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# ANB Sensors, AQ² pH Sensor

## Detecting Potential Illegal Connections in Stormwater Networks Calibration-Free ANB Sensor

## INTRODUCTION

Illegal or unintended connections between foul sewer systems and surface water drainage networks can introduce wastewater into storm drains, causing environmental impacts and regulatory compliance issues. Water utilities face increasing pressure to identify these illegal cross-connections.

Traditional inspection methods are labour-intensive, intermittent, and often unable to provide continuous evidence of abnormal discharges. Continuous monitoring provides a more effective approach by revealing recurring patterns and anomalies that occur over daily or weekly cycles.

ANB Sensors' calibration-free pH sensors offer particular advantages for these applications because they can operate for extended periods without routine maintenance or recalibration and can tolerate periods of intermittent immersion that would challenge conventional glass electrodes.

## DEPLOYMENT SITES & METHODOLOGY

Two AQ² sensors were deployed within two different storm drain outlets on the same street in Southeast England. The two monitoring locations were designated as Location 1 and Location 2.

### Sensor Configuration

- Power supply: External battery
- Data logging: Internal SD card
- Sampling mode: Continuous (5-second interval)
- Duration: 1 month

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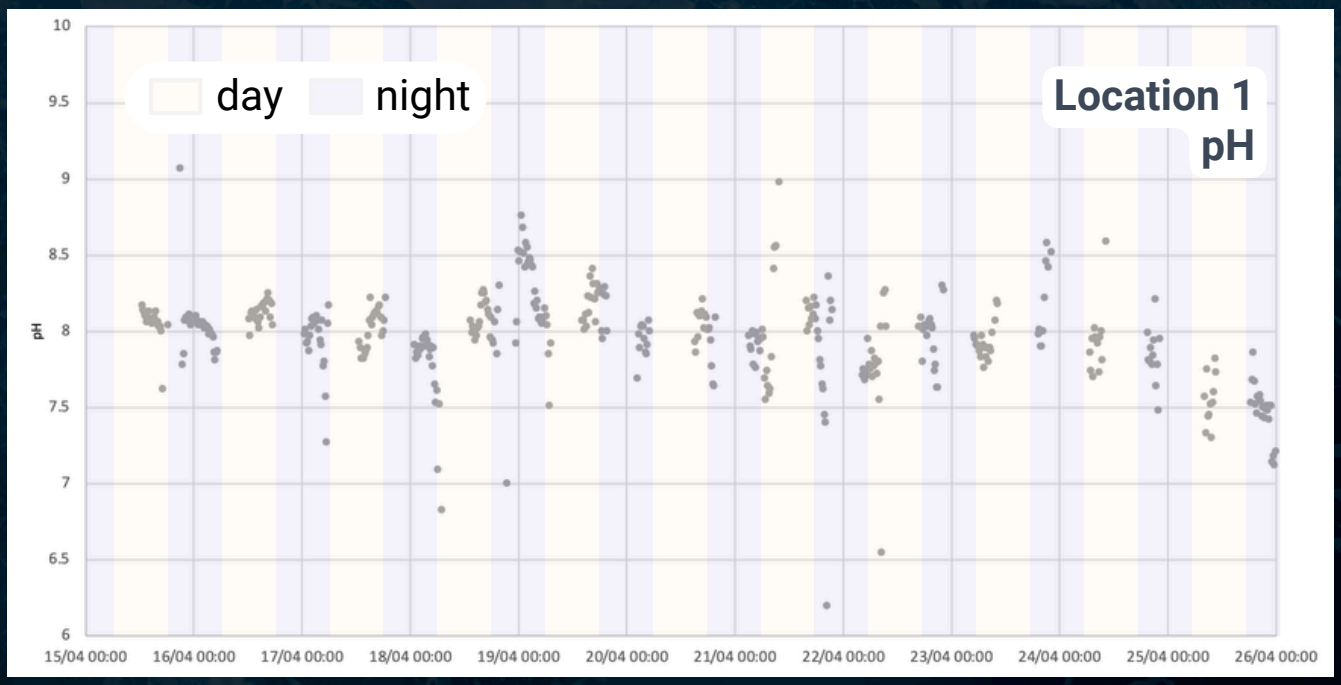
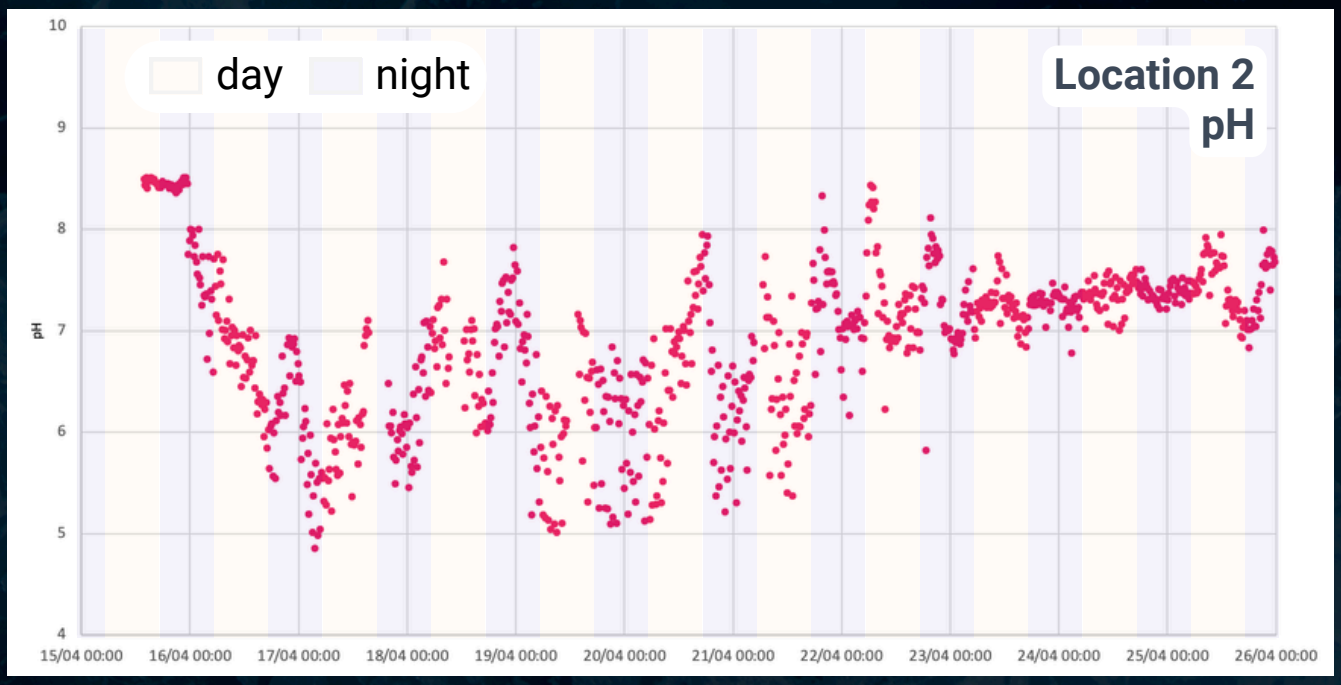
## RESULTS & OBSERVATIONS




The deployment revealed distinct differences between the two locations. At Location 2, temperature followed a typical environmental pattern, decreasing during the night and increasing during daylight hours in response to ambient conditions. In contrast, Location 1 exhibited the opposite behaviour, with temperature consistently increasing overnight. This unusual temperature profile suggests the presence of an additional water source influencing the storm drain and warrants investigation. Corresponding changes in pH were also observed at Location 1 during night-time periods. As the sensors incorporate internal temperature compensation, these pH variations cannot be attributed to temperature effects on the measurement and therefore represent genuine changes in water chemistry. The combination of elevated night-time temperatures and associated pH changes at Location 1 may indicate intermittent inputs that differ from normal stormwater runoff.

