

Adran yr Economi a'r Seilwaith
Department for Economy and Infrastructure



Llywodraeth Cymru
Welsh Government

**THE CHESTER TO BANGOR TRUNK ROAD (A55) (JUNCTIONS 16 AND 16A
IMPROVEMENT REALIGNMENT AND SLIP ROADS) ORDER 202-**

**THE CHESTER TO BANGOR TRUNK ROAD (A55) (JUNCTIONS 16 AND 16A
IMPROVEMENT REALIGNMENT AND SLIP ROADS) (SIDE ROADS) ORDER 202-**

**THE WELSH MINISTERS (THE CHESTER TO BANGOR TRUNK ROAD (A55)
(JUNCTIONS 16 AND 16A IMPROVEMENT REALIGNMENT AND SLIP ROADS))
COMPULSORY PURCHASE ORDER 202-**

PROOF OF EVIDENCE

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WELSH GOVERNMENT, ENGINEERING
DOCUMENT REFERENCE: WG 1.05.02**

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1. Author

- 1.1 My name is Jonathan Bayliss. I have a BSc (Eng) in Civil Engineering awarded by Imperial College London in 1976. I have been a Chartered Civil Engineer (MICE) with the Institute of Civil Engineers since 1981.
- 1.2 I have worked in the civil engineering industry for 44 years and been mainly involved in the design of major infrastructure schemes that include highways, bridgeworks and rail.
- 1.3 I am currently a Technical Director with Ramboll UK Limited in Chester and regularly undertake Technical Lead roles on major infrastructure schemes including:
 - a) HS2B - Discipline Lead for Route Civils development of route corridors between Sheffield and Leeds/York 2017 to 2020
 - b) Engineering Manager – Design Verification Doha Green Line Underground 2013 to 2016
 - c) Highways Team Leader – Mersey Gateway Crossing 2001 to 2013 -
 - d) Highways Team Leader - A477 St Clears to Red Roses Improvement - 2010 to 2013
 - e) Highways Team Leader – N9 Knocktopher to Powerstown – 2007 to 2011
 - f) Highways Team Leader - A627(M) Junction Improvement 2001 to 2002
 - g) Designer - River Severn Bridge, Bridgnorth Bypass 1981 to 1983
- 1.4 The project for improvements at Junction 15 and 16 has developed so that it encompasses Junctions 14 and 16A as well. Furthermore, the two sets of junctions, namely Junctions 14 and 15 to the west at Llanfairfechan, and Junctions 16 and 16A to the east at Dwygyfylchi and Penmaenmawr, are being treated under different sets of draft Orders and Environmental Statements. This proof of evidence addresses Junctions 16 and 16A, Dwygyfylchi and Penmaenmawr, hereby referred in this proof of evidence as the 'Scheme' or the 'Junction 16 Scheme' as appropriate.
- 1.5 I have been involved with ongoing development of the design since January 2020.
- 1.6 I have reviewed documents related to earlier stages of the scheme and agree with the conclusions reached and options taken forward based on the scheme objectives and constraints at the time.

- 1.7 I have been responsible for refinement of the preferred option to better fit with constraints and to agree in principle technical standards and any key relaxations or departures that will be required.

2. Introduction

- 2.1 Within this Proof of Evidence, I propose to explain the approach taken to the development of the Engineering Design of the A55 Junction 16 and 16A scheme, encompassing route selection, accommodation of, and interface with the existing highway network, highway alignment for link and junction design, drainage, signage, public transport and non-motorised user facilities.
- 2.2 The opinions expressed are my own unless I state otherwise. I have been assisted by colleagues from within the project team in the various tasks that are reported in this document. Colleagues are also presenting evidence within their specialist environmental expertise. Where a topic is covered in detail by the proof of evidence of another specialist, I provide a cross reference to the relevant proof

Structure of Evidence

- Part 3 Briefly describes the existing conditions at Junction 16 and Junction 16A on the A55, including the significant constraints which have informed the design.
- Part 4 Summarises the development of the design to arrive at the preferred solution being considered at Inquiry.
- Part 5 Describes the proposed scheme from an engineering perspective including highway alignments, structures, drainage.
- Part 6 Considers the objections and discusses issues which relate to the engineering design of the Scheme. engineering issues or make reference to other experts.
- Part 7 Provides my conclusion.

