Submission ID: 31603

Registration Identification Number: 20049691
Written Representation files (3no) uploaded 12/11/2024

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Dear Planning Inspectorate,

I am pleased to submit a Written Representation to the A46 Bypass scheme.

1) I have a further comment to make on the Statement of Reasons or Case for the Scheme over my previous Relevant Representation submission on the 14th of July 2024.
   The Applicant mentions, in the Response to Relevant Representations, that "*Chapter 3 (Assessment of Alternatives) of the Environmental Statement [APP-047] provides information on an Alternative Modes Assessment".* However, this primarily refers to local transport within the Newark area. Yet a justification for the Newark By-pass is that it is the last section of the A46 that has not been upgraded to dual carriageway, forming a link between the M1 at Leicester and the A1 at Newark and part of the National Network.

   I do not see an assessment of regional transport alternatives, where railway transport could contribute, such as flows between Lincoln, Nottingham, Leicester and Birmingham, nor whether the re-construction of the Newark By-pass would lead to an abstraction of ridership from the existing train services.

   The assertion by the Applicant of capacity limits on the Nottingham to Lincoln Railway due to the flat crossing with the East Coast Main Line and level crossing issues (presumably primarily, with the Great North Road at Newark Castle Station) should raise the question as to whether the removal of these constraints would allow more competitive train services, to ease the burden on the A46.

2) The Applicant refers to the Statement of Common Ground between National Highways and Network Rail [APP-7.29].
   In Part 2 (Accessibility and Integration) of the SoGC; "Items not agreed" include the Applicants position on "*Headroom and OCS [Overhead Contact System] proposals have been captured within the scheme SOR's and OCS Options Report and the associated 4no Network Rail's DRN's. Any derogations against Network Rail standards will be based on the information accepted within the DRN's.*"

The Applicant refers to the road deck height of the A46 as being agreed in the SoGC. It is not clear if this refers to the road surface height or the soffit height. For the railway the primary issue is headroom, measured by the height of the running rail A.O.D. and the distance between the top of the running rail and the soffit (deck underside) of the bridge.

This issue of headroom is important for the railway scheme to provide a grade separation of the Nottingham to Lincoln railway and the ECML. To this end I have examined the relevant reports, thus:

I have received under a F.O.I. request the relevant report from the Department for Transport: -
Newark Rail Flyover, Compatibility with A46 Dualling Project,
Department for Transport 19/08/2022,
Report 203847-ATK-REP-GEN-000001 Rev. 1.
(Atkins 2022 Report)

I have received under a F.O.I. request an earlier report from Network Rail: -
Network Rail LNE Programme 03/02/2016,
Newark - Grade Separation Feasibility Report,
140365-JAC-NWK-0-RP-EM-000001 Rev. P04.
(Jacobs 2016 Report)

The Jacobs 2016 Report is a continuation of development work first undertaken by Mott MacDonald, I have received this report under a F.O.I. request from Network Rail: -
Mott MacDonald Drawing Newark Dyke Feasibility Study Grade Separation Option for the ECML and Lincoln to Nottingham Line Scheme, 2 - 43073/BRG/0004 Rev P1 – November 1999.
(Mott MacDonald 1999 Report)

My comments on these reports are shown hereunder:

A key issue from a transport perspective is to ensure that railway freight services are not disadvantaged by the imposition of steep gradients on the Nottingham to Lincoln railway.

The Nottingham to Lincoln railway (Engineer’s Line Reference:- NOB1) generally has a ruling gradient of 1:302 (3.311‰) in the Down direction

towards Lincoln and -1:285 (3.509‰) in the Up direction towards Nottingham.
There is a short section of -1:100 (-10.00‰) of 144.84 metres followed by another short section of -1:132 (-7.60‰) of 241.40 metres in the Up direction towards Nottingham on the adjoining NOB2 railway between West Holmes Junction and Boultham in Lincoln. At 386.24 metres total gradient length with a rise of 2 metres, this is less than the 550 metre to 750 metre train length. Otherwise there are no adverse gradients between Immingham, Nottingham and the Midlands. This permits some of the heaviest freight trains in the U.K. of 3,200 tonnes trailing load in the Nottingham direction and 2,400 tonnes trailing load in the Lincoln direction to operate.

The Jacobs 2016 Report acknowledges this need to reduce the gradients on any new flyover line:

"The vertical alignment has been developed to achieve a 1 in 100 curve compensated vertical grade rising from under the existing A46 to the proposed new structure at the ECML."

The relative shortness of the western side ramp (circa 700 metres) and the difference in railway height of circa 7.5 metres gives an approximate gradient of 1:93 (10.75‰), however this has not been achieved in the Atkins 2022 Report.

The physical constraints are:-

a) Rail to soffit height of the A46 East bridge:

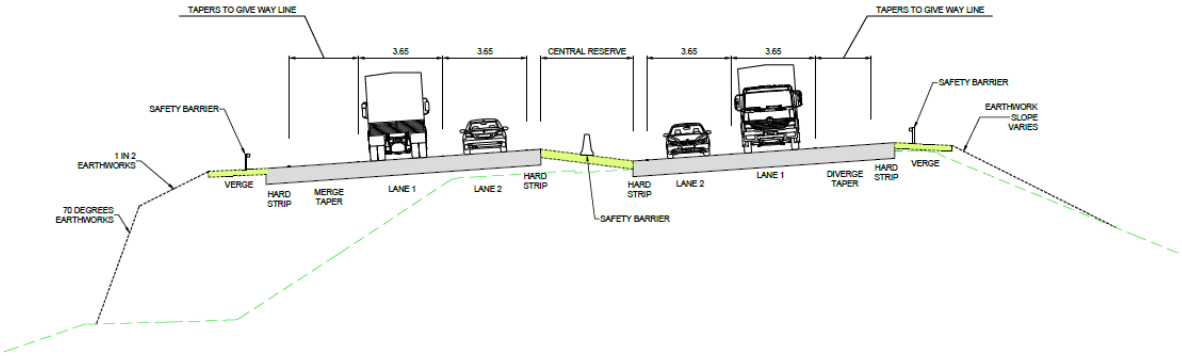
The existing rail height A.O.D. beneath the A46 East overline railway bridge on NOB1 is given as 12.3m in Elevation 1 in the D.C.O. submission documents.

