

Appendix B: Proposed Options Workshop Report

Armagh East Link

Proposed Options Workshop Report

1064968/0000/R/0001
Version 3.0

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1064968-A-D-0814	A	Alignment 13 (Sheets 1 to 4 of 4)
1064968-A-D-0815	A	Alignment 14 (Sheets 1 to 2 of 2)
1064968-A-D-0816	A	Alignments 15 & 16 (Sheets 1 to 2 of 2)
1064968-A-D-0817	A	Alignment 20 (Sheets 1 to 3 of 3)
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1064968-A-D-0820	A	Scheme Constraints

1 Introduction

A one day workshop was held on Friday 27th February 2015 at the Mouchel Offices in Holywood, Belfast. The main objective of the workshop was to review potential route options for the Armagh East Link. The workshop was attended by representatives of Transport NI (TNI), Southern Division, and their consultant's Mouchel.

The objectives of the workshop were:-

- To present scheme constraints data and the 11 emerging preliminary route options for discussion including the "2007 Preferred Option";
- To discuss the proposed options' benefits and dis-benefits;
- To establish which proposed options, if any, to take forward for further consideration.

This report summarises the workshop, the documents produced and its findings.

A list of staff in attendance is presented in Appendix A.

2 Scheme Background

The proposed Armagh East Link is intended to run to the east of the city centre, from the A28 Markethill Road in the south to the A3 Portadown Road in the north, incorporating a proposed junction with the A51 Hamiltonsbawn Road. The perceived project benefits include:-

- Improving traffic movement in and around the city;
- Relieving congestion on associated key routes to improve the environment of the historic city centre;
- Improving road safety;
- Facilitating future development in and around the city of Armagh; and,
- Improving the road network between the North and South of the Province.

In 2004 Roads Service (now Transport NI), commissioned Mouchel (formerly Mouchel Parkman) to investigate options for the proposed Armagh East Link. The commission was to take the scheme through Public Consultation to the announcement of the Preferred Route, followed by the development of the Preferred Route to a stage sufficient to enable Orders to be published, procurement of a contractor, administration of the contract and supervision of construction.

An integral feature of the Regional Development Strategy (RDS) was the requirement to develop a Regional Transportation Strategy having a vision of “a modern, integrated and sustainable transportation system which benefits society, the economy and the environment and which actively contributes to social inclusion and everyone’s quality of life”. In July 2002, the Assembly approved the strategic direction and underlying principles of the ‘Regional Transportation Strategy for Northern Ireland 2002-2012’ (RTS). The RTS identified strategic transportation investment priorities and considered potential funding sources over a 10 year period as well as setting down guidance as to how funding would be split between areas and transport modes.

Delivery of the RTS is being progressed through 3 multi modal transport plans, one of which is the Regional Strategic Transport Network - Transport Plan (RSTN TP).

The Regional Strategic Transport Network (RSTN) of Northern Ireland comprises the rail network, five Key Transport Corridors, four Link Corridors, the Belfast Metropolitan

Transport Plan and the remainder of the trunk road network. It comprises 5% of the total road network but carries 37% of the traffic. A number of priority schemes to improve the RSTN were ongoing and appraisal work (based on the Government's five key criteria of environment, safety, economy, accessibility and integration) was undertaken to identify further Strategic Roads Improvement (SRI) schemes for inclusion in the RSTN TP. The RSTN TP follows the funding levels envisaged in the RTS, although they were extrapolated to match the longer period of the RSTN TP (2005 – 2015).

The proposed Armagh East Link was included within the ten-year Plan, with a recommendation that it be constructed towards the end of this period.

Also included in the RSTN TP, to improve the road network around Armagh, was the Armagh North–West Link from the A3 round the north of the city to the A28 west of Armagh.

A joint Public Information Day to explain the principles behind the various options for the East Link and the North-West Link was held on Monday 13th March 2006, at the Armagh City Hotel. A further Public Exhibition Day for the Armagh East Link scheme was held on the 20th March 2007 to present the alignment and junction options for what, at that time, had been identified as the preferred route and update the public on scheme developments.

Due to the economic downturn progress on a number of schemes was slowed down as public expenditure decreased. The Armagh East Link was one of those schemes. In 2014 a decision was taken to update members of public on the status of the scheme and gain feedback from the public, elected members and other interested parties on changes since the last Information Day. Subsequent to this decision a Public Exhibition Day was held on the 11th June 2014 to seek current views on the 2007 Preferred Option. Exhibition boards displaying an "Introduction", the "Preferred Scheme Option", "Proposed Junction Layouts", "Environmental Assessment Information", "Land Issues Information" and "Statutory Procedures" were commissioned along with advertisement posters and information leaflets. An increased level in public concern in relation to integration, accessibility and safety from the time of publishing the Stage 1 Scheme Assessment Report was noted at the southern/A28 end of the scheme. Queries were also raised regarding the development of Edenaveys Industrial Estate between 2007 and 2014, and whether a tie in to the A28 in that vicinity would now be preferable.

In light of the information gathered from the event it was deemed prudent to reassess the viability of the 2007 Preferred Option and consider whether other options are now worthy of consideration given the changes in land use and, potentially, traffic flows and patterns of movement within the study area.

3 Background to Preliminary Route Options

A study area was chosen for the assessment process. It was considered that in light of the previous 2006 and 2007 assessments, and, feedback from the 2014 Public Exhibition Day, the *Central Corridor* from the 2007 assessments was the previous corridor closest to the town centre that should still be considered and this therefore formed the western boundary of the study area. The A28 and A3 formed the north and south limits of the study area and to the east a line was chosen that was deemed to be as far out as practicably possible from the urban limits that may still achieve the project benefits.

The study area is presented in a drawing which can be seen in Appendix B, together with the route options considered at the workshop.

The A28 and the A3 to the south and north of the study area, formed the limits of any proposed route options to the east of the city centre. The locations for possible tie-in points for route options on these two trunk roads formed a set of constraints that informed the development of route options between the A28 and A3. The potential tie-in points within the study area are listed below:-

A28 Tie-In Points

- At the Ardmore Road junction (A28).
- Approximately 130m north of Edenavey's Industrial Estate Junction (A28).
- At the Edenavey's Industrial Estate Junction (A28).
- Approximately opposite No. 57 Markethill Road (A28).
- To the east No. 62 Markethill Road (A28).