Core Documents Referenced

- 2.3 Within my proof I make reference to the following Core Documents:
- a) WelTAG Stage 1 Report (Document Ref WG 4.03.04)
 - b) WelTAG Stage 2 Report (Document Ref WG 4.03.05)
 - c) Junction 16 Alignment and Junction Strategy Report (Document Reference WG 4.03.08)
 - d) WelTAG Design Options Report (Document Ref WG 4.03.04)
 - e) Geotechnical Design Report (Document Ref WG 4.04.03)

Links with other Proofs of Evidence

- 2.4 I will rely on the following expert witnesses to cover their respective specialist fields:

Witness in Chief - James Healey - WG.1.01
Climate Change and Carbon - Simon Price - WG.1.02
Traffic and Economics - Nigel Roberts - WG.1.03
Planning Policy - Shân Wyn Jones - WG.1.04
Environment - Andrew Sumner - WG.1.06
Landscape and Visual Impact - Jon Stoddard - WG.1.07
Ecology - Donna Hall - WG.1.08
Noise - Craig Barson - WG.1.09
Air Quality - Graham Harker - WG.1.10
Water Quality / Flooding - Steve Cox - WG.1.11
Contaminated Land - Phil Studds - WG.1.12

3. Existing Conditions

Existing Road Network

- 3.1 The A55 Trunk Road is a Dual 2 Lane All Purpose (D2AP) Carriageway operating at the national speed limit (70 mph).
- 3.2 Junction 16 is current configured as a three-arm roundabout with connections to the A55 and to Conway Road serving Penmaenmawr from the east.
- 3.3 A priority junction with a central right turn lane (from Conwy Road), a short distance from the roundabout along Conway Road serves Dwygyfylchi from the west via Ysguborwen Road
- 3.4 Junction 16A is currently configured as a compact junction serving only the westbound carriageway of A55. Junction 16A serves Dwygyfylchi from the east via Glan-yr-Afon Road.
- 3.5 The A55 (westbound only) provides access to the Orme Services, with a Shell Petrol Filling Station, independent café and parking adjacent to the 'Iron Bridge' footbridge over to the beach.
- 3.6 To the east of Junction 16A, the two carriageways diverge, with the eastbound carriageway following the coast road (with reduced speed limit), and the westbound carriageway linking to the west portal of the Penmaenbach Tunnel. This area is also used to give access to a sewage treatment works, to Network Rail, and for managing convoy working to allow maintenance of the tunnel.

Accidents

- 3.7 There are no particular concerns with the safety of current highway configurations, which is supported by accident records. Reference should be made to the Traffic and Economics Proof (Document Reference 1.03.02) for accident statistics.

Constraints

- 3.8 The A55 is generally bounded by the London to Holyhead Railway line and the National Cycle Network Route 5 (NCNR5) to the north and by a mixture of plantation, agricultural land and housing to the south.
- 3.9 To the west of Junction 16 the A55 (and cycle path NCNR5) crosses the rail line. Whilst some adjustment of alignment is possible (due to widened verges the Scheme design has sought to avoid any significant modification to this structure.
- 3.10 Conway Road and Ysguborwen Road in the vicinity of the roundabout required significant cutting to link to the level of the A55. These cuttings are

now well established with mature planting, which the Scheme design has sought to retain.

- 3.11 The Maes-y-Llan residential estate extends from Ysguborwen Road down to the A55, providing a very narrow corridor through which to provide a new link.
- 3.12 Maintaining direct access (from A55 westbound) to the Orme View Services has been a constraint on the design.
- 3.13 Maintaining access to the Dŵr Cymru Welsh Water Sewage Treatment Works.
- 3.14 Maintaining access for Network Rail (for maintenance of their rail tunnel).
- 3.15 Maintaining access for North and Mid Wales Trunk Road Agent (NMWTRA) for maintenance associated with tunnel and coastal route.

4. Development of the Scheme

Overview

- 4.1 Four options were identified for the improvement of Junction 16 and assessed against the scheme objectives. The preferred option as a result of this process was refined to address particular concerns, with a number of variant options considered, and resulting in a number of updates, with an agreed scheme presented for public exhibition and consultation. A final (but significant) update was made following consultation to address changes in constraints and is the basis for the scheme presented to the Inquiry.