The Jacobs 2016 Report, Newark Flyover Permanent Way GRIP 2 Sketch 4 gives the existing soffit height at the Nottingham end of the bridge as 17.620m A.O.D. from survey with a proviso that the whole soffit width of the overline bridge needs to be surveyed. This produces a rail to soffit height of 5.32 metres.

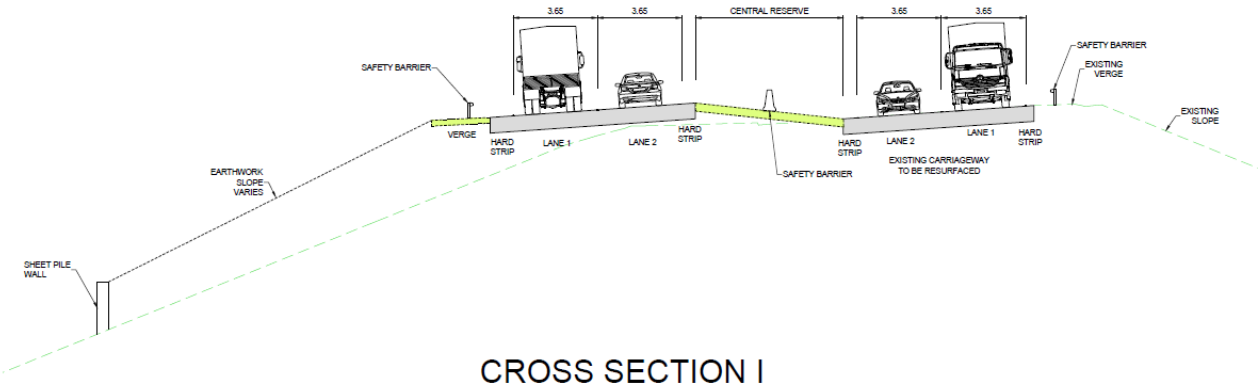
With a nominal 4.8 metres required rail to soffit height this gives an intended provision in the Jacobs 2016 Report to raise the railway height under the bridge by 0.52 metres and lengthen and hence lessen the otherwise severe gradient.

However as the Jacobs 2016 report cautions; the soffit measurement is at the higher side of the superelevation of the existing A46, this may produce a lower side measurement considerably less, in effect negating the intended provision.

Cross-sections from the D.C.O. drawings show the effect of superelevation:



CROSS SECTION H
DUAL CARRIAGEWAY TO THE SOUTH OF THE NOTTINGHAM TO LINCOLN RAILWAY LINE
EAST CROSSING



CROSS SECTION I
DUAL CARRIAGEWAY TO THE NORTH OF THE NOTTINGHAM TO LINCOLN RAILWAY LINE
EAST CROSSING

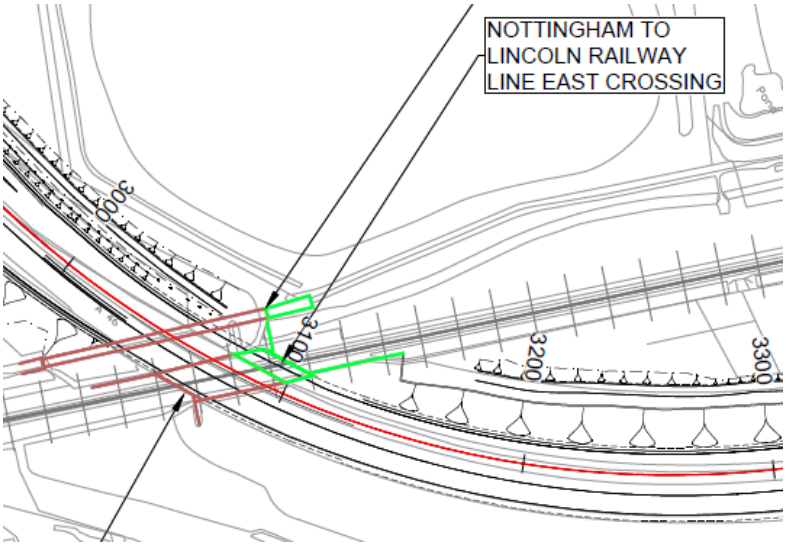
It should be noted that these cross-sections show staggered carriageways, whereas the Applicant's response to the Relevant Representation states that:

"The Scheme is proposing to retain the existing levels of the A46 and not fully reconstruct the existing carriageway in order to raise the level

of the existing bridge over the Lincoln line railway and instead this bridge is being widened online to the north."

