Ashbourne Bypass Engineering Feasibility Study

March 2010

Derbyshire County Council Scheme Number

Scott Wilson Works Number   D130439
Revision Schedule

Ashbourne Bypass Engineering Feasibility Study

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1 Introduction

This report has been prepared by Scott Wilson Ltd. on behalf of Derbyshire County Council (DCC) under the Three Counties Alliance Partnership framework contract to investigate a bypass route linking the A52 with the A515 on the western outskirts of the Ashbourne, Derbyshire.

The streets in the centre of the town are quite narrow and suffer greatly from congestion caused both by heavy lorries and tourist traffic. Hence, the Derbyshire County Council has asked Scott Wilson to investigate an alternative route or routes on the western side of the town to divert through traffic from the town centre creating a safer and healthier environment for the local people and visitors.

The main purpose of this feasibility study is to investigate possible bypass routes and advise DCC on the most feasible routes for further detailed engineering design. The site is located on the southern gateway to the Peak District National Park, and lies on sandstone and the sandstone & conglomerate interbedded strata along an existing valley. The routes run from A52 Mayfield Road to the A515 Buxton Road, over terraced pasture and grazing farmland with gentle slope of between 5 to 12%.

Based on the site visit and desk study a number of possible by-pass alignments have been examined and most viable one has been considered for further investigation. All routes provide an access from the A52 Mayfield Road to A515 Buxton Road bypassing narrow and congested road sections in the town centre. The alignments are also within the indicated corridor as described in the project brief provided by DCC.
1.1 Desired Output

It is accepted that information to enable a preliminary design to be undertaken is limited at present, and that this report shall form part of a more detailed study and route assessment. This report is therefore intended to provide guidance on the selection of possible routes, and to highlight potential areas where further consideration may be required in the detailed design.

Following completion of the study it is intended that a report detailing the following shall be provided.

- The method of design adopted for the preliminary design of the Bypass Route
- An estimate of the possible construction cost for the works based upon similar works in the area.
- Identify constraints likely to be encountered by a potential route, or routes and describe the scale of mitigation required to address the concerns.
- Review the topography indicated within the shaded area against the Design Manual for Roads and Bridges TD 9/93 Highway Link Design against horizontal and vertical constraints.
- Provide revised corridors consistent with TD 9/93, assuming a design speed of 85 KpH, carriageways width of 7.3 metres wide with a 2.40 metres wide footway/cycleway to one side. No lighting would be required.
- Identify any works related to the retention or diversion of side roads or public footpaths, or any other constraint.
- Identify below ground constraints likely to be encountered by each of the potential routes. Describe where appropriate the scale of mitigation required to address the concerns. For example, are there any geological constraints entailing undue risks that need to be specified, together with likely engineering requirements such as piling, or other ground treatments.
- Undertake a preliminary desk study of the areas geology, providing where appropriate advice regarding likely scope to any mitigation works.
- A provisional AutoCAD drawing of horizontal alignment, typical cross sections and basic junction layouts.
- Describe the earthworks and structures likely to be required.
- Record impacts of each alignment.
- On the basis of the above, provide a preliminary estimate of the likely total cost of delivering each route option.
2 Existing Road Network

The study starts from the Mayfield Road roundabout on A52, to the south of Ashbourne town. There is a three arm roundabout forming a junction between the Mayfield Road and A52 at this location. The roundabout is also the southern limit of the current Ashbourne bypass. The roundabout has an inscribed circle diameter of approximately 21m. Over this section, A52 is a single carriageway with footpath on one side. It has a speed limit of 40mph and width varies from 6.8 m to 9m.

The adjacent land use to the north and south of the A52 is predominantly farmland. Just to the north of the roundabout there is a dead end road called Waterley Lane leading to the waste water treatment plant.

To the northeast of the study area, the A515 runs in a north south direction through Ashbourne town centre forming blind junction with B5035. This section of the A515 Buxton Road through town centre is a substandard road. The existing vertical and horizontal alignments have not been analysed, but by inspection, the vertical alignment would appear not to comply with current design standards. The gradient from the visual inspection show a long fall of 15% at the corner by the junction with Windmill Lane and North Avenue. The alignment would also appear to contain a number of substandard vertical and horizontal curves. The combination of the horizontal and vertical alignments leads to the existing stopping sight distance being heavily restricted. For 50kph TD9/93 requires a desirable minimum stopping sight distance of 70m, which can be relaxed to 50m (one step below desirable) away from junction or access. In this case the existing highway cannot meet current standards, even if they were relaxed. By inspection the route reveals that these stopping sight distances are not achieved at a number of locations along this section of A515. As a result, a by-pass route that would avoid this road section in the town centre would appear to be essential.

The land adjacent to the road on the north of its junction with B5035, north of the town centre is mainly agricultural, whereas on the south the road is bordered mainly by residential properties.

Before joining the A515 Buxton Road to the north the study area under consideration crosses Mapleton Road. This is a single carriageway road with 5.5 m width and 30mph speed limit. This is the route leading to Mapleton village from town centre.
3 Route Development

3.1 General Background

The brief from Derbyshire County Council suggested that the proposed bypass would be an outer western route between the A52 southwest of the town and the A515 to its north. The client has instructed Scott Wilson Ltd to consider only single carriageway by-pass routes for the Engineering Feasibility Study.

3.2 Route 1

For this option, a new roundabout would be provided on the A52 approximately 200 m west of the existing Mayfield Road roundabout. It is currently envisaged that this roundabout would be a three-arm roundabout with the similar size and layout as the existing Mayfield Road roundabout. For this provision a new roundabout will be provided approximately 200m along the A52 from the existing roundabout. The design period and forecast of traffic growth should be subject to the requirements of the Derbyshire County Council and local transport policies. Once a preliminary design has been produced, capacity and delays can be predicted for this roundabout using suitable computer software, which incorporates models developed from the relationships in TRL Report 281. However, the final decision should be taken based on the traffic modelling of the proposed roundabout.