Design Options

- 4.2 A long list of Options was initially prepared, including non-road options. These were reported on as part of the Welsh transport appraisal guidance (WelTAG) Stage 1 process. The outcome of this was a short list of four options. Details can be found in the WelTAG Stage 1 Report (Document Ref WG 4.03.04)
- 4.3 Initially four options (Options A to D) for the improvement of Junction 16 were identified and evaluated using the WelTAG criteria. Options A, which provided grade separated access to A55 in both directions at Junction 16A, but only westbound access at Junction 16, and Option B, which provided full grade separation at Junction 16 were found to perform best against the scheme objectives.
- 4.4 However public consultation raised some concerns, and various sub-options were developed. On assessing these variants, Option A1 emerged as the preferred solution, the key change being the provision of a link road fully between Junctions 16 and 16A, effectively as a bypass to Dwygyfylchi and identified as the Preferred Option.
- 4.5 This part of the process is reported in full in the WelTAG Stage two report (Document Ref WG 4.03.05) and summarised in the Alignment and Junction Strategy Report (Document Ref WG 4.03.08).

5. The Scheme

Scheme Overview

- 5.1 The Scheme General Arrangement Drawings are included at Appendix A.
- 5.2 The Scheme includes improvements at Junction 16 to replace the existing roundabout with westbound only diverge and merge slip roads connecting to a new roundabout.
- 5.3 Conway Road is realigned at the new roundabout and a new walking and cycle route provided to Penmaenmawr with a crossing at the sports ground.
- 5.4 A new link road is provided between Junctions 16 and 16A, with priority junctions connecting to Ysguborwen Road and Glan-Yr-Afon Road. A new walking and cycle route will run the full length with spurs connecting into the Dwygyfylchi community and on-demand signal crossings.
- 5.5 Junction 16A will be upgraded to full grade separation with the junctions onto the link road under signal control, including connection for walking and cycling route to link with NCNR5.

Applicable Design Parameters

- 5.6 UK Speed limits are given in miles per hour (mph), whereas design speeds tend to be specified using kilometres per hour (kph) and represents the 85th percentile speed (observed or expected) and isn't necessarily related to the posted speed limit.
- 5.7 A55 Mainline will operate at the National Speed Limit (70 mph) and adopt a design speed of 120 kph (75 mph)
- 5.8 Junction 16 and 16A Slip roads will operate at the National Speed Limit (70 mph) and adopt a design speed of 70 kph (75mph) as recommended by standards.
- 5.9 The link Road will operate under a speed limit of 40 mph and the presented design is based on a design speed of 70 kph (44 mph)
- 5.10 Conway Road will operate under a speed limit of 40 mph and the presented design is based on a design speed of 70 kph (44 mph)
- 5.11 Glan-yr-Afon and Ysguborwen Roads will operate under a speed limit of 30 mph and the presented design is based on a design speed of 60 kph (37 mph)

Scheme Development

- 5.12 The development of the design has been described above and is detailed in the Alignment and Junction Strategy Report (Document Ref WG 4.03.09) This

report describes each alignment together with any non-compliances for which Departures from Standards will be required.

- 5.13 Refinement of the preferred option, and in particular a more detailed examination of compliance with standards, and potential need for departures, prompted a re-examination of certain areas, and resulted in three significant changes to the preferred option.
- 5.14 Whilst the Scheme sought to retain as much A55 carriageway as possible, this required some more significant departures, notably with respect to vertical curvature and visibility at Junction 16A (which sits on a crest). In discussion with the Welsh Government Standards Panel, a lesser departure was agreed as the way forward. This requires full depth reconstruction of lengths of both carriageways but will provide more flexibility to accommodate other constraints at detail design stage.
- 5.15 Concern over the reduced junction spacing between Junction 16A, westbound on-slip and the Orme View Services, for which a departure is required, resulted in the addition of a mitigating auxiliary lane between the two tapers, for which a departure has been agreed in principle.
- 5.16 At Junction 16 concern over the alignments of the westbound off-slip and associated link road alignment past the priority junction prompted a review of the overall junction type, and a more compact roundabout solution (than previously considered) was found to be workable, with benefits in terms of impact on established landscaping to the south, and in meeting desirable highway standards for both trunk road (Welsh Government) and local road (Conwy County Borough Council).

