M74 Junction 5, Raith

Stage 3 Report
Part 1: Environmental Statement

Volume 1
Main Statement and Figures

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Contents

Non Technical Summary

List of Tables

List of Figures

List of Appendices

Volume 2

1 Introduction

1.1 The Environmental Statement

This Environmental Statement (ES) presents the findings of an Environmental Impact Assessment (EIA) of the proposal to improve Junction 5 of the M74, at Raith. Volume 1 contains the Environmental Statement and Appendices; Volume 2 contains Figures referenced in Volume 1. The location of the scheme is shown in Figure 1.1. The ES is issued in accordance with EC Directive 85/337 as applied by the Roads Scotland Act 1984, as amended by the Environmental Impact Assessment (Scotland) Regulations 1999 and is a Public Statement. Representations on the scheme proposal should be addressed to:

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Written responses are invited within 42 days of the advertised date of publication of the Environmental Statement. A Non-Technical Summary has been published to accompany this Environmental Statement and is available free of charge. Copies of the Environmental Statement and the Non Technical Summary are available for download from the website www.transportscotland.gov.uk.

The Environmental Statement is available for public viewing at the above address and at the locations listed in the Non-Technical Summary.

1.2 Background to the Scheme

The Central Scotland Transport Corridor Studies (CSTCS) identified and investigated specific interventions to resolve or ameliorate the transport problems within the A8, A80 and M74 corridors in order to meet the Government's five policy objectives in respect of Environment, Economy, Safety, Integration and Accessibility. In January 2003 and following the report of these studies, Scottish Ministers announced their decisions. Central Scotland Transport Corridor Studies, Decisions Paper, January 2003, Executive Decision 16 stated:

An investigation into ways of improving the performance of the trunk road network …. including Raith Interchange on the M74 will be undertaken as part of the delivery phase for the upgrading of the A8 between Baillieston and Newhouse.

Major issues were identified as follows;

- the preferred route should provide a free-flow A725 route through M74 Raith Junction, removing north-south traffic from the at-grade Raith roundabout.

- there is currently significant congestion at peak times on all approaches to the junction, including queuing back onto the M74 motorway
- the presence of notable environmental constraints including a SSSI, SINCs and River Clyde floodplain
- the design of the preferred route should reflect the Scottish Minister's general policy on strategic traffic growth across Scotland.

The choice of preferred junction arrangement for Raith Junction should reflect the proposed provision of the M8 Baillieston to Newhouse, and acknowledge the possible capacity and operational improvements being studied on the adjacent motorway network.

1.2.1 The Need for the Scheme

Raith junction and the surrounding motorway network are vital links in the trunk road network of Central Scotland and serve substantial existing developments as well as some of the most substantial future development sites in Scotland.

Severe traffic problems exist at Raith Junction due to the interaction of heavy turning volumes from the A725 and the M74 at the signalised roundabout. Significant congestion occurs in and around both the AM and PM peak periods.

The combination of high traffic volumes and circulating traffic on the roundabout cause both the north and southbound exit slips from the M74 to block back as far as the main motorway, with queues forming on the motorway nearside lane. The A725 southbound traffic (from Bellshill) approaching Raith Junction also queues severely, as circulating traffic conflicts with the north-south traffic. The A725 northbound traffic (from East Kilbride) often blocks back to Whistleberry Toll roundabout, situated immediately south of Raith Junction. Whistleberry Toll is effectively an integral part of the Raith Junction and consequently experiences significant queuing on the A725.

1.2.2 Scheme Objectives

Specific objectives were identified for the scheme, drawing on the recommendations of CSTCS Executive Decision 16. The objectives were to:

- Provide free flow for A725 traffic
- Relieve traffic congestion at the Junction
- Minimise impacts on the environment
- Design to reflect Scottish Minister's general policy on strategic traffic growth

1.2.3 The Assessment Team

The Scottish Executive appointed MouchelFairhurst JV (a joint venture comprising Mouchel Parkman and WA Fairhurst & Partners) to investigate alternatives and develop a preferred option for the junction improvement. MouchelFairhurst JV (MFJV) is supported by SiAS (Traffic & Transport Consultants), Young Associates (Environmental Consultants) and Roger Tym & Partners (Economic Development Consultants), with specialist inputs from Air Quality Consultants (AQC) and Hamilton and McGregor (Noise and Vibration Consultants).

1.2.4 Previous Studies

A number of possible alternative solutions to junction congestion issues were prepared and given initial consideration against the identified objectives for the scheme. Six schemes were given initial consideration (MFJV Stage 1 Environmental/Engineering Options Reports March 2004), from which three revised schemes were assessed and compared at Stage 2 (MFJV Stage 2 Environmental / Engineering Options Report Oct 2005).

2 Scheme Selection

2.1 Introduction

The purpose of this chapter is to provide a summary of the option identification and selection process that has led to the current preferred Scheme.

2.2 Consideration of Options for Improvement

The identification of alternative alignments and junction strategies are described in the M74 Junction 5,Raith, Stage 2 Option Assessment Report (MFJV report number 20, dated 15 July 2007).

2.3 Stage 2 Assessment

The Stage 2 Route Option Assessment Report and Stage 2 Environmental Assessment Report were submitted to the Scottish Executive in November 2004. The reports described and made comparative assessments of three Options: B(ii), C(ii) and D, shown schematically on Figures 2.1, 2.2 and 2.3 respectively.

Option B(ii) takes A725 North/South traffic over Whistleberry Toll and the M74 (at a third level). The existing Raith roundabout is retained to facilitate turning movements to and from the M74. A loop is provided from the M74 Southbound diverge to the A725 towards East Kilbride to ease merging traffic on the East Kilbride Expressway. This merge is constrained by the proximity of the River Clyde and existing structures carrying the A725 and the B7071 over the river. Local traffic to and from Bellshill that currently uses the south facing slip roads at Orbiston is rerouted through a proposed 2-way link road that occupies the existing southbound carriageway of the A725. This removes a weaving conflict between the existing junction and the proposed slip roads from the Raith roundabout.

B(ii) involves the construction of a high level embankment and elevated structures to cross the existing M74 motorway at a height of some 17 to 18 metres above natural ground level. In total three structures are proposed crossing the M74 motorway and the new realigned slip roads to the modified Raith Circulatory roundabout. Each structure will require the construction of bridge abutments between around 12 and 18 metres in height. Foundations will require to be piled due to the underlying poor ground conditions. The deck superstructures for this Option will require large spans to be accommodated particularly over the existing M74 where there is a desire to avoid central reserve piers. Spans of up to 50 – 60 metres will be required.

Option C(ii) provides a similar operational solution to Option B(ii). The principal difference is that the alignment of the A725, after crossing over Whistleberry Toll is further north and crosses under the M74. The alignment is further north to cross beneath the back of the nosings on the M74 slip roads and provide the necessary headroom clearance between the M74 and the proposed A725.

Option C(ii): is the least technically challenging; the main difficulty being the construction of an underbridge to allow the realigned A725 to pass below the existing M74 motorway.

The technique likely to be adopted would be similar to that described below for Option D. With this option there is no significant intrusion below the water table so that there are no issues here such as are present with Option D.

Option D takes the A725 in an underpass beneath the existing Raith Roundabout and the M74. Turning movements are provided for by slip roads from Raith to the mainline A725 largely utilising the existing roundabout.

Option D: is the most complex solution in relation to structural design and construction. Underbridge structures are required to convey the realigned A725 below the existing M74 motorway and also below the existing Raith Junction circulatory roundabout at two locations. These requirements place the new A725 carriageway some 6 to 8 metres below natural ground level and around 12-13 metres below the existing M74 motorway which is on elevated embankment at this location.

2.3.1 Preferred Scheme

From the options considered, Option D was selected as the preferred junction arrangement to be taken forward to full conceptual design and assessment.

This option offered:

- Significantly, least impact on designated ecological sites
- Significantly, least landscape and visual impact
- Least requirement for flood compensation storage
- Least impact on developable land
- Best Net Present Value and the highest benefits

2.4 Traffic Assessment

Traffic and transportation modelling and forecasting assessments for the proposed scheme were based on a two-tier transport modelling hierarchy comprising:

- Higher Tier – Strategic Model (4-Stage Transport Model); and
- Lower Tier – Local Model (Traffic Microsimulation Model).

The higher-tier Strategic Model, CSTM3A, is an enhanced four-stage multi-modal transport model that incorporates trip generation, mode choice, destination choice and route assignment capabilities. CSTM3A was developed (as an update of CSTM3) for the Central Scotland Transport Corridor Studies (CSTCS) by MVA on behalf of the Scottish Executive.

The Strategic Model is used to provide travel demand forecasts and inputs to the environmental and economic assessments. In addition, the Strategic Model forecasts provide estimates of traffic growth that are applied to the lower tier, Local Model.

The use of CSTM3A ensures a consistent approach with the methodologies adopted for the M74 Completion and M80 Stepps to Haggs commissions in modelling the strategic and multi-modal aspects of the proposed schemes.

The lower tier, Local Model is a Paramics traffic microsimulation model covering the main strategic routes within the immediate sphere of influence of the Scheme. The function of the Local Model is to provide more detailed outputs to aid the design and operational assessments of Scheme options.

During the CSTCS, the Scottish Executive approved forecast planning and economic scenarios for the application of CSTM3A in forecast mode. A range of scenarios was devised and tested during CSTCS that resulted in two scenarios, Scenario 1 (S1) and Scenario 2 (S2), being carried forward for the plan development of the study corridors. These have been adopted for the M8 Baillieston to Newhouse Study to ensure consistency with the CSTCS. In general, S1 represents a higher level of growth than S2. Strategic Model runs, which were used for the economic and environmental assessments, were undertaken for Scenarios S1 and S2 and years 2010 and 2020.

Outputs from the Strategic Model (Scenario 1) were used to assist with the air quality and traffic noise and vibration assessments that have been carried out and reported in this Environmental Statement. Scenario 1 was used to provide higher growth and hence ‘worst case’ predictions for the air quality and traffic noise and vibration assessments.

After consideration of the output for CSTM3A Scenario 1 and Scenario 2 predictions and in the context of presently observed levels of traffic flows and growth, it was agreed that Scenario 2 provided a more realistic estimate of traffic flows in the year of opening. Designs have been taken forward on the basis of free-flow traffic on A725 in the peak hours with CSTM3A Scenario 2 traffic levels in 2010.

2.4.1 Committed Do-Minimum and Enhanced Do-Minimum Networks

Committed Do-Minimum

There is a number of transport schemes planned or due for implementation that influence the Raith Junction Improvement Scheme. The scheme assessment assumes that these measures are in place prior to the Preferred Scheme proceeding. This network is commonly referred to as the Do-minimum or Committed Do-minimum (CDM) and has been defined as comprising the road improvement schemes shown in Table 2.1 below and other transportation improvement initiatives that are planned to be in place prior to the opening year of the proposed Raith scheme (2010).

The Do Minimum road and public transport networks were based largely on the assumptions adopted for the CSTCS Do Minimum network with the addition of the M74 Completion and M80 Stepps to Haggs commissions.

It is noted that, although not part of the defined Do-Minimum, both the M8 Baillieston to Newhouse and Associated Network Improvements have been included as part of the Raith scheme.

Table 2.1 – 2010 Committed Schemes, Do Minimum Network (Additional Projects to Existing Network)

Ref	Authority	Scheme
1	Edinburgh	A8000 dualling
2	Falkirk	M876 Junction 2 Slip Roads
3	Glasgow	Quality Bus Corridor 1 - Faifley to Baillieston
4	Glasgow	Kingston Bridge - Removal of Restrictions
5	Glasgow	Finnieston Bridge
6	North Lanarkshire	Gartcosh Park & Ride and Public Transport Interchange
7	North Lanarkshire	Bargeddie Signals to roundabout conversion
8	North Lanarkshire	Closure of A8011 Central Way, Cumbernauld
9	North Lanarkshire	Ravenscraig Link Roads
10	ScotRail	May 2001 timetable improvements
11	ScotRail	September 2001 timetable improvements
12	ScotRail	Twice daily Carstairs to Edinburgh service
13	Scottish Executive	A8 Baillieston to Newhouse Major Maintenance
14	Scottish Executive	A876 Kincardine Bridge Eastern Link
15	Scottish Executive	A876 Kincardine Bridge
16	South Lanarkshire	Rutherglen Town Centre Improvements
17	South Lanarkshire	Cambuslang Town Centre Improvements
18	South Lanarkshire	A71/A72 Garrion Bridge Improvements
19	Stirling	Stirling - Alloa Sustainable corridor
20	East Renfrewshire	Glasgow Southern Orbital
21	Scottish Executive	M77 Fenwick to Malletsheugh
22	Glasgow	QBC Measures - Battlefield Road
23	Glasgow	QBC Measures - Dundrennan Rd
24	Glasgow	QBC Measures - Rhannan Rd
25	Glasgow	QBC Measures - Tollcross

Ref	Authority	Scheme
26	Glasgow	QBC Measures - Possil Road
27	Glasgow	QBC Measures - Clarkston
28	Glasgow	QBC Measures - Great Western Road
29	Glasgow	QBC Measures - Paisley Road West
30	Glasgow	QBC Measures - Maryhill Road
31	Glasgow	QBC Measures - Dumbarton Road
32	Glasgow	QBC Measures - Gallowgate/Shettleston
33	Scottish Executive	M8 Junction 21 (Seaward Street) Improvements
34	Glasgow	Dumbreck Road Traffic Management/Bus Priority Measures
35	Glasgow	East End Regeneration Route
36	South Lanarkshire	Larkhall Rail Service
37	Scottish Executive	M80 Stepps to Haggs Including Auchenkilns Roundabout Improvement
38	Scottish Executive	M74 - Polmadie Road/Aikenhead Road Connection
39	Scottish Executive	M74 Completion - Fullarton to Kingston Area
40	Strathclyde Developments Limited	Strathclyde Business Park Road Infrastructure Improvements

Enhanced Do-Minimum

Traffic modelling of the local area indicated very strongly that the Do-Minimum network would experience significant traffic congestion on the network at several locations on the periphery of the proposed M8 scheme, including Raith Junction, in 2010. The consequence of this congestion is that traffic would not reach the A8 corridor and therefore the full traffic implications, including the economic benefits of any proposed improvements would not be appropriately modelled, or benefits realised.

In cases such as this, where the expected congestion is beyond tolerable limits, it is good practice to develop and model further improvements to the Do-Minimum network which release this traffic. In effect, the constraints in the network are removed and the preferred scheme option has been assessed to evaluate its performance.

The level of intervention has been designed to be the minimum necessary to provide a reasonable operational performance in the network out with the main M8 scheme being considered. This does not mean there will be no congestion whatsoever on the network prior to the scheme opening, rather that congestion will be more tolerable, or will occur for a shorter duration at peak times.

For this commission, improvements have been identified that supplement the committed Do-minimum network. This revised network is referred to as the Enhanced Do-Minimum (EDM) in this report. The EDM has also been applied to the modelling of the preferred Raith Option and to the assessments of air quality (Chapter 6) and Noise and Vibration (Chapter 12).

- Modelled interventions have included capacity improvements on:
- M8 Eastbound, Junction 10 (Easterhouse) to Junction 8 (Baillieston Interchange)
- M73 Junction 2 (Baillieston) to Junction 1 (Maryville)
- M74 West of Junction 4 (Maryville)
- M74 Junction 4 (Maryville) to Junction 5 (Raith)
- Closure of local road connections to M73 at Junction 1 (Maryville)

3 The Preferred Scheme

3.1 Introduction

This chapter provides a detailed description of the preferred scheme for the M74 Junction 5, Raith, hereinafter referred to as the Raith Junction. This introduction gives a broad outline of the proposals for the Raith Junction with the preceding sections covering the main elements of the scheme in greater detail. The plan and profile of the proposed A725 and Raith Junction are shown on Figures 3.1a – 3.1g.

The Raith Junction is located at the intersection of the M74 motorway and the A725 Trunk Road adjacent to Bothwell and Bellshill. The proposed scheme comprises a 3 level grade separated junction at Raith together with associated works on the A725, M74, Bellshill Road and B7071. The following gives an overview of the works proposed:

- **Raith Junction Lower Level, New A725 –** The proposed scheme creates a new A725 link and makes provision for the A725 to bypass below the Raith junction through 3 new underbridges.

- **Raith Junction Upper Level, M74 Alterations –** The proposed scheme requires modification to the M74 (N) diverge and merge slips and M74 (S) diverge slip with minor alteration to the M74 (S) merge slip.

- **Raith Junction Mid Level, Raith roundabout -** The proposed scheme aims to follow the alignment of the existing Raith roundabout, however the south section requires alteration to accommodate the dual carriageway link road southbound approach to the B7071.

- **Raith Junction, Associated Improvements -** Outwith the Raith Junction, A725 and M74 associated works are proposed to the Whistleberry toll junction, B7071/Bellshill Road junction, the Orbiston Private Access

The proposals for each of the elements of the scheme outlined above are described in greater detail in the following sub-sections.

3.2 A725

Under the preferred scheme the A725 will be modified over a length of approximately 1.75km. The proposed alignment generally follows the existing on a steep 6% gradient downhill section between WCML and the Raith Junction to the east of the M74 and also a level section between the Raith Junction and the river Clyde structure to the west of the M74. A new section of road through the Raith Junction links the 2 existing approaches to the Raith Junction effectively allowing the A725 to bypass the Raith roundabout. The proposed new A725 link will be constructed below the existing circulatory carriageway of the Raith Junction and the M74 at a significant depth ranging from six to eight metres below the existing ground level.

The proposed A725 is generally a dual 2 Lane All purpose Road (D2AP). The westbound carriageway is reduced to a single lane prior to the Raith roundabout west underbridge in order to facilitate traffic flows merging on to the A725 (W). This reduction in width if achieved by white lining. Continuing westbound the A725 resumes as two lanes following a lane gain from the roundabout.

To the east of Raith Junction the A725 (E) widens to three lanes in the form of a lane gain to cater for traffic merging from the roundabout on the steep eastbound on-slip. This additional lane continues in a north-easterly direction, crossing the WCML, before terminating at the Orbiston Junction slip road.

Diverge slip roads are provided from the proposed A725 (E) and (W) to facilitate traffic travelling to the M74, to the B7071 (Hamilton & Bothwell) or to Strathclyde Country Park. Similarly merge slip roads are provided onto the A725 for the opposite manoeuvres.

3.3 M74

Under the preferred scheme the diverge slip roads from the M74 (N) and M74 (S) to the Raith junction are modified to increase capacity by utilising the existing hard shoulders as additional running lanes.

Between Bothwell services and the Raith junction the M74 (S) widens to 4 lanes in the form of a lane gain from the Bothwell services merge slip before reducing to 3 lanes through a lane drop at the M74 to Raith Junction Diverge. The existing M74 (N) merge is modified to include a ghost island merge direct from the new Raith Junction B7071 link road.

The introduction of an additional lane between Bothwell services and the Raith junction together with the modification on the M74 (N) merge requires additional land take and consequential demolition of the existing private access road bridge to Bothwell house. A new bridge and minor modifications to the existing access road will be required under the scheme.

3.4 Raith Roundabout

Modification to the existing signalised 7-arm roundabout is proposed under the preferred scheme to accommodate the new A725 and realignment of associated links. The most significant modification is to the section of the Raith roundabout west of the M74 to accommodate the dual carriageway link road southbound approach to the B7071.

The design of the proposed circulatory carriageway has been developed to maximise lane provision and ranges from 2 to 4 lanes. Generally 3 lanes are provided to the west of the M74 and 4 lanes to the east however this is restricted to 2, due to spatial constraints, under the M74 north structure. Provision has been made for single lane drops to the M74 (S) and M74 (N). Diverging slips roads are also provided to the proposed A725, the B7071 link road and the M74.

3.5 Associated Improvements

3.5.1 Whistleberry Toll

Under the preferred scheme the Whistleberry Toll roundabout will be removed. Traffic movements currently accommodated by this existing at grade 3-arm roundabout will be accommodated by the new A725, a 3-arm signalised junction (with a 1 way entry to the adjacent private properties) and alternative routing of vehicles via the Raith Roundabout.

The new signalised junction, including pedestrian control, will be served by a 2 lane diverge from the A725 (E) with right and left turning options on to the new B7071 link road providing access to the B7071, M74 (N) directly and M74 (S) via the Raith Roundabout. Traffic movements between the A725 (W) and the B7071 and also the B7071 and A725 (E) will be routed via the Raith roundabout.

3.5.2 B7071/ New Raith link road Junction

It is proposed to replace the existing 3 arm mini roundabout at the B7071 and new Raith Junction B7071 link road junction with a signalised junction including pedestrian crossing facilities.

3.5.3 Orbiston Private Access

Under the preferred scheme an existing private access from the A725 located west of the WCML will be closed. In place of this, access from the A725 (E) and (W) will be via the Raith Roundabout exit to Strathclyde Park continuing through the local road network and along a new access road running adjacent to the A725.

3.6 Amount and Nature of Landtake

The overall scheme requires the purchase of land to allow its construction, future operation and maintenance. Some of the land that is necessary is already in the ownership of Scottish Ministers. The total landtake necessary for the scheme (including existing roads) is approximately 63 ha, of which 53.2 ha is already in the ownership of Scottish Ministers. Additional land totalling approximately 9.8 ha will therefore need to be purchased.

3.6.1 Road Drainage

A description of the River Clyde and its tributaries and water features is provided in Chapter 15, Road Drainage and the Water Environment. The nature of the existing floodplain, flooding and drainage outfall locations are also described therein.

3.6.2 Proposed Drainage for the New Road

The overall drainage strategy has been developed in accordance with DMRB and SUDS design manual and Planning Advice Note (PAN) 61 advice on good practice and other relevant information. The primary function of the road drainage is to drain the carriageway and associated road construction. The adopted drainage strategy will follow the ‘management train approach’. The main objective would be to treat and control runoff as near to the source as possible, thus protecting downstream habitats.

Solutions developed will thus provide suitable habitats for flora and fauna reducing flood risk and protecting the downstream watercourses from point source, diffuse and accidental contamination.

The outfall design will include 20m^3 volume of storage, as recommended by DMRB, for defence against accidental spillage, for example from overturned lorries.

The SUDS proposals for the new road will promote the use of source control methods such as filter drains and swales. The site controls such as extended detention basins with wet pool for attenuation and treatment of surface runoff prior to discharge to the existing watercourses will be an essential part of the drainage design. In accordance with DMRB the attenuation basins will be designed to cater for 1 in 100 year flood event. Preliminary designs have assumed that peak discharge rates will be limited to the 1 in 2 year 'greenfield' runoff.

3.7 Construction Programme

The construction period is expected to be 24 months. The aim of the construction sequence will be to minimise disruption to the existing environment and avoid unnecessary delay and disruption to existing road users and the surrounding area. Individual operations, such as earthworks and piling operations, will be restricted in terms of the working hours and noise/vibration levels during the course of the construction contract to achieve this mitigation.

3.8 Earthworks

The assessment of the earthworks quantities has been based on the conceptual alignment of the road. For the purposes of undertaking this assessment the engineering slopes have been assessed to be 1V:2.5H in cuttings and 1V:2H in embankments. The soils encountered and their suitability for classification as engineering fill has been based on the ground investigations undertaken during MFJV studies.

The bulk earthworks for the complete scheme are:

Cut Material – 370,587m^3

Fill Material – 218,445m^3

3.9 Structures

The scheme to improve the Raith Junction and introduce a grade separation of the A725 traffic from the existing roundabout and the M74 motorway requires the construction of an underpass structure below the existing junction and includes several associated bridge structures to carry the existing road network over this new underpass and to provide new cycle/pedestrian access over the junction. These structures comprise:

- Two underbridges below the circulatory carriageway of the roundabout.
- An underbridge below the M74.

- Two bridges over the junction providing pedestrian/cyclist over the junction.

The accommodation road bridge over the M74 to the north of the scheme, providing access to Bothwell House, will be removed. A new accommodation overbridge will be provided adjacent to the original position, but re-aligned.

3.10 Property Demolished

No private residencies will be demolished. A small stable is the only private property that and the adjacent Scottish Water local pumping station at Langside Road, Bothwell (to the south west of the proposed scheme), are, however will be directly affected. The stable will be rebuilt nearby.

3.11 Hours of Working

Hours of working and permitted noise levels/durations will be agreed in advance with the relevant Local Authority departments and stipulated as a requirement of the contract. Typical standard working hours are likely to be from 0700 to 1900 Monday to Friday. Some weekend and limited night working may be required but will need to be programmed and agreed in advance in accordance with the requirements of the contract.

3.12 Construction Site Access Routes

Haul routes will wherever possible be restricted to land within the site. This will require the Contractor to identify and construct temporary route(s) within the site boundary to transport material from one location to the other.

Access points to the construction site from the road network will be stipulated within the Employer's Requirements and will be determined on the basis of safety, proximity to the site boundary and to protected sites (Hamilton Low Parks Site of Special Scientific Interest, and Laighlands Site of Interest for Nature Conservation), and to minimise disruption.

3.13 Lighting

BS 5489 and associated technical documents containing new lighting classifications and design criteria, aimed at improving the safety of the road user and creating optimum cost effective design solutions will be considered when compiling the applicable carriageway lighting designs. Lighting design will reflect the new layout and vehicle movements through the junction, whilst taking due cognisance of the maintaining authorities requirements, with the specification and provision of appropriate columns, lanterns and control equipment.

The design of the new lighting will aim to minimise the lighting footprint, avoid light spill/pollution and attempt to match or better the lighting footprint of the existing lighting equipment.

3.13.1 Raith - M74 Underpass

The proposed scheme creates a tunnel effect and careful consideration will be given to the effect of the underpasses on the lower carriageway and the reduction in the natural daylight. This reduction in daylight will result in the need to install lighting on the roof surface of the underpasses to illuminate the carriageway. This lighting will need to have a capability of operating at high levels during normal daylight hours to cater for bright sunshine and at reduced levels during the hours of darkness when the operational light level will be reduced to reflect that of the surrounding area at night.

3.13.2 General Design Principles

Lighting of the carriageways will be achieved from lighting columns in the verges allowing ready access to the columns during maintenance. The final positions and set-back shall be selected to reflect the characteristics of the road and the speed at which the vehicles will travel along each section.

Portable lighting may be required during the construction phase if natural light is inadequate during working hours. Portable lighting may also be required overnight in areas where temporary traffic diversions are in place.

3.14 Fencing

Temporary and permanent fencing will be required during the construction and operation of the scheme to maintain public safety, define and limit working areas, prevent unauthorised access and to protect adjacent land.

3.15 Temporary Compounds and Storage Areas

Contractor's compounds and material storage areas will be established at appropriate locations in the vicinity of construction activities. The precise location of the storage areas have not yet been determined, and will be considered by the contractor at a later stage. However, the compounds will be sited appropriately, away from watercourses and locations identified as sensitive and/or vulnerable so that, after site restoration, there are no permanent environmental impacts.

The position of the contractor's main compound(s) will depend on many factors and cannot at this time be fixed with certainty.

Once the areas for the compounds are agreed, topsoil will be stripped and the area covered with sub-base or similar type material. The area may also be surfaced if appropriate. Portable cabins will be erected on site to accommodate offices and welfare facilities. Main compounds will require mains water connection, septic tanks which will be required for foul water drainage or foul connections as appropriate, and an electricity supply (which may be provided either by generator or by connection to mains supply). Connection of telephone lines will generally also be required.

The reinstatement of the compound area(s) will require the removal of temporary services, surfacing and sub-base and the area finished to the satisfaction of the landowner.

3.16 Traffic Management

Disturbance to and restrictions upon existing traffic will be avoided wherever possible. Traffic management will however be required during the construction phase, and may comprise temporary road diversion to avoid conflict with construction site traffic/activities, access and speed restrictions and traffic signalling. A detailed traffic management plan for the scheme will be developed by the Contractor, and agreed in advance in accordance with the requirements of the contract.

The construction of the scheme will require the adoption of significant traffic management measures both on the M74 motorway, the A725 trunk road and associated slip roads and side roads.

The traffic flows on the M74 motorway will be under temporary traffic management for the duration of the works to construct the new motorway underbridge, which shall likely be undertaken in phases. It is anticipated the temporary traffic management will consist of contraflow operation on one carriageway of the motorway, while works proceed on or below the other carriageway. The duration of this operation is estimated to be approximately 55 weeks.

The temporary traffic management to accommodate the construction of the two roundabout underbridges will consist of sufficient number of traffic lanes running on temporary roads offline from the existing road alignment and therefore the bridge construction. The anticipated duration of such traffic diversion is estimated to be 35 weeks for each bridge. Whether the works, and therefore traffic management measures, for the M74 underbridge and the two roundabout underbridges are under construction concurrently or not will be dependent on the contractor's plan for the works.

Further traffic management will be required on the existing A725 to permit the underpass construction at the locations of the tie-in between the existing road and the new road.

The location of the scheme dictates that a significant extent of the works will be undertaken at locations which constitute an 'island site' and therefore temporary traffic management measures will likely be employed throughout the road network affected by the scheme to permit safe access and egress of vehicles associated with the works.

3.17 Pollution Prevention

The Contractor will be required to comply at all times with the requirements of the contract specification with regard to prevention of pollution. Consultation has been undertaken with SEPA with respect to measures required to prevent pollution to watercourses, and to deal with accidental spillages and discharge points to watercourses. The specific measures to be utilised during construction works will be agreed between the Contractor and SEPA in advance of any works on site.

3.18 Landscaping

A conceptual landscaping design has been developed for the preferred scheme. The aim of the final planting scheme will be to blend the improved junction and road alignments into the surrounding landscape as much as possible. Planting will be in keeping with existing natural vegetation patterns and types and native species (of local provenance and where practicable local origin) will generally be used. It is envisaged that sufficient topsoil will be available from site to accommodate required landscape contours using material from construction excavation. .

4 Approach and Methods

4.1 Introduction

The aims of the DMRB Stage 3 ES are:

- to expand on the DMRB Stage 2 information collated regarding the environment of the study area and to focus on the most significant aspects;
- to identify and assess predicted environmental impacts associated with the scheme; and
- to identify measures to avoid or mitigate adverse impacts and enhance beneficial impacts so that these can be incorporated into the scheme detailed design, construction and operation.

This chapter describes the general approach to the environmental assessment and methods used in the assessment process for each environmental subject area.

4.2 General Approach to the Assessment

4.2.1 The Design Manual for Roads and Bridges Volume 11

The ES has been prepared in general accordance with the guidance provided by DMRB (1993 and amendments).

DMRB, Volume 11 (Environmental Assessment) provides guidance on the level of environmental impact assessment required at key stages in the development of such schemes and the requirements for reporting of the potential effects on the environment.

As advised in DMRB, the EA for proposed road schemes comprises three stages that progressively require greater levels of assessment detail. A Stage 1 Environmental Assessment is a preliminary assessment aimed at identifying environmental advantages, disadvantages and constraints associated with broad route corridors or improvement strategies. An indication of potential effects is provided which at this stage is unlikely to take into account detailed road alignments or mitigation measures.

A Stage 2 Environmental Assessment aims to identify factors and effects that require investigation in order to select a preferred route or improvement strategy.

At Stage 3 a detailed assessment of the preferred scheme is undertaken. This will involve an environmental impact assessment and the production of an Environmental Assessment Report (EAR) or the publishing of an ES.

This Stage 3 ES has been undertaken with respect to the twelve environmental topics described in DMRB Volume 11:

- Air Quality;
- Cultural Heritage;

- Disruption Due to Construction;
- Ecology and Nature Conservation;
- Landscape Effects;
- Land Use;
- Traffic Noise and Vibration;
- Pedestrians, Cyclists, Equestrians and Community Effects;
- Vehicle Travellers;
- Water Quality and Drainage;
- Geology and Soils; and
- Policies and Plans

4.2.2 Assessment Methods

The assessment of impacts has been undertaken in accordance with the following general process for all environmental parameters:

- identify baseline conditions of the site and its environs;
- consider potential impacts and assess their significance, taking into account sensitivity of resources and magnitude of impact;
- identify appropriate mitigation measures to address the impacts identified; and
- assess the significance of residual impacts.

Consideration has also been given to the potential for cumulative/interactive (also in-combination) impacts. In a broad sense, cumulative impacts refer to the accumulation of effects on the environment relative to other past, present or foreseeable actions that occur in an additive or interactive manner.

The impact assessment for each environmental parameter has been undertaken in comparison with a 'baseline' situation. The 'baseline' generally refers to the existing conditions and how these are predicted to change if the scheme did not proceed and no other work was undertaken (Do Nothing). As described in Section 2.4, a number of transport schemes are planned, or due for implementation, that influence the proposed scheme, and the assessment assumes that these measures are in place prior to the Raith Scheme proceeding. This improved network is referred to as the Committed Do Minimum (CDM) and is used in the Air Quality, and Traffic Noise and Vibration assessments.

Baseline information has been gathered through site visits, the review of maps, data collection, reports obtained from statutory and non-statutory organisations, and field surveys.

4.2.3 Predicted Impacts

Predicted impacts arising from the scheme have been identified and described and an assessment of the level of significance for each effect determined as far as practicable in relation to the topic area under consideration.

Significance varies according to the environmental aspect or topic area being considered and the context in which the assessment is made, and depends to a large degree on the availability of data relating to existing environmental conditions and the value applied to these conditions. However, in general, the level of significance of impacts has been defined using a combination of the sensitivity of the environmental feature and the magnitude of impact. The significance of impacts has been defined as far as is practicable in the appropriate chapters of this Environmental Statement.

Sensitivity has generally been defined according to the relative value or importance of the feature, i.e. whether it is of national, regional or local importance, or by the sensitivity of the receptor in the case of the air quality and noise assessments.

Magnitude of impact has been determined by reference to any applicable legislative or policy standards or guidelines, and the following factors:

- the degree to which the environment is affected, e.g. whether the quality is enhanced or impaired;
- the scale of the receptors of change, e.g. the size of land area or number of people affected and degree of change from the existing situation;
- the scale of change resulting from impacts; and
- whether the effect is temporary or permanent.

The nature of impacts may vary and may be direct or indirect, secondary, cumulative, short, medium or long-term, reversible or irreversible. Impacts may be positive (beneficial) or negative (adverse).

4.2.4 Mitigation

Where possible, mitigation measures have been developed based on guidance provided in Planning Advice Note 58 on EIA as illustrated in Table 4.2. This considers mitigation as a hierarchy of measures ranging from prevention of environmental effects by avoidance, through to compensatory measures for effects that cannot be remedied. At this stage, the conceptual design has a series of specific mitigation strategies identified and incorporated into the scheme, which will be expanded upon and form part of Contractual documents. The mitigation strategies will require further design and refinement by the Contractor as part of the specimen design prior to the commencement of construction activities.

Table 4.2 Hierarchy of Mitigation Measures

Level of Mitigation	Definition
Prevent	To prevent adverse environmental effects at source for example through choice of site or specification of construction equipment. For example the route alignment has been altered where practicable to avoid sensitive locations, including moving the motorway alignment to avoid the need to cross the North Calder Water more than once.
Reduce	If adverse effects cannot be prevented, steps taken to reduce them through such methods as minimisation of cause of impact at source, abatement on site and abatement at receptor. For example the addition of noise screening at several points along the proposed route to reduce adverse noise impacts.
Remedy/offset	When effects remain that cannot be prevented or reduced, they are offset by such remedial or compensatory action as provision of environmental improvements, opportunities for access and informal recreation, creation of alternative habitats and prior excavation of archaeological features. For example new crossing points and footpath/cycleway enhancements for non-motorised users (pedestrians/cyclists etc.) and extensive areas of new woodland, scrub and hedgerow planting.

The approach to the mitigation of adverse environmental impacts is to avoid them where possible. This will be achieved by consideration of ways in which to prevent adverse effects at source, rather than relying on measures to mitigate the effects. This can include consideration of scheme design and the incorporation of special features into the design (such as access arrangements for vehicles or pedestrians), Employer's Requirements, or by proposals relating to operational equipment or working methods for inclusion in the Contract Documents.

Where avoidance of impacts is not feasible (due to engineering or economic requirements), measures will be included to minimise or reduce potential impacts through abatement measures either at source, at the site (for example, by the use of noise attenuation measures or screen planting and landscaping), or at the receptor (for example, translocation of plant species).

4.2.5 Residual Impacts

The assessment of significance of residual impacts takes into account mitigation measures that will be adopted in each chapter of this ES. Mitigation measures that are possible, but not definite, are not included in the residual impact assessment since they cannot be guaranteed at the present time. Further detailed requirements will be included in Contractual documents as appropriate.

5 Consultations

5.1 Introduction

The purpose of a consultation exercise is to:

- ensure that statutory consultees (i.e. those with responsibilities for protecting the environment and regulating any activities which may adversely affect existing environmental conditions) and other non-statutory bodies with a particular interest in the environment are informed of the proposed scheme and are provided with an opportunity to comment;
- obtain baseline information regarding existing environmental site conditions;
- establish key environmental issues and identify potential impacts to be considered during the environmental assessment;
- identify those issues which are likely to require more detailed study and those which can be justifiably excluded from further assessment; and
- provide a means of identifying the most appropriate methods of impact assessment.

5.1.1 List of Consultees

Consultees (see Table 5.1) were initially contacted by letter as part of the DMRB Stage 2 assessment; providing information on the details of the proposed scheme and requesting baseline information, records and comments concerning the proposals. The information requested was tailored specifically for each consultee and a location plan showing the proposed section of road for improvement provided.

Further consultation meetings, emails, letters and telephone calls during 2004 to 2006 supplemented and updated the Stage 2 consultations and maintained ongoing liaison with key stakeholders over the development of the preferred scheme and proposed mitigation.

5.1.2 Consultee responses

The issues raised by the individual consultees are addressed in the relevant chapters of this report.

Table 5.1 List of Consultees

Statutory Consultee	Non-statutory Consultee *
Glasgow City Council (various Departments) Health and Safety Executive Historic Scotland North Lanarkshire Council (various Departments) Scottish Environment Protection Agency (SEPA) Scottish Executive Scottish Natural Heritage South Lanarkshire Council (various Departments)	Botanical Society of the British Isles British Horse Society British Trust for Ornithology Butterfly Conservation (Scotland) Central Scotland Forest Trust Clyde Amphibian and Reptile Group Clyde Bat Group Clyde River Foundation Clyde Ringing Group Concern for Swifts (Scotland) Plantlife Scotland River Clyde Fisheries Management Trust Royal Society for the Protection of Birds Scottish Badgers Scottish Ornithologists Club Scottish Rights of Way and Access Society Scottish Wildlife Trust Smiths Gore (For Coal Authority) Strathclyde Country Park Ranger Service Sustrans Scotland West of Scotland Archaeology Service

* Other non-environmental organisations, such as Utilities, were also consulted and their responses are discussed in the DMRB Route Option Assessment Report (MFJV 2004).

6 Air Quality

6.1 Introduction

This chapter describes the expected air quality impacts associated with the proposed M74 Junction 5 upgrade (the Scheme). The impacts assessed are those resulting from construction activity and those caused by emissions from traffic. Construction impacts are only likely to occur within the immediate vicinity of the works, but the proposed Scheme has the potential to influence traffic movements, and thus air quality, on roads that are some distance from the proposed works.

The air quality assessment begins with the same study area as the transport model, which includes the whole of Central Scotland, as well as a representation of roads much further away. Within this large area the "local" air quality assessment focuses on those locations where impacts are expected to be greatest. Such locations include residential properties, schools, and any potentially sensitive ecosystems which are near to proposed new roads or to existing roads where a significant change in vehicle numbers is expected. Figure 6.1 describes the local air quality study area, which extends at least 2km from any road that might be significantly affected by the Scheme and includes parts of North Lanarkshire, Glasgow, South Lanarkshire, East Renfrewshire and even East Ayrshire. The local assessment deals with two pollutants: nitrogen dioxide and fine particles (PM_{10}) which are the pollutants of greatest concern from road vehicles in a local context. The "wider-scale" assessment deals with five pollutants: carbon monoxide; nitrogen oxides; total hydrocarbons, PM_{10} and carbon dioxide and calculates the change in total emissions from the entire road network from the transport model.

Local air quality is assessed for the planned opening year of the scheme, which is 2010. A range of measures introduced at the national level to steadily reduce vehicle emissions mean that the opening year is also expected to be the worst-case year for the Scheme. Wider-scale air quality impacts are assessed both for the planned opening year and also for the design year, which is 2020.

6.2 Baseline Assumptions

The proposed Scheme is one of three road upgrade proposals that are all closely linked; the other two being the M8 Baillieston to Newhouse, and the M8 Baillieston to Newhouse Associated Network Improvements (ANIs). Both of these other proposals are the subject of separate assessment, however, traffic modelling carried out as part of the assessment of the proposed scheme indicates that the objectives and benefits of the Scheme will only be realised if the two other proposals also go ahead. Thus, if the air quality assessment were based on traffic data which simulated the construction of the proposed Scheme in isolation, it is considered that this assessment would be based on an underestimate of the traffic flows and operational characteristics most likely to ultimately materialise for the Scheme. The road traffic model has therefore not been run to predict the impacts of the proposed Scheme against a future year baseline of the existing network.

In common with the other sections of this Environmental Statement that deal with impacts related to road traffic, a pragmatic approach has been taken in order to assess the impacts associated with the Scheme. The approach describes the air quality impacts that the Scheme is likely to bring about, assuming that each of the other two proposals also goes ahead. It relies on assessing the with-Scheme scenario against an enhanced do-minimum (which is termed the Raith Reference Case, or RMN). The RMN road traffic model includes committed developments and also representations of both the M8 Baillieston to Newhouse and the ANIs. Thus, the with-Scheme results predict the impacts with each of the three proposals in place. The difference between the RMN and the with-Scheme is the impact attributable to the M74 Junction 5 Scheme alone.

