TDI160019

Northumberland County Council

TECHNICAL SERVICES
ROADS DESIGN

FEASIBILITY REPORT

BLYTH RELIEF ROAD

TDI160019

DATE: January 2017

FEASIBILITY REPORT

BLYTH RELIEF ROAD

Prepared by
Roads Design Team

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Contents

Executive Summary i
1. Introduction 1
1.1. Introduction 1
1.2. Report Structure 3
2. Existing Condition 4
2.1 Strategic Road 4
2.2 Local Highway Links 4
2.2.1 Princess Louise Road 4
2.2.2 Plessey Road 5
2.2.3 A1061 6
2.2.4 Crawford Street 8
2.3 Junctions 8
2.3.1 A189/ A1147 / B1331 Bedlington Junction 8
2.3.2 A193 Broadway Circulatory / Princess Louise Road 8
2.3.3 A193 Rotary Way / Plessey Road Roundabout 8
2.3.4 A193 Links Road / A1061 South Newsham Road/ B1329 Links Road Roundabout 8
2.3.5 A189 / A192 Roundabout 8
2.3.6 A192 / A1061 Roundabout 8
3. Environmental Issue 9
3.1. Introduction 9
3.2. Land Ownership 9
3.3. Air Quality 11
3.4. Cultural Heritage 13
3.5. Nature Conservation 13
3.5.1. Land Based Designations 13
3.5.2. Marine Designations 15
3.6. Ecology 17
3.6.1. Habitats 17
3.6.2. Species 19
3.7. Landscape 19
3.7.1. Land Use 19
3.7.2. Marine 19
3.8. Ground Conditions 19
3.8.1. Pollutant Incidents 19
3.8.2. Landfill 21
3.8.3. Sewage Treatment Works 23
3.9. Noise and Vibration 23
3.10. Public Rights of Way 23
3.11. Flooding 27
3.11.1. Rivers and Sea 27
3.11.2. Surface Water 29
3.12. Geology and Soils 31

4. Engineering Constraints 32
4.1. Design Parameters 32
4.1.1. Highway Link 32
4.1.2. Headroom 34
4.1.3. Junctions 34
4.2. Buildability 34
4.2.1. Route 1 34
4.2.2. Route 2 35
4.2.3. Route 3 35
4.2.4. Route 4 35
4.2.5. Route 5 38
4.2.6. North South Route 38
5. Utilities 39
5.1. Affected 39
5.1.1. Northumbrian Water Limited (NWL) 39
5.1.2. National Grid 39
5.1.3. Fulcrum Pipelines 39
5.1.4. British Telecom Openreach 39
5.1.5. Network Rail 40
5.2. Not Affected 40
6. Cost Estimate 41
7. Option Appraisal 42
7.1. Qualitative Assessment 42
7.2. Added Value 42
8. Summary and Conclusion 44
8.1. Summary and Conclusion 44
8.2. Additional Studies 44
APPENDIX A: Drawings 45
APPENDIX B: Environmental Maps 48
APPENDIX C: Qualitative Assessment 57
APPENDIX D: Cost Estimates 59

Figure 1 – Site and Route Options 2
Figure 2 – Footpath beside the Allotment Gardens 4
Figure 3 – Plessey Road 5
Figure 4 – Plessey Road Wagonway 5
Figure 5 – South Newsham Level Crossing 6
Figure 6 – Parking Area (South side) 6
Figure 7 – Signal Box 6
Figure 8 – View to existing segregated cycle path at A1061 / A193 Roundabout Exit 7
Figure 9 – Existing Cycle Route along the A1061 South Newsham Road 7
Figure 10 – NCC Landownership 10
Figure 11 – Air Pollution 12
Figure 12 – Land Designation 14
Figure 13 – Marine 16
Figure 14 – Habitats 18
Figure 15 – Pollutant Incidents 20
Figure 16 – Recorded Landfill 22
Figure 17 –Public Right of Way 25
Figure 18 –Cycle Routes 26
Figure 19 –Flood Map (Rivers and Sea) 28
Figure 20 –Flood Map (Surface Water) 30
Figure 21 –Urban Road Types 33
Figure 22 – Approximate Extent of Route 4 Impact 37

Executive Summary

Northumberland County Council Technical Services Design Section has been requested to prepare feasibility designs for five proposed high level route options for a new relief road to improve links between Blyth and the A189 Spine Road and to provide guidance to consultants to take forward three route options for scheme appraisal.

The aim of this feasibility study is to provide a high level review of these routes focusing on:

- Environmental risk;
- Engineering constraints;
- Buildability issues;
- Utilities; and
- Costs.

All route options are viable but railway level crossing and land acquisition are the prominent buildability issues for some options. Cost will be the determining factor in deciding the options to be taken forward.

The findings of this Study are summarised below.

- Route 1 (total cost estimate of **£52.2 million**) has significant environmental impact in general but high environmental impact on River Blyth SSSI. Ground contamination risk and impact on flood risk are also high; however, it creates a new direct link opening up new regeneration sites in Northumberland.
- The viability of Route 2 (total cost estimate of **£21.8 million**) depends upon successful land acquisition from Persimmon / Wimpey development which could increase the cost substantially. The option has moderate environmental impact in general. The proposed new interchange to the A189 results in a sub-standard weaving length on the A189 between the existing junctions.
- The environmental impact of Route 3 is generally moderate (total cost estimate of **£19.7 million** but could be substantially increased by the land acquisition cost from Persimmon / Wimpey development as in Route 2). Route 3 maintains the weaving length on the A189 as existing.
- Route 4 (total cost estimate of **£20.2 million)** requires a number of adjacent properties to be demolished which will add to the total scheme cost. The visual, noise and air quality impact is considered to be high for the residents of properties adjacent to the proposed road bridge over the Ashington Blyth & Tyne (ABT) railway.
- Route 5 (total cost estimate of **£24 million)** has moderate to low environmental impact. The proposal is compatible with the ABT railway scheme, and the proposed new road bridge will reduce the train delays for ABT services and improve safety for road users.
- The proposed North South Route (total cost estimate of **£24.1 million)** should be built in conjunction with Routes 2, 3 and 5 if supported by the traffic modelling for the chosen route. This proposal creates a new north south link across Blyth which could potentially reduce traffic congestion on the A193 Rotary Way, and it complements the proposed ABT Newsham Railway Station. The environmental impact is considered to be moderate to low.

This Study concludes that the, Routes 2, 3 and 5 are to be taken forward to scheme appraisal with the option to include the North South Route if required.

The following additional studies are recommended:

- A full ecological survey to be undertaken for the preferred route and associated improvements. This would be the precursor to an environmental impact assessment if the preferred route is developed further.
- Full land ownership details should be established along the preferred route in order to determine requirements for compulsory acquisition of land and compensation, wayleaves and accommodation works.
- Detailed topographical survey.

1. Introduction

1.1. Introduction

Northumberland County Council Technical Services Design Section has been requested to prepare feasibility designs for five proposed route options for a new relief road to improve links between Blyth and the A189 Spine Road and to provide guidance to consultants to take forward three route options for scheme appraisal.

The need for the scheme stems from the increased traffic congestion and road safety issues on Cowpen Road which have been an ongoing concern for Northumberland County Council for a number of years. Several local traffic schemes have been carried out to improve traffic safety and junction capacity locally, but Blyth's ability to function as the North East Enterprise Zone on energy sector will need to be supported by reliable road infrastructure which will attract investors to Blyth which in return will generate employment and boost local economy.

A number of transport studies have been undertaken in the past including the "Blyth Transport Study" prepared by AECOM dated April 2015. This study highlights existing and potential future traffic problems within Blyth and identifies a range of short and long term options to mitigate the traffic congestion problems.

The Transport Study identifies a new relief road as a potential solution to improve north-south connectivity across Blyth as well as reducing the congestion along the A193 Cowpen Road. The Transport Study also recognises the potential environmental risks, engineering constraints and costs which will influence the viability of the relief road.

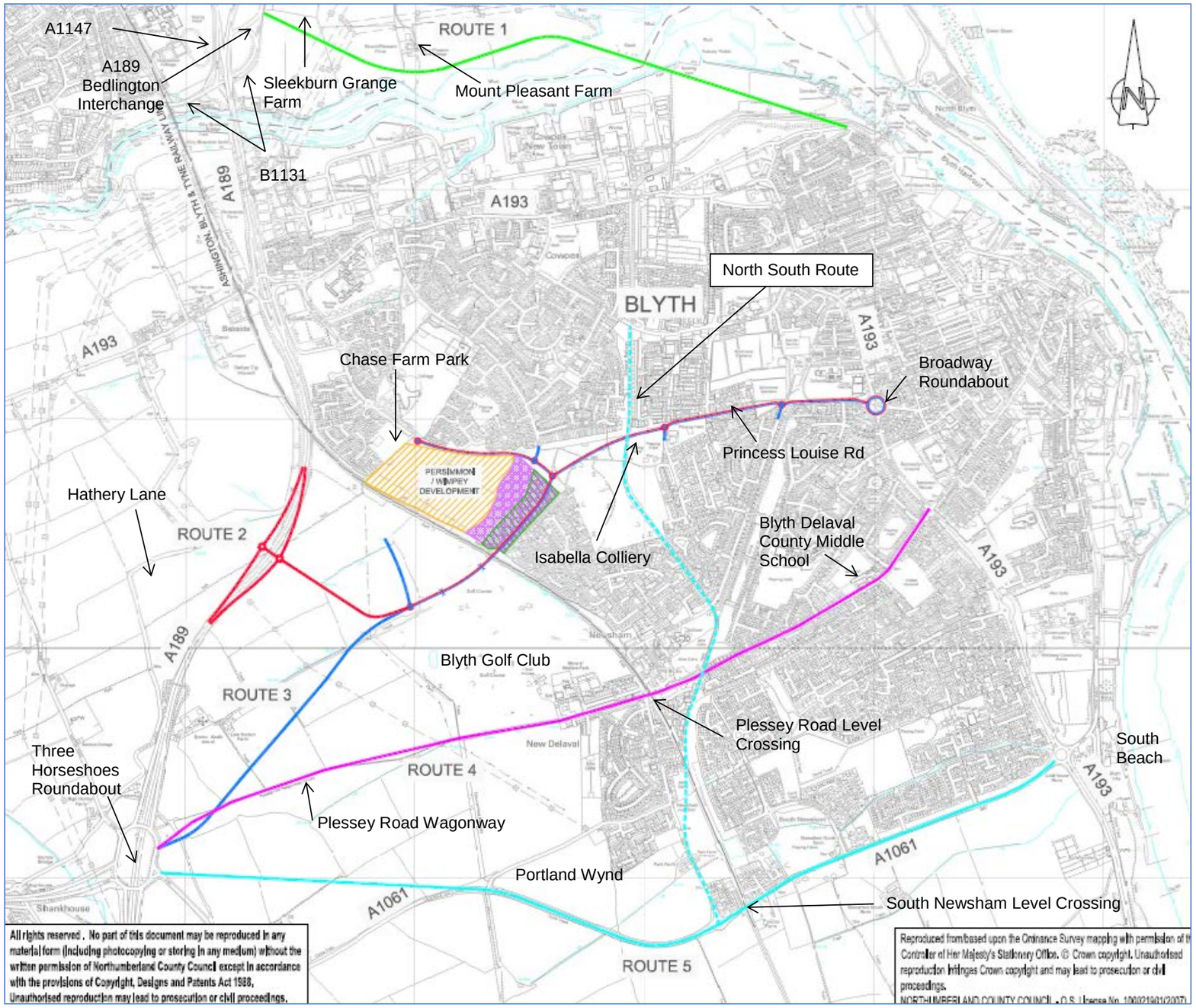
Following the Transport Study, five route options have been identified as outlined below. The North South Route was then added to provide a new arterial route in a north south direction.

The aim of this Feasibility Study is to provide a high level review on these six routes focusing on:

- Environmental risk;
- Engineering constraints;
- Buildability issues;
- Utilities; and
- Costs.

Three of these options will be identified to be taken forward to scheme appraisal.

Figure 1 – Site and Route Options



1.2. Report Structure

The following sections of the report are structured as follows:

- Chapter 2 – Existing Condition;
- Chapter 3 – Environmental Issues;
- Chapter 4 – Engineering Constraints;
- Chapter 5 – Utilities;
- Chapter 6 – Cost Estimates;
- Chapter 7 – Option Appraisal; and
- Chapter 8 – Summary and Conclusion

2. Existing Condition

A site visit was undertaken on 10 November 2016 to observe existing conditions on the strategic and local highway network which are considered to be relevant to the proposed routes.