Route 1 commences at the proposed by-pass roundabout on the A52 as described above ends at the proposed new junction on the A515. The entire route runs in a north-westerly to north-easterly direction, predominantly through open farmland. In the beginning, from chainage 00 to 150 route passes across the rear boundary of the sewerage treatment plant in a north-westerly direction and then continue through open farmland up to the end of the route in a north-easterly direction. At chainage, 1650 alignment crosses abandoned railway embankment now used as the Tissington Trail. It is envisaged that the route would pass beneath the trail using a large box culvert system rather than a bridge. This would allow larger verges to be provided to the Tissington Trail to aid the retention of the existing vista. This route will join A515 with a new proposed junction just south of its existing junction with Spend Lane on A515, which is also the northern limit of the study.

The proposed alignment leaves the proposed roundabout with a short section of straight, running in a north-westerly direction. There is then a right hand bend with a 339m radius. This bend runs to approximately chainage 550. The horizontal alignment then consists of a long straight section to chainage 1450, followed by a left hand bend with a radius of 943m. Finally, there is straight running section again from chainage 1800 to 2800, on the approach to the proposed junction at A515.

This section of the alignment has been designed for a design speed of 70kph, which is suitable for a speed limit of 40mph. According to TD9/93 Table 3, minimum radius of horizontal curve for this design speed (one step below desirable minimum) should be 255m with 7% superelevation, which would be satisfied by the proposed horizontal curve of 339m radius at this location.
The current speed limit for the A52 at this location has also 40mph speed limit. Hence, it is considered that a 40 mph speed limit would be appropriate from chainage 00 to 550 section of the alignment. The design speed for the proposed alignment increases after this point to 85kph, which satisfies the horizontal radius of proposed alignment for the remaining section of the route.

The vertical alignment initially consists of a gentle down hill gradient of 0.5% for approximately 700m from the proposed roundabout. The gradient then changes to uphill slope of about 0.75% until chainage 1700. There is then a K20 sag curve followed by another K55 crest. The K55 crest curve is required to lower the alignment for crossing abandoned railway embankment. The alignment has been kept down under the railway embankment to provide adequate head room for this proposed route.

A new junction would be provided at crossing point with Mapleton Road. It is currently envisaged that this junction would be a ghost island junction. However, this junction choice would need to be carefully considered during the detailed design process, as it may need to be upgraded to a signalised junction. The access to the new bypass will be restricted to the left-hand side only and the right-hand side of the Mapleton Road will have no access to the new bypass road.

The vertical alignment leaves the railway embankment on an uphill gradient of 1% at chainage 1700 to 2800 with a K20 sag curve. At chainage 2800, this route connects A515 at proposed new junction.

A new signalised junction has been considered at the end of the route on A515, just south of its junction with Spend Lane as shown on drawing no: D130439/Junction. Another option has also been considered for this point. In this option the lay out of the junction has been considered in such a way that the traffic flow to and from town centre is discouraged. As a result, it is believed that most of the traffic will prefer to follow proposed bypass route resulting in reducing congestion on and around the town centre. A preliminary junction layout is shown on drawing no: D130439/J1. Introducing a junction and a new by pass route may lead to the reassignment of traffic to and from other routes. There is therefore a need to assess the surrounding network for the traffic and safety implications of introducing a new junction.

Without a topographical survey, it will be impossible to provide an accurate earthworks design or quantities for this widening works. We shall provide a best estimate of the factors affecting the vertical alignment based upon the available information and upon visual survey. It is recommended that a more detailed geotechnical survey to determine the exact nature of the ground conditions is undertaken when the final alignment for this route and layout of the junction is agreed.

It has not been determined how private properties fronting the proposed corridor would access the new route. In order to improve the safety and efficiency of the route it would be necessary to control the number of accesses. This may result in the closing of existing access and provision of a parallel access road with a single point of access.

It is currently envisaged that the proposed alignment cross section will comply with TD27/05 requirements for a rural single carriageway all-purpose road (S2). From chainage 00 to 1700, the proposed route is in a low embankment and from chainage 1700 in a shallow cutting before
joining to A515 at proposed roundabout. The typical cross sections and their elements are shown in drawing no; D130439/CS.

This route could accommodate overtaking sections. The route would allow the most efficient movement of through traffic. The corridor is sufficiently far enough away from the main areas of residential properties to provide significant benefits in terms of noise and air quality.

### 3.3 Route 2

Route 2 was developed in response to a problem identified for Route 1 during the site visit to avoid the culvert crossing of the Tissington Trail. In fact, Route 2 follows the Route 1 from chainage 00 to 1200 and from chainage 1200, it follows new alignment crossing just north to the existing car park to chainage 2150 at new proposed junction on A515. The terrain for this option is also same within this section. It means the vertical alignment also remains same. For details, refer to Route 1 above.

However, this route connects to A515 at proposed new junction approximately 500m south of the proposed junction for Route 1. This junction will also have similar layouts and characteristic as for Route 1 junction, described in previous section.

The Route 2 alignment leaves Route 1 alignment at chainage 1200 with a horizontal curve of 959m radius, running in a north-easterly direction. The route then crosses the existing Mapleton Road at chainage 1550 close to the farm access road. It then passes to the north of the existing Tissington Trail car park at grade. This route would separate the Tissington Trail from the adjacent tunnel, and would require specific facilities for the cycle route to cross the new alignment at this point. The bypass route then curves back to join A515 with a left-hand curve of 554m radius. All these horizontal curves comply with the requirements of TD9/93 for minimum desirable curve radius and stopping sight distance.

In terms of the vertical profile, the route gently slopes upwards from southeast to northeast. After a shallow cutting the alignment leads into a slight upwards gradient of 1% to meet proposed junction at A515.