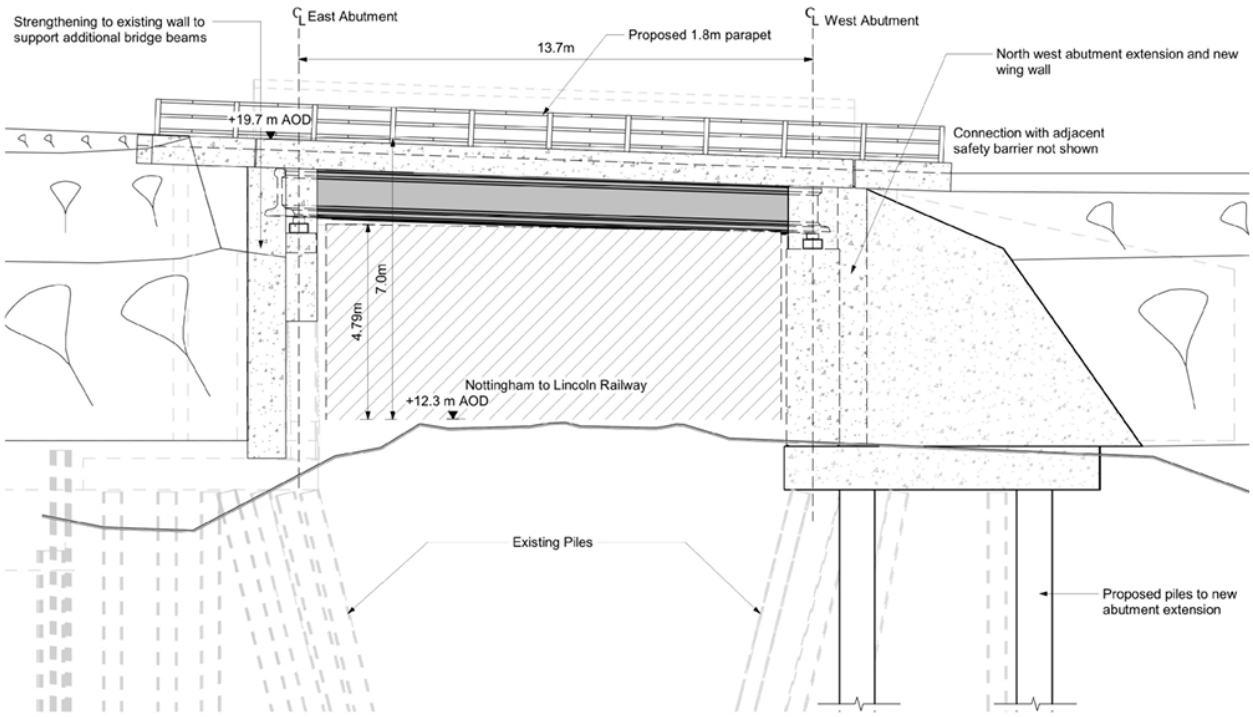
The arrangements on the cross-sections H & I above do not seem to co-incide with the plan view shown on the D.C.O. and the Applicant's response that both seem to imply a co-planar arrangement of the new soffit with the old soffit rather than staggered separate carriageway soffits.

The concern here is that the additional bridge span in a co-planar arrangement lowers the effective soffit height when the need is to raise the soffit height to allow the railway grade to commence as early as possible on the exit from the original bridge.



ENGINEERING PLANS AND SECTIONS
Plan and profiles – Sheet 3 of 37 Mainline Northbound

Also in the D.C.O. documents is Elevation 1 showing the additional span:



Elevation 1

1 : 100

This shows: -

- a rail height of 12.3m A.O.D.;
- a maximum rail to soffit height of 4.79m: &
- a rail to road surface height of 7m.

This gives a construction depth of 2.21m.
It also gives an additional headroom of only 0.01m over the desirable minimum soffit height of 4.780m for the standard structure gauge.

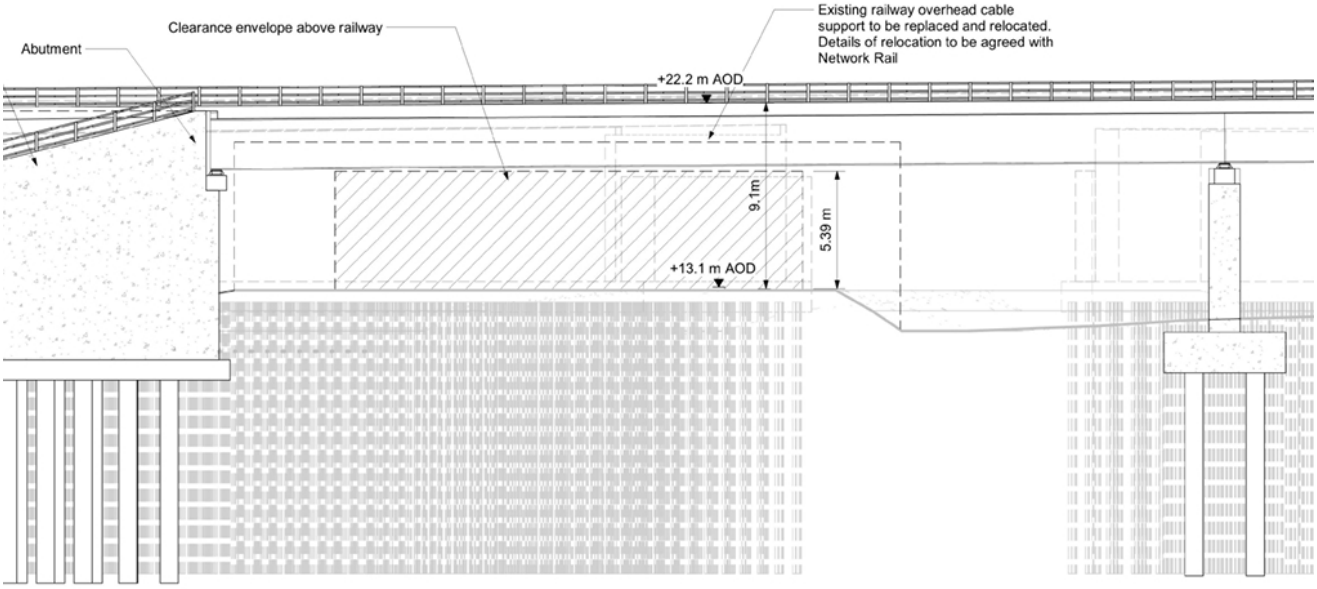
In effect the D.C.O. Elevation 1 shows the soffit height at the new widened northern side of the bridge and the Jacobs 2016 Report shows the soffit height at the original southern side of the bridge. The difference in soffit height might be explained by the co-planar arrangement of carriageways due to the super-elevation of the road.