2.1 Strategic Road

The A189 Spine Road runs in a north south direction, connecting Blyth to other conurbation areas in Northumberland and Newcastle. The A189 is located to the west perimeter of the study area, and is largely a dual carriageway. The section of the A189 to the north of Blyth reduces to a single carriageway at the A189 Woodhorn roundabout and at Quorum Business Park for the section to the south of Blyth. The A189 connects to the A19 at the Moor Farm Roundabout, allowing drivers to continue to the A1 and to the A19 Tyne Tunnels.

2.2 Local Highway Links

2.2.1 Princess Louise Road

Princess Louise Road is a single carriageway road to the west of the A193. The south side of the road is fronted by residential properties and Blyth Princess Louise County First School. St. Wilfrid's RC Primary School is located on the north side of the road. The road bends southwards and continues as Newsham Road; this section is fronted by residential properties on both sides of the road. The access road to Blyth Sports Centre is situated to the west of Princess Louise Road; it connects to Princess Louise Road and Newsham Road via a T-junction.

Princess Louise Road is separated from Ogle Drive by allotment gardens. There is a footpath running along the south side of the allotment gardens for pedestrians.

Ogle Drive is a single carriageway residential street which also serves Isabella Community Centre. A turning area is located at the end of Ogle Drive.

Figure 2 – Footpath beside the Allotment Gardens

2.2.2 Plessey Road

Plessey Road is a single carriageway and has a 30mph speed limit. The road serves the neighbouring residential areas, sport facilities, commercial properties and schools. The residential properties along the road have direct access to Plessey Road. On-street parking and kerbside bus stops also feature regularly along Plessey Road.

Figure 3 – Plessey Road

To the west of the B1523 Newcastle Road / Delaval Street junction, parked cars were observed on both sides of Plessey Street, narrowing the road sufficient to single lane flow only. The road continues for approximately 400 metres before terminating at the start of Plessey Road Wagonway.

Figure 4 – Plessey Road Wagonway

2.2.3 A1061

The A1061 Laverock Hall Road is a single carriageway road running in an east west direction along the southern perimeter of Blyth. The road is one of the two roads connecting Blyth to other conurbations in Northumberland and to Newcastle via the A189. The character of the road is split into two at the South Newsham B1523 / A1061 Roundabout. The section to the west of the roundabout is surrounded by agricultural land whist to the east the road is bounded by a mix of residential and commercial properties on the north side and agricultural land on the south side.

The Ashington Blyth & Tyne (ABT) railway intersects the road at South Newsham level crossing. There are barriers on both approaches, a signal box to the south of the A1061 and parking areas situated to the north and to the south of the A1061. There is also a bus stop adjacent to the entrance to the parking area to the south of the A1061.

Figure 5 – South Newsham Level Crossing

Figure 6 – Parking Area (South side)

Figure 7 – Signal Box

There is a continuous footway along the north side of the A1061 between the A1061 / South Newsham Road and the A1061 / A193 roundabout. Direct access from properties to the A1061 is largely restricted apart from a small number of properties which have direct access to the A1061 including Railway Cottages to the west of the level crossing.

The A1061 / Benbridge Park junction was upgraded to a roundabout recently to accommodate Portland Wynd housing development. The upgrade included a creation of a shared use path along the north side of the A1061 from the new roundabout to the east of the A189. Along the south side, a shared use path runs between the A1061 / Benbridge Park roundabout and the A1061 / Sandringham Drive traffic signal junction. After the Sandringham Drive traffic signal junction the path continuous as a cycle path which widens to a segregated cycle path at the approach to the A1061 / A193 roundabout.

Figure 8 – View to existing segregated cycle path at A1061 / A193 Roundabout Exit

Figure 9 – Existing Cycle Route along the A1061 South Newsham Road

2.2.4 Crawford Street

Crawford Street is a single carriageway road. The road is fronted largely by residential properties on the south side, and by industrial properties on the north side. The industrial properties are set back from the road by grass embankment.

2.3 Junctions

2.3.1 A189/ A1147 / B1331 Bedlington Junction

The A189 / Bedlington junction is a grade separated roundabout with restricted movement. The junction layout is broadly following a 4 – way, 2-level cyclic configuration with an adaptation to eliminate a direct link from the A189 southbound to the A1147; vehicles wishing to join the A1147 to Bedlington Station are required to use the B1331 then turn right onto the A1147 via a ghost island under the A189 flyover (see Figure 1).

2.3.2 A193 Broadway Circulatory / Princess Louise Road

The connection between the A193 and Princess Louise Road is provided via a large roundabout with approximately 90 metres inscribed circle diameter (ICD). The surrounding areas are largely commercial properties with some residential properties and a small grassed area. Echelon parking bays feature around the perimeter of the roundabout, providing parking areas for these properties.

The central island contains several mature trees, grassed areas and footpaths.

There are large splitter islands on each of the roundabout approaches providing a crossing facility for pedestrians and the necessary deflection for vehicles. No formal pedestrian crossing facilities have been provided to connect the refuge islands to the footpaths within the roundabout central island.

2.3.3 A193 Rotary Way / Plessey Road Roundabout

The A193 / Plessey Road Roundabout is a 4-arm normal roundabout connecting the residential areas to the A193 Rotary Way. The central island is domed, and there are wide splitter islands on all its approaches to provide crossing facilities for pedestrians.

2.3.4 A193 Links Road / A1061 South Newsham Road/ B1329 Links Road Roundabout

This junction is a 4-arm normal roundabout with an ICD of approximately 70 metres. Grass areas occupy all its four quadrants and its central island. The section of the A193 Links Road to the south of the roundabout is a dual carriageway. This roundabout also provides access to South Beach site and is part of National Cycle Network 1.

2.3.5 A189 / A192 Roundabout

The A189 / A192 roundabout, locally known as the Three Horseshoes roundabout, is a 5-arm grade separated roundabout. The roundabout is one of the two connections to Blyth from the A189 providing a route to Cramlington. The area surrounding the roundabout is largely agricultural land. The A192 East arm connects the A189 roundabout to the A1061 via another roundabout.

2.3.6 A192 / A1061 Roundabout

The A192 / A1061 roundabout is a 4-arm roundabout with an ICD of approximately 80metres. The roundabout provides an alternative link to Cramlington to the west as well as Seaton Delaval and New Hartley to the south east. To the east, the A1061 continues to South Newsham then to South Beach. The roundabout is surrounded by agricultural land.

3. Environmental Issue

3.1. Introduction

All of the proposed routes are anticipated to impact on the existing environment in Blyth and therefore a high level review was undertaken based upon the environmental data available at the time of writing, namely:

- Northumberland County Council GIS Database;
- Northumberland County Council Digital Maps;
- Defra MAGIC website; and
- The Environment Agency website.

Considering the data limitation available for this review, this review should be used as guidance only and should not be considered as a replacement for an Environmental Impact Assessment which would be required for this scheme.

Relevant maps have been extracted and are incorporated in the relevant sections below. An A3 size copy of the maps is included in Appendix B. A plan summarising locations of the environmental issues and the proposed routes is included in Appendix C.

3.2. Land Ownership

Acquisition of land from private landowners will be required for the entire length of Route 1 and for the proposed new junctions to the A189 and Crawford Street.

The existing road alignment would be largely retained for the online section of Route 2 but land acquisition is required for the new offline section and the proposed junctions to the A189. Land acquisition from Persimmon / Wimpey development is also required to cover the proposed offline section, which is approximately 450 metres long.

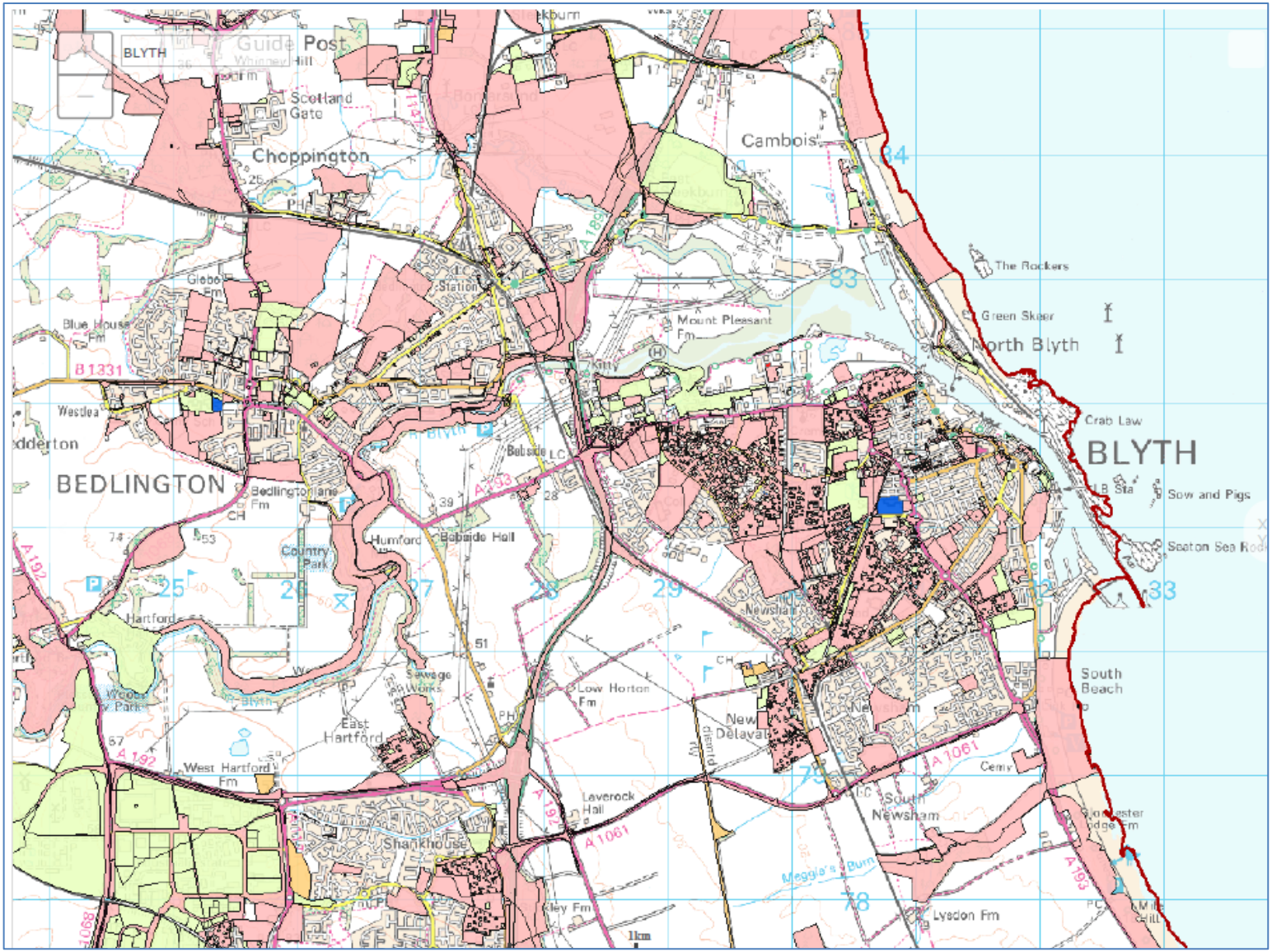
Route 3 requires similar land acquisition as Route 2.

The proposed Route 4 utilises the current alignment of Plessey Wagonway (bridleway). Acquisition of land from either side or both sides of the bridleway is required to accommodate the proposed offline section.

The proposed Route 5 requires land acquisition on parts of its length. The land ownership plan below shows areas along South Newsham Road which have been purchased and safeguarded for highway improvements. The reclamation site on the south side of South Newsham Road is also owned by the Council which could facilitate the land requirement for the proposed bridge over the Ashington Blyth & Tyne (ABT) railway line. Additional land acquisition from third parties is potentially required including the former Poultry Farm and railway car park for creating the road bridge and for the offline section from the A1061 Benbridge Park roundabout to the A1061 / A189 roundabout. This option also includes alterations to accommodate access to Laverock Hall and Laverock Hall Cottages, requiring further land acquisition from private landowner(s).

Network Rail owns the land on the route of the disused mineral railway line and therefore the proposed North South route requires land acquisition from Network Rail and potentially from private landowner(s).

Figure 10 – NCC Landownership



Source: NCC Digital Maps

3.3. Air Quality

The air pollution map covering the study area has been extracted from the Environment Agency as illustrated below.