Highway Works

- 5.17 The A55 will be offset slightly to the south at Junction 16, compared to the current roundabout. The alignment is constrained at the railway bridge crossing, but the adjusted alignment provides for improved horizontal radius and visibility for eastbound traffic (no longer slowing to the roundabout). This will also allow improvements to the NCNR5 cycleway.
- 5.18 The Junction 16 westbound diverge will be a simple taper, with compliant cross section and alignment. There is limited opportunity, due to the following merge being constrained by the railway bridge, at detail design to reposition this slip road further to the west, thereby increasing junction spacing from the Orme View Services
- 5.19 The Junction 16 westbound merge will be a simple taper with compliant cross section and alignment, constrained in its position and length by the railway structure to the west.

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- 5.20 Junction 16 roundabout has an Inscribed Circle Diameter (ICD) of 40 m, dictated by the alignment of the approaches and needs to accommodate the turning movements of Heavy Goods Vehicles (HGV) between the arms. The level of the roundabout is set to avoid excavating into the slope to the south in order to retain the existing plantation.
- 5.21 Conway Road alignment largely retains its current alignment but is adjusted on the approach to the roundabout. It is anticipated that detail design will include a gateway feature east of the sport ground, and traffic calming measures (reduced width and speed cushions) between this gateway and Penmaenmawr, taking into consideration adjacent approved developments.
- 5.22 The link road between Junction 16 roundabout and Maes-y-Llan is constrained by the need to accommodate the junction with Ysguborwen Road, but can achieve a compliant alignment. A screening bund with stone wall is provided to the south to provide noise and visual mitigation to both the link road and A55 beyond from properties on Ysguborwen Road.
- 5.23 Ysguborwen Road is realigned to form a new junction with the link road. A length of the old road will be retained to the west to provide access to the Oasis Christian Centre.
- 5.24 The link road past Maes-y-Llan will be at the level of the A55, with retaining walls required past the sea-facing properties 17,19,37,38. The alignment here originally anticipated future widening of A55 which is now unlikely. It is anticipated detail design will align the link road as close to A55 as practical to increase the separation from Maes-y-Llan and benefitting the link road alignment to the east around the Orme View Services.
- 5.25 The link road from Maes-y-Llan to Junction 16A is aligned to the rear of the Orme View Services. Whilst a more straightforward alignment was identified in front of the Orme View Services, this would remove direct access from the A55 to the Services. The alternative was seen as being a higher risk to delivery of the project (insofar as the necessary agreement might not be achieved with both owners of the Services) and, in that circumstance, new Orders would be needed to acquire additional lands, incurring delay to the Scheme). On the other hand, the current Orders do not prevent adoption of an alternative alignment in front of the services.
- 5.26 The alignment to the rear of Orme View Services will involve some relaxation of link road standards. Currently the alignment has minimal impact on the Orme View Services carpark and minimises impact on public open space. To achieve a more compliant alignment would involve more land take from the carpark and might impact its use by HGV vehicles.

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- 5.27 The link road approach to J16A is based on loop/connector road standards in CD 122¹ (Document RefWG 4.01.76) which provide for tighter radii associated with links at grade separated junctions.
- 5.28 Glan-yr-Afon Road is re-aligned to meet the link road on embankment at a priority junction. The junction is on the outside of a bend in the link road providing good visibility in both directions. The road will tie-into the existing alignment around the caravan park entrance. A new cycle path will be provided on the north side from the link road to the extent of the Scheme entering Dwygyfylchi. A replacement cattle grid is included. Traffic calming features will be included along Glan-yr-Afon Road and at key locations within Dwygyfylchi in order to improve safety and discourage rat-running through the village.
- 5.29 The link road continues across the A55 on a new Overbridge, with signal control junctions at both ends controlling access to and from the slip roads.
- 5.30 Junction 16A Eastbound Diverge includes an access to the Welsh Water Sewage Treatment Works. This represents an improvement over the current arrangement, which is directly from the A55 eastbound carriageway. The present alignment includes an auxiliary lane, not required based on traffic levels, but to give additional length for vehicles to the Treatment Works to slow and signal their intention to following vehicles. Its is anticipated at detail design that a simple taper will be sufficient with a deceleration length provided within the hard shoulder. This will benefit the accommodation of NCNR5.
- 5.31 Junction 16A Eastbound Merge is a simple taper merge, but includes an access to Network Rail and to NMWTRA for maintenance of their respective tunnels. This represents an improvement over the current arrangement, with both authorities gaining access directly from the A55 slip road. The scheme will leave an area of redundant eastbound carriageway to be reconfigured as part of detailed design to accommodate the maintenance requirements, including convoy working.
- 5.32 Junction 16A Westbound Diverge will provide a simple taper, with compliant slip road to the link road junction.
- 5.33 Junction 16A Westbound Merge is currently configured as a lane-gain, in order to accommodate an auxiliary lane west to the Orme View Services access, in mitigation for the reduced junction spacing, for which a departure has been sought. In the event that an alternative which removes direct access

