

CASE STUDY AECOM | Safety in Design – October 2021

Introduction

Aligned with themes set out in the National Highways Home Safe and Well campaign, at AECOM, Safety, Health and the Environment (SHE) and Safety in Design (SiD) is intrinsic to all of our decisions during design development phases, to post construction hand over.

A recent example of applying Safety in Design at an early PCF stage, during optioneering, is on the M1/M62 Lofthouse Interchange (TA2 pipeline RIS 3 programme).

The M1/M62 Lofthouse Junction is a major motorway to motorway interchange, connecting two of the country's busiest motorways, the M1 and the M62, which are the main North to South and East to West routes in the north of England.

The M1/M62 Lofthouse Interchange is currently subjected to high levels of congestion causing delays to traffic during peak hours, meaning often queuing traffic backs onto the mainline of both the M1 and M62 motorways which is a safety concern.

As the scheme is at PCF Stage 2, the stage is to review the previously identified options and identify the option that can meet the requirements for the scheme.

The purpose of the scheme is to:

- *Improve connectivity and support economic growth*
- *Improve journey times and create more capacity*
- *Make journeys safer*
- *Minimise the impact on the natural and built environment*





Overview

M1 / M62 Lofthouse Interchange project is currently at Options Selection Phase (PCF2.) The AECOM IPT have been undertaking regular design reviews to establish a number of ways to mitigate the potential impacts of the design corridor on local facilities (such as schools and local farms) by adjusting the design to minimise land take.

For the options taken forward, several modifications were investigated that mitigated the extent of land take, but imposed additional safety implications for the road user, such as narrow lanes, reducing the cross sectional width of the free-flow links therefore reducing the amount of earthworks needed. However this resulted in substandard geometry, such as narrow lanes or substandard slip road dimensions, meaning they were discounted.

The preferred option explored is to, retain the proposed design layout, but reduce the **height** of the junction as a whole. Therefore maintaining the current proposals for the horizontal and sliproad geometry, but improve the vertical geometry to not only, look at reducing land take, but to provide benefit to the road user, but improve the maintenance and construction requirements.



Challenges

- Maintaining a safe design whilst mitigating the impacts of land take which have the potential to incur additional costs through utilising a substandard design
- Preventing fundamental changes to the concept design from the options identified at PCF1
- Understanding the wider impacts of the potential changes at an early stage of the design process

“The implications for safety should be at the forefront of discussions and actions.”



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Action Taken



Design Review – A review of the initial design from PCF1 was undertaken by the AECOM IPT to identify areas of safety concerns and improvements for the end user, this review identified elements of the design that were substandard and looked at ways to minimise or remove the substandard element.

Impact Review – A review of the impact of land take from local stakeholders resulting from the earthworks footprint that would be needed to facilitate the initial design and cross section was undertaken.

Review of Mitigation – Mitigation options that were explored to determine their effectiveness, but also the impacts on the safety of the end user. Following this review the preferred option to reduce the height of the junction was taken forward. This option, looked at ways to Eliminate or reduce departures, but also reduce the height that maintenance activities would be required to be undertaken at.

Implementation of Design Modifications – Although the AECOM review had been undertaken to select the best option for safety and mitigation, another review was held during the modification process to identify any other implications. Amending the vertical geometry, allowed the height between structures to be reduced and reduced the volume of earthworks for the scheme, reducing not only the cost, but also the potential carbon impact of the scheme, while also having a positive impact on safety for the road user.



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Results

The work undertaken reduced the overall design height of the junction by reducing the vertical curvature of alignment, which also improved forward visibility and SSD for the end user. This resulted in a significant reduction of 'fill' required, reducing the retained height for earthwork interventions throughout the scheme, which in the future will improve the resulting maintenance regimes, showing hpw maintenance has been considered at this early stage. During construction reduced earthworks will mean a reduction in the number of loads of fill material delivered to site, removing trips from the network, reducing placement and compaction activities and the duration of the overall construction.



It has been estimated that this reduction, has the additional benefit of introducing a saving of 283,302 kg of carbon.

This work is to be presented to the Yorkshire North East health and Safety forum in November.

The implications for safety should be at the forefront of discussions and actions. In considering Safety in Design at concept stage of the design process, this has identified opportunities to benefit the end user, providing a shorter construction duration reducing the amount of earthworks making it a safer scheme to build, operate and maintain. Although the maintenance activities remain, the access and extents of maintenance activities when working at height have been reduced.

Height of the scheme -



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