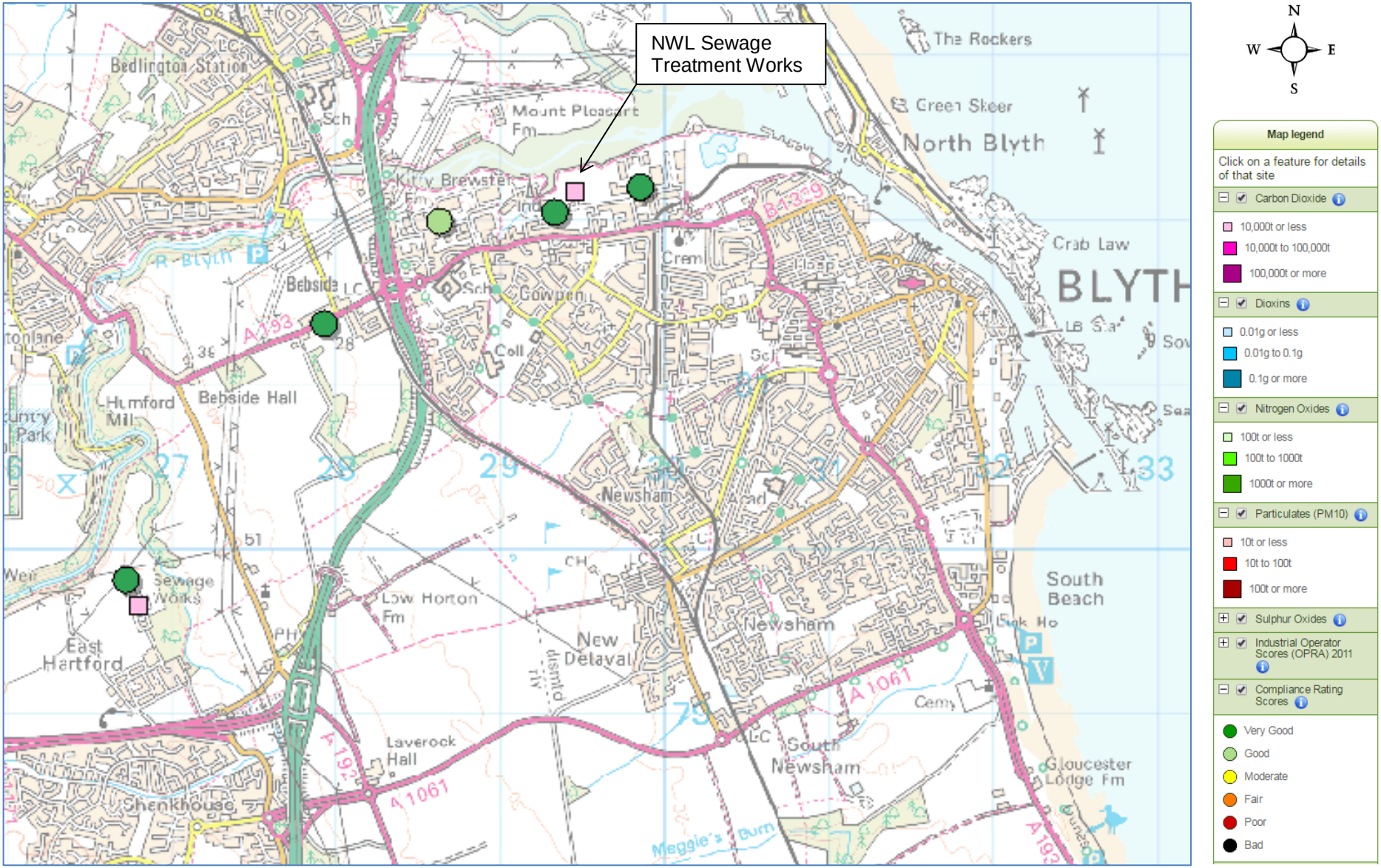
The plan shows that there are no Designated Sites within the study area. The nearby Northumbrian Water Limited (NWL) Sewage Treatment Works is recorded to emit 10,000t or less pollutant.

For the purpose of this study, the impact of each route on the air quality has been based upon the approximate number of properties within 50m of the road centre line and within 200m of the road centre line for each route.

Table 3.1: Air Quality – Number of Properties

Route	Number of properties within 50m	Number of properties within 200m
Route 1	60	300
Route 2	100	400
Route 3	140	400
Route 4	240	600
Route 5	90	500
North South Route	230	1500

Figure 11 – Air Pollution



Source: Downloaded from the Environment Agency

3.4. Cultural Heritage

Three listed buildings are identified within the study area:

- Low Horton Farm House – Grade II listed;
- War Memorial in Miners Welfare Park – Grade II listed; and
- Gate Pier at entrance to Link House Farm – Grade II listed.

Low Horton Farm House is located adjacent to Route 3; the War Memorial is adjacent to Route 4 and the Link House Farm is adjacent to the A193 / A1061 roundabout for Route 5 option. However, none of these buildings would be directly affected by any of the proposed routes (see Appendix C).

3.5. Nature Conservation

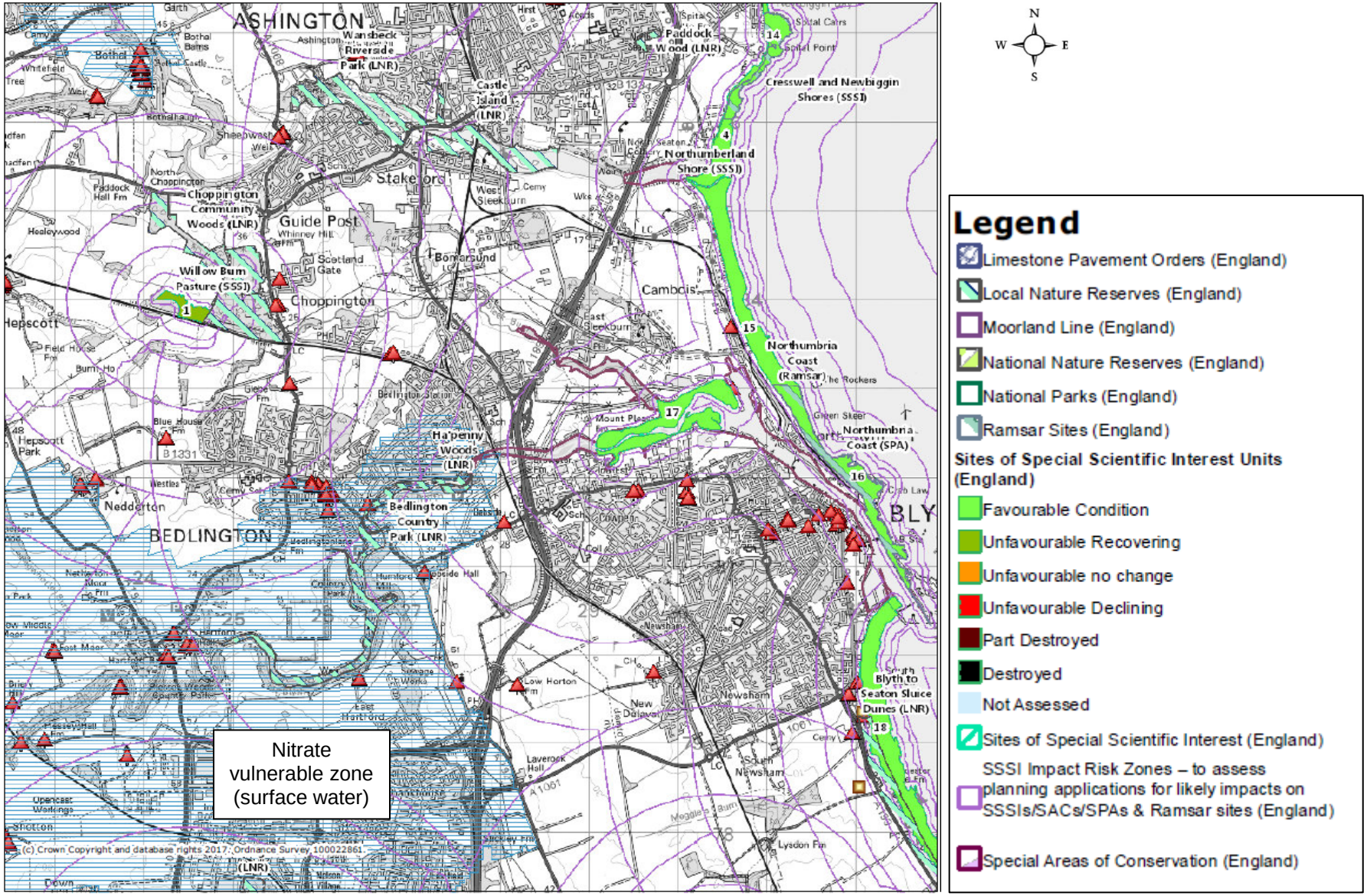
3.5.1. Land Based Designations

Blyth Estuary is part of Northumberland Shore Sites of Specific Scientific Interest (SSSI). The area provides wintering grounds for shore birds. Blyth Pier and the estuarine areas of the site are regularly supporting over 250 bird species including international and national significant redshank and golden plover.

The Estuary will be directly affected by the proposed Route 1 during its construction and throughout its use.

The area to the southwest of the study area is identified as Nitrate Vulnerable Zone (surface water) and therefore has higher risk from agriculture nitrate pollution. The proposed junctions for Routes 3, 4 and 5 are located near or within this zone therefore care must be taken during site clearance and waste disposal to reduce migration or wider contamination of nitrate.

Figure 12 – Land Designation

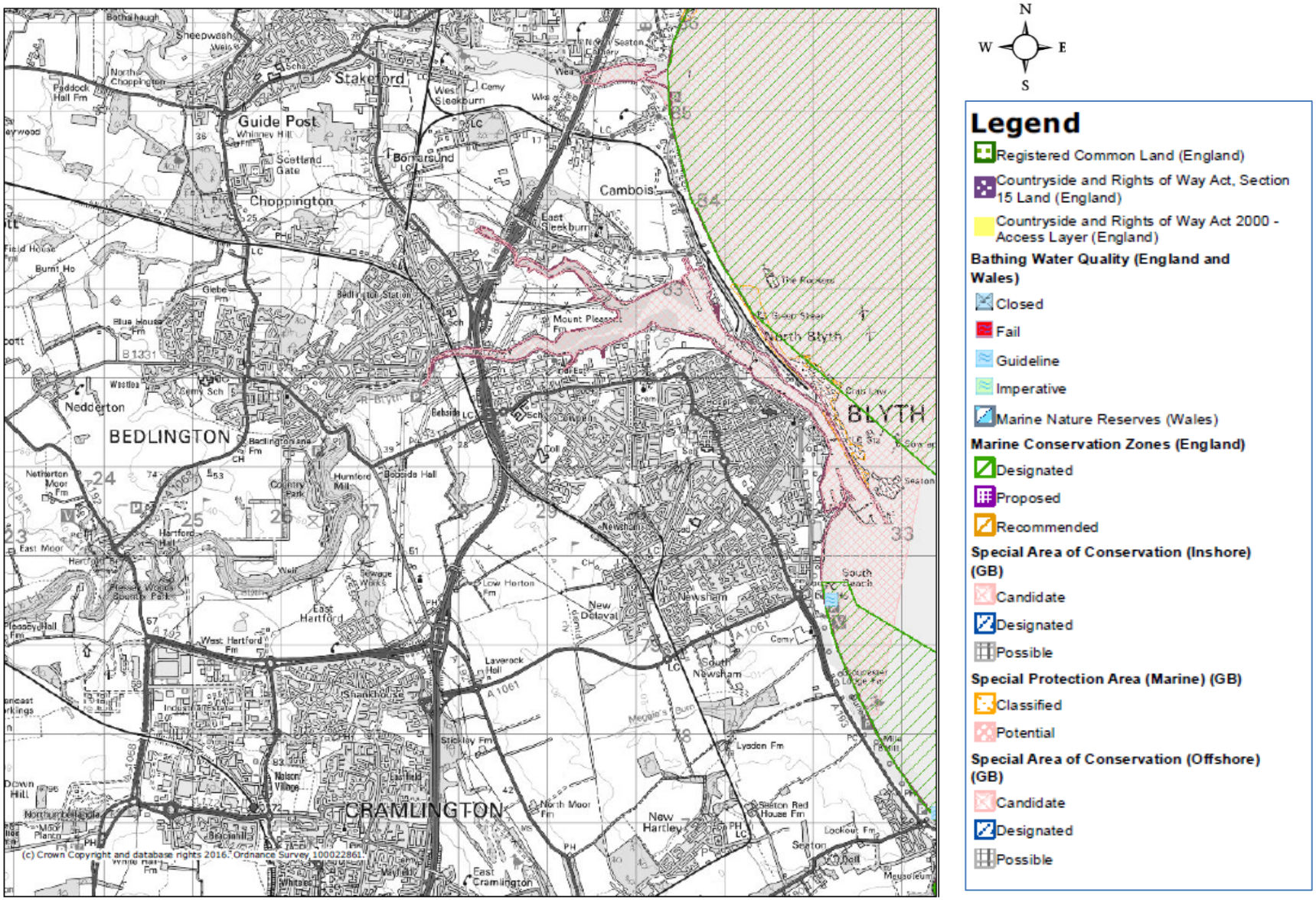


Source: Downloaded from magic.defra.co.uk

3.5.2. Marine Designations

Blyth Estuary is part of Northumberland Marine potential Special Protection Area (pSPA), and has been identified as a candidate for Special Area of Conservation for inshore and offshore categories as shown below. The Estuary is used as foraging area for Sandwich Terns from Coquet Island which will be affected if Route 1 is chosen.