¹ [CD 122 - Geometric design of grade separated junctions - DMRB \(standardsforhighways.co.uk\)](http://standardsforhighways.co.uk)

between A55 and Orme View Services is taken forward, the merge layout could revert to a simple taper.

Structures

- 5.34 The scheme involves a combination of new structures and modifications to existing structures. These are described in outline below. Outline Approval-in-Principle drawings for these structures can be found in the Core Document as included at Appendix B.
- 5.35 A retaining wall will be required over approximately 110 m between the Junction 16 Westbound On-slip and Conway Road to avoid having to realign Conway Road to the south with the loss of mature landscaping.
- 5.36 A retaining wall will be required over approximately 170 m between Junction 16 Westbound Off-slip and the new link road to be able to provide a compliant vertical alignment for the link road.
- 5.37 Two retaining walls will be provided between Maes-y-Llan and the link road due to the narrow available corridor and to be able to maintain the frontages to north-facing properties. The eastern wall will be extended to accommodate the footpath from Maes-y-Llan down to the link road.
- 5.38 The existing culvert taking the Afon Gyrach under the A55 will be extended to the south to accommodate the proposed auxiliary lane widening.
- 5.39 A new bridge will be provided on the link road crossing Afon Gyrach.
- 5.40 A new overbridge will be provided at Junction 16A spanning both carriageways of A55. It will be supported on a bankseat within the embankment to the south, on a pier in the central reserve and behind the retaining wall to the north.
- 5.41 A retaining wall will be provided to the northside of A55 at Junction 16A between the ends of the eastbound off-slip and on-slip noses, to minimise the overall width through the junction and accommodate visibility on the A55.
- 5.42 A retaining wall will be provided along the north side of the eastbound slip-roads at Junction 16A between from the access to Welsh Water east towards the Network Rail/Tunnel access, to the extent that an embankment cannot be accommodated.
- 5.43 The existing footbridge adjacent to Orme View Services, otherwise known as the Puffin or iron footbridge, will be replaced. The new structure will be Equality Act 2010-compliant, providing accessible ramps to the community, the NCNR5 cycleway and the beach. The existing bridge will remain in place until the new bridge is constructed.

Earthworks and Geotechnics

- 5.44 The ground conditions impacting the design are reasonably well understood based on both record documentation from the previous dualling works and a comprehensive ground investigation undertaken in 2019 as described in the Geotechnical Design Report (Document Ref WG 4.04.03). These will be supplemented by specific additional investigations prior to commencing detail design.
- 5.45 The geology at Junction 16 and 16A has been subdivided into three ground profiles based on the stratigraphy observed within exploratory holes.
- 5.46 The area to the west of the A55 Services (Puffin Café) is characterised by superficial deposits of predominantly cohesive Glacial Till.
- 5.47 The area from east of the A55 Services to Junction 16A is characterised by an upper layer of glacial clays, sands and gravels, and localised alluvial soils underlain by predominantly granular Glacial Till.
- 5.48 The area to the east of Junction 16A is characterised by shallow deposits of alluvial sediments underlain by glacial silts, sands and gravels.
- 5.49 The focus of the geotechnical design will be foundations to the eastbound retaining walls and overbridge at Junction 16A and the treatment of the alluvial sediments east of Junction 16A.
- 5.50 The main earthworks is limited to the south side at Junction 16A, filling to embankments for the westbound slip roads and to the link road south of the junction.