A3 Tie-In Points

- In the vicinity of Linsey's Heights Junction (A3).
- At the Drumman Heights and Drummanmore Road Roundabout (A3).
- At the junction of the North-West Link Scheme tie-in point to the A3.
- Approximately 130m to the west of Tirnascope Road's junction with the A3.

The starting point for discussions at the workshop were 10 preliminary options developed during previous preliminary assessments prior to the workshop. Using the *Design Manual for Roads and Bridges* (DMRB), specifically TD 9/93, *Highway Link Design*, these route options were developed and refined for the purpose of discussion at the workshop. These route options were developed initially with regard to topographical constraints and other major constraints collated on a Scheme Constraints map that was presented at the workshop, a copy of which is provided in Appendix D. The route options were reviewed at the workshop under a number of headings and key factors and considerations recorded in a document for ease of comparison. The final document, entitled *Proposed Options Comparison Spreadsheet* is presented in Appendix C. A summary of each of the route options and the associated assessment of options is presented in the next section of this report.

4 Summary of Route Options & Assessment of Options

4.1 Assessment Criteria

For consistency, the proposed options had the following criteria as standard to facilitate assessment and comparison on equivalent terms:-

- All junction types at this stage were considered as roundabouts and will be further assessed / designed at a later stage in the project;
- Proposed Carriageway width in all options is 7.3m;
- Proposed options in an urban setting were considered to have a footway design of 1.3m in width and a cycleway design of 1.75m in width;
- Proposed options in an urban setting were considered to have street lighting along the entire length of the proposed route;
- Proposed options in a rural setting were considered to have a combined footway and cycleway of 3.5m in width on the city side of the proposed route only; and,
- Proposed options in a rural setting were considered to have street lighting at junctions only.

4.2 Constraints Discussion

The constraints within the scheme study area were presented and the impact of the proposed route options discussed prior to discussion of each option. The constraints discussed included, but were not limited to the following:-

- Potential archaeological constraints;
- Flooding constraints;
- Residential dwellings;
- Poor ground;
- High ground; and,
- Areas of woodland.

A plan identifying the major constraints identified is provided in Appendix D.

4.3 Description of Route Options

The route options considered at the workshop are shown on Drawing No. 1064968-A-D-0810 (Version A), which is provided in Appendix B. The route options are described briefly below, moving from the western options across to the more easterly options. Plan & Long Section drawings for each of the route alignments that formed the route options are presented in Appendix E.

2007 Preferred Option

The 2007 preferred option is 2.23km in length and is situated in an urban environment: it is the shortest route option and the closest to the city centre. It utilises Ardmore Road at its southern end, where it ties into the A28. Heading north it runs to the rear of Bannvale Villas and continues north towards the A3, approaching the A3 to the west of Linsey's Heights.

Option 15

Option 15 ties into the A28 approximately 130m to the north-east of the junction with Edenaveys Industrial Estate. The route heads north and passes to the east of the Ardmore area before turning westwards to align with the 2007 Preferred Route in the vicinity of Hamiltonsbawn Road, and continues on the 2007 Preferred Route thereafter. Option 15 is 2.78km in length.

Option 16

Option 16 is a variation on Option 15 and is 2.78km in length. It ties into the A28 at the same tie-in as Option 15 and again passes to the east of the Ardmore area. However, it has a tighter horizontal geometry than Option 15 to facilitate its tie-in and alignment thereafter to the 2007 Preferred Route close to Bannvale Villas.

Option 12

Option 12 is 2.96km in length and is largely situated in a rural environment. Option 12 utilises the Edenaveys Industrial Estate junction at its southern end before heading north across country to pass to the east of Linsey's Heights and tie-into the A3 at the location of the existing Drumman Heights Roundabout.

Option 50

Option 50 is 3.42km in length and utilises the Edenaveys Industrial Estate junction at its southern end before heading north on a more easterly alignment than Option 12,

before tying into the A3 in the vicinity of the proposed tie-in point for the North-West Link to the A3.

Option 40

Option 40 utilises the Edenaveys Industrial Estate junction at its southern end before heading north on the same alignment as Option 50 up to Hamiltonsbawn Road, before taking a more westerly alignment across country to tie into the A3 at the location of the existing Drumman Heights Roundabout. Option 40 is 3.16km in length.

Option 20

Option 20 is 3.23km in length and is situated in a largely rural environment. Option 20 utilises the Edenaveys Industrial Estate junction at its southern end before heading north. It takes a more easterly alignment than Option 50 and Option 40 until beyond Hamiltonsbawn Road before swinging west to utilise the same alignment as Option 40 to tie in at the Drumman Heights Roundabout.

Option 10

Option 10 is located towards the eastern limit of the study area, is 3.66km in length, and is situated in a rural environment. It 10 takes an approximately northern route across country from a point on the A28 approximately opposite No. 57 Markethill Road to a point on the A3 to the west of Tirnascope Road's junction with the A3.

Option 11

Option 11 is similar to Option 10 from the A28 heading north as far as Hamiltonsbawn Road before taking a more easterly approach to tie into the same point on the A28. Option 11 is 3.76km in length.

Option 13

Option 13 is 4.52km in length and is situated in a rural environment. Option 13 has the most easterly tie-in point on the A28, to the east of the junction of Derryrairie Road with the A28, to the east of No. 62 Markethill Road. It crosses Hamiltonsbawn Road close to its junction with Drumbeemore Road, before turning slightly west and crossing Tirnascope Road in the vicinity of No. 11 Tirnascope Road. It continues thereafter towards the proposed tie-in point between the North-West Link and the A3.

Option 14

Option 14 is a variation on Option 13 that utilises a slightly more direct route between the same two tie-in points on the A28 and A3 respectively. It crosses Hamiltonsbawn

Road further west than Option 13, crossing to the west of Hamiltonsbawn Road's junction with the eastern end of Stockingmans Hill Road. This option includes connector roads to connect Hamiltonsbawn Road to the proposed route option. Option 14 is 4.44km in length.