Because each of the three separate road proposals will clearly influence the same road network, the opportunity has been taken to assess their cumulative impacts. This has been done by comparing the predicted with-Scheme traffic flows against those associated with the Committed Do-Minimum (CDM) traffic network (which includes committed developments only). The difference between the CDM and with-Scheme will thus be the cumulative impacts of all three proposals together. The approach can be summarised thus:

- Scheme-only impacts = with-Scheme minus RMN
- Cumulative impacts = with-Scheme minus CDM

It should also be noted that the air quality assessment is based on traffic growth predictions modelled under CSTM using the high growth "Scenario 1". It is thus a worst-case assessment which is considered unlikely to be achieved in reality. Scenario 2, representing a moderate growth prediction has been used as the basis of other aspects of the scheme design and assessment, but for the air quality and noise and vibration assessments (see Chapter 13 Noise and Vibration), a precautionary approach assessing potential worst case conditions has been adopted in line with guidance set out in the Design Manual for Roads and Bridges.

6.3 Methods

6.3.1 Policy Context and Assessment Criteria

The air quality assessment has been carried out in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, 2003) and with reference to the following documents:

- The Environment Act 1995, Part IV;
- The Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2000;
- The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Addendum, 2003;
- The Air Quality (Scotland) Regulations 2000;
- The Air Quality (Scotland) Amendment Regulations 2002;

Reference has also been made to Interim Advice Note 61/05, which supplements the DMRB 11.3.

The significance of both existing and future pollutant concentrations is best assessed by reference to the national air quality standards and objectives, established by the Government to protect human health. The ‘standards’ are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of a pollutant. The ‘objectives’ set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of the costs, benefits, feasibility and practicality of achieving the standards. The objectives are prescribed within the Air Quality (Scotland) Regulations, 2000 (Stationery Office, 2000 (Scottish Statutory Instrument 2000 No. 97)). The objectives for nitrogen dioxide were to be achieved by 2005 and will continue to apply in 2010. The objectives for PM_{10} were to be achieved by 2004 and will also continue to apply in 2010. The Air Quality (Scotland) Amendment Regulations 2002 (Stationery Office 2002 (Scottish Statutory Instrument 2002 No. 297)) define more stringent objectives for PM_{10} that will also apply in 2010. A summary of these objectives is provided in Table 6.1. The 1-hour nitrogen dioxide objective is in practice less stringent than the annual mean objective. An analysis of national roadside monitoring data has shown that an exceedance of the 1-hour objective is only likely if the annual mean is greater than 60 $\mu g/m^3$ (Laxen and Marner, 2003). It is therefore not considered further in this assessment.

The European Union has also set limit values for both nitrogen dioxide and PM_{10}. Achievement of these values is a national obligation rather than a local one. The EU limit value for nitrogen dioxide is the same level as the UK objective but is to be achieved by the later date of 2010. The EU limit values for PM_{10} are the same level as the 2004 UK objectives, and are to be achieved by 2005. Thus, assessing against the nitrogen dioxide and PM_{10} objectives for Scotland provides the most stringent approach.

Table 6.1: Relevant Air Quality Objectives

Pollutant	Air Quality Objective		Strategy Compliance Date
	Concentration: $\mu g/m^3$	Measured as	
Nitrogen dioxide (NO_2)	200	1 hour mean; not to be exceeded more than 18 times per year	31/12/2005
	40	Annual mean	31/12/2005
Particles (PM_{10}) (gravimetric)	50	24 hour mean; not to be exceeded more than 35 times per year	31/12/2004
	40	Annual mean	31/12/2004
	50	24 hour mean; not to be exceeded more than 7 times per year	31/12/2010
	18	Annual mean	31/12/2010

There are no statutory objectives for dust. It is therefore common practice to provide a qualitative assessment based largely on experience elsewhere, as well as focusing on mitigation measures to minimise emissions.

The air quality objectives only apply at locations where members of the public are likely to be exposed to air pollution for the time period specified in the objective. Thus, for the annual mean and 24-hour objectives that are the focus of this assessment, the primary receptors will be residential properties.

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2000 and its 2003 Addendum set out how different sectors can contribute to achieving the air quality objectives. Local Authorities are seen to play a particularly important role. Every authority must carry out a review and assessment of air quality in its area to identify whether the objectives will be achieved by the relevant date. If this is not expected to be the case, the Authority must declare an air quality management area (AQMA), and prepare an action plan in pursuit of the necessary improvement. The AQMA can be larger than the area of exceedance if the Local Authority believes that this is beneficial.

6.3.2 Impact Significance

In order to simplify interpretation of the predicted local air quality impacts, a series of descriptors has been defined which describe impact magnitude and overall impact significance. The definition of impact magnitude is solely related to the degree of change in pollutant concentrations. Impact significance takes account of the impact magnitude and also of the absolute concentrations and how they relate to the air quality objectives or other relevant standards. There is no official guidance for the UK on defining air quality impact magnitude and significance, and the criteria used are ultimately based on professional judgement. They are, however, the same criteria that are defined by the Irish National Roads Authority in the consultation draft of its Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes (NRA, 2006) and are also the same criteria used in the M8 Baillieston to Newhouse Stage 3 Assessment. They are set out in Appendix AQ.6.1. Because the assessment of construction impacts is ultimately subjective, it is not appropriate to simplify the predicted impacts using descriptive criteria. The wider scale impacts are assessed according to the same impact magnitude criteria as those used for local air quality impacts. The significance of the impacts of the Scheme as a whole is ultimately assessed subjectively, based on professional judgement.

6.3.3 Local Air Quality Assessment Methods

Information on existing and predicted future levels of air pollutants has been obtained from:

a) Discussion with, and review of recent air quality review and assessment reports by: North Lanarkshire Council, Glasgow City Council, South Lanarkshire Council, East Renfrewshire Council, and East Ayrshire Council.

b) Monitoring data from continuous analysers and diffusion tubes operated by North Lanarkshire Council, Glasgow City Council, South Lanarkshire Council, East Renfrewshire Council, and East Ayrshire Council. When the data analysis began, the most recent full calendar year was 2004. Thus, measurements from 2004 have been used to define baseline conditions.

c) Estimated background concentrations of nitrogen oxides (NO_x), nitrogen dioxide and PM_{10} published by Defra and the Devolved Administrations (DAs) (2006a[1])

d) Dispersion modelling, as described below.

The DMRB 11.3 recommends that if a scheme is likely to give rise to significant impacts, the Stage 3 assessment should involve detailed dispersion modelling. Because the proposed Scheme is likely to influence air quality across a large area, detailed dispersion modelling has been undertaken.

The calculations have been performed using the AAQuIRE dispersion model (described in detail at www.fabermaunsell.com), which is one of the models accepted by Defra and the DAs (2006b) for use in air quality review and assessment, and is suitable for use in DMRB Stage 3 air quality assessments. The road-transport facet of this model is based around algorithms from the internationally validated CALINE 4 dispersion model. The meteorological data required for modelling pollutant dispersion were taken from the complete hourly dataset from the Met Office site at Glasgow Centre, this being the closest to the study area, for the full 2004 calendar year. When the data analysis began, this was the most recent full calendar year of both meteorological and air quality monitoring data and is thus the most appropriate year to use.

Only roads on which traffic flows are likely to change significantly as a result of the Scheme are likely to have a significant influence on local air quality. The local air quality assessment has thus focused on those roads that are expected to experience at least a 10%[2] change in annual average (1-way)[3] traffic flows due to the scheme, where flows (either with or without the Scheme) would be at least 2500 vehicles per day (1-way). Roads on which absolute (1-way) flow <u>changes</u> of at least 2500 vehicles per day, even where this is less than a 10% change have also been included, as have all new roads that would be constructed as part of the Scheme. All of these roads have been explicitly entered into every run of the dispersion model. In addition, all other roads that are included in the transport model and fulfil one of the following criteria have also been included in every model run.

a) Links that are a part of the same roadways as links with a 10% change in 1-way flow, even where these links have less than a 10% change (for example the opposite carriageway of a road, or a slip road).

b) All roads within 200m of any of the air quality receptors that are included in the transport model.

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[1] The versions of these maps that were first published in 2006 have been used in this assessment.
[2] It is common practice to screen out roads with less than a 10% change in flow from local air quality assessments because such changes would have a very small impact on air quality.
[3] The screening used 1-way flows because 2-way traffic data were not readily available. The approach used is at least as stringent as the more typical method of a 10% change in 2-way flow (and 5000 vehicles per day).

c) Roads which clearly join two 10% change roads but which will not, in themselves, experience a 10% change (in other words, the explicitly modelled road network has been augmented so that it is more coherent).

All of the links that have been explicitly included in the model are shown in Figure 6.1. Emissions from those roads that have not been explicitly included will be accounted for by addition of predicted background concentrations, which have been taken from the national maps published by Defra and the DAs (2006a). These background maps include emissions from both traffic and non-traffic sources and there will thus inevitably be some double-counting of the traffic emissions. Further details of the modelling methodology are given in Appendix AQ 6.1.

Air quality has been modelled at seventy-two receptors, which are shown in Figure 6.1. These locations have been chosen to represent the roadside façade of the closest residential property to roads where the largest changes in traffic flows are expected, with the exception of Receptors 1 (Manse Road, Motherwell) and 34 (Auld House, Coatbridge), which represent worst-case locations within North Lanarkshire Council's AQMAs, and Receptors 2 and 42, which represent pertinent monitoring locations. Thirty-four of the seventy-two receptors are the same locations that were modelled as part of the M8 Baillieston to Newhouse Stage 3 Assessment. These are highlighted in Appendix AQ.6.1.

In addition to predicting pollutant concentrations at specific receptors, the assessment has also included a count of properties that would be expected to experience either an increase or a reduction in pollutant concentrations as a result of the proposed scheme. This is not, strictly, a requirement of a Stage 3 DMRB assessment, but it does provide a useful indication of the overall impacts of a scheme. The property count has included all ordnance survey, non-business, address points that are within 200m of one of the explicitly included road links (as shown in Figure 6.1). There are almost 61,000 residential properties within 200m of the defined links. These properties will potentially be affected by changes in emissions from all roads in the study area. It is not practicable to model the changes in concentrations at all of these properties. However, a method was devised for the M8 Baillieston to Newhouse Stage 3 Assessment to model the change in concentrations at representative properties, and the technique has been repeated here. It relied on the use of post codes, which typically represent a group of 16 properties in a relatively small area[4]. There are 3,787 post-code areas within 200m of the defined links. Nitrogen dioxide concentrations at one property in each post-code area have been

[4] In built-up areas, where there might be numerous roads with the potential to significantly influence ambient concentrations, a post-code area typically spans about 50m and often much less. In more rural areas, a single post code might represent a larger area than this, but typically, the density of the road network also tends to be lower in such areas. Thus, less resolution is needed in order to predict the sign of the change in concentration. Although the absolute pollutant concentrations within a post code area may vary considerably, air quality at each property within a post-code area is likely to be primarily influenced by the same roads. This will mean that, for example, if a single property within a post code experiences an improvement due to the Scheme, all properties within that post-code are likely to experience an improvement. While there will be some cases in which this does not hold, these will be very infrequent.

modelled explicitly for both the RMN and with-Scheme[5]. The difference represents the change with the scheme, which may be +ve or –ve, depending on whether the concentrations increase or decrease. All the properties within the post-code area are assigned with this modelled plus or minus. The +ve values are summed and the –ve values summed to provide an indication of the overall number of properties expected to experience a deterioration or an improvement in air quality with the scheme. This analysis has not been carried out for the cumulative assessment.

This method of assigning predicted changes to property counts is more thorough than the methodology set out in the Scottish Transport Appraisal Guidance (STAG), which relies on concentrations predicted using the DMRB screening model. This is because it takes account of the potential influence of every affected road at each location. The STAG methodology only looks at the roads closest to counted properties. The method used also has the advantage of not requiring paired 2-way traffic data, which were not readily available.

All of the values presented here are the best possible estimates, but uncertainties in the results might cause over-predictions or under-predictions. All of the measurements presented in this chapter have an intrinsic margin of error. Defra and the DAs (2006c) suggest that this is of the order of plus or minus 20% for diffusion tube data and plus or minus 10% for automatic measurements. The model results rely on modelled traffic data and any uncertainties in these data will carry into this assessment. There will be additional uncertainties introduced because the modelling has simplified real-world processes into a series of algorithms. For example: it has been assumed that during each year, the vehicle fleet within the study area will conform to the national (UK) average composition; it has been assumed the emissions per vehicle conform to the factors published in DMRB 11.3; it has been assumed that wind conditions measured at Glasgow airport during 2004 will occur throughout the study area during 2010; and it has been assumed that the subsequent dispersion of emitted pollutants will conform to a Gaussian distribution over flat terrain. As is explained in Appendix AQ 6.1, an important step in the assessment is verifying the dispersion model against the measured data. By comparing the model results with measurements, the combined influence of the majority of these uncertainties can be assessed. This comparison is given in Appendix AQ 6.1 (Figures AQ1.6 and AQ1.7). The comparison shows that there is no significant bias in the results and that the model predicts the measured values reasonably well.

The limitations to the assessment should be borne in mind when considering the results. While the model should give an overall accurate picture, i.e. one without bias, there will be uncertainties for individual receptors. Clearly in future years the uncertainties are likely to be greater than they are now. The results are ‘best estimates’ and are treated as such in the discussion.

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[5] Within each post code area concentrations will vary depending on the distance from nearby roads. Because of this, the modelled concentrations (as opposed to whether there is an increase or decrease in concentration) will not provide a reliable indication of concentrations at individual properties.

6.3.4 Ecological Air Quality Impact Assessment Methods

In accordance with Interim Advice Note 61/05 to the DMRB, an assessment of potential impacts on vegetation has also been carried out. The detail of this assessment is described in Appendix AQ.6.1.

6.3.5 Wider-Scale Air Quality Assessment Methods

An estimate of the total emissions of five pollutant categories: carbon monoxide; nitrogen oxides (NOx); total hydrocarbons (THC); particulate matter (PM_{10}) and carbon dioxide (CO_2) has been undertaken according to the methodology set out in DMRB 11.3, using the DMRB spreadsheet V1.02 (November 2003). This assessment addresses the change in total emissions that would result from the proposed scheme compared to the Do-minimum alternative. The assessment has been carried out for base years 2001 and 2004 (with the 2004 traffic data derived as described in Appendix AQ.6.1), the opening year (2010) and the design year (2020). The assessment has included all traffic on the entire modelled network, not just the links that were explicitly included in the local assessment.

The emission factors used by the DMRB model, and more specifically the mathematical equations behind the vehicle-category-specific speed emission curves, become unreliable at speeds of less than 5kph. In order to minimise the distorting influence of very slow speeds on the aggregated emission totals, the speeds on all of the links with predicted average speeds less than 5kph have been adjusted to equal 5kph prior to input into the DMRB spreadsheet. Appendix AQ.6.1 (Effects of Congestion on Emissions) explains some residual artefacts associated with average speeds.

6.3.6 Construction Impact Assessment Methods

Locations sensitive to dust emitted during construction will be places where members of the public are regularly present. Residential properties and commercial operations close to the works will be most sensitive to construction dust. Any sensitive vegetation or ecology that is very close to dust sources might also suffer some negative effects.

It is very difficult to quantify dust emissions. It is thus not possible to predict changes to dust soiling or PM_{10} concentrations with any confidence. In these circumstances, it is common practice to provide a qualitative assessment based largely on experience elsewhere, as well as focusing on mitigation measures to minimise emissions. There are no formal assessment criteria for dust. In the absence of formal criteria, a set of distance based criteria have been developed. These distances are based on professional experience drawn from involvement with assessments of many different types of project, discussions with many practitioners in the field, and from consideration of a range of published reports (e.g. BRE, 2003; Defra and the DAs, 2003b). The criteria are set out in Table 6.2. The approach adopted for assessing potential construction dust impacts is a count of the number of properties that might be affected. The property counts are based on Ordnance Survey Address Point data. The precise approach used is described in detail in the assessment section.

Table 6.2 : Assessment Criteria for Dust from Construction Activities, with Standard Mitigation in Place

Source		Potential Distance for Significant Effects (Distance from source)		
Scale	**Description**	**Soiling**	**PM_{10} [a]**	**Vegetation effects**
Major	Large construction sites, with high use of haul routes	100 m	25 m	25 m
Moderate	Moderate sized construction sites, with moderate use of haul routes	50 m	15 m	15 m
Minor	Minor construction sites, with limited use of haul routes	25 m	10 m	10 m

6.4 Baseline Conditions

All five local authorities that are within the local air quality study area have carried out reviews and assessments of air quality over a number of years. Their principal conclusions are summarised below:

In 2004, (North Lanarkshire Council, 2004) North Lanarkshire Council identified likely exceedances of the 2010 PM_{10} objectives at three locations and have thus declared AQMAs in Motherwell, Coatbridge and Chapelhall. More recent evidence (North Lanarkshire Council, 2005) has indicated that exceedances are unlikely in Motherwell, but that exceedances of the 2010 PM_{10} objectives are likely at Harthill. North Lanarkshire Council have also identified possible exceedances of the annual mean nitrogen dioxide objective within the Motherwell and Chapelhall AQMAs, as well as at Uddingston, Coatbridge, and Auchenkilns. Motherwell and Uddingston are fairly central to the local air quality Study Area and have thus been the focus of specific receptor modelling. Similarly, the proposed Scheme might influence air quality in Coatbridge, so this area too has been the focus of specific receptor modelling. Chapelhall, Harthill and Auchenkilns are outside of the local air quality Study Area because there are no roads on which significant changes in traffic flow are expected within 2km of these areas. The two AQMAs within the local air quality Study Area are shown in Figure 6.1.

Glasgow City Council declared the centre of the city an AQMA in 2001 because exceedances of the annual mean nitrogen dioxide objective were predicted (Glasgow City Council, 2001). The Updating and Screening Assessment (Glasgow City Council, 2003) included monitoring data from locations outside the AQMA, where the nitrogen dioxide objective was also likely to be exceeded. The report also acknowledged that there was a risk of the 2010 PM_{10} objectives being exceeded at locations across the city. The Updating and Screening Assessment was followed by a Detailed Assessment (Glasgow City Council, 2005) which concluded that additional AQMAs for nitrogen dioxide were required and that exceedance of the 2010 PM_{10} objectives both within the city centre and also outside of the city centre were likely. None of the areas highlighted by Glasgow City Council's air quality review and assessment are within the local air quality Study Area and thus none are shown in Figure 6.1.

South Lanarkshire Council have also carried out regular reviews and assessments of air quality (e.g. South Lanarkshire Council, 2005) and have not needed to declare any AQMAs. They did, however, carry out a Detailed Assessment of PM_{10} concentrations at a single junction (Whirlies Roundabout) that was of particular concern. This involved both monitoring and modelling of PM_{10} concentrations close to the junction. The Detailed Assessment recommended that although an AQMA wasn't required, the situation at this junction should be kept under review, particularly as there is potential new residential exposure close to the location of the PM_{10} monitor. The location of the PM_{10} monitor has thus been included as a specific receptor in this current assessment. This junction is highlighted in Figure 6.1.

East Renfrewshire Council have also carried out regular reviews and assessments of air quality (e.g. East Renfrewshire Council, 2005) and have not needed to declare any AQMAs.

East Ayrshire Council have also carried out regular reviews and assessments of air quality (e.g. East Ayrshire Council, 2005) and have not needed to declare any AQMAs.

Tables 6.3 and 6.4 set out the measurements of nitrogen dioxide and PM_{10} concentrations that were made by the five councils during 2004 within the local air quality Study Area. The locations that the Councils provided for their monitors were not all precise enough to produce a Figure showing their locations. The measured data in Tables 6.3 and 6.4 have thus been included as indicative of the named streets and areas. During 2004, North Lanarkshire Council operated automatic monitors measuring nitrogen dioxide at four sites within the local air quality Study Area. Each of these operated for approximately six months. They also monitored nitrogen dioxide using diffusion tubes at a large number of sites. North Lanarkshire have also operated automatic monitors measuring PM_{10} for six months at three sites within the Study Area. Glasgow Council operated a large number of monitors, but only four of these were within the local air quality Study Area during 2004. During 2004, South Lanarkshire Council operated ten nitrogen dioxide diffusion tube sites in the area. South Lanarkshire Council also operated an automatic monitor for PM_{10} for two months at a single site. During 2004, East Renfrewshire Council operated nine diffusion tube sites within the local air quality Study Area. East Ayrshire operated one site within the Study Area.

In addition to defining baseline conditions using monitoring data, the dispersion model has been run to predict existing conditions (2004) and conditions in 2010 if the Scheme and other non-committed developments do not go ahead at seventy-two receptors. The complete results are presented in Appendix AQ.6.1, and the results for a selection of fifteen of these receptors are reproduced in Tables 6.5 and 6.6. These fifteen receptors have been chosen to represent those locations where the predicted impacts of the scheme are most significant.

Both the measurements and the model results show some exceedances of 40 $\mu g/m^3$ as an annual mean nitrogen dioxide concentration during 2004, but the objective did not apply during this year. By the proposed Scheme opening year (2010), no nitrogen dioxide objective exceedances are expected. The largest measured concentration (45

$\mu g/m^3$ in 2004) was at Bank Street (II)[6] in Coatbridge. The largest predicted concentration (44 $\mu g/m^3$ in 2004) is at Ivycott, on Carnboe Road.

No exceedances of the 2004 PM_{10} objectives were measured and none have been predicted by modelling. When adjusted to predict 2010 values, the measurements do not suggest that the 2010 PM_{10} objectives will be exceeded; but achievement of the annual mean objective will be by a very small margin. Furthermore, as noted above, North Lanarkshire Council has predicted exceedances of this objective based on their own analysis of previous monitoring data. The model results indicate that the annual mean 2010 PM_{10} objective is likely to be exceeded at the worst-case locations, namely at the junction of the A8 with Knockside Ave (Ivycott, Carnbroe Rd) (Receptor 32), and at Lysa Vale Place in Bellshill (Receptor 17). Exceedances of the annual mean 2010 PM_{10} objective in the baseline case are also predicted at three receptors that are not presented in Table 6.6. These are Receptors 28: Maryville View in Uddingston; Receptor 25: Sheepburn Road, Uddingston; and Receptor 51: Wellhall Road, Hamilton. Results for these three receptors are presented in Appendix AQ.6.1.

The short monitoring study at Whirlies Roundabout resulted in an annual mean equivalent PM_{10} concentration of 28 $\mu g/m^3$ in 2004. However, this is likely to have been influenced by locally-generated PM_{10} from an adjacent building site (South Lanarkshire Council, 2005). South Lanarkshire Council (2005) have modelled the PM_{10} concentration at this location and predicted an annual mean concentration of 19 $\mu g/m^3$ in 2004. This compares well with the concentration modelled in this current study of 18 $\mu g/m^3$ in 2004.

It is worth noting that a large number of locations across Scotland are expected to exceed the 2010 PM_{10} objectives based on current best-practice air quality assessment methods. Ongoing work (e.g. a monitoring study being carried out by North Lanarkshire Council) may provide evidence that the proportion of volatile particles in Scottish PM_{10} is being over-predicted and thus total measured concentrations are being unnecessarily factored upward. The risk of objective exceedance may thus be smaller than the data in this report suggest. This assessment follows current national guidance and also the approach used by all of the Councils within the Study Area.

As is noted above, there are two AQMAs within the local air quality Study Area: Motherwell and Coatbridge. Those locations within each AQMA at which the impacts of the Scheme are expected to be greatest have been included as specific receptors in Tables 6.3 and 6.4. The modelling does not suggest that exceedances of either the nitrogen dioxide or the PM_{10} objectives are likely at either receptor in the baseline case.

Table 6.3: Measured and Predicted Baseline Annual Mean Nitrogen Dioxide Concentrations within the Local Air Quality Study Area

	Site Type	2004	2010
Automatic Measurements [a]			
Calder Court, Coatbridge	Urban Background	26	22[h]
Motherwell Civic Centre	Roadside	23	19[h]
Wishaw	Roadside	25	20[h]

[6] This is the monitoring site nomenclature used by the Council.

	Site Type	2004	2010
Motherwell Cross	Roadside	39	32 [h]
North Lanarkshire Council Diffusion Tube Measurements [b]			
Coatbridge 1, Bank St.	Kerbside	37	30 [h]
Coatbridge 2, Whifflet Court	Roadside	29	24 [h]
Civic Centre, Motherwell	Kerbside	38	31 [h]
Health Centre, Motherwell	Roadside	21	17 [h]
Emily Drive, Motherwell	Background	15	13 [h]
Kethers lane, Motherwell	Background	17	15 [h]
Coursington Road, Motherwell	Roadside	18	15 [h]
Craigneuk Road, Carfin	Kerbside	18	15 [h]
Coatbridge 3, Hozier Street	Kerbside	26	21 [h]
Camp Street, Motherwell	Background	19	16 [h]
Cinema carpark, Braehead	other (motorway)	40	33 [h]
Orchard Farm A8 East	other (motorway)	32	26 [h]
Braehead Farm, Bargeddie	other (motorway)	38	31 [h]
New Edinburgh Road, Uddingston	other (motorway)	40	33 [h]
Alpine Grove, Uddingston	other (motorway)	26	21 [h]
Fallside Road, Uddingston	other (motorway)	32	26 [h]
Tinkers Lane, Motherwell	Roadside	29	24 [h]
Castlehill Road, Overtown	Roadside	23	19 [h]
Coatbridge, Bank Street II	Roadside	45	37 [h]
Delburn St Motherwell	Roadside	25	20 [h]
Merry St, Motherwell	Roadside	40	33 [h]
Shawhead RBT, Coatbridge	other (motorway)	41	34 [h]
Glasgow City Council Diffusion Tube Measurements [c]			
Drumhead Road	Background	17	15 [h]
Dougrie Road 1	kerbside	19	16 [h]
Dougrie Road 3	Roadside	21	17 [h]
Invergarrie Road	Background	13	11 [h]
South Lanarkshire Council Diffusion Tube Measurements [d]			
Civil Centre, East Kilbride	Roadside	22	18 [h]
Kingsway, East Kilbride	Roadside	45	36 [h]
Vancouver Drive, East Kilbride	Background	11	10 [h]
Glen Esk, East Kilbride	Background	14	12 [h]
Cadzow Street, Hamilton	Roadside	27	22 [h]
Houston Street, Hamilton	Background	14	12 [h]
Balfron Crescent, Hamilton	Background	12	10 h
Burnpark Avenue, Uddingston	Roadside	27	22 [h]
North British Road, Uddingston	Background	24	21 [h]
Donaldson road, Larkhall	Background	22	19 [h]
East Renfrewshire Council Diffusion Tube Measurements [e]			
Rouken Glen Road, Giffnock	Roadside	29	24 [i]
Eastwoodmains Road, Giffnock	Roadside	31	25 [i]
Clarkston Toll, Clarkston	Roadside	24	20 [i]
Sheddens Roundabout, Clarkston	Roadside	21	17 [i]
Riverside Terrace, Busby	Roadside	20	16 [i]
Broompark Dr, Newton Mearns	Background	9	8 [i]
Glasgow Road, Eaglesham	Roadside	15	12 [i]
Montgomery Street, Eaglesham	Roadside	26	21 [i]
Greenhags, Newton Mearns	Roadside	18	15 [i]
East Ayreshire Council Diffusion Tube Measurements [f]			
Lainshaw Street, Stewarton	Roadside	26	21 [i]
Background Concentrations [g]			
Range across local Study Area	Background	4 - 24	3 - 20
Model [h]			(CDM)
1 Manse Road, Motherwell (AQMA)	Roadside	34	28
16 47 South View, Bellshill	Roadside	33	27
17 6 Lysa Vale Place, Bellshill	Roadside	40	33
22 7 Clydeview, Bothwell, Glasgow	Roadside	29	24
23 Strathclyde Park Inn, Hamilton Road, Motherwell	Roadside	38	31

		Site Type	2004	2010
32	Ivycott, Carnbroe Road, Coatbridge	Roadside	44	37
34	Auld House, Whifflet Street, Coatbridge (AQMA)	Roadside	35	29
35	84 Carmyle Ave, Glasgow	Roadside	30	25
42	PM_{10} monitor on Whirlies Roundabout	Roadside	34	28
45	25 Macbeth, East Kilbride	Roadside	33	27
49	142 Parkville Drive, Blantyre	Roadside	31	26
55	91 Mote Hill, Hamilton	Roadside	34	28
56	14 Hamilton Road, Bothwell	Roadside	32	27
57	28 Fallside Road, Bothwell	Roadside	29	24
61	71 Olifard Avenue, Bothwell	Roadside	29	24
Objective				**40**

[a] Data supplied by North Lanarkshire Council. Data from approximately 6 months during 2004 (equal mix of summer and winter) adjusted to annual mean equivalent by North Lanarkshire Council following advice in Defra and DAs (2003b), using a comparison with long-term trends at Glasgow Centre. Data taken from North Lanarkshire Council (2005).
[b] Data taken from North Lanarkshire Council (2005). Diffusion tubes were supplied and analysed by Glasgow Scientific Services using 20% Triethanolamine (TEA) in water. Results have been adjusted for bias by North Lanarkshire Council based on a collocation study at Harthill. The adjustment factor was 0.86.
[c] Data taken from Glasgow City Council (2005). Diffusion tubes were supplied and analysed by Glasgow Scientific Services using 20% TEA in water. Results have been adjusted for bias by Glasgow City Council based on a collocation study at Glasgow Centre. The adjustment factor was 0.74.
[d] Data supplied by South Lanarkshire Council. Diffusion tubes were supplied and analysed by Glasgow Scientific Services using 20% TEA in water. Results have been adjusted for bias using the factor provided by Defra (2006b) (sheet version 03/06). The adjustment factor was 0.83
[e] Data taken from East Renfrewshire Council (2005). Diffusion tubes were supplied and analysed by Glasgow Scientific Services using 20% TEA in water. Results have been adjusted for bias by East Renfrewshire Council based on a factor previously provided by Defra (2006b). This adjustment factor was 0.81.
[f] Data taken from East Ayreshire Council (2005). Diffusion tubes were supplied and analysed by Glasgow Scientific Services using 20% TEA in water. Results have been adjusted for bias by East Ayreshire Council.
[g] Provided by Defra and the DAs (2006a). The range of background concentrations across the entire Study Area (this range has only been taken for presentational purposes, for receptor modelling, the background concentration for the relevant background square has been used).
[h] Results of dispersion modelling. The 2010 data are for the CDM model as this will best represent the baseline case. All modelling results presented in the main text of this report have been adjusted following the approach set out in Appendix AQ6.1. Appendix AQ6.1 also presents a direct comparison between measurements and model results.
[i] Predicted based on the national trends and projections using factors provided by Defra and the DAs (2006a). These factors supersede those that were published in LAQM TG(03) (Defra and the DAs 2003b).

Table 6.4: Measured and Predicted Baseline PM10 Concentrations Within the Local Air Quality Study Area

Location		Type of Site	Annual Mean ($\mu g/m^3$)		Number of 24-hour exceedances	
Measurement			**2004**	**2010**	**2004**	**2010**
Calder Court, Coatbridge [b]		Urban Background	19	18[f]	(36)[g]	1[g]
Motherwell Civic Centre [b]		Roadside	13	12[f]	(27)[g]	0[g]
Motherwell Cross [b]		Roadside	13	12[f]	(27)[g]	0[g]
Whirlies Roundabout [c]		Roadside	28	-	21[h]	-
Background Concentrations [d]						
Range across local Study Area		Background	11 - 19	10 - 18	0 - 2[h]	0 - 1[h]
Model [e]				(CDM)		(CDM)
1	Manse Road, Motherwell (AQMA)	Roadside	18	17	1	1
16	47 South View, Bellshill	Roadside	17	16	1	0
17	6 Lysa Vale Place, Bellshill	Roadside	20	**18**	3	2
22	7 Clydeview, Bothwell, Glasgow	Roadside	15	14	0	0
23	Strathclyde Park Inn, Hamilton Road, Motherwell	Roadside	19	18	2	1
32	Ivycott, Carnbroe Road, Coatbridge	Roadside	22	**22**	7	6
34	Auld House, Whifflet Street, Coatbridge (AQMA)	Roadside	17	15	1	0
35	84 Carmyle Ave, Glasgow	Roadside	15	14	0	0
42	PM_{10} monitor on Whirlies Roundabout [d]	Roadside	18	16	1	0
45	25 Macbeth, East Kilbride	Roadside	18	17	1	1
49	142 Parkville Drive, Blantyre	Roadside	18	18	2	1
55	91 Mote Hill, Hamilton	Roadside	18	17	1	0
56	14 Hamilton Road, Bothwell	Roadside	17	16	1	0
57	28 Fallside Road, Bothwell	Roadside	15	14	0	0
61	71 Olifard Avenue, Bothwell	Roadside	15	14	0	0
Objective			**40**	**18**	**35** (50[g])	**7**

[a] All results gravimetric equivalent (measurements are taken as the Tapered Element Oscillating Microbalance (TEOM) result x 1.3. At the moment this is the most reliable approach to interpreting Scottish TEOM data but it is thought to be a worst-case approach).
[b] Data supplied by North Lanarkshire Council. Data from approximately 6 months during 2004 (equal mix of summer and winter) adjusted to annual mean equivalent by North Lanarkshire Council following advice in Defra and DAs (2003), using a comparison with long-term trends at Glasgow Centre.
[C] Data taken from South Lanarkshire Council (2005). Data from just two months of monitoring have been adjusted to an annual mean equivalent by South Lanarkshire Council following advice in Defra and DAs (2003), using a comparison with long-term trends at Edinburgh St Leonards. The TEOM monitor was very close to a building site and thus will have measured locally suspended dust. Because the measured 2004 concentration is likely to have been significantly influenced by a building site that is unlikely to be present in 2010, factoring the data forward to predict levels in 2010 is not appropriate with these data.
[d] Provided by Defra and the DAs (2006a). The range of background concentrations across the entire study area (this range has only been taken for presentational purposes, for receptor modelling, the background concentration for the relevant background square has been used).
[e] Results of dispersion modelling. The 2010 data are for the CDM model as this will best represent the baseline case.
[f] Predicted based on the national trends and projections using factors provided by Defra and the DAs (2006a). These factors supersede those that were published in LAQM TG(03) (Defra and the DAs 2003b).
[g] Data presented as 98th percentile 24-hour mean concentrations – which should be assessed against 50$\mu g/m^3$ (the 24-hour objective concentration) rather than 35 (the number of permitted exceedances of the 24-hour objective concentration).
[h] Calculated from the relationship with the annual mean set out in LAQM TG(03) (Defra and the DAs 2003b).

6.5 Local Air Quality Impacts

6.5.1 Nitrogen Dioxide

Predicted annual mean nitrogen dioxide concentrations at seventy-two receptors are set out in Appendix AQ.6.1. The results are also summarised in Figure 6.1. Figure 6.1 also indicates the significance of the impact of the Scheme at each receptor[7]. In order to simplify presentation, the results for fifteen of the receptors, which have been chosen to represent a sample of the most significant impacts across the study area, are reproduced in Table 6.5. The precise positions of these fifteen receptors are described in Figures 6.2 and 6.3.

The results are predicted for 2010, which is the proposed Scheme opening year and will thus be the worst-case year for local air quality impacts. As is explained in the Baseline Assumptions section, the with-Scheme predictions can be compared against the predictions for the Raith Reference Case (RMN) to estimate the air quality impacts of the proposed Scheme. The predictions for 2010 can be assessed against the annual mean objective for nitrogen dioxide. Exceedances of the 1-hour nitrogen dioxide objective are unlikely as none of the predicted annual mean concentrations is greater than 60 $\mu g/m^3$ (Laxen and Marner, 2003). The predicted impacts of the Scheme are appraised using the descriptive criteria and are set out in Appendix AQ.6.1.

The Most Significant Scheme-Related Impacts

No objective exceedances are likely in 2010 at any of the seventy-two receptors either with or without the proposed Scheme. The proposed Scheme will improve conditions at some locations and worsen them at others. The largest change that is expected as a result of the Scheme is an improvement. This is at Receptor 35, which is near to the M74, the A763 (Carmyle Road) and the A74 (London Road). A large reduction in annual mean nitrogen dioxide concentrations is expected here, but because baseline levels are expected to be well below the objective (with the Scheme), the significance of this benefit is judged to be moderate. The largest deterioration is expected at Receptor 32, which is adjacent to the existing A8[8]. The changes that are expected here are also judged to be large and the impacts are judged to be moderate adverse. Elsewhere, the impacts of the Scheme are expected to be, at most, slight and in most cases negligible.

[7] The results in Figure 6.1 are given for either nitrogen dioxide or PM_{10}, depending on which pollutant will give rise to the greatest impact at that receptor (for example, if the impact is negligible for nitrogen dioxide, but slight adverse for PM_{10}, then it is shown as slight adverse in the Figure).

[8] This receptor was modelled for the Stage 3 assessment of the M8 mainline and showed a large benefit due to that proposal. This is discussed further in the cumulative effects section.

Table 6.5: Predicted Annual Mean Nitrogen Dioxide Concentrations (g/m3) With and Without the Proposed Scheme at Fifteen Receptors.

R	Description	2004	2010 Without Scheme[a]	2010 With Scheme	Change due to Scheme (%)	Impact Magnitude	Impact Significance
1	Manse Road, Motherwell (AQMA)	33.5	27.5	27.8	0.9%	Extremely Small	Negligible
16	47 South View, Bellshill	33.1	27.8	30.3	9.3%	Small	Slight Adverse
17	6 Lysa Vale Place, Bellshill	39.5	33.1	34.5	4.2%	Very Small	Slight Adverse
22	7 Clydeview, Bothwell, Glasgow	28.7	23.7	24.9	4.7%	Very Small	Negligible
23	Strathclyde Park Inn, Hamilton Road, Motherwell [b]	37.6	31.5	32.8	4.2%	Very Small	Slight Adverse
32	Ivycott, Carnbroe Road, Coatbridge	44.0	27.0	31.2	15.6%	Large	Moderate Adverse
34	Auld House, Whifflet Street, Coatbridge (AQMA)	34.8	28.7	29.0	1.0%	Extremely Small	Negligible
35	84 Carmyle Ave, Glasgow	29.7	31.0	25.1	-19.0%	Large	Moderate Beneficial
42	PM_{10} monitor on Whirlies Roundabout [c]	33.8	27.7	28.7	3.6%	Very Small	Negligible
45	25 Macbeth, East Kilbride	33.2	28.2	29.0	2.9%	Very Small	Negligible
49	142 Parkville Drive, Blantyre	30.5	25.7	27.5	7.3%	Small	Slight Adverse
55	91 Mote Hill, Hamilton	33.9	28.4	25.6	-9.9%	Small	Slight Beneficial
56	14 Hamilton Road, Bothwell	32.0	26.9	25.7	-4.6%	Very Small	Negligible
57	28 Fallside Road, Bothwell	28.6	24.1	23.1	-4.1%	Very Small	Negligible
61	71 Olifard Avenue, Bothwell	29.3	24.4	25.0	2.4%	Very Small	Negligible
Objective			**40**				

[a] Under the RMN scenario. These predictions are different from those presented in the baseline section, which reflected the CDM scenario.
[b] The robust assumption has been made that the inn has long-term residents that represent valid exposure for the annual mean and 24-hour objectives.
[c] It is assumed that new flats will be occupied on this site by 2010, and thus the annual mean and 24-hour objectives will apply here.

Predicted Changes Close to the Proposed Works

The three receptors which are closest to the proposed works at Raith are Receptors 22, 23 and 61. Each of these locations would experience a very small increase in annual mean nitrogen dioxide concentrations. At the two residential houses to the west of the M74, concentrations would remain well below (i.e. less than 75% of) the level of the annual mean objective and thus the significance of the predicted change is judged to be negligible. The concentration at the Strathclyde Park Inn will be below (but not well below) the objective with or without the Scheme and thus the significance of the predicted change is judged to be slight adverse.

Predicted Changes within the AQMAs

Extremely small increases in annual mean nitrogen dioxide objectives are expected at those receptors in Table 6.5 that are within AQMAs. The change at both of these worst-case locations would be less than 1% of the without-Scheme concentration and are judged to be negligible. It is worth noting that Appendix AQ.6.1 sets out the results for three additional receptors within AQMAs: one (Receptor 29) within the Coatbridge AQMA and two (Receptors 2 and 71) within the Motherwell AQMA. Very small reductions in annual mean nitrogen dioxide concentrations are expected at all three of these receptors, showing that the very small and extremely small changes in concentration might be either upward or downward at different locations within the AQMAs.

Whirlies roundabout is not an AQMA, but is a location that South Lanarkshire Council have previously expressed concern over. The predicted change in annual mean nitrogen dioxide concentrations at this receptor is negligible.

6.5.2 PM_{10}

Predicted annual mean and 24-hour PM_{10} concentrations at seventy-two receptors are set out in Appendix AQ.6.1. The results are also summarised in Figure 6.1. Figure 6.1 also indicates the significance of the impact of the Scheme at each receptor[7] at each of the seventy-two receptors. In order to simplify presentation, the results for fifteen of the receptors, which have been chosen to represent a sample of the most significant impacts across the study area, are reproduced in Tables 6.6 and 6.7. These are the same fifteen receptors chosen for nitrogen dioxide and their precise positions are described in Figures 6.2 and 6.3.

The results are predicted for 2010, which is the proposed Scheme opening year and will thus be the worst-case year for local air quality impacts. As is explained in the Baseline Assumptions section, the with-Scheme predictions can be compared against the predictions for the Raith Reference Case (RMN) to estimate the air quality impacts of the proposed Scheme. The predictions for 2010 can be assessed against the 2010 annual mean and 24-hour objectives. The predicted impacts of the Scheme are appraised using the descriptive criteria and are set out in Appendix AQ.6.1.

The Most Significant Scheme-Related Impacts

The annual mean 2010 PM_{10} objective is predicted to be exceeded at three of the seventy-two receptors without the Scheme and at seven receptors with the Scheme. The difference is brought about by Receptors 23, 32, 45, 49, and 51[9], which move from achievement to exceedance and Receptor 28, which moves from exceedance to achievement of this objective due to the Scheme. The results are set out in Appendix AQ.6.1 and, for all but two of the Receptors (51 and 28), are also shown in Table 6.6.