Thus there appears to be some incompleteness in the basic information supplied in the D.C.O. documents and also in the Atkins 2022 report with regard to the A46 East bridge over the railway.

The provision of a General Arrangement drawing of the complete bridge with the headroom and soffit heights at the existing side and the widened side shown would answer these concerns.

b) The height of the grade separated bridge over the East Coast Main Line:

The existing ECML rail height above A.O.D. is given as 13.1m in Elevation 3 in the D.C.O. documents, however the Profile drawing in the D.C.O. documents shows the height at chainage 3,850m as being 13.326m. This measurement needs to be confirmed; what is the actual rail height?



Elevation - 3

1 : 200

The ECML rail height above A.O.D. given in the Jacobs 2016 Report is 13.460m A.O.D. In the Atkins 2022 Report no specific height is given.

There is a level gradient on the ECML at this point, so the A.O.D. reading under the A46 viaduct span should be identical to that under the proposed railway viaduct span.

Gradient modelling:

I have modelled the railway gradients in Excel, a summary is presented in these notes, the excel files are sent separately.

Jacobs 2016 Newark Flyover Report Calculations re-examined - H. Pack	Length m.	Gradient ratio	Gradient ‰
Southern Grade from A46 northwards to west end of ECML viaduct span			
Chainage measured from start of gradient and to bridge ends	730.000		
Grade height	6.999		
Primary uncompensated gradient		104	9.59
Final straight track gradient		**100**	**10.01**
Iterated curved track grade height	5.547		
Final uncompensated track gradient on curves		105	9.48
Iterated compensated track gradient on curves		100	10.01
Final Equivalent Track Gradient		**100**	**10.01**
NB Jacobs show the equivalent track gradient as the curve compensated gradient.			

Jacobs 2016 Newark Flyover Report Calculations re-examined - H. Pack	Length m.	Gradient ratio	Gradient ‰
Northern Grade from east end of vertical curve on ECML viaduct span northwards towards A1 overline bridge			
Chainage measured from east end of ECML viaduct to end of down grade	1197.296		
Grade height	8.394		
Primary uncompensated gradient		143	7.01
Initial compensated gradient on curves		139	7.19
Final straight track gradient		**142**	**7.05**
Final uncompensated track gradient on curves		145	6.87
Iterated compensated track gradient on curves		142	7.05
Final Equivalent Track Gradient		**142**	**7.05**
NB Jacobs do not show an equivalent track gradient, only a curve compensated gradient			

Atkins 2022 Newark Flyover Report Calculations re-examined - H. Pack	Length m.	Gradient ratio	Gradient ‰
Southern grade from A46 northwards to west end of ECML viaduct span			
Chainage measured from start of gradient and to bridge end (adjusted to start of main grade)	696.076		
Grade height	8.077		
Primary uncompensated gradient		86	11.60
Initial compensated gradient on curves		82	12.19
Final straight track gradient		**84**	**11.96**
Final uncompensated track gradient on curves		88	11.38
Iterated compensated track gradient on curves		84	11.96
Final Equivalent Track Gradient		**84**	**11.96**

Atkins 2022 Newark Flyover Report Calculations re-examined - H. Pack	Length m.	Gradient ratio	Gradient ‰
Northern Grade from east end of vertical curve on ECML viaduct span northwards towards A1 overline bridge			
Chainage measured from east end of vertical curve on ECML viaduct to end of down grade	1168.872		
Grade height	9.003		
Primary uncompensated gradient		130	7.70
Initial compensated gradient on curves		127	7.88
Final straight track gradient		**129**	**7.78**
Final uncompensated track gradient on curves		132	7.60
Iterated compensated track gradient on curves		129	7.78
Final Equivalent Track Gradient		**129**	**7.78**

I was able to replicate the gradient profile of the Jacobs 2016 report from the information given. However the rail to soffit heights need to be understood at the A46 Eastern bridge, it is probable that the raised rail level under the bridge is unachievable.

I was unable to fully replicate the gradient profile of the Atkins 2022 report from the information given.

I have assumed that the rail height of the ECML of 13.460m A.O.D. from the Jacobs 2016 report was used in the Atkins 2022 Report modelling. This produces a grade height of 8.077m from the Nottingham direction. This is considerably lower than the 8.7m mentioned in the RailSys modelling in the Atkins 2022 Report. I have used the values given in the Atkins 2022 Report for construction depth, ballast & track depth and the rail to soffit height of 5.4m.