Figure 13 – Marine



Source: Downloaded from magic.defra.co.uk

3.6. Ecology

3.6.1. Habitats

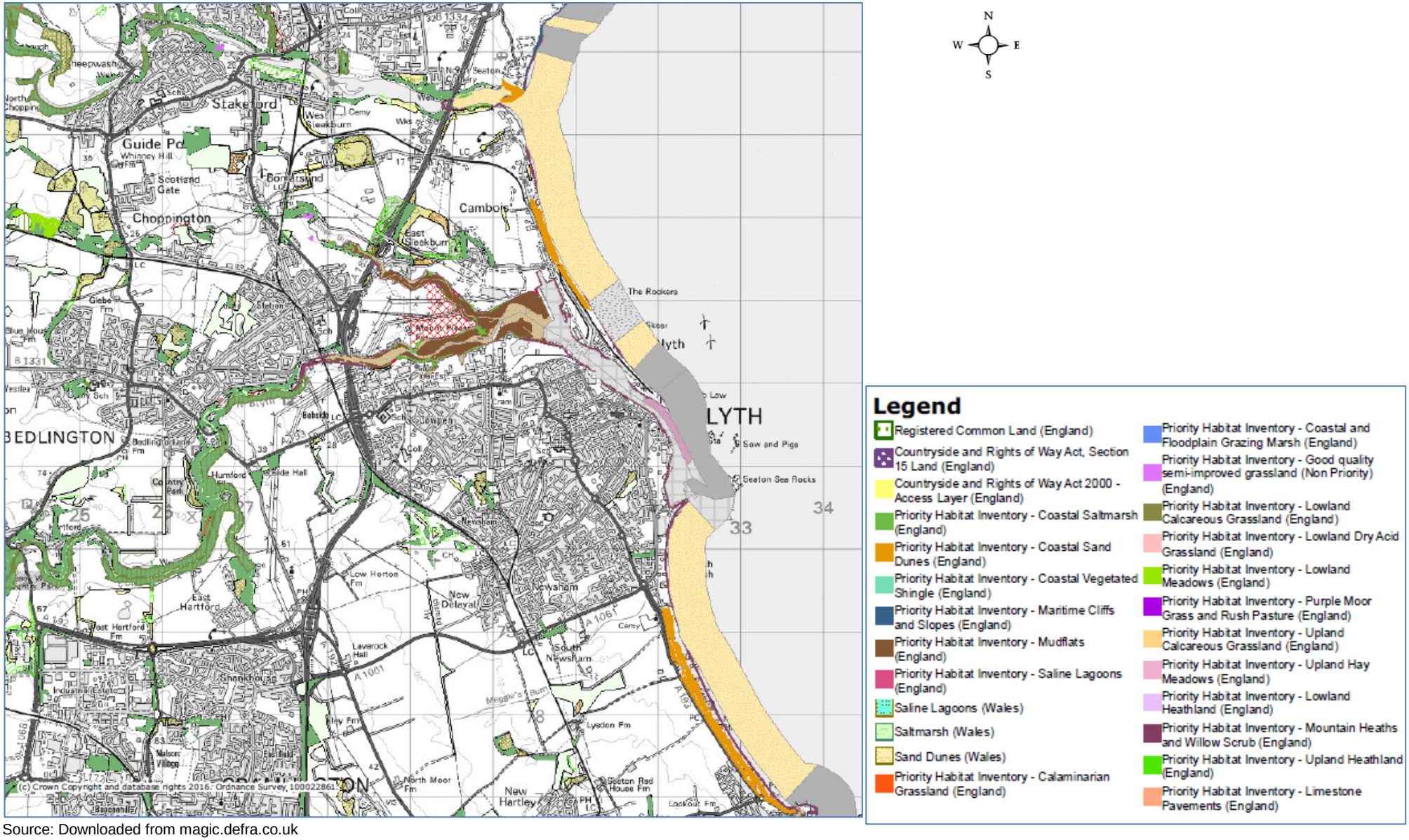
The mudflats of the Blyth Estuary are identified as Priority Habitat Inventory and intertidal substrate foreshore. The creation and operational of Route Option1 will have a detrimental impact on this important coastal and marine habitat.

Several localised woodland areas are identified within the study area. Route 2 will impact on the woodland area along the A189, within Blyth Golf Club and around the disused mineral railway line.

Route 3 will impact on the woodland within Blyth Golf Club and around the disused mineral railway line.

Route 5 will impact the deciduous woodland east of Poultry Farm, and the proposed North South Route will impact on the woodland area within the disused mineral railway line near Isabella Community Centre.

Figure 14 – Habitats



Source: Downloaded from magic.defra.co.uk

3.6.2. Species

Three arable assemblage farmland birds are identified within the study area including Grey Partridge, Lapwing and Tree Sparrow.

Bats are also identified adjacent to Route 4, at or near Blyth Delaval County Middle School. However the existing road alignment is to be retained at this section, so the impact is likely to be marginal.

3.7. Landscape

3.7.1. Land Use

The site is well within the conurbation area of Blyth. The built-up area concentrates at the east side of the ABT railway line towards the coast. Outside the urban and suburban areas, the land use is mainly arable and agriculture.

The National Planning Policy Framework (NPPF) paragraph 112 sets out a requirement for local planning authorities to take into account the economic and other benefits of the best and most versatile agricultural land. Consequently, local planning authorities should seek to use areas of poorer land quality, in preference to that of a higher quality, for development.

Natural England uses the Agricultural Land Classification (ALC) system as a framework to classify land into five grades (Grade 1 to 5). Grade 3 has been subdivided into Subgrades 3a and 3b. Grades 1, 2 and 3a represent the best and most versatile land. Grade 3b is moderate, Grade 4 is poor and Grade 5 is very poor.

The ALC score within the study area ranges from Grade 3b to 4 and 5 and therefore is suitable for development.

3.7.2. Marine

Special Areas of Conservation (SAC) sites are strictly protected sites designated under the EC Habitats Directive, and River Blyth has been listed for its estuary. The Estuary is also listed in the “Water Framework Directive (WFD): Clearing the Waters for All” as WFD Estuarine and Coaster Water Bodies and WFD Habitats Lower Sensitivity.

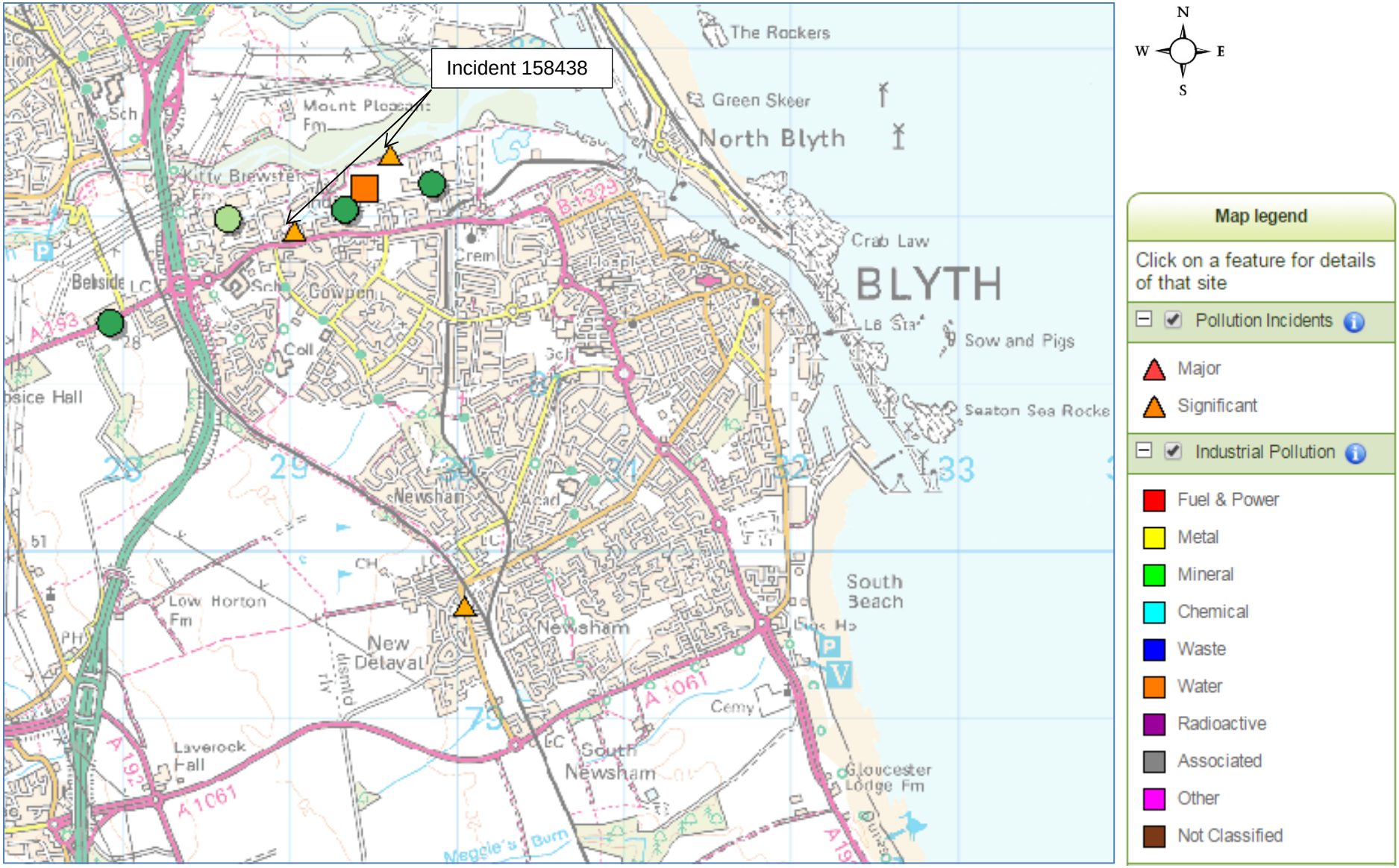
3.8. Ground Conditions

For the purpose of this study, the risk of contaminated land has been assessed based upon the distance of the proposed routes from the recorded pollutant incidents or contaminated land sites.

3.8.1. Pollutant Incidents

Records of pollutant incidents within the study area have been extracted from the Environment Agency maps as illustrated below.