4.4 Summary of Option Assessment

The findings of the route assessment are collated in the document entitled *Proposed Options Comparison Spreadsheet*, presented in Appendix C of this report. Each of the ten route options were assessed and commented upon under the following headings:-

- i) General Summary – a short commentary describing the initial design approach to the route option under consideration.
- ii) Horizontal Alignment.
- iii) Vertical Alignment.
- iv) Junction Issues.
- v) Side Road Issues.
- vi) Overtaking Issues.
- vii) Earthwork Issues.
- viii) Drainage Issues.
- ix) Property Issues.
- x) Client Workshop Feedback – a short commentary outlining any key findings with regard to the viability of the respective route options.

4.4.1 Comparison of Route Options Against Workshop Criteria

A Red/Amber/Green assessment was undertaken against criteria ii) to x) above to highlight key issues and concerns. Key findings from the workshop assessments and discussions under the above headings included:-

- a) Horizontal Alignment: no significant issues were identified, although Options 20 and 50 incorporate slightly more onerous design parameters or require further design input to refine further.

- b) Vertical Alignment: no significant design issues were identified; Option 50 was rated Amber due in part to the combination of vertical design with horizontal design parameters.
- c) Junction Issues: no fundamental issues were identified, however Options 40 and 50 were rated Amber due to the inclusion of roundabouts at the southern end of their alignments where the options meet the A28; Option 14 was rated Amber due to the complexities and impact associated with connecting that route option to Hamiltonsbawn Road.
- d) Side Road Issues: no fundamental issues were identified; Option 50 was rated Amber as it proposes stopping up Killuney Road either side of the route option close to the route option's northern end.
- e) Overtaking Issues: the 2007 Preferred Option and Options 15 and 16 do not provide overtaking sections, however, this is consistent with their lower design speeds and more urban settings; overtaking sections could be provided on the other route options.
- f) Earthwork Issues: Option 11 was rated Red as it was estimated to have an unsuitable earthworks balance that would lead to a significant volume of surplus material; Option 14 was rated Red as it was reported to have an even more onerous deficit in material – some scope existed to reduce this deficit but it was considered that that could lead to some further adverse impacts.
- g) Drainage Issues: no fundamental issues were identified, albeit the 2007 Preferred Option and Options 15 and 16 were rated Amber as the impact of their drainage requirements on the existing A28, A51 and/or A3 drainage systems would require further investigation.
- h) Property Issues: Options 13 and 20 were rated Red due to property issues; the 2007 Preferred Option, Options 10, 14, 15, 16, were rated Green; the other options were rated Amber.
- i) Client Workshop Feedback: Options 11, 14 and 20 were rated as Red, due to the combination of issues in each respective option, and, their lesser design characteristics and/or increased impacts compared to other similar options as discussed further below.

4.4.2 Comparison of Similar Route Options to Each Other

The route options could be loosely considered to fall into three categories:-

- i) The *inner options*– Options 15, 16 and the 2007 Preferred Route being closer to the city centre than the other route options.
- ii) The *central options* – Options 12, 20, 40 and 50, tying into the A28 in the vicinity of Edenaveys Industrial Estate and the A3 at either the Drumman Heights Roundabout, or the North-West Link tie-in to the A3.
- iii) The *outer options* – Options 10, 11, 13 and 14, generally tying in further to the east on both the A28 and A3 and being the longest options.

Comparison of the route options in each category identified the following conclusions:-

- Option 11 was discounted in favour of Option 10 due to the less onerous earthworks and gradients associated with Option 10 and lesser severance and impacts on existing farm settlements.
- Option 14 was discounted in favour of Option 13 due to the less onerous earthworks with Option 13 and the requirement to bridge Option 14 over Hamiltonsbawn Road: the resulting link roads connecting Option 14 to Hamiltonsbawn Road would also add to Option 14's impacts.
- Option 12 was favoured over Option 20 due to more onerous property impacts associated with Option 20, and, private accesses that would need to be connected onto Option 20 would be on an overtaking section of carriageway. Options 40 and 50 were also considered to be more favourable than Option 20.
- Option 15 was discarded in favour of Option 16 due to more onerous earthwork impacts and the greater impact on residential dwellings.

5 Conclusions & Recommendations

5.1 Conclusions

It was recognised at the workshop that several elements of information remain outstanding, for example, outline scheme costs, traffic modelling, and an economic assessment. It was also considered that, on the basis of the previous traffic assessments, traffic transference to the new link would generally be in proportion with the distance from the centre of Armagh, i.e. a more “inner urban” link is considered to provide greater traffic relief than a more remote rural link due to the greater volume of traffic that may be attracted to a route option closer to the city centre. However, the proposed Armagh North-West Link Road could also have a considerable effect on the transference of traffic and this too could create a significant impact on the traffic and economic results for the Armagh East Link. Given the foregoing, it was considered at the time of the workshop that some of the *inner* or *central* route options are likely to prove more favourable than the *outer* options considered at the workshop, although this could not be confirmed until cost estimates, and traffic modelling and associated economic assessments for the route options, have been undertaken and analysed (with and without Armagh North-West Link in place).

It was concluded that four route options should be taken forward for further consideration and reported upon within the pending Route Assessment Report, specifically:-

- **2007 Preferred Option:** This option was previously identified as the preferred option following a more detailed assessment than that which has more recently been undertaken and therefore remains a candidate for assessment; no new information has been received that would omit this option from further consideration at this time.
- **Option 16:** This option offers a viable *inner option* alternative to the 2007 Preferred Option and was one of those developed as a response to comments received at the last Public Information Day held in June 2014; the option has the potential to be amended to tie in to the A28 via the A28’s junction with the Edenaveys Industrial Estate.
- **Option 50:** This option offers a viable *central option* that ties in to the A3 at the proposed tie-in point for the North-West Link to the A3; the traffic and

economic implications of such an option should be considered further, given that an engineering option is potentially viable.

- **Option 12:** This option offers another *central option*, is a viable engineering option and, without prejudice to its own assessment, would be a useful comparator in any assessment of the other three options, located as it is between the 2007 Preferred Option and Option 16, and, Option 50.