### 3.4 Route 3

Once again, the starting point of the route is same as the Route 1 and 2 at the A52. In order to reduce the route length this option was explored as an alternative to the Route 2. This route follows the Rote 2 alignment up to chainage 650. After this point, alignment cuts off in a north-easterly direction. The alignment continues to travel towards north to cross Mapleton Road at around chainage 1700 and joins A515 at about 200m north of its junction with North Avenue/Windmill Lane.

This section of the alignment is bordered mainly by farm land up to the backside of the St. Oswald Hospital at chainage 1250 and then the alignment runs close to the residential properties to the east and farm land to the west.

Leaving Route 2 at chainage 650, Route 3 runs in a straight section for about 800m. It then goes through a slight left-hand bend radius of 500m followed by another straight section to join
A515. The proposed junction and its layout at the end of this alignment will be same as for Route 2.

The preliminary lay out of the proposed junction is shown in Junction drawing

After chainage 650, the vertical alignment of this route is changed significantly. In contrast to Route 2 it rises steeply at a gradient of approximately 9% up to chainage 1050. So the vertical alignment initially consists of an uphill gradient of approximately 9% for a length of 800m with a K20 sag curve followed by a K20 crest curve at around chainage 1200. The alignment rises to a high point at approximately chainage 1000. The vertical alignment then followed in a gentle slope of 1% along the ridge before crossing Mapleton Road at chainage 1700. At this point the alignment crosses the Mapleton Road with a low embankment as described in Route 2. This section of the alignment then ends with another K20 crest curve before joining A515 at new junction. It is noted that, the vertical alignment between chainage 650 to 1050 does not satisfy the maximum gradient requirements set out in TD9/93.

The proposed junction lay out and its features to tie-in to A515 remain same as for Route 2. For detail, refer to Route 2 &1.

The main benefit of this route is that it mirrors a natural step in the valley side, and would be able to use an existing hedge line to mask the route from the valley floor.

### 3.5 Route 4

Initially this route was also believed to be an option during the desk study. From the site visit on 2nd March 2010, it appeared that the alignment rises in a steep gradient from south to north for a considerable length. Particularly, from chainage 250, the road starts to climb, reaching a maximum gradient of about 12%. Due to the length of this incline (about 600 metres) a climbing lane for heavy vehicles would be essential. The first section of this gradient would be on a low embankment, but as the route climbs up the hill, it starts to move into cut, reaching a maximum depth of about 6m where it cuts the escarpment face. As a result, it does not comply with the requirements of maximum allowable gradient set out in TD9/93.

As this route continues further north to chainage 1450, some properties across this alignment would need to be demolished. Moreover from chainage 950 onwards the most of the section of this alignment passes across the back gardens of residential properties.

In addition, this route passes in a close proximity to the sewerage treatment plant and cemetery in the beginning of the alignment.

The proximity of this route to the sewerage treatment plant and cemetery meant construction would likely to cause significant disruption to these facilities and may incur considerable costs for the necessary permanent works. Managing the impact of the route on these facilities significantly limited the options available for both vertical and horizontal alignments.

Based on the above site constraints this route has not been considered further as an option of the bypass route.
3.6 Route 5

Route 5 closely follows the alignment of Route 4 from chainage 00 to 1100. The difference between these two routes is only at the crossing point at Mapleton Road at chainage 1500, where the route 4 crosses through a low embankment north to the car park, whereas Route 1 crosses through residential properties over the Mapleton Road.

The analysis made for Route 4 above are also valid for Route 5, hence on the same principal as Route 4, this route has also been dropped and not been considered for further assessment.
4 Standards and Departures from Standard

4.1 General Background

The proposed alignments have been designed in accordance to the TD9/93 of the Design Manual for Roads and Bridges. Cross sections of the proposed alignments have been based on TD27/05. Where allowance has been made for ghost island junctions, these have been designed in accordance with TD42/95. Any roundabout on the scheme would have to be designed to TD16/93.

The proposed bypass routes do not require any departures from standard for the currently proposed alignments. They have utilised the permitted relaxations in some places. The alignments comply with the recommendation of TD9/93, for:

- Provision of overtaking sections
- Provision of one step below desirable visibility in none overtaking section

TD9/93 recommends that 30% of the proposed road should be overtaking sections (Category 2 road, Table 7). This requirement has been achieved on proposed routes.

The full overtaking sight distance for a design speed of 85kph is 490m and 285m for a 70kph design speed. These requirements mean that the proposed alignments have no overtaking sections. Some of the sections have been designed for a design speed of 70kph to match the design speed limit of the existing surrounding network. The one-step below the desirable minimum stopping sight distance has been provided throughout the alignments. The alignments will require a significant amount of warning lining and possibly the use of hatching to discourage speeding.

TD9/93 recommends that in sections of none overtaking the k value on vertical crest curves should be one step below the desirable minimum value. This is to ensure that none overtaking section’s forward visibility is restricted to clearly dissuade overtaking in these areas (TD9/93 para. 7.30). This requirement however conflicts with another requirement, which is to provide the full stopping sight distance in the vicinity of a junction (TD9/93 para. 1.26). The alignments have been designed to provide full stopping sight distance in the vicinity of junctions, which has required the use of the desirable minimum crest curves within none overtaking sections. This is particularly the case for the alignments close to the proposed roundabout on the A52 and junction on the A515.

It is currently envisaged that the proposed alignment cross section will comply with TD27/05 requirements for a rural single carriageway all-purpose road (S2). The typical cross sections for the routes are shown in drawing D130439/CS.

The selection of junction type has been guide by Figure2/2 in TD42/95, which is shown below. This gives recommended junction types based on the predicted major road and minor road traffic flows.
Using this graph the predicted main line traffic flows effectively preclude the use of any junction other than a roundabout (or other type). This however would appear to be an excessive requirement for very minor junctions, such as the junction with Mapleton Road. It is therefore proposed that the junctions onto the mainline are ghost island junctions.