The Jacobs 2016 Report uses the “Dynamis” software to produce single train runs on the proposed 1:100 (10.00‰) curve compensated gradient.

The methodology is described in Appendix C of the Jacobs 2016 Report as a sub-report: “Tata Steel Projects Report B90906-REP-OPS0001 Rev P02 Newark Grade Separation Gradient modelling Study dated August 2015.

Dynamis can model single train runs with great accuracy including the ability to stop, restart and accelerate with the whole train on the gradient, it also measures degraded conditions such as poor adhesion and restricted locomotive power.

It essentially measures the operability of individual trains. It is able too, to measure the energy consumption of trains over different options for the grades.

The sister RailSys v11 programme used in the Atkins 2022 Report has a range of functions incorporated from the Dynamis programme. RailSys is primarily designed for the production of wide area timetables.

Missing from the RailSys analysis in the Atkins 2022 Report is restarting with a freight train completely on the 1:78 (12.82‰) gradient.

It would be sensible to replicate the Dynamis runs in the Jacobs 2016 Report with the proposed infrastructure in the Atkins 2022 Report and any improved infrastructure that may be proposed. The runs would need to test both normal and degraded conditions and stopping and restarting on the gradient.

3) With regards to the steepness of the gradients, the Jacobs 2016 Report is centred around reducing the gradients to a more acceptable 1:100 (10.00‰) or better. In contrast the Atkins 2022 Report concentrates on buildability, there is no emphasis on improving gradients in their remit. In consequence the Atkins 2022 Report gradients are substantially more severe than those achieved in the Jacobs 2016 Report.

   The gradients in the Atkins 2022 Report need further consideration. The proposed gradient of 1:78 (12.82‰) would be considered excessive for a freight train. The grade is similar in length to that of a maximum length 750m freight train, so re-starting a heavy train on that grade with poor adhesion may be problematic.

   Given the constraint imposed by the existing A46 East bridge, how then can the gradient be improved?

   a) Lengthen the grade at the southern end under the A46 East Bridge.
      Move the 40m vertical curve at the southern end of the grade to underneath the existing A46 bridge, starting to the west of the A46 bridge towards the existing crossover at the 12.00m level and terminating at the northern end of the existing A46 bridge.

      The existing railway is on a rising gradient of 1:362 (2.76‰) between Newark Castle Station at 17miles 422 yards (27,740m) and the River Devon Trent Viaduct at 17miles 1267 yards (28,520m) and the 40m vertical curve under the bridge can begin on this gradient from Newark Castle Station to the east of the existing crossover.

      The horizontal transition of 50m can then commence underneath the new A46 bridge span.

      The effect of this will be to start the grade at 27,910m instead of 27,992m, thereby lessening the gradient.

      To allow this the new span will need to be wide enough to accommodate the horizontal transition and raised high enough to acccomodate the proposed grade. At 1:100 (10.00‰), for example, an additional span width of circa 10m with the skew bridge, that would equate to the soffit level of the new span being raised 0.1m.

b) Reduce the separation distance between the new railway and the new northbound carriageway of the A46 from the 11m to 7m from the running rail to the hard strip of the road. The respective distance requirements are: -

Design Manual for Roads & Bridges (DMRB):

- 1m Hard Strip;
- 2.5m Verge including VRS;

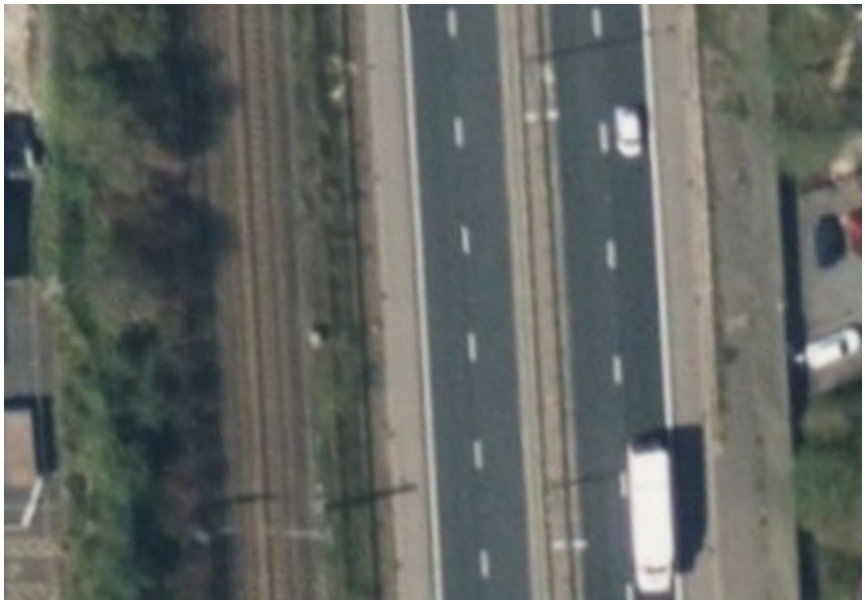
Track Design Handbook (TDH):

- 1625mm clearance from running rail;
- 300mm cess walkway.

Plus allowance for a combined track and highway drainage scheme.

This would substantially reduce the earthworks' cost and enable the new railway to avoid passing over the Hydro-Electric Plant, thereby allowing the overall height of the railway viaduct to be reduced. It would also enable the railway to cross the River Devon Trent and the ECML and NSE railways at narrower points thereby reducing the bridge spans and potentially allowing simpler, less obtrusive bridge designs to be employed.

c) Both measures (a & b) combined could facilitate an increase in the curve radii on the western grade from the Atkins 2022 Report of 900m to closer to the Jacobs 2016 Report of 1000m. An improvement to 950m is postulated. This would reduce the curve resistances and compensated gradients.