5.2 Recommendations

The following recommendations for current or future action were identified:-

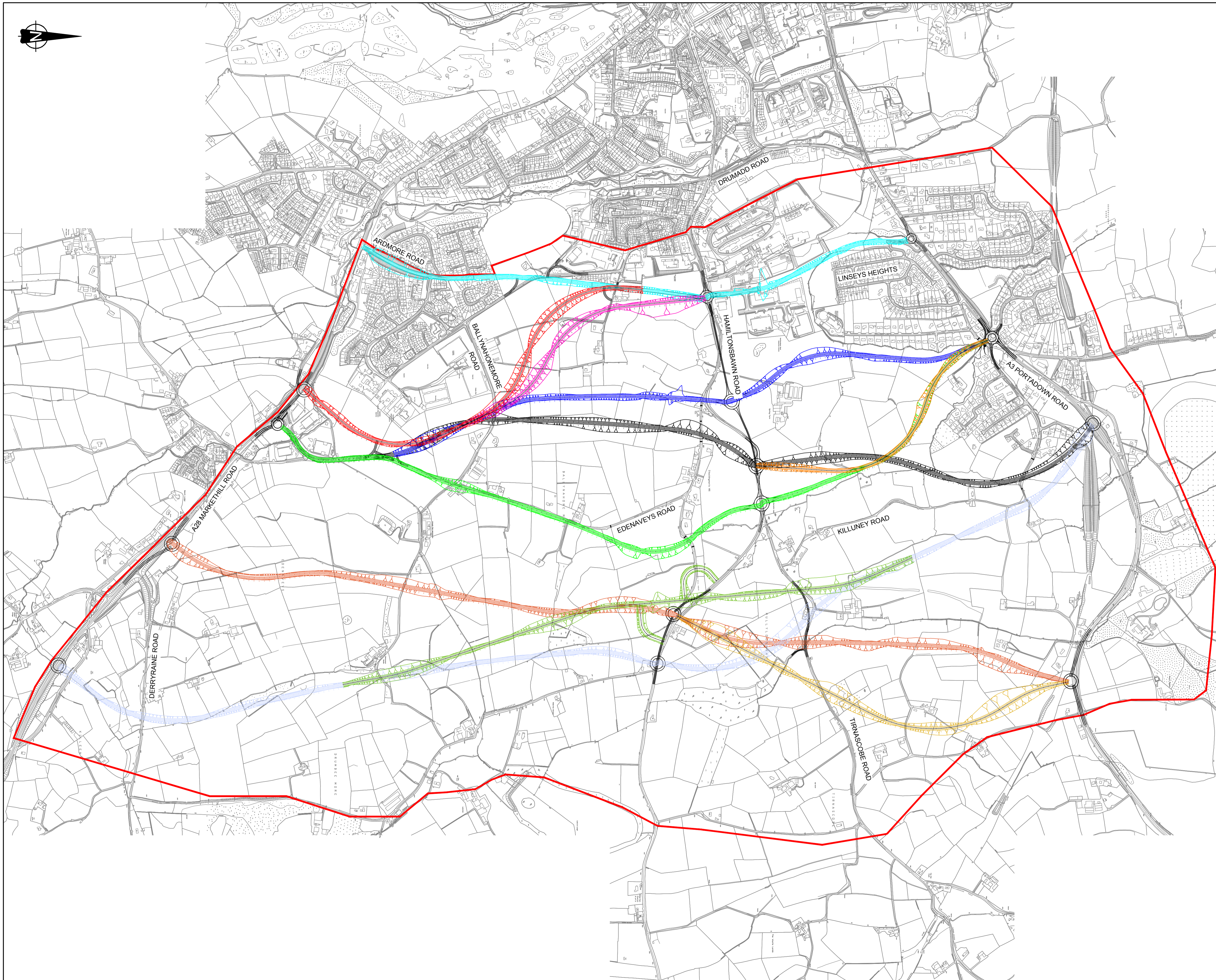
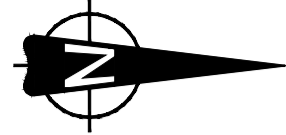
- i) Traffic data to be finalised to give definitive feedback on ruling in/out of options;
- ii) Benefit to Cost Ratios (BCRs) to be developed for the 4 remaining options;
- iii) Cost estimates to be further developed and reported upon within the pending Route Assessment Report;
- iv) Undertake further assessment of the potential realignment of the A51 Hamiltonsbawn Road associated with Option 12 and Option 50;
- v) Undertake further investigations into the reconfiguration of the roundabout at Drumman Heights and Drummanmore Road Roundabout on the A3 to cater for a fifth arm to accommodate a route option as per Option 12: and,
- vi) Option 50 should be investigated further to consider the potential inclusion of a compact grade separated junction to tie into the existing A51 Hamiltonsbawn Road.

Appendix A: Staff in Attendance

Table A1 – Staff in Attendance

TransportNI	Mouchel
Eoghan Daly	Jonathan Bradley
Clare McGeown	Virginia Kangley
Brian McClelland	Aless Tsitsimpis
	Alan Peacock
	Ryan Wade

Appendix B: Scheme Study Area & Preliminary Route Options




- Legend**
- 2007 Preferred Option
 - Option 10
 - Option 11
 - Option 12
 - Option 13
 - Option 14
 - Option 15
 - Option 16
 - Option 20
 - Option 40
 - Option 50
 - Study Area

Ver	Amendment		By	Checked	Approved	Date
Drawn	Date	Checked	Date	Approved	Date	
RPW	19/02/15	VK	17/04/15	JTB	17/04/15	