The main junctions at A52 Mayfield road in the beginning of the bypass route is envisaged to be roundabout, whereas at the end of the route at A515 a lies into the existing alignment, with a junction provided for the old alignment onto the new road. The proposed roundabout and junction have not been designed yet as this is out of scope for this study.
5 Drainage

5.1 General Background

The proposed alignments have been reviewed to identify possible means of discharging surface water run off from the proposed carriageway. No consultation has been carried out with the Environment Agency, Drainage Board or Water Company to see if they would agree to the proposed methods of outfall.

The drainage design shall be considered for a 1 in 100 year storm return period with a 20% uplift on volumes for global warming in line with current recommendations.

The ground water from the surrounding area will tend to move towards the more permeable sub base and fill material beneath the carriageway construction. In order to contain this it is anticipated that some form of filter or basal layer drainage system will be required beneath the highway construction to reduce the moisture content of the highways construction.

In addition the area forms part of the flood plain for the River Dove. Any works that decrease the flood storage volume available may require mitigation measures to provide additional storage to replace that lost. It is therefore preferable for any works to be restricted to existing ground level. If mitigation measures are required they are likely to be in the form of ponds or wetland areas.

In the absence of existing surface water sewers in the area it would seem that surface water drainage will have to be via existing streams and drainage ditches. In the absence of drainage studies for the area these must be assumed to be running at capacity downstream during peak discharges at present, and some form of retention reservoirs may be required to moderate peak flows.

Consultation should be undertaken with the local land drainage authority for the area to ensure that existing drainage paths are not affected by the proposals. The authority is believed to be Ashbourne District Council.

5.2 Route 1

It is currently envisaged that the system would drain from the proposed roundabout at chainage 00 towards chainage 700. Storage facilities would have to be provided to attenuate the rate of outfall to the stream around chainage 700. A pollution control device will also be required to achieve the minimum legal requirements for the quality of discharging surface water, as set out by the Environment Agency. The system could then outfall into the adjacent stream at this location.

From chainage 1050 the system will also drain back to a low point at approximately chainage 700. The system could then outfall into the stream at this location. Storage will need to be provided to attenuate the rate of outfall to the equivalent of a green field site. It is currently envisaged that a detention/balancing pond could be constructed in the land between the...
proposed alignment and the stream. A pipe culvert will be provided at chainage 700 to discharge drainage system to the stream.

The system will drain from chainage 1050 to the proposed detention pond at around chainage 1350; likewise, the surface water will drain back from chainage 1500 to the same location and outfall in to the stream together with a pipe culvert.

Two more outfalls have been proposed at chainages 1950 and 2650 to discharge surface water drainage system into the nearby stream. The system will drain back from chainage 2300 and 2750 to the proposed outfall point at chainage 2650. Another outfall point will collect surface drainage from chainage 1700 to 2300 and discharge it into the existing stream. This ditch is likely to require some offsite upgrading works to accommodate the additional flows.

It is anticipated that around each outfall location some storage facilities would be required to attenuate the proposed flows, to the equivalent of a green field site. Pollution control measures would also be required.

5.3 Route 2

As mentioned in section 3.3 above, Route 2 follows the same alignment as Route 1 from chainage 00 to 1200. This means that the drainage system will remain same as described for Route 1 up to this chainage.

The drainage system for the proposed route will be achieved through a combination of both outfalls into existing watercourses and into existing highway drainage system. It is anticipated that flow attenuation measures will be required including the use of balancing ponds at each outfall location, online storage ditches and oil interceptors at suitable location along the route.

Drainage system from chainages 1200 and 1450 would run to the proposed outfall point at chainage 1300, from chainage 1450 and 1650 the system would drain back to the existing Mapleton Road drainage system if one exists of suitable capacity.

From chainage 1650 onwards and the system will run to the proposed outfall point at chainage 2000, where the system from chainage 2100 will also collected at this point and drain down into the existing watercourse.

5.4 Route 3

Again, it is clear from the route description under section 3.4 that the Route 3 follows the Route 1 and 2 from chainage 00 to 650. Hence, it is assumed that the surface drainage system will also have same provision within this section as for Route 1 and 2.

After chainage 650, the vertical alignment of this route rises steadily. It climbs at a gradient of approximately 9% up to chainage 1050. Therefore, a careful consideration should be given to select the drainage section and its parameters for this section of the route. From chainage 900 drainage, system would run to the proposed outfall location at chainage 600.
Likewise from chainage 1050 to chainage 900 the system would drain back into the other proposed outfall point detailed previously.

As the alignment runs through a ridge after chainage 1050, it is anticipated that a shallow drainage system will drain to the existing highway drainage system at chainage 1700, Mapleton Road crossing. This would probably flow into the existing stream via the existing highway drainage network. It is likely that these highway drains would require some improvement and the provision of online storage to control the peak flow.

From chainage 1700 onwards, drainage system runs into the proposed outfall location at chainage 2000. The system will also drain back from chainage 2150 to this location.

5.5 Route 4

The drainage system for the proposed route will be a combination of both outfalls into existing watercourses detailed above and into existing highway drainage systems if sufficient capacity exists. This alignment starts at A52 Mayfield Road, on A52. Given the nature of the topography of the proposed alignment the drainage system from chainage 450 drains back into existing highway drainage network around chainage 00 on the A52. Due to the lack of a suitably close watercourse, this part of the route would be required to outfall into the existing highway drainage. An outfall is planned at chainage 800 that collects surface drainage from chainage 1150 to 450 and finally discharge into the existing stream.

The surface drainage system from chainage 1150 would drain via the existing highway drains into the Mapleton Road drainage. Again, due to lack of a suitably close watercourse, the last section of this route from chainage 1900 would also require to drain back into the existing Mapleton Road drainage. In order to accommodate these additional flows, it is anticipated that the existing drainage system would require upgrading.

5.6 Route 5

Given the close proximity of this route to the Route 1 and with the similar topographical nature, the drainage system for this route will have similar arrangement as for the Route 1. For details, refer to 5.5 Route 1.
6 Existing Conditions

6.1 Site Topography

All proposed routes start at the A52 Mayfield Road (chainage zero) and run across agricultural fields with different gradients to meet the A515 at Buxton Road just north of its junction with Windmill Lane.