View of Liverpool & Manchester Railway in close proximity to M602

Distance from running rail to motorway hard shoulder is circa 7m.

River Devon Trent showing the weir and Hydro-Electric Power station

d) Reduce the height of the railway viaduct and hence grade height
This depends on avoiding the Hydro-Electric Power station, on electrical clearances for the Overhead Line and construction and track depth.

In the Jacobs 2016 Report the railway viaduct soffit height above the running rails was set at 5.1m in accordance with the Track Design Handbook, Minimum Soffit Heights for Standard Structure Gauge, Primary InterCity main routes, Desired Height for OLE Normal Clearance with full tolerance.

In the Atkins 2022 Report the railway viaduct soffit height above the running rails was set at 5.4m at a similar height to the existing A46 viaduct. This was to clear the Hydro-Electric Power station and to reduce OLE alterations on the ECML. This consequent increase in the severity of the gradients was not addressed in the Atkins 2022 Report.

Whilst a reduction in soffit height to 5.1m would be good, it would be better if the OLE alterations were úndertaken to reduce the height further to 4.780m, in accordance with the Track Design Handbook, Minimum Soffit Heights for Standard Structure Gauge, Primary InterCity main routes, Minimum Height for OLE Normal Clearance with full tolerance.

The limiting factor for OLE clearances in the Newark A46 viaduct area at chainage 120 miles 1258 yards (194.27km) is not necessarily Newark Northgate Station, but Newark Lincoln Road overline bridge 620m distant at chainage 120 miles 574 yards (193.65km). This bridge as seen in the Geograph photograph shows an overbridge apparently with normal clearances with reduced tolerances, or reduced clearances. This may indicate a soffit height of 4.640m or less. If confirmed, this may enable an acceptable OLE wire gradient for a soffit level of 4.780m for the new railway viaduct.

Newark Lincoln Road overline bridge © Ashley Dace, Geograph

e) Construction and Track Depth

The various types of bridge available for the viaduct over the ECML have an effect on the overall grade height. Various bridge types have been discussed in the reports. For the purposes of reducing the grade height, the deck types need to be assessed for construction depth.

In the Jacobs 2016 Report the construction depth for a widened Box Girder structure (presumed composite deck) is deduced after allowances for ballast, sleepers and rails as 0.594m.

In the Atkins 2022 Report the construction depth for a Warren Truss structure with cross-girders & concrete deck is given as 0.900m. This is a substantial increase on the Jacobs 2016 Report.

It is also possible to postulate the use of a widened “E” Type bridge such as it is believed were installed as a pair of 50m spans over the River Trent at Gainsborough.

For examining an alternative solution, the deck construction depth is assumed to be 0.800m.The ballast depth is normally 0.300m, with the use of shallow depth 5EF36 sleepers & CEN56 rail this gives a reduced track depth of 0.630m compared with using 5F41 sleepers & CEN56 rail that gives a track depth of 0.665m. The combined construction and track depth is then 1.430m. The ECML rail to soffit height is proposed at 4.8m.

Newark Flyover Report Calculations re-examined - H. Pack

Most measures to lower grade height included	Length	Gradient ratio	Gradient ‰
Southern Grade from A46 northwards to west end of ECML viaduct span			
Chainage measured from start of gradient and to bridge ends (adjusted to start at north end of existing A46)	760.076		
Grade height	7.339		
Primary uncompensated gradient		104	9.66
Curve radius R	950.000		
Initial compensated gradient on curves		98	10.21
Final straight track gradient		**100**	**9.97**
Final uncompensated track gradient on curves		106	9.41
Iterated compensated track gradient on curves		100	9.96
Final Equivalent Track Gradient		**100**	**9.96**
Northern Grade from east end of vertical curve on ECML viaduct span northwards towards A1 overline bridge			
Chainage measured from east end of vertical curve on ECML viaduct to end of down grade	1197.296		
Grade height	8.394		
Primary uncompensated gradient		143	7.01
Curve radius R	3000.000		
Initial compensated gradient on curves		139	7.19
Final straight track gradient		**142**	**7.05**
Final uncompensated track gradient on curves		145	6.88
Iterated compensated track gradient on curves		142	7.05
Final Equivalent Track Gradient		**142**	**7.05**

If the ECML rail height of 13.1m A.O.D. in the D.C.O. Elevation 3 is found to be accurate, then a further reduction in the Final Equivalent Track Gradient to 1:105 (9.49‰) is possible on the western grade.

An additional reduction in deck construction depth from 0.8m to 0.6m would enable a Final Equivalent Track Gradient of 1:108 (9.23‰) on the western grade.

These small alterations to the grade height could have a significant effect on the operability and acceptability (under the railway Network Change process) of the proposed changes to the Nottingham to Lincoln railway and on the energy consumption of trains traversing the proposed grade separated railway.

A more detailed focus on these options for viaduct types, construction depth and track depth is needed than is given in the Atkins 2022 Report.

f) Survey data

The D.C.O. documents show a rail height of 13.1m A.O.D. underneath the A46 viaduct over the ECML. This contrasts with Jacobs 2016 Report height of 13.460m A.O.D. If verified that this is actually the current rail height, not the sleeper height, then an additional reduction in the viaduct height of 0.360m is possible. This highlights the issue of reliable data needed for rail levels A.O.D. and soffit heights for both the current A46 viaduct span over the ECML and the A46 overline bridge East over the Nottingham to Lincoln railway.