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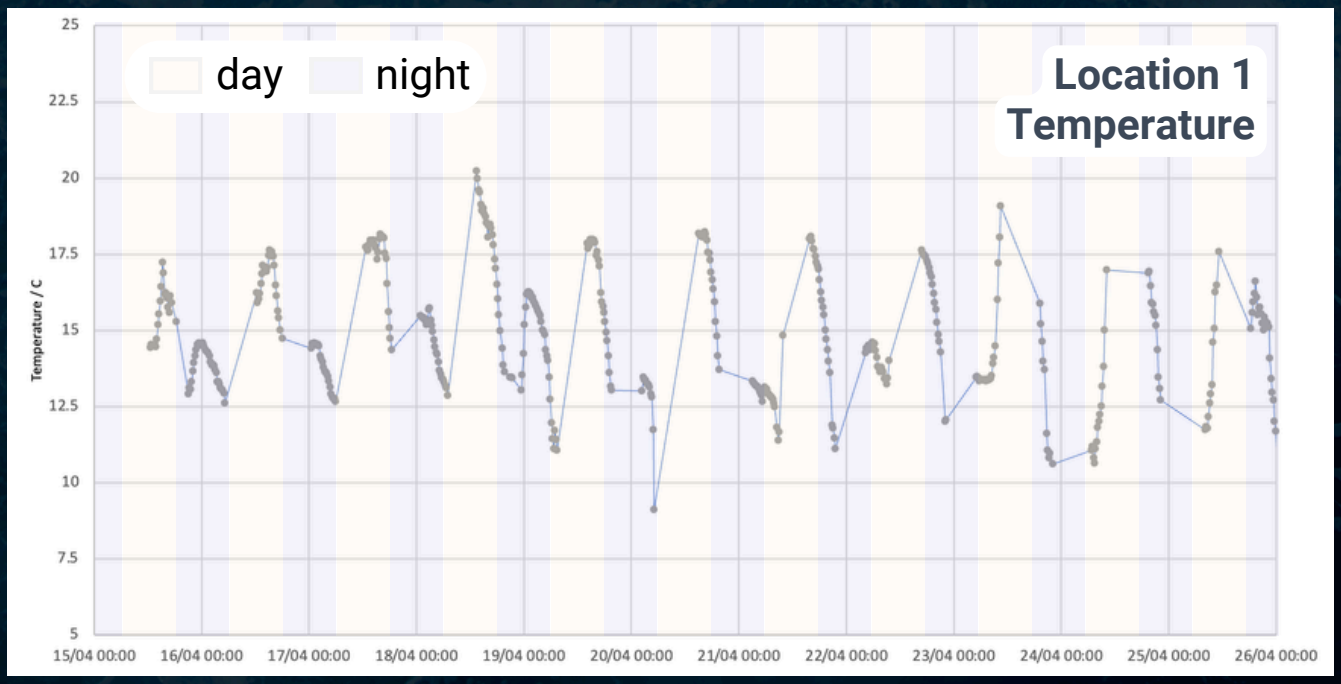