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[9] An exceedance of the objective in the baseline case at this receptor was described in the baseline section, but this was in the committed do-minimum situation. The only 2010 scenario in which an exceedance is not predicted at this receptor is the Raith Reference Case (RMN).

Table 6.6: Predicted Annual Mean PM10 Concentrations (g/m3) With and Without the Proposed Scheme at Fifteen Receptors.

R	Description	2004	2010 Without Scheme[a]	2010 With Scheme	Change due to Scheme (%)	Impact Magnitude	Impact Significance
1	Manse Road, Motherwell (AQMA)	17.9	16.2	16.3	0.5%	Extremely Small	Negligible
16	47 South View, Bellshill	16.6	15.7	17.6	12.2%	Medium	Moderate Adverse
17	6 Lysa Vale Place, Bellshill	19.7	**18.5**	**19.6**	5.9%	Small	Substantial Adverse
22	7 Clydeview, Bothwell, Glasgow	15.1	14.2	15.0	5.7%	Small	Slight Adverse
23	Strathclyde Park Inn, Hamilton Road, Motherwell [b]	18.8	17.8	**19.3**	8.7%	Small	Substantial Adverse
32	Ivycott, Carnbroe Road, Coatbridge	22.2	15.6	**18.4**	17.5%	Large	Very Substantial Adverse
34	Auld House, Whifflet Street, Coatbridge (AQMA)	16.5	15.0	15.3	1.5%	Very Small	Slight Adverse
35	84 Carmyle Ave, Glasgow	14.9	16.6	13.9	-16.1%	Large	Moderate Beneficial
42	PM_{10} monitor on Whirlies Roundabout [c]	17.7	16.3	16.8	3.1%	Very Small	Slight Adverse
45	25 Macbeth, East Kilbride	17.8	17.5	**18.1**	3.3%	Very Small	Moderate Adverse
49	142 Parkville Drive, Blantyre	18.1	17.6	**18.8**	6.7%	Small	Substantial Adverse
55	91 Mote Hill, Hamilton	17.6	16.6	14.7	-11.1%	Medium	Moderate Beneficial
56	14 Hamilton Road, Bothwell	16.6	15.8	15.3	-3.2%	Very Small	Slight Beneficial
57	28 Fallside Road, Bothwell	15.3	14.5	13.9	-4.2%	Very Small	Slight Beneficial
61	71 Olifard Avenue, Bothwell	15.2	14.4	14.7	1.9%	Very Small	Slight Adverse
Objective		**40**	**18**	**18**			

[a] Under the EDM scenario. These predictions are different from those presented in the baseline section, which reflected the CDM scenario.
[b] The robust assumption has been made that the inn has long-term residents that represent valid exposure for the annual mean and 24-hour objectives.
[c] It is assumed that new flats will be occupied on this site by 2010, and thus the annual mean and 24-hour objectives will apply here.

The largest expected change as a result of the Scheme is a deterioration at Receptor 32, which is adjacent to the existing A8[10]. The change that is predicted here is large and since it would also give rise to an objective exceedance, it is judged to be very substantial adverse. The largest improvement would be at Receptor 35, which is near to the M74, the A763 (Carmyle Road) and the A74 (London Road). This receptor would experience a large reduction, but because the predicted levels are below the objective with or without the Scheme, this change is judged to be only moderate beneficial. Elsewhere, substantial adverse impacts are expected at Receptors 17 (adjacent to the junction of the

[10] This receptor was modelled for the Stage 3 assessment of the M8 mainline and showed a large benefit due to that proposal. This is discussed further in the cumulative effects section.

A721 with the A725), 23 (adjacent to the proposed Scheme), and 49 (adjacent to the A725 junction at Auchinraith); while moderate adverse impacts are expected at Receptors 16 (adjacent to the A725 in Bellshill) and 45 (at the junction of the A725 with the A749 at Calderwood); and a moderate beneficial impact is expected at Receptor 55 (at the junction of the A724 and the B755 in Hamilton). Other changes that are expected as a result of the proposed Scheme will be smaller than these. The reason that the impacts described above are termed as so significant is not that large changes are predicted; the descriptions relate mainly to whether or not exceedances of the annual mean 2010 PM10 objectives are predicted. As noted in the baseline section, it is likely that this assessment has tended to over-estimate PM_{10} concentrations in relation to the gravimetric-equivalent air quality objectives.

Predicted Changes Close to the Proposed Works

The three receptors which are closest to the proposed works at Raith are Receptors 22, 23 and 61. Receptors 22 and 23 would both experience smalls increases in annual mean PM_{10} concentrations. The change at Receptor 61 would be very small. The impact of these changes at the two residential properties would be slight adverse, but as noted above, the concentration at the Strathclyde Park Inn is predicted to exceed the objective with the Scheme and thus the impact is judged to be Substantial Adverse.

Predicted Changes within the AQMAs

As is explained above, there are five receptors within AQMAs. Of the two receptors in the Coatbridge AQMA, one (Receptor 34) would experience a slight adverse impact, while one (Receptor 29) would experience a slight beneficial impact. Of the three receptors in the Motherwell AQMA, two (Receptors 1 and 2) would experience negligible impacts, while one (Receptor 71) would experience a slight benefit.

The 2010 annual mean PM_{10} objective is unlikely to be exceeded near to Whirlies Roundabout (which is the location of concern to South Lanarkshire Council) with or without the proposed Scheme. A slight adverse impact is predicted at this location.

24-hour PM_{10} Concentrations

Very few exceedances of 50 $\mu g/m^3$ as a 24-hour mean PM_{10} concentration are expected in 2010 and no objective exceedances are likely with or without the proposed Scheme in place. The largest changes are expected at Receptors 17, 23 and 32. Even at these locations, the anticipated impacts are judged to negligible.

The results for the five receptors within AQMAs indicate that the number of exceedances of 50 $\mu g/m^3$ as a 24-hour mean PM_{10} concentration is not expected to change as a result of the Scheme.

Table 6.7: Predicted Number of Exceedances of 50 μg/m3 as a 24-hour Mean PM_{10} Concentration With and Without the Proposed Scheme at Fifteen Receptors.

R	Description	2004	2010 Without Scheme[a]	2010 With Scheme	Impact Magnitude	Impact Significance
1	Manse Road, Motherwell (AQMA)	1	0	0	Extremely Small	Negligible
16	47 South View, Bellshill	1	0	1	Extremely Small	Negligible
17	6 Lysa Vale Place, Bellshill	3	2	3	Very Small	Negligible
22	7 Clydeview, Bothwell, Glasgow	0	0	0	Extremely Small	Negligible
23	Strathclyde Park Inn, Hamilton Road, Motherwell [b]	2	1	3	Very Small	Negligible
32	Ivycott, Carnbroe Road, Coatbridge	7	0	2	Very Small	Negligible
34	Auld House, Whifflet Street, Coatbridge (AQMA)	1	0	0	Extremely Small	Negligible
35	84 Carmyle Ave, Glasgow	0	1	0	Extremely Small	Negligible
42	PM_{10} monitor on Whirlies Roundabout [c]	1	0	1	Extremely Small	Negligible
45	25 Macbeth, East Kilbride	1	1	1	Extremely Small	Negligible
49	142 Parkville Drive, Blantyre	2	1	2	Extremely Small	Negligible
55	91 Mote Hill, Hamilton	1	1	0	Extremely Small	Negligible
56	14 Hamilton Road, Bothwell	1	0	0	Extremely Small	Negligible
57	28 Fallside Road, Bothwell	0	0	0	Extremely Small	Negligible
61	71 Olifard Avenue, Bothwell	0	0	0	Extremely Small	Negligible
Objective		**35**	**7**	**7**		

[a] Under the EDM scenario. These predictions are different from those presented in the baseline section, which reflected the CDM scenario.
[b] The robust assumption has been made that the inn has long-term residents that represent valid exposure for the annual mean and 24-hour objectives.
[c] It is assumed that new flats will be occupied on this site by 2010, and thus the annual mean and 24-hour objectives will apply here.

6.5.3 Number of Properties that might be Affected by Changes in Local Air Quality

As is explained in the methodology section, dispersion modelling has been used to classify the likely direction of any changes in air quality at every residential property within 200m of roads on which significant changes in concentration are expected. This is not required by the DMRB but has been calculated in order to provide a more comprehensive assessment. Table 6.8 sets out the results, which are also shown in Figure 6.4. As noted above, the approach taken is more thorough than the screening method set out in the Scottish Transport Appraisal Guidance (STAG). Overall, it is likely to show a greater number of properties with an increase in concentrations than would be shown by the STAG screening method. This is because it takes account of the effect of changes in traffic on roads which are some distance from the properties being counted.

It is important to note that all predicted changes in concentration have been counted in Table 6.8, regardless of how small these changes would be. As can be inferred from the modelled concentrations at the worst-case receptors, the vast majority of the changes described in Table 6.8 will be negligible. Furthermore, at increasing distance from a road, the influence of that road becomes less, and thus many of the properties in the 50m and greater distance bands are being influenced more by the perturbation of the local background than by the changes on the nearby road. This is the main reason why Table 6.8 shows that many more properties are predicted to experience a deterioration in air quality than an improvement at the larger distances from the road. The largest impacts from road traffic tend to be close to roads and it is thus very important to note that in the first two distance bands in Table 6.8 (i.e. within 50m of road centrelines), more properties are expected to experience an improvement in air quality than a deterioration in air quality. On balance, the results in Table 6.8 are judged to be essentially neutral.

Table 6.8: Number of Properties Expected to Experience Improved and Deteriorated Air Quality as a Result of the Proposed Scheme.

Distance From Road Centreline	Number of residential properties likely to experience deteriorated air quality	Number of residential properties likely to experience improved air quality
0 m – 25 m	2831	3566
25 – 50 m	4144	4183
50m – 100m	9021	7390
100m – 150m	8990	6580
150m – 200m	8538	5490

6.5.4 Impacts on Vegetation

Appendix AQ 6.1 sets out in detail the results of the DMRB assessment of impacts on vegetation following the methodology in Interim Advice Note 61/05. There are three Sites of Special Scientific Interest (SSSIs) that might be potentially influenced by changes in air quality due to the proposed Scheme. All have been designated for their woodland. The sites are: Milburn, which is adjacent to the A71 east of Larkhall; Avondale, which is adjacent to the A71 west of Larkhall; and Bothwell Castle Grounds, which is on the River Clyde west of Bothwell. All three sites are shown in Figure 6.1.

As is explained in Appendix AQ 6.1, the relevant air quality criteria for ambient concentrations of oxides of nitrogen are not expected to be exceeded at any of the sites in 2010 with or without the Scheme in place. The Scheme would bring about improvements at all three sites ranging from extremely small to moderate, and bring impacts ranging from negligible to slight beneficial according to the criteria defined Appendix AQ 6.1.

As is explained in Appendix AQ 6.1, the relevant air quality criteria for nitrogen deposition are likely to be exceeded in 2010 with or without the Scheme. The Scheme is expected to bring about an extremely small reduction in nitrogen deposition flux at all of the locations assessed. These changes amount to slight beneficial impacts.

6.5.5 Cumulative Local Air Quality Impacts

As is explained in the Baseline Assumptions section, comparing the predicted with-Scheme concentrations with those under the Committed Do-Minimum (CDM) scenario provides an indication of the combined impacts of the proposed Scheme along with those of the proposed M8 Baillieston to Newhouse works and the proposed Associated Network

Improvements. The same modelling exercise as that described above for the Scheme-only impacts has been carried out for the cumulative impacts[11]. The predicted impacts at each of the seventy-two Receptors are set out in Appendix AQ 6.1. The tables in Appendix AQ 6.1 also highlight whether the cumulative impact significance at any receptor is different from the Scheme-only impact (as described previously).

Nitrogen Dioxide Concentrations

For nitrogen dioxide, eleven out of the seventy-two receptors would experience cumulative impacts that would be described differently from the Scheme-only impacts. Five of these (Receptors 4, 6, 20, 26 and 62) would experience a negligible impact from the Scheme, but a slight beneficial cumulative impact. Of the remaining six: two (Receptors 31 and 45) would change from negligible to slight adverse; one (Receptor 15) would change from slight adverse to negligible; one (Receptor 16) would change from slight adverse to moderate adverse; one (Receptor 35) would change from moderate beneficial to negligible; and one (Receptor 32) would change from moderate adverse to moderate beneficial.

Thus, for nitrogen dioxide, the largest difference between the Scheme-only impacts and the cumulative impacts is at the receptor at which the Scheme-only impacts would be worst (Receptor 32). The negative impact that was described for this receptor in the Scheme-only impacts section would, overall, become a beneficial impact.

Annual Mean PM_{10} Concentrations

For annual mean PM_{10} concentrations, eighteen out of the seventy-two receptors would experience cumulative impacts that would be described differently to the Scheme-only impacts. Five of these (Receptors 3, 27, 36, 38 and 39) would experience a slight beneficial impact from the Scheme, but a negligible cumulative impact. Four (Receptors 1, 2, 20 and 62) would experience a negligible impact from the Scheme, but a slight beneficial cumulative impact. Three (Receptors 19, 21 and 46) would change from slight adverse to negligible. Of the remaining six, one (Receptor 51) would change from slight adverse to slight beneficial; one (Receptor 29) would change from slight beneficial to slight adverse; one (Receptor 35) would change from moderate beneficial to negligible; one (Receptor 45) would change from moderate adverse to substantial adverse; and one (Receptor 32) would change from very substantial adverse to very substantial beneficial.

Thus, for annual mean PM_{10} concentrations the most significant differences between the scheme-only impacts and the cumulative impacts are expected at Receptors 45 and 32; which are shown in Figures 6.2 and 6.3. Receptor 45 is adjacent to the junction of the A725 with the A749 at Calderwood. At this worst-case roadside receptor the predicted annual mean PM_{10} concentration would move from 17.5 $\mu g/m^3$ to 18.1 $\mu g/m^3$ due to the Scheme and from 17.1 $\mu g/m^3$ to 18.1 $\mu g/m^3$ due to all three proposals together. Receptor 32 is adjacent to the existing A8 at its junction with Knockside Avenue and is

[11] The modelled road network has not been redefined for the cumulative impacts analysis, so the network of links explicitly included (as well as the choice of receptors) is based on the Scheme-only impacts.

the location that was highlighted as having the most significant Scheme-only impacts. At this receptor, the Scheme alone is expected to raise the annual mean PM_{10} concentration from 15.6 $\mu g/m^3$ to 18.4 $\mu g/m^3$. However, a baseline concentration of 15.6 $\mu g/m^3$ would only be achieved if the M8 Baillieston to Newhouse proposal was in place. The concentration predicted at this receptor in the 2010 committed baseline situation (CDM) is 21.7 $\mu g/m^3$. Thus, the cumulative effect of all three proposals together at this receptor would be to reduce the annual mean PM_{10} concentration from 21.7 $\mu g/m^3$ to 18.4 $\mu g/m^3$, which is a very substantial beneficial impact.

24-hour PM_{10} Concentrations

The cumulative 24-hour PM_{10} impacts are only expected to be appreciably different from the Scheme-only PM_{10} impacts at one receptor (Receptor 32), at which the Scheme-only impact would be described as negligible, but the cumulative impact would be described as slight beneficial.

Cumulative Impacts within the AQMAs

There are five receptors within AQMAs. For nitrogen dioxide and 24-hour PM_{10} levels, the cumulative impacts would be described in the same way as the Scheme-only impacts at each receptor. Annual mean PM_{10} concentrations would move from negligible to slight beneficial at Receptors 1 and 2, which are both within the Motherwell AQMA, and move from slight beneficial to slight adverse at Receptor 29, which is within the Coatbridge AQMA. They would remain as slight adverse at Receptor 34, which is also in the Coatbridge AQMA and as slight beneficial at Receptor 71 which is in the Motherwell AQMA.

The Scheme-only impacts would be essentially the same as the cumulative impacts at Receptor 42, which is at Whirlies Roundabout in South Lanarkshire.

Cumulative Impacts within the SSSIs

Appendix AQ 6.1 sets out the cumulative impacts of all three proposals on the two SSSIs at which Scheme-only impacts were assessed. The improvement that the Scheme would bring about at both sites would be even greater with all three proposals in place, but would not change the description of impacts given in the Scheme-only impacts section.

6.6 Wider-Scale Impacts

Table 6.9 sets out the total emissions of five air pollutants from all vehicles on the road network included in the transport model during 2001, 2004, and both 2010 and 2020 with and without the proposed Scheme. As is explained in the introduction, the modelled road network includes the whole of Central Scotland, as well as a representation of roads much further away. Some national estimates of total emissions are also presented for comparative purposes.

The proposed Scheme is expected to cause an extremely small increase in the emissions of all five pollutants from the modelled road network. The predicted change is not considered to be significant, particularly when compared to the national total emissions data.

Table 6.9: Total Emissions from the Entire Modelled Road Network with National Estimates for Comparison

	Carbon Monoxide (Kt)	THC (kt)	Nitrogen Oxides (Kt)	PM_{10} (kt)	Carbon Dioxide (Mt)
2001[a]	74.69	12.15	75.59	2.21	7.87
2004 [a]	51.96	8.64	64.32	1.96	8.72
2010 RMN	36.93	6.16	44.37	1.18	9.38
2020 RMN	38.97	6.33	31.75	0.82	10.33
2010 with Scheme	36.98	6.17	44.38	1.18	9.39
2010 change (EDM To Scheme)	0.05	0.00	0.02	0.00	0.01
2010 % change (EDM To Scheme)	**0.13%**	**0.07%**	**0.03%**	**0.09%**	**0.10%**
2020 with Scheme	39.00	6.34	31.76	0.82	10.34
2020 change (EDM To Scheme)	0.03	0.00	0.01	0.00	0.01
2020 % change (EDM To Scheme)	**0.09%**	**0.05%**	**0.03%**	**0.10%**	**0.06%**
Comparative Values					
2003 Total UK emissions (UNECE)[b]	3006	1102	1806	140	559
2003 Total UK emissions (IPCC)[c]	2757	1087	1569	-	572
2003 UK Transport emissions (IPCC)[c]	1402	164	709	-	126
2002 Scotland total emissions (IPCC)[c]	-	-	-	-	61
2010 Total UK emissions [d]	-	-	-	-	564
2020 Total UK emissions [d]	-	-	-	-	589
2010 UK transport emissions[d]	-	-	-	-	166
2020 UK transport emissions[d]	-	-	-	-	184

[a] As is explained in Appendix AQ 6.1, the baseline transport model was run for the year 2001. For the purposes of the local air quality assessment, flows for 2004 were predicted by interpolating between the 2001 model and the 2010 CDM model.

[b] The most recent year available from Defra and the DAs (2006c). Statistics on a United Nations Economic Commission for Europe (UNECE) basis are used to report progress against international targets for sulphur dioxide, nitrogen oxides, ammonia and volatile organic compounds. UNECE excludes land use change and also shipping in UK ports, but includes aviation emissions below 1000 metres to cover take-off and landing cycles.

[c] The most recent year available from Defra and the DAs (2006c). IPCC emission formats are reported to the United Nations Framework on Climate Change. IPCC includes land use and all emissions from domestic aviation and shipping, but excludes international marine and aviation bunker fuels.

[d] Estimates presented by Defra and the DAs (2005). Inherent in these predictions are policy measures for which many different assumptions are possible. It is for this reason that different values exist in other publications. The choice of reference source does not have a significant influence on the conclusions of this assessment.

6.6.1 Cumulative Wider-Scale Impacts

Table 6.10 sets out the total emissions of the five wider-scale impact air pollutants from all vehicles on the modelled road network under the CDM modelling scenario and compares these figures with the With-Scheme data from Table 6.9. The cumulative impacts of the proposed Scheme along with the M8 Baillieston to Newhouse works and the Associated Network Improvements would be larger than those predicted for the Scheme alone but would still be less than a 1% change for all pollutants. The changes are thus extremely small and the impacts judged to be negligible.

It should be noted that the only practical method for calculating total emissions across such an expansive road network makes use of annual average vehicle speeds. Along a free-flowing road, this speed is likely to be fairly representative, but on roads which are congested for part of the time, the average speed might be made up of a wide range of speeds. As is explained in Appendix AQ 6.1, this can lead to an under-prediction of emissions from congested road networks.

Traffic modelling predicts that without any road improvement works (i.e. the CDM scenario), this road network is likely to become increasingly congested over the next fifteen years. The three road proposals discussed here are expected to relieve this congestion. It is thus likely that the CDM emissions have been under-predicted, particularly in the 2020 scenario. This will mean that the increase in emissions attributed to the Scheme has been over-predicted.

Table 6.10: Cumulative Wider-Scale Impacts

	Carbon Monoxide (Kt)	THC (kt)	Nitrogen Oxides (Kt)	PM_{10} (kt)	Carbon Dioxide (Mt)
2010 CDM	36.82	6.15	44.26	1.17	9.34
2020 CDM	38.91	6.33	31.65	0.81	10.29
2010 with Scheme	36.98	6.17	44.38	1.18	9.39
2010 change (CDM to Scheme)	**0.16**	**0.01**	**0.12**	**0.01**	**0.04**
2010 % change (CDM to Scheme)	**0.42%**	**0.19%**	**0.27%**	**0.58%**	**0.48%**
2020 with Scheme	39.00	6.34	31.76	0.82	10.34
2020 change (CDM to Scheme)	**0.10**	**0.00**	**0.11**	**0.01**	**0.05**
2020 % change (CDM to Scheme)	**0.25%**	**0.03%**	**0.34%**	**0.79%**	**0.45%**

6.7 Construction Impacts

Dust might potentially be generated from any number of on-site activities, but the main dust sources are likely to be earth movement during site preparation, vehicles travelling over unpaved ground during dry weather, concrete crushers (if used), and lime stabilisation processes. There will also be the potential for some dust generation from construction activities such as handling of dusty materials and cutting of stone/concrete. Site material may also be tracked out along roadways by vehicles leaving the site. During dry weather this material might subsequently be raised as dust by passing vehicles. Mitigation of these impacts is discussed in the next section.

It is not possible at this stage to state with any certainty what activities are likely to take place. The assessment of construction dust is thus indicative, but the approach that has been adopted should provide a reasonable assessment. It has been assumed that dust might be generated anywhere within the area of the proposed junction layout. Similarly, dust is likely to be generated in the area around any of the existing roadways that would be removed by the Scheme. It has been assumed that this entire area is a major source of dust in terms of the descriptors set out in Table 6.2. According to Table 6.2, and assuming that standard mitigation measures are in place, there might thus be significant dust soiling up to 100m from these areas, with significant PM_{10} and vegetation effects up to 25m.

It is not known at this time where construction vehicles would exit the site onto main roads and so the worst-case assumption has been made that they might exit the site onto any existing main road that intersects the horizontal alignment of the Scheme design. This is followed by a second worst-case assumption, that dirt might be tracked up to 500m along any of these roads. Vehicles passing along these roads are then judged to be a minor source of dust according to Table 6.2. There might thus be some dust soiling within 25m of the centreline of any of these roads, with some PM_{10} and vegetation impacts within 10m.

Table 6.11 shows the number of properties within the various distance bands described above. It should be stressed that these numbers do not represent the number of properties likely to be affected, but those properties which, based on the information currently available, are thought to have a risk of possible impacts. The assessment does not imply that significant impacts would be likely at all of these locations, or that if incidents did occur, they would be frequent. Any dust incidents would be highly dependent on the weather, requiring dry conditions and winds blowing towards a receptor. These conditions would also need to be combined with an activity creating dust close to the receptor. This should only be the case if there had been an inadequate application of the mitigation measures, which experience suggests can happen from time to time. Dust-creating activities would not occur at all of the identified locations for the duration of the works. In most locations, the duration will be limited.

Table 6.11 Number of Properties Potentially Affected by Construction Dust.

	Dust Soiling		PM_{10} Impacts
	Residential	Businesses	Residential
Number of properties potentially affected by dust raised on-site.	195	7	24
Additional number of properties that could be affected by the tracking out of dirt along local roads.	71	0	2

The businesses that might be affected are The Strathclyde Park Inn; The Holiday Inn at Strathclyde Park; LBG Waterston (Architects); Autoglass; Welby Healthcare (including Science and Nature); Fireplace World; and the Harte Group.

There will inevitably be some dust raised outside of this boundary, for example from the construction compounds and from any haul routes that are not within the planned new roadways. However, these activities will be situated as far as possible from any residential properties and are unlikely to add significantly to the counts presented in Table 6.11.

The edges of Hamilton Low Parks SSSI that are nearest to the proposed works may experience some dust-related impacts, but these will be temporary and are likely to be of limited duration.

The number of construction vehicles and plant operating on site will be so small in comparison to existing flows on the surrounding road network that any impact of exhaust emissions on local air quality will be negligible.

6.8 Mitigation

This assessment has identified no specific requirement to mitigate the effects of emissions from road traffic. Measures to mitigate dust emissions would, however, be required during the construction phase. Mitigation should be straightforward, as the necessary measures are routinely employed as 'good practice' on construction sites. The measures to be employed during construction would include:

- Locating any unpaved haul routes as far as possible from occupied residential properties.
- Use of water-sprays to ensure that any unpaved routes across the site are maintained in a damp condition when in use.
- Imposition and enforcement of a 5 mph speed limit on unpaved ground.
- Sheeting of lorries carrying dusty material on and off site.
- Early sealing of open ground with vegetation.
- Locating any concrete crushing plant well away from residential areas.
- Location of stockpiles of potentially dusty material as far from sensitive locations as possible.
- Regular use of a water-assisted dust sweeper on local roads if necessary, to remove any material tracked out of the site.
- Regular cleaning of paved areas on-site.
- Use of a jet-spray vehicle and wheel wash for all vehicles leaving the site.
- Use of water suppression during any demolition works near to occupied residential properties.
- Use of water suppression during any cutting of stone or concrete.

Where mitigation measures rely on water, it expected that only sufficient water will be applied to damp down the material. There should not be any excess to potentially contaminate local watercourses.

During all stages of the construction works there will be close liaison with the Local Authorities,.

Some degree of soil contamination has been identified within the scheme boundaries (see Chapter 16, Geology and Soils), and standard precautions will be set in place and vigilance maintained during earthmoving to protect the public and site workers. Where potentially harmful contamination is suspected, the normal methods of assessment should be applied and appropriate action taken.

6.9 Conclusions

A Stage 3 DMRB assessment of the potential air quality impacts associated with the proposed improvements of Junction 5 of the M74 (Raith) has been carried out. Attention has been given to impacts during the construction phase; and to local air quality impacts, impacts on sensitive ecosystems, and wider-scale impacts during the operational phase.

In terms of local air quality impacts, the proposed Scheme is expected to improve air quality in some locations and to cause air quality to deteriorate in others. At most locations, any change in local air quality will be negligible. The residential properties immediately west of the proposed works will experience deteriorated air quality as a result of the Scheme, but any change would be, at most, slight and levels will remain below the relevant air quality objectives with or without the Scheme. The largest changes in air quality are expected several kilometres away from the proposed works. This is because of the changes in traffic flow that the Scheme will generate. The largest improvement is expected near to the junction of the A763 (Carmyle Road) with the M74. The largest deterioration is expected adjacent to the A8. Close to roads, where air quality tends to be worst, the improvements in air quality due to the Scheme are likely to outweigh the deteriorations. Further from roads, where air quality problems are less likely, the deteriorations will outweigh the improvements. Overall, the net effect of the proposed scheme on local air quality is judged to be essentially neutral.

There are three Sites of Special Scientific Interest that could potentially be influenced by changes in local air quality brought about by the Scheme. According to the assessment methodology set out in the DMRB, the Scheme would have a beneficial impact at all three sites. These improvements would range from negligible to slight.

In terms of wider-scale impacts, the Scheme is expected to bring about an extremely small increase in the total emissions of relevant air pollutants across the road network. In context, this increase is judged to be negligible.

Any effect of construction vehicle emissions on local air quality will be negligible. The construction works do, however, have the potential to create dust. During construction it would be necessary to apply a package of mitigation measures to minimise dust emissions. Even with these mitigation measures in place, those properties that are closest to the construction works and to roads near to site entrances might experience some dust soiling. Any effects would be temporary and any events would be infrequent, depending on the weather conditions and occurrence of dust raising activities.

Attention has also been given to the potential for cumulative operational impacts from this Scheme and from the proposed M8 Baillieston to Newhouse works and the Associated Network Improvements. As with the Scheme-only impacts, improvements are expected at some locations and deteriorations are expected at others. The most significant difference to the Scheme-only impacts is that the location that would have the largest deterioration due to the Scheme will, overall, experience a very substantial beneficial impact. Overall, the impacts remain broadly neutral. In terms of wider-scale cumulative impacts, the three schemes together would cause an extremely small increase in the total emissions of relevant air pollutants across the road network. In context, this increase is judged to be negligible.

6.10 References

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7 Cultural Heritage

7.1 Introduction

This section provides an assessment of the potential effects associated with the proposed road improvement scheme with respect to cultural heritage using guidance set out in DMRB Volume 11 (Environmental Assessment).

Cultural heritage refers to archaeological remains, Listed Buildings, Conservation Areas, Historic Gardens, Designed Landscapes and other heritage designations.

Generally, four categories of archaeological remains may be encountered comprising:

- upstanding remains: built structures such as buildings, field boundaries, and features such as standing stones and stone circles;
- earthworks: soil-covered remains that can be seen as surface undulations at ground level. These can include ruined buildings or their foundations, banks, mounds, ramparts, ditches, gullies and hollows;
- buried features: soil-covered remains which have no visible trace at ground level (possibly revealed by aerial photography); and
- artefact scatters: scatters of potsherds, flint, tools, metal objects, animal bones, worked stone, mortar or human remains.

Palaeoenvironmental evidence may also be found in association with archaeological remains and this can be used for dating purposes and to provide evidence of past land use or landform change.

The objective of a cultural heritage assessment is to undertake sufficient investigations to identify the significant archaeological impacts likely to arise from construction of the preferred route, to identify and characterise archaeological constraints and identify mitigation options associated with that route.

Historic Scotland (HS) generally assess the information gathered during the Stage 1 and 2 desk studies (and any walkover studies) and establish whether further field survey is required. Historic Scotland has determined during Stage 3 consultations that the desk-based collation of information is sufficient to characterise the nature of the identified heritage resource of the study area. However, the issue of previously uncovered remains will still need to be addressed as part of a mitigation strategy.

During the consultation exercise undertaken in 2004 and 2005, as described in Chapter 5, Historic Scotland determined that neither a formal Phase 1 desk assessment nor Phase 2 field evaluation need be undertaken for route planning purposes. Historic Scotland also advised that the information gathered to date on the location and description of sites of cultural heritage interest within the study area is sufficient and serves the purpose of the formal phases of archaeological work detailed above.

The assessment of effects on cultural heritage is largely based on the location and footprint of the scheme. Information regarding specific scheme components, such as excavation during the construction phase, will be further developed by the Contractor. Any activities that may cause disruption or damage to, for example, previously unrecorded features which cannot reasonably be anticipated as part of the Environmental Statement, will need to be considered and addressed by the Contractor in consultation with Historic Scotland.

7.2 Methods

The key objectives of the assessment approach have been to:

- identify the known and potential cultural heritage resources on and around the proposed scheme options and to evaluate the importance of sites and features recorded;
- describe the potential effects of the option locations on these resources; and
- recommend any measures to mitigate significant adverse impacts.

These objectives were achieved through establishing baseline conditions and subsequently defining any potential effects of the conceptual design on this baseline resource.

7.2.1 Baseline Methods

Information regarding existing and potential cultural heritage features within the vicinity of the proposed options has been collated through a desk-based review of existing archaeological data and through consultation with Historic Scotland and West of Scotland Archaeology Service (WoSAS).

7.2.2 Impact Assessment Methods

As outlined in Chapter 4, Approach and Methods, impacts were considered in terms of site value and the magnitude of the impact; the significance of predicted impacts was then determined through a combination of value and magnitude.

7.2.3 Site Value

The site value, or status, of each site was determined as detailed in Table 7.1 below.

Table 7.1 Definition of Site Value for Cultural Heritage

Value or Status	Criteria
National	Scheduled Ancient Monuments Listed Buildings (Category A)
Regional	Listed Buildings (Category B), archaeological sites deemed to be of regional interest
Local	Listed Building (Category C), archaeological sites deemed to be of local interest
Negligible	Sites of less than local or negligible importance or sites that have been completely destroyed or otherwise leave no physical trace (and therefore cannot be assigned a value).

Historic Designed Landscapes are not specifically listed in the above table, as the designation may apply to areas of varying significance, from local to national. Levels of importance, based on professional judgement, have been individually assigned to any Designed Landscapes in the vicinity of the scheme.

7.2.4 Impact Magnitude

The severity, or magnitude, of impact was assessed independently of the site value, based on professional judgement informed by planning policy and other relevant guidance, and assigned to one of the categories described in Table 7.2 below.

Table 7.2 Impact Magnitude Criteria

Impact Magnitude	Criteria
Major, adverse	Between approximately 50% and 100% demolition or loss of a site, or where there would be complete severance of important parts of a site such as to significantly affect the value of the site.
Moderate, adverse	Loss of part (between approximately 15% and 50%) of a site, major severance, major effects on setting, or substantial increases in noise or disturbance, such that the value of a site would be diminished but to a minor degree.
Slight, adverse	Minimal effect on a site (up to 15%) or a medium effect on its setting, or where there would be minor severance, increases in noise, vibration, disturbance or amenity, such that there would be no effect on its value.
Negligible, adverse	Very little appreciable effect on a site, a minimal effect on its setting, or where there are impacts which are not considered relevant to the historic value of a site.
No impact	
Negligible, beneficial	Very little appreciable effect on a site, a minimal benefit to its setting, or where there are impacts which are not considered relevant to the historic value of a site.
Slight, beneficial	Minimal enhancement of a site, a medium beneficial effect on its setting, or where there would be a minor reduction of severance, noise, vibration, disturbance or amenity such that there would be no effect on its value.
Moderate, beneficial	Major reduction of severance, a major beneficial effect on setting, or substantial reductions in noise or disturbance such that the value of a site would be enhanced to a minor degree.

These definitions are based on professional judgement and are necessarily approximate due to the need to address non-tangible issues, such as the relative importance of the specific part of a site to be affected within the context of the overall site.

7.2.5 Impact Significance

The significance of impact (beneficial and adverse) was determined as a combination of the value of the site and the magnitude of impact as shown in Table 7.3.

Table 7.3 Assessment of Significance Criteria

Site Value	Magnitude of Impact			
	Major	**Moderate**	**Slight**	**Negligible**
National	Major	Major	Moderate	Slight
Regional	Major	Moderate	Slight	Negligible
Local	Moderate	Slight	Slight	None
Negligible	Slight	Negligible	Negligible	None

Impacts on sites may be direct (such as damage or severance), or indirect impacts on setting (such as a road in close proximity creating noise or visual impacts on a site). Impacts on the setting of local sites were not considered significant and the setting of local sites was therefore not assessed. The concept of 'setting' is largely a visual concept and, for those sites of more than local importance, has been considered as part of the Landscape Effects assessment (Chapter 11).

7.3 Baseline Conditions

7.3.1 Planning Policy Context

The following national and local policies provide a framework within which the archaeological assessment has been undertaken and mitigation measures recommended. These policies are also discussed in Chapter 17 – Policies and Plans.

- National Planning Policy Guideline (NPPG) 5 - Archaeology and Planning states that the preservation of ancient monuments and their setting is a material consideration in determining proposals for development. NPPG5 provides guidance to the planning authority in determining applications of development that could have effects on sites of importance and the scope for mitigation where necessary and appropriate;
- NPPG18 - Planning and the Historic Environment considers wider issues associated with the historic environment, stating that planning authorities should ensure that planning applications are accompanied by information about the historical, architectural, environmental and archaeological significance of the site affected by proposals, so the effects of proposals can be fully evaluated;
- Planning Advice Note (PAN) 42 - The Planning Process and Scheduled Ancient Monuments focuses on development control and its role in safeguarding archaeological resources. It defines where remains should be preserved in situ, and where it may be appropriate to excavate and record them; and
- The North Lanarkshire Southern Area (Planning Policies ENV20 and ENV 21), the Monklands Local Plan (Planning Policy Env18) and the Glasgow City Plan (Planning Policies ENV9, HER1, HER2, HER4 and HER5) note the

importance of cultural heritage features including listed buildings, Scheduled Ancient Monuments, Designed Landscapes and other archaeological features. Scheduled Ancient Monuments and Designed Landscapes are identified as being of national significance, with a high degree of protection being attached to them. Locally important archaeological sites are also identified in the plan, stating that development proposals must have regard for such sites and plans must respect them.

7.3.2 Consultations

Historic Scotland and WoSAS were contacted in respect of the provision of the following baseline information:

- details of sites of archaeological or built heritage value (national, regional or local);
- details of any Historic Gardens, Designed Landscapes, Listed Buildings or Conservation Areas;
- the potential for unidentified or unrecorded archaeological features or remains; and
- comments on the proposed scheme.

Information has been provided based on records detailed in the National Monuments Record of Scotland (NMRS) and the regional Sites and Monuments Record (SMR). The NMRS comprises the national collection of material relating to the archaeological and architectural heritage of Scotland, whereas the SMR contains regional information (in this case for the West of Scotland) for all known archaeological sites and finds.

Historic Scotland noted that the scheme does not raise any significant historic environment concerns and that no specific mitigation measures are required.

7.3.3 Results of the Desk Study

A total of 20 sites were identified in the vicinity of the scheme through consultation and reference to previous studies.

Consultation with Historic Scotland indicates that there are no designated features of cultural heritage within the area of potential works, although two Scheduled Ancient Monuments and six Listed Buildings within 1km. There still however remains the potential for unrecorded archaeological features which are not listed on the NMRS. Previous disturbance associated with road construction, mining, industrial development plus development of nearby residential areas is likely to have significantly reduced the likelihood of such features.

Details of each site are provided below in Table 7.4, including the name of each site, its NMRS reference where applicable, and the type of site. The locations of these sites are shown in Figure 7.1.

Table 7.4 List of Cultural Heritage Sites

Site	Name	Map Reference	NMRS Reference	Type	Category
1	Bothwell Park House	NS71245924	NS75NW 235	Residential	Grade B
2	Raith Cottage Road Bridge	NS71785785	NS75NW 55	Road Bridge	N/A
3	Bothwell Sewage Works	NS712575	NS75NW 59	Sewage Works	N/A
4	Bothwell Bridge Battle Site	NS712576	NS75NW 5	Battle Site	N/A
5	Bothwell Bridge	NS71075776	NS75NW 8	Road Bridge	Grade A
6	Obelisk	NS71055783	NS75NW 38	Monument	Grade B
7	Laighlands Road	NS70915849	NS75NW 77	Residential	Grade A
8	Fairfield Place, Castlebank	NS70885858	NS75NW 120	Residential	Grade B
9	Green Bank	NS70745860	NS75NW 86	Residential	Grade B
10	Fairfield House	NS70805865	NS75NW 126	Residential	Grade B
11	Sweethope House	NS70805871	NS75NW 154	Residential	Grade B
12	Hamilton Palace Colliery	NS72415798	NS75NW 64	Coal Mine	N/A
13	Roman Bridge	NS72885796	NS75NW 1	Bridge	Grade B
14	Bothwellhaugh Roman Bath-House	NS72955788	NS75NW 23	Roman Bath-House	SAM
15	Bothwellhaugh Roman Fort	NS73075777	NS75NW 2	Roman Fort	SAM
16	St Catherine's Chapel	NS729581	NS75NW 10	Chapel	N/A
17	Orbiston **Castle**	NS73115815	NS75NW 24	Tower-House	Grade C(S)
18	Orbiston Dovecot	NS73195808	NS75NW 3	Dovecot	N/A
19	Orbiston Ice-House	NS73375798	NS75NW 26	Ice-House	Grade C(S)
20	Watching Brief, Bothwellhaugh	NS734577	NS75NW 56	Watching Brief	N/A
21	Bothwell Conservation Area				N/A
22	Designed Landscape				N/A

7.3.4 Statutorily Designated Sites

Scheduled Ancient Monuments (SAMs)

SAMs are nationally important sites and monuments that are legally protected under the Ancient Monuments and Archaeological Areas Act 1979. There are no SAMs on or immediately adjacent to the proposed scheme, although several are to be found in the Bothwell area.

Conservation Areas and Historic Designed Landscapes

There are no Conservation Areas on or immediately adjacent to the proposed scheme.

Listed Buildings

Listed buildings are those buildings of special architectural or historic interest that help enrich cultural history. The list of buildings in Scotland is aimed at safeguarding the built heritage and promoting its understanding and is compiled and maintained by Historic Scotland on behalf of the Scottish Ministers, in accordance with the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997. The listings are divided into three categories (A, B and C(S)) based on different levels of interest or importance.

Consultation confirmed that there are no listed buildings within the scheme extents or adjacent to it. Listed buildings are present in the wider area.

7.3.5 Unscheduled/unlisted Sites

Numerous sites of archaeological interest and value have been recorded across Scotland that are not specifically designated. Many of these have been uncovered as the result of aerial surveys, geophysics and through ongoing development planning, and are recorded in the National Monuments Record Scotland (NMRS) and/or the relevant regional Sites and Monuments Record (SMR).

7.3.6 Importance of Sites Identified

The importance and, where applicable, status of the archaeological sites described above has been determined through consultation with Historic Scotland and reference to the criteria in Table 7.1.

7.3.7 Potential for Unrecorded Sites

It is anticipated that the study area may be of limited interest, when considering previous disturbance associated with industrial activity, road development and agricultural land use, which is likely to have removed existing upstanding remains and buried features. However, there may be remains of previously unrecorded sub-surface features present and therefore a general programme of archaeological sampling may be required.

7.4 Predicted Impacts

7.4.1 Introduction

The assessment of potential impacts has been undertaken based on the alignment of the preferred scheme. National Policy and Guidance emphasises the need to take into account the effects of development on both designated and undesignated sites, as well as known and unknown remains. Potential impacts have therefore been assessed based on the footprint of the proposed scheme and the consequential direct or indirect effects on the sites identified in Table 7.4.

