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Case Study

Digital Twin – Digitising the M25

PROJECT	M25 Digital Mapping
CUSTOMER	Connect Plus M25
LOCATION	M25
FRAMEWORK	Life Cycle Renewals
COMPLETION	202
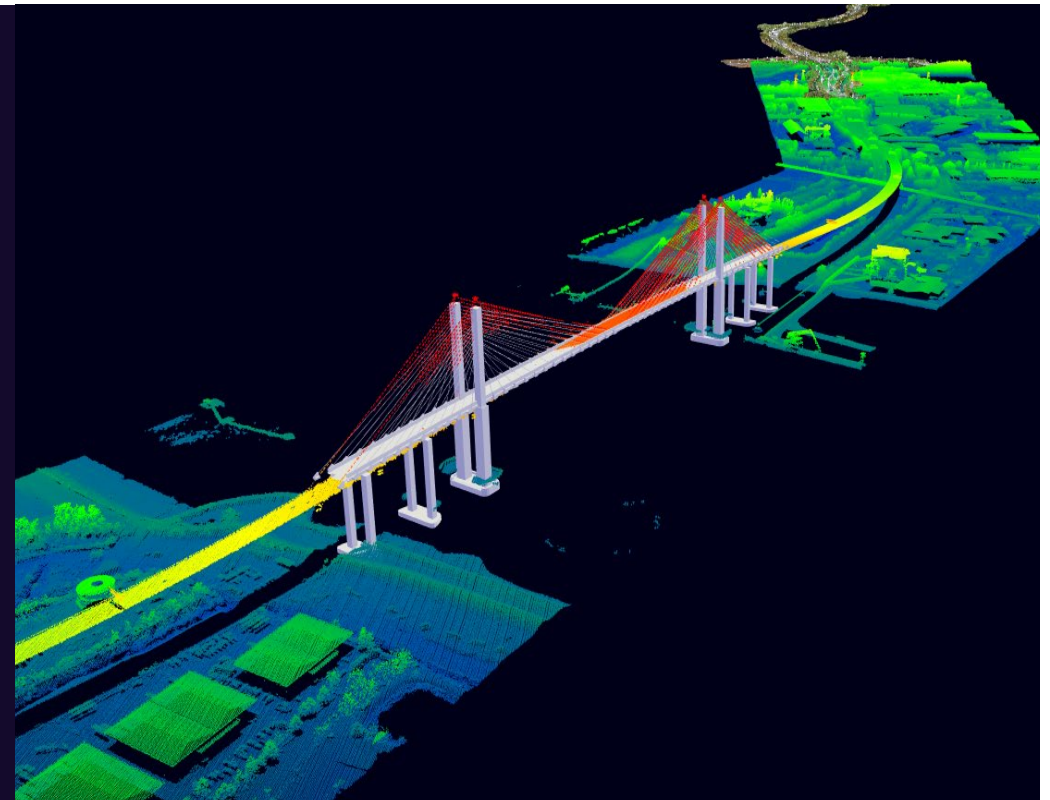
Challenge

Intelligent transport infrastructure is on the horizon which means that very soon an asset will be able to tell us when it needs an intervention without the traditional regime of inspections. It will transform the way we plan, deliver, and maintain our infrastructure bringing tangible benefits to the economy and to the lives of people travelling, working, and living on our transport corridors.

Creation of a 'digital twin' of your asset opens the possibilities to exploit emerging technology. In the case of a road or rail network, the first step is to undertake digital mapping and create a virtual 3D model to which every element from underground services and structures to overhead lines can be added to create a digital representation of the real world (Fig 1). From there the potential from organic growth of the model is endless:

•	historic data pinned to every asset for optimum maintenance scheduling.

•	real time monitoring to provide condition status for planning interventions and enhancements.

•	scheme progress tracked and reported by overlaying drone surveys.

•	data easily shared between multiple parties: owners; designers; suppliers.

Connect Plus, a consortium who operate and manage the M25 and its key arterial routes on behalf of National Highways recognised the potential.
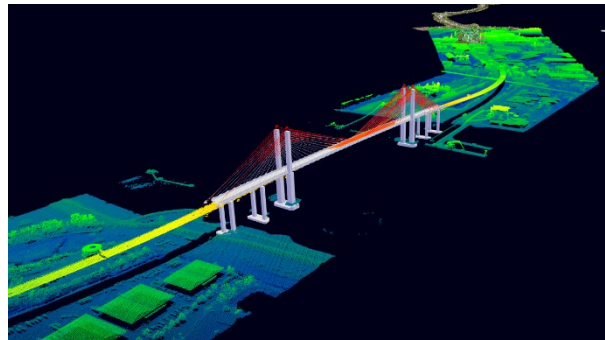

Figure 1 - Sensat 3D Visualisation

Figure 2 - Drone

Solution

Mapping the M25 using traditional survey methods would have been disruptive and costly. An alternative solution was developed with Sensat using their advanced drone data capture and visualisation capability to complete a photogrammetric survey from the air.

Sensat was in a unique position, they had Civil Aviation Authority permissions to fly in London airport airspace and using an EVLOS (extended visual line of sight) exemption enabling the drone to fly 12km from the pilot. That meant the fixed wing drones could remotely capture high-resolution photography data to produce accurate and dense geo-referenced point cloud data remotely without lane closures or traffic management on the M25.

The proposal was channeled through the Connect Plus Innovation Strategy Group and given the go ahead.

Utilising Connect Plus and Connect Plus Services' detailed knowledge of the M25 and Osborne Infrastructure's operations expertise, Sensat's advanced drone technology captured 23 billion data points and 85,000 high-resolution images in just 30 days – the largest drone mapping endeavour to have taken place in the UK to date (Fig.2).

👍 Outcome

Connect Plus have taken the first step by digitally mapping all 120 miles of the M25 network together with strategic partners Connect Plus Services, Sensat and Osborne Infrastructure.

The accurate high resolution 2D and 3D data of the M25 has been shared across the M25 Operation and Maintenance community and can be put to immediate use. The projected benefits in terms of planned schemes in 2020/21 alone are:

- 26 less shifts for surveys which reduces cost, saves time, and keeps people safely off the network.

- No disruption through lane closures or narrow lane running.

- Carbon emissions are reduced by 95% on traditional surveys.

- Time saving by using Sensat's visualisation platform and 'live' data for remote measuring and real time progress reporting (Fig.3).

By capturing the information once and sharing across teams, a single source of data is created for all M25 suppliers. This will be the platform for the M25 'digital twin' (Fig 4 and 5).

From there it has the potential to be a step change in whole life asset management. New emerging technologies will enable the integration of data like statutory appliances, and allow real-time monitoring of structures, as the industry moves towards more dynamic predictive maintenance of our infrastructure assets (Fig 6).

Figure 3 – Remote Measurements for Laybys

Figure 4 -Single Data Source Used by All

Figure 5 - Remote Asset Monitoring