas to Sussex is virtually complete. Construction of the 11km of tunnels, three pumping stations and the wastewater treatment works and sludge recycling centre by 4Delivery Brighton and Hove (a joint venture between Veolia Water, Costain and MWH) was ready to receive flows from the local catchment in September 2012. Working within the constraints of stringent planning conditions and environmental consents, phased commissioning began to bring the plant to full operational capacity.



The new wastewater treatment works serves a population equivalent of approximately 300,000 from Brighton & Hove and seven sub-catchments: Roedean, Ovingdean, Woodingdean/Rottingdean, Saltdean, Saltdean East and Peacehaven.

Flows previously received only preliminary treatment at Portobello WwTW before being released 1.5km offshore. Under the Urban Wastewater Treatment Directive, the 95 million litres of wastewater produced in the catchment each day must now receive treatment to secondary standard.

The process

Connecting into the old Victorian sewer at Brighton Marina, wastewater is transferred from the existing sewer network to the new Peacehaven WwTW via a new 2.4m internal diameter, gravity-fed sewer. Three intermediate pumping stations vertically lift flows a total of 48m along the route by a mixture of fixed and variable speed pumps.

Once at the works, the wastewater receives preliminary treatment via 6mm band screens and aerated channels designed by Veolia Water Solutions and Technologies to remove fats, oils, grit and greases (FOGG). Classifiers clean and deposit grit into skips whilst the fats, oils and greases (FOG) are concentrated in dissolved air flotation plants to be re-used in the sludge digestion process.

Primary treatment consists of Multiflo lamella tanks which settle solids with the assistance of chemicals, specifically ferric chloride as a coagulant and anionic polymer as a flocculant. Secondary treatment is provided by Biostyr Biologically Aerated Flooded Filter (BAFF), consisting of ten cells, which ensure that quality consents for suspended solids, biological oxygen demand, chemical oxygen demand and heavy metals, are met using biofilm covered polystyrene beads. The quality consents for the final effluent can be found in Table 1 below.

Quality Consent	95%ile	Upper	% Removal
BOD	25mg/l	50mg/l	70%
COD	125mg/l	250mg/l	75%
TSS		150mg/l	
Fe, Al		4mg/l	

The sludge stream is fed from two main inputs; co-settled (primary and secondary) sludge from the lamella tanks and imported sludge cake from Newhaven WwTW.

Treatment consists of the screening and co-settlement of the sludge before it is thickened on gravity belt thickeners. The resulting 7% dry solid sludge feeds three anaerobic mesophilic digesters



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operating at 35°C with a 14-day retention time. Biogas produced in the digestion and post digestion tanks is used to generate energy through the combined heat and power unit, and can be used to heat the digesters and provide electricity for use on site. The sludge is then dewatered in Andritz centrifuges to 26% dry solids and then dried in an Andritz thermal drier where it is formed into pellets which are exported off site for spreading to land.

Into commissioning

To address initial local opposition to the project, the planning consent included 63 conditions including stringent limits for both noise and odour from the operational plant.

A liaison group was set up to keep the local community informed of progress with commissioning. Ahead of the start of commissioning the group was given a presentation on the process followed by a walk around the site. Information was also distributed to local residents explaining what was happening and what to expect at each stage of the process.

Working closely with the planning authority and environmental health, a comprehensive Odour Management Plan was developed. Weekly update meetings were held to ensure the regulatory bodies were kept fully informed and up to date on progress and issues.

Construction and installation phases allowed for commissioning to commence in early summer 2012. Each process was taken through a thorough testing regime; dry tests were undertaken to ensure material and structures were appropriate and wet tests with clean

water ensured the system had the correct hydraulic ratings and levels. Site acceptance tests then took place to test the equipment against the functional design specifications using potable water to simulate flows.

Bringing the plant online

The plant was brought online in three phases; Turn of Flows (TOF) 1, 2 and 3. Wastewater flows from the catchment were first introduced to the new network on 25 September 2012. Opening the penstocks at the Marina GDS diverted the wastewater away from the old Portobello works and into the new sewer tunnel. In dry weather, it takes approximately three hours for the flows to pass along the new 8.9km tunnel to the new treatment works.