Potential adverse impacts associated with road development on recorded and previously unrecorded archaeological resources may include:

- physical loss or damage;
- severance;
- disturbance due to vibration, compaction or subsidence; and
- effects on setting and loss of amenity.

Such effects apply equally to all road construction activity and ancillary works which cause ground disturbance. This includes construction of the new road carriageway itself, all side roads and accesses, material storage areas, temporary site accesses, and any mining consolidation or landscaping plans beyond the road margins, particularly those involving earthmoving and tree planting.

7.4.2 Physical Damage/Loss/Severance of Sites or Remains

Physical loss or damage to identified archaeological sites/features may occur as a result of land take required to accommodate the footprint of the scheme and any ancillary works such as temporary access routes and storage compounds.

The footprint of the scheme does not affect any scheduled features of cultural heritage value.

There is also a potential for unrecorded features to be present within the vicinity of the existing road. These features may be disturbed/damaged/lost by road widening, construction of new sections of road, earthworks and excavation. As the value of any such features cannot be predicted at this stage, the magnitude and significance of any impacts cannot be determined. However, given the local/negligible importance of features already identified, the impacts are anticipated to be negligible adverse.

Although unlikely, given the previous ground disturbance that has occurred in the vicinity of the proposed scheme, there is the potential for new sites or artifacts to be uncovered as a consequence of the scheme construction, which may be potentially beneficial in the long-term. If items or features of interest are uncovered, their value and any potential impacts will be assessed on a case-by-case basis in discussion with Historic Scotland.

The location of construction site storage site compound(s) has not been determined at this stage, but it is assumed that these can and will be positioned so as not to affect any known cultural heritage features.

7.4.3 Disturbance due to Compaction, Vibration and Subsidence

Potential indirect effects may occur as a result of vehicular access to the site during the construction period and certain activities such as piling, and localised dewatering during construction of the underpass. Impacts may result from the movement of heavy vehicles within the working corridor and the vibration of construction equipment. This could result in compaction of unrecorded buried features immediately adjacent to the works with potential disturbance or damage to sites situated close by. Settlement (or subsidence) may also occur, should areas of groundwater be affected within the working corridor, which has the potential to destabilise the ground beneath sites and possibly result in erosion of the site. No recorded/known features will be affected in this way.

Although areas of shallow groundwater will be encountered within the working corridor, appropriate methods will be employed to ensure that water levels are not detrimentally affected (locally lowered or raised) during the construction period. It is therefore anticipated that impacts arising from any settlement and subsidence would be unlikely to occur, and are therefore assessed to be negligible adverse.

As there are no sites of cultural heritage value within or adjacent to the scheme **no** impact is predicted.

7.4.4 Effects on Setting and Amenity

In terms of visual intrusion on the archaeological sites or features identified affecting their setting during operation, all types of sites have been taken into account.

Given that there is an existing motorway junction already in place, and that the proposed scheme does not cause any significant change the layout or overall size of the junction, the impact of the scheme on the setting of scheduled sites or listed buildings which have views across the junction has been assessed as being of **negligible** magnitude and of **no overall significance**.

One NMRS, Bothwell Park House overlooks the working area, however, views are restricted and any effects will be temporary, (the scheme construction programme is estimated to be two years) , negligible and not significant.

Potential visual impacts of the scheme as a whole are assessed in Chapter 11.

7.5 Mitigation

Although no significant effects are predicted, based on current available information, the possibility exists that further sites may be unrecorded and may be disturbed during construction. Therefore, during site clearance and construction, the Contractor will be made aware of the possibility of unrecorded find the need for consultation with Historic Scotland and appropriate construction techniques. If the Contractor uncovers any features during excavation works that may be of cultural heritage significance, works should be halted to enable Historic Scotland to determine whether any archaeological recording or removal is required.

7.6 Residual Impacts

Subject to the implementation of the mitigation measures described above, no significant impacts are anticipated to the known cultural heritage resource in relation to the Scheme. **Historic Scotland has confirmed that no specific mitigation measures are required**.

Potential implications relating to the disturbance of unrecorded sites may occur and this may require further consideration if archaeological sites are uncovered. However, due to the value of sites identified in the area to date, significant effects are thought to be unlikely. No residual impacts on the cultural heritage resource are predicted with the construction of the preferred scheme.

7.7 References

Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment (1993, amended and updated 2003), The Highways Agency, The Scottish Executive Development Department, The National Assembly of Wales and The Department of the Environment for Northern Ireland.

National Monuments Record of Scotland (data provided by West of Scotland Archaeology Service).

North Lanarkshire Council, (2001), North Lanarkshire Southern Area Local Plan - Finalised Draft (Modified June 2001).

North Lanarkshire Council, (2003) Northern Corridor Local Plan.

Scottish Office, National Planning Policy Guidance (NPPG) 5 - Archaeology and Planning, (1994).

Scottish Office, National Planning Policy Guidance (NPPG) 18 - Planning and the Historic Environment, (1999).

Scottish Office, Planning Advice Note (PAN) 42: Archaeology - The Planning Process and Scheduled Ancient Monuments.

West of Scotland Sites and Monuments Record (data provided by West of Scotland Archaeology Service).

8 Land Use

8.1 Introduction

This Chapter examines the likely effects on land use of road improvements at Raith Junction (M74 Junction 5) associated with the proposed upgrading to motorway standard of the A8 Trunk Road between Baillieston and Newhouse. The objective is to identify and assess potential constraints and opportunities associated with the predicted land take requirements of the proposed scheme described in Chapter 3.

The study area for consideration of land use effects is centred on the existing Raith Junction and covers the anticipated extent of the influence of the proposed scheme. It has no precisely defined boundary but encompasses key areas of land which may be affected by the proposed scheme as indicated on Figures 8.1 and 8.2.

8.2 Baseline & Impact Assessment Methods

This assessment has been prepared in accordance with the principles and techniques outlined in DMRB Volume 11 (Environmental Assessment), Section 3 Environmental Assessment Techniques, Part 6 - Land Use as amended in August 2001. A desk study was undertaken which comprised a review of relevant plans and other published documents listed in Section 8.7 of this Chapter, including the previous Stage 1 and 2 Assessments. Walkover site surveys were also undertaken aimed primarily at verifying or updating information collated during the desk study. Limited consultation with the relevant Local Authorities and statutory agencies has also taken place.

It is acknowledged that the DMRB does not have a defined scale of impacts on land, however for this chapter the sensitivity and value resource is discussed within this chapter of the report. Generally, the magnitude of the potential impact can be identified as follows,

- High: The resource would be located on the line of a route section of the proposed scheme or would be severed from associated resources; the scale of the impacts is high; the nature of the impacts is generally permanent; key elements and characteristics of the baseline conditions are completely lost.
- Moderate: The scheme would result in direct and indirect impacts leading to a noticeable change in the environment; the scale of the impacts are moderate; the nature of the impacts are either permanent or temporary; key elements and characteristics of the baseline conditions are partially lost.
- Low: Direct and indirect impacts would result from the scheme leading to a slight change in the environment; the scale of the impacts are low; the nature of the impacts are either permanent or temporary; only minor loss or alteration of key elements and characteristics of the baseline conditions.

Table 8.1 – Determinants of Significance

		SENSITIVITY		
		Low	**Moderate**	**High**
MAGNITUDE	**High**	Moderate	High / Moderate	High
	Moderate	Slight / Moderate	Moderate	High / Moderate
	Low	Slight	Slight / Moderate	Moderate

This assessment, as detailed in Table 8.1 above, combines the sensitivity to change of the various receptors with the assessment of the magnitude of the impact in question in order to predict the significance of the proposed scheme impact.

Impacts can also be positive or negative as well as neutral / negligible where there is either no impact or where positive or negative impacts balance. For the purpose of this assessment, impacts that have been assessed as being either moderately negative or positive or above are considered to be significant in terms of the Environmental Impact Assessment (Scotland) Amendment Regulations 2002. Although slight negative or positive and neutral impacts are not considered significant, they remain worthy of consideration.

The baseline land use information is presented principally by means of drawing based records which form an integral part of the assessment report. Figure 8.1 refers to development and community land, whilst agricultural land is referred to on Figure 8.2. In each case the outline of the proposed alignment is overdrawn in order to illustrate the effects on land within the study area. Figure 8.2 (Land Capability for Agriculture) also indicates the boundaries of land expected to be required to facilitate the road improvement including that predicted to be necessary for flood storage to compensate for existing flood plain capacity lost to the proposed scheme. Indicative compensatory flood storage areas are illustrated in Chapter 15 (Road Drainage and the Water Environment) and on Figures 20.2 and 20.3.

Impacts are assessed in terms of the following:

- amount of land take;
- value of the land affected, in terms of agricultural or other usage;
- effects on designated or protected land;
- loss of community land; and,
- degree of fragmentation or severance.

Impact magnitude ranges from adverse to beneficial, and are assessed as being significant or not significant.

8.3 Baseline Conditions

8.3.1 Private Property

There are numerous residential and commercial properties in the vicinity of the proposed scheme. Stables / equestrian buildings at Langside Road, Bothwell (to the north west of the proposed scheme), is the only private property which will be directly affected (See Figure 8.1, Development & Community Land).

8.3.2 Community Land

Land used by the public (community land) is defined in DMRB as being 'Common', including town or village greens, and 'Open Space' which is any land laid out as public parks or used for the purpose of public recreation or which is a disused burial ground. Land in these categories which could be lost to road construction is subject to legal restrictions requiring suitable exchange land to be provided. Land used as public footpaths or for other public access is considered in Chapter 13 (Pedestrians, Cyclists, Equestrians and Community Effects).

The relevant local authorities do not maintain comprehensive records of land used by the community in the designated categories identified above and reliable determination has not, therefore, been possible. At the suggestion of South Lanarkshire Council (SLC), areas within that authority boundary shown as Community Land in Figure 8.1 constitute land which is public open space and has incidental amenity benefit or is known to be used for recreation. SLC information is based on a Council land audit within settlement envelopes and may not, therefore, be exhaustive. Areas shown as Community Land within North Lanarkshire is land which is in public ownership as confirmed by the Council and which, by implication or observation, is deemed to fall within one of the designated categories.

8.3.3 Development Land

As indicated on Figure 8.1 (Development and Community Land) the study area is covered by two local authorities, South Lanarkshire and North Lanarkshire. During the process of preparing this assessment, the proposed scheme has been assessed against the following documents. The local authority development planning designations for both South and North Lanarkshire are shown on Figure 8.1 (Development and Community Land).

- South Lanarkshire (Hamilton District) Local Plan (SLLP), Adopted August 2000;
- North Lanarkshire Southern Area Local Plan Finalised Draft 1998 (NLFD), Modified 2001, 2004 and 2005;
- South Lanarkshire Consultative Draft Local Plan (SLCD), October 2005; and
- South Lanarkshire Consultative Draft Local Plan Supplementary Consultation (SLSC), February 2006.

The adopted local plans used for the purposes of development control are the SLLP and NLFD. However the SLLP is currently the subject of a review with a six week consultation period held on the SLCD published in October 2005. During this six week period a number of new pressure for change sites were brought to the attention of South Lanarkshire, therefore, the SLSC, a supplementary consultation document was produced in February 2006, for consultations to be held over a further three week period. The finalised version of the South Lanarkshire Local Plan was published in August 2006 with a Public Local Inquiry to be held in 2007.

The SLCD, NLFD and SLSC have been utilised as the most recent local plan documents for the purposes of this assessment. Figure 8.1 (Development and Community Land) has, therefore, been produced on this basis.

The majority of the extent of the proposed scheme located within the local authority of South Lanarkshire is designated through Policy STRAT2 of the SLCD as green belt. There is great importance of the need to preserve the existing designated green belts and to establish confidence in their permanence. In terms of Raith Junction and the proposed scheme the purpose of the green belt designation is to primarily control the growth of built-up areas, prevent neighbouring towns from merging and provide for enjoyment of the countryside. Development within green belts should, therefore, be strictly controlled in accordance with Policy STRAT2 which states that South Lanarkshire will strongly resist the encroachment or introduction of urban uses. Any development that is considered appropriate in principle should be located and designed in a manner that will not significantly adversely affect the agricultural, natural heritage, amenity value and landscape character of the green belt.

To the immediate south west of Raith Junction and as indicated on Figure 8.1, land designated as green belt is also a Site of Special Scientific Interest (SSSI) and subject to nature conservation protection through Policy ENV4 of the SLCD. Raith Haugh is a wetland SSSI forming part of the Hamilton Low Parks SSSI. In addition to the SSSI, areas to the immediate north east and north west of the existing junction are designated as Sites of Importance for Nature Conservation (SINCs). Policy ENV4 states that development which would affect SSSI's or Local Nature Reserves will only be permitted where the objectives of the designation and the overall integrity of the area will not be compromised and where any significant adverse effects can be demonstrated to be capable of being successfully mitigated.

The green belt and SINC designations to the north east and north west of Raith Junction are increasingly under pressure for new development, particularly housing. The site at the junction of Hamilton and Bellshill Road in Bothwell to the south west of the proposed scheme is also under pressure for new development. As indicated on Figure 8.1, these areas have been designated as pressure for change sites through the SLCD and SLSC. Policy STRAT5 of the SLCD states that South Lanarkshire will assess such sites in terms of their appropriateness for change of use, when considered in terms of national, strategic and local policy contexts and requirements. Those sites deemed to be appropriate for change will be detailed in the forthcoming Finalised Local Plan.

Policy TRA2 of the SLCD is also relevant as part of the Clyde Walkway both existing and proposed is located around the extent of the existing Junction (See Figure 8.1). Through Policy TRA2, South Lanarkshire will seek to safeguard existing and proposed walking and cycling routes within the area of the SLCD. Particular support is given to the development of the Clyde Walkway. Development proposals adjacent to or on the line of such routes will require to take account of the route and where appropriate developer contributions will be sought to the provision or upgrading of the route.

As with South Lanarkshire, the majority of the extent of the scheme located within the boundary of North Lanarkshire is designated as green belt under Policy ENV6 of the NLFD. This policy states that North Lanarkshire will safeguard the function and character of the green belt, within which there will be a presumption against development or change of use other than that directly associated with, and required for, agriculture, forestry, the generation of power from renewable sources, outdoor leisure and recreation, telecommunications and other appropriate rural uses.

The area to the immediate south east of the existing junction is also designated through Policy L8 of the NLFD as Strathclyde Country Park. Policy L8 states that North Lanarkshire will continue to maintain and further enhance facilities at Strathclyde Country Park consistent with the Park Development Strategy and the policies of the NLFD. The Park Development Strategy was approved by North Lanarkshire in June 2000 and seeks to provide new visitor and sports facilities and to upgrade the existing provision in addition to continuing and developing management strategies in respect of woodlands and nature conservation.

In line with the policies of the SLCD and SLSC, the NLFD designates the Clyde Walkway through Strathclyde Country Park. Policy L2 of the NLFD states that North Lanarkshire will seek to encourage and support the provision of a suitable quality and range of leisure development within the North Lanarkshire area.

With regards to nature conservation, and as stated above, the Raith Haugh SSSI located within South Lanarkshire forms part of the Hamilton Low Parks SSSI which is located within North Lanarkshire to the south east of Raith Junction. Policy ENV14 states that North Lanarkshire will protect and enhance natural resources by safeguarding SSSI's. North Lanarkshire will not permit development proposals which would adversely affect SSSI's.

As indicated on Figure 8.1, a Single User High Amenity Site (SUHAS) can also be found at the northern extent of the scheme to the east of the M74 southern carriageway.

Overall there are no sites for future development designated within the immediate corridor of the proposed scheme, although the scheme does encroach to a minimal degree into the SUHAS towards the northern extents.

8.3.4 Agricultural Land

In the Glasgow and Clyde Valley Landscape Assessment prepared by Scottish Natural Heritage (SNH), the whole of the proposed scheme falls into the landscape type described as Broad Urban Valley, in which the former rural character has been lost.

Although disguised by extensive planted features, the Hamilton to Bothwell section of the valley is heavily influenced by urban characteristics including major road infrastructure and the Strathclyde Country Park as well as the built environment of neighbouring settlements.

Between Raith Junction and Bothwell the open land is typically urban fringe in character and used for casual horse grazing. The only conventional remaining farmland is confined to the north of Raith around Bothwell Park. The higher ground is occupied by pasture used for cattle grazing, but the lower areas are unfarmed wetland. Fields are relatively small and hedgerows survive but in deteriorating condition. There is a further area of pasture, apparently grazed by horses, adjoining the A725 on rising ground immediately above Strathclyde Country Park.

Agricultural land is classified by the Macaulay Land Use Research Institute (MLURI) according to its capability for crop production. The system provides for seven grades of land quality with a number of sub-divisions, each capable of producing specified crops to an acceptable yield standard. The defined categories can be further modified by sub-class limitations of climate, gradient, soil, wetness, or erosion. Grades 1, 2 and 3.1 are recognised as being the best and most versatile agricultural land and are collectively known as Prime Quality Land. Land around urban areas is often not classified by MLURI, whether or not it is in agricultural use.

Due to their urban or recreational nature and as indicated on Figure 8.2 (Land Capability for Agriculture), large parts of the study area are unclassified by the MLURI Land Capability for Agriculture Classification. There are no areas of Prime Quality Land and the majority of classified land is Grade 4.1 (variable production of a narrow range of crops, primarily ley grassland). On higher ground to the north west of Orbiston, land is classified as Grade 3.2 (average production of a moderate range of crops). The land classified as Grade 4.1 is further downgraded by the application of sub class soil and wetness limitations as shown on Figure 8.2 (Land Capability for Agriculture).

The Scottish Executive Environmental and Rural Affairs Department (SEERAD) can designate agricultural land as an Environmentally Sensitive Area (ESA) where it has special landscape, wildlife or historic interest, which can be protected or enhanced by supporting specific agricultural practices. There are no designated ESAs or other non statutory agricultural designations within the study area.

8.4 Predicted Effects

8.4.1 Private Property

The stables / equestrian buildings located to the north-west of the proposed scheme will undergo relocation or demolition to accommodate the proposed scheme. No other relocation or demolition in relation to private property has been identified as part of the proposed scheme. There is no significant impact on private property.

8.4.2 Community Land

Within the limitations of identification criteria as detailed in section 8.3 above, it is apparent that the proposed scheme would have no noticeable effect on land used by the public (See Figures 8.1 and 8.2). Further discussion is provided in Chapter 13 – Pedestrians, Cyclists, Equestrians, and Community Effects.

There is minor encroachment into the north western edge of Strathclyde Country Park caravan and camping site but this would not affect its continued use.

The loss of community land is considered to be low adverse, with no significant impact on community land.

8.4.3 Designated Development Land

Consideration of development effects is an interactive process which examines how the proposed scheme may affect local planning authority development designations and conversely how restrictive planning designations may affect the proposed scheme.

In general terms the proposed scheme is not significantly constrained by environmental designations. Land designated as SSSI will be directly lost to the scheme, although the degree of encroachment into the SSSI has been kept to a minimum as part of the iterative conceptual design process. Mitigation measures to compensate for the habitat loss involved have also been developed as part of the scheme.

Nonetheless and as indicated on Figures 8.1 (Development and Community Land) and 20.1 (Environmental Mitigation Strategy), the proposed scheme encroaches into the land use and environmental designations immediately surrounding the existing junction.

To the north east of the existing junction it is proposed to construct a flood compensation storage area which will include a new wetland area and be allowed to naturally vegetate as part of the proposed landscape and habitat mitigation strategy. This area forms part of the Bothwell Park Local Nature Reserve and there will be habitat loss, although this will be mitigated in the form of the new habitat created in the flood compensation storage feature, (see Chapter 10 – Ecology and Nature Conservation). However, the land take in this area (9.9 hectares) has been increased so as to minimise the land take into the Raith Haugh SSSI located to the south west of the existing junction (2.3 hectares). The land take to the north east as stated above also includes a pressure for change site, where the local authority will assess such sites for their appropriateness in terms of change of use when considered in terms of national, strategic and local policy contexts and requirements.

A SuDS pond will be constructed to the north west of the existing junction, with a land take of 1.0 hectare. As with the area to the north east of the existing junction, this area forms part of a Local Nature Reserve, however, the land taken for the SuDS pond in this area is of low nature conservation value and will therefore have a minimal adverse impact, which is subsequently outweighed by the benefits of a new area of wetland and a pressure for change site. Again, it is proposed that the pond will contribute new wetland habitat as part of the landscape and ecological mitigation strategy.

Indirect impacts which may affect the value of the designated SINC's and SSSI are discussed in Chapters 10 (Ecology and Nature Conservation) and 15 (Road Drainage and the Water Environment).

Minor land take will also be required into the SUHAS and pressure for change site located directly adjacent to the southern carriageway of the M74 towards the northern extents of the scheme. This will facilitate the proposed realigned accommodation bridge at Bothwell House.

To the south east of Raith junction, minimal land take will also be required into Strathclyde Country Park and its associated green belt designation, but will not affect the use or functioning of this area.

The proposed scheme will facilitate the provision of safer and more attractive routes for the Clyde Walkway and proposed National Cycle Route NCR74 in particular. Chapter 13 – Pedestrians, Cyclists, Equestrians and Community Effects, provides further information on access provision for non-motorised users.

The impact on development land and designated areas is medium adverse due to the encroachment into the SSSI and locally designated SINC. This is considered to be significant in the absence of mitigation.

The impact on public access to the amenity areas such as the Country Park is considered to be slight beneficial but not significant overall.

8.4.4 Agricultural Land

The total area of land required to accommodate the proposed scheme is approximately 63 hectares, of which 53.2 hectares are currently within the ownership of Scottish Ministers. That part of the land take which is classified as being capable of agricultural production as detailed in Table 8.2 below and on Figure 8.2 is estimated at 28.7 hectares.

Table 8.2 – Estimated Land Take

Classification	Land Take
Unclassified Land	35.3 ha
Non Prime Agricultural Land – Grade 4.1	28.7 ha
Total	**63 ha**

These figures are inclusive of all the designated features as detailed in Table 8.3 below and stand alone to show the land take of unclassified land and non prime land.

Table 8.3 – Loss of Designated Features

Classification		Land Take
Site of Special Scientific Interest		2.3 ha
Sites of Importance for Nature Conservation	Laighland	1.6 ha
	Bothwell	0.6 ha
Tree Preservation Orders		0 ha
Protected Open Space		0 ha
Protected Urban Woodland		0 ha
Ancient Woodland		0 ha
Total		**4.5 ha**

None of the agricultural land as shown on Figure 8.2 is classified by MLURI as prime quality land, but as stated above falls within Grade 4.1 (variable production of a narrow range of crops, primarily ley grassland). The land is further downgraded by the application of sub class soil and wetness limitations as shown on Figure 8.2 (Land Capability for Agriculture). Actual 'farmed' land affected is the grazing area of Laighlands Local Nature Reserve, which lies to the immediate north west of Raith Junction where a loss of 3.7 hectares would be involved.

On this basis classified agricultural land would be affected but given the grade and total extent of the land take, the effect is minimal and not significant.

8.5 Mitigation Strategy

Mitigation to minimise land take has been an inherent element of the road design and an environmental mitigation strategy relevant to land use has been developed (See Figure 20.1).

The general principles listed under the sub headings below are the basis of the strategy to mitigate the predicted land use effects.

8.5.1 Private Property

Mitigation is required in relation to the demolition and relocation and rebuilding nearby of the stables to the north-west of the proposed scheme (Figure 20.1). No other mitigation measures have been identified as necessary, as no other private properties are affected by land take or severance as part of the proposed scheme.

8.5.2 Community Land

No significant area of publicly used land would be lost to the proposed scheme, therefore, it is not necessary, to identify exchange land which could be made available in mitigation of such a loss. Mitigation of the effects on land used for public access is discussed in Chapter 13 (Pedestrians, Cyclists, Equestrians and Community Effects), and will result in a slight beneficial effect.

8.5.3 Development Land

There would normally be a presumption against development where restrictive environmental planning designations apply. Mitigation measures applied to the scheme need to be especially robust to justify its potential environmental intrusion.

The land take from sites designated for future development, i.e. the pressure for change sites to the north east and north west of Raith Junction is restricted to the minimum necessary for the construction of the scheme and ancillary works.

The overall land take is the minimum necessary to achieve the required scheme objectives within the safety parameters, and to provide essential mitigation. Land take will:

- Compensate for loss of land within the SSSI by providing safeguarded compensatory habitat; and
- Provide features essential to the scheme such as a new drainage management system (including SuDS pond and ditches), flood storage, and maintenance accesses.

The loss of green belt and land designated for nature conservation is compensated by the provision of mitigation land, and proposed enhancement of landscape and nature conservation interest through new planting and seeding. These measures are introduced for reasons of visual amenity and flood attenuation and storage as well as biodiversity. The flood storage and protection proposals have been designed sympathetically to take consideration of their topographical and planted context, so as to minimise potential adverse effects on environmental quality (See Figure 20.1 & Table 8.4).

Table 8.4 – Mitigation Planting

Compensatory Landscape Planting	
	Area / Quantity Added
Semi Natural Woodland	1.65 ha
Wet Woodland Scrub	2.32 ha
Native Shrub / Scrub	0.5 ha
Ornamental Shrub	1.33 ha
Total	**5.8 ha**
Mixed Species Hedgerow	1678 lm
Specimen Trees	51 nos

Upon completion of the construction of the proposed scheme, the ongoing management of the land within the mitigation area to the north east of the junction will have a long term management plan prepared for it, to ensure the development and maintenance of biodiversity benefit.

Roads which become redundant as a consequence of the proposed scheme will be incorporated into areas of environmental mitigation associated with the road.

The scheme design has provided the opportunity to accommodate planning policy requirements for improved countryside access on safe and attractive routes.

8.5.4 Agricultural Land

Actual loss of agricultural land cannot be mitigated, but is minimised through careful route alignment. Land take is confined to that considered essential for construction of the scheme with associated drainage and landscape work.

8.6 Residual Effects

8.6.1 Private Property

There would be relocation of a small stable to the north west of Raith Junction and it is considered that there will be no adverse residual effects as a result.

8.6.2 Community Land

Apart from very minor land take on the north western edge of Strathclyde Park, which can be adequately mitigated, the proposed scheme does not affect land used by the public. On this basis, there would be no change in the baseline condition following construction of the proposed scheme.

Anticipated beneficial changes to land used for public access should, however, be noted as described in Chapter 13 (Pedestrians, Cyclists, Equestrians and Community Effects).

8.6.3 Development Land

The proposed scheme supports SLC's emerging economic development policies for the A725 Whistleberry Corridor, and the scheme impact upon the future development potential of the sites designated as Pressure for Change (Strategy 5, within Local Authority Development Policies) around the north of the scheme extents.

Moderate intrusion into land designated for nature conservation and as green belt will occur as a result of the proposed scheme. However, appropriate and adequate mitigation of both road works and flood alleviation measures have been proposed so as to not prejudice the continued viability of nature conservation and environmental planning designations including those peripheral to the route corridor.

The impact upon sites for future development will be minimal in the short term, but potentially beneficial in the long term as the proposed scheme may facilitate bringing forward the identified pressure for change sites for appropriate development and will enhance the marketability of the A725 corridor as a development location through improved accessibility. However, these benefits may be achieved at the expense of environmental quality, even with suitable mitigation measures in place.

8.6.4 Agricultural Land

As a result of the proposed scheme there would be some loss of land capable of agricultural production, classified as Grade 4.1. Real loss to agriculture would be less than implied since large parts of the defined areas are not currently in active agricultural use.

The loss of agricultural grassland per se is not critical, this land is at present poorly drained and its loss wouldn't be of any detriment to the surrounding area. The long term effects of this agricultural loss will ultimately benefit the biodiversity of the surrounding habitat and therefore the increased value of the local areas of nature conservation. The conceptual mitigation strategy (see Figure 20.1) could have significant and wider beneficial effects on nature conservation interests in the longer term instead of land in nominal agricultural use.

8.7 References

Design Manual for Roads and Bridges Volume 11 Environmental Assessment (1993, amended and updated 2003), The Highways Agency, The Scottish Executive Development Department, The National Assembly of Wales and The Department of the Environment for Northern Ireland.

Glasgow and Clyde Valley Landscape Assessment. Review No 116 (1999) Scottish Natural Heritage

Land Capability Classification for Agriculture. Sheet 64. Macaulay Land Use Research Institute

North Lanarkshire Southern Area Local Plan (Finalised Draft 1998, Modified June 2001) North Lanarkshire Council Planning and Environment Department

South Lanarkshire (Hamilton District) Local Plan, (Adopted August 2000) South Lanarkshire Council Planning and Building Control Services.

South Lanarkshire Local Plan Consultative Draft (October 2005) South Lanarkshire Council Planning and Building Sontrol Services

South Lanarkshire Local Plan Further Consultative Draft (February 2006) South Lanarkshire Council Planning and Building Sontrol Services

Local Planning Issues for the Hamilton Area: Consultation Document, (May 2003) South Lanarkshire Council

M8 Baillieston to Newhouse and Associated Improvements: M74 Junction 5, Raith – Stage 1 Report. (March 2004) Mouchel Fairhurst Joint Venture.

Ordnance Survey Data (1:10,000 Raster, tile refs. NS65NE/NS75NW and 1:50,000 Landranger, sheet 64).

9 Disruption Due to Construction

9.1 Introduction

This section presents the assessment undertaken to determine the potential disruption to the environmental parameters discussed in Chapters 6 - 16 as a result of construction activities, using the guidelines set out in Volume 11 of the DMRB (1993 and amendments).

'Disruption due to construction' is a term that covers the effects on people and on the natural environment that can occur between the commencement of pre-construction works and the end of the contract maintenance period. At this stage in the road detailed design and construction period is estimated at 24 months, and the maintenance period is likely to be up to 5 years for landscape elements. Disruption due to construction is usually a localised phenomenon. However, some impacts can create effects over a wider area.

This assessment takes into account nuisance related impacts on local residents, workers, vehicle and non-vehicle travellers arising from noise, vibration, dust, changes in journey times and loss of amenity associated with the operation of equipment or from the movement of heavy construction traffic. Construction activities can impact routes utilised by different types of user including pedestrians and cyclists. There is also the potential for impacts on the natural environment through disturbance associated with drainage, accidental spillage and dust generation, noise, lighting as well as effects on ecology and cultural heritage.

The assessment of disruption due to construction is based on the conceptual design described in Chapter 3. The detailed construction programme and methods will be finalised by the Contractor as part of his design and will be subject to further consultation and refinement.

9.2 Methods

This assessment has been carried out using the guidelines set out in Volume 11, Section 3, Part 3 of the DMRB (1993 and amendments). Site visits during the assessment of the various topic areas were used to identify the location of properties and features which may be sensitive to disruption.

Resource quality and sensitivity criteria applied in the assessment of construction phase impacts are as stipulated within the appropriate chapters of the report.

9.3 Baseline Conditions

DMRB Volume 11 states that studies have shown that at least half of the people living within 50 m either side of a site boundary were seriously bothered by construction nuisance in one form or another, but that beyond 100 m less than 20% of people affected were seriously bothered. In accordance with the DMRB, the study area for the assessment of disruption due to construction comprises a corridor 100 m either side of the proposed scheme.

Chapter 3 (The Preferred Scheme) describes the key elements of the Scheme. It is anticipated that conventional methods of construction will be used with the precise nature of works being determined by the Contractor commissioned to undertake the works and agreed with the appropriate authorities. Baseline conditions are discussed in detail in the appropriate chapters of this report.

Table 9.1 shows the approximate number of properties present within 100 m of each side of the Scheme route. Designated features such as Listed Buildings and Scheduled Monuments are described in Chapter 7, Cultural Heritage. Two Listed Buildings, shown on Figure 7.1 as Obelisk and Bothwell Bridge, lie near to the southernmost part of the scheme. Neither feature will be affected during construction work.

Other associated areas of potential disruption, such as site compounds, will be located within the defined footprint of the scheme, but their exact locations have not yet been confirmed.

Table 9.1 Approximate Numbers of Properties and Distances from the Proposed Scheme.

	Number of Properties and Distance from the Scheme Footprint		
	0 – 50 m	50 – 100 m	Total Number
Scheme	18	125	143

9.4 Predicted Impacts & Mitigation

Disruption impacts considered under the following headings are generally those that are considered likely to be temporary in nature, although it is recognised that certain impacts arising during the (temporary) construction period may be permanent. Potential impacts relating to specific topic area are discussed along with the mitigation that will be set in place. Impacts are also considered in detail in the relevant topic chapters, as they may persist following construction of the scheme.

In addition to specific mitigation measures outlined, the potential construction-related impacts of the scheme will be controlled through the Employer's Requirements and an Environmental Management Plan (EMP). The Contractor will be required to develop and implement the EMP prior to the commencement of work on site.

Construction operations that, without mitigation, could cause significant local impacts include:

Stripping and storage of topsoils and sub-soils;

Land take for ancillary works including site compounds;

Traffic and other access diversions affecting traffic flows in the vicinity of the junction and potentially across the wider network;

Noise, vibration, vehicle emissions and dust generation during earthmoving and operation of vehicles and plant on-site along with the passage of construction vehicles along the road network;

Dewatering of excavation areas, creation of site runoff management features and temporary alterations to local drainage;

Landscape and visual changes caused by construction activities, earthworks, vegetation removal and presence of construction plant and temporary compounds; and,

Temporary lighting and night-time working.

9.4.1 Earthworks and Major Structures

The earthworks quantities associated with construction of the scheme are set out in Table 9.2 below.

Table 9.2 Earthworks Quantities (approximate)

Material	Quantity m^3
Cut	370,587
Fill	218,445
Acceptable for re-use within scheme	98842
Required import for construction (e.g.embankments)	121600
Requiring offsite re-use or disposal (surplus)	283500

There will be a large surplus of excavated material from construction activities given that junction modifications are dominated by the underpass. It is likely that a proportion of this material could be used for construction of the associated link roads and for landscaping or environmental features. A proportion of material from the proposed excavation will be acceptable for re-use within the scheme, but the majority of the arisings will require removal from site. The surplus material will either require disposal to a landfill, or could be re-used elsewhere subject to the engineering properties of the soil. It may be possible to re-use the material on other trunk road schemes where additional fill material is required during construction.

Excavated material that is found to be initially to be unsuitable for re-use in earthworks due to the physical properties could be utilised in landscaping features such as earth bunds. It is possible that a proportion of the excavated material could be treated in such a way to render it useful for inclusion in the works, for example lime/cement stabilisation or modification.

Despite the surplus of site won materials there may be some requirement for importing geotechnically acceptable fill material for embankment and capping construction purposes. These will most probably be won from existing stockpiles such as colliery spoil tips. The West Lothian oil shale tips have supplied large volumes of material in the past for central Scotland road schemes due to its easy availability and geotechnical properties. The shale (burnt blaes) is classified as an all-weather, granular material and, although stocks are now dwindling, this is a possible source of off-site fill. Closer sources of fill may be identified but these will depend on other construction activity which may be taking place at the appropriate time. Also, the condition of these alternative materials and certainty of supply will be less able to be guaranteed. Dedicated borrow-pits on or close to the scheme are improbable since the known geology of the area does not suggest any nearby source of higher quality materials. Clean sands and gravels would also command a premium price and therefore would be unlikely to be considered for general fill.

There are many construction activities with potential to cause disruption during the construction period. These include the movement of construction materials to the site, the movement of materials within the site, general construction activities and the removal of material to licensed sites off-site as necessary.

The most concentrated activities will be at the junction itself where significant excavation will be necessary to construct the underpass.

The position of the Contractor's compound(s) has not yet been confirmed, but location(s) will be restricted to within the land made available for the scheme. The Contractor's working area will also be excluded from the land set aside for environmental mitigation on the northwest side of the junction, apart from those essential works directly related to construction of adjacent features such as the flood storage compensation areas, new wetland areas, ditches and access tracks.

Site investigations and assessment work undertaken at this time indicate that much of the material to be excavated will require further processing to allow it to be utilised in the construction of the embankments that support the roads in areas. Aside from the normal volumes of construction-related traffic, it is probable that additional plant movements will be necessary to remove excess material from site.

Landfill tax costs make it probable that off-site disposal of waste materials is an increasingly unattractive option. It is expected that almost all of the excavated material will be used on site, and that where this cannot be made acceptable as engineering fill, it will be put to productive use in landscape and environmental features such as earth bunds. Hence, it is anticipated that off-site tipping areas and export traffic will be reduced to the minimum possible.

9.4.2 Haul Routes and Construction Traffic

Localised haul routes will be restricted to land within the site. This will require the Contractor to identify and construct temporary routes within the site boundary to transport material from one location to the other.

Access points to the construction area from the local road network will be stipulated within the Employer's Requirements and will be determined on the basis of safety, proximity to the sensitive receptors and to minimise disruption.

Off-site disposal or re-use of excavated material which is not suitable for on-site use (although this to be kept to a minimum) is currently estimated to be 283500m^3. the Contractor will be required to seek opportunities to re-use this material on other construction schemes.

The earthworks operations on a construction site are influenced by the weather and the principal season for these activities is generally accepted as between the months of April/May and September/October. It is anticipated that the bulk earthworks operations will extend into 2 earthwork seasons. Given the high traffic flows on the adjacent trunk road network, including the M74, and the quantities of materials that may require to be exported/imported, the impact of additional vehicle movements may be significant at times of peak working activity. The degree of impact cannot be determined until the actual quantities to be exported are confirmed.

The construction of the road pavement will also require the import of the various constituent materials. It is estimated that approximately 121,600m^3 of material will be required to be imported for embankments.

Remaining operations, such as import of concrete to construction points or delivery of materials are less intensive and restricted to relatively short periods of time and to isolated sites within the site. Their impacts also therefore are unlikely to be discernible in the context of existing levels of traffic on the surrounding network.

9.4.3 Disruption to Traffic

Traffic management to enable the construction of the Scheme will have disruption impacts on existing road users; local and regional traffic movements will inevitably experience some disruption due to construction of the Scheme, the extent of which cannot be determined until a more detailed site works programme has been prepared.

Off-line working, where this is practicable, will reduce disruption to vehicle travellers and also to pedestrians and cyclists using the footpath/cycleway network. It has been assumed that some temporary local diversions and/or land closures will be required where construction activity intersects with existing roads.

Additional HGV movements will result from construction activities as described above. Most construction traffic is expected to use the M74 and other main strategic routes – already carrying high traffic flows. Heavy vehicles would be expected to avoid the local network of minor roads, hence reducing the potential level of disturbance to residents.

9.4.4 Air Quality

Dust might potentially be generated from any number of on-site activities, but the main dust sources are likely to be earth movement during excavation works, vehicles travelling over unpaved ground during dry weather, and lime stabilisation processes. There will also be the potential for some dust generation from construction activities such as handling of dusty materials. Site material may also be tracked out along roadways by vehicles leaving the site. During dry weather this material might subsequently be raised as dust by passing vehicles.

Assuming that standard mitigation measures are in place, there might thus be significant dust soiling up to 100m from these areas, with significant PM_{10} and vegetation effects up to 25m. Vehicles passing along roads intersecting the junction are judged to be a minor source of dust (see Chapter 6, Table 6.2). There might thus be some dust soiling within 25m of the centreline of any of these roads, with some PM_{10} and vegetation impacts within 10m.

The edges of Hamilton Low Parks SSSI that are nearest to the proposed works may experience some dust-related impacts, but these will be temporary and are likely to be of limited duration.

The number of construction vehicles and plant operating on site will be so small in comparison to existing flows on the surrounding road network that any impact of exhaust emissions on local air quality will be negligible.

A Method Statement for the construction phase will be drawn up by the contractors, to include the mitigation measures identified in Chapter 6. Even with these mitigation measures in place, those properties that are closest to the construction works and to roads near to site entrances might experience some dust soiling. Any effects would be temporary and any events would be infrequent, depending on the weather conditions and occurrence of dust raising activities.

9.4.5 Cultural Heritage

Consultation with Historic Scotland confirmed that there would be no direct effect on any known cultural heritage features. Detailed archaeological fieldwork has not been undertaken for the proposed scheme and Historic Scotland has stated that neither a formal Phase 1 archaeological desk study nor a Phase 2 archaeological field evaluation was required. Historic Scotland's initial desktop assessment of existing archaeological records is considered sufficient to indicate that cultural heritage constraints will not be a significant issue in relation to the proposed scheme.

Areas of new land take will be required for the scheme, potentially encompassing areas where archaeological features may remain undetected. Should unanticipated artefacts/remains be encountered during construction, these will be dealt with in accordance with current procedures and within Historic Scotland's Special Requirements. The methods used will be agreed with Historic Scotland, West of Scotland Archaeological Services and the Scottish Executive as appropriate.

9.4.6 Land Use

Landtake impacts during the construction phase in general concern land requirements for works and storage areas and disruption to existing land usage and local access outwith the land permanently required for the scheme. The majority of land required for the scheme is already in the ownership of Scottish Ministers; however there will be a need to purchase additional land (Chapter 8 Land Use). There is no land take from sites designated for built development, and the land required for construction lies within the area required for the scheme itself. Disruption to the use of and access to farmland during the construction phase will be temporary in nature and the Contractor will be required to maintain access to land throughout the construction period.

The proposed scheme would have a negligible effect on land used by the public as discussed in Chapter 8.

Although some degree of disruption to land use during construction of the scheme will be unavoidable, the Contractor will be required to provide the following mitigation measures:

- maintain continued communication with affected landowners, local residents and businesses;
- restrict land take to that made available for the scheme and to the minimum necessary for construction of the scheme and ancillary works;
- provide designated temporary access points should continued accessibility and severance be considered a temporary problem;
- access arrangements to properties (and for non-motorised users and vehicles in general) to be fully considered prior to works on site and necessary facilities constructed before any works that may cause disruption are undertaken; and
- where agreed to do so, re-instate areas of temporary land-take to their former land use as quickly as possible upon completion of the Scheme. This applies to small areas of temporary landuse where groundwater recharge wells may be necessary.