Newark Flyover Report Calculations re-examined - H. Pack	Length	Gradient ratio	Gradient ‰
All measures to lower grade height included, plus ECML lower track height as per D.C.O. Elevation 3			
Southern Grade from A46 northwards to west end of ECML viaduct span			
Chainage measured from start of gradient and to bridge ends (adjusted to start at north end of existing A46 bridge)	760.076		
Grade height	6.979		
Primary uncompensated gradient		109	9.18
Curve radius R	950.000		
Initial compensated gradient on curves		103	9.73
Final straight track gradient		**105**	**9.50**
Final uncompensated track gradient on curves		112	8.93
Iterated compensated track gradient on curves		105	9.48
Final Equivalent Track Gradient		**105**	**9.48**
Northern Grade from east end of vertical curve on ECML viaduct span northwards towards A1 overline bridge			
Chainage measured from east end of vertical curve on ECML viaduct to end of down grade	1197.296		
Grade height	8.394		

Primary uncompensated gradient		143	7.01
Straight track length (no horizontal transitions shown because of curve radii of 3,000m)	933.921		
Initial straight track grade height	6.548		
Curved track length (no horizontal transitions shown because of curve radii of 3,000m)	262.875		
Initial curved track grade height	1.843		
Curve radius R	3000.000		
Initial compensated gradient on curves		139	7.19
Final straight track gradient		**142**	**7.05**
Final uncompensated track gradient on curves		145	6.88
Iterated compensated track gradient on curves		142	7.05
Final Equivalent Track Gradient		**142**	**7.05**

I note that the Applicant has stated in the Response to Relevant Representations that the feasibility designs for grade separation have been examined and agreed with the relevant parties. However there appears to be several unresolved issues with the work undertaken to date.

4) With all the reservations raised above about the relationship between the A46 widening scheme and the Nottingham to Lincoln Railway Grade Separation scheme, the lack of a consistent multimodal approach is detrimental to both schemes. I understand from the Atkins 2022 Report that an earlier Atkins 2021 Report considered such an approach, but that it failed because of D.C.O. consent issues and the lack of advancement of the railway scheme. However the Atkins 2022 report does state that if the earthworks could be done together then the 11m gap between the two alignments could be substantially reduced and overall costs reduced. Secondly the level of disruption to the A46 would also be substantially reduced.

   It is my contention that a more multimodal approach would involve:-

   - Constructing the earthworks for both projects together, under the D.C.O. process, excluding the earthworks involving the tie-ins to the existing Nottingham to Lincoln Railway;
   - Marginally raising the soffit height of the new Northbound carriageway of the A46 East Bridge and broadening the bridge span as necessary without a major alteration to the A46 profile;

   Thus: -

   - Reducing the cost to both projects and the public purse for the subsequent full construction of the Nottingham to Lincoln Railway Grade Separation scheme;

- Enabling a closer physical alignment of the the new grade separated railway and the new northbound carriageway of the A46;
- Substantially reducing the disruption to the A46 and the general public in the Newark area from the subsequent construction of a new grade separated railway; &
- Enabling the enhancement of the freight and passenger services of both the Nottingham to Lincoln and East Coast Main Line railways, bearing in mind that the cancellation of the HS2 project will put increased pressure on the capacity of the ECML.

Yours faithfully,

Howard Pack 12th November 2024

Registration Identification Number: 20049691

Dear Planning Inspectorate,

I am pleased to submit a Summary of the Written Representation to the A46 Bypass scheme.

1) I have a further comment to make on the Statement of Reasons or Case for the Scheme over my previous Relevant Representation submission on the 14th of July 2024, viz:
   I do not see an assessment of regional transport alternatives, where railway transport could contribute, such as flows between Lincoln, Nottingham, Leicester and Birmingham, nor whether the re-construction of the Newark By-pass would lead to an abstraction of ridership from the existing train services.

   The assertion by the Applicant of capacity limits on the Nottingham to Lincoln Railway due to the flat crossing with the East Coast Main Line and level crossing issues (presumably primarily, with the Great North Road at Newark Castle Station) should raise the question as to whether the removal of these constraints would allow more competitive train services, to ease the burden on the A46.

2) The Applicant refers to the Statement of Common Ground between National Highways and Network Rail [APP-7.29].
   In Part 2 (Accessibility and Integration) of the SoGC; “Items not agreed” include the Applicants position on “*Headroom and OCS [Overhead Contact System] proposals”*

   This issue of headroom is important for the railway scheme to provide a grade separation of the Nottingham to Lincoln railway and the ECML. To this end I have examined the relevant reports received under F.O.I. requests, thus:

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(Jacobs 2016 Report)
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A key issue from a transport perspective is to ensure that railway freight services are not disadvantaged by the imposition of steep gradients on the Nottingham to Lincoln railway.

The Nottingham to Lincoln railway generally has a ruling gradient of 1:302 (3.31‰) in the Down direction towards Lincoln and -1:285 (-3.51‰) in the Up direction towards Nottingham.

This permits some of the heaviest freight trains in the U.K. of 3,200 tonnes trailing load in the Nottingham direction and 2,400 tonnes trailing load in the Lincoln direction to operate.

The Jacobs 2016 Report acknowledges this need to reduce the gradients on any new flyover line:

“The vertical alignment has been developed to achieve a 1 in 100 curve compensated vertical grade rising from under the existing A46 to the proposed new structure at the ECML.”