Figure 15 – Pollutant Incidents



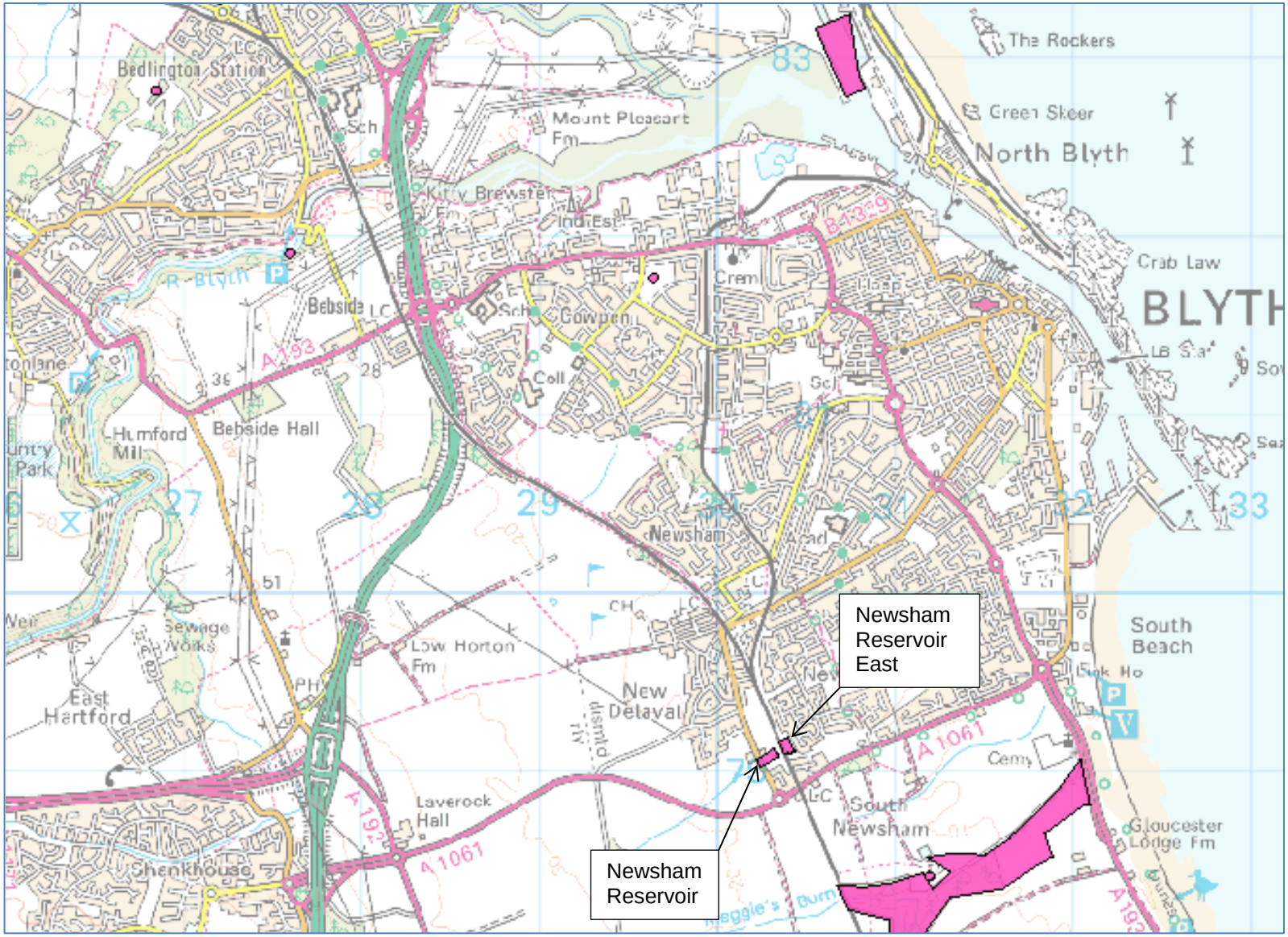
Source: Downloaded from the Environment Agency

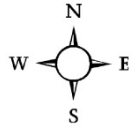
One notable incident was recorded at the proximity of Route 1 which could be affected by the proposed route. The incident number 158438 records an incident of oils and fuel spillage on 15 May 2003. The impact of this incident on the soil quality is recorded as minor but significant impact to the water ecosystem. The incident is recorded to have no impacts to the air quality.

3.8.2. Landfill

The Environment Agency map records locations of authorised landfill, historic landfill and mining waste sites. Newsham Reservoir is recorded as landfill from 1977 until 1993 and Newham Reservoir East from 1982 to 1983; both sites accepting inert and commercial waste. This sites are located near the proposed North South route so might present a ground contamination risk.

Figure 16 – Recorded Landfill





Map legend

Click on a feature for details of that site

- Authorised Landfill
- Site boundary
- Historic landfill
- Site boundary
- Mining Waste
- Closed Mining Waste Sites
- Other national environmental organisations
- Natural Resources Wales Area of responsibility
- Scottish Environment Protection Agency Area of responsibility

Source: Downloaded from the Environment Agency

3.8.3. Sewage Treatment Works

The proposed Route 1 is to be located near the existing Northumbrian Water Limited sewage treatment works. Potentially some or all of the treatment tanks would need to be removed or altered. Given the function of these tanks any alterations or works affecting them would increase risk of contamination which needs to be isolated and treated before the spoils can be safely disposed.

3.9. Noise and Vibration

People who own and occupy property that has been reduced in value by more than £50 by physical factors caused by the use of a new or altered road can claim for compensation under Part I of the Land Compensation Act 1973. These physical factors include noise and vibration.

For the purpose of this study sensitive receptors are defined as those within 50metres of the new or altered road. Beyond 200 metres the noise effects are deemed to be marginal and therefore the noise impact assessment from the proposed routes is considered to be relevant only for properties within 200 metres of the proposed routes as summarised below.

Table 3.2: Noise – Number of Properties

Route	Number of properties within 200m (approximate)
Route 1	300
Route 2	400
Route 3	400
Route 4	600
Route 5	500
North South Route	1500

3.10. Public Rights of Way

There is an existing footpath (reference 600/057) situated to the north of Mount Pleasant Farm, running in an east west direction towards River Blyth. Two other footpaths (reference 300/008 and 300/107) are running along the south side of River Blyth, providing a riverside route from Cowpen New Town to Blyth Harbour. The proposed Route 1 connects the footpath on the north side with the one on the south side of River Blyth. The creation of the offline route to Crawford Road will also improve the connection to the conurbation along the harbour side of Blyth, opening up the land to the east of the A189 which is currently occupied by Sleekburn Grange Farm and Mount Pleasant Farm.

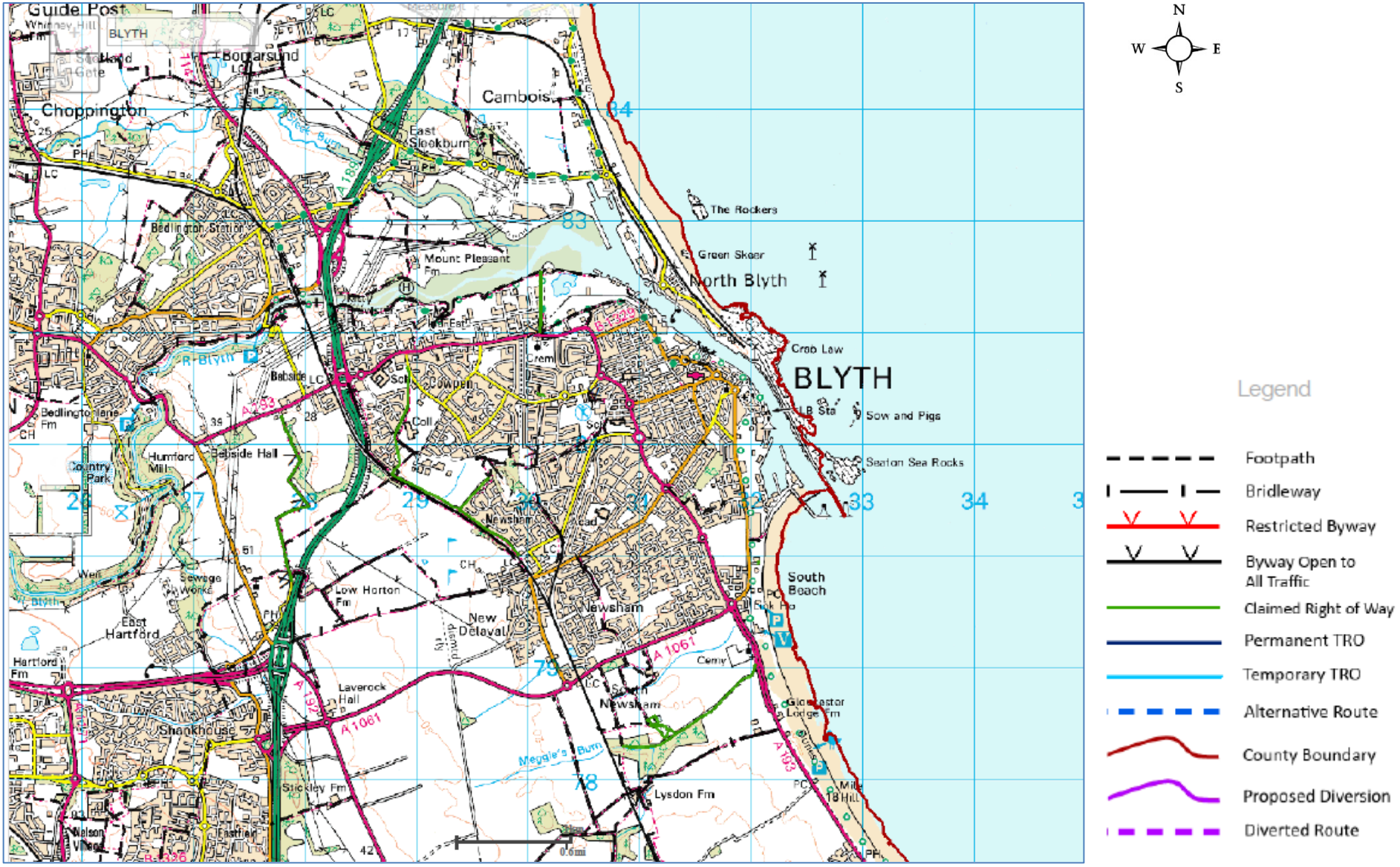
There is an existing footpath (reference 300/013) recorded across the A189 providing a connection between Hathery Lane and Chase Farm Park. A footpath (reference 300/022) is also recorded running along the northern perimeter of Blyth Golf Club. All of these footpaths appear to be disused and gradually become disconnected. Routes 2 and 3 propose a creation of a new link which includes a shared use path to reconnect the area to the south west of the ABT railway line to the area to the north east of the ABT line. Route 2 provides a further connection to Hathery Lane, whilst the proposed Route 3 connects to East Hartford via the A189 Three Horseshoes Roundabout.

The proposed Route 4 includes a creation of a 3-metre shared use path on each side of the new link road to replace the existing Plessey Wagonway. This proposal retains the provision of an east-west route. Provision of crossing facilities will be required to mitigate disconnection to Low Horton Farm footpath (reference 300/040); the design of this crossing facility will be carried out at a later design stage.

The creation of shared use path on both sides of the proposed Route 5 would improve the existing cycling and walking route along the road which are not consistent and disjointed presently. The proposed shared use path would also improve accessibility to the future ABT railway station for pedestrians and cyclists.

The North-South Road option removes the community severance from the disused mineral railway. This proposed option includes a creation of a 3-metre shared use path on each side of the new link road which would enhance the walking and cycling routes within Blyth.

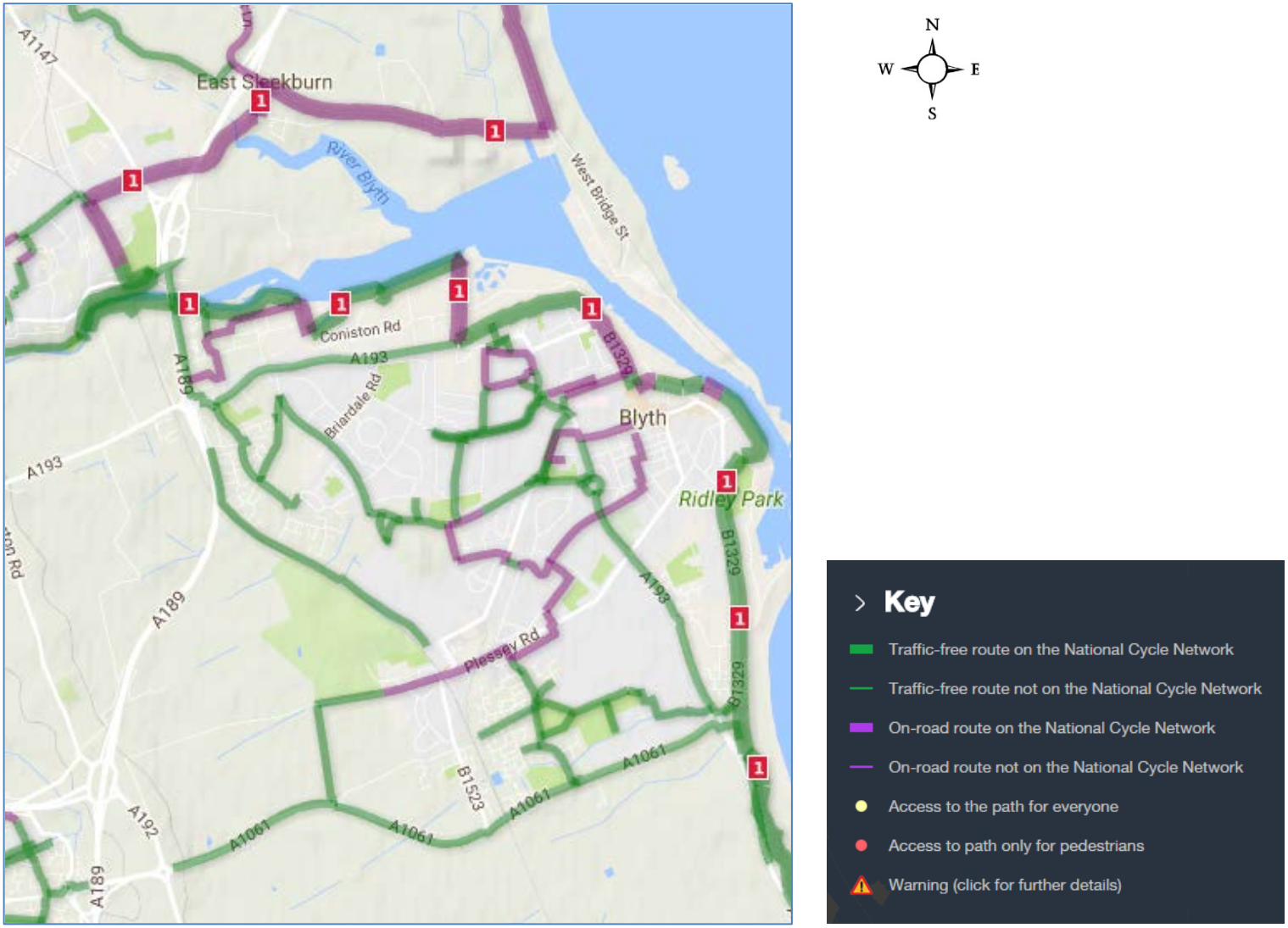
Figure 17 –Public Right of Way



Source: NCC Digital Maps

A map of cycling routes in the study area has been extracted from Sustrans' website as given below.