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Client **transportni**

Project **Armagh East Link**

Purpose **Workshop**

Title **Armagh East Link Proposed Options**

Scale @ A1	Not to Scale	Ver.
Drawing No.	1064968-A-D-0810	A

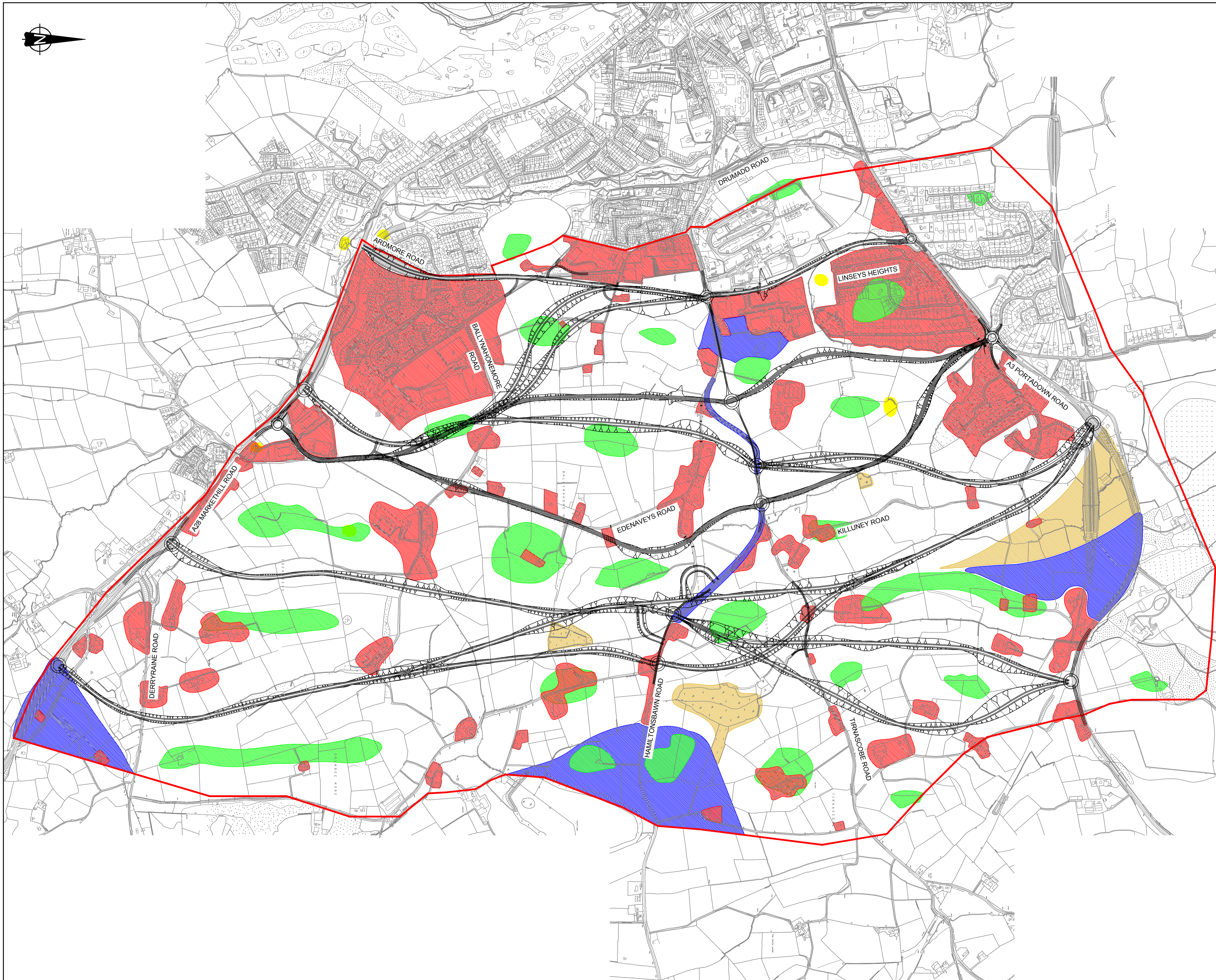
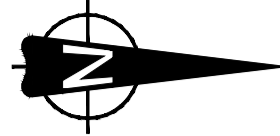
Appendix C: Proposed Options Comparison Spreadsheet