The relative shortness of the western side ramp (circa 700 metres) and the difference in railway height of circa 7.5 metres gives an approximate gradient of 1:93 (10.75‰), however this has not been achieved in the Atkins 2022 Report.

The physical constraints are:-

a) Rail to soffit height of the A46 East bridge over the railway:

The Jacobs 2016 Report and the the D.C.O. documents give varying measurements for the rail to soffit height.

In effect the D.C.O. Elevation 1 drawing shows the soffit height at the new widened northern side of the bridge and the Jacobs 2016 Report shows the soffit height at the original southern side of the bridge. The difference in soffit

height might be explained by the co-planar arrangement of carriageways due to the super-elevation of the road.

The provision of a General Arrangement drawing of the complete bridge with the headroom and soffit heights at the existing side and the widened side shown would answer these concerns.

b) The height of the grade separated bridge over the East Coast Main Line:

The existing ECML rail height above A.O.D. is given as 13.1m in Elevation 3 in the D.C.O. documents, however the Profile drawing in the D.C.O. documents shows the height at chainage 3,850m as being 13.326m. This measurement needs to be confirmed; what is the actual rail height?

Gradient modelling:
I have modelled the railway gradients in Excel, the excel files are sent separately.

I was able to replicate the gradient profile of the Jacobs 2016 report from the information given. However the rail to soffit heights need to be understood at the A46 Eastern bridge, it is probable that the raised rail level under the bridge is unachievable. Viz:

Southern Grade from A46 northwards to west end of ECML viaduct span:
Final Equivalent Track Gradient: 1:100 (10.01‰).
Northern Grade from east end of vertical curve on ECML viaduct span northwards towards A1 overline bridge:
Final Equivalent Track Gradient: 1:142 (7.05‰).
NB Jacobs show the equivalent track gradient as the curve compensated gradient.

I was unable to fully replicate the gradient profile of the Atkins 2022 report from the information given. Viz:

Southern Grade from A46 northwards to west end of ECML viaduct span:
Final Equivalent Track Gradient: 1:84 (11.96‰).
(The Atkins 2022 report gave the gradient as 1:78 (12.82‰))

Northern Grade from east end of vertical curve on ECML viaduct span northwards towards A1 overline bridge:

Final Equivalent Track Gradient: 1:129 (7.78‰).

The Jacobs 2016 Report uses the “Dynamis” software to produce single train runs on the proposed 1:100 (10.00‰) curve compensated gradient.
Dynamis can model single train runs with great accuracy including the ability to stop, restart and accelerate with the whole train on the gradient, it also measures degraded conditions such as poor adhesion and restricted locomotive power.

It essentially measures the operability of individual trains. It is able too, to measure the energy consumption of trains over different options for the grades.

The sister RailSys v11 programme used in the Atkins 2022 Report has a range of functions incorporated from the Dynamis programme. RailSys is primarily designed for the production of wide area timetables.

Missing from the RailSys analysis in the Atkins 2022 Report is restarting with a freight train completely on the 1:78 (12.82‰) gradient.

It would be sensible to replicate the Dynamis runs in the Jacobs 2016 Report with the proposed infrastructure in the Atkins 2022 Report and any improved infrastructure that may be proposed. The runs would need to test both normal and degraded conditions and stopping and restarting on the gradient.

3) The gradients in the Atkins 2022 Report need further consideration. The proposed gradient of 1:78 (12.82‰) would be considered excessive for a freight train.

Consideration needs to be given to marginally raising the new Northbound carriageway soffit by circa 0.1m and redesigning the new railway’s vertical geometry to lengthen the grade.

With accurate information on the rail and soffit heights A.O.D. it should be possible to at least achieve a gradient of 1: 100 (9.96‰).

If the ECML rail height of 13.1m A.O.D. in the D.C.O. Elevation 3 is found to be accurate, then a further reduction in the Final Equivalent Track Gradient to 1:105 (9.49‰) is possible on the western grade.

These small alterations to the grade height could have a significant effect on the operability and acceptability (under the railway Network Change process) of the proposed changes to the Nottingham to Lincoln railway and on the energy consumption of trains traversing the proposed grade separated railway.

4) With all the reservations raised above about the relationship between the A46 widening scheme and the Nottingham to Lincoln Railway Grade Separation scheme, the lack of a consistent multimodal approach is detrimental to both schemes. I understand from the Atkins 2022 Report that an earlier Atkins 2021 Report considered such an approach, but that it failed because of D.C.O. consent issues and the lack of advancement of the railway scheme.

   It is my contention that a more multimodal approach would involve:-

   - Constructing the earthworks for both projects together, under the D.C.O. process, excluding the earthworks involving the tie-ins to the existing Nottingham to Lincoln Railway;
   - Marginally raising the soffit height of the new Northbound carriageway of the A46 East Bridge and broadening the bridge span as necessary without a major alteration to the A46 profile;

   Thus: -

   - Reducing the cost to both projects and the public purse for the subsequent full construction of the Nottingham to Lincoln Railway Grade Separation scheme;
   - Enabling a closer physical alignment of the the new grade separated railway and the new northbound carriageway of the A46;
   - Substantially reducing the disruption to the A46 and the general public in the Newark area from the subsequent construction of a new grade separated railway; &
   - Enabling the enhancement of the freight and passenger services of both the Nottingham to Lincoln and East Coast Main Line railways, bearing in mind that the cancellation of the HS2 project will put increased pressure on the capacity of the ECML.

Yours faithfully,

Howard Pack 12th November 2024