9.4.7 Ecology and Nature Conservation

Impacts on ecology and nature conservation arising during the construction phase may often persist through the operation of the scheme. In view of this, construction and disruption related impacts are addressed in detail in Chapter 10 Ecology and Nature Conservation. The construction of the scheme will directly impact upon Hamilton Low Parks Site of Special Scientific Interest (SSSI) and Laighlands Site of Interest for Nature Conservation (SINC), with some permanent land take, and localised temporary disruption to habitats adjacent to the working area. The impact of the land take is considered to be moderate adverse in the absence of mitigation, given the designated nature of the sites and the degree of encroachment that will occur (2.3 ha from the SSSI and 2.2 ha from the SINC).

During the construction phase, temporary dewatering (groundwater management) will be required in order to construct the underpass for the A725. This will cause a localised draw-down of groundwater around the junction, with the potential to affect wetland habitats and the species they support, if they are groundwater-fed. Hydrogeological investigation (Section 9.4.14 and Chapter 16) indicates that there will negligible or no impacts upon Strathclyde Loch SINC or on the River Clyde. Ponds fed by surface waters alone will be unaffected. Two ponds are considered to be fed by a combination of surface and groundwater, and therefore have the potential to experience a low to moderate (and hence significant) adverse impact (Pond 1 Figure 15.2 lies within the SSSI and is therefore part of a nationally important ecological receptor).

Construction activity in the bird breeding season may disrupt or even displace some sensitive species close the working areas of the scheme. Although birds in this area will have become habituated to traffic noise from the motorway and junction, offline construction such as excavation of the flood compensation storage areas and SUDS basin is likely to have a low to moderate adverse impact over the short-term if carried out during the breeding season. Wintering birds which use the area are on the whole likely to be less sensitive to disruption due to construction of the scheme as they are more mobile and there are alternative habitats in the vicinity to which they can move on a temporary basis.

Construction activity will be confined to the footprint of the scheme, ie there will not be additional temporary land take and associated disturbance outwith the scheme extents. This restricts the extent of potential ecological disturbance. No protected species have been recorded within the scheme extents or adjacent to them, other than badgers, which are known to be present nearby. Badgers will not be directly impacted by construction activity and impacts on badgers during construction are considered to be low adverse and not significant. Mitigation measures are recommended to ensure that indirect disruption is minimised and that badgers are excluded from straying into working areas.

A discussion of suitable mitigation measures in relation to ecology and water quality and drainage is contained in Chapters 10 and 15 respectively, but it should be noted that mitigation measures for these two topic areas frequently overlap and interlink. A summary of the required measures is set out as follows:

- a water quality protection plan to minimise risks to receiving waters;
- detailed procedures for minimising drainage and groundwater management impacts on wetland habitat to be agreed with SNH and SEPA.
- protected species surveys, including for otters and badgers, to be undertaken in the correct survey season prior to the commencement of works on site;
- pre-construction surveys to identify the extent of any stands of non-native invasive plants, and required control and/or removal measures.
- should operations occur close to a known badger sett, but not so close as to need licensing, a “people and machinery exclusion zone” extending to a 30 m radius around the sett to be fenced off;
- implementation of good construction site management to avoid/minimise generation of excessive litter, dust, noise and vibration;
- topsoil handling, storage and re-use plan to be implemented by the Contractor to maintain viability of soils and preserve soil microfauna and flora;
- location of storage and construction compounds agreed in consultation with an ecologist to protect habitats or species of nature conservation value;
- working areas, including temporary access tracks, kept to a practical minimum through areas of vegetated habitat, and their boundaries clearly delineated at the commencement of works;
- existing vegetation to be retained as far as practicable;

- sensitive areas such as ponds and ditches, defined in the EMP as requiring protection from accidental damage or disturbance, to be securely fenced prior to the commencement of site clearance; and
- nests, eggs and young of all species of wild bird to be protected from deliberate damage during the breeding season (March to August inclusive). To minimise the potential for such damage, vegetation likely to be used by breeding birds within working areas to be removed outwith the breeding season;
- measures to protect birds at other times of year will include fencing and protecting sensitive habitats adjacent to the scheme extents and minimising local disruption effects as far as practicable.

During construction, the Contractor will be required to prepare an Environmental Management Plan and work in accordance with the Controlled Activities Regulations (CAR), SEPA's Special Requirements, and Pollution Prevention Guidance (PPGs). The Contractor will also be required through the Employer's Requirements to produce and implement suitable Method Statements prior to the commencement of work on the site.

9.4.8 Landscape and Visual Effects

Excavation and construction processes, temporary accommodation works and the use of vehicles and machinery will result in temporary adverse visual impacts to overlooking receptors, in particular residences at Bothwell, as well as pedestrians and cyclists in the vicinity of the junction. The use of temporary floodlighting and security lighting at night (if required) would also cause visual intrusion. It is anticipated that the most intrusive activities will relate to:

- vehicles and machinery, including HGVs, excavators and cranes;
- earthworks;
- vegetation removal, soil stripping and excavation;
- the creation of temporary spoil mounds, material storage areas and compounds; and,
- transient features such as fencing, lighting and signage.

Visual impacts arising from these changes will affect road users, local residents and non-motorised users (NMU) crossing the road network (generally pedestrians and cyclists). The works will generally be highly visible to road travellers where the construction takes place alongside the approach roads to the junction, including the M74.

The Contractor will be required to implement the following mitigation measures in accordance with an agreed Method Statement to minimise potential landscape and visual impacts:

- retaining existing vegetation where possible to provide screening during works;
- limiting the size and extent of working and storage areas. Timing and phasing works to minimise the duration of impacts at any one location/set of visual receptors. Use of fencing to define the working areas;

- good housekeeping of the construction site and storage areas, keeping the site tidy and free of litter and debris so far as is possible;
- use of temporary floodlighting only when strictly necessary; lighting and night-time working to be in line with Local Authority requirements;
- careful selection and placement of site compounds, material storage areas and spoil heaps to minimise detriment to the landscape and to visual receptors;
- using spoil to create temporary screening of working areas where applicable; and
- early planting of trees, shrubs and grassed areas as well as new ponds and wetland creation to establish the structure of the longer-term visual and landscape mitigation.

9.4.9 Noise and Vibration

Noise and some degree of localised vibration in the vicinity of working areas will be unavoidable, arising from the movement and loading/unloading of vehicles and machinery, earthworks and general construction activities. However, much of the working activity will be at distances greater than 100m from residential areas. Without mitigation it is likely that pedestrians and cyclists and, to a lesser extent, vehicle travellers travelling around the road network will experience elevated noise levels. Current roads-dominated background noise will however tend to mask much of the construction-related noise where residential areas lie close to the existing M74 and other heavily-trafficked roads. Evening and night-time working would be likely to increase short-term noise impacts on local residents.

The contractor will be required to work within agreed times of the day to limit noise impacts. These limits will be detailed within the Employer’s Requirements and will be agreed in consultation with the relevant Local Authority to mitigate these impacts.

Noise mitigation will follow statutory guidance and requirements agreed and set in place with the Scottish Executive and relevant local authorities. These may include restrictions on workings hours, avoidance of unsocial hours where working closest to residential areas, and use of noise screening.

9.4.10 Pedestrians, Equestrians, Cyclists and Community Effects

Pedestrians and cyclists using routes across and around the junction, including the Clyde Walkway will experience temporary severance or diversion during the construction period. This is likely to be in the immediate vicinity of work on or around the Scheme. Such diversions will mean longer journeys and some temporary loss of amenity for pedestrians and cyclists while they occur.

Diversions of roads and associated pavements/footpaths and cycleways will be avoided where possible, but may have temporary effects on non-motorised users. Given the relatively low level of use of the pedestrian and cycle routes affected during the construction phase and the fact that temporary diversions will be agreed with the Local Authority and set in place where required, impacts will be low adverse and short-term, and no significant adverse impacts are anticipated on non-motorised users.

Likewise, temporary traffic management may cause temporary disruption to local residents and businesses if carried out without mitigation. Mitigation measures will be determined when the construction programme and phasing has been confirmed and agreed with the Local Authority and the Transport Scotland as appropriate.

9.4.11 Vehicle Travellers

Views from the road will be adversely affected where there are views of earthworks, vegetation and soil stripping during the construction phase, however these views will be transient due to the speeds at which vehicles will be travelling on the motorway, and the restricted extent of the scheme itself.

During the construction phase driver stress is likely to increase for a temporary period where localised traffic management is set in place, considered to be at times a moderate adverse impact. Traffic management may cause slower traffic flows, increase driver uncertainty with regard to journey times and heighten fears of vehicle break-down or accidents. The significance of impacts on vehicle travellers during the construction period can only be confirmed when a traffic management plan has been drawn up.

Mitigation measures will aim to reduce adverse impacts on driver views through careful positioning and screening of site compounds and storage areas and other measures as described in Section 9.5 of this Chapter and in Chapters 11 and 14. Driver stress arising from local disruption and traffic management measures will be alleviated through clear signage and road markings and by minimising the duration of such disruption as far as practicable.

9.4.12 Road Drainage and the Water Environment

A full discussion of suitable measures in relation to road drainage and flood protection is contained in Chapter 15. Road drainage management, the water environment and ecological mitigation measures (Chapter 10) overlap and interlink to a degree. Groundwater impacts are discussed in Chapter 16 and Section 9.4.14 below.

Impacts on the hydrological characteristics and water quality of the River Clyde, the un-named Burn and associated ponds and wetland habitats within the scheme footprint may result during the construction phase. This may occur due to the following:

- temporary disruption to hydrological and hydrogeological flows during construction (including temporary dewatering and recharge, burn diversion and culverting, creation of new ditches and new wetland areas);
- accidental spillage/mobilisation of sediments into local watercourses;
- Mobilisation of contaminants from contaminated soil/ groundwater;
- accidental spillage of liquid contaminants into local watercourses; and/or
- inputs of leachate derived from on-site stored construction materials.

Certain effects are also applicable to the operational stage of the Scheme and these aspects are discussed in Chapter 15.

Works within or in close proximity to watercourses and ponds, (shown on Figure 15.2) will require particular attention. The Burn diversion and proposed flood embankment will encroach marginally into Pond 3, requiring part of its perimeter to be reshaped. The pond currently discharges into the Burn, and this hydraulic connectivity will be maintained.

The exiting unnamed Burn will require diversion and a new culvert will be constructed under the A725 before it emerges along a new ditch within the SSSI. The design of the new culvert reflects the very shallow gradients that exist, slow movement of water, and the need for the structure to allow two-way movement of water to link floodplain areas and help regulate the natural floodplain function of land either side of the roads. A method statement for construction of the ditch within the SSSI will be drawn up and agreed with SNH before work is permitted to proceed.

Diversion works for the Burn (temporary and permanent) and construction of new ditches will require careful controls to minimise potential impacts upon the aquatic environment and wetland habitats. Works affecting watercourses will be subject to consultation in advance and will generally require a licence from SEPA under the Controlled Activities Regulations (CAR) in advance of any activity on site.

Overall potential construction phase impacts upon surface water resources are assessed as low adverse with mitigation in place. New pond and wetland habitat will be created as a result of the drainage and flood management design for the scheme, including a SUDS pond and new open ditches and a new permanent pond within flood storage Area 2 north of the junction (Figure 20.2). In addition the proposed mitigation (Figure 20.1) includes the creation of a series of shallow wetland 'scrapes' and ditches north of the junction to compensate for land take within the SSSI and to complement nearby existing wetland habitat.

In order to safeguard against potentially adverse impacts upon water quality and drainage, all works during the construction phase will be carried out in line with best practice guidelines, including SEPA's Special Requirements and Pollution Prevention Guidelines. An appropriate drainage system will be constructed and implemented during the construction phase. This will be further developed by the Contractor and agreed with SEPA well in advance of any works on site.

The early establishment of temporary drainage facilities in line with standard construction good practice will avoid the majority of potential problems during construction.

It is assumed for the purpose of assessment that construction operations would adopt standard practices in line with guidance provided by SEPA including Pollution Prevention Guidelines (PPGs) and supported by consultation with the local SEPA Environmental Protection Team. PPGs relevant to this project are likely to include:

PPG 1: General Guide to the Prevention of Pollution;

PPG 2: Above Ground Oil Storage Tanks;

PPG 5: Works in, near or liable to affect watercourses; and

PPG 6: Working at Construction and Demolition Sites.

Mitigation measures (to be incorporated into Contract requirements) will include:

- safe storage of on-site materials such as oils, fuels, concrete and cement products, to prevent potentially contaminating spillage events. Bunded storage areas to be established for oil and fuel storage away from watercourses, waterbodies, ditches and drains. No batching or mixing of concrete, or refuelling, to be carried out near to watercourses, ditches or ponds;
- provision of erosion control measures, cut-off ditches, silt traps, containment bunds and storage reservoirs of appropriate size in line with SEPA requirements, in order to intercept runoff and prevent sediments entering local watercourses and to minimise soil erosion;
- the provision of clearly defined 'no access' areas indicated on site plans and on site adjacent to sensitive watercourses, and the installation of protective fencing to prevent unauthorised staff, plant and machinery access;
- runoff interception and control measures for grouting operations (where required) to include settlement ponds and provision for the removal and safe disposal of settled material off site as necessary; and
- contingency procedures in case of emergencies/unforeseen events to be set in place by the Contractor as part of the Environmental Management Plan (EMP).

9.4.13 Geology and Soils

The proposed Scheme will require the excavation and import of material (see Table 9.2). Current estimates of volumes are approximate and earthworks quantities will be addressed in more detail during preparation of the Specimen design and contractual documents to provide a balanced approach, such that embankments are constructed as far as possible with acceptable or treated material excavated from the construction of the underpass. The construction of the underpass will generate an estimated 170,000m^3 of arisings, which contain traces of heavy metals, PAHs and TPHs. The excavated soils do not constitute a hazardous Waste, and therefore can can be reused.

The soils, groundwater and surface waters of the area have been established to be contaminated with traces of metals and hydrocarbons and this is described more fully in Chapter 16, Geology and Soils. The impacts associated with contaminated soils or water following completion of the proposed underpass are also discussed in Chapter 16.

A proportion of the excavated material within the site is likely to be suitable for use within the scheme, thereby reducing the need to transport off-site and dispose. The importing of bulk earthworks materials will be kept to a minimum.

It is preferable that the bulk quantities should be moved the least distance within the confines of the site to minimise disruption from the earthworks activities.

It is anticipated that some of the excavated soils may need to be temporarily stored on site prior to replacement as fill material for embankments. Soil storage will be located away from watercourses and waterbodies and mitigation areas. Soils not required as fill will generally be removed from site as soon as excavated given the limited construction footprint that will be available to Contractors. The extent of works and the exposure of soils during the construction phase are considered to have an impact magnitude of moderate, resulting in an overall slight adverse impact (insignificant).

Disturbance to the geological and soil attributes of the study area during scheme construction will be minimised through the adoption of the following mitigation measures:

- limitation of the extent and location of working and storage areas;
- implementation of erosion and sediment controls;
- appropriate handling and storage of spoil;
- re-use of excavated materials as part of the scheme landscaping strategy wherever possible; and
- removal of surplus material off-site to a suitable disposal facility.

9.4.14 Groundwater impacts

Construction of the proposed underpass will involve installation of cut-off piles and walls and the construction of a base slab. Given the conditions that have been encountered during the ground investigations at the junction, input from specialist dewatering contractors will be required to safely draw down groundwater levels sufficiently to enable construction. It is anticipated that dewatering will involve pumping at a rate of 100 – 150 litres/second from a series of dewatering wells and will create a temporary cone of depression during construction of the underpass structures.

A large proportion of the area surrounding Raith Junction is environmentally sensitive with a Site of Special Scientific Interest (SSSI) located south of the junction and Sites of Importance for Nature Conservation (SINCs) located north and north west of the junction. These sites are discussed in more detail in Chapter 10, Ecology and Nature Conservation. The wetland and ponds within these designated sites are considered to be potentially sensitive to changes in ground water level. Theoretical analysis also shows that properties surrounding the site could be affected by a reduction in groundwater level causing ground settlement. In order to ensure that the temporary dewatering does not cause unnecessary drawdown of the ecologically sensitive surface water ponds, or general groundwater in the area, mitigation measures will be incorporated into the dewatering scheme. These will include groundwater and surface water recharge to limit any wider impact outwith the construction area should further assessment and observation at the time of construction confirm that this is required.

During the construction phase, contaminated groundwater will be pumped from the area of the underpass excavation but cannot be discharged to similarly contaminated surface waters without prior remediation to reduce contamination concentrations to acceptable levels. This may be achieved using permanent reed beds or physio-chemical methods to treat the groundwater before it enters surface water bodies. The effectiveness of any treatment method will be monitored and controlled by undertaking sampling and testing of pre- and post- treatment water in full consultation with SEPA.

There are four waterbodies within the predicted area of groundwater drawdown that will result from dewatering for construction (Pond numbers as referenced in Figure 15.4).

- Strathclyde Loch
- River Clyde
- Pond 5 (north of junction)
- Pond 1 (south of junction within SSSI)

Of these, Strathclyde Loch will not be affected by dewatering as investigations indicate that the loch is hydraulically isolated and that there will be no significant lowering of loch water levels during the construction phase. The River Clyde will similarly experience insignificant impact compared to overall river flow, and all abstracted groundwater will in time find its way back to the river with no net loss.

Studies carried out as part of the scheme assessment (Groundwater Assessment Report, OGI 2006, Appendix 16.3; Geotechnical Interpretative Report, MFJV 2006 Appendix 16.2), indicate that Pond 5 may be fed by a combination of surface drainage, groundwater and artesian flow. As a result, dewatering could reduce the rate of groundwater infiltration into the pond, causing water levels to fall somewhat. Pond levels can be maintained via groundwater recharge adjacent to the pond, or more directly via recharge to surface waters. This latter approach will require the recharged water to be pre-treated to remove contaminants and would be possible only with SEPA approval.

Similarly, Pond 1 (in the SSSI) is fed by a combination of surface and groundwaters. The pond will be protected from adverse impacts resulting from dewatering during construction through localised groundwater recharge via recharge wells and, if required, additional surface water recharge upstream (the surface drainage from the land around the junction drains via the Burn to the pond. It is considered that there will be negligible adverse impacts to this pond with monitoring and mitigation measures in place.

Continued monitoring of both ground and surface water in the vicinity of the excavation will ensure that a water balance is maintained. A monitoring programme involving monthly level measurements at each of the ponds within the SSSI and SINC areas potentially affected by the proposed scheme is underway, and will continue through the construction phase to provide data on baseline conditions pre-construction and to determine any necessary recharge to surface waters.

Early discussions will be held with SEPA to gain approval for the groundwater management measures proposed and any treatment methods before discharge, along with necessary discharge consent(s). Special measures may be required to treat contaminants within the groundwater that will be abstracted from the excavation works prior to any discharge into surface waters, and ultimately into the River Clyde.

A further impact from mobilisation of contamination in soils and groundwater relates to construction workers who could be at risk of coming into contact with contaminants during construction activities. This risk is mitigated however by ensuring standard health and safety procedures are followed and appropriate personal protective equipment (PPE) is worn.

Working methodologies should be in accordance with Health and Safety Executive Guidance “HS(G) 66 – Protection of Workers and the General Public During the Development of Contaminated Land, 1991” and SEPA Pollution Prevention Guidelines. Mitigation will include controlling dust emissions and minimising the exposure of contaminated material to erosion by run off or wind activity. Provided that potentially contaminated material is excavated and handled in a responsible manner to prevent migration to other receptors, the risks and associated impacts may be reduced to acceptable levels.

9.5 General Scheme Mitigation

This section describes general mitigation ‘good practice’ measures applicable to the whole Scheme. Specific construction-related mitigation measures as described above and in the relevant topic chapters will be set in place during the construction phase to reduce adverse effects on sensitive receptors. Disruption at any individual construction location will be reduced as far as possible through a combination of good practice measures, agreed as necessary with SNH, SEPA and the relevant Local Authority.

The potential impacts of the proposed scheme will be controlled through the development and implementation of an Environmental Management Plan (EMP) and through Construction Method Statements. The Contractor will be required to implement the EMP prior to the commencement of work on site.

Further measures should be taken during the construction period to ensure that the contractors follow the recommendations contained within the above guidelines.. Specific measures will be required of the Contractor as part of the specimen design and Environmental Management Plan (EMP) for appropriate and adequate pollution mitigation with regards to the type of facilities required and the methodology adopted.

General mitigation measures will include:

- minimising land take by defining a specific working corridor during construction and protecting sensitive receptors through signage, fencing and specific instruction of site staff;
- programming work to reduce impacts from construction activities, and in particular to avoid cumulative or repetitive disruption to local communities and road users;
- working practices and hours agreed in advance with the appropriate Local Authorities. Site operation hours to be restricted as required, especially where site activity could cause disruption to adjacent sensitive properties;
- the Local Authority maximum allowable noise levels on working sites written into contract documents;
- Network Rail consulted on works planned close to West Coast Main Line;
- work on Sundays generally restricted to “quiet” operations, although some work may have to be undertaken on Sundays to minimise disruption to traffic during the rest of the week. Night-time working only undertaken where it is not practicable to undertake work during normal site hours;

- rights of way redirected and kept open (unless specific circumstances necessitate short periods of closure, e.g. for safety reasons) so as to limit disturbance to pedestrians, equestrians and cyclists;
- road closures and temporary diversions, should they occur, kept to a minimum and, if necessary, phased to minimise inconvenience and delays to road users and occupiers;
- safety fencing and warning signs used to safeguard the public, redirect NMUs temporarily and prevent unauthorised access to working areas; and
- physical control measures implemented as part of good working practices, including runoff control, damping down haul roads and washing vehicles before entry onto the public road, selection of low noise/vibration equipment, fencing as appropriate and minimise floodlighting at night.

9.6 Residual Impacts

Impacts caused during the construction phase of the proposed scheme are typically short-term or temporary in nature. When coupled with the implementation of mitigation measures specified in the Environmental Management Plan (EMP) and Method Statements prepared by the Contractor prior to commencement of works on site, many of these impacts can be successfully avoided or reduced. As such, the overall residual construction phase impacts are assessed as being low adverse with the exception of possible localised and temporary dust soiling, visual and landscape impacts and impacts upon driver views and driver stress which may be moderate adverse at times. These latter impacts are short-term in nature, but are difficult to mitigate other then through good site practice, use of temporary screening where appropriate and careful phasing of works.

Providing the mitigation measures are put in place then most properties within 100 m are likely to experience intermittent low to moderate adverse impacts. However, properties closer to proposed working areas (within 50m) may experience a greater degree of disruption at certain times during the construction period. It is not possible to eliminate airborne emissions or noise entirely from construction sites, but the residual impact upon receptors overall is assessed as not significant.

With the implementation of generally accepted good practice measures and appropriate mitigation measures the residual impact of construction activity on ecology is likely to be reduced. Impact severity will depend on the location of particular working areas in relation to identified sensitive ecological receptors. While much of the construction activity will affect ecological receptors of relatively low importance and sensitivity; the risk of significant adverse impacts will be increased for those receptors within or near to statutory designated sites. Residual impacts, with mitigation measures in place to protect sensitive habitats and species, most notably within the SSSI and SINC areas, are considered to be slight adverse and not significant.

With mitigation measures in place, construction activity will nonetheless cause direct and indirect disruption on the road network and pedestrian and cyclist access, albeit on a temporary basis. Construction traffic using the existing network, including heavy equipment movements, may also cause intermittent disruption. Residual disruption to pedestrians and cyclists is considered to be low adverse and not significant, leading to improvements in overall safety and amenity for non-motorised users on completion of the scheme.

Taking into account mitigation measures, visual impacts are anticipated to remain adverse with respect to both nearby properties and road users, but will be temporary in nature and potentially lessened throughout the construction period by the phasing of different activities.

Groundwater management and the potential impacts of this process on nearby properties, surface water features and wetland habitats will be monitored and controlled throughout the construction period. Identified mitigation measures and ongoing monitoring of sensitive receptors, developed in consultation with the statutory bodies, will ensure that adverse impacts will be no more that low adverse and not significant.

Similarly, surface water quality will be maintained and protected through the implementation of the Contractor's EMP, ensuring that there are no significant impacts on watercourses, ditches, ponds, the River Clyde and associated wetland habitats and the species they support.

9.7 References

Mouchel Fairhurst JV, M74 Junction 5, Raith - Contamination Assessment Report, 2006 (Appendix 16.1).

Mouchel Fairhurst JV: M74 Junction 5,Raith - Geotechnical Interpretative Report on Construction of Underpass, 2006 (Appendix 16.2).

OGI, M74 Junction 5, Raith - Groundwater Assessment for Construction of Underpass, July 2006 (Appendix 16.3)

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10 Ecology and Nature Conservation

10.1 Introduction

This chapter provides an Ecological Impact Assessment of the preferred road improvement scheme for M74 Junction 5, Raith, hereafter referred to as Raith junction. It presents information on baseline conditions and the nature conservation value of the area with the potential to be affected by the proposals. It then outlines the nature and significance of the potential impacts on flora and fauna within and adjacent to the scheme alignment. Mitigation measures are proposed to avoid, minimise or compensate for potential adverse effects, and enhancement measures to maximise the biodiversity value of new habitats created by the improvement scheme are set out. The chapter concludes with an assessment of the residual impacts of the scheme on ecology and nature conservation.

The scope and area of surveys in the study area were developed through an ongoing process of liaison with the design team and Scottish Natural Heritage (SNH).

10.2 Methods

The methodology followed for this Ecological Impact Assessment (EcIA) is as described for a Stage 3 assessment in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 4 Ecology and Nature Conservation.

10.2.1 Consultations and Desk Study

A Stage 2 DMRB Environmental Impact Assessment Report was submitted to the Transport Scotland (MFJV, 2005). As part of the Stage 2 assessment, consultations were carried out with relevant statutory and non-statutory organisations in November 2005 to provide an understanding of the study area's ecological interest and to elicit the views of consultees on the potential ecological impacts of the proposed options. Key consultees, SNH and North and South Lanarkshire Councils, were then further consulted through meetings and correspondence during the Stage 3 DMRB assessment, to ensure that their views on impacts and preferred mitigation options and enhancement opportunities were taken fully into consideration in the specimen design proposals.

The nature conservation organisations consulted with in respect to the Stage 3 DMRB assessment are presented in Table 5.1 in Chapter 5.

In addition to consultations and review of the Stage 2 assessment, the desk study for the current Stage 3 DMRB assessment included review of the following sources of information:

- http://www.bto.org – for detailed descriptions of UK bird status and trends;
- http://www.rspb.org.uk – for UK bird status;
- http://www.jncc.gov - for statutory European sites;
- http://www.scottishwildlifetrust.org.uk - for non-statutory wildlife sites;

- http://www.sepa.org.uk - for salmonid fisheries information;
- http://www.northlan.gov.uk – planning / biodiversity for North Lanarkshire;
- http://www.southlanarkshire.gov.uk – planning / biodiversity for South Lanarkshire;
- http://www.searchnbn.net - for species records;
- http://www.scotland.gov.uk - for Scotland's Biodiversity Strategy; and
- http://www.ukbap.org.uk - for the UK Biodiversity Action Plan (BAP) and North and South Lanarkshire Councils' Local Biodiversity Action Plans (LBAPs).

10.2.2 Field Survey

Extended Phase 1 Habitat Survey

The study area boundary is as shown in Figure 10.1. This area was subject to an extended Phase 1 habitat survey in the period May to July 2004, focussing primarily on semi-natural and other vegetated land up to approximately 500 m either side and at each end of the scheme. Phase 1 habitat survey is a standardised method of recording habitat types and characteristic vegetation, as set out in the "Handbook for Phase 1 Habitat Survey – a technique for Environmental Audit" (JNCC, 1993). This habitat survey method was extended in accordance with the "Guidelines for Baseline Ecological Assessment" (IEA, 1995) through the additional recording of specific features indicating the presence, or likely presence, of protected species or other species of nature conservation significance. Descriptive "target notes" (shown as red numbered circles in Figure 10.1 and referred to throughout this Chapter as **TN**s), were recorded to provide details of characteristic habitats, features of ecological interest, or any other features which required note to aid ecologically sensitive design or mitigation.

Whilst not a full botanical or protected species survey, the extended Phase 1 method of survey enables suitably trained and experienced ecologists to obtain an understanding of the ecology of a site such that it is possible either:

1. to confirm the conservation significance of the site and assess the potential for impacts on habitats/species likely to represent a material consideration in planning terms; or

2. to establish the scope and extent of any additional specialist ecological surveys that will be required before such confirmation can be made.

Additional Specialist Surveys

It was concluded during the Stage 2 DMRB assessment that a number of issues would require further specialist survey in order to obtain a more detailed understanding of baseline conditions for the Stage 3 DMRB assessment of the preferred scheme. The specialist surveys listed in Table 10.1 were therefore undertaken in 2005 through to 2006.

Table 10.1 Specialist Ecological Surveys Carried Out, 2004 - 2005 and 2006

Species	Status	Survey Date(s)
Flora of the SSSI, SINCs, and main areas of proposed land take.	One Site of Special Scientific Interest (SSSI) and two non-statutory designated local nature conservation sites (SINCs).	May to July 2004 (Phase 1 habitat survey), September 2005 and May 2006 (NVC survey).
Breeding Bird Surveys	Great Britain specially protected bird species	April to June 2004 April to July 2005
Wintering Bird Surveys	Great Britain specially protected bird species	October 2004 to February 2005, October 2005 to February 2006
Otter and Water Vole Survey	Non-statutory designated local nature conservation site with European Protected Species.	April 2004, March 2005 and March 2006.
Great Crested Newt	European Protected Species	July 2004 April to May 2005 April to May 2006
Aquatic Invertebrate survey	Red Data Book or Biodiversity species	July 2006
Bats	European Protected Species	May 2004 September 2005 June and September 2006
Badger	Great Britain protected species	2004, 2005 and 2006 (walkover surveys)

Further information about the specialist survey methods used is provided in the relevant Technical Appendices in Volume 2 of this Environmental Statement, as follows:

- Appendix 10.1 Extended Phase 1 habitat survey;
- Appendix 10.2 Phase 2 - National Vegetation Classification (NVC) survey of the SSSI, SINCs and main areas of land take;
- Appendix 10.3 Otter and water vole survey, 2004 to 2006;
- Appendix 10.4 Great crested newt surveys, 2004-2006;
- Appendix 10.5 Breeding bird surveys 2004 and 2005;
- Appendix 10.6 Wintering bird surveys 2004 – 2005 and 2005 - 2006;
- Appendix 10.7 Aquatic Invertebrate survey 2006

- Appendix 10.8 Bat survey 2006.

A Confidential Annex (Badger survey) is available on request from Transport Scotland.

10.3 Data Limitations

As the extended Phase 1 habitat survey and Phase 2 - NVC survey were conducted in the period May to September, some early - flowering species may not have been visible at the time of the survey. However, experienced botanical surveyors carried out these surveys and it is considered that the survey results are representative of the flora of the study area, and include all the dominant and characteristic species.

In addition to permanent ponds, there is a reasonable possibility of temporary / seasonal waterbodies being present within the survey area during wet seasons which have not been surveyed for amphibians. Although temporary ponds may be suitable for use by amphibians for breeding, this limitation is considered not to be significant in terms of assessing the amphibian status of the area.

10.4 Impact Assessment Methods

In addition to the requirements of DMRB Volume 11, the EcIA has been completed with reference to the methodology set out below, which has taken into account a range of suggestions contained in current guidance and best practice, including the following publications:

- National Planning Policy Guideline (NPPG) 14, Natural Heritage. Scottish Office Development Department, 1999;
- Planning Advice Note (PAN) 60; Planning and Natural Heritage. Scottish Executive Development Department, 2000;
- Circular 15/99 Environmental Impact Assessment (Scotland) Regulations, 1999;
- Nature of Scotland. A Policy Statement. Scottish Executive, 2001;
- Handbook on Environmental Impact Assessment. Scottish Natural Heritage, Feb. 2006;
- The Biodiversity sub-objective of Transport Analysis Guidance (TAG), Department for Transport, 2004; and
- Guidelines for Ecological Impact Assessment in the United Kingdom. The Institute of Ecology and Environmental Management (IEEM), June 2006.

Several stages of evaluation and application of significance criteria are involved in the process of EcIA. The approach adopted for the EcIA in this case is set out below.

10.4.1 Evaluation

Criteria are applied to assess the nature conservation value of the habitats and species / populations that the site supports. As there is rarely comprehensive quantitative data on the habitat or species population resource, particularly at the Regional to Local level, the nature conservation evaluation process necessarily also involves a qualitative component. This requires a suitably trained and experienced ecologist to make a professional judgement based upon a combination of published sources, consultation responses and knowledge of both the site and the wider area. The categories of nature conservation value used in this Chapter are as follows:

- International – sites, habitats and species / populations of significance in a European context;
- UK – sites, habitats and species/populations of significance in the context of the UK;
- National – sites, habitats and species/populations of significance in the context of Scotland;
- Regional – habitats/species/populations of significance in the context of the Clyde Valley;
- Local – sites, habitats and species/populations of significance in the context of either South or North Lanarkshire Council areas;
- Low – habitats and species/populations of less than Local significance, but of some value; and
- None – Negligible or no nature conservation value.

10.4.2 Impact Magnitude

The magnitude of an impact depends upon the nature and sensitivity of a receptor and the range of potential effects arising from the implementation and operation of a proposed development. In assessing the likely magnitude of an effect, it is necessary to have as great an understanding as possible of its timing, intensity, frequency, duration and reversibility. For the purposes of this assessment, the nature of the effects on specific receptors is described in the Impacts section, and then the magnitude of these combined effects is summarised as being in one of the categories “imperceptible”, “low”, “medium” or “high”, depending upon the extent of the area or population deemed likely to be affected by the development.

Table 10.2 below provides an indication of the terms in which the magnitude of ecological impacts is considered in this Chapter. The following definitions have been applied in respect of timescales:

- “immediate” within approximately 12 months;
- “short-term” within approximately 1 to 5 years;
- “medium-term” within approximately 6 to 15 years; and

- "long-term" 16 years or more.

Table 10.2 Levels of Impact Magnitude

Magnitude	Description
Imperceptible	Not expected to affect the conservation status of the site, habitat or species under consideration in any way, therefore no noticeable effects on the ecological resource, even in the short-term.
Low	Noticeable effects, but either of sufficiently small scale or short duration to cause no harm to the conservation status of the site, habitat or species. Detectable in short- but not in medium-term.
Medium	Significant effect on the nature conservation status of the site, habitat or species, but would not threaten the long-term integrity of the system. Detectable in short- and medium-term.
High	Significant effect on the nature conservation status of the site, habitat or species, likely to threaten the long-term integrity of the system. Detectable in short-, medium- and long-term.

10.4.3 Significance of Impacts

The determination of impact significance involves the interaction of both the nature conservation value of the site, habitat or species concerned, together with the magnitude of the various impacts upon it. The more ecologically valuable a site and the greater the magnitude of the impact, the higher the significance of that impact is likely to be.

Table 10.3 shows in general terms the way in which the significance of ecological impacts is considered in this Chapter. It is important to appreciate that this does not represent a rigid framework for assessment - there are gradations between different categories of site and impact, and on occasion the significance of a particular impact may not accord precisely with the categories shown below. Impacts identified as minor are considered not to be significant for the purposes of this EcIA.

Table 10.3 Generalised Impact Significance Matrix

Nature Conservation **Value**	**Magnitude of Potential Impact**			
	High	**Medium**	**Low**	**Imperceptible**
International	Exceptional	Major	Moderate	Minor
National (including both UK and Scotland)	Exceptional	Major	Moderate	Minor
Regional – Clyde Valley	Major	Moderate	Minor	Minor
Local – South and North Lanarkshire	Moderate	Minor	Minor	Negligible
Low – less than Local	Minor	Negligible	Negligible	Negligible
None	Negligible	Negligible	Negligible	Negligible

10.5 Baseline Conditions

Background information on the underpinning legislative and planning policy context is provided in Chapter 17 Policies and Plans.

10.5.1 Statutory Nature Conservation Designations

The northern section of Hamilton Low Parks Site of Special Scientific Interest (SSSI), also known as Raith Haugh, lies within the ecological study area. The SSSI is recognised as being part of a series of national importance because its habitats support a range of wetland and woodland birds. There are no statutory designated sites of international nature conservation value within 2km of the survey boundary, and one site of national nature conservation value, outside the survey area but within 2km, Bothwell Castle Grounds SSSI. Only Hamilton Low Parks SSSI will be affected by the proposed improvements to Raith junction. The other statutory designated site, mentioned above, is not considered further in this Chapter due to its distance from the scheme. A detailed botanical survey of the section of Hamilton Low Parks that lies within 500m of the scheme extents is given in Appendix 10.2.

More distant SSSIs are discussed in Chapter 6, Air Quality, with respect to the potential impacts on vegetation of changes in air quality due to the proposed scheme[12]. The assessment concludes that the Scheme will have a slight beneficial impact, in terms of air quality, at the two sites considered. Other potential impacts on the ecology of these SSSIs are not considered further in this Chapter due to their distance from the scheme.

The River Clyde, situated at the southern edge of the survey area is part of the wider Clyde catchment designated as baseline salmonid waters under EC Directive 78/659/EEC. The South Calder Water and the River Avon are also core salmonid rivers, and they adjoin the Clyde just upstream of the Raith junction area.

10.5.2 Non-statutory Nature Conservation Designations

The planning framework for non-statutory sites for nature conservation is set out in NPPG14.

<u>Sites of Interest for Nature Conservation (SINCs)</u>

There are three SINCs that either lie within, or partly within, the study area. A detailed botanical survey of all SINCs in the survey area is given in Appendix 10.2. SINCs are a common type of non-statutory designated site considered to be of regional or local ecological importance (NPPG14, Scottish Office, 1998).

South Lanarkshire SINCs

The following SINCs are designated as they are assessed as contributing to the Local nature conservation resource of South Lanarkshire.

Bothwell Corridor Site VIII (NS715592; 5 ha) – **Bothwell Park Wood and Disused Railway**. This is a woodland dominated site that lies at the northern part of the study area.

Bothwell Corridor Site IX (NS713588) – **Laighland / Bothwell Park Wetlands**. This site is composed of three sub-sites. These are:

- Laighland Wetland 1 (NS716589, 4 ha) is an area of wetland and wet woodland that forms the largest part of the SINC and is adjacent to the A725;

- Laighland Wetland 2 (NS714590, 2.5 ha) is an elongated area of wetland that runs north from the M74 to the southern edge of Bothwell Park Wood (see above); and

[12] In accordance with Interim Advice Note 61/05, all SACs, SPAs, cSPAs, Ramsar or SSSI sites within 200m of any road on which there are potentially significant changes in traffic flows were identified. .

- Laighland Wetland 3 (NS712587) is another elongated area of wetland, including two areas of open water that lies along the southern edge of the M74 embankment in the Laighland area. This sub-site is isolated from the rest of the SINC by the M74.

North Lanarkshire SINCs

The following SINCs are designated as they are assessed as contributing to the Local nature conservation resource of North Lanarkshire.

The northern edge of the SINC at Strathclyde Country Park (North Lanarkshire SINC 75/1a) lies within the southeast part of the survey area. This part of the SINC comprises Strathclyde Loch, its shoreline and a man-made island. However, the SINC also includes native woodland that fringes the South Calder Water about 0.5 km southeast of the study area. The North Lanarkshire Local Biodiversity Action Plan (North Lanarkshire Council, 2000) recognises the general ecological value of all wildlife habitats of the Country Park to the local area.

Scottish Wildlife Trust “Wildlife Sites”

There are no Scottish Wildlife Trust (SWT) Wildlife Sites (WSs); sites that are generally of local importance, within the ecological study area or in the local area that surrounds Raith junction.

Wildlife Corridors

Together the SINCs and SSSI of the Raith junction area form part of a “green network” of regional importance (Glasgow and the Clyde Valley Structure Plan Joint Committee, 2000). The Clyde Valley is the most important wildlife corridor in the area and the Raith junction area is considered an important link in the chain of wildlife habitats of this corridor.

Ancient and Long-established Woodland

SNH provided the locations of areas within the study area that are included in its Inventory of Ancient Woodland (IAW) sites. Ancient Woodland is not a formal designation as such, but in Scotland is a term applied to sites whose documented history shows them to have been continuously wooded since approximately 1750. Long-established woodlands are secondary woodland with a documented history extending back from 100 – 250 years. Ancient Woodland sites and their mature soils are considerably more complex and biodiverse ecosystems than secondarily wooded sites, and long-established woodland more complex than recent plantings. Ancient and long-established woodlands therefore represent environmental capital that should be considered to be a finite resource, as it is not renewable in a human timescale.

Bothwell Park Wood SINC is the only part of the ecological study area that contains Inventory Ancient Woodland. However, there is a considerable area of IAW in the district; including the river valley of the South Calder Water about 1 km to the east of Raith junction and Black Muir Plantation approximately 1 km southwest of the junction. The scheme does not extend into the IAW at Bothwell Park Wood.

10.5.3 Habitats and Vegetation Communities

Figure 10.1 shows the Phase 1 habitat types recorded within the study area, and it also shows the location of target noted (red circles with a corresponding description number - **TN**) sites. Target note numbered descriptions can be found in the technical report at Appendix 10.1.

The following habitats, listed in conventional order used in the Phase 1 manual rather than in order of abundance, are present within the survey area.Semi-natural broadleaved woodland;

- Broadleaved plantation woodland;
- Mixed plantation woodland;
- Dense scrub;
- Scattered scrub;
- Scattered broadleaved trees;
- Semi-improved neutral grassland;
- Improved grassland;
- Marshy grassland;
- Tall ruderal;
- Swamp;
- Standing water;
- Running water;
- Amenity grassland;
- Hedgerow; and
- Built-up areas / hardstanding.