Proposed Options Comparison Spreadsheet

	Alignment 10	Alignment 20	Alignment 40	Alignment 50	Alignment 11	Alignment 12	Alignment 13	Alignment 14	Alignment 15	Alignment 16	2007 Preferred Option (AP)
General / Summary	Length = 3660m. Construction Length = 3660m. Re-modelled alignment 1 - using a 100A design speed as this route is considered rural.	Length = 3230m. Construction Length = 2580m. Despite the generally rural nature, it is thought that the existing 40mph speed limit at the northern tie-in, the envisaged speed limit alteration to 40mph at the southern tie-in, the envisaged future expansion of Ednavays Industrial Estate (Ch0-750m) and intermittent properties along the road it is considered that a 40mph design speed and limit would be appropriate.	Length = 3160m. Construction Length = 2710m. This route is similar to that of Alignment 5 from the southern tie-in to the A51. North of the A51 the route heads north westerly to join with the A3 at an enlarged RBT at Killurney Bridge similar to Alignment 20. It is considered that the design speed for such a route should be 40mph with a 30mph limit for the industrial estate area. (The proposed Ednavays Road Junction provides such a location). At present the A28 to A51 has a 60mph design speed so there is scope for a lesser design provision.	Length = 3420m. Construction Length = 2970m. Given the rural nature of this corridor and the direct link to the A3 and Armagh Northern Link (both 60mph), it is thought that this section of road should generally be designed to 60mph design speed with a 30mph limit for the industrial estate area. (The proposed Ednavays Road junction provides such a location).	Length = 3760m. Construction Length = 3760m. This route is similar to that of Alignment 10 from the southern tie-in to the A51. North of the A51 the route heads north westerly to join with the A3 at a new RBT similar to Alignment 10. It is considered that the design speed for such a route should be 60mph (100A) due to its rural location and existing speed limits at the proposed junctions.	Length = 2960m. Construction Length = 2510m. This route is similar to that of Alignment 5 from the southern tie-in to the A51. North of the A51 the route heads north westerly to join with the A3 at an enlarged RBT at Killurney Bridge similar to Alignment 20. It is considered that the design speed for such a route should be 40mph with a 30mph limit for the industrial estate area. (The proposed Ednavays Road Junction provides such a location).	Length = 4515m. Construction Length = 4515m. Given the rural nature of this corridor and the direct link to the A3 and Armagh Northern Link (both 60mph), it is thought that this section of road should be designed to 60mph design speed throughout.	Length = 4440m. Construction Length = 4440m. Given the rural nature of this corridor and the direct link to the A3 and Armagh Northern Link (both 60mph), it is thought that this section of road should be designed to 60mph design speed throughout. The alignment offers an alternative to Alignment 13 to avoid the demolition of 2 properties. The alignment does not lend itself to a RBT connection on the A51, therefore a CGSJ is proposed as an alternative - (traffic permitting).	Length = 2780m. Construction Length = 2780m. The proposal is intended to form an alternative to the "Preferred" alignment by bypassing the existing housing estate at the southern end. It is envisaged that this road would have street lighting north of the A51 and would be an "urban distributor" in nature where a 30mph speed restriction would be satisfactory. South of the A51 a 40mph speed limit is thought to be more appropriate as the road is more rural in nature. Arguably provides the worst connection to the Proposed Armagh Northern Link. This alignment will not be considered further in favour of Alignment 16 which performs better in terms of severance, earthworks and landtake.	Length = 2780m. Construction Length = 2780m. The proposal is intended to form an alternative to the "Preferred" alignment by bypassing the existing housing estate at the southern end. It is envisaged that this road would have street lighting north of the A51 and would be an "urban distributor" in nature where a 30mph speed restriction would be satisfactory. South of the A51 a 40mph speed limit is thought to be more appropriate as the road is more rural in nature, with an extension of the 40mph gateway to the proposed RBT on the A28. Arguably provides the worst connection to the Proposed Armagh Northern Link.	Length = 2230m. Construction Length = 1550m. It is envisaged that this road would have street lighting throughout and would be an "urban distributor" in nature where a 30mph speed restriction would be satisfactory. This speed limit is also sympathetic with the existing speed strategy for the side road network. Arguably provides the worst connection to the Proposed Armagh Northern Link.
Horiz Align Comments	Generally 1 step reduction to 510mR throughout. 1 step SSD used where applicable but no departures on approaches to junctions.	3 & 2 Step Horiz - (existing curves in newly constructed industrial estate) - although 120m SSD is available. Proposed section - 1 step reduction to 255mR to avoid property on Stockingmans Road.	2 Step horiz at 30mph - (127mR existing curves in newly constructed industrial estate) - although 120m SSD is available.	2 Step horiz at 30mph - (127mR existing curves in newly constructed industrial estate) - although 120m SSD is available. 2 step horiz relaxation Ch550m. Combination Dep - 2 step horiz / crest / SSD Ch 800m to generate level section for overtaking at Ch910m onwards. This also provides a definitive end of overtaking section and a staged reduction in design provision for the proposed 30mph near the industrial estate. Combination Dep - 1 step horiz / 2 crest / 2 SSD Ch 1650m to generate level section for overtaking at Ch1600m backwards. This also provides a definitive end of overtaking section and a staged reduction in design provision on the approach to the proposed RBT although no reduction SSD is proposed on approach. 1 step Horiz & SSD circa Ch2800-3100m but not on approach to A3 junction.	2-Step horiz at proposed A3 RBT in order to achieve suitable approach angle. Otherwise 1-Step throughout.	2 Step horiz at 30mph - (127mR existing curves in newly constructed industrial estate) - although 120m SSD is available.	Generally 1 step reduction to 510mR throughout. 1 step SSD used where applicable but no departures on approaches to junctions.	Generally Des Min or 1 step reduction to 510mR throughout. 1 step SSD used where applicable but no departures on approaches to junctions.		A 2-step relaxation on approach to A3 RBT. No other reduction in horiz curvature.	A 2-step relaxation on approach to A3 RBT. No other reduction in horiz curvature. 1 Band C curve - (existing section Ch0-450m). The alignment makes best use of Southern Regional College Road and Linsey's Heights roads.