Without a topographical survey, it will be impossible to provide an accurate earthworks design or quantities for the works. We shall provide a best estimate of the factors affecting the vertical alignment based upon the contour levels available and upon visual survey. This will provide an estimate of cutting and embankment areas (also see 3.3 below).

Parallel to the west of the proposed bypass an extensive stream course exists that appears to form a large part of the local land drainage system. The stream discharges to the River Dove to the southwest of the proposed routes. Alteration of this stream would be costly and may affect the hydrology of the area. As a result it is recommended that no alteration is undertaken and the bypass is aligned as far as possible from this stream course.

The site along the proposed bypass route is predominantly at grade with a terraced gentle slope facing southwest towards the stream. As all routes approach the A515 Buxton Road they have to cross either a major disused railway embankment or an abandoned tunnel which form the Tissington Trail (part of the national cycle route network) and Mapleton Road.

6.2 Geotechnical Issue

From the visual ground investigations carried out and desk studies of the area under consideration, it appears that the ground conditions are predominantly Sandstone deposition in nature. However, in areas adjacent to the drainage ditches the drawdown of the ground water table caused by the ditch will result in a marked reduction of moisture content.

In addition, given the alluvial nature of the surrounding area, it can be assumed that soil conditions could vary throughout the length of the route, with the possibility of localised areas or ‘lenses’ of varying material. These lenses may be sands, gravels or clays.

In view of this it can be assumed that the bearing capacity of the in the area will be poor in the base of the valley, with varying soil strengths anticipated to be encountered within the alluvial areas.

Preliminary design will therefore take the worst possible case for the soil bearing capacity, and provide additional surface water drainage paths in an effort to reduce the moisture content of the soil beneath the highway construction.

It is recommended that a more detailed geotechnical survey to determine the exact nature of the ground conditions is undertaken when the final alignment is agreed.
6.3 Flora and Fauna

A separate environmental assessment of the area would be essential as the route crosses areas designated as nature reserves. However, from visual survey on the 2nd March 2010 it was noted that the proposed routes would result in the removal of a number of mature species of trees and hedges that currently form part of the field boundary system outside these areas.

Should these trees, hedges (or other forms of flora or fauna) endanger the development route it may be possible to minimise the risk by using Route 3, running parallel to existing field boundaries and minimising the number of trees affected. This could also result in the remaining trees forming a visual barrier for the route from the village of Hatton.

In addition, the area contains wet areas and ponds. It is likely that these areas may contain amphibians, and it is therefore recommended that any investigation pay attention to this possibility, and that the final design seeks to minimise disturbance to any pond or wet area. Should the removal of such an area be needed it is likely that the Environment Agency shall seek a replacement area as part of the works.

6.4 Existing Buildings

From the visual survey there are some buildings and farmhouse affected by the proposed routes. Alteration to the existing buildings within the routes boundaries has been considered, but the full extent of any alterations not investigated due to limitations on site access.

Route 3 shall require demolition of part of the back store and back garden facilities adjacent to the Mapleton Road crossing.

Like wise Route 3 shall require acquisition of existing Tissington Trail car park facilities at chainage 1650, just north of the Mapleton Road.

6.5 Existing Services

A search for statutory undertakers services has not been undertaken in this study. However, it is recommended that detailed information be made once the potential route is finalised.

6.6 Historic Monuments

All routes will cross areas designated as ‘Of Historic Significance’ and works will result in the disturbance of those areas. Of all routes it is considered that Route 1 will cause the minimum disturbance as it may be possible to construct the road at grade or on a small embankment to minimise the removal or disturbance of artefacts.
7 Proposed Design

The final road alignment has yet to be confirmed by Derbyshire County Council, therefore, for the purposes of this report an approximate alignment is to be designed, with assumed chainages commencing in the south at A52. It is assumed from the general site topography that the route will be approximately at grade with low embankment and no significant structures, or cuttings.

The information currently available or referred to for the preparation of the preliminary design and accompanying report is listed in Appendix A – Background Information. Where definitive information is not available any design is to be based upon best practice using nationally recognised standards, but assuming the probable worst case scenario.

7.1 Proposed Widths

The proposed carriageway width has been specified by Derbyshire County Council as 7.30 metres wide. A 2.40 metre wide footway/cycleway is also provided, which with 1 metre wide verges would result in a minimum width of . As a result, the proposed width of the route will be in the order of 11.7 metres wide without drainage facilities. With drainage facilities such as road side ditches a width of approximately 17.7 metres is envisaged.

Should some form of landscape mitigation be required to shield the new bypass road from surrounding areas any additional width required will have to be specified as part of a landscape mitigation package.

7.2 Pavement Design Subgrade and Capping

Pavement design should be carried out in accordance with Highways Agency requirements as given in DMRB HD26/06 (Ref 6). Given the anticipated variation of ground conditions across the site it may be assumed that the thickness of capping layer and sub grade required will vary and will be dependant upon the type ground encountered and methods of ground treatment adopted.

It can be assumed that, in order to facilitate the movement of ground water beneath the carriageway construction in flood events, that some form of basal layer will be installed (see 3.8 below). This is normally created by sandwiching a layer of free drainage material between two geotextile membranes. This basal layer may also form part of the ground improvement work required for poor soil conditions and result in a reduction of the thickness of sub-grade and capping layers.

7.2.1 Subgrade and Capping

In the absence of a geotechnical report or investigation and the possibility of varying soil conditions aligned with high moisture content the worst case scenario has been considered and a CBR of less that 2% assumed.

According to DMRB vol7, section.2, HD 25/94 figure 3.1, for the pavement foundation with less than 2% CBR, a subbase thickness of 150mm on top of 600mm capping has been adopted. The
capping layer is assumed to comprise of free draining material which will also form the basal drainage layer.

