

CASE STUDY — RESILIENCE INNOVATION IN HIGHWAY MAINTENANCE

Remote Monitoring of Drainage Pump Assets: Eagle Farm and Fen Farm Underpasses

Evidence submission — Local Highways Maintenance Transparency Report 2026/27 (Department for Transport)

Authority	Milton Keynes City Council (MKCC)
Programme	Drainage asset resilience — remote monitoring of underpass drainage pumping stations
Sites	Eagle Farm underpass and Fen Farm underpass, Milton Keynes highway network — both identified as priority sites with a known surface water flooding risk
Innovation	AES GSM SMS text dialler pump alarm with 12-hour battery backup and multi-network IoT SIM, providing 24/7 automated fault alerting from previously unmonitored pump assets
Baseline	Pump failure currently detected reactively — typically only once the underpass has flooded or a member of the public reports it
Capital cost	Approximately £714–£762 per unit depending on float switch cable length; circa £1,500 total for both sites, plus electrical installation
Transparency link	Innovation and continuous improvement; network resilience and climate adaptation; preventative maintenance and whole-life cost

1. Background and strategic context

Underpasses are among the most flood-vulnerable assets on any highway network. As low points in the drainage system they depend entirely on mechanical pumping, and when a pump fails the consequence is not gradual deterioration but rapid, complete loss of the asset — closure, diversion, emergency response and, in the worst cases, damage to the carriageway construction and risk to road users.

The Department for Transport's 2026/27 transparency reporting requirements ask local highway authorities to demonstrate how they are adopting innovation and moving from reactive repair towards preventative, whole-life management of the network. Drainage assets are a clear test of this: the pumps themselves are well maintained, but until now MKCC has had no means of knowing that a pump has stopped working until the effects are already visible on the network.

Eagle Farm and Fen Farm underpasses have both been identified as priority sites with a known surface water flooding risk. MKCC is installing automated remote monitoring at both locations to close the gap between pump failure and the council becoming aware of it.

2. The innovation

The intervention uses an AES GSM SMS text dialler pump alarm — a low-cost, self-contained telemetry unit connected directly to the existing pump control installation. It requires no new IT infrastructure, no fixed network connection and no SCADA system, which is what makes it deployable at remote highway drainage sites where conventional telemetry would be disproportionate in cost.

How it works

- Fault inputs — six volt-free inputs connect directly to high-level float switches, pump trip contacts, pressure switches and Klaxon thermal overloads, with eight analogue and digital inputs in total.
- Multi-channel alerting — on a fault the unit issues SMS text messages, emails and text-to-speech voice calls to an unlimited number of recipients, so alerts can reach the ITSC duty team, the drainage team and out-of-hours standby simultaneously.

- Resilience under power failure — two channels are pre-wired for power and battery failure, and an integrated 12-hour battery backup with recharging relay means the alert is still raised during a complete mains outage. This is the critical failure mode: a power cut disables the pump precisely during the storm conditions when it is most needed.
- Connectivity in difficult locations — every unit carries a multi-network Tier-1 IoT SIM roaming across all four UK networks (EE, Vodafone, O2, Three), automatically selecting the strongest available signal. Optional antenna extensions address poor reception in subterranean plant rooms and metal kiosks — a common failure point for single-network devices in underpass environments.
- Whole-life certainty — supplied with five years of pre-paid SIM credit, removing ongoing contract management and the risk of a monitoring service lapsing unnoticed through an expired or unfunded SIM.
- Alarm start and stop reporting — the unit reports both the onset and the resolution of a fault, giving positive confirmation that an intervention has restored the asset to service rather than simply that someone attended.

Units are supplied in an IP65-rated enclosure and are remotely configured by the manufacturer after electrical installation, so no on-site parameter setup is required by the installing electrician. Each device also has a live screen on the supplier's IoT portal, accessible by app or browser, allowing MKCC to manage contacts and interrogate device status directly.

3. What changes on the network

Aspect	Current position (baseline)	With GSM SMS dialler
Fault detection	Reactive — failure typically becomes known once the underpass has already flooded or a member of the public reports it	Automatic — SMS, email or text-to-speech call issued at the moment of pump trip, high level or power failure
Typical time to awareness	Hours to days, dependent on public reporting or the next inspection visit	Effectively immediate, 24/7, including outside working hours
Power failure visibility	None — a mains failure disabling the pump is invisible until flooding occurs	Dedicated pre-wired power-failure channel with 12-hour battery backup, so the alert is raised even during a total mains outage
Intervention type	Emergency response after flooding: closure, signing, pumping out, clean-up, possible carriageway damage	Planned intervention before flooding: attend, reset or repair the pump within the available response window
Network availability	Underpass closure and diversion during and after a flood event	Closure avoided in most scenarios; underpass and any associated walking and cycling route remain open
Asset data	No record of pump run behaviour or fault frequency	Alarm start and stop logging via the IoT portal, building a fault-history dataset for both sites

4. Value for money

At approximately £714–£762 per unit — around £1,500 for both sites plus electrical installation — the intervention is a very small fraction of the cost of a single flood event at either underpass. The avoided costs of one event include emergency call-out and out-of-hours attendance, traffic management and diversion signing, tankering and clean-up, reactive drainage jetting, potential carriageway and structure damage, and the wider economic disruption of closing a strategic underpass on the MK network.

The five-year pre-paid SIM means there is no recurring revenue commitment during that period, so the whole-life cost is effectively the capital cost plus installation. On any reasonable assumption about flood event frequency at two known-risk sites, the intervention pays for itself on the first avoided event.

5. How this evidences the transparency report requirements

- Innovation and continuous improvement — application of low-cost IoT telemetry to a previously unmonitored highway asset class, delivering continuous condition awareness without the capital and revenue burden of conventional SCADA telemetry.

- Shift from reactive to preventative maintenance — the intervention directly converts an asset failure mode that was only detectable after the consequence (flooding) into one detectable at the point of failure, allowing planned intervention within the available response window.
- Network resilience and climate adaptation — underpass drainage capacity is increasingly tested by high-intensity rainfall events; assuring the pump assets that protect these locations is a proportionate, deliverable adaptation measure.
- Value for money — a circa £1,500 capital intervention across two sites materially reduces exposure to flood events costing many multiples of that figure, with no recurring cost for five years.
- Evidence quality — alarm start and stop logging via the IoT portal generates an auditable record of pump faults and response times at both sites, directly available to DfT as sampled evidence and as a baseline for extending the approach.

6. Next steps and wider rollout

Eagle Farm and Fen Farm are being treated as the initial deployment. Performance will be assessed over the first winter period against two measures: the number of pump faults detected that would previously have gone unnoticed, and the time between alert and intervention. Subject to those results, MKCC will review the wider inventory of pumped drainage assets — including other underpasses, subways and low-point installations across the network — to identify further sites where the same low-cost monitoring approach would deliver a proportionate resilience benefit. The approach is also transferable to other unmonitored highway assets dependent on mechanical plant.

Prepared by MKCC Highways Service — August 2026. Technical source: Automated Environmental Systems Ltd, GSM SMS Text Dialler Pump Alarm with Battery Backup product brochure and specification. Supporting evidence (installation records, alarm logs, response records) will be held by the Highways Service and available to DfT on request.