Vert Align Reductions	No relaxations or departures in gradient. Combination 1 step departures in crest and SSD where applicable in accordance with Para 7:30.	No relaxations or departures in gradient. 2 number 1-step combination departures in crest and SSD to signify the end of overtaking sections in accordance with Para 7:19.	At present the southern section has a 60mph design speed and compliant other than relaxations in gradient to 7.5% max at Ch 650m & Ch1780m. Northern section is fully compliant at 40mph.	Also see Horiz Align Reductions for combinations. Relaxations in gradient to 7.5% max at Ch 650m & Ch1780m.	No relaxations or departures in gradient. Combination 1 step departures in crest and SSD where applicable in accordance with Para 7:30.	Relaxations in gradient to 7.5% max at Ch 650m, Ch1650m & Ch 2300.	No relaxations or departures in gradient. Combination 1 step departures in crest and SSD where applicable in accordance with Para 7:30.	No relaxations or departures in gradient. Combination 1 step departures in crest and SSD where applicable in accordance with Para 7:30.		The alignment is at grade for Bannvale Villas, Orangefield Drive, A51, Southern Regional College and Linsey's Heights to cater for junctions. No departures or relaxations and the layout would conform to a 40mph design speed if required. Further work is required in terms of safety for junctions provision / visibility / dubious overtaking etc.	The alignment is at grade for Bannvale Villas, Orangefield Drive, A51, Southern Regional College and Linsey's Heights to cater for junctions. No departures or relaxations and the layout would conform to a 40mph design speed if required. Further work is required in terms of safety for junctions provision / visibility / dubious overtaking etc.
Junction Issues	Consistent junction strategy of RBT's only. RBT possible at A28, although relatively close to Derraine Road. Acceptable approach to the A51 for RBT connection. Acceptable approach to the A3 for RBT connection.	Consistent junction strategy of RBT's only. RBT possible at A28, although approach is substandard. Acceptable approach to the A51 for RBT connection. Acceptable approach to the A3 for RBT connection.	Consistent junction strategy of RBT's only. RBT possible at A28, although approach is substandard. Acceptable approach to the A51 for RBT connection, although the A51 EB approach is not ideal. Acceptable approach to the A3 for RBT connection.	Consistent junction strategy of RBT's only. RBT possible at A28, although approach is substandard. Acceptable approach to the A51 for RBT connection, although the A51 EB approach is not ideal. Alignment allows for a direct connection to the A3 and Armagh Northern Link Road.	Consistent junction strategy of RBT's only. Acceptable approach to the A51 for RBT connection. Acceptable approach to the A3 for RBT connection.	Consistent junction strategy of RBT's only. RBT possible at A28, although approach is substandard. Alignment offers an improved layout for the proposed A51 RBT. Acceptable approach to the A3 for RBT connection.	Consistent junction strategy of RBT's only. RBT possible at A28 at start of existing 2+1 section. Alignment offers an acceptable approach to the proposed A51 RBT. Acceptable approach to the A3 for RBT connection inc. Armagh Northern Link.	Inconsistent junction strategy of CGSJ and RBT's. RBT possible at A28 at start of existing 2+1 section. Alignment does not offer an acceptable approach to the A51 for a proposed RBT junction. Acceptable approach to the A3 for RBT connection inc. Armagh Northern Link.		The alignment does favour an RBT junction on A28. The alignment does favour an RBT junction on A51. The alignment does benefit from a more eastern approach to the A3 to better facilitate a RBT and a RBT would be consistent with others on the A3.	The alignment does favour an RBT junction on A51. The alignment does benefit from a more eastern approach to the A3 to better facilitate a RBT and a RBT would be consistent with others on the A3.
Side Road Issues	Alignment crosses Ballynahonemore Road on overbridge. Connectivity to A51 via RBT. Stockingmans Road to be stopped up adjacent to alignment. Tirnascobe Road requires minor realignment. Is approximately 1.2km from proposed Armagh Northern Link connection.	Alignment crosses Ballynahonemore Road on overbridge. Connectivity to A51 via RBT. Stockingmans Road to be stopped up adjacent to alignment. Is approximately 450m from proposed Armagh Northern Link connection.	Alignment crosses Ballynahonemore Road on overbridge. Connectivity to A51 via RBT. Stockingmans Road to be stopped up adjacent to alignment. Is approximately 450m from proposed Armagh Northern Link connection.	The alignment bridges Ballynahonemore Road. The route does create a better solution in terms of a roundabout on the A51 although the A51 EB approach is not ideal. The alignment is more sympathetic to Killurney Road. It is proposed that this be stopped up after Killurney Park Road with properties to the east accessing via Tirnascobe Road	Alignment crosses Ballynahonemore Road on overbridge. Connectivity to A51 via RBT. Stockingmans Road to be stopped up adjacent to alignment. Tirnascobe Road to be stopped up adjacent to alignment. Is approximately 1.2km from proposed Armagh Northern Link connection.	Alignment crosses Ballynahonemore Road on overbridge. Connectivity to A51 via RBT. Stockingmans Road to be stopped up adjacent to alignment. Is approximately 450m from proposed Armagh Northern Link connection.	Derraine Road to be stopped up adjacent to alignment. Alignment crosses Ballynahonemore Road on overbridge. Connectivity to A51 via RBT. Alignment crosses Tirnascobe Road via underbridge. Provides a direct connection to the Armagh Northern Link Road	Derraine Road to be stopped up adjacent to alignment. Alignment crosses Ballynahonemore Road on overbridge. Connectivity to A51 via overbridge and CGSJ. Alignment crosses Tirnascobe Road via overbridge. Provides a direct connection to the Armagh Northern Link Road		The alignment does benefit from being at grade for the Bannvale Villas, Orangefield Drive, A51, Southern Regional College and Linsey's Heights to cater for junctions. Alignment crosses Ballynahonemore Road on overbridge. Is approximately 1.0km from proposed Armagh Northern Link connection.	The alignment does benefit from being at grade for the Bannvale Villas, Orangefield Drive, A51, Southern Regional College and Linsey's Heights to cater for junctions. Is approximately 1.0km from proposed Armagh Northern Link connection.
Overtaking Issues	Approximately 34% in both directions, in two easily recognisable sections. The alignment could therefore fall under category 1 or 2. - (7.3m with or without hardstrips).	Approximately 17% in both directions, in one easily recognisable section. The alignment could therefore only fall under category 1. - (7.3m without hardstrips).	Approximately 18% in both directions, in one easily recognisable section. The alignment could therefore only fall under category 1. - (7.3m without hardstrips).	Approximately 16% in both directions, in one easily recognisable section. The alignment could therefore only fall under category 1. - (7.3m without hardstrips).	Approximately 18% in both directions, in one easily recognisable section. The alignment could therefore only fall under category 1. - (7.3m without hardstrips).	Approximately 17% in both directions, in one easily recognisable section. The alignment could therefore only fall under category 1. - (7.3m without hardstrips).	Approximately 38% in both directions, in three easily recognisable sections. The alignment could therefore fall under category 1 or 2. - (7.3m with with or without hardstrips).	Approximately 37% in both directions, in three easily recognisable sections. The alignment could therefore fall under category 1 or 2. - (7.3m with with or without hardstrips).		The design does not provide an overtaking opportunity.	The design does not provide an overtaking opportunity.