Highway Drainage

- 5.51 The Scheme will result in an overall increase in the area of drained highway at Junction 16/16A, largely due to the addition of the link road. and the Scheme design takes into consideration climate change. Attenuation is proposed at a number of locations and takes different forms according to space available and levels.
- 5.52 Attenuation is proposed west of Junction 16 roundabout between Conway Road and the westbound on-slip for the roundabout, start of link road and start of Conway Road. This likely to be an underground tank to be able to drain the associated area. It will outfall to the existing/modified A55 drainage network.
- 5.53 Attenuation is proposed between Junction 16 roundabout and Maes-y-Llan for the link road and Junction 16 westbound off-slip. This is likely to be oversize pipes parallel with the link road due to space and level constraints.

- 5.54 Attenuation is proposed between the Orme View Services and Afon Gyrach for the link road. This will be a surface pond, outfalling to Afon Gyrach adjacent to the link road.
- 5.55 Attenuation is proposed west of Junction 16A between the link road and Junction 16A westbound on-slip for the link road, slip roads, and elevated part of Glan-yr-Afon Road. This will be a surface pond, outfalling to Afon Gyrach adjacent to the link road.
- 5.56 Junction 16A mainline and eastbound slip-roads will drain unattenuated to existing outfalls via a modified network.

Land Drainage

- 5.57 The land drainage regime will not be significantly impacted by the scheme. The A55 corridor will continue to cut-off flows towards the sea. Existing crossings will be maintained and where necessary extended.

Construction

- 5.58 Exact details for constructions will be a matter for the appointed contractor and his designer and will be influenced to a certain extent by the resources and skills available. Nevertheless, the Scheme as presented seeks to minimise the works and impact during construction in a number of ways.
- 5.59 Generally two narrow lanes of A55 traffic will be maintained in both directions, but subject to a temporary speed restriction.
- 5.60 The Junction 16 roundabout will remain operational until full movements are available at Junction 16A and the link road is open to traffic to provide an alternative access.

Statutory Undertakers and Utilities

- 5.61 There are a number of utilities requiring to be diverted and/or protected as part of the works:

Scottish Power – Link road crossings and tunnel feeds

Lighting

- 5.62 The existing A55 and specifically the Junction 16 roundabout is illuminated, and this will remain the case for the improved at-grade junction at Junction 16 and the new grade-separated junction at Junction 16A.
- 5.63 The proposed link road will also be illuminated. New and replacement lighting columns will have low light spill luminaires.

Public Transport

- 5.64 The scheme will not have a significant impact on rail services.

- 5.65 Existing bus services will be improved by the new junction arrangements, In particular the eastbound services through Dwygyfylchi which currently join the A55 at Junction 16A, but have to travel west to Junction 16 to turn round, will be able to travel directly east from Junction 16A, with savings in route length and journey times.

Active Travel

- 5.66 The Scheme will include significant improvements to Active Travel Routes, providing a continuous, off highway route from Junction 16A (with links to NCNR5 and to the east of Dwygyfylchi), to Orme View Services (with links to the NCNR5, beach and residential areas), then to Junction 16 and west along Conway Road to Penmaenmawr.
- 5.67 Whilst not strictly an Active Travel component, the existing NCNR5 cycleway will be improved over the extent of the Scheme to 3 m width (except at a few pinch points)

Lands to be Permanently or Temporarily Acquired

- 5.68 The lands required permanently have been determined in relation to the engineering design to deliver the: proposed new Trunk Road, junctions, side roads, structures, drainage and Private Means of Access (PMAs), associated landscaping and mitigating measures and the need to provide access for the Welsh Government to inspect and maintain the highway infrastructure.
- 5.69 The lands required temporarily have been determined to provide essential access or working space in relation to the works, and suitable sites for construction compounds.
- 5.70 In my opinion, the footprint of the Scheme which requires Title land for permanent works in the Compulsory Purchase Order (CPO) and proposed modifications is appropriate and achieves a balance between the factors of environment, land interests, construction risk, programme and Scheme cost.
- 5.71 In my opinion, the Title land for the permanent works and the rights of access for inspection and maintenance included in the CPO (and the proposed modifications) are essential for the Scheme.

