

## Category 3 Check of LU Euston Station Replacement Substation, Ventilation Shaft and Tunnels HS2 Ltd.

**Location:** Euston, London

**Date:** 2019 - 2025

**Structure:** Temporary Construction Shaft (pre-cast concrete segments, SCL), SCL Tunnels, Ventilation Shaft

**Length:** SCL Tunnels approximately 85m in length.

**Cross-Section:** SCL tunnels approximately 6.5m in excavated diameter.

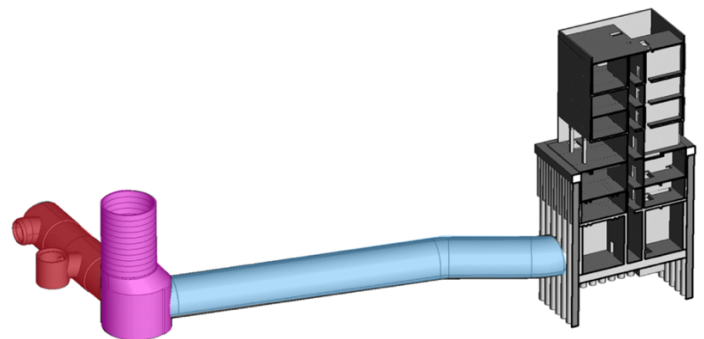
**Geology:** London Clay and Lambeth Group

**Cost:** Est. £300 million

**Client:** Mott MacDonald

**Owner:** HS2 Ltd.

Gall Zeidler Consultants (GZ) was commissioned to undertake the Category 3 Check of the design of the new London Underground Substation/Vent Shaft, Temporary Construction Shaft and associated Tunnels. The CAT 3 check comprised independent reviews, checks and check calculations of the detailed design (RIBA 4 stage) relating to the tunnel, substation/ventilation shaft and construction shaft.



**Figure 1:** 3D model image of the construction shaft, tunnels and ventilation/substation shaft structural elements. (Source: Mott MacDonald)

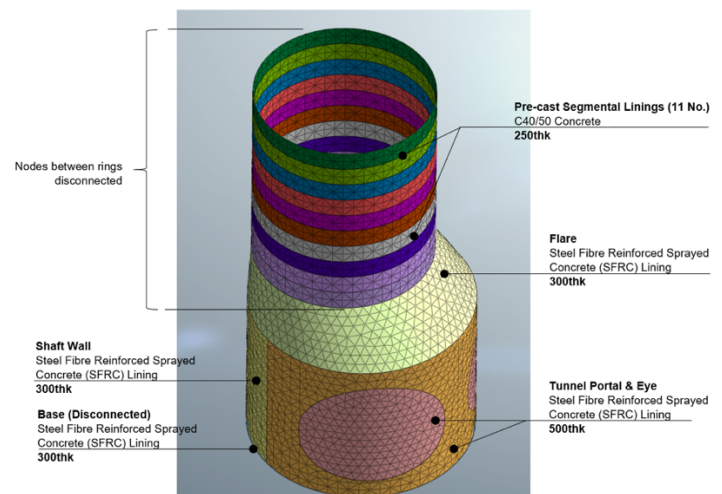
### Category III Check Design Services:

As part of the High Speed 2 (HS2) Euston Station enabling works, this project involved the construction of a replacement ventilation/substation shaft and associated tunnels including a temporary construction shaft.

The SCL tunnels, connecting the new vent shaft with existing LU infrastructure, comprised of two linings, a fibre reinforced sprayed concrete primary lining and a cast-in-place concrete secondary lining. The tunnels were constructed in advance of the main HS2 Euston Station works, with their vertical alignment designed to accommodate future excavation of the station box above.

A temporary construction shaft provided access for the construction of the tunnels. It consisted of an 8.2m diameter segmental lining, constructed to a depth of 11m, transitioning to an SCL section that flared out to a diameter of 10.25m. Two tunnels were broken out from the shaft chamber.

The ventilation and substation shaft formed a new multi-storey building, housing LU equipment spread across five floors. The shaft was constructed using secant pile walls and a bottom-up construction method, with a footprint of 20m (W) x 20m (L) x 20m (D).



**Figure 2:** GZ developed a fully staged construction 3D finite element (FE) model for the analysis of the temporary construction shaft.