7.2.2 Flexible pavement

According to DMRB vol.7 section 2 HD 26/06, figure 2.1, for the class 2 foundation with stiffness > 100MPa the combined design thickness of the flexible pavement will be 200mm. (See Appendix C).

As per HD 36/06, the permitted options are considered as follow.
- 40mm Thin wearing course surfacing system
- 60 mm Dense Bituminous Macadam (DBM) 50 binder course
- 100mm Dense Bituminous Macadam DBM 50 base course

Maximum AAV for aggregate for TWCS - 16
Minimum PSV required for TWCS - 55

7.3 Earthworks

It is important to note that, due to the topography of the area, the earthworks balance of each bypass route is poor.

Currently the proposed route is assumed to have no major structures or strengthened earthworks required along the route apart from the works on Route , although structures are likely to be required at the stream crossing points. Consideration should be given to the foundation design of these structures considering the local ground conditions following confirmation of the road alignment.

The structures are most likely to be precast concrete box culverts whose design will enable their dead load and the applied load from the road construction to be spread over their base area, reducing the ground pressure loading on the made up ground.

The soil strength results in the alluvial soil are expected to be quite low and include local variations in soil conditions crating soft spots. Without treatment, improvement or removal the soft spot areas are unlikely to provide a suitable foundation for the proposed road, due to its low strength and variable nature.

This would normally also require the increase in depth of capping and sub-base layers to compensate for the low ground strength by distributing the load over a greater area.

A ‘standard’ road pavement construction is therefore likely to result in an undulating road surface over time as the road subsides over the weaker areas and the stronger layers remain unchanged. This is likely to result in serviceability and maintenance problems to the road and drainage as cracks, low spots and steps form.

Cuttings or embankments should be formed at a shallow angle; an assumed slope of 1:2 has been taken for design purposes. This may require some form of retention or slope stabilisation in
the initial stages before root growth from landscape planting can establish to help to stabilise any new slopes.

### 7.4 Safety Fencing / Boundary Fencing

As the route will form part of the Derbyshire County Council highways networks there is no requirement under TD 19/06 'Requirement for Road Restraint Systems' for the provision of safety fencing along the route.

However, given the possibility of heavy vehicles reaching high speeds along the route and the presence of adjacent water features such as drainage ditches, it is recommended that the final design consider the requirements of the Technical Directive for the protection of such features.

Where features such as box culvert bridges, large culverts or water features have been identified as a possibility from the preliminary design costs for safety fencing have been included in the estimate of costs.

Agricultural boundary fencing shall be required along the route, the exact nature depending upon accommodation works agreements. In addition it is likely that hedge planting shall be required by the landowners. It is advised that the ownership of the fence and hedge line is transferred back to the land owners at the expiration of the normal construction maintenance period. Additional land take will be required to accommodate any hedge planting required, although this area of land would be transferred back to the original landowner with the hedge line maintenance responsibility.

### 7.5 Anticipated Construction Costs

#### 7.5.1 Highways Construction

Highway construction costs are based upon the construction of a 7.30 metre wide carriageway and associated footway/cycleway at existing ground level. Given the area is alluvial up ground it can also be assumed that the ground bearing strength may be poor in general and that additional costs for ground improvement shall be required.

An exercise has been carried out to cost roadworks per 100 meters at today’s prices (March 2010) using rates obtained from the Highways Agency Framework 2 Contract. The approximate cost has been found to be in the order of £150,000 per 100m length purely for carriageway construction.

Comparable costs from the A6192 Markham Lane (let in 2004) are £1,100 per meter, for a 7.3m wide carriageway without footway or cycleway, or remediation works for soil conditions. Given inflation at today’s rates and the additional metre strips width, this would equate to £1,600 per metre for the highway construction when taken in isolation.
Additional side road or junction alteration construction costs may increase the rate locally up to £3,500 per metre. This would typically take place at the junction of the A515 Buxton Road and new roundabout on the A52 Mayfield Road.

Structures shall be needed at the crossing of the Tissington Trail. At present the usage of the Tissington Trail cannot be confirmed, so loading of the box culvert for Route 1 cannot be predicted. From previous works a figure of £1,000,000 has been provided for the outline design estimate, but this may vary depending upon the width of the culvert required, the depth of cover, and the loading.

It is envisaged that a box culvert or similar structure will be constructed for Route 3 and 3 at around chainage 1650. A rough estimate would be between £175,000 to £225,000 in construction costs, allowing for the use of precast concrete box culverts to serve the new carriageway, with the local re-lining of disturbed watercourses.

Given these costing an estimate of construction costs for the routes are

**Route 1**
- 2800 m length @ £1,600 per metre = 4,480,000
- Box culverts at embankment crossing 1,000,000 *(provisional figure – see previous notes)*
- Box culverts for stream crossing 3 no. @£200,000 600,000
- New Junction construction at A515 = 300,000.
- New roundabout construction at A52 = 500,000
- Ground mitigation works (estimated see 7.5.2 below) 158,200

**Total** £7,038,200

**Route 2**
- 2145 m length @ £1,600 per metre = 3,432,000
- Box culverts for stream crossing 3 no. @£200,000 600,000
- New Junction construction at A515 = 300,000.
- Property acquisition car park and services 400,000
- New roundabout construction at A52 = 500,000
- Ground mitigation works (estimated see 7.5.2 below) 121,475

**Total** £5,390,475

**Route 3**
- 2150 m length @ £1,600 per metre = 3,440,000
- Allowances for cutting steep slope 1,032,000
- Property acquisition no 3 @ 250,000 750,000
- Box culverts for stream crossing 3 no. @£200,000 600,000
- New Junction construction at A515 = 300,000.
- New roundabout construction at A52 = 500,000
- Ground mitigation works (estimated see 7.5.2 below) 121,480