To aid the success of commissioning, flows arriving at the works were restricted to a steady 600l/s, with any surplus flows continuing to pass through the Portobello WwTW.

From the outset the level of treatment at Peacehaven WwTW needed to be equivalent to the levels of wastewater received at Portobello WwTW to ensure no detriment occurred to the receiving water during commissioning.

Therefore when flows first arrived at Peacehaven WwTW for TOF 1, they were initially passed through the 3 (No.) 6 mm band screens and 3 (No.) fat, oil, grease and grit channels before being diverted directly down the long sea outfall. Screenings are treated by 2 (No.) of the 4 (No.) combiwashers to wash and compact the material before disposing into skips.



Peacehaven BAF - Courtesy of Southern Water

Fats, oils, greases and grit are separated in the FOGG tanks by a chain and flight system with forced aeration. The floating element is pushed to the far end of the tank to be collected by a rotating scum trough. This element was initially temporarily diverted down the outfall until the digesters were brought online. Grit collected at the bottom of the tank is scraped into hoppers for washing in the grit classifiers.

This phase was run for four weeks to prove the FOGG process was working, avoiding the possibility of any FOGG being carried over to the lamella settlement stage.

TOF 2 occurred on the 29 October 2012, with the partial opening of a temporary penstock in the common FOGG outlet. Restriction on flows was maintained at 600l/s using this penstock as control.

Additional flows were allowed to weir over into the bypass used in TOF1 directly to the outfall. Flows passed forward from this stage were introduced to 2 (No.) Multiflo settlement tanks at a time with one week's proving before then bringing the second two tanks online. At this stage the plant was receiving all flows from Brighton & Hove. Ferric chloride and anionic polymer dosing were setup during this period. The sludge stream was brought online with primary desludging filling the co-settled tanks via the 6mm pressure relief screens. Two further weeks were allowed to stabilise the lamella tanks before turning flows to the final secondary treatment phase.

At Turn of Flows 3, primary settled flows were introduced into the Biostyr BAFF secondary treatment phase on the 20 November 2012, bringing all 10 (No.) cells online simultaneously at full flows with the exception of sludge return liquors.

Effluent quality was initially low as the biological processes developed and stabilised. See figures 2, 3 and 4 below.

The final stage was to connect the remaining sub-catchments which occurred on the 18 December 2012 and later the return liquors. Within three weeks of introducing wastewater to the BAFF the resultant effluent was of sufficient quality to comply with consents and use on site in various applications. The graphs below represent the plant moving through the commissioning process to consistently comply with the required consents.

Bringing the sludge stream online required close management of each sludge tank and treatment to ensure a coordinated approach. Prior to TOF 2 the digesters were seeded using stable sludge from digesters on other Southern Water sites. This was screened and tankered into the site to fill 2 (No.) digesters ready for accepting indigenous sludge. The imported sludge had also to be from a mesophilic digester, preferably one which has had a period of stability.

Co-settled sludge produced by the Multiflo lamellas on site is passed through the gravity belt thickening process before being pumped into the digester feed tanks. Feeding was ramped up slowly in accordance with seeding a digester on a green field site. Eventually the third digester was filled with digested sludge from the first two. All indicators from sampling were of healthy, well seeded digesters that soon produced a high quality gas to first introduce the flare and then the gas bag and boilers. With time and progressive ramping up of feeds the digested sludge overspilled to the post digestion tanks.

The Andritz dryer was finally introduced to provide an outlet for the sludges produced. The sludge is first dewatered in centrifuges and then fed to the drum dryer to produce 92% dry solid granules. The granules are bagged and stored in the west of the site until being removed for spreading to land. Newhaven cake imports began on 4 February 2013 to bring the plant to full operational flows and loads as permitted by planning.