Figure 18 –Cycle Routes



Source: Downloaded from www.sustrans.org.uk

In terms of public rights of way, all of the five proposed options are considered to provide positive impact on public rights of way and cycle routes.

3.11. Flooding

Flood maps have been downloaded from the Environment Agency. The risk of flooding of the natural flood plain if there were no flood defences is categorised into three Flood Zones, which are:

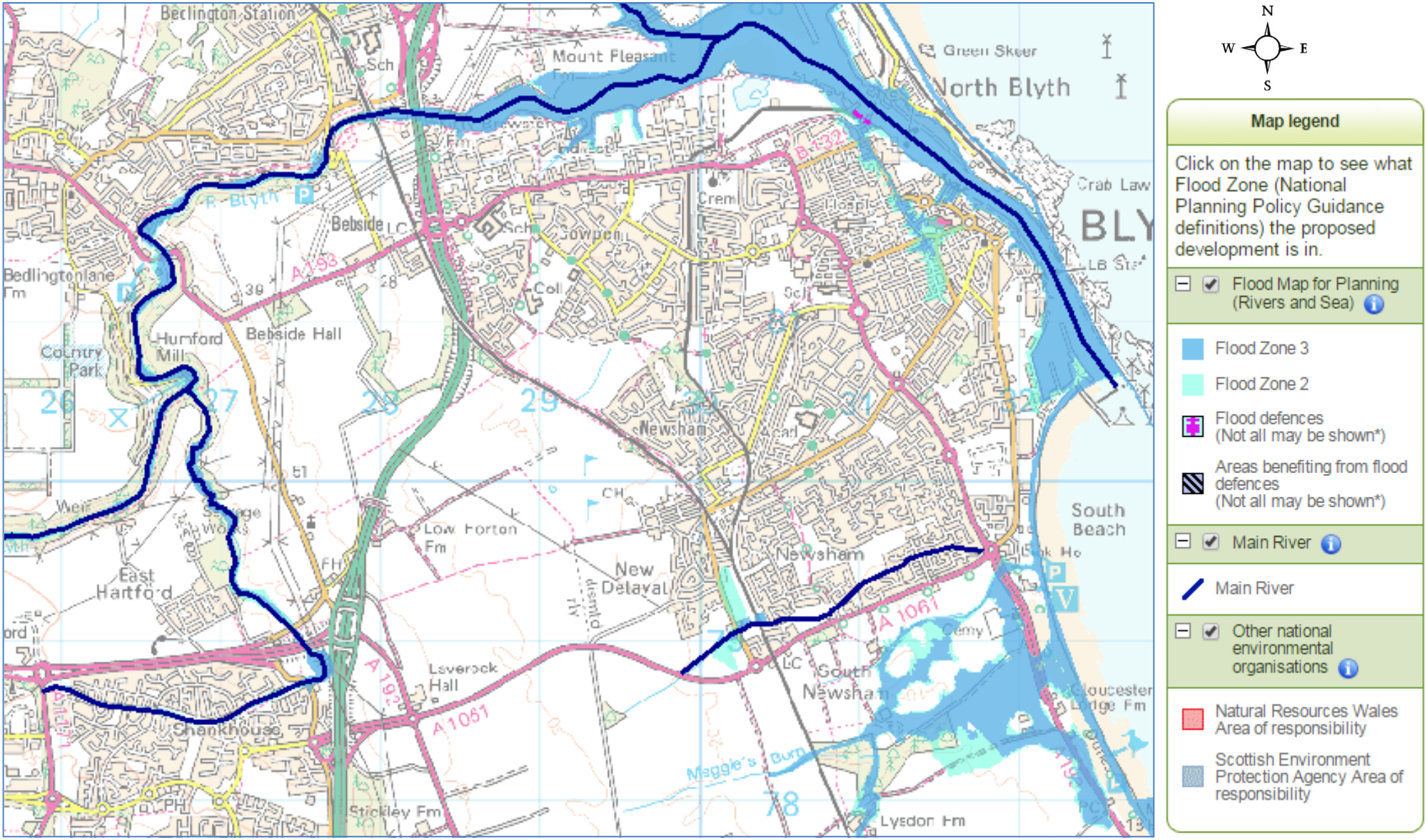
- Flood Zone 3 shows areas that could be flooded, if there were no flood defences:
  - From the sea with a 0.5 per cent (1 in 200) or greater chance of happening each year;
  - Or from a river with a 1 per cent (1 in 100) or greater chance of happening each year.
- Flood Zone 2 shows the additional extent of an extreme flood from rivers or the sea, such as a major flood , with up to a 0.1 per cent (1 in 1000) chance of occurring each year.
- Flood Zone 1 shows the area where flooding from rivers and the sea is very unlikely and there is less than a 0.1 per cent (1 in 1000) chance of flooding occurring each year.

The flood map covering the study area and how each of the proposed routes would affect the flood plain are discussed below.

3.11.1. Rivers and Sea

Naturally, the proposed Route 1 is likely to have the most impact on the flood plain due to its close proximity to River Blyth. Whilst the Flood Zone 3 area is largely covering the area along and near the river bank, the Flood Zone 3 area is shown extended to Crawford Street and the B1329. The proposed Route 1 requires a bridge over River Blyth to tie in to existing road network. The proposed route would potentially create additional surface water run off which would exacerbate the flood risk on Crawford Street and its neighbouring area.

Figure 19 –Flood Map (Rivers and Sea)



Source: Downloaded from the Environment Agency

The proposed Routes 2, 3 and 4 are within the Flood Zone 1 where there risk of flooding from rivers and sea is low and therefore the impact from these routes is likely to be marginal.

There are areas identified as Flood Zones 2 and 3 to the south of the A1061. As the proposed Route 5 is largely following the existing road alignments of the A1061, the increase of non-permeable area created from the upgrade to a dual carriageway could potentially increase the flood risk of the flood plain.

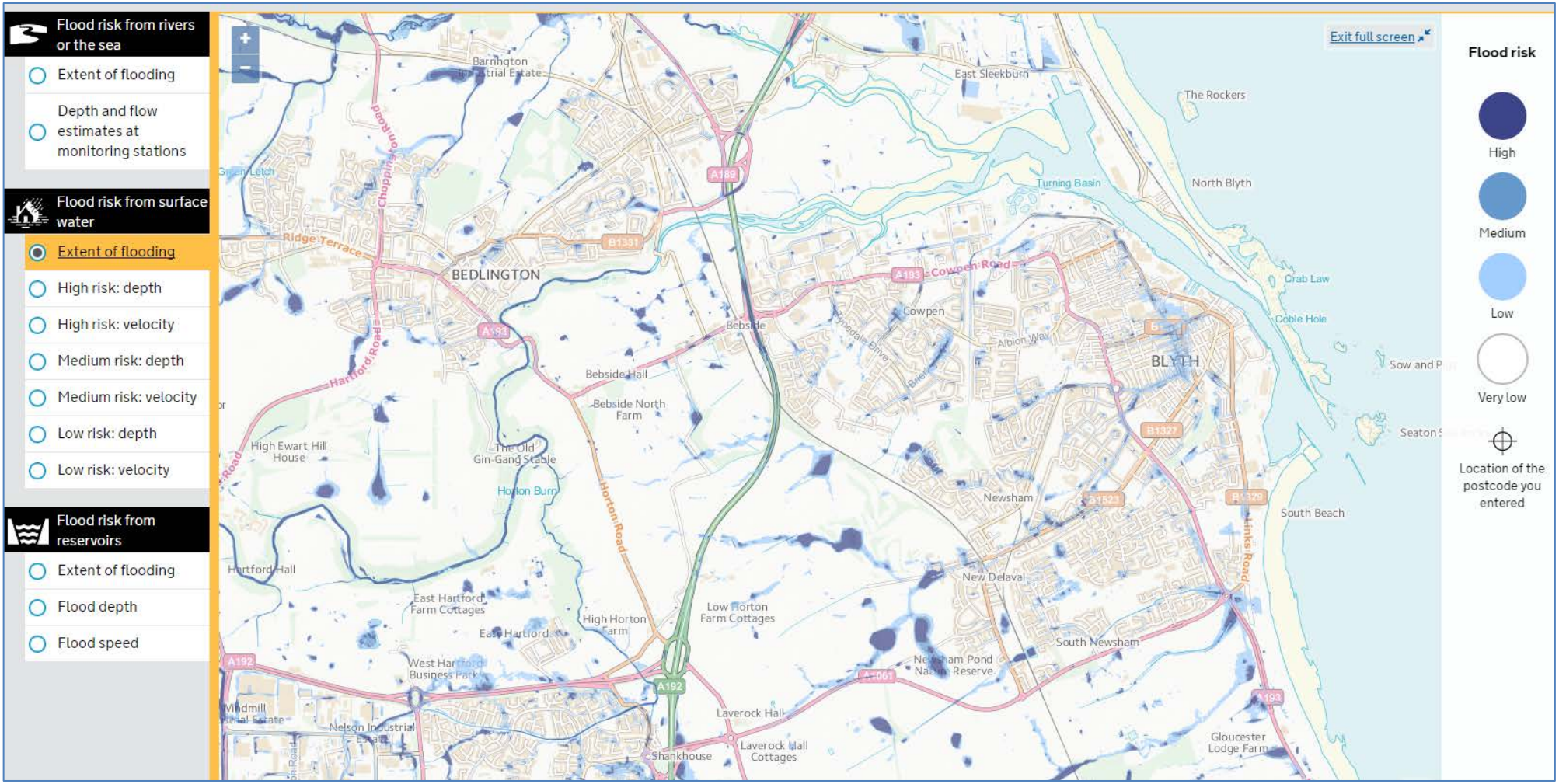
The creation of non-permeable area resulting from the proposed North South Route could potentially increase the flood risk of the localised flood plain to the east of South Newsham Road.

3.11.2. Surface Water

Surface water (pluvial) flooding is caused by prolonged heavy downpours when the ground is already saturated and the increase in surface water is above the volume with which the drains and sewers could cope. Surface water flooding are becoming more common in urban areas where green fields are replaced by non-permeable areas so the rainwater flows straight into the drainage system rather than soaking away into the ground.

The map of areas with surface water risks within the study area is given below.

Figure 20 –Flood Map (Surface Water)



Source: Downloaded from the Environment Agency

There are several localised medium to high risk flood risk area identified around the proposed Route 1. The flood depth is recorded to be below 900mm except for the A189 on-slip which is over 900mm. As previously discussed, the proposed Route 1 is also located near the flood plain for river and sea and therefore the impact from this proposed route on flooding is anticipated to be significant.

The proposed Routes 2 and 3 could potentially increase the surface water flood risk around Blyth Golf Course and Low Horton Farm which have been identified to have localised medium to high flood risk. The flood depth is recorded to be more than 900mm at its deepest.

Localised high flood risk areas with flood depth of more than 900mm are also identified within the area to the south of Plessey Road and to the north of the A1061 which would be affected by the proposed Route 4.

The proposed Route 5 is near the identified flood risk area to the north of the existing A1061. Further medium to high flood risks areas are also identified on Sandringham Drive, Newsham North Farm and Newsham South Farm. There is a substantial flood risk area identified at and around the A1061 South Newsham Rd / A193 Rotary Way roundabout which could potentially affected by the proposed Route 5.

