

TROJAN UV™ CASE STUDIES

Municipal Wastewater



Trojan UV Solutions:
for Combined Sewer
Overflows and Storm and
Sanitary Sewer Overflows

The Stormwater Management System, **COG MOORS WASTEWATER TREATMENT WORKS**, South Wales

PROJECT BACKGROUND

Wales is said to be wetter throughout the year than Northern Ireland and England, and is known for intense rainfall activity. Therefore, effectively treating and managing the country's substantial stormwater runoff is of utmost importance. It's also subject to increased scrutiny from governing bodies.

Cog Moors Wastewater Treatment Works (WwTW) in South Wales services the areas of Barry and Penarth. Total population is approximately 240,000, and incoming flows can reach approximately five cubic metres per second (CUMEC).

Discharge from the Cog Moors WwTW is adjacent to three bathing water beaches. Due to the growing popularity of these beaches, especially from April through September, the Environment Agency Wales (EAW) introduced

stringent stormwater spill limits (three per bathing season) and discharge consents.

Meeting a limit of three spills per bathing season meant construction of an additional 25,000 m³ of stormwater storage tanks. Considering this option involved significant construction costs and a greatly enlarged physical footprint for the WwTW (they already had 16,500 m³ of storage tanks). These factors led Cog Moors WwTW to evaluate other possibilities for dealing with the spills. Choosing an option with a low carbon footprint (eCO₂) was another important factor for the WwTW. And so, it was decided that an economic and environmental comparison would be made between the addition of storage tanks and adding ultraviolet (UV) disinfection to the treatment train.

THE TROJAN SOLUTION

Trojan worked with Imtech Process Ltd - Cog Moors WwTW's engineering contractor - to complete modeling and run a pilot project from May 2007 to January 2008. These studies proved to Cog Moors WwTW and the EAW that not only was UV technology very effective in treating stormwater, it was also the better economic and environmental choice.

In March 2009, three TrojanUV4000Plus™ systems were installed in time to treat water for the 2009 bathing season. As the last stage in the treatment process, the UV systems disinfect all storm flows prior to discharge into the sea.

The TrojanUV4000Plus has increased the quality of discharge, achieving the same environmental improvement to the bathing waters as reducing the number of spills to three per bathing season. A 0.5-log inactivation of bacteria and

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viruses was required for comparison, and the UV system easily and consistently achieved a 2-log reduction.

An economic analysis calculated capital cost, annual operating expense and 20-year Net Present Value (NPV) for both the UV disinfection and additional storage options. On all accounts, UV disinfection was the substantially lower cost option. Figure 1 displays relative cost comparison charts using the additional storage option as a baseline. UV disinfection's capital expenditure was 34.2%; operating expense was 11.8%; and NPV was 42.9% of the cost of additional storage.

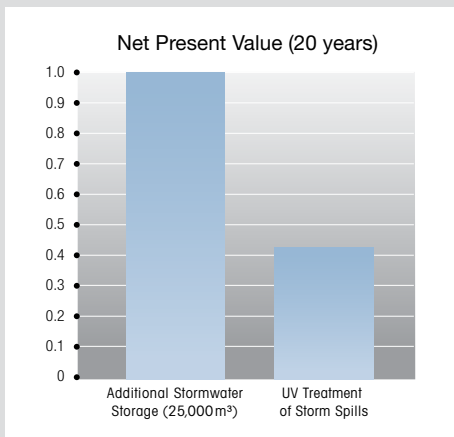
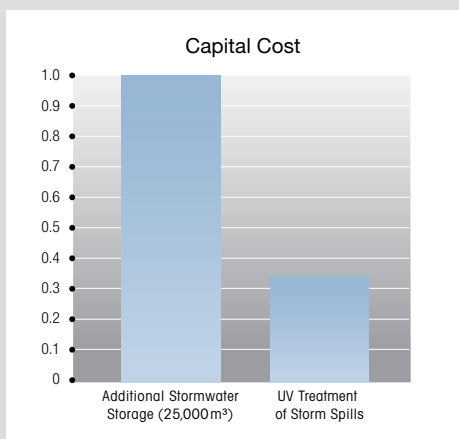
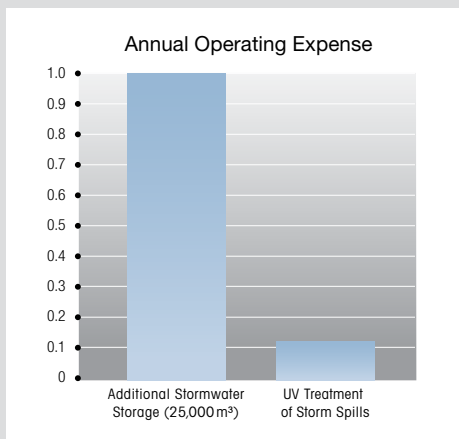


Figure 1. Economic Analysis (left and above)



A carbon footprint analysis revealed the findings in Table 1. The eCO₂ for UV treatment of stormwater spills was 1,394 tonnes versus 12,860 tonnes for additional storage tanks. UV treatment has a substantially lower environmental impact, with the largest contributing factor being emissions from the construction of the concrete storage tanks.

Table 1. Carbon Footprint Analysis (below)



FULL SCALE SYSTEM

SYSTEM DESIGN PARAMETERS

- 35 mg/l TSS
- 10 to 15 mWs/cm² UV design dose for 2-log removal of FC 95%ile
- Two duty channels plus one redundancy
- **PEAK FLOW CAPACITY:** 54.3 MGD (8,568 m³/hr)
- **UV TRANSMITTANCE (UVT):** 30% at 254nm
- **DISINFECTION METHOD:** UV

Other benefits of using UV technology for this project include:

- Stormwater is treated faster and discharged more rapidly
- Higher quality water discharged from outfall

References:

Gareth Withers (2009) Cog Moors WwTW an innovate use of UV technology to achieve Bathing Water compliance. Wastewater Treatment & Sewerage.

CARBON FOOTPRINT ANALYSIS

SOURCE OF EMISSIONS	ADDITIONAL STORMWATER STORAGE (25,000m ³)	UV TREATMENT OF STORM SPILLS
Emissions for concrete tanks/channels	8,463	94
Emissions for non-concrete aspects of construction	4,231	47
Emissions for Operation over 20-yr	155	1,253
Emissions for treatment of additional returned storm water for 20-yr	11	Na
Estimate of total embodied CO₂ for 20-yr	12,860	1,394

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