**Total** £6,743,480
Route 4
1915 m length @ £1,600 per metre = 3,064,000
Allowances for cutting steep slope
30% extra over = 919,200
Property acquisition no 3 @ 250,000 = 750,000
Box culverts for stream crossing 3 no. @£200,000 = 600,000
New Junction construction at A515 = 300,000.
New roundabout construction at A52 = 500,000
Ground mitigation works (estimated see 7.5.2 below) = 108,198

Total £6,241,398

Route 5
1950m length @ £1,600 per metre = 3,120,000
Allowances for cutting steep slope
30% extra over = 936,000
Property acquisition no 3 @ 250,000 = 750,000
Box culverts for stream crossing 3 no. @£200,000 = 600,000
New Junction construction at A515 = 300,000.
New roundabout construction at A52 = 500,000
Ground mitigation works (estimated see 7.5.2 below) = 110,175

Total £6,316,175

For comparison, figures provided in TA46/97 Traffic Flow Ranges for Use in the Assessment of New Rural Roads - Annex C Construction Costs give a construction cost range of between £1.3 and £2.3 million per km. based upon 1994 prices. Taking a base rate of inflation for construction industry of 4% at current prices this equates to a cost of between £2.25 and £3.98 million per km.

7.5.2 Geotechnical Costs

The additional costs of ground mitigation works will vary depending upon the type of work undertaken and the scale of those works at each particular location. Given the possibility of varying ground conditions within the site, and the lack of accurate data from site to identify specific ground conditions, any estimate of costs associated with geotechnical works has been taken for the worst case scenario, based upon previous experience of such sites.

It is anticipated that the entire site shall use geotextile membranes of some form, either for soil strengthening or for separation of the new construction from existing contaminated ground to prevent leachate.

Ground mitigation works are taken as the provision of a drainage / capping layer between two layers of geotextile membrane, estimated at £5/m2. This is extended 1.0 metres beyond the edge of the construction area.

It may be possible to reduce the cost of ground mitigation works following geotechnical investigations in the area, but at present the worst case scenario has been taken for costing purposes.
7.5.3 **Anticipated Statutory Undertakers Costs**

It may be reasonable to assume that additional costs will be incurred for the movement and/or replacement of existing services at the junctions of the route with the existing highways network. Without a preliminary design study being completed it is impossible to identify the full extent of these works or services affected by the highway alignment, but it is believed that alterations to services will be limited to adjustment of existing agricultural water and electrical supplies, overhead power supplies and British telecom ducts.

Existing pumped combined sewers can normally be sleeved or protected by suitable reinforced slabs as they are usually sited at sufficient depth in agricultural fields to avoid damage by farming operations. This should be verified by further investigation with the appropriate statutory undertaker.

It is difficult to quantify these works at present, but given the rural nature with the availability of land adjacent to the proposed alignments, it is anticipated that additional costs will be limited and could be carried out in advance of any construction works.

The works may have to be undertaken by the service supply firms themselves, and additional costs attached to the works for their specialist attendance and supervision. For that reason we believe that a sum in the region of between £300,000 to £400,000 should be put aside for these works.

7.5.4 **Contaminated Land**

Given the previous usage of the Tissington Trail as a railway line it is probable that the area is contaminated with residual materials. This normally takes the form of high sulphate readings from coal slag and residual heavy metals. It the estimates it has been assumed that any excavated materials will be reused on site as fill material. If materials are contaminated and have to be removed from site it is anticipated that additional cost will be incurred as these materials will have to be disposed of to specialist tips.

Prior to the final design of the accepted route it is recommended that a full investigation into soil contamination is undertaken.

7.5.5 **Anticipated Total Costs**

Given the anticipated costs for highways construction and ground mitigation works it is believed that the total costs for the scheme (excluding land acquisition and accommodation works) shall be in the region of £7.038 million for Route 1, £5.30 million for Route 2, £6.74 million for Route 3, £6.24 million for Route 1 and £6.316 million at current rates.

Following decisions on the preferred Route, it is believed that these costs may be reduced by further ground investigation works reducing the ground mitigation works, and liaison with the statutory undertakers affected by the works.
8 Conclusion

The purpose of this report is not to recommend a particular route, as the assessment of a route needs to be done based on wider issues.

There are no significant geotechnical problems or drainage issues currently identified to discount any particular option.

Each of the Routes 1 to 3 that have been developed can be designed and constructed in accordance with the current standards. Routes 4 and 5 are not considered viable due to the problems with access gradients between the cemetery and water treatment works.

There are some significant risks with all the options, which cannot be fully identified or quantified at present, these are:

- Public Utility Diversion Works
- Unknown Geology
- Soil Contamination

All routes will need to cross the Tissington Trail, disturb areas designated of historical or natural significance, and remove the current rural nature of the stream valley. However, the current road network through Ashbourne which this route will replace is below current standards, and the disruption that the provision of the bypass must be weighed against the benefit to the town of Ashbourne as a whole, and to the users of the A512 and A52.
9 Appendices
9.1 Appendix A – Background Information Referred To

- Design Manual for Roads and Bridges - Currently available at the Highways Agency web site
  http://www.standardsforhighways.co.uk/dmrb/index.htm

- Proposed Alignment Design in accordance to the TD9/93
  http://www.standardsforhighways.co.uk/dmrb/vol6/section1/td993.pdf

- Cross section of the proposed alignment Design in accordance to the TD27/93
  http://www.standardsforhighways.co.uk/dmrb/vol6/section1/td2705.pdf

- Any Roundabout Design to be in accordance to the TD16/93
  http://www.standardsforhighways.co.uk/dmrb/vol6/section2/td1607.pdf

- County Specific Requirements from Derbyshire County Council Development Control - Currently available at the Leicestershire County Council web site
  http://www.leics.gov.uk/index/highways/road_pathway_maintenance/htd.htm
9.2 Appendix B - Drawing List