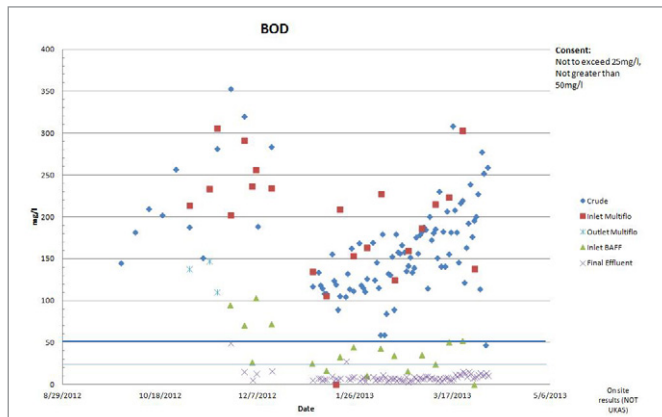


Figure 2: BOD sample results - Courtesy of Southern Water

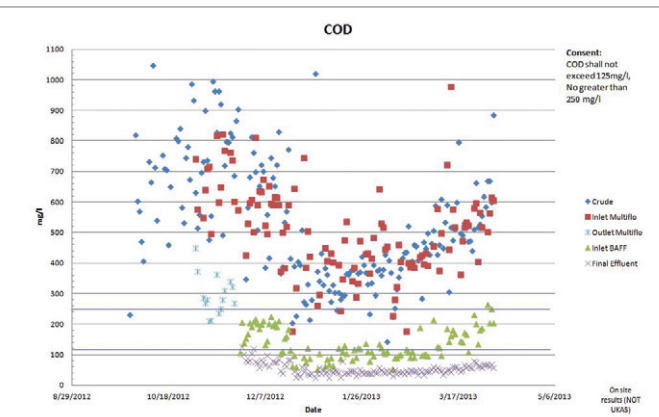


Figure 3: PCOD sample results - Courtesy of Southern Water



Peacehaven WwTW - Courtesy of Southern Water

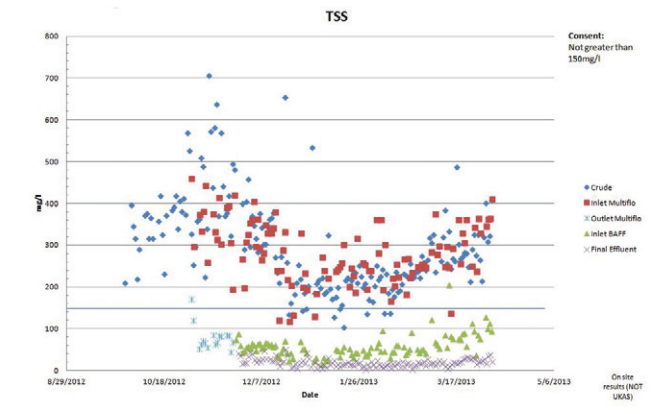


Figure 4: TSS sample results - Courtesy of Southern Water



Marine Drive Pumping Station - Courtesy of Southern Water

Optimisation & handover to operations

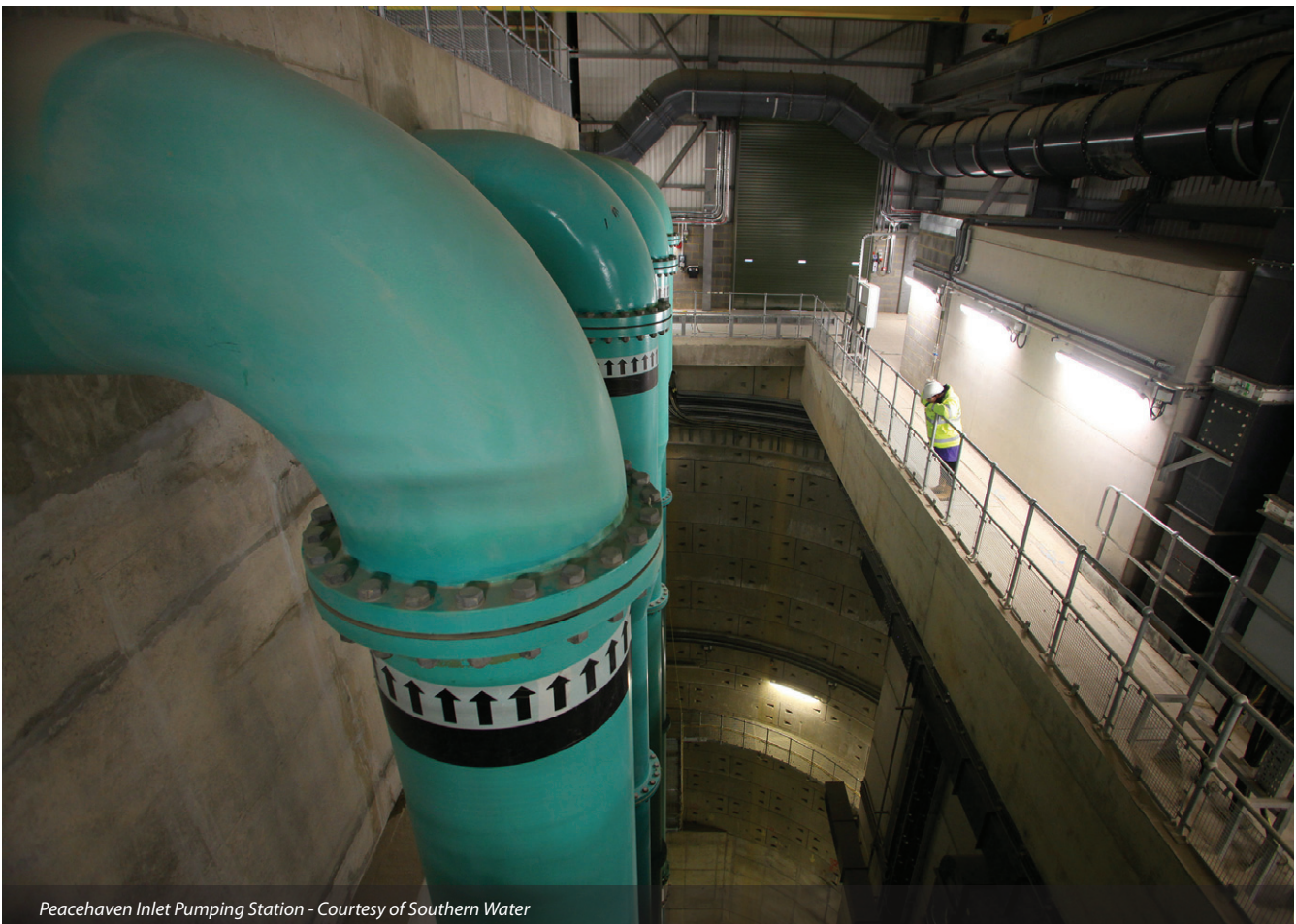
Once complete the process was optimised to reach the quality and discharge consents prior to take-over. Three advantages introduced early in the process will considerably help to achieve handover:

- Early integration of client operators. By operators being present through turning flows and commissioning, along with contractor formal training, operations are much smoother with processes fully understood beforehand.
- Building confidence with the local community through organised visits, communication with residents, swift actions to any concerns and detailed recording of nuisance information.
- Visibility to the client was provided through thorough analysis of alarms to support and satisfy the client in the plant's performance.

Summary

Through the construction and commissioning of this scheme, Southern Water (the client), 4Delivery (detailed design, construction, commissioning) and Mott MacDonald (SW's engineer for planning and outline design, client's technical governance during design, construction and commissioning) have successfully brought cleaner seas to Sussex. A phased programme of ramping up flows and loads to the plant allowed for a controlled introduction, stabilisation and optimisation of the processes involved in treating wastewater to the latest European standards. The final hurdle is to deliver a fully integrated and operational works into Southern Water's portfolio of wastewater sites.

The Editor & Publishers would like to thank Samantha O'Hara, Commissioning Engineer with 4Delivery Brighton & Hove, for providing the above article for publication.



Peacehaven Inlet Pumping Station - Courtesy of Southern Water



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