A summary description of these habitats, including an assessment of their nature conservation value, is provided below. This is based upon data that are provided in full at Appendix 10.1 and Figure 10.1 (Phase 1 habitat survey of study area) and Appendix 10.2 (NVC – Phase 2 survey of the SSSI, SINCs and main areas of land take) and Figures 10.2 and 10.3.

In this Chapter, habitats are discussed in order of abundance within the study area, starting with those that are most common. Where appropriate, habitats have been grouped.

Man-made Habitats – Built-up Areas, Improved Grassland and Amenity Grassland

The eastern part of the study area (Strathclyde Country Park) is dominated by managed habitat consisting of amenity grassland and of built-up areas devoted to recreation and business. The suburban fringe of Bothwell forms the western periphery of the study area (the Laighlands area). To the north of the junction (Bothwell Park area) man-made habitat is less prevalent, being formed from the buildings of Bothwell Park Farm and the private parkland and paddock of Bothwell Park House. There are no existing man-made habitats within the SSSI.

All of these man-made habitats are common and widespread, both in the local area and more widely throughout Scotland and the rest of the UK and, although they support a range of flora and fauna, their intrinsic nature conservation value is assessed as being negligible.

Low Intensity Managed Grasslands

The majority of grassland within the study area is classified as semi-improved neutral grassland, and typifies parts of Hamilton Low Parks SSSI, the Laighlands area and a good part of the Bothwell Park area. These grasslands are generally associated with wetland habitats. In general, these grasslands are rank in nature with levels of botanical diversity that are only marginally higher than improved grassland. The low botanical value of the semi-improved grasslands is ascribed to a lack of management in modern times, such as seasonal vegetation cutting combined with ineffectual drainage management and considerable levels of livestock poaching (in the Laighlands and Bothwell Park grasslands). Scrub encroachment within the grasslands of the SSSI is evidence of early ecological successional processes.

Although the intrinsic interest of these grassland habitats is negligible/low in botanical terms, they do support a range of faunal species, including farmland birds that are of conservation interest. For this reason, these commonly-occurring semi-improved grassland habitats are assessed across the study area as being of low to local nature conservation value. The grassland habitats in close juxtaposition to woodland within the Bothwell Park area and SSSI, are considered to contribute to the functional ecology of these woodlands, i.e. faunal species that are resident in the woodlands are likely to forage in adjacent grasslands.

Woodland and Scrub

Woodland is an important feature of the study area but it is not the principal wildlife habitat in the immediate vicinity of Raith junction. This reflects the fairly low cover of woodland throughout Lanarkshire (i.e. 14% in South Lanarkshire; South Lanarkshire Biodiversity Partnership, 2003). As part of an initiative to maintain and increase woodland in the region, native woodland is a priority habitat in the Lanarkshire BAPs (*e.g.* HAP WH1 in South Lanarkshire). No key South Lanarkshire woodland sites are located in the vicinity of the survey area.

The SSSI and SINCs of the survey area contain woodland and scrub of varying type and ecological significance. The most significant native woodland in the survey area is the

Bothwell Park SINC with the central part of the site (**TN** 12) composed of Inventory Ancient Woodland. The woodland ground layer vegetation of Bothwell Park Wood SINC (**TN** 12) reflects the woodland's IAW status, and contains extensive stands of bluebell (*Hyacinthoides non-scripta*). None of this woodland lies within the scheme footprint.

To the south of Bothwell Park Wood SINC, semi-natural Woodland forms the margins of the Laighlands Wetlands SINC. These woodlands are predominantly scrub in character although there is an area of high forest wet woodland that fringes the low lying, poor drained southern edge of Bothwell Park Wood SINC (**TN** 13).

To the northeast of Raith junction a limited amount of semi-natural Woodland is present in Strathclyde Country Park, and it is found close to the A725, but semi-mature broadleaved plantation is more typical of the Country Park's woodland.

Within the SSSI there is a moderate sized woodland compartment close to the M74 embankment (**TN** 4), which is semi-natural Woodland. Also, some stretches of the riverbank of the River Clyde are vegetated by scrubby willows but riparian woodland cover levels are low overall.

There are no commercial plantations within the survey area and all woodland plantations have been created to improve the area's aesthetic appeal and amenity value. Native broadleaved species have been generally planted. Early mature broadleaved plantation woodland is common in the Strathclyde Country Park and has been created as strips and small blocks that surround the amenity grassland dominated parkland. Similar planting, although somewhat more immature, fringes the footpath / cycle path that lies at the northern edge of the SSSI on the steep southern embankment of the A725.

Planted woodland screening exists on the embankments of the A725, M74 and also beside the River Clyde where the M74 crosses it. A variety of scrub species characterise these areas, such as hawthorn and blackthorn (*Prunus spinosa*). The most notable area of continuous scrub lies at the northern margin of the SSSI by the embankment of the M74, and it is likely that this is a relict of farmland hedges that existed before Raith junction was built. In general woodland plantation and scrub adjacent to road embankments have no real botanical interest and are subject to too much disturbance to be of conservation interest. Nevertheless, the planting helps to screen the core of the SSSI from visual disturbance, air pollution and the effects of regular human incursion.

Aquatic, Marginal and Swamp Habitats

The River Clyde is the most important watercourse that lies within the study area, albeit at the outer margins of the scheme. The riverbank of the Clyde is composed of a thick, and rather unstable, accumulation of soft, sandy silt (**TN** 8). Tall ruderal habitat and scattered scrub that demonstrates a good degree of botanical diversity characterises the riverbank (**TNs** 2 and 8). A minor tributary of the Clyde (an un-named burn known hereafter as the Burn) and a network of man-made ditches drain the Raith area. The hydrology of the area is described further in Chapter 15. Consultations and field-based observations indicate that the Burn and land drains within the Laighlands and SSSI parts of the Raith area have been subject to considerable levels of dredging and widening in recent years. This has adversely affected the ecological value of the watercourses of the area. The minor watercourses that drain the Bothwell Park area have not been subject to such disturbance.

There is a fairly even distribution of standing open water across the study area; most water bodies being relatively small in area, except for Strathclyde Loch that lies to the east of Raith junction. Figure 15.2 shows ponds around the junction and Appendix 10.7 Figure 1 shows the distribution of ponds across the wider Raith area which were subject to a pond habitat assessment as part of an invertebrate survey in 2006. It should be noted that the water bodies as shown on the most recent Ordnance Survey map (Explorer sheet 343) exaggerate the amount of open water in the small ponds of the area as they are unmanaged and have reached a successional stage where they have become extensively colonised by tall-herb fen and swamp habitat. Furthermore, the pond shown on the Ordnance Survey maps in the southwestern part of Laighlands (NS710584) has been almost completely infilled and replaced by grassland. However, just to the southeast of this locality there is a small pond with wetland vegetation (**TN** 16) at an earlier successional stage.

With the notable exception of Strathclyde Loch, which is artificial and managed for recreation and sport, most areas of open water in the study area are unmanaged and naturalised. Most probably owe their origin to subsidence caused by coal mining in the area in the past, most notable in the Laighlands and Bothwell Park areas, combined with large-scale earthworks (including borrow pits) associated with the original construction of the M74. The margins of all the natural water bodies in the area have been subject to wetland vegetation development as they are shallow with soft muddy substrate. Consequently open water forms only a small proportion of much of the study area's wetlands.

Wetland habitats are an important part of the Raith area as most of it lies within the floodplain of the River Clyde. The Laighlands Wetland SINC and SSSI contain significant areas of marsh, tall herb fen and swamp habitat (**TN** 3, 9, 10, 14, 19, and 20). However, there is a small area of wetland habitat in the southern edge of Laighlands (**TN** 16) that has no ecological designation. Habitat assessment suggests that this wetland area is of low conservation interest as it suffers heavily from poaching by livestock.

A detailed botanical description of SSSI and SINC designated wetlands is given in Appendix 10.2, with NVC communities shown on Figures 10.2 and 10.3. In general the wetlands of the Raith area are considered to be, in part, hydrologically connected, although the presence of culverted sections of the Burn (under the M74 and A725) results in the wetlands of Raith being discontinuous.

<u>Other Habitats – Tall Ruderals and Hedgerow</u>

Tall ruderal habitat dominates the southern section of the SSSI and especially the riparian zone (**TN** 2, 7 and 8). This area is mainly vegetated by herbaceous plants that colonise the partly eroded soft alluvial soils of the steep, high riverbank and adjacent floodplain. Some willow scrub is also present in the riparian zone but it is subordinate compared with the tall ruderal vegetation. Botanical diversity is noteworthy at **TN** 8 with species including viper's bugloss (*Echium vulgare*), reflexed stonecrop (*Sedum rupestre*), bittersweet (*Solanum dulcamara*) and tansy (*Tanacetum vulgare).*

Species-poor hedgerows form some of the field boundaries within the Laighlands area and have been recently planted as part of the landscaping where the SSSI adjoins the embankment of the A725. Two short stretches of very overgrown hawthorn hedge are evident at the very northern edge of the SSSI. These are probably relict features of farmland that existed before the construction of Raith junction.

10.5.4 Flora

Species of Conservation Interest

Consultations with the Botanical Society of the British Isles (BSBI) indicate that two locally uncommon plants have been recorded in the ponds of the Laighlands Wetlands SINC. Mudwort (*Limosella aquatica*) is a nationally scarce species in the UK and it becomes progressively rarer to the north (Stace, 1997). The species was reported by the BSBI to be found in all the ponds of the Laighlands Wetland SINC and in the Hamilton Low Parks SSSI. Most notably the species is noted by the BSBI to have only been found in one other site in Lanarkshire. Grey club-rush (*Schoenoplectus tabernaemontani*) was reported by the BSBI to have been recorded in Laighland Wetland 3 that lies south of the M74. The plant has a very scattered inland UK distribution (Stace, 1997) although it is commoner in coastal areas. In addition the BSBI indicate that grey club-rush has only been recorded at two other sites in Lanarkshire. Even so, mudwort and grey club-rush are not South Lanarkshire LBAP species. These species are unrecorded in North Lanarkshire and are not mentioned in the North Lanarkshire LBAP.

Mudwort was not recorded during botanical fieldwork in the Raith junction area in 2004 and 2005/6. Grey club-rush was however recorded at Pond 18, which lies adjacent to the M74.

There are a few plants of water figwort (*Scrophularia auriculata*) found at the southern edge of the study area. This species is rare in Scotland (Stace, 1997) and is a North Lanarkshire LBAP species (described as being vulnerable and locally rare), but the species is not included in the South Lanarkshire LBAP. For the purposes of this assessment the species is assessed as being of nature conservation significance in the context of Scotland

The remainder of the study area supports vegetation communities typical of those associated with the habitats present, as described above, which are generally well represented across this part of lowland Scotland and more widely across Great Britain. They are of negligible to low botanical interest.

Invasive Species

Invasive plants are uncommon in the study area. No species were recorded during survey whose seeding or planting are outlawed by the Wildlife and Countryside Act

(1981 and amendments). The only abundant, aggressively invasive species is Indian balsam (*Impatiens glandulifera*) being commonplace in the riparian zone of the River Clyde (**TN** 2 and **TN** 8). There are a small number of plants of the non-native common blue-sow-thistle (*Cicerbita macrophylla*) also within this riparian zone. This is an unagressive garden escape species that probably poses no threat to the ecology of the area. The aggressively invasive species Japanese knotweed (*Fallopia japonica*) is commonplace in the riparian zone of the River Clyde a few kilometres downstream of the Raith study area.

10.5.5 Terrestrial Fauna

Otter[13]

Consultations with a local otter recorder reveal that there has probably always been otter territory in the stretch of the River Clyde that lies within the study area . Otter signs were found during the initial ecological surveys (2004 and 2005). A follow-up otter survey of the survey area in March 2006 (Appendix 10.3) indicated the presence of a holt and other signs of otter activity on the north bank of the River Clyde within the SSSI. Figure 10.4 shows the location of signs of otter (and of mink and brown rat) noted during survey.

Otters are present along most of the Clyde in this area, and the presence of otter territory is a feature of the survey area that is considered to be of significance given the European Protected status of this species.

Bats[14]

Consultations and desk study did not reveal any records of bat roosts within the area. Habitat-based assessment during the Phase 1 survey suggested that there was a possibility of tree roosts being present in the more mature woodlands of the Raith area (e.g. **TN** 4, 12 and 13). Only one area of mature woodland (**TN** 4) is located within close proximity to the scheme and the much larger Bothwell Park Wood (**TN** 12 and 13) lies at the periphery of the ecological study area.

A detailed habitat-based assessment of potential roost sites in the vicinity of Raith junction was undertaken by a licensed bat worker (J. Colebrook, SNH bat licence number 5499) in September 2005. A dusk/dawn survey of key locations considered to have

[13] Otters *Lutra lutra* are protected as “European protected species” through inclusion on Schedule 2 of The Conservation (Natural Habitat, &c.) Regulations 1994, as amended, and the species is also protected through listing on Schedule 5 of the Wildlife and Countryside Act 1981, as amended. The otter is also the subject of UK and North Lanarkshire Local Species Action Plans (SAPs).

[14] All species of British bat and their roosts are protected as “European protected species” through inclusion on Schedule 2 of The Conservation (Natural Habitat, &c.) Regulations 1994, as amended. They are also protected under the Wildlife and Countryside Act 1981, as amended. Six bat species, one of which (common pipistrelle *Pipistrellus pipistrellus*) occurs in North Lanarkshire are also UK BAP priority species, and both common and soprano pipistrelle *P. pygmaeus* and Daubenton’s bat *Myotis daubentonii* have SAPs under the North Lanarkshire BAP.

potential to support bat roosts was carried out in September 2006 (Appendix 10.8). The assessment concentrated on identifying locations where combinations of potential roosts and foraging areas existed and were linked to the wider countryside by "flight lines" such as hedges, rivers, or patches of woodland and trees.

The habitats with potential consist of young and semi mature broadleaved woodland located on marshy ground between the River Clyde and the M74. Willow, ash and sycamore are dominant with occasional hawthorn and lime. Although the areas of woodland, scrub, marshy ground and River Clyde constitute good foraging habitat for bats, and bat activity was recorded in the area (most likely common and soprano pipistrelle and Daubenton's bats along the watercourse), the trees are not old enough to have developed features of use by roosting bats.

Only the eastern part of the study area (Strathclyde Country Park) contains buildings with potential as bat roost sites, and these lie outwith the scheme. No buildings will be affected by the scheme. Inspection of road bridges within the ecological study area by a licensed bat worker indicated that they were unsuitable as potential bat roosts.

In terms of bat foraging the study area has high potential, especially along the riparian corridor of the River Clyde. In addition, many of the woodlands of the Raith area have open woodland edges that form good bat foraging habitat.

Overall, the habitats within the study area are considered to be of some value to any bats that do roost in the wider area, principally as potential foraging habitat, and bat activity was recorded in the study area. However, the areas affected by the proposed improvements are unremarkable habitat, with no potential roost sites, and they are considered to be of negligible value in terms of their potential for use by bat species.

Great Crested Newt[15]

Reports on great crested newt *Triturus cristatus* surveys carried out during 2004, 2005 and 2006 are provided in Appendix 10.4. Figure 1 of Appendix 10.4 shows the location of the surveyed ponds.

Presence / absence level amphibian surveys were carried out on a total of 5 water bodies in early 2004. Following an initial scoping for great crested newts, as part of the Stage 2 DMRB assessment, assessment of land within 500m[16] of the alignment identified the presence of 5 potentially suitable ponds (**TN** 3, 10, 14, 16, 19 and 20).

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[15] Great crested newts *Triturus cristatus* are protected as "European protected species" through inclusion on Schedule 2 of The Conservation (Natural Habitat, &c.) Regulations 1994. This species is also listed on Schedule 5 of the Wildlife and Countryside Act 1981, as amended, and is listed as a priority species under both the UK and North Lanarkshire Local BAPs.

[16] The statutory agency for nature conservation, Scottish Natural Heritage, pays regard to guidance on GCN survey methods, published by the English statutory agency English Nature, which recommends surveys of ponds up to approximately 500m beyond the boundary of a planning application site.

Great crested newt surveys were carried out at these ponds in July 2004 and May 2005. No great crested newts or eggs were found. However, the northern pond in the Laighlands area (**TN** 20) was determined in 2005 to comprise potentially suitable habitat for great crested newts, although it is rather isolated from similar habitats in the district.

Combinations of common frog and toad tadpoles, adult to immature frogs and toads, palmate newts and smooth newts were present in the 5 ponds surveyed[17] in 2004. The northern pond in the Laighlands area (**TN** 20) had the most amphibian interest of all the ponds surveyed as it supported smooth and palmate newts and adult common frogs and toads, albeit in low numbers. Survey of the pond within the SSSI (**TN** 3) was very limited as it was inaccessible. The habitat-based assessment (describing the ponds according to standard criteria) included in the 2006 survey (Appendix 10.4) indicated that this pond was not good quality habitat for amphibians.

A further survey of the 5 ponds (albeit only a limited survey of the pond - **TN** 3) was carried out in May 2005 and April to June 2006. The eggs of smooth newt species were present in two ponds in the Laighlands area (TN 16 and 20). At the latter pond, toad tadpoles were also present. Smooth newts were present in the pond in the Laighlands area close to the A725 (**TN** 16). Overall, the amphibian populations were small in size. Again, no evidence of great crested newts was found in any of the 2005 surveys.

A pond habitat appraisal in 2006 identified 12 surface water features (not permanently present) within 500m of the scheme boundary (Appendix 10.7 Figure 1). Several of these ponds were inaccessible for amphibian survey, due to restricted access or for health and safety reasons. Six ponds were surveyed for presence/absence of great crested newts in May-June 2006. These found no evidence of great crested newts nor their eggs in any of the ponds surveyed. Smooth newts were recorded in two of the six ponds surveyed Bothwell Park (TN10) and Laighland wetland SINC (TN16), confirming that the amphibian population in wetlands at Raith is small.

From the surveys, it is reasonable to conclude for the purposes of this assessment that great crested newts are absent from the study area.

Water Vole[18]

The water vole is a priority species in the UK BAP and also in the South and North Lanarkshire BAPs. There are Species Action Plans (SAPs) for water vole in both areas. In North Lanarkshire the water vole SAP is tied in closely with North Lanarkshire's HAP for rivers and streams and standing water. In North Lanarkshire the distribution of water voles is reasonably well understood. In contrast in South Lanarkshire the distribution

[17] Common frog, common toad, smooth newt and palmate newt are all listed on Schedule 5 of the Wildlife and Countryside Act 1981, as amended, but are only subject to limited protection. The smooth newt is a species of local interest in the South Lanarkshire LBAP.

[7] Water voles *Arvicola terrestris* are partially protected through inclusion on Schedule 5 of the Wildlife and Countryside Act 1981, as amended. The water vole is also the subject of UK and both Glasgow and North Lanarkshire Local Species Action Plans (SAPs).

and extent of the water vole populations in the district remains unclear, with data suggesting that they are not present even in potentially suitable watercourses in the district. Consultations with a local mammal recorder indicate that there have been water vole colonies within 5km of the Raith junction area in the past five years (*pers comm*. R.Green), and it has been suggested that water voles could be present closer to the study area than existing records show.

The initial ecological survey of the Raith area in 2004 (Appendix 10.1) and water vole field survey in May 2006 (Appendix 10.3) found no evidence of water vole activity within, or in the vicinity of, the survey area, even though there is potentially suitable wetland habitat. Evidence was found of mink and brown rat along the banks of the River Clyde, both of whom are predators of water voles.

In the regional context, Glasgow (10 km grid square NS66) is reported to contain an important population of water vole *Arvicola terrestris* that is flourishing, expanding and active (R. Green, 2004, *pers. comm*.), but the habitat fragmentation and barriers represented by the complex of infrastructure and industry that dominate the M74 corridor to the west of Raith junction means that it is highly unlikely that water voles from the Glasgow area range into the study area.

In view of the above, it is concluded that water voles are absent from the study area, and given the fragmented nature of wetland habitats it is currently of no nature conservation value in respect of this species.

Badger[19]

There are two geographically-distinct badger groups within the survey area, located on opposing sides of the junction. In general badgers appear to avoid habitats that lie close to the junction. Moreover, there is little or no evidence of interaction between the two badger groups and the number of recorded badger road traffic casualties in the vicinity of Raith junction are low. A detailed description of the badger ecology including analysis of the impacts of the scheme on badgers is provided in a Confidential Badger Annex, which is available from Transport Scotland on application.

The presence of badgers is a feature of local nature conservation value in the context of the surrounding urbanised environment.

Non-Specially Protected Mammals

Brown hare (*Lepus europaeus*) is a UK BAP species and a South and North Lanarkshire BAP species as there are indications that the UK population has declined significantly in recent years. There is indication of a brown hare population in the grasslands of Hamilton Low Parks SSSI (**TN** 5).

[19] Badgers *Meles meles* and their setts are protected under the Protection of Badgers Act 1992, and through listing on Schedule 5 of the Wildlife and Countryside Act 1981, as amended.

There is also a considerable population of roe deer and rabbit within the survey area and especially the SSSI section (**TN** 4 and **TN** 5).

10.5.6 Birds

The Raith area is widely recognised as an important site for a wide range of birds throughout the year. In particular the Hamilton Low Parks SSSI is designated for two ornithological qualifying features, namely its assemblage of breeding birds generally and, in particular, the largest breeding population of grey heron in Scotland, in the woodland within the SSSI to the south of the River Clyde. Other species are mentioned in the SSSI citation, some of which use habitats that will potentially be affected by the proposed scheme. For this reason, surveys for breeding and wintering birds, covering wetland, farmland and woodland birds were undertaken from the early summer of 2004 to the end of the winter period 2005 to 2006.

No specially protected species of wild bird[20] (e.g. barn owl) were determined to be associated with the study area. Although the banks of the Clyde contain suitable kingfisher breeding habitat in the form of steep-sided riverbanks composed of alluvium (**TN** 8) reasonably suitable for kingfisher nest-hole formation, no breeding kingfisher were recorded during 2004-2005 surveys.

Consultation with Bothwell Park Ringing Group (I Livingstone, Clyde Ringing Group, *unpublished information*), on sand martin counts from the 1990's indicate that the habitat around the Bothwell Park Pool (also known as Bluebell Pond, and shown as Pond Number 21 in Appendix 10.7 Figure 1) has in previous years provided a safe spring roost for the majority of the Lanarkshire population. High numbers of birds (c. 2000 - 4000 peaks) were recorded in 1995 and 1996. The area around Bothwell Park Pool is reported to be the only known spring roost site within the Clyde recording area. The site is also used by migrating swallows in late August and September. For both these species there is reported to be no known alternative roost site in the Clyde valley. Birds from the rest of Scotland have also been recorded as using this site as a stop-over site on migration.

The bird species in Tables 10.4 (breeding birds) and 10.5 (wintering birds) are those that have some formal degree of recognition in respect of their conservation status. A detailed description of the results of breeding and wintering bird surveys are provided in Appendices 10.5 and 10.6, respectively. The most recent breeding bird survey (2005) and wintering bird survey (2005 to 2006) form the basis of ornithological assessment of the study area, although the 2004 breeding bird survey and 2004 to 2005 winter bird survey (carried out to inform the DMRB Stage 2 assessment of alternative scheme options) complement the most recent surveys.

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[20] Most common species of bird, their nests and eggs benefit from a degree of protection under Section 1 of the Wildlife and Countryside Act 1981, as amended. However, certain species of wild bird, benefit from a higher level of "special" protection through inclusion on Schedule 1 of The Wildlife and Countryside Act 1981, as amended. These species are often referred to as "Schedule 1 birds".

Mouchel FAIRHURST

Table 10.4 Breeding Birds of Notable Conservation Status in the Raith Area

Common name	Species	UK BAP species	LBAP species	Population status *	Notes
Skylark	*Alauda arvensis*	✓	✓	R	2 pairs in Laighland and 1 pair in Bothwell Park.
Reed bunting	*Emberiza schoeniclus*	✓	✓	R	15 pairs in Bothwell Park and 1 pair in Laighland.
Song thrush	*Turdus philomelos*	✓		R	3 pairs in the country park and 1 pair in SSSI.
Common bullfinch	*Pyrrhula pyrrhula*	✓		R	1 pair in Bothwell Park.
House sparrow	*Passer domesticus*	✓		R	Breed at the urban fringes of the Raith junction area.
Starling	*Sturnus vulgaris*	✓		R	Breed at the urban fringes of the Raith junction area.
Lapwing	*Vanellus vanellus*		✓	A	1 pair in Laighland.
Dunnock	*Prunella modularis*			A	4 pairs in Bothwell Park, 2 pairs in the country park and 2 pairs in SSSI and 1 pair in Laighland.
Water rail	*Rallus aquaticus*			A / S	2 pairs in Bothwell Park and 1 pair in Laighland.
Mistle thrush	*Turdus viscivorus*			A	1 pair in Laighland.
Mute swan	*Cygnus olor*			A	1 pair in Bothwell Park.
Willow warbler	*Phylloscopus trochilus*			A	11 pairs in Bothwell Park, 5 pairs in SSSI, 4 pairs in Laighland, and 1 pair in the Country Park.
Tree pipit	*Anthus trivialis*			A	1 pair in Bothwell Park in 2004.

Common name	Species	UK BAP species	LBAP species	Population status *	Notes
Goldcrest	*Regulus regulus*			A	Small breeding population in Bothwell Park and the Country Park in 2004.
Kestrel	*Falco tinnunculus*			A	1 pair in Bothwell Park in 2004.
Barn swallow	*Hirundo rustica*			A	Breed at the urban fringes of the Raith junction area.
Swift	*Apus apus*		✓ **	G	Breed at the urban fringes of the Raith junction area.
Grey Heron	*Ardea cinerea*			S / G	A major heronry is located just beyond the southern edge of the survey area.

*R – Birds of Conservation Concern: 2002-2007- red list species

*A – Birds of Conservation Concern: 2002-2007 - amber list species

*G – Birds of Conservation Concern: 2002-2007 - green list species

*S – Species noted in the Hamilton Low Parks SSSI citation

** North Lanarkshire LBAP priority species

Table 10.5 Wintering Birds of Notable Conservation Status in the Raith Area

Common name	Species	UK BAP species	LBAP species	Population status *	Notes
Bullfinch	*Pyrrhula pyrrhula*	✓		R	Low to moderate numbers at Laighlands and SSSI
House sparrow	*Passer domesticus*	✓		R	At the urban fringe of the survey area
Linnet	*Carduelis cannabina*	✓		R	2 observed on 03 Feb 2005 at Laighlands
Reed bunting	*Emberiza schoeniclus*	✓		R	Very low numbers at SSSI in 2004 and Bothwell Park pond

Common name	Species	UK BAP species	LBAP species	Population status *	Notes
					in 2005
Song thrush	*Turdus philomelos*	✓		R	Very low number dispersed across Raith area in 2005
Starling	*Sturnus vulgaris*	✓		R	Common at the urban fringe of the survey area
Snipe	*Gallinago gallinago*			A / S	Moderate numbers in wetland areas
Water rail	*Rallus aquaticus*			A / S	Recorded in SSSI in 2004 and Bothwell Park pond in 2005
Lapwing	*Vanellus vanellus*		✓	A	55+ birds roost and loaf on island at north end of Strathclyde Loch
Cormorant	*Phalacrocorax carbo*			A	Strathclyde Loch 10+
Dunnock	*Prunella modularis*			A	Moderate number dispersed across Raith area
Gadwall	*Anas strepera*			A	4 in October 2005 at Bothwell Park pond
Goldcrest	*Regulus regulus*			A	Very low number
Golden plover	*Pluvialis apricaria*			A	Strathclyde Loch
Goldeneye	*Bucephala clangula*			A	Strathclyde Loch
Greylag goose	*Anser anser*			A	Strathclyde Loch
Grey wagtail	*Motacilla cinerea*			A	Very low number in area
Herring gull	*Larus argentatus*			A	Strathclyde Loch
Kestrel	*Falco tinnunculus*			A	One resident pair in Bothwell Park area
Lesser black-backed gull	*Larus fuscus*			A	1 in Strathclyde Country Park in November 2005

Common name	Species	UK BAP species	LBAP species	Population status *	Notes
Lesser redpoll	*Carduelis cabaret*			A	Moderate numbers on occasion at Laighland and Bothwell Park
Mistle thrush	*Turdus viscivorus*			A	Moderate numbers across the area
Mute swan	*Cygnus olor*			A	Small to moderate numbers at Bothwell Park pond and Strathclyde Loch
Redwing	*Turdus iliacus*			A	Commonly abundant in area, Bothwell Park in particular
Shoveler	*Anas clypeata*			A	Occasional good number at Bothwell Park pond
Teal	*Anas crecca*			A	Moderate numbers at Bothwell Park pond and Strathclyde Loch
Whooper swan	*Cygnus cygnus*			A	A small number occasionally in Laighland and SSSI
Wigeon	*Anas penelope*			A	1 in the SSSI on 26 Nov 2004
Grey heron	*Ardea cinerea*			S / G	Commonly hunt in the SSSI
Sparrowhawk	*Accipiter nisus*			S / G	In Strathclyde Country Park

*R – Birds of Conservation Concern: 2002-2007- red list species

*A – Birds of Conservation Concern: 2002-2007 - amber list species

*G – Birds of Conservation Concern: 2002-2007 - green list species

*S – Species noted in the Hamilton Low Parks SSSI citation

The breeding bird population of the SSSI as a whole is a feature of national nature conservation value. The breeding bird assemblage elsewhere within the survey area, is of local (possibly regional around Bothwell Pond due to hirudine use) nature conservation interest, and the wintering bird interest is of local nature conservation interest.

10.5.7 Reptiles

No reptiles were observed during the baseline surveys, and no records of reptiles were available for the study area through consultation. It is considered unlikely that reptiles are present in the area and thus the site is of no nature conservation value in respect of reptiles.

10.5.8 Aquatic Fauna

The study area falls within the River Clyde catchment, which comprises designated baseline salmonid waters (EC Directive 78/659/EEC).

Consultation with the Clyde River Foundation revealed that there is no existing information available regarding the presence of fish species in the River Clyde and its tributaries. Migratory species travel along the reach of the Clyde that passes through the Raith area during their life cycle. No evidence of fish was found during ecological surveys of the watercourse, ditches and wetlands around the junction.

<u>Aquatic Invertebrates</u>

Experienced ecologists undertook an aquatic macro-invertebrate survey (Appendix 10.7) of six ponds in the vicinity of Raith junction in July 2006 using an adapted methodology from the National Pond Survey (Pond Action 1994). The surveyed ponds are shown in Appendix 10.7 Figure 1 as Numbers 16-21 inclusive. All sites were sampled for three minutes (net in the water time), using sweep sampling methodology. All invertebrates were retained and preserved for identification to species level with the exception of specialist taxa, such as oligochaetes and chironomids. A report on the survey and findings is contained in Appendix 10.7.

Based on the results, the surveyed ponds are currently of very poor quality with the majority of the species present being common and widespread. Although the absence of a species within a sample does not guarantee its lack of presence in the pond itself, as a whole, the ponds showed a low diversity, and low relative abundance, of invertebrate taxa. This data appears to support the poor water quality data for the ponds (see also Chapters 15 and 16 which discuss the findings of surface and groundwater contamination assessments). In general all the ponds surveyed are considered to be of low conservation significance in terms of aquatic invertebrates. Of the taxa recorded only one species, *Holocentropus stagnalis* (a caddisfly), was identified as being of conservation significance. *Holocentropus stagnalis* is recorded throughout England and Wales, but is rarely noted in Scotland. It is therefore, in Scotland, deemed nationally scarce. The presence of *Holocentropus stagnalis* indicates that Pond 17 has (potentially) slightly greater conservation value for invertebrates in comparison to the other ponds surveyed, but this is based on one survey period and would need further survey data through a complete season or seasons to provide a firmer indication of relative pond interest. For the purpose of the scheme assessment however, this initial baseline survey provides an appropriate indication of current pond water quality and a ‘snapshot’ of interest for invertebrates.

10.5.9 Assessment of Nature Conservation Value

Table 10.6 summarises the nature conservation value given to the key habitats and species assessed as being of significance within the study area.

Table 10.6 Summary of Features of Nature Conservation Value

Ecological Feature	Nature Conservation Value
Statutory SSSI designation - qualifying features of the Hamilton Low Parks SSSI, i.e. assemblage of breeding birds and, specifically, largest heronry in Scotland.	National - UK
SINCs – 3 local designated sites (qualifying interest not specified)	Local value
Floodplain of the River Clyde Valley – mosaic of open water, fen, swamp, marsh, semi-improved neutral grassland and riparian woodland habitats	Habitats around the Raith junction collectively contribute substantively to the Clyde Valley wildlife corridor – a feature of Regional nature conservation value
Otter – European species in River Clyde – holt and feeding habitat unaffected by scheme extents.	International (European Protected Species)
Breeding birds – presence of a range of species of conservation value in survey area	National in relation to the SSSI. Elsewhere Local to Regional
Wintering birds – presence of a range of species of conservation value in survey area	Local
UK Nationally scarce plants, mudwort and grey club-rush. The latter present at one pond, the former not found but potentially present in seedbank	Local
Scottish rare plant, water figwort – at southern edge of study area	Local
Badger – two centres of activity – setts unaffected	National (UK protected species)
Other fauna, e.g. amphibians, deer, brown hare	Low
Other habitats and plant species	Low

10.6 Predicted Impacts

10.6.1 General Effects

Potential ecological impacts relating to the scheme are identified below. These mainly relate to construction activities and the associated disturbance caused by these activities but also include operational impacts, where relevant to ecology. Although general impacts during the construction period are considered under Disruption due to Construction (Chapter 9), ecological impacts arising during construction often have implications post construction during scheme operation. For this reason such impacts are discussed in this Chapter. Section 10.7 then goes on to discuss mitigation and section 10.8 identifies the predicted residual impacts, with mitigation in place.

10.6.2 Do-minimum Scenario

In this scenario, there is no new road construction within the study area and the existing baseline conditions will remain. These would however alter over time due to:

- natural ecological succession if the habitats are left undisturbed by human activity, for example resulting in loss of open water and 'scrubbing up' of ponds;
- other influences and impacts arising from new development in the surrounding area in the future; and
- through continued human disturbance.

Overall, the predicted impacts from a do-minimum scenario will be negligible to low adverse for all ecological receptors and **not significant**.

10.6.3 Site Clearance/Construction Stage

The construction period is currently estimated to last for two years, during which time there will be various phases of work across the scheme extents. There are five principal categories of ecological impact identified for the site clearance and construction stages, as follows:

- habitat loss;
- habitat fragmentation/barriers;
- direct physical damage to wildlife;
- disturbance due to human activity and noise, vibration, dust and light; and
- effects on surface water levels and flows, and quality.

Habitat Loss

Habitat loss will result from site clearance and construction of the scheme. In accordance with best practice, the scheme has passed through a number of design iterations over the course of the Stage 2 and Stage 3 DMRB assessments, resulting in a preferred scheme with the least land-take requirement of the alternatives considered. As the footprint of the construction area is effectively the same as that of the completed scheme, the impacts of habitat loss are discussed in relation to the construction phase.

As the preferred scheme conceptual design has developed, the encroachment upon significant ecological features of the survey area has been reduced as far as practicable. The majority of habitats affected by the scheme land-take comprise undesignated grassland, hawthorn, willow, birch scrub or young woodland, and roadside planting of **low** nature conservation value. This loss will be of **imperceptible** magnitude in terms of the functioning of the local ecosystem, and is thus a **negligible** impact.

Although the development of the scheme conceptual design has sought to minimise encroachment into designated land, 2.3 ha, of the land required for the scheme lies within the Hamilton Low Parks SSSI, which represents a loss of 2% of this UK statutory designated site (the total area of SSSI is 107.6 ha). The habitat to be lost is at the northern boundary of the SSSI where it adjoins the existing road network and junction, and is restricted to mostly young woodland landscape planting and species-poor, very overgrown hawthorn hedgerows that are not key habitat either for breeding birds generally, or for any of the species specifically mentioned in the SSSI citation. The heronry, and valuable wetland habitats of the SSSI lie outside the proposed land-take area.

This loss from a UK statutory designated site is predicted to result in an immediate impact of **low** magnitude, having no long-term or irreversible impacts in terms of the overall ecological functioning of the SSSI. Despite the relatively low nature conservation value of the habitat affected relative to the other parts of the SSSI, any direct impact to a statutory designated site is considered to be **significant**.

A further area of 2.2 ha (overall scheme land-take is described further in Chapter 8) is required for the scheme from the Laighland/Bothwell Park Wetland SINCs. The majority of this is of low botanical diversity, comprising improved grassland and young woodland landscape planting. Pond 3 (Figure 15.2) will be directly impacted by the diversion of the un-named Burn, SUDs basin and flood embankment immediately north west of the junction, resulting in the loss of approximately 16% of its current area. Pond 18 currently discharges into the un-named Burn and this hydraulic connectivity will be maintained as part of the scheme, particularly as this Pond is likely to form part of the natural flood storage for the watercourse.

In the absence of mitigation, the loss of land within this locally important SINC**,** including loss of one (ephemeral) pond and encroachment into another waterbody, would represent an impact of **medium** magnitude on the conservation status of this wetland ecosystem and consequently be assessed as a **minor** impact, i.e. not significant.

Consultions show that there are past records of the UK nationally scarce plant mudwort in all of the waterbodies at this SINC, although none was recorded during the current botanical surveys of the site. The possibility that propagules of this annual plant may persist in the seed bank around the pond cannot be ruled out. In the absence of mitigation, it is possible that an opportunity to restore this UK scarce plant to the site could be lost. Pond 18 contains grey club-rush, and has the potential to retain seeds of mudwort in its sediments. Both these species are assessed as having **local** value and their loss from this one pond would be assessed as an impact of **medium** magnitude, and thus a **minor** impact, i.e. not significant.

The majority of land to be lost to the scheme lies outside protected areas and comprises habitats with no special conservation status, such as improved grassland and young woodland landscape planting. There are however also small areas of semi-improved neutral grassland, marshy grassland and scattered scrub which will be lost to the scheme. A ditch within the Bothwell Park area will be re-aligned, but the existing feature has been dredged and widened in the past, reducing its ecological value. The water quality in this ditch is poor and the vegetation communities do not contain any species of high conservation value. The loss of these **low** value habitats, is considered to be an impact of **low** magnitude in the absence of mitigation and not significant.

No other valuable plants or habitats will be lost to the scheme. The grassland, tree plantings and scrub habitats which will be lost during the site clearance stage are typical of the surrounding area and have no substantive nature conservation value in their own right, although they do have value in supporting a range of bird species. They are widespread in the local area and the loss of small areas of these habitats will be an impact of **low** magnitude, i.e. a **negligible** impact. The extent of the areas to be cleared, and their position in relation to signs of protected species such as otter and badger, means that there is no direct impact to these species predicted as a consequence of habitat loss during the site clearance/construction phase.

Habitat FragmentationBarriers

The footprint of the proposed scheme aligns closely to the existing road layout and new construction will affect only limited areas of adjacent land. It is considered that no additional habitat fragmentation or barrier effects will result from construction of the proposed scheme. The existing culvert taking the un-named burn under the A725 between Laighlands and the SSSI is generally blocked with sediment and flooded due to the very low gradients that exist, and is therefore unsuitable for the passage of mammals such as otter (no signs of otter were found during survey apart from along the bank of the River Clyde). A new culvert is required for the scheme, but its construction is unlikely to improve this situation. Investigation into potential opportunities to enhance the free movement of wildlife via the culvert indicate that it acts as a 'siphon' for two-way water movement as part of the natural functioning of the floodplain around the junction. The very small gradient from one side of the culvert to the other and the requirement for flood bunds either side of the road limits opportunities to increase the movement of mammals under the road either via the culvert or via separate mammal tunnels. No additional measures to increase the potential 'permeability' of the area to otter are therefore proposed as part of the scheme.

Disturbance/Damage to Wildlife and Areas used for Breeding/Shelter

Site clearance activities in advance of construction will potentially disturb, or damage, wildlife that is present in the habitats that are being cleared. The species and groups discussed below all benefit from varying degrees of statutory protection from damage, so it should be stressed that the concept of an impact in the absence of any mitigation (as assessed below) is purely theoretical, as mitigation measures – including under licence where appropriate – will be a legal requirement of the construction phase.

Although fresh signs of otter, including a holt and footprints, were recorded on the River Clyde during the 2006 surveys, no holts will be affected by the scheme as they lie at least 400m away from the scheme extents and no work is proposed at the River Clyde itself apart from creation of an outfall point for road drainage, which will be located well away from the recorded holt (see Figures 10.4 and 15.2). Thus no impact on otters from damage/disturbance predicted as a consequence of the construction phase.

None of the badger setts identified (Confidential Badger Annex) during the surveys lie within 30 m of the proposed construction activities; thus no impact on badgers from damage/disturbance is predicted as a consequence of the construction phase, so long as working areas are securely fenced to prevent animals entering them.

There are no habitats with potential for use as bat roosts within the footprint of the scheme, and thus no impacts to roosting bats are predicted.

There are no great crested newts in the study area, but small numbers of smooth newts were recorded in the small waterbody to be lost to the scheme, as well as frog and toad tadpoles. In the absence of great crested newts, the amphibian population of the area represent a feature of **low** value and, in the absence of mitigation, a **medium** magnitude impact resulting from the loss of waterbodies and surrounding wetland, would be a **negligible** impact and not significant. The remaining wetlands of Laighland SINC provide alternative amphibian breeding sites considered sufficient to maintain these species.

A range of breeding birds, including species of conservation concern, will be present in the areas affected by clearance works, especially in wooded and scrub areas, but also elsewhere such as at Bothwell Pool north of the A725 which is valuable for passage hirudines and water rail. In the absence of mitigation, site clearance during the bird breeding season would result not only in an immediate loss of breeding habitat, but also potentially damage to nests, eggs and young birds. Site clearance in the winter months would avoid this degree of impact, as wintering species are relatively more mobile and disturbance impacts would be lower.