D130439 / 1.1 Ashbourne Bypass – Route 1 – Alignment Sheet 1 of 2
D130439 / 1.2 Ashbourne Bypass – Route 1 – Alignment Sheet 2 of 2
D130439 / 2.1 Ashbourne Bypass – Route 2 – Alignment Sheet 1 of 2
D130439 / 2.2 Ashbourne Bypass – Route 2 – Alignment Sheet 2 of 2
D130439 / 3.1 Ashbourne Bypass – Route 3 – Alignment Sheet 1 of 2
D130439 / 3.2 Ashbourne Bypass – Route 3 – Alignment Sheet 2 of 2
D130439 / 4.1 Ashbourne Bypass – Route 4 – Alignment Sheet 1 of 2
D130439 / 4.2 Ashbourne Bypass – Route 4 – Alignment Sheet 2 of 2
D130439 / 5.1 Ashbourne Bypass – Route 5 – Alignment Sheet 1 of 2
D130439 / 5.2 Ashbourne Bypass – Route 5 – Alignment Sheet 2 of 2
D130439 / CS Ashbourne Bypass – Typical Cross section
Ashbourne Bypass – Proposed Roundabout at A52
Ashbourne Bypass – Proposed Junction 1 at A515
Ashbourne Bypass – Proposed Junction 2 at A515
Ashbourne Bypass – Proposed Junction at Mapleton Road crossing
MAPLETON ROAD

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PROPOSED ASHBOURNE BYPASS

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Project

PROPOSED ASHBOURNE BY-PASS

Drawing Title

MAPLETON ROAD / ASHBOURNE BY-PASS JUNCTION

Scale at A4:

Drawn RD

Approved

Revision

Checked Date

05/03/10

Date

www.scottwilson.com
D130439/J1

ASHBOURNE BY-PASS

ROUTES TO FIRST JUNCTION
BUXTON ROAD
NORTH OF B5034 NORTH AVENUE
9.3 Appendix C – Client Brief

Insert .pdf of Client Brief here
Derbyshire County Council

Ashbourne Bypass: Feasibility Study
1 Introduction

1.1 Ashbourne is an attractive market town lying on the southern fringes of the Peak District National Park. The conservation area and local roads suffer greatly from congestion caused both by tourist traffic and by heavy lorries struggling up the steep and narrow A515. A bypass, linking the A52 with the A515, would potentially remove all but local traffic from the town, creating safer and healthier conditions for those who live in and visit it.

1.2 A number of alternative routes for a bypass scheme have been considered in the past, including using a former railway tunnel under the town. However, the current preference of the County Council is an outer western alignment between the A52 west of the town and the A515 to its north.

1.3 Derbyshire County Council are aware that the topography of the area will make it difficult to find an alignment that is both satisfactory in engineering terms and avoids a disproportionate environmental impact, although little in the way of investigation of the scheme is still has at this stage been undertaken.

2 Scope of Feasibility Study

2.1 Figure 1 (attached) shows corridor (shaded) through which a possible western bypass could be considered together with an Environmental Constraints Plan.

2.2 Derbyshire County Council wishes to undertake a feasibility exercise into the practicalities in providing a bypass for Ashbourne. This will need to cover engineering feasibility, costs, and constraints and, although it would not give us a definitive indication of the impacts of a scheme, it will help to establish its deliverability.

2.3 A comprehensive appraisal of planning constraints is not being requested at this time. There are though a number of constraints that need to be taken into account if a scheme were to be progressed in the corridor shown in Figure 1.

2.4 The shaded area is intended as a guide and not to be interpreted as a ‘do not cross’ line.

2.5 Initially, therefore, the commission requires the consultant to undertake the following specific tasks:
2.5.1 From the Constraints Plan in Figure 1, identify constraints likely to be encountered by a potential route, or routes and describe the scale of mitigation required to address the concerns.

2.5.2 Review the topography indicated within the shaded area against the Design Manual for Roads and Bridges TD 9/93 Highway Link Design against horizontal and vertical constraints.

2.5.3 Provide revised corridors consistent with TD 9/93, assuming a design speed of 85 KpH, carriageways width of 7.3 metres wide with metre running strips. No lighting would be required.

2.5.4 Similarly, any works related to the retention or diversion of side roads or public footpaths, or any other constraint identified in Figure 1, should be identified.

2.5.5 From the Geology Plans Figures 2 and 3, identify belowground constraints likely to be encountered by each of the potential routes. Describe where appropriate the scale of mitigation required to address the concerns. For example, are there any geological constraints entailing undue risks that need to be specified, together with likely engineering requirements such as piling, or other ground treatments.

2.5.6 Undertake a preliminary desk study of the areas geology, providing where appropriate advice regarding likely scope to any mitigation works.

2.5.7 Undertake preliminary design using MMX (or similar suitably appropriate data).

2.5.8 Describe the earthworks and structures likely to be required.

2.5.9 Record impacts of each alignment.

2.6 On the basis of the above, provide a preliminary estimate of the likely total cost of delivering each route option.

3 Reporting

3.1 The report is intended for consideration by a wider ‘lay’ audience. It is anticipated the report provide a commentary upon the constraints to the scheme. For example, a particular alignment may require cutting. Whilst it is not anticipated that the report be a detailed engineering appraisal, the reader would be informed as to the implications for example a cutting depth of X metres would be required, this would entail encompassing a swathe of land Z metres deep.

3.2 Whilst at this stage the scope of the feasibility study does not include a detailed Environmental Statement, it is anticipated that any obvious Environmental impacts would be pointed out for instance if extensive cutting is envisaged this is likely to be visible from a considerable distance. Similarly, and again as an example, a number of routes potentially could be severed; these should be identified together with a commentary upon their implications.

4 Budget

4.1 The maximum budget available for this work is £5,000.

Figures 3 and 4 are derived from information provided by the British Geological Survey. Unfortunately, restrictions on the County Council’s licence prohibit placement of the data on the Internet in any non-queryable electronic format so it is not possible to provide the base information required to undertake this part of the exercise. The Consultant will therefore need to procure this information from the BGS or likewise source.