Scheme Objectives

- 5.72 In my opinion, the Scheme would have a positive impact when measured against the Scheme objectives to the extent to which they fall within my area of expertise:
- 5.73 Objective 1: Improve access to regional, national and international markets and improve access to employment opportunities

- 5.74 Objective 2: Improve road safety on the A55 from Junction 14 to Junction 16A – This will be achieved by the removal of the roundabout at Junction 16, provision of partial grade separation at Junction 16 and provision of full grade separation at Junction 16A and more generally by adherence to current standards.
- 5.75 Objective 3: Improve journey times and journey time reliability on the A55 from Junction 14 to Junction 16A. This will be achieved by the removal of the roundabout at Junction 16, removing the need for the majority of A55 traffic to slow and negotiate the roundabout.
- 5.76 Objective 4: Improve resilience on the A55 for strategic and local traffic. This Scheme will make a significant contribution to improving resilience, insofar as the Link Road provides a parallel route to the A55.
- 5.77 Objective 5: Improve journey times, journey time reliability and safety for access onto the A55. Delays will be reduced, particularly at peak times, for vehicles joining A55, improving journey times and reliability. The new arrangement will improve safety, removing the need to assess gaps in passing traffic.
- 5.78 Objective 6: Reduce severance with coastal areas for the Non-Motorised Users and enhance provision made for walkers and cyclists. New access to coastal areas is provided at Junction 16A and improved access provided at Orme View Services and a continuous new route for cyclists and pedestrians will be provided from Junction 16A to Penmaenmawr.
- 5.79 Objective 7: To take reasonable steps to build healthier communities and better environments. The engineering design encourages modal shift from cars to walking and cycling as well as accommodating mitigation and environmental improvements (landscaping, noise and visual screen etc) as advised by the environmental team.
- 5.80 Objective 8: Opportunities to provide integrated transport are increased. The addition of cycle paths and Active Travel routes as part of the Scheme will provide a continuous route with improved access to the centre of Dwygyfylchi. The new junction 16A will provide significant route length and journey time savings for existing bus services. The Active Travel improvements and linkages to NCNR5 will improve access to Penmaenmawr railway station.
- 5.81 Objective 9: Minimising technical departures from standard (to improve safety) Development of the preferred design through a number of iterations has been able to reduce both the number and degree of departures.
- 5.82 Objective 10: Minimising the need to reduce speed limits (to reduce delays). Other than for environmental reasons, the need to reduce speed limits would stem from an unacceptable number and/or degree of departures associated

with the desirable speed. There is no (engineering) need to recommend reduced speed limits for this scheme.

- 5.83 Objective 11: Minimising disruption during construction (to local residents and business, as well as along the A55 itself). Disruption during construction is ultimately dictated by the Contractor working within constraints which the WG may decide to impose. The engineering design can only anticipate construction methods and programme and try to provide maximum flexibility. The Scheme aims to do this by retaining existing structures and overlaying existing pavements as much as possible making it easier to adjust traffic management. The contractors traffic management proposals will be an important consideration when evaluating tenders.

6. Objections – Engineering Issues

6.1 All objections received have been provided with a written response, including responses related to any engineering issues, to which I have contributed where appropriate.

6.2 Responses to a small number of objections, where it has been possible to mitigate a concern, or to correct an unintended consequence, may require detailed amendments to the Compulsory Purchase Orders (CPO) in due course.

6.3 I discuss below the key engineering issues raised in objections.

Conway Road Traffic Calming

6.4 In response to the proposed development along Conway Road, an alternative arrangement has been proposed which would see a gateway feature for Penmaenmawr established to the east of the sports ground. The road from the sports ground to the current limit of Penmaenmawr, would then provide a transition (30 mph) into the main village (likely 20 mph), and in order to reduce speed on an otherwise straight section of road would consider traffic calming measures. The cycleway would be kept adjacent to the carriageway and the margin strip omitted to minimise impact on the proposed development.

Replacement Footbridge at Orme View Services

6.5 Crossing link road to footbridge – Whilst feasible to extend the footbridge from an engineering perspective, the proposed at-grade crossing can be detailed to provide a compliant and safe solution.

Safe Access to Orme View Services

6.6 Road Safety Assessment – an independent road safety assessment raised known issues related to junction spacing and maintaining direct access to the Services from A55. The need to provide a scheme which maintained direct access is discussed in my evidence, together with the mitigating measures which are proposed.

6.7 Two alternative access arrangements to Orme Services (Puffin Café and Shell Orme Petrol Filling Station) were suggested, which are similar to options already discounted by the design team (but not on engineering grounds) Discussions are ongoing with the respondent, and it is anticipated an Alternative will be prepared for consideration at the Inquiry.