The proposed North South Route is utilising the disused mineral railway line which is identified to be a surface water flood risk area. Three further flood risk areas are located at its junction with Plessey Road, near the junction with the ABT line (Newsham Junction) and at Park Farm Cottages.

There are several localised high and medium flood risk areas within the study area. All of the proposed routes could have an impact on the flood risk and could potentially exacerbate the surface water flooding. The Blyth Relief Road scheme could potentially create an opportunity to review and implement a strategy for surface water management within the study area which would address the ongoing flooding issue as well as mitigating the impact from any of the proposed routes.

3.12. Geology and Soils

The site is largely underlain by slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils. The main surface texture is classified and loamy, and fertility is defined as moderate. The soil is likely to have low permeability.

4. Engineering Constraints

This chapter outlines the design parameters and assumptions which have been made in preparing the initial design of the proposed routes. It also discusses buildability issues which is part of the high level qualitative assessment in Chapter 6.

The scheme option layouts and typical cross sections are included in Appendix A.

4.1. Design Parameters

The initial horizontal and vertical alignments of the proposed routes have been developed in accordance with the relevant standards in the Design Manual for Roads and Bridges (DMRB) including:

- TA 79/99: Traffic Capacity of Urban Roads;
- TD 9/93: Highway Link Design;
- TD 27/05: Cross Sections and Headrooms;
- TD 16/07: Geometric Design of Roundabouts;
- TD 42/95: Geometric Design of Major/ Minor Priority Junctions; and
- TD 39/94: The Design of Major Interchanges

4.1.1. Highway Link

The study area is a mix of urban and suburban areas. The main conurbation of Blyth occupies the area between the east of the ABT railway and Northumberland Coast whist the area between the west of the ABT railway and the A189 is largely agricultural land.

The proposed Routes 2, 3, 4 and 5 are located within both urban and suburban areas. The urban section of the Routes 2 and 3 is carrying local traffic with direct frontage to houses, shops and businesses. This section falls within the Urban All-Purpose (UAP) category 4 in TA79/99 where the recommended speed limit is 30mph. The section within the suburban area will have limited direct frontage and accesses and therefore a high standard single carriageway can be provided within this section (i.e. UAP1). A recommended 40mph speed limit would be suitable for this section.

The proposed Route 5 also serves both urban and suburban areas although direct access to the A1061 is already limited. On this basis, it is considered that the whole section of the Route 5 can be designed as a high standard dual carriageway (UAP1) and a speed limit of 40mph or 50mph would be suitable subject to meeting the land constraints.

The North South route is located well within the urban area. Although direct access to the proposed route is limited, the alignments of this route are restricted by the space available within the existing railway land and by the existing levels of its surrounding properties and roads. Considering these limitations, it is considered that UAP4 category is more suited to this route, allowing it to provide a good connectivity for local traffic and for pedestrians and cyclists.

The proposed Route 1 is within agricultural and industrial land and therefore fits well into the UAP1 category. The route is proposed to tie in to Crawford Street which also serves the nearby residential areas. It is considered that a high standard singe carriageway would be more suitable for this route. A speed limit of 40mph is considered to be suitable to meet the land constraints.

The definition of urban road types has been extracted from TA79/99 and is given below.

Figure 21 –Urban Road Types

Feature	ROAD TYPE				
	Urban Motorway	Urban All-purpose			
	UM	UAP1	UAP2	UAP3	UAP4
General Description	Through route with grade separated junctions, hardshoulders or hardstrips, and motorway restrictions.	High standard single/dual carriageway road carrying predominantly through traffic with limited access.	Good standard single/dual carriageway road with frontage access and more than two side roads per km.	Variable standard road carrying mixed traffic with frontage access, side roads, bus stops and at-grade pedestrian crossings.	Busy high street carrying predominantly local traffic with frontage activity including loading and unloading.
Speed Limit	60mph or less	40 to 60 mph for dual, & generally 40mph for single carriageway	Generally 40 mph	30 mph to 40 mph	30mph
Side Roads	None	0 to 2 per km	more than 2 per km	more than 2 per km	more than 2 per km
Access to roadside development	None. Grade separated for major only.	limited access	access to residential properties	frontage access	unlimited access to houses, shops & businesses
Parking and loading	none	restricted	restricted	unrestricted	unrestricted
Pedestrian crossings	grade separated	mostly grade separated	some at-grade	some at-grade	frequent at-grade
Bus stops	none	in lay-bys	at kerbside	at kerbside	at kerbside

Source: TA 79/99

A summary of proposed link geometries including speed limits is given below.

Table 4.1: Proposed Route Geometry and Speed

Route		Link Geometry	Speed Limit (mph)	Design Speed (kph)
Route 1		7.3m single carriageway 1m verge 3m shared use path	40	70A
Route 2	Online	Existing	30	60B
	Offline	7.3m single carriageway 3m shared use path (south side) 2m verge (north side)	40	70A
Route 3	Offline	7.3m single carriageway 3m shared use path (south side) 2m verge (north side)	40	70A
Route 4	Online	Existing	30	60B
	Offline	7.3m single carriageway 1m verge 3m shared use path	40	70A
Route 5	Online and Road Bridge	7.3m dual carriageway 1m verge 1.8m central island 3m shared use path	30	60B
	Offline	7.3m dual carriageway 1m verge 1.8m central island 3m shared use path	40 or 50mph	70A or 85A
North South Road		6.75m single carriageway 3m shared use path	40	70B

4.1.2. Headroom

Routes 2, 3, 4, 5 and North South Link cross the existing Ashington Blyth & Tyne (ABT) railway line. It is anticipated that new bridges / underpasses would be required to replace the existing level crossing. Any proposed works impacting on the ABT line will require approval from Network Rail and will have to comply with Network Rail standard NR/L2/CIV/003; engineering Assurance of Building and Civil Engineering Works.

For the purpose of this study, the proposed design uses 5.3m headroom clearance to the soffit, or 6.3metres measured from the top of the track to the finished road surface on the bridge deck or from the finished road surface to the railway structure for an underpass. The bridge spans range from 14 metres to over 400 metres (Route 1).

4.1.3. Junctions

New junctions or alterations of existing junctions are required to connect the proposed link roads to the existing roads.

For the purpose of this study the new or altered junctions have been designed as follows.

- All new roundabouts for single carriageway road have at least 30metres Inscribed Circle Diameter (ICD);
- Where the new roundabouts connecting dual carriageway, the minimum ICD is 40metres;
- A new T-junction has been proposed to tie Routes 3 and 4 in with the existing A189 Three Horseshoes Roundabout. This proposal requires the speed limit to be reduced to 30mph at the roundabout approaches to provide the required visibility;
- The North South Road has been designed as a single carriageway. Where the route intersects with existing single carriageway roads, the junctions have been designed as roundabouts with at least a 30m ICD.
- A new traffic signal junction has been designed to connect the proposed North South Route to Plessey Road.

It should be noted that the above proposed dimensions are subject to traffic modelling to ensure the proposed junctions have the capacity to accommodate current and future traffic demand. At the time of writing traffic surveys were completed and were being validated for developing the appropriate traffic models.

The scheme layout is included in Appendix A.

4.2. Buildability

4.2.1. Route 1

At the A189 Bedlington Interchange, a new arm is to be added to provide a connection from Route 1. The new junction will need to maintain access to the A189 for the existing A1147 and B1331 as well as accommodating movements from Route 1 to the A189, A1147 and B1331. Ideally the new junction will need to be located approximately at the midpoint between the A189 southbound diverge slip and merge slip roads to meet the visibility requirements from the diverge slip road and from Route 1. For the purpose of this study, the new junction has been shown as an additional arm of the Interchange so further design is required if Route 1 is selected for scheme appraisal.

Given that the layout of the Interchange is already complex, an additional arm or junction would make its configuration even more complex. This could potentially have impact on road safety. Existing levels at the proposed location for the new roundabout are relatively similar to those on the circulatory area of the interchange and therefore are not considered to be an issue.

Route 1 also requires a new crossing over the River Blyth for approximately 400 metres long. The span is likely to require the bridge to be a cable stayed suspension type which is significantly more in capital costs than a standard concrete road bridge. The bridge also requires bridge piers in River Blyth Estuary SSSI which will have high environmental impact.

The southern section of Route 1 is close to the existing Northumbrian Water Limited (NWL) Sewage Treatment site, and it might require land from NWL. Considering the use of this site, ground contamination is anticipated and need to be addressed during the removal of the existing sewage treatment areas. Specialist advice is required to identify appropriate mitigation measures to isolate and manage the ground contamination risks.

4.2.2. Route 2

The main buildability issue for this proposed route is land. This proposal includes a creation of a short section of a single carriageway within an existing allotment site which will be covered under the Allotment Act 1950.

The Allotments Act 1950 restated the requirement for local authorities to provide allotments. This Act however does not prohibit Councils to build on allotment land if alternative sites are provided.

> *'Where a local authority has purchased (or appropriated) land for use as allotments the local authority shall not sell, appropriate, use, or dispose of the land for any purpose other than use for allotments without the consent of the Secretary of State for the Environment and such consent (may be given unconditionally or subject to such conditions as the Secretary of State thinks fit, but) shall not be given unless the Secretary of State is satisfied that adequate provision will be made for allotment holders displaced by the action of the local authority or that such provision is unnecessary or not reasonably practicable.*
>
> *[Section 8 of the Allotments Act 1925]*

Approximately 4 hectares of land is required from the parcel of land currently owned by Persimmon / Wimpey for the road corridor.

A new road bridge or underpass is required to facilitate the new road across the ABT line. The viability of the new bridge or underpass is dependent upon the land negotiations with Persimmon as well as the landowner of the agricultural land to the south of the ABT line.

The layout of the proposed interchange to connect Route 2 to the A189 is considered to be simple. The nearby area is relatively flat and at grade with the A189 therefore no buildability issues are anticipated. The introduction of a new interchange on the A189 results in a sub-standard weaving length between the existing A189 junctions; the weaving length is reduced to less than one kilometre, which is the recommended minimum weaving length (TD22/06). A road bridge is also required over the A189 to allow access to and from the A189 northbound.

4.2.3. Route 3

Route 3 is largely similar with Route 2 except for the connection to the A189. Route 3 proposes to connect onto the A189 at the existing A189 Three Horseshoes Roundabout so the weaving length on the A189 will be retained as existing.

4.2.4. Route 4

The main buildability issue with this route is the ABT line crossing. The existing Plessey Road level crossing is recorded as a level crossing with manned barriers and CCTV monitored. The line is currently used by freight trains, approximately ten trains per day. The proposal to re-open the ABT line to provide a passenger rail service with a 30 minute frequency will increase the frequency when the level crossing barriers will be down. Combining this with the increased traffic on Plessey Road

resulting from the new connection to the A189 requires this level crossing to be upgraded to avoid delays for trains and vehicles and to improve safety for train and road users.

A site visit was carried out to assess feasibility to create a new road bridge over the existing railway line. In order to provide a 6.3metres headroom over the railway, a distance of approximately 200 metres long is necessary to meet the requirements of the Equality Act and the vertical alignment of the carriageway. The proposed route is currently designed with a road bridge to take Plessey Road over the railway line. The existing level crossing will still be used for vehicles travelling to and from Winship Street and Newcastle Road.

If the above proposal is not deemed as acceptable by Network Rail, new ramps of 200 metres are required to lift Winship Street / Carr Street and Newcastle Road. In practical terms, the ramp extends from the approach to the rail crossing approximately to Winship Street / Warwick Street junction and to Newcastle Road / Hartley Terrace junction as show in the figure below.

Retaining structures are likely to be required to minimise the number of properties to be demolished but the elevated roads will have significant visual, noise, vibration and air quality impact for the properties within the highlighted areas. To ensure the structural integrity of the adjacent properties is not affected by the proposed works, structural surveys are required to be undertaken prior to commencing and after completing the works.

Considering the above, the proposed works are considered to have high impact on the surrounding community.

The proposed connection to the A189 is similar to Route 3 and therefore no buildability issues are anticipated associated with section of Route 4.

Figure 22 – Approximate Extent of Route 4 Impact

4.2.5. Route 5

The railway crossing is also an issue for the proposed Route 5. The ramp length to provide the required headroom will have a significant visual impact on the neighbouring residential properties. However, the area to the south of the A1061 is largely unoccupied except for the existing railway signal box, electrical sub-station and car park. The impact from the proposed road bridge is considered to be significant.

The widening of the A1061 to dual carriageway will require additional land take and tree removals. Some of the existing junctions are to be replaced with roundabouts and the existing A1061 / A193 roundabout is to be altered. These works will require significant traffic management which is anticipated for this type of roadworks.