	Alignment 10	Alignment 20	Alignment 40	Alignment 50	Alignment 11	Alignment 12	Alignment 13	Alignment 14	Alignment 15	Alignment 16	2007 Preferred Option (AP)
Earthwork Issues	Cut = 261K, Fill = 177K. - Ch750m onwards. Assuming a 30% unsuitable value due to drumlin landscape would generate a 6K surplus.	Cut = 61K, Fill = 45K. - Ch650m onwards. Assuming a 30% unsuitable value due to drumlin landscape would require a 2K import.	Totals Cut = 169K, Fill = 87K. - Ch450m onwards. Cut S=147K + N=22K, Fill S=61K + N=26K. Assuming a 30% unsuitable value due to drumlin landscape would generate a 31K surplus.	Cut = 221K, Fill = 134K. - Ch450m onwards. Assuming a 30% unsuitable value due to drumlin landscape would generate a 21K surplus.	Totals Cut = 169K, Fill = 87K. - Ch450m onwards. Cut S=110K + N=332K, Fill S=100K + N=43K. Assuming a 30% unsuitable value due to drumlin landscape would generate a 166K surplus. Northern section offers extremely poor earthworks balance.	Cut = 100K, Fill = 76K. - Ch450m onwards. Assuming a 30% unsuitable value due to drumlin landscape would generate a 6K surplus.	Cut = 199K, Fill = 125K. Assuming a 30% unsuitable value due to drumlin landscape would generate a 14K surplus.	Totals Cut = 99K, Fill = 332K. Cut S=14K + C=23K + N=62K, Fill S=34K + C=297K + N=1K. Assuming a 30% unsuitable value due to drumlin landscape would generate a 262K shortfall. There is a little scope for improving this figure by circa 100k by lowering sections of Alignment 13 to the north and south of Alignment 14, however, a balance would probably require impacting on Ballynahonemore Road and Tirnascoke Road.		Totals Cut = 128K, Fill = 92K. Cut S= 84K + N=44K, Fill S= 80K + N=12K. Assuming a 30% unsuitable value due to drumlin landscape would generate a 2K shortfall.	Cut = 56K, Fill = 13K. - Ch470m onwards. Assuming a 30% unsuitable value due to drumlin landscape would generate a 26K surplus.
Drainage Issues	Alignment generally runs parallel with existing watercourses. Outfalls available at low points at:- Ch 0m - Existing highway drainage Ch 1180m - Watercourse at Ballynahonemore Road (Ch980m). Ch 2060m - Existing highway drainage Ch 3660m - Existing highway drainage and/or adjacent watercourse	Trapped sags removed. Outfalls available at low points at:- Ch 280m - Existing road outfall into adjacent watercourse Ch 3180m - Killurney Bridge outfall.	Outfalls required at Ch 320m and Ch 3160m (Killurney Bridge) as absolute minimum number of outfalls.	Trapped sag removed. Outfalls required at Ch 320m and Ch 3420m as absolute minimum number of outfalls.	Alignment generally runs parallel with existing watercourses. Outfalls available at low points at:- Ch 0m - Existing highway drainage Ch 1180m - Watercourse at Ballynahonemore Road (Ch980m). Ch 2060m - Existing highway drainage Ch 3660m - Existing highway drainage and/or adjacent watercourse	Outfalls required at Ch320m, Ch1950m & Ch3000m (Killurney Bridge) as absolute minimum number of outfalls.	Outfalls required at Ch200m, Ch1730m & Ch45150m as absolute minimum number of outfalls. Minor watercourse diversion Ch 0-200m	Outfalls required at Ch540m as well as the relevant outfalls and impacts for Alignment 13.		Drainage will generally fall towards the A28, A51 and A3.	Drainage will generally fall towards the A28, A51 and A3.
Property Issues	No direct impact on buildings although accesses arrangements will require alteration.	2 properties require demolition. 3 gardens affected at Killurney Bridge tie-in.	3 gardens affected at Killurney Bridge tie-in.	The garden of 2 properties (3230m & 3320m), are affected although this could be lessened with retaining walls or made worse once the final location of the proposed Armagh Northern Link Road is determined.	Accommodation structure may be required Ch3200m	3 gardens affected at Killurney Bridge tie-in.	2 properties require demolition due to RBT solution at A51.	No direct impact on buildings although accesses arrangements will require alteration.		Generally good, as the route utilises land already in the ownership of TNI. Impact on garden of property on Orangefield Drive. Impact on garden of property on A3. Difficulties in accessing existing properties on northern side of A3.	Generally good, as the route utilises land already in the ownership of TNI. Impact on garden of property on Orangefield Drive. Impact on garden of property on A3. Difficulties in accessing existing properties on northern side of A3.
Client Workshop 27/02/2015 Feedback	60mph design speed agreed. Alignment is valid subject to traffic and BCR study.	Alignment 12 favoured over Alignment 20 due to property accesses in overtaking opportunity and property impacts and reasons above.	40mph design speed agreed. With 30mph in industrial estate area. Alignment is valid subject to traffic and BCR study.	60mph design speed agreed. With 30mph in industrial estate area. Alignment is valid subject to traffic and BCR study. Agreed to realign A51 for better RBT arrangement and and improve northern tie-in connection to North-West Link proposals.	Alignment 10 favoured over Alignment 11 due to earthworks volumes / steeper existing gradients and severance / impacts on existing farm settlements.	40mph design speed agreed. With 30mph in industrial estate area. Alignment is valid subject to traffic and BCR study. Agreed to develop A3 RBT further to increase certainty of impacts on residential properties.	60mph design speed agreed. Alignment is valid subject to traffic and BCR study. Agreed to develop A3 RBT further to provide better tie-in with North-West Link proposals.	Alignment 13 favoured over Alignment 14 due to earthworks volumes /costs, in addition to inconsistent junction provision and safety concerns at a CGSJ on a single carriageway road.	Alignment 16 favoured over Alignment 15 due to reasons above.	40mph design speed agreed as 360mR is required for the route. 30mph limit agreed in industrial estate area. Agreed that plated speed is T.B.C. and appropriate departures sought. Alignment is valid subject to traffic and BCR study. Agreed to develop A3 RBT further to increase certainty of impacts on residential properties and to be adjusted to pass through industrial estate area.	30mph design speed agreed throughout. Agreed to develop A3 RBT further to increase certainty of impacts on residential properties and new RBT to be shown on A28 for consistency of design provision.

Appendix D: Scheme Constraints Drawing



- Legend**
- Proposed Route Options
 - Study Area
 - Residential Dwellings/Commercial Buildings
 - High Ground/Drumlins
 - Horizontal/Vertical Constraints
 - Poor Ground
 - Archeology Areas

Ver	Amendment	By	Checked	Approved	Date
Drawn	Date	Checked	Date	Approved	Date
RPW	04/03/15	VK	17/04/15	JTB	17/04/15

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Client **transportni**

Project **Armagh East Link**

Purpose **Workshop**

Title **Armagh East Link Scheme Constraints**

Scale @ A1	Not to Scale	Ver.
Drawing No.	1064968-A-D-0820	A