Improvements to Glan-yr-Afon Road

6.8 Glan-yr-Afon Road will be improved to a consistent width and alignment, and to have improved visibility although not significantly wider in general. The

main change will be the addition of a cycleway / footpath along the north edge of the road and traffic calming measures to reduce vehicle speed entering the village.

- 6.9 It is not possible, as part of this Scheme, to address the lack of footway provision further into Dwygyfylchi.

Accident Data does not Support Contention that Roundabout is Unsafe and Dangerous

- 6.10 It is true that accident records do not necessarily highlight safety issues with the current roundabout arrangement. Accident risk is assessed on the basis of two factors, the likelihood of an incident occurring, and the severity of the incident.
- 6.11 Likelihood will be dependent on familiarity with the junction arrangement, which largely comes from having a compliant design. Mitigations might take the form of signage or rumble strips, which alert drivers. Likelihood is clearly greater where the driver is required to take action, such as when approaching any junction. Likelihood is also a function of the number of vehicles using the junction.
- 6.12 Severity is primarily dependant on vehicle speed, and mitigations are likely to involve containment in the form of barriers to protect against crossing into the opposing carriageway or down steep embankments.
- 6.13 With a roundabout all traffic is required to take action, to slow and give way if necessary. In addition, the layout is unusual for this type of road, and unexpected in the context of the majority of the A55 corridor. The likelihood is therefore relatively high. Equally the severity is relatively high where it involves vehicles at speed potentially running into slow or stationary vehicles.
- 6.14 On the other hand with a grade separated junction the likelihood is much less for mainline traffic, which is not required to take action, and the severity for merge/diverge related incidents will be less due to a much smaller speed differential. The likelihood of incidents on the slip road junctions will be similar in principle to the roundabout, but apply to a much smaller volume of traffic, and be less severe due to lower speeds.
- 6.15 Hence taken together the accident risk will be less for the grade separated junction.

Scheme is Non-Compliant

- 6.16 A number of Objectors have noted that the Scheme is reliant on Departures from Standards and I refer to some of these departures earlier in this proof.
- 6.17 It should be realised that it can be difficult, even with a greenfield design, to fully comply with every clause of every standard. This is even more the case

for improvement schemes such as this where multiple constraints have to be accommodated, such as on the eastbound diverge, where the existing Welsh Water access over the railway, and the National Cycle Route have to be accommodated within an acceptable alignment for the slip road. This reality is recognised within design standards by a process of relaxations and departures, which progressively increases the level of scrutiny afforded to less than ideal arrangements and ensures that safety is not compromised.

- 6.18 On the mainline, we have agreed a one step relaxation to avoid more extensive carriageway reconstruction and modifications to existing structures. Without this relaxation construction would be more extensive costly and disruptive to traffic flows during construction. As this coincides with the junction a departure will be required.
- 6.19 The Scheme will provide access to the Dŵr Cymru Treatment Works and for Network Rail from the eastbound slips at Junction 16A. Such accesses are not normally allowed, and hence a Departure will be required.
- 6.20 Minimum junction spacing is required on trunk roads (including to service accesses). The reduced spacing between Junction 16A and entrance to Orme Services has been mitigated by providing of a third lane and improving visibility, but nevertheless a departure will be required.

7. Conclusion and Declaration

- 7.1 My proof of evidence includes facts which I regard as being relevant to the opinions which I have expressed, and the Inquiry's attention has been drawn to any matter which would affect the validity of that opinion.
- 7.2 As Highways Lead for the Scheme, I have sought to provide a safe highways design, in compliance with standards, accommodating design elements and mitigating measures identified as necessary by other engineering and environmental specialists, and hence to determine the appropriate extents of lands to be acquired on a temporary or permanent basis.
- 7.3 In my opinion the engineering design has been carried out in accordance with Design Manual for Roads and Bridges (DMRB) Standards, and any derogations, in the form of relaxations or departures have been determined in accordance with good practice and are appropriate and reasonable in the circumstances.
- 7.4 Further, in my opinion the lands to be acquired, whether on a temporary or permanent basis, to construct the Scheme, associated mitigating measures and to be able to maintain the same, are equally appropriate and reasonable in the circumstances,
- 7.5 I believe the facts I have stated in this proof of evidence are true and that the opinions expressed are correct.
- 7.6 I understand my duty to the Inquiry to assist it with matters within my expertise and believe that I have complied with that duty.