4.2.6. North South Route

The North South Route provides an opportunity to create an arterial route in addition to the existing A193 Rotary Way. It should be noted that the land of the disused railway line itself is not recorded being owned by NCC in the land ownership plan so the viability of this route depends upon NCC being able to acquire the land.

Aside from the land ownership issue, the proposed North South Route sits on the disused railway line which is generally around six metres lower than the road levels of the neighbouring roads or properties therefore levels provide a constraint in creating connections to the existing local road network via three roundabouts and a traffic signal junction.

The first new roundabout is proposed to connect the new route to Albion Way. There are properties around this area which are set back from the railway line by open fields, which are owned by Northumberland County Council (NCC). The available land allows for creation of slip roads to connect the North South Road to Albion Way which will be linked to the proposed new roundabout on Albion Way.

The second roundabout is proposed to be connected onto Ogle Drive serving the residential areas to the south of Albion Way and to the west of Newsham Road. The areas surrounding the proposed roundabout are wide open field, which is owned by NCC.

At the junction with Plessey Road, the railway line is at grade with Plessey Road. The junction however is surrounded by residential and commercial properties limiting the space available to create a roundabout. The neighbouring properties also limit the visibility from the North South Route and therefore a traffic signal junction is considered to be more suitable for this location.

The North South Route is proposed to terminate at the B1523 South Newsham Road via a new roundabout. There is land available and the existing levels could accommodate the proposed roundabout although it appears that the land is not owned by NCC and therefore the viability of this proposal is subject to land acquisition.

5. Utilities

New Roads and Street Works Act 1991 (NRSWA) C2 notices have been submitted to utility companies requesting information of utility apparatus within the study area.

5.1. Affected

5.1.1. Northumbrian Water Limited (NWL)

There is a recorded water main and abandoned line along the eastern side of the A189 slip road and to the east of South Newsham level crossing which would be affected by the proposed Route 1. Route 1 also would affect NWL sewer and sewage treatment works.

The existing sewer and water main would be affected by the proposed slip roads connecting Route 2 to the A189. The new road would also affect the existing sewer and water main on Ogle Drive.

In addition to the existing sewer and water main on Ogle Drive, the existing water main serving Long Horton Farm would be affected by the proposed Route 3.

The existing water main serving New Delaval which is running along the existing Plessey Road Old Wagonway could potentially be affected by the proposed Route 4.

The proposed widening of the A1061 as part of the Route 5 would also affect the existing sewer which runs across the A1061 to the west of the A1061 / B1523 roundabout. The existing water main would be affected by the proposed new alignment and alterations at the existing junctions as part of Route 5.

5.1.2. National Grid

National Grid apparatus has been identified as being in the vicinity of the proposed Route 1. The apparatus includes:

- Electricity transmission underground cables and associated equipment;
- Electricity transmission overhead lines; and
- Above ground electricity sites and installations.

There is no National Grid apparatus identified near the proposed Routes 2, 3, 4, 5 and the North South Route.

5.1.3. Fulcrum Pipelines

Fulcrum Pipelines apparatus is identified as being present on a section of Crawford Street which terminates at Morpeth Road School. However it is anticipated that this apparatus would not be affected by the proposed Route 1.

5.1.4. British Telecom Openreach

The existing BT apparatus at the following locations are anticipated to be affected by the proposed Route 1:

- along the eastern perimeter of the A189 / B 1331 / A1147 junction;
- along the western side of the NWL sewage treatment site; and
- along the southern kerbline of Crawford Street;

The proposed Route 2 and 3 would affect the existing BT apparatus at the following locations:

- along the northern kerbline of Princess Louise Road; and

- to the north east of the Ogle Drive T-junction.

The proposed Route 5 would affect the existing apparatus at:

- on both sides of the A1061 between the B1523 South Newsham Rd and Fulmar Drive traffic signal junction; and
- on the verge on the north side of the A1061 between Fulmar Drive traffic signal junction and the A193 / A1061 roundabout.

5.1.5. Network Rail

Network Rail apparatus would be affected by the proposed Routes 2, 3, 4, 5 and North South. The apparatus includes the infrastructure at two level crossings of the ABT railway line and one level crossing of the disused mineral railway line, namely:

- ABT Railway Plessey Road Level Crossing - affected by Route 4;
- ABT Railway Newsham South Level Crossing – affected by Route 5; and
- Disused Mineral Railway Isabella Colliery Level Crossing – affected by North South Route.

In addition to the above, the North South Route could potentially have an impact at Newsham North signal box.

5.2. Not Affected

The following utility companies have confirmed that they do not have any apparatus within the study area:

- Vodafone
- Sky Telecommunications
- Virgin Media
- Instalcom

6. Cost Estimate

The estimated costs for the construction of the proposed routes are given below, to the nearest £0.1 million.

Table 6.1: Construction Cost Estimate

Route	Cost Estimate (£ million)
Route 1	27.6
Route 2	9.1
Route 3	7.9
Route 4	9.1
Route 5	11.2
North South Road	6.9

The above cost includes allowances for utility works and contaminated land.

Additional allowances have been made for costs associated with design and supervision (10% of capital cost), land, planning application, Part 1 claims, risk (10% of capital cost + design and supervision + land + planning application + Pt 1 claims), Site Investigation (1.5% of capital cost) and optimism bias (44%).

The total costs for the proposed routes are summarised below.

Table 6.2: Total Cost Estimate (£million)

Route	Route 1	Route 2	Route 3	Route 4	Route 5	North South
Construction cost	27.6	9.1	7.9	9.1	11.2	6.9
Design and supervision	2.8	0.9	0.8	0.9	1.1	0.7
Land	1.0	2.1	2.1	0.4	0.8	2.3
Planning application	0.2	0.2	0.2	0.2	0.2	0.2
Part 1 claims	1.0	1.4	1.4	2.0	1.7	5.1
Risk	3.3	1.4	1.2	1.3	1.5	1.5
Site Investigation	0.4	0.1	0.1	0.1	0.2	0.1
Optimism bias	15.9	6.6	6.0	6.2	7.3	7.3
TOTAL COST	**52.2**	**21.8**	**19.7**	**20.2**	**24.0**	**24.1**

7. Option Appraisal

7.1. Qualitative Assessment

The table below summarises the high level qualitative assessment for the proposed route options. Each option has been scored against the issues discussed in the previous chapters as follows.

Scoring system:
1 = high impact
2 = significant impact
3 = moderate impact
4 = low impact
5 = marginal impact

Table 7.1: Qualitative Assessment Summary

	Route 1	Route 2	Route 3	Route 4	Route 5	North South Route
Cost	£52.2 million	£21.8 million	£19.7 million	£20.2 million	£24.0 million	£24.1 million
Ground conditions	High (1)	Marginal (5)	Low (4)	Low (4)	Low (4)	Significant (2)
Buildability	High (1)	Significant (2)	Moderate (3)	High (1)	Moderate (3)	Moderate (3)
Departures / Relaxations	Moderate (3)	Significant (2)	Low (4)	Low (4)	Moderate (3)	Moderate (3)
Utilities	Significant (2)	Moderate (3)	Low (4)	Significant (2)	Significant (2)	Moderate (3)
Community Severance	Marginal (5)	Low (4)	Low (4)	Low (4)	Marginal (5)	Marginal (5)
Ecology / Habitat	High (1)	Moderate (3)	Moderate (3)	Marginal (5)	Moderate (3)	Marginal (5)
Noise / air pollution	Low (4)	Moderate (3)	Moderate (3)	High (1)	Moderate (3)	Low (4)
Impact on public rights of way	Marginal (5)	Low (4)	Low (4)	Low (4)	Marginal (5)	Marginal (5)
Visual impact	Moderate (3)	Significant (2)	Significant (2)	High (1)	Low (4)	Low (4)
Cultural Heritage	Marginal (5)	Marginal (5)	Low (4)	Low (4)	Low (4)	Marginal (5)
Landscape	High (1)	Marginal (5)	Marginal (5)	Marginal (5)	Marginal (5)	Marginal (5)
Flooding	High (1)	Moderate (3)	Moderate (3)	Moderate (3)	Moderate (3)	Moderate (3)
Land Ownership	High (1)	Moderate (3)	Moderate (3)	Moderate (3)	Moderate (3)	Significant (2)
Nature / Marine Conservation	High (1)	Marginal (5)	Marginal (5)	Marginal (5)	Marginal (5)	Marginal (5)
SCORE	**34**	**49**	**51**	**46**	**52**	**54**

7.2. Added Value

The capital cost required for the proposed Route 1 is substantially more than for other options but Route 1 creates a new direct link from Cambois and East Sleekburn to Blyth opening up new regeneration sites in Northumberland.

The reopening of the Ashington Blyth & Tyne (ABT) Railway for passenger trains is part of Northumberland County Council's long term strategy to improve regional public transport links to Newcastle and to provide links to Enterprise Zones and regeneration sites in the Northumberland and North Tyneside employment corridor. The scheme aims to run a passenger train service between Woodhorn and Newcastle with a 30 minute frequency during peak periods and an hourly service during off peak. Newsham has been identified as one of the potential stations and one of the 26 level crossings which would be affected by the proposed ABT scheme. The proposed Route 5 includes adding an arm at the A1061 / South Newsham Road roundabout with a new road bridge over the railway to replace the existing level crossing. The level crossing removal will reduce the train delays for ABT services and will improve safety for road users.

By creating a new north south link across Blyth, the proposal would allow traffic demand to be shared between the North South Route and the A193 which could potentially reduce traffic congestion on the A193 Rotary Way. The North South Route is to be connected to the B1523 South Newsham Road and to the A1061 South Newsham roundabout, providing a good link to the proposed ABT Newsham Railway Station.

8. Summary and Conclusion

8.1. Summary and Conclusion

All route options are viable but the level crossings and land acquisition are the main buildability issues for most of the options. Cost will be the determining factor in deciding the options to be taken forward for appraisal.

The findings of this Study are summarised below.

- Route 1 is estimated to have a total cost of **£52.2 million**. The option has significant environmental impact in general but high environmental impact on River Blyth SSSI. Ground contamination risk and impact on flood risk are also high; however, it creates a new direct link opening up new regeneration sites in Northumberland.
- The viability of Route 2 (estimated total cost of **£21.8 million**) depends upon successful land acquisition from Persimmon / Wimpey development which could increase the cost substantially. The option has moderate environmental impact in general. The proposed new interchange to the A189 results in a sub-standard weaving length on the A189 between the existing junctions.
- Route 3 is estimated to have a total cost of **£19.7 million** but could be substantially increased by the land acquisition cost from Persimmon / Wimpey development as in Route 2. The environmental impact is generally moderate and it maintains the weaving length on the A189 as existing.
- Route 4 is estimated to have a total cost of **£20.2 million**. This option requires a number of adjacent properties to be demolished which will add to the total scheme cost. The visual, noise and air quality impact is considered to be high for the residents of properties adjacent to the proposed road bridge over the Ashington Blyth & Tyne (ABT) railway.
- Route 5 is estimated to have a total cost of **£24 million** has moderate to low environmental impact. The proposal is compatible with the ABT railway scheme, and the proposed new road bridge will reduce the train delays for ABT services and will improve safety for road users.
- The proposed North South Route is estimated to have a total cost of **£24.1 million** and should be built in conjunction with Routes 2, 3 and 5 if supported by the traffic modelling for the chosen route. This proposal creates a new north south link across Blyth which could potentially reduce traffic congestion on the A193 Rotary Way, and it complements the proposed ABT Newsham Railway Station. The environmental impact is considered to be moderate to low.

This Study concludes that the, Routes 2, 3 and 5 are to be taken forward to scheme appraisal with the option to include the North South Route if required.

8.2. Additional Studies

The following additional studies are recommended:

- A full ecological survey to be undertaken for the preferred route and associated improvements. This would be the precursor to an environmental impact assessment if the preferred route is developed further.
- Full land ownership details should be established along the preferred route in order to determine requirements for compulsory acquisition of land and compensation, wayleaves and accommodation works.
- Detailed topographical survey.

APPENDIX A: Drawings

Drawing List:

- Scheme Layout – drawing number TDI160019/10/A193/01/01
- Typical Road Cross Sections – drawing number TDI160019/10/A193/01/03
- Typical Structural Cross Sections – drawing number TDI160019/10/A193/01/04

APPENDIX B: Environmental Maps

Drawing List:

- Land Ownership
- Landscape
- Land Based Designation
- Marine
- Habitats
- Woodland
- Species (excluding Birds)
- Public Right of Way

APPENDIX C: Qualitative Assessment

Drawing List:

- Qualitative Assessment – drawing number TDI160019/10/A193/01/02

APPENDIX D: Cost Estimates