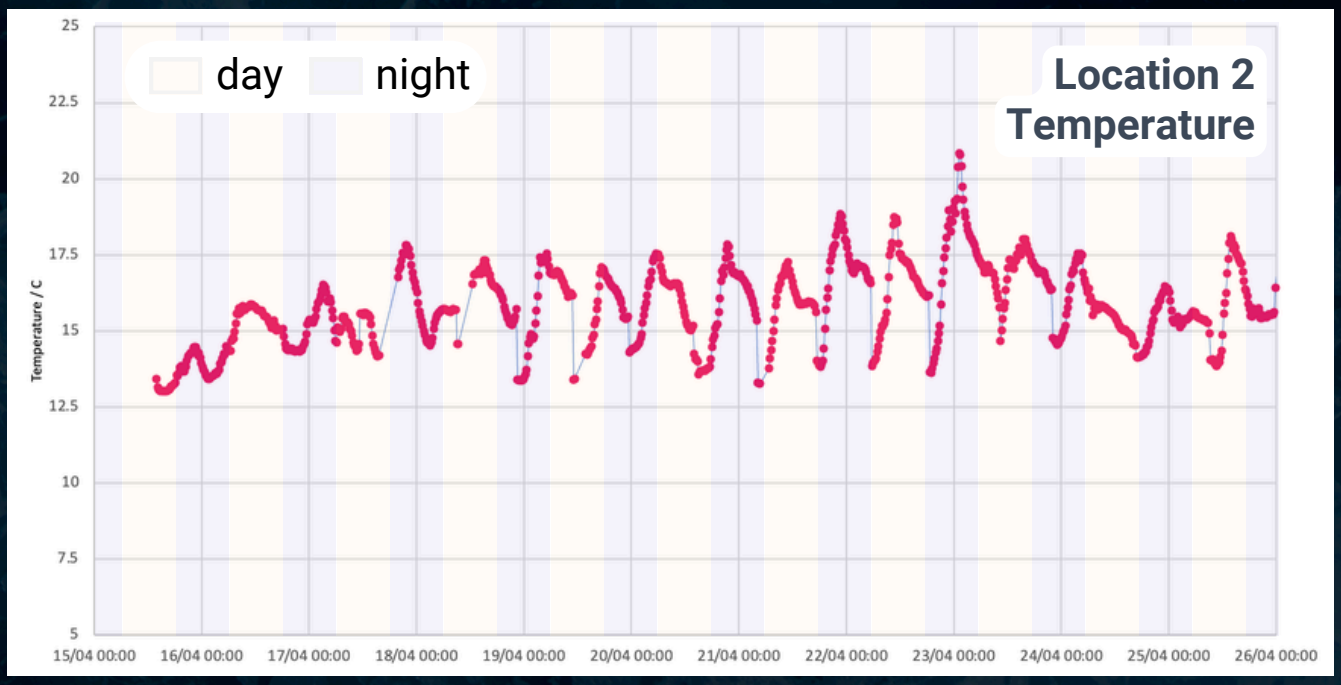


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## SENSOR HEALTH FEEDBACK

Unlike a glass probe, the AQ$^2$ sensor gives continuous feedback on the sensor health. Throughout the trial, a range of transducer health codes were recorded. These events are believed to be associated with periods when the sensors were not fully immersed but remained sufficiently wet to avoid triggering a complete immersion failure alarm. Such conditions are expected within storm drain environments where water levels fluctuate. Location 1 experienced a greater number of immersion-related events than Location 2, suggesting more variable conditions at that site. Despite these occurrences, both sensors continued to provide useful measurements throughout the monitoring period.

## WHY THIS DEPLOYMENT MATTERS

The trial demonstrates the value of continuous pH and temperature monitoring for screening stormwater assets and identifying locations that may be affected by non-stormwater inputs. The contrasting behaviour observed between Locations 1 and 2 indicates that Location 1 may be influenced by an additional source of water, potentially consistent with an illegal or unintended connection. While further investigation would be required to confirm the source, the monitoring data successfully identified a clear difference in water quality behaviour between the two sites.

An additional benefit demonstrated by this deployment is the suitability of calibration-free pH sensors for stormwater applications. Storm drains frequently experience intermittent wetting and drying, conditions that can permanently damage conventional glass pH probes or require them to be recalibrated before further use. In contrast, the deployed sensors remained operational despite periods of partial immersion and exposure, enabling reliable long-term monitoring in an environment that would be challenging for traditional pH measurement technologies. This capability makes calibration-free pH sensors particularly well suited to utility-led programmes aimed at identifying illegal connections, tracking intermittent discharges and improving understanding of drainage network behaviour.

## CONCLUSIONS

The one-month deployment successfully demonstrated the feasibility of continuous pH and temperature monitoring within stormwater infrastructure. The two monitored locations exhibited substantially different behaviours, and the observed differences suggest that continuous water quality monitoring can provide valuable evidence for identifying locations that may warrant further investigation for illegal or unintended sewer connections.

The trial also demonstrated the practical advantages of calibration-free pH technology in environments where conventional glass electrodes would be vulnerable to drying and loss of performance. Continuous, maintenance-free monitoring therefore represents a powerful tool for utilities seeking to improve drainage network understanding and identify potential sources of contamination within stormwater systems.