None of the individual bird species with potential to be affected is of high nature conservation value, and even though the breeding and wintering birds of the area are assessed as being collectively of **local to regional** nature conservation value. Temporary effects on the sub-set of the wider bird population in the area would be assessed as being an impact of **low** magnitude, resulting in a **minor** impact, i.e. not significant.

Given the legislative protection afforded to birds whilst breeding, mitigation will be required as standard in order to protect birds during the breeding season, and site clearance activities would normally take place outside the bird breeding season.

Disturbance due to Human Activity, Noise, Dust and Light

The presence of humans and vehicular activity within and adjacent to the construction working corridor may have the effect of deterring use of the area by certain species, particularly during working hours and indirectly disturb sensitive species beyond the footprint of the scheme. The main species likely to be affected are breeding birds, including ground-nesting species such as willow warbler, which have been recorded close to the M74. Birds are likely to be deterred from establishing nest sites close to the main centres of human presence and construction activity, but further away from these may become habituated to construction activity given that it has a restricted footprint. The **low** magnitude impact of temporary disturbance on what is considered to be a general breeding bird assemblage within the study area of **local** value is predicted to constitute a **minor** impact in population terms, i.e. not significant.

Badger will be less affected by the daytime presence of people and machinery than the birds, as they are largely nocturnal. There are no setts for daytime shelter in the vicinity of the proposed works, the scheme does not impact upon known sett locations, nor will it affect foraging areas. There are thus **negligible** impacts on badgers predicted from this aspect of disturbance.

Other species, including brown hare and deer, can be expected to move away from points of disturbance, which will be confined to the footprint of the works, and hence these receptors of **low** nature conservation value will experience **low** magnitude, **minor** impacts.

Site clearance and construction activities are commonly associated with noise and vibration disturbance. With the exception of some of the bird species that breed within the study area, none of the ecological receptors listed in Table 10.6, and likely to be present in areas subject to daytime construction noise, is particularly sensitive to the predicted level of noise disturbance. The songbird populations within and immediately adjacent to the proposed scheme extents are evaluated as being of **low** value. The behaviour of these songbirds will already be adjusted to background noise because of pre-exisitng high levels of noise and disturbance emanating from the motorway, major roads and junction. The impact of additional noise, i.e. noise perceptible above current levels, resulting from construction, will be limited to the times of the day when the construction site is active (generally 0700 – 1900 hours). This makes it unlikely that any perceptible additional noise will coincide with main periods of dawn and dusk singing activity. The generation of additional noise is considered to be of **low** magnitude, and therefore a **negligible impact** is predicted.

During dry weather, wind and/or the use of vehicles on exposed substrates may cause dust to rise up and settle on adjacent vegetation. Measures to suppress dust generation for the benefit of construction site and other workers/residents/motorists is addressed in Chapter 6 Air Quality, and Chapter 9 Disruption Due to Construction, and will be addressed as part of the construction Environmental Management Plan (EMP) and will also have an incidental effect of providing a degree of protection for the ecology of the site. However, even in the absence of such mitigation, dust deposition will represent **negligible** impact in respect of the kind of habitats present in the vicinity of the works, principally because the kind of vegetation most likely to be adversely affected by dust, e.g. rich bryophyte assemblages, is not present.

The junction approaches and M74 are currently lit. The proposed scheme will not significantly add to current light levels around the junction. The height of any new lighting will not be elevated above current levels. During the winter, temporary lighting associated with construction may overlap slightly with periods when badgers will be actively foraging. In the absence of mitigation, it is conceivable that insensitive lighting could contribute towards disturbing the regular movements of these mammals, although **negligible** impacts are predicted from this source of disturbance in isolation.

Potential Pollution to Wetlands and Watercourses

There is a requirement for a new SUDs basin, drainage ditches, burn diversion and culvert as part of the scheme, as set out in Chapter 15, which will entail works in/close to Ponds 16, 18 and 21 (Appendix 10.7 Figure 1).

In the absence of mitigation, the construction of the new culvert and diversion of a section of the un-named burn could result in the release of sediment and/or otherwise polluted runoff into watercourses near to and/or downstream of working areas. There is a legislative requirement for works to watercourses to be subject to licence, and this in turn requires that strict environmental protection measures will be implemented during both construction and operational phases of the proposed development. Further details on this aspect are given in Chapter 15.

The potential for impacts on these aquatic habitats and the species they support in the event of an accidental release of pollutants during construction cannot be entirely ruled out, although in the tightly regulated and well-managed operation of a major trunk road construction site, the risk of such an accident is likely to be low and will be covered by contingency plans included within the EMP.

As any such incident would be a result of an accidental release (with a low probability of occurring), it is not possible to be definitive about the nature, scale or duration of potential impacts. An investigation into the potential risk of directing road runoff drainage through the natural drainage that runs through the SSSI (Chapter 15) has rejected this option as presenting an unacceptable pollution risk to the SSSI, and the drainage design therefore ensures that all road runoff is attenuated, treated and discharged directly to the River Clyde. The scheme design therefore avoids drainage of road runoff into SSSI land.

The potential for the SSSI wetlands to receive less water as a result of managed road runoff has also been investigated as part of the drainage assessment (Chapter 15). The contribution of road runoff to surface waters in the SSSI is of negligible significance, and no adverse impacts are anticipated as a result of the implementation of a SUDs management system.

However, should an accidental release occur during the construction phase, the impact would be likely to be of **imperceptible - low magnitude** and highly localised in extent, affecting aquatic communities that consultations and water quality assessment suggest are likely to be of **low** conservation value**.** A **minor** impact, i.e. one of no significance is therefore predicted.

<u>Groundwater and Surface Water Flows</u>

Groundwater management (localised dewatering) to enable construction of the underpass (estimated to require 12 months of the overall 24 month construction period) for the A725 will be required. This is discussed in detail in Chapters 15 and 16. This temporary dewatering will draw down the groundwater around the junction, potentially affecting some surface water features which are considered to be fed by a combination of surface water, groundwater and artesian flow. Upon cessation of dewatering activity, groundwater levels would return to normal relatively quickly and hence the potential impact upon surface waters would be of limited duration.

In the absence of any measure to mitigate any drawdown effects, potential impacts on those waterbodies which are partly fed by groundwater are considered to be of **low** magnitude, with noticeable effects, but limited in duration and unlikely to extend beyond one year. In view of the sensitive wetland habitats both within the SSSI (site of national importance), and the SINCs, this is an impact of **medium** significance.

10.6.4 Post Construction/Scheme Operation

There are four main categories of impact identified for the operational stage, which are listed below:

- habitat loss (permanent), fragmentation or severance;
- wildlife mortality;
- wildlife disturbance;
- effects on water flows and quality; and

Habitat Loss, Fragmentation or Severance

Impacts arising from habitat loss, fragmentation and/or severance are largely the same as described previously for the construction phase The scheme has been developed to minimise land take within the SSSI, however some encroachment has been unavoidable, requiring 2.3 ha of land. Part of this land take will be for road construction, and part will be for the creation of SUDs features, and flood protection bunds alongside the road. Habitat loss for road construction will be permanent at the operation phase of the scheme, but other areas (outside the SSSI) that fall within the scheme extents, such as compensatory flood storage, will naturally re-vegetate and/or be planted and seeded and in time will provide new habitat.

The scheme follows very closely the current layout of the roads in this area and involves the loss of only narrow strips of adjoining habitat. There is additional land take required for flood compensation storage and SUDs drainage management. Operation of the scheme will entail no additional fragmentation or barrier effects by comparison with the existing situation. During operation of the scheme, the existing fragmentation effect of the junction and road layout (in potentially presenting a barrier to movement north from the River Clyde) will be unaltered for species such as otters. There are currently no signs of this species currently active around the junction area away from the banks of the River Clyde. There is at present no record of fish or otters moving up the small un-named burn that runs through the wetlands of the SSSI to the River Clyde.

Wildlife Mortality

Once the road scheme is operational, it is predicted that there will be little difference in the levels of disturbance experienced by wildlife to that currently experienced due to the existing layout. The scheme will not result in any new road crossings for wildlife, although freeing up the traffic movement on this junction will result in vehicles travelling at an increased speed, which could increase the potential level of wildlife mortality on the roads in this area, in the absence of mitigation. There are currently low levels of badger mortality in the vicinity but, as the badgers in the area tend to avoid the habitats that lie immediately adjacent to the junction (unsuitable for foraging), and the scheme does not involve interruption or fragmentation of any existing badger movement routes, there will be no increase in the level of risk to this species from the new road layout, i.e. **no impact.**

Otter casualties have been recorded since 1985 on the M74 south of Raith junction (Appendix 10.3), but none at the junction itself. This is consistent with the lack of any signs of otter activity in the vicinity of the junction away from the River Clyde. .

There is a population of roe deer in the area, so the increased speeds likely to result from the new road layout, and the altered layout at the roundabout itself could increase the likelihood of collision between deer and vehicles, in the absence of mitigation. Deer represent a feature of **low** nature conservation value, and collisions lead to **low** magnitude impacts on the population within the study area, i.e. a **negligible** impact in ecological terms. However, there is nevertheless a requirement for mitigation in relation to this issue due to the increase in risk to motorists from accidents involving these large mammals.

Wildlife Disturbance

The wildlife in this area is already habituated to locally high levels of disturbance from current traffic levels at the junction and human activity, and the proposed scheme will not materially alter the current situation.

Water Flows and Quality

In the absence of mitigation, potential impacts on the water resources, and consequently on wetland habitats and the species they support within the area around the junction may result through the altered volume of surface water runoff into receiving waters, and from accidental spillage of contaminants, which may enter nearby wetlands and watercourses. This has the potential to release particulate matter, materials derived from rubber tyres and fuel and other contaminants into the watercourse and cause disturbance to aquatic life.

Investigations into groundwater and surface waters (Chapters 15 and 16) indicate that both are currently contaminated and of poor quality. The 2006 aquatic invertebrate survey (Appendix 10.7) also noted that the ponds surveyed had poor water quality.

Increases in run-off and containment of contaminants will be controlled as an integral part of the scheme design, which includes a road drainage scheme incorporating SUDs, with attenuation and treatment of road drainage (Chapter 15). This would be a statutory requirement as drainage discharges are subject to regulation by SEPA. The effects on water quality in receiving waters such as the River Clyde, which is of **regional** value at the junction, is predicted to be of **imperceptible** magnitude given the large dilution effect of the receiving watercourse and therefore assessed as a **minor impact** and not significant.

10.7 Mitigation

The design of the proposed scheme has passed through a series of iterations, designed to minimise the potential for adverse environmental effects, and during that process ecological impacts have been reduced as far as practicable by limiting landtake and avoiding sensitive areas where possible. The design has been modified to minimise encroachment into the SSSI. Mitigation provision is illustrated in Figure 20.1. General measures to reduce adverse effects on ecology and nature conservation include:

- minimising the footprint of the works as far as practicable;
- restricting the extent of working areas and using fencing to protect adjacent habitats and prevent access to working areas by animals such as badger;
- managing the timing and phasing of works;
- avoiding key habitats, and areas used by protected species;
- minimising pollution; and,
- implementing appropriate site restoration and new habitat creation.

10.7.1 Detailed Design and Pre-Construction Stage

Compensation for loss of SSSI Habitat

An ecological 'set-aside' area will be provided as part of the scheme, safeguarding wetland, marsh and scrub habitat within the Bothwell Park area west of the M74 and north of the A725 adjacent to Bothwell Pool. This area, currently in the ownership of Scottish Ministers, will include new habitat creation designed to complement existing, including the creation of new wetland scrapes to attract waders.

Within the SSSI, the possibility of excavating some additional shallow wetland areas will be explored in consultation with the landowner, South Lanarkshire Council, and SNH.

Maintaining and Enhancing Biodiversity Value

Ecologists have been, and will continue to provide input to designs for new drainage arrangements and site landscaping, to ensure that opportunities are taken to maximise the biodiversity value of new habitats created by the proposals. It is important to ensure that biodiversity enhancement proposals are appropriate to the locality and the existing interest of the surrounding area. A particular opportunity exists at Laighland Wetlands to try to recover material from the site that could well contain propagules of the UK nationally scarce plant mudwort, and to create conditions that will enable it to establish in newly created wetland habitats associated with the SUDS, and research will be required at this stage to establish a strategy that has the best chance of achieving a successful outcome.

An area of plantation woodland will be lost to the scheme to allow for the creation of a flood compensation storage area adjacent to the River Clyde. Although a bat survey in this area indicated that there were no bat roosts in this woodland, the Employer's Requirements will require Reasonable Avoidance Measures (RAMs) for bats to be set in place during any felling of trees at this location. A list of RAMs is provided in Appendix

10.8. In addition, to provide positive measures for bats in the area, it is proposed that a range of different bat boxes will be installed at suitable locations (in consultation with the Country Park Rangers). These should be installed at various heights (but above the reach of the public), and facing a range of aspects. Monitoring of the bat boxes would be beneficial to assess their success

Design of New Wetlands

The completed scheme will include elements which, in addition to their function as drainage and flood management features, will contribute to the creation of compensatory or new habitat. The created wetlands will form a core part of the ecological mitigation for the scheme, complementing and adding to existing habitat around the junction.

These include:

- permanent and temporary wetland within flood compensation storage areas,
- species-rich native grassland and wildflower areas;
- a SUDS basin for the treatment of road runoff which will also provide new wetland habitat, and
- open ditches and re-aligned Burn

In addition, new wetland scrapes will be created (Figure 20.1) to complement the existing wetlands and marsh/swamp habitats that provide some of the key ecological interest.

The provision of a new SUDs feature represents a net increase in pond habitat in the vicinity of the junction. This is in line with SEPA's Habitat Enhancement Initiative which promotes the use of ponds within SUDS to protect and conserve biodiversity.

The current junction layout provides no attenuation or treatment of runoff from the junction and hence the surrounding drainage system, including wetlands in the SINCs and SSSI, are potentially at risk from accidental spillage events. The proposed scheme design provides for a SUDS drainage management system which will contain runoff from accidental pollution events, and will attenuate general road runoff before directing it via a new drainage system direct to the River Clyde, avoiding sensitive wetland habitats.

Permanent wetland habitat will be created as part of the proposed flood compensation storage provision (see Chapter 15). Flood storage Area 2 (Figure 15.2), north of the junction, will be achieved by excavating an area of land immediately adjoining the junction. The excavation will be over-deepened below the water table to expose the groundwater and create a new wetland area close to Bothwell Pool (Figure 20.1). The margins and depth of the wetland will be designed to be varied and to provide topographic and habitat diversity. Adjacent to Area 2, shallow excavations will be carried out as ecological mitigation, creating wetland 'scrapes' and open ditches.

It is likely that Area 2 would over-time make a positive contribution to the nature conservation resource of the local area, as this, together with the created shallow wetland scrapes, will become established and can be expected to develop nature conservation interest within the short- to medium-term. New wetland areas will be allowed to naturally vegetate but will be kept clear of encroaching scrub and trees. This avoids the risk of accidentally introducing non-native aquatic plants during the process of planting up.

Both flood storage areas (Area 1, adjacent to the River Clyde, and Area 2) shown on Figure 15.4 will contain water of varying depths throughout the year, as they fulfil their operational function. Ephemeral standing water of this nature can benefit a range of wildlife and will complement nearby wetland habitats.

Design of Planting

Mitigation planting (for ecology and for landscape and visual benefit) will take place throughout the scheme extents (Conceptual Mitigation Stratgey illustrated in Figures 20.1 - 20.7), using native species of tree, shrub and seed varieties. Chapter 11, Landscape and Visual, describes the proposed planting in more detail. Tree and shrub planting will follow the guidelines available from the Forestry Commission, namely *Forestry Practice Guides: The management of semi-natural woodlands: Wet Woodlands* (Forestry Authority, 1994), *Forests and water guidelines* (Forestry Commission, 1988) and *Forestry Authority Bulletin 112: Creating New Native Woods* (Rodwell and Patterson, 1994).

The early establishment of a planted buffer zone between the road and the SSSI will help to protect the important wetland habitats within the SSSI and reduce potential disturbance to birds

Planning to Minimise Environmental Risk

The construction stage will also be based upon principles designed to maintain and enhance the biodiversity of the site. A Contractor's Environmental Management Plan (EMP) will be developed, with Construction Method Statements for activities in areas of sensitivity.

Protection of Surface Water Features and Water Quality

A water quality protection plan will be implemented to ensure that the potential risks to receiving waters are minimised. This will include, for instance, measures to avoid/minimise potential for problems such as fuel and other chemical spills. A Pollution Incident Response Plan will be included in the EMP, to ensure that impacts from any potential accidental spill are reduced to a minimum.

Works likely to affect wetlands, watercourses, ponds and ditches will be subject to specific Method Statements and legislative requirements from SEPA. Arrangements for dewatering will be agreed with SEPA and SNH (see also Chapters 9, 15 and 16 with regard to ground and surface water mitigation measures during construction).

The Contractor will be required to manage impacts by continuing on-going monitoring of surface pond levels (baseline data collection has already commenced as part of the scheme design development) before, during and after construction. This will provide the necessary level of supervision to ensure that dewatering required for construction of the A725 underpass will not have an adverse impact on surface water features.

Appropriate measures will be identified and agreed with SNH and SEPA to identify when water levels fluctuations would trigger a mitigation response such as ground and surface water recharge. Possible solutions, should any significant drop in normal water levels for the time of year be identified, will need to be developed in detail and agreed before the most appropriate solution can be implemented. Options include recharging extracted groundwater via boreholes near to ponds, or possibly recharge direct to surface waters via drains/ditches, but would need approval from SEPA. Extracted groundwater will require pre-treatment (for example filtration or settlement) before it can be used for surface water recharge purposes.

Monitoring Change

Although protected species are present along the road corridor, and surveys to date have found signs of otter activity, and badger setts in the vicinity of the scheme, their use of the land around Raith junction may change over time because the species concerned are mobile. Lack of evidence at any one time does not preclude them being present on site in the future, especially if, as with otters, the population is thought to be undergoing an expansion in its range. It is therefore recommended that further protected species surveys, including for otters and badgers, should be undertaken in the correct survey season prior to the commencement of works on site. In this way, if baseline conditions have changed appropriate mitigation can be identified and implemented, including licensed works if necessary. Pre-construction ecological surveys will be set out in the Employer's Requirements.

Pre-construction surveys to identify the extent of stands of non-native invasive plants such as Japanes knotweed will also be carried out in order that measures may be set in place for appropriate control and/or removal during the construction phase if considered necessary.

Mitigation Strategies and Obtaining Licences

Where pre-construction surveys indicate that there will be impacts on protected species of animal and plant, detailed mitigation schemes will need to be agreed with SNH and/or the Scottish Executive (depending upon the species concerned) and appropriate licences obtained before works to disturb those species/habitats can be lawfully implemented by the Contractor.

On the basis of survey information gathered during 2004-2005 and 2006, for the current conceptual design, there is no requirement for any licences in relation to carrying out works likely to disturb protected species.

If however, pre-construction surveys reveal the requirement for such a licence, licensed destruction of the shelter of a protected species usually requires that a new artificial shelter has to be in place before the original place of shelter can be destroyed, and mitigation can take some time to design, a lead-in time of at least 12 months should be allowed for these protected species issues to be fully designed in detail and agreed with the authorities, so that licences to commence works can be obtained.

Planning Construction Compound and Storage Areas

Decisions on the location of storage and construction compounds will be made by the Contractor in consultation with a suitably experienced ecologist, to ensure that habitats or species of nature conservation value are not adversely affected. The location of compounds will be restricted to the land made available to the contractor for construction, and will exclude the mitigation area to the north of the junction which has been allocated for construction of Flood storage Area 2 and wetland scrape creation (see Figure 20.1)

Maintaining Habitat Links

As the proposed scheme lies so close to the existing road layout, there will be no severance of the existing habitat links in the Raith junction area. However, habitat links may in time be improved through the provision of mitigation planting associated with the scheme, and the creation of temporary and permanent ponds and wetland scrapes.

10.7.2 Site Clearance and Construction Stage

Definition of Working Areas

The working areas, including temporary access tracks, will be kept to a practical minimum through areas of vegetated habitat, and their boundaries will be clearly delineated at the commencement of works. An ecologist will be consulted in decision making regarding areas proposed for use as construction compounds or site storage areas, so that sensitive habitats are avoided wherever possible. The habitat mitigation area (Figure 20.1) will not be part of the land made available to the Contractor other than for works necessary to create the mitigation features themselves, including the flood protection area, wetland scrapes and ditches.

Protective Fencing

Existing vegetation to be retained, wetland areas, stands of invasive species or other sensitive areas such as trees, ponds or ditches defined in the EMP as requiring protection from accidental damage or disturbance, will be securely fenced prior to the commencement of site clearance. The area enclosed within the fencing will include the root systems of the vegetation affected. Fencing will be fit for purpose ("Netlon" or similar is not suitable) and be clearly visible to drivers of large construction vehicles. Storage of materials will not be permitted within the fenced areas. The fences will be maintained to ensure their continued function throughout construction, but will be removed from site on completion of the works.

Deer fencing will be erected at the scheme boundary (for instance at the base of the flood bund) alongside the A725 as it enters the junction underpass. This is to minimise the potential for deer collisions with vehicles at the junction or its approaches.

The locations and specifications for protection or exclusion fencing will be set out in the Specimen Design and Employer's Requirements.

Control of Invasive Species

The only abundant, aggressively invasive species recorded within the survey area is Indian balsam in the riparian zone of the River Clyde beyond the extents of the scheme. Even though the seeding or planting of this particular species is not outlawed by the WCA and Japanese knotweed has not at present been recorded within the scheme extents, as a matter of best practice the Contractor will be required to identify and implement measures to control the and prevent possible spread of invasive species.

Planning to Minimise Risk of Nuisance

Good construction site management will be implemented to avoid/minimise generation of excessive litter, dust, noise and vibration. This will be controlled and monitored through the Contractor's EMP.

Ground Preparation and Restoration

Topsoil should be removed and stored separately from the underlying subsoil. Topsoil, in particular, should be stored for as short a time as possible. When ground affected by construction works is being restored, subsoils should be placed beneath topsoil, and steps taken to ensure that the new surfaces will settle so as to be flush with the surrounding ground level. These and other soil handling and management measures will be identified and implemented by the Contractor as part of the EMP.

Minimising Potential for Impacts on Breeding Birds

The nests, eggs and young of all species of wild bird are protected from deliberate damage during the breeding season (generally March to August inclusive.) under the terms of the Wildlife and Countryside Act 1981, as amended. It is best practice to minimise the potential for such damage by removing vegetation likely to be used by breeding birds outside of the breeding season. Alternatively, a search of vegetation by the site ecologist immediately prior to clearance will be carried out, so that breeding sites can be identified and their clearance delayed until any young have fledged. It should be noted that it is not always possible to be certain that breeding birds are not present and in such circumstances a precautionary approach is adopted.

Minimising impacts to breeding ground-nesting birds presents a different challenge, as their breeding habitat cannot be removed, and thus the timing of construction works becomes a more important issue. Where possible, works of short duration in or close to the main areas of grassland used by ground-nesting birds should be scheduled to take place outside of the bird breeding season. Where this is impracticable, e.g. due to wet winter ground conditions, or where works are of longer duration, a different approach may be required.

Commencing construction activity before the arrival of ground nesting birds in March, so that levels of human and vehicle activity are high on the construction site during the bird's territory establishment phase, is likely to be successful in deterring most birds and encouraging them to seek out alternative habitat nearby. However, if construction cannot be timed in this manner, or if particular parts of the site will be relatively undisturbed during these critical few weeks, then additional measures to render ground conditions unsuitable for nesting is one of a number of alternative deterrents that might be considered.

Minimising Impacts on Wintering Birds

Wintering birds using land in the immediate vicinity of the junction will experience temporary disruption during the construction phase where working periods coincide with their being present. Mitigation opportunities are limited to

- Timing of works to avoid the winter period – however the impact of this may be to increase adverse impacts on birds/other species at other times of the year; and,
- Restricting the extent of works as far as practicable – already identified as a general mitigation requirement and the working footprint is very tight to the scheme and junction footprint.

Wintering birds are mobile and will move away relatively freely from disturbed areas. The confined nature of the construction means that while there will be a zone of disturbance around the periphery of the scheme, there remains alternative habitat nearby such that birds will not be displaced to such an extent that they suffer no more than minor disruption impacts.

Minimising Potential for Impacts on Amphibians and Fish

Detailed procedures for minimising impacts on amphibians and fish will be agreed with SNH and SEPA. Work affecting ditches, the burn and ponds will take place at a suitable time of year to minimise detrimental impact to wildlife. This, ideally, would be outside the amphibian breeding season and after the larval stage when they are able to leave the ponds to find new habitat. The best time would be from approximately October - February, which would also allow any invertebrates to emerge from the ponds and would be outside the bird breeding season, so would not impact on any birds which may be breeding in wet grassland around the ponds.

In the unlikely event that great crested newts were found during construction, the legislation would require works on site to cease and a licence be obtained for works to re-commence.

Rescue of Mudwort Propagules and translocation of grey club-rush

Mitigation in respect of mudwort may be feasible (to be determined in consultation with SLC Biodiversity officer) and would involve excavating areas of soil/substrate from around the pond to be lost, where mudwort was recorded in the past, and transferring this material to the habitat creation area during the site clearance and construction phase. This may trigger re-growth of seed or propaules contained in soils and sediment and potentially re-establish a population in the area. A suitable method statement for this will be required, developed in consultation with relevant experts in the field.

Grey club-rush is present at Pond 18, which will be directly impacted by the scheme. It is recommended that a method to translocate a proportion of this species, either within the same pond, or to populate the newly created wetlands, is identified in consultation with relevant specialists. A method statement to map and translocate grey club-rush will be included in the Employer's Requirements.

Minimising Potential for Construction Impacts on Mammals

No artificial holts (for otters) or setts (for badgers) are considered necessary as mitigation for the scheme as there will be no significant impacts on either otters (not currently present other than along the banks of the River Clyde) or badger (not near the scheme extents). If pre-construction surveys in the future indicate that otters or badgers have excavated setts within the footprint of the scheme, suitable mitigation measures will need to be drawn up by the Contractor and agreed with SNH and carried out under the appropriate licence before construction activity could commence at that location.

Where operations are occurring close to a known sett, but not so close as to need licensing, a "people and machinery exclusion zone" extending to a 30 m radius around the sett will be fenced off using Heras or similarly robust temporary fencing. This will ensure legislative compliance by protecting the sett from accidental damage, whilst still allowing the nocturnal mammals free passage away from their shelter at night time.

Construction activity should not limit the free movement of badgers across the site. Areas of sensitivity, such as setts, should not be directly illuminated. Open trenches should be ramped in at least one location to provide a means of escape in case of animals falling in.

Deer fencing shall be erected to keep deer out of working areas and excavations.

10.7.3 Operation Stage

Fencing

Any permanent mammal fencing, where it is to be provided, will be in place before the new road is opened. This will include deer fencing around the northernmost part of the SSSI where it adjoins the A725 and the roundabout.

Management of ecological mitigation areas, SUDs basin and flood storage areas.

Low intensity maintenance of these areas will take place to maintain their operational functioning and biodiversity interest. A maintenance plan will be prepared by the Contractor.

10.7.4 Post-Construction Monitoring and Management

Measures will be put in place to ensure that mammal fencing is checked and maintained as appropriate, on an ongoing basis.

Although it is considered (Chapters 15 and 16) that there will be negligible - low impacts on surface water due to the construction of the scheme, surface water (pond) levels will continue to be monitored during and post-construction. The monitoring will check that the impacts of dewatering during construction, and the operation stage of the completed scheme, are not causing adverse draw-down effects over and above normal seasonal fluctuations in levels. Contingency measures will be identified by the Contractor/Operator to manage any significant impacts.

Post-construction monitoring may be required in respect of any protected species mitigation carried out under licence, and the nature and timing of such monitoring will be agreed between the Contractor and the relevant authorities at the time when the licence is applied for.

Long-term, sustainable management of the mitigation areas will form part of the mitigation, and a management plan for the created wetlands will be drawn up and implemented by the organisation responsible for the longer-term management and maintenance of the junction and associated road land. As part of this element of mitigation, a management plan and a scheme for monitoring for the presence of mudwort within the site will be implemented.

10.8 Residual Impacts

The above mitigation measures will reduce adverse ecological impacts arising from the construction and operation of the proposed scheme and in time may provide localised biodiversity benefits. The boundary of the SSSI will be permanently altered as a result of the scheme, entailing the loss of 2.3 ha of habitat. The habitat to be directly lost is however of relatively low intrinsic nature conservation value, despite its location within the designated site. Compensation habitat containing new mitigation areas will reduce the adverse impact on the SSSI and may in time provide local biodiversity benefit by increasing the area of wetland habitat (including reedbed) of value to birds, invertebrates and amphibians. A buffer zone of planted scrub/shrubs will in time help protect the remaining SSSI land from disturbance and impacts from the adjacent road and its users. Strict controls and monitoring during the construction phase (via an Environmental Management Plan) will ensure that indirect adverse impacts on the SSSI are avoided.

With mitigation in place, including provision of a compensatory ecological set-aside area, and subject to consent from SNH, there is predicted to be a residual impact of **imperceptible** magnitude on the ecological functioning of the SSSI, and is thus a **minor** impact and not significant.

The decision to discharge all surface water drainage to the Clyde (Chapter 15) will significantly reduce the potential for an accidental spillage event from the trunk road network at the junction to affect the sensitive local surface water environment. This is predicted to lead to a **low positive** impact.

Potential impacts on surface waters and associated wetland habitats will be avoided through ongoing monitoring and the implementation of measures to maintain natural surface water levels. Residual impacts on pond/wetland water levels will be **imperceptible** and not significant as a result.

Other ecological receptors where potential impacts identified as being of low or imperceptible magnitude and not significant before mitigation, will nonetheless benefit from the measures proposed.

It is predicted that, if all mitigation measures are implemented as recommended, there should overall be no significant permanent residual adverse impacts resulting from this scheme.

10.9 References

Design Manual for Roads and Bridges (DMRB) Vol. 11 Environmental Assessment.

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11 Landscape and Visual

11.1 Introduction

The objective of this Chapter is to establish the significance of landscape and visual effects for the road development at the Raith Junction, and to identify suitable mitigation measures. The assessment re-evaluates baseline conditions established at Stage 2 which determines the value or sensitivity of landscape character, quality and visual receptors.

This section has been prepared in accordance with the principles and techniques outlined in DMRB Volume 11 (Environmental Assessment), Section 3, Part 5. Information was gathered principally by means of desk study, but supported by site visits aimed particularly at an analysis of landscape character and quality within the study area as shown within the supporting illustrative drawings, Landscape Effects - Baseline Landscape (Figure11.1), Landscape Character and Context (Figure 11.2) and Landscape Quality and Visual Effects (Figure 11.3). The landscape and visual impact assessment has also been undertaken with reference to the methodology set out in *The Landscape Institute and The Institute of Environmental Management Assessment's Guidelines for Landscape and Visual Impact Assessment (2002)* in order to incorporate the most current and accepted techniques; 'Landscape Character Assessment Guidance for England and Scotland' published by the Countryside Agency and Scottish Natural Heritage; and Planning Advice Notice 58 – Environmental Impact Assessment, as published by the Scottish Executive.

Relevant published documents were reviewed as detailed in Section 11.12, References. Site specific information was also gathered via consultation with statutory bodies including Scottish Natural Heritage (SNH), the Royal Commission on the Ancient and Historical Monuments of Scotland, North Lanarkshire Council and Glasgow City Council. The visual assessment at Stage 3 requires illustrated description of the anticipated significant effects of the development proposal to identify receptors; properties and areas / routes of public access affected. The Photo Viewpoint illustrations (Figures 11.4 – 11.16) establish the visual envelope from the receptors and have now been progressed to include details of the visual baseline, predicted effects, mitigation measures, the magnitude of impact and significance of effects.

Data collection was undertaken by way of familiarisation of the site (principally by car from the surrounding minor roads and tracks), desk study and field survey on foot. Since landscape and visual impact assessment are closely related, the data collected have been used for both as appropriate.

11.2 Landscape Effects Methodology

11.2.1 Landscape Assessment Methods

The five main steps in the landscape assessment process are:

- Data collection;

- Description of landscape baseline;
- Classification (character & quality);
- Evaluation; leading to potential positive/ negative effects; and
- Assessment of significance of identified effects.

Landscape assessment consists initially of the collection of baseline data relating to the components, character and scenic quality of the landscape, and an assessment of the sensitivity of the landscape to change. In undertaking the assessment, consideration was given to the following factors:

- Experience of the landscape is not only visual, but involves all five senses;
- Data relating to the components of the landscape, its character and quality will include reference to baseline information presented in separate related sections (e.g. Ecology and Nature Conservation, Cultural Heritage);
- The value placed on an area is dependant not only on its inherent scenic quality, but on its situation, rarity and usage;
- Historical and cultural associations may contribute to the value placed on landscape not generally considered to be of visual or other importance; and
- Landscapes which, although not of a quality to warrant national or regional designation may be of great local value.

11.2.2 Landscape Resource

The landscape resource refers to landscape elements or an assemblage of elements that will be directly or indirectly affected by the proposed development. They may include topography, geological or man made elements, woodland, trees and hedgerows, land use and combinations of elements that create distinctive landscape character.

Landscape effects associated with the proposed scheme are determined by changes to the physical landscape, the character and quality of the landscape resource (the receptor) and how this is perceived and experienced. Landscape assessment considers the different aspects of the landscape resource, which are outlined below:

Elements – individual landscape components such as hills, valleys, woods, trees and hedges, ponds, buildings and communication routes (incl. prominent or eye-catching features that are quantifiable and easily described);

Characteristics – elements, or combinations of elements, that contribute to the particular character of an area (incl. intangible characteristics such as tranquillity, wilderness and cultural associations); and

Character – a distinct, recognisable and consistent pattern of elements and characteristics that creates distinctiveness and a sense of place. Areas of similar character can be described and identified on maps (incl. designated landscapes, conservation areas, and other acknowledged special areas of interest).

The aim of the desk study is to identify the landscape resource components:

- Landscape designations;
- Landscape character;
- Topography;
- Vegetation of significant landscape value;
- Areas of important features of historical, cultural or local importance; and
- Possible suitable mitigation measures.

The field survey was undertaken as part of the assessment process to confirm the information obtained during the desk study and to gain any additional in-situ details. As part of the field survey a Visual Envelope (as illustrated on the Landscape Effects - Landscape Quality and Visual Effects Figure 11.3 and the Photo Viewpoints, Figures 1 - 13) was identified, showing the principal visual receptors from which the road or traffic may be visible, concentrated around Visually Intrusive Highway elements and assessed their significance, as stated within DMRB Guidelines Stage 3. This is considered further in section 11.8 Visual Effects Methodology.

Public use of open spaces, roads and footpaths was observed during the course of the field survey. This has a direct bearing on landscape as a human resource and is taken into account in the evaluation process. Further information relating to public use of the environment is provided within Pedestrians, Cyclists, Equestrians and Community Effects (Chapter 13).

Landscape Character

Recent National Planning Policy Guidelines (NPPG's 1, 14 & 18) highlight the importance of sound analysis of the character of an area. The assessment analyses the baseline conditions highlighting the unique features (landscape resource) which can be attributed to a recognised landscape character. The landscape is classified into broadly homogenous units of character based on existing character assessments (such as that carried out by Scottish Natural Heritage, SNH), regional or local landscape character assessments or designations (such as that which may be carried out by a local authority) and detailed analysis of the landscape resource baseline data to determine site specific character areas for the purposes of this assessment.

The significance of landscape effects depends upon the extent to which the landscape changes are perceptible in the wider context. In the context of the Raith Junction, this includes the relationship of the scheme to the identified landscapes within the study area, Local Plan and the SNH Character Areas.

11.2.3 Sensitivity & Value of the Landscape Resource

The landscape resource has an associated value and sensitivity. Sensitivity is a measure of the capacity of the landscape to accommodate change without change in character. Value is a measure of the perceived importance of the components and features of the landscape to users.

Landscape Value

For the purpose of this assessment, landscape value or importance has been defined as "the importance ascribed to the landscape by public perception, value to the community or professional judgement." In this study, informal public use of open spaces, roads and footpaths as observed during the course of the field survey, together with professional judgement on landscape quality (see below) was used to ascertain the value of the landscape and whether this was considered to be of local, regional or national importance.

The guidelines stated within SNH and The Countryside Agency Landscape Character Assessment 'Guidance for England and Scotland' recommend the development of thresholds of landscape value and Table 11.1 provides a definition of the criteria used to assess value for the purpose of this study. The analysis of landscape value or importance aims to reflect the perceived value of the landscape at a specific scale, identify the group to which it is important and describe why it is important.

Table 11.1 – Criteria for Assessing Landscape Value

<table>
<tr><th colspan="2">Value</th><th>Typical Criteria</th><th>Typical Scale</th><th>Typical Examples</th></tr>
<tr><td rowspan="2">High</td><td>Exceptional</td><td>High importance and rarity;
No or very limited potential for substitution</td><td>Designated at International or National level</td><td>World Heritage site, National Park, Area of Outstanding Natural Beauty (AONB), National Scenic Area (NSA), Environmentally Sensitive Area (ESA).</td></tr>
<tr><td>High</td><td>High importance and rarity
Limited potential for substitution</td><td>Designated at a National or Regional level.</td><td>National Park, AONB, National Scenic Area, Areas of Great Landscape Value (AGLV), Regional Scenic Area.</td></tr>
<tr><td>Moderate</td><td>Medium</td><td>Medium importance and rarity
Limited potential for substitution</td><td>Designated at a Regional or Local level.</td><td>AGLV, Regional Scenic Areas, ESA</td></tr>
</table>

Value		Typical Criteria	Typical Scale	Typical Examples
	Medium - Low	Medium importance and rarity Some or good potential for substitution	Undesignated but of Regional or, local scale value	Undesignated but value expressed for instance in demonstrable use
Low	Poor	Low importance and rarity	Local	Areas identified as having some redeeming feature or features and possibly identified for improvement
	Very poor	Degraded condition	Local	Areas identified for restoration or improvement.

Table 11.1 establishes general guidance on the perceived level of landscape value. A landscape may have international, national, regional and local level planning and environmental designations, which may reinforce the associated value by the general public.

Quantification of landscape 'value' can be attributed to the use and perception of particular characteristics that contribute to a sense of place, the visitor, or user experiences of the landscape.

National scale or publicly recognised/designated/or defined policy areas reflect the perceived value of the landscape to society as a whole. The 'broad brush' nature of any designations as stated within Table 11.1, and their boundaries require more detailed study at a site-specific scale. This establishes what is locally important about the affected landscape and to whom it is important.

In addition landscapes that are not of a quality to warrant national or regional designation may be of great local amenity value, in particular natural features, semi-natural vegetation, local parks and gardens in urban areas.

Landscape Sensitivity

The associated landscape effects of any development are dependent upon the sensitivity of the landscape resource and the magnitude of impacts. Sensitivity equates to the degree to which a particular landscape type or area can accommodate or is susceptible to change arising from a particular development, without detrimental effects on its character, quality or value. Landscape designations are only one of a number of factors considered influencing the relative sensitivity of the landscape resource affected by the proposed development. Sensitivity is also influenced by the following:

- Existing land use;
- The pattern and scale of the landscape;

- Visual enclosure/openness of views of the landscape, and distribution of visual receptors; and
- The value placed on the landscape.

Table 11.2 below determines criteria for the sensitivity of the landscape resource.

Table 11.2 – Landscape Sensitivity Criteria

Sensitivity	Criteria
High	Important elements of a landscape of a particularly distinctive and valued character (e.g.: National Park, AONB) susceptible to relatively small changes. Landscape features of particularly distinctive character such as broadleaf woodland and mature trees, old intact diverse or visually significant hedgerows, significant landforms, natural watercourses, historic/archaeological features, semi-natural vegetation.
Medium	A landscape of moderately valued characteristics, perhaps of local significance and reasonable tolerant to changes; or a formerly highly sensitive landscape whose sensitivity has been degraded by the presence of intrusive features. Landscape features such as coniferous forestry and scrub, young fragmented or species poor hedgerows, young or senescent trees, recent or fragmented walls.
Low	Low value or degraded landscape tolerant of substantial change without adverse impact on character. Landscape features such as arable land or improved grassland, derelict or reclaimed land, fences, degraded or remnant hedgerows, dead, moribund or diseased trees, general landform without significant features.

11.2.4 Magnitude of Impacts

Magnitude of impact (change) is the extent and degree to which the fabric and character of the landscape changes as a result of the proposed development. An evaluation of the magnitude of the proposed changes on the elements of the landscape, through which the preferred route option will pass, was carried out through a review of the nature, scale and extent of the change, together with its duration and degree of permanence, using the criteria outlined in Table 11.3 below.

Table 11.3 – Landscape Magnitude of Impact Criteria

Magnitude	Criteria
Severe	Total loss or major obvious change in key landscape characteristics noticeable over an extensive area.
Substantial	Notable change in landscape characteristics over an extensive area ranging to very intensive change over a more limited area.

Moderate	Minor changes in landscape characteristics over a wide area ranging to notable changes in a more limited area.
Slight	Minor changes in landscape characteristics over a limited area.
Negligible / None	Minor or virtually imperceptible change in any area or landscape components.

11.2.5 Significance of Effects

Significance is not absolute and should be defined in relation to individual developments and their context and location. The two principal criteria determining significance are the magnitude of the impact and the sensitivity of the receptor. A higher level of significance is generally attached to large-scale impacts and impacts on sensitive or highly sensitive receptors; thus moderate magnitude impacts on highly sensitive sites can be more important than severe/substantial impacts on less sensitive sites. Professional judgement is required to make a balanced and objective assessment taking all of these criteria into account.

Significance thresholds can therefore be determined from different combinations of sensitivity of the landscape resource and magnitude of impact, which is simplified in Table 11.4 below.

Table 11.4 –Significance of Landscape Effect

Resulting Significance of Effect					
Sensitivity (Table 11.2)	**Magnitude of Impact (Table 11.3)**				
	Severe	**Substantial**	**Moderate**	**Slight**	**Negligible / None**
High	Substantial Effect (significant)	Substantial Effect (significant)	Substantial Effect (significant)	Moderate Effect (significant)	Slight Effect (not significant)
Medium	Substantial Effect (significant)	Substantial Effect (significant)	Moderate Effect (significant)	Slight Effect (not significant)	No change (not significant)
Low	Moderate Effect (significant)	Moderate Effect (significant)	Slight Effect (not significant)	Slight Effect (not significant)	No change (not significant)

Overall significant effects may be adverse, neutral or beneficial, and are assigned a level on the scale: No change/Negligible-Slight-Moderate-Substantial, taking into account mitigation measures and different stages of the project lifecycle. Intermediate levels, such as slight to moderate, may also apply. The following Table 11.5 assigns criteria to each level of landscape effect, as applied in this assessment.

Table 11.5 –Criteria for Significant Landscape Effects

Significant Effect	Definition – The Proposed Scheme Residual Effects
Substantial Adverse Effect	Cannot be fully mitigated. Possible cumulative effects at complete variance with character landform, scale and pattern Will be substantially damaging to a high quality landscape.
Moderate Adverse Effect	Out of scale with landscape resource, leaving an adverse effect on a landscape of recognised quality.
Slight Adverse Effect	Does not quite fit into the landform and scale of the landscape affecting an area of recognised landscape character.
Slight Beneficial Effect	Potential to improve landscape quality & character fitting scale, landform, and landscape pattern.
Moderate Beneficial Effect	Potential to improve landscape quality & character to enable restoration of previously removed valued features.
Substantial Beneficial Effect	Environmental fit responds well within the site context, improving the quality of the valued landscape character through the removal of damage caused by existing land uses or addition of beneficial features.
No Change (Negligible)	Does not affect the landscape or complements the scale, landform and pattern of the landscape, maintaining existing quality

Separate assessments concentrating upon discrete sections of road and each aspect of the landscape have been undertaken due to the complexity of the road scheme.

11.3 Baseline Conditions

11.3.1 Landscape Designations

The study area is centred on the Raith Junction between M74 and A725, settlements of Bothwell (west of M74), Orbiston/ Bellshill to the east, isolated dwellings around Bothwell Park to the north and Strathclyde Country Park south east of the junction. The associated landscape planning designations (North Lanarkshire Council and South Lanarkshire Council are summarised below:

- Green Belt;
- Conservation Area;
- Nature Conservation Designations;
    - o Site of Special Scientific Interest (SSSI);
    - o Sites of Importance for Nature Conservation (SINC's); and

  - o Local Nature Reserves.

- Locally designed landscapes within the Local Plan Policy, as previously covered within Chapter 17 Policies and Plans, Chapter 8 Land Use and Figure 8.1 Development and Community Land.

Planning designations also include;

- Designed landscapes;

- Historic settlements, archaeological sites; and

- Green corridors, urban greenspace, river landscapes, deciduous woodland in the form of farm woodlands and hedgerow trees (some designated as Protected Urban Woodland).

Figures 11.1 and 11.2 (Baseline Landscape, Landscape Character and Context) illustrate the existing landscape designations identified within the study area.

11.3.2 Landscape Character

In a regional context the study area forms part of the Clyde Basin Farmlands Regional Character Area (RCA) identified in the Glasgow and the Clyde Valley Landscape Assessment, prepared by Scottish Natural Heritage (SNH), which comprises much of the lowland area of the Clyde Basin surrounding the Glasgow conurbation.

Key features of the Clyde Basin Farmlands (RCA) include;

- Rolling farmlands lying over glacial and fluvial- glacial deposits and lower floodplain farmlands on fluvial deposits; and

- Historic mineral working has resulted in dereliction or damaged land.

The study area lies within two Local Landscape Character Areas (LLCA's) as defined by SNH, and as shown on Landscape Effects Figures 11.2 Landscape Character and Context. These areas are characterised as follows:

- Incised River Valley (Uddingston Clyde); and

- Broad Urban Valley (Bothwell - Motherwell).

The SNH evaluation of the two local landscape character areas have been considered even though the Broad Urban Valley is the only area significantly affected by the road proposal. This highlights the valued landscape components and features which help to determine the regional and local character, which provides the surrounding area with its unique sense of place and subsequent perceived landscape value.

The three key components of the LLCA's are landform, vegetation/landcover of significance and cultural/ historical associations. Relevant characteristics are summarised below from the original report No. 116; Glasgow and the Clyde Valley Landscape Assessment, prepared by Scottish Natural Heritage (SNH).

Incised River Valley (Uddingston Clyde)

Landform:

Key Characteristics:

- Narrow, steep sided valleys cut deeply into the plateau farmlands. Elsewhere erosion is evident and subsidence is common place;
- Agriculture within wider valley floodplain with a mixture of pastures and arable land use; and
- Transport routes run along the flat valley floor with steep and sinuous connecting routes running perpendicular down the valley sides.

Vegetation/Landcover: (of significance)

Key Characteristics:

- Ecologically rich broadleaf woodlands (SINC's) on steep valley sides sheltered and settled areas, often hidden within the wider landscape;
- Unique physical features of woodland, characteristic patterns of land use and settlement has created a recognised landscape character; and
- The Uddingston Clyde Valley represents an important surviving corridor of undeveloped land in an area increasingly pressurised by urban fringe activities.

Cultural and Historical Associations:

Key Characteristics:

- Historic landscape features such as woodlands, walls, bridges, large houses, and designed landscapes;
- A number of Incised River Valleys provide a recreational resource, such as the River Clyde Walkway combining access and interpretation; and
- Settlements lie within less constrained and more accessible sites which are visible from within the valley.

Broad Urban Valley (Bothwell - Motherwell).

Landform:

Key Characteristics:

- Well-defined floodplain up to 1km wide bordered by valley slopes inhabited by urban areas.(Bothwell and Orbiston);

- Settlements/ urban areas located on higher ground above the valley slopes are visible from within the valley. (Bothwell and Orbiston); and

- Valley floor is dominated by road infrastructure occur along major road routes at the urban fringes (M74/ A725) and are therefore important strategic 'gateways' into the conurbation's of Glasgow and form many people's first impression of the city.

Vegetation / Landcover: (of significance)

Key Characteristics:

- Strong settlement edge and motorway corridor has led to fragmented pattern of farm and policy woodlands;

- Introduced road corridor planting schemes and large water body, grassland and woodland planting in Strathclyde Country Park dominate within the valley floor;

- The rural character of the valley has suffered as tree cover has declined and the visual influence of settlements, transport infrastructure and mineral workings increased.(Bothwell Park); and

- Some unique physical features associated with the recognised designated (Green Belt/ SSSI's & SINC's) and designed landscapes are still evident. (Raith Haugh/ Bothwell Park/Strathclyde Country Park).

Cultural and Historical Associations:

Key Characteristics:

- Rich archaeological (Scheduled Ancient Monument) and historical qualities (Conservation Area Bothwell). Industrial heritage features such as bings, tip, quarries, derelict railways and designed landscapes (Hamilton Palace) as well as remnants of pre-industrial estate landscapes;

- Urban fringe and industrial activity fragments the agricultural, rural character. Historical industrial heritage sometimes difficult to perceive, but the urban areas have a direct or indirect adverse effect on this landscape type;

- Development pressure due to good access to major transport routes (M74/ A725) has led to reclamation/ regeneration activities, which are removing these historical landscape remnants; and

- Various development, past and present are defined by their damaged and fragmented rural character, occurring where urban fringe and major elements of transport infrastructure has created visual, aural and severance effects (M74/ A725 and Strathclyde Country Park).

The typical characteristics of all the two identified significant Local Landscape Character Areas (LLCA's) are all evident within the study area itself. The linear presence of the existing M74 including the A723 and A725, within the existing landscape, forms a significant part of the existing landscape baseline conditions. The existing road alignments and associated enhancement planting act as a buffer between the urban corridor (settlements) and more rural character of agricultural land use and the Strathclyde Country Park.

11.3.3 Landscape Classification – Assessment of Quality & Value

The landscape baseline conditions, as illustrated on Figures 11.1 to 11.3 Landscape Effects Baseline Landscape/ Landscape Character and Context / Landscape Quality and Visual Effects, has highlighted the individual features and components of value at a local level (communication routes/ landscape/ topography). The junction proposal affects the perceived quality of the existing landscape resource in which it sits. This in turn provides mitigation opportunities and constraints that respond to the significance of effects in relation to the individual development proposal, and likely residual effects.

The landscape quality (or condition) relates more closely to landscape features and the associated physical appearance of these elements in terms of a visual (woodland screening/ prominent landform/ built form edge), functional and ecological perspective (Landscape Designations/Characters), as illustrated on Figure 11.2, Landscape Effects Landscape Character and Context.

The landscape character within the road corridor setting is not of a quality to warrant national or regional designation. It is assessed to be of local value, set within the urban fringe. A field study was undertaken from public roads and footpaths noting the physical and human influences on the landscape and any current trends/pressures for change.

The resulting landscape quality of the study area is shown on Figure 11.3 and generally categorised as follows;

- **Broad Urban Valley (Bothwell – Motherwell)** is **medium** quality typically;
  For the purposes of the landscape assessment the local landscape character area of Broad Urban Valley has been divided into 4 site specific character areas: Bothwell, Strathclyde Country Park, Raith Haugh and Laighlands / Bothwells.

Bothwell Park – Locally High / Medium quality typically.

Rare or occasional detracting features, strong landscape structure; characteristic, balanced pattern and combinations of landform / cover with distinct features worthy of conservation, creating a definitive sense of place. Typical characteristics are illustrated in Photo Viewpoints 1 and 3.

Elements – The individual elements that contribute to the local quality of this particular area is a scattering of trees and scrub with wetland plants surrounding a marginal wetland area containing ponds and wet ditches. The A725 and the M74 are prominent eye catching features and form a continual boundary to the east, south and west.

Characteristics – The characteristics of this area are formed by the combination of elements of trees, scrub and wetland that contribute to this area of high amenity value within the green belt.

Character – This area has a consistent pattern of features forming the wetland character of this area, its uniqueness of being a transition space between higher dryer ground and lower wetland areas supporting a variety of wildlife. Parts are classed as a 'Site of Importance for Nature Conservation' (SINC) within the Broad Urban Valley.

Strathclyde Country Park – Locally High / Medium quality typically:

Rare or occasional detracting features, strong landscape structure; characteristic, balanced pattern and combinations of landform/cover with distinct features worthy of conservation, creating a definitive sense of place typical characteristics, are illustrated in Photo Viewpoints 2 and 5.

Elements – The individual elements that contribute to the quality of The Strathclyde Country Park is a managed area of open amenity grassland, large boating lake, dense wooded vegetation and transportation routes contribute to this recreational area.

Characteristics – The characteristics of this particular area are formed by the combination of elements of trees, scrub and wetland that contribute to this area of community land use for informal sports and recreational activities.

Character – This area has a consistent pattern of features such as roadside planting, amenity grassland areas and large water bodies. This parkland is a valued community recreational resource within the Broad Urban valley.

Raith Haugh (SSSI) - Locally High / Medium quality typically:

This area has a recognised landscape structure, characteristic, pattern and combinations of landform/ cover are still evident. There is scope to improve management for land / cover with some features worthy of conservation. Detracting features (predominately the existing road infrastructure) are present, and typical characteristics are as illustrated on Photo Viewpoints 6.

Elements – This is predominantly a wetland/ wet woodland area which contains woodland, scrub, reeds and wet marginal grassland. This area has three roads within its locality, the A725, M74 and B7071 and is edged by the River Clyde to the south.

Characteristics – The characteristics of this particular area are formed by the combination of elements of roadside trees, scrub and wetland that contribute to this area's character.

Character – This area to the south of the Raith Junction has a distinctive pattern of elements, it is low lying close to the river and liable to flooding. Raith Haugh is classed as a Site of Special Scientific Interest (SSSI) within the Broad Urban Valley.

Laighlands / Bothwell - Locally Low quality typically:

This area has a weak/degraded landscape structure, where it is difficult to distinguish landscape features, field patterns or combinations of landform/ cover. A lack of management/ intervention has resulted in a degradation of the quality of this local landscape as illustrated on Photo Viewpoints 8 & 9.

Elements – The individual elements that contribute to the quality of this particular area is a scattering of scrub with some wetland plants surrounding a semi wetland area containing ponds and wet ditches. The A725 and the M74 are prominent, eye catching features forming a continual boundary to the east; the residential area of Bothwell forms a boundary to the west.

Characteristics – The characteristics of this particular area are formed by the combination of elements of trees, scrub and wetland. Horse grazing has had a heavy impact upon this area and contributes to forming the low landscape quality.

Character – This specific area does not reflect the surrounding landscape, the land currently used as grazing for horses has detracting features associated with its land use. The removal of hedgerows and the poor state of fencing gives this particular area a lower quality than other parts of the Raith area within the Broad Urban Valley.

11.3.4 Landscape Classification – Summary of Quality & Value

The urban fringe landscape context of the scheme combined with no national or locally recognised designations suggests the perceived value is predominantly moderate using the criteria set out in Table 11.1 – Criteria for Assessing Value.

This assessment results from a detailed field survey providing quantification of the landscape value perceived by the local community and society affected by the road scheme and the higher value placed upon it due to the accessibility and landscape resource within the existing site context.

For the purposes of this assessment the determination of landscape quality has been based on the condition of the recognised landscape elements and features that contribute to the differing characters as described above.

This establishes the subjective landscape quality areas of low, medium, high & unclassified, using the above methodology, modified by the observed ‘urban fringe’ influence upon the landscape resource. This led to localised downgrading or upgrading in areas where perceived scenic value is considered to increase quality. Landscape Quality for the study area is illustrated on Figure 11.3 Landscape Effects - Landscape Quality and Visual effects.

As a result of the quality and value of the areas, SNH have identified policies for the two LLCAs that are considered within the study area. These include enhancement guidelines to be considered within the scheme design and management:

- Incised River Valley’s – Landscape planning and management should aim to conserve and enhance the distinctive combination of landform, land cover and settlement features that distinguish the Incised River Valleys within Glasgow and the Clyde Valley. Conservation and appropriate management of woodlands, together with the sensitive control of development are central to this objective.

- Broad Urban Valley’s – Planning and management should aim to manage the existing landscape to reduce the visual influence of urban and transport features and to create a new and integrated landscape where former areas of countryside have been lost, and derelict or damaged land left in its place. A framework for the long term restoration of such areas should be established.

11.4 Landscape Predicted Effects

11.4.1 Introduction

The methodology and criteria described in Section 11.2 have been used to assess the predicted landscape effects of the preferred route scheme taking into account the likely magnitude of the impact and the sensitivity of the landscape resource being affected in order to determine the significance of the effect. Figures 11.4 to 11.16 (Photo Viewpoints 1-13) describe the nature and significance of the predicted effects for the full project cycle [Construction (short-term)/ Operational (mid-term)/ 15 years from opening (long-term)].

The conceptual design for the scheme has the potential for significant effects on the landscape resource - directly within the proposed development footprint and indirectly upon the wider site context. The nature of impacts have been assessed considering the following factors:

- Direct / indirect;

- Permanent / temporary;

- Primary / secondary;

- Short / long term;

- Positive / negative.

11.4.2 Landscape Effects

The slip roads within the proposed junction design will predominantly remain at the existing elevation, although the road footprint will be enlarged. (See Figures 11.1, 11.2, and 11.3 Landscape Effects – Baseline Landscape, Landscape Character and Context and Landscape Quality and Visual Effects). It is considered that the landscape effects are therefore likely to be limited to receptors close to the junction as summarised below in Table 11.6, which provides a summary of the landscape as a receptor affected by the proposed scheme.

The main potential effects on landscape resource are briefly summarised as:

- Permanent and temporary change in land use/management as a result of the proposed land take associated with the scheme due to flood compensatory storage areas at Bothwell Park and adjacent to the River Clyde;

- Permanent alteration to topography and skyline due to the introduced landform of road embankments, flood protection bunds, cuttings, bridge structures and slip roads around the junction;

- Temporary/permanent loss of woodland during construction phase and disturbance to flora and fauna as a result of associated activities around the SSSI, SINC and Local Nature Reserves and Strathclyde Country Park;

- Changes to land cover resulting from mitigation measures e.g. native mixed broad-leaved woodland planting around the major new junction layout. Change in perceived landscape pattern and environmental fit due to flood compensatory storage areas at Bothwell Park and adjacent to the River Clyde;

- Changes to public access and recreation routes linking the main settlement/leisure/commercial destinations. Provision of new pedestrian and cyclist linkages for the wider community surrounding the new road alignment (See Chapter 8); and

- Secondary impacts as a result of the proposed development in relation to: heritage and nature conservation sites, watercourses and drainage regimes, human beings and surrounding amenity.

The effects on the landscape are considered first on site specific character areas and then on specific landscape elements. The following tables (11.6 Landscape Character – Summary of Effects and 11.7 Landscape Elements Assessment) and text summarise the effects on the landscape.

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Effects on Landscape Character

Table 11.6 – Landscape Character - Summary of Effects (See Figures 11.4 -11.16, Photo Viewpoints 1 – 13)

Location Area	Orientation	Source of Impact / Quality / Value	Effected Landscape
Bothwell Park	NE of junction	Main Route (A725) – Medium/High quality (valued locally) Flood compensatory storage – High quality (valued locally)	Green Belt, SINC's (1) Local Nature Reserve, Woodland screening removed
Strathclyde Country Park	SE of junction	Main Route (A725) – Medium/ High quality (valued locally)	Green Belt, Woodland screening removed
Raith Haugh (Hamilton Low Parks SSSI)	SW of junction	Main Route (A725) – Medium/ High quality (valued locally) Flood compensatory storage- Medium quality (valued locally)	Green Belt, SSSI, Woodland screening removed
Bothwell	NW of junction	Slip Road (B7071) and SUD's pond – Low quality (valued locally) .	Green Belt, SINC's (1) Local Nature Reserve, Woodland screening removed

Effects on Landscape Elements

Effects on Landform

The existing landform is dominated by the road corridor within broad urban valley, with agriculture in between urban fringe located on the elevated valley sides (north, west and south).

The scheme will involve localised re-modelling of topography and skylines due to introduced road embankments / cuttings, elevated bridge structures and slip roads around the immediate context of the junction.

Changes to landform are predominantly localised to the area immediately adjacent to the existing junction and the M74/A725. In addition, the access bridge over the M74 to the north of the junction will be rebuilt, and the A725 crossing of the railway line at Orbiston will be widened. These works will cause little change to the existing landform. The two new flood compensation storage areas will change the existing landform north of the junction and adjacent to the River Clyde, but their design and scale will not cause widespread or notable alterations to the landscape resource in the long-term due the mitigation strategy.

Overall the impact on landform is considered to be Slight Magnitude due to the scale/ degree of permanence of change upon the landscape resource.

Changes to Land Use / Management

Increase in associated features, flood storage within the junction and an enhancement of wetland features, will alter land use (agricultural and equestrian). The A725 re-alignment directly affects the Raith Haugh (SSSI) and future maintenance access has been accommodated within the scheme design. Similarly the flood storage at Bothwell Park allows for continued access to the agricultural areas of the Bothwell Park Farm. The SUDs pond at Laighland in the long-term will continue the wetland/ reed habitat and character of the surrounding area. Mitigation measures will look to reintroduce the features removed initially.

Overall the impact on landuse is considered to be Moderate Magnitude due to the scale/ degree of permanence of change upon the landscape resource.

Effects on Vegetation / Land Cover

The loss of roadside planting along the existing M74 corridor (on embankments) because of road widening, will affect the edge of the Strathclyde Country Park. The total loss of existing established planting within Raith roundabout, because of the A725 underpass and recreational route over-bridge, will be replaced where possible. Loss of planting within central reservation of the A725, because of the slip road for underpass, will remove tree cover. The two new flood compensation storage areas will change the existing landcover north of the junction and adjacent to the River Clyde, but their design and scale will cause notable alterations to the landscape resource in the short-term only. Mitigation measures will look to reintroduce the features removed initially.

Overall the impact on vegetation / land cover is considered to be Moderate Magnitude due to the scale/ degree of permanence of change upon the landscape resource.

Effects on Designated Areas

Site of Special Scientific Interest (SSSI)

The new alignment and widening of the A725 and the northbound M74 off-slip road encroaches into the Hamilton Low Park SSSI within the Broad Urban Valley, which will affect the valuable ecological resource.

Planted features within the SSSI will also be removed as part of the proposed road scheme. Mitigation measures will look to reintroduce the features removed initially.

Overall the impact on the SSSI is considered to be Moderate Magnitude due to the scale/ degree of permanence of change upon the landscape resource.

Sites of Importance for Nature Conservation (SINC's)

Two SINC's will be adversely affected by the new widened road provision and compensatory flood storage areas, affecting landform/ land cover [loss of amenity/woodland/wetland habitat (See Photo Viewpoints 1, 3, 8 & 9)]. Mitigation measures will look to reintroduce the features removed initially.

Overall the impact on SINC's is considered to be Moderate Magnitude due to the scale/ degree of permanence of change upon the landscape resource.

Strathclyde Country Park

The new alignment and widening of the A725 southbound off-slip road encroaches into the Country Park within the Broad Urban Valley, which will affect the roadside woodland screening landcover adjacent to the campsite. Mitigation measures will look to reintroduce the features removed initially.

Overall the impact on the country park is considered to be Slight Magnitude due to the scale/ degree of permanence of change upon the landscape resource.

Table 11.7 – Landscape Elements Assessment (See Figures 11.2 & 11.3 Landscape Effects – Landscape Character and Context / Landscape Quality and Visual Effects)

Resource	Landscape Character	Sensitivity & Value	Magnitude	Nature of Effect	Mitigation	Significance of Effects Short Term: 0-15yrs Long Term: 15yrs +
Landform / Topography	Existing road corridor within broad urban valley with agriculture in between urban frin on the elevated valley sides(north, west and south)	Low:	Slight: Direct effect t receptors surrounding new major junctions.	Re-modelling of topography and skylines due to introduced landform of road embankments/cuttings, structures and slip roads	Road alignment better integrated by responding to existing landform and retains significant existing vegetation particular affinity with the surroundings. New embankments/ cuttings profiles to assist with flood protection/ visual screening (sensitive integration into existing resource)	Short Term: Slight Adverse Long Term: Negligible
Landcover- Tree & Woodland	Irregular woodland cover enclosed rural character (east), ofte mature hedgerow an farmland woodland blocks. Maturing screen planting arou communication route M74/A725 and indust	Moderate:	Moderate: Direct effect t resource surrounding new major junctions.	Changes to landcover around the junction for structures, earthworks, roads and flood compensatory storage. Localised change to existing landscape pattern and environmental fit	Mitigation and enhancement planting of native mixed broad-leaved woodland with particular affinity with the surroundings. New enhancement planting to assist with creating ecological links whilst addressing landscape and visual effects	Short Term: Moderate Adverse Long Term: Slight Adverse
Landcover - Valuable Habitats	Nationally important SSSI. Locally importa riparian habitat	High:	Slight: Direct/indirec effect to habi	Direct loss of part of the SSSI and part of SINC. Disturbance to existing	Enhancement and management of existing wetland/ ponds. Protective measure to minimise disturbance to	Short Term: Moderate Adverse

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Resource	Landscape Character	Sensitivity & Value	Magnitude	Nature of Effect	Mitigation	Significance of Effects Short Term: 0-15yrs Long Term: 15yrs +
	/Wetland, ponds with SINC's and Local Nature Reserves. Agricultural woodland scrub and grassland habitats.		surrounding new major junctions.	flora and fauna adjacent to the development through operational activities of flood compensatory storage and any residual adverse effects	valuable habitats. Wildlife movement/migratory requirements to link into green corridors. Flood compensatory storage will enhance the wetland character of the area.	Long Term: Slight Averse
Land-use/ Management	Existing road corridor with urban influences the east & west. Strathclyde Country Park / leisure use (SV & Greenbelt agricultu land defined by field patterns (SE)	Moderate:	Slight: Direct/indirec effect to resource	Changes in land use/management within development footprint. Land outwith the footprint returned back to landowner for future management/ use.	Reinstatement of recognised landscape character (native mixed broad-leaved woodland and strong field delineation) prior to agricultural/ industrial/ mining activities.	Short Term: Slight Adverse Long Term: Negligible
Land use- Road/ rail Networks and Non Motorised User Routes	Road corridor and junction containing M74, A725, B7071, B7070 & minor roads Access to countryside recreational resource PROW, Clyde Walkway, National Cycleway and designated paths	Low/:	Slight: Transient off site effect fro receptors and restricted access within site context	Temporary restrictions/diversions during construction phase. Improved layout addressing; visual intrusion; physical severance and travelling distances/ times for non road users.	Enhancement native mixed broad-leaved woodland planting to assist in screening the proposed development. New provision for better linkages (east/west) to the wider community surrounding the junction (NCN74). Restoration of route severance by safe recreation route with over bridges to major leisure/ community destinations	Short Term: Slight Adverse Long Term: Slight Beneficial

Resource	Landscape Character	Sensitivity & Value	Magnitude	Nature of Effect	Mitigation	Significance of Effects Short Term: 0-15yrs Long Term: 15yrs +
Landcover-Drainage	Strathclyde Loch, Ra Haugh, River Clyde and associated minor water courses/bodies	Moderate: :	Slight: Direct/indirec effect to resource	Disturbance to existing resource adjacent to the development through operational activities (localised dewatering) and any indirect affect on surface water bodies and water courses	Road alignment better integrated by responding to existing landform and retains significant existing watercourses/water bodies New embankments/ cuttings profiles to assist with flood protection/ visual screening (sensitive integration into existing resource. Habitat creation of wetland features and continued monitoring of surface water bodies (de-watering).	Short Term: Slight Adverse Long Term: Negligible

11.5 Visual Effects Methodology

11.5.1 Visual Assessment Methodology

Visual effects relate closely to landscape effects, but are mainly concerned with changes that arise in the composition of available views, from identified receptors. Visual assessment concerns people's perception and response to changes in visual amenity. Effects may result from new elements in the landscape that cause visual intrusion or new features that obstruct views across the landscape as well as loss of existing features. As with landscape effects, visual effects can be positive or negative.

The assessment considers the approximate visibility of the development when taking into account landform and landcover; identifying principal representative viewpoints and sensitive visual receptors from publicly accessible areas within the study area.

The assessment criteria for visual effects concentrated upon the parameters stated below:

- ***Visual Analysis*** – (identification of potential sources of effects) - extent to which the road will be visible (a road line is highlighted as Visually Intrusive Highway, where cuttings/embankments are 4m above/below existing topography) from identified receptors; residential properties, public buildings (workplaces), recreational resources and designated landscapes are illustrated on Landscape Effects - Landscape Quality and Visual Effects (Figure 11.3) and Photo Viewpoints 1-13 (Figures 11.4 to 11.16).

- ***Sensitivity of Visual Receptors*** – capacity of visual amenity to accept change are illustrated on Photo Viewpoints 1-13 (Figures 11.4 to 11.16).

- ***Magnitude of visual impacts and resulting significance of effect are illustrated on Landscape Effects*** - Landscape Quality and Visual Effects Figure 11.3 and Photo Viewpoints 1-13 (Figures 11.4 to 11.16).

- ***Mitigation*** – measures by which effects are reduced or the road is integrated into its landscape setting. The visual effects of the proposed scheme have been assessed taking into account any mitigation 15 years after the scheme opens, are illustrated within the Conceptual Mitigation Strategy (Figure 20.1).

- ***Photomontages*** – These show the main wire frame perspectives of bridges, structures and proposed ground modelling to aid the assessment of visual intrusion where the anticipated effects from Photo Viewpoints are significant. The visual effects are overlaid as a photo illustrated and rendered perspective sketch of the proposed road development onto the Photo Viewpoints of the established visual envelope baseline.

11.5.2 Sensitivity of Visual Receptors

The sensitivity of the visual receptors/viewpoints was assessed by evaluation of a range of factors, including:

- The nature and context of the receptors/viewpoints;
- The nature of the existing view;
- The expectations of users/receptors (occupants of dwellings were considered to have higher expectations and more sensitive than occupants of industrial buildings/ or vehicle users;
- The importance and value of the development site in the view; and

The criteria used to determine the sensitivity of the receptors to the proposed changes are shown below in Table 11.8.

Table 11.8 Sensitivity of Visual Receptors

High Sensitivity	Residential properties / public rights of way –footpaths/bridleways and waterways – where the landscape to be changed is an important element in the view
Moderate Sensitivity	Roads/ Other non residential buildings - Sporting / recreational facilities/ where the landscape to be changed is an important element in the view; Residential properties PROW's/ where the landscape to be changed is less important element in the view
Low Sensitivity	Roads/ Other non residential buildings - Sporting / recreational facilities/ where the landscape to be changed is less important element in the view; Residential properties PROW's/ where the landscape to be changed is an unimportant element in the view

11.5.3 Magnitude of Impact to Visual Amenity

The assessment of magnitude of impact includes the consideration of the likely effects of development on visual amenity, taking into consideration the scale of the change to the landscape, the addition or loss of visual elements, the change in visual amenity and the amount/extent of the view affected. The criteria for the magnitude of impact, is presented below.

The main elements of magnitude evaluation include:

- The extent of the receptors view affected by the development as a proportion of the view available;
- The distance of the receptor from the proposals;
- The angle of the view relative to the main activity of the receptor;
- The level of integration or contrast created by the road, the traffic on the road and its associated elements within the view; and
- The potential for effective mitigation of adverse effects and opportunities for landscape enhancement.

Magnitude is determined by the distance from the viewer, the extent of change in the field of vision, the proportion or number of viewers affected and the duration of activity apparent from each viewpoint, or a sequence of points that may have transient views e.g. along a road. The following criteria are used to determine magnitude of impacts (table 11.9):

Table 11.9 – Magnitude of Visual Impacts

Severe Magnitude	All viewers affected / proposal forms majority or all of the view and alters all the components and significantly alters the character of the view.
Substantial Magnitude	Majority of viewers affected / the proposals dominate the view and fundamentally change its character and components
Moderate Magnitude	Many viewers affected / the proposals are noticeable in the view, affecting its character and altering some of its components and features
Slight Magnitude	Few viewers affected / the changes are only a minor element of the overall view that are likely to be missed by the casual observer and/or scarcely appreciated.
Negligible / None	Barely any viewers affected / change in view is virtually imperceptible.

The changes brought about by a proposal may be long or short term, permanent or temporary. Mitigation may or may not be achievable.

The visual assessment identifies effects on individual views and visual amenity taking into consideration the sensitivity and importance of the receptor and the magnitude and duration of the impact.

11.5.4 Significance of Visual Effects

Significance is not absolute and can only be defined in relation to each development and its location. For the purposes of this assessment a 'significant effect' whether adverse or beneficial is considered to be of either moderate or substantial significance. The two principle criteria determining significance are the magnitude of the visual impacts and the sensitivity of the receptor. A higher level of significance is generally attached to large-scale effects and effects on sensitive or highly sensitive receptors; thus small effects on highly sensitive sites can be more important than large effects on less sensitive areas.

Table 11.10 shows the combinations used to determine significance of the resulting effects:

Table 11.10 –Significance of Visual Effect

Resulting Significance of Effect					
Sensitivity (Table 11.8)	**Magnitude of Impact (Table 11.9)**				
	Severe	**Substantial**	**Moderate**	**Slight**	**Negligible / None**
High	Substantial Effect (significant)	Substantial Effect (significant)	Substantial Effect (significant)	Moderate Effect (significant)	Slight Effect (not significant)
Medium	Substantial Effect (significant)	Substantial Effect (significant)	Moderate Effect (significant)	Slight Effect (not significant)	No change (not significant)
Low	Moderate Effect (significant)	Moderate Effect (significant)	Slight Effect (not significant)	Slight Effect (not significant)	No change (not significant)

The thresholds for significance of effects on visual amenity are categorised according to the following scale:

- Substantial adverse or beneficial effect – where the scheme would result in a significant deterioration (or improvement) in the existing view;
- Moderate adverse or beneficial effect – where the scheme would result in a noticeable deterioration (or improvement) in the existing view;
- Slight adverse or beneficial effect – where the scheme would result in a barely perceptible deterioration (or improvement) in the existing view; and

- None (Neutral) – no discernible deterioration (or improvement) in the existing view.

11.6 Predicted Visual Effects

11.6.1 Introduction

The visual assessment considers the preferred option and its surrounding context, focusing on identified primary receptors that will experience visual effects, as stated previously within the methodology. Key Photo Viewpoint Locations are determined (locations shown on the Landscape Effects – Landscape Quality and Visual Effects Figure 11.3) and used to establish a visual envelope; the overall baseline position; the anticipated visual effects of the proposed scheme, taking into account factors such as local topography, vegetation and existing development (built form). The results of the visual assessment determine the significance of effects on views from publicly accessible viewpoints, in terms of the magnitude of impact that would be generated by the proposed development and the sensitivity of the receptor. Views identified in Figures 11.4 to 11.16 (Photo Viewpoints 1-13) have been assessed from an average height of approximately 1.8m above ground level from publicly accessible areas within the study area around the Raith Junction.

Where the established visual envelope illustrated within the Photo Viewpoints has been affected significantly, wire frame perspective of bridges, structures and ground modelling have been prepared (taking into account mitigation measures) to aid the assessment of visual effects.

Although the scheme may be visible to a degree beyond the highlighted receptors within the visual analysis and subsequent Visual Envelope Mapping (Figure 11.3); illustrated Photo Viewpoints 1-13 (Figures 11.4-11.16); Landscape Quality and Visual Effects Drawing (Figure 11.3); it is considered that any potential visual effects would not be significant and, therefore, would not be considered further in this Chapter.

11.6.2 Visual Assessment

The assessment identifies a number of principal representative viewpoints and sensitive receptors within the study area, using the criteria set out above. The visual receptors and Photo Viewpoints 1-13 (illustrated on Figures 11.3 and 11.4 – 11.16) establish the Visual Impact Schedule. The resulting significance of effects from identified receptors and viewpoints is categorised as severe, substantial, moderate, slight or none (no change) when taking into account the following criteria;

- Baseline visual amenity and viewpoints;
- Sensitivity of visual receptors;
- Magnitude of visual impacts; and
- Mitigation measures.

Visual amenity and visual effects are illustrated on the Landscape Effects Landscape Character and Context & Landscape Quality and Visual Effects (Figures 11.2 & 11.3) and combined to provide an indication of major visual barriers, landform, woodland screening, intervening built form, cuttings and embankments (visually intrusive highway). Photo Viewpoint Locations establish definitions of arcs of views.

11.6.3 Predicted Visual Effects

The likely negative visual effects of road building are identified as:

- Intrusion of the scheme footprint into medium to high quality landscape (Bothwell Park Farm);
- Large earthworks, which intrude into views from nearby property and public places.(Residential areas at Bothwell & Strathclyde Country Park);
- Intrusive embankments, structures, traffic, lighting or signage within low-lying land. New over bridges/footbridges (3 in number), retaining walls for A725 underpass;
- Unsympathetic junctions between new and existing landscapes.(Bothwell);
- Intrusion of large earthworks and associated landtake affecting heritage and nature conservation sites.(Raith Haugh SSSI and SINC sites); and
- Changes to watercourses and drainage regimes (Flood Compensatory Storage Areas, 2 in number, SUDs pond, wet ditches, 2 in number).

The scheme will look to minimise the likely visual effects associated with the elevated recreational routes, by providing the A725 road alignment beneath the existing roundabout. There are similar effects due to loss of roadside woodland to the west of the M74, to the roundabout itself and by the widening of the road to the east of the M74. Overall, this will have an effect on the visual amenity both in terms of its value for screening and visual containment, and also as a valuable view overall.

The following text should be read in conjunction with the Landscape Effects Figures - Baseline Landscape (11.1) /Landscape Character and Context (11.2) /Landscape Quality and Visual Effects (11.3), and in conjunction with the illustrations, seeks to establish the associated visual effects upon the visual resource. The receptors considered in the assessment include residencies, urban areas, communication routes, places of work and recreational facilities using the methodology shown above.

The following Visual Impact Schedule lists the sensitivity of the receptor, the magnitude of the impact and the significance of the resulting effect for both visual receptors and photo viewpoints (as shown on Figure 11.3 Landscape Quality and Visual Effects) and forms the basis of the visual assessment.

Table 11.10 – Visual Impact Schedule (Refer to Fig 11.3 Landscape Quality and Visual Effects)

Visual Receptor	Area	Sensitivity	Magnitude of Impact	Residual Significance of Effects
Bothwell (Laighland Rd) – eastern edge of residential area –(receptor I)	West	High	Moderate	Slight Adverse
Bothwell (Croftbank) – eastern edge of residential area – (receptor II)	W	Moderate	Moderate	Slight Adverse
Bothwell (Clyde view) – eastern edge of residential area – (receptor III)	SW	High	Substantial	Moderate Adverse
Bothwell (Shelley Drive) – eastern edge of residential area – (receptor IV)	NW	Moderate	None	None
Isolated Dwellings – Bothwell Park/ Bothwell Park Farm north of junction – (receptor V)	N	Moderate	Slight	Slight Adverse
Orbiston (South View)- south west edge of residential area – (receptor VI)	NE	Moderate	None	None
Orbiston (Mary Rae Rd)- south west edge of residential area – (receptor VII	NE	Moderate	Slight	None
Isolated Dwellings – south west edge of residential area of Orbiston - (receptor VIII)	NE	Low	Slight	None
Strathclyde Country Park – Caravan/ camping site – (receptor IX)	E	High	Substantial	Moderate Adverse
Strathclyde Country Park – Hotel/ Public House - (receptor X)	E	High	Substantial	Moderate Adverse
Strathclyde Country Park – recreation picnic area – (receptor XI)	SE	Moderate	None	None
Douglas Park (Killmallie House) – (receptor XII)	NE	Moderate	Slight	Slight Adverse
Bothwell (Clydeview) – (receptor XIII)	SW	Moderate	Moderate	Slight Adverse

Visual Receptor (Photo viewpoints)	Area	Sensitivity	Magnitude of Impact	Residual Significance of Effects
Bothwell Park Road Overbridge / M74 (Photo viewpoint 1)	N	Moderate	Moderate	Slight Adverse
Strathclyde Country park – A725 (Westbound) (Photo viewpoint 2)	NE	Moderate	Moderate	Slight Adverse
Bothwell Park A725 (eastbound) (Photo viewpoint 3)	NE	Moderate / High	Substantial	Moderate Adverse
Strathclyde Country Park Entrance (Photo viewpoint 4)	SE	High	Substantial	Slight Adverse
Strathclyde Country Park (Photo viewpoint 5)	SE	High	None	No Change
Raith Hough – A725 Overbridge / River Clyde (Photo viewpoint 6)	S	Moderate / High	Moderate	Moderate Adverse
Bellshill Road B7071 (Photo viewpoint 7)	S	Moderate / High	Moderate	Slight Adverse
Laighland Road (Bothwell) (Photo viewpoint 8)	SW	High	Substantial	Moderate Beneficial
Laighland Road (Bothwell) (Photo viewpoint 9)	SW	High	Substantial	Moderate Beneficial
Glebe Avenue (Bothwell) (Photo viewpoint 10)	NW	Moderate / High	Slight	Slight Beneficial
A725 eastbound (Bothwell) (Photo viewpoint 11)	SW	Moderate	Substantial	Moderate Adverse
Clyde View (Bothwell) (Photo viewpoint 12)	SW	High / Moderate	None	No Change
Bothwell Park Road Overbridge / M74	N	Moderate	None	No Change

Visual Receptor (Photo viewpoints)	Area	Sensitivity	Magnitude of Impact	Residual Significance of Effects
(Photo viewpoint 13)				

Note Area – orientation/location of receptor in relation to the Raith Junction*

The following text provides detailed descriptions of the key visual receptors.

Views from Residential/Urban Areas/Individual Dwellings

Within the two settlements in the study area bordering the proposed Raith junction scheme, there are receptors that have a range of partial and open, mid, short and long distance views of the road, with the possible exception of Strathclyde Country Park, due to the intervening combination of landform and land cover. Variations in the visual envelope of the preferred option are a result of the existing landform and significant vegetation, which restrict views of the road in places. There will however be seasonal variations in the extent of screening of the road by the existing vegetation.

The Raith junction scheme and its associated features will be visible from surrounding residential & urban areas and individual dwellings, as illustrated within the Landscape Quality and visual Effects (Figure 11.3) and Photo Viewpoints 1-13 (Figures 11.4-11.16). These are discussed further below to establish the magnitude of visual impacts from the identified principal representative viewpoints and sensitive receptors.

Bothwell

Residences along the eastern boundary of Bothwell overlook the existing roundabout junction and the main motorway M74 route. (See Photo Viewpoints 7, 8, 9, 10 & 12). The properties along Clyde View and Laighlands Road will have open views of the proposed road improvements to the A725 & B7071. These residences are situated approximately 25 metres from the nearest point of the scheme, and roadside woodland currently helps to limit views towards the junction and road corridor, albeit seasonally. The proposed underpass, taking the A725 under the M74/ Raith Junction and the addition of new on / off slip roads will increase the footprint of the road junction, which will be (temporarily until new screening planting matures) more visible due to the removal of existing screening vegetation. There will also be new recreational route over bridges which will be visible from receptors, predominantly along Laighlands Road.

The individual dwelling of 'Laighland' will have uninterrupted views of the enlarged Raith roundabout. (See Photo Viewpoint 8 & 9). The under section of the A725 passing under the M74/ Raith Junction and the addition of on / off slip roads will increase the road footprint of the road junction, due to the distance and elevation of the receptors similar to those properties along Laighlands Road.

More limited views will be possible from Glebe Avenue. But as the existing landform rises from 35 to 55 metres above existing levels at Croftbank Gate, properties at Croftbank Avenue and Fairfield Place will experience more elevated full and partial views. (See Photo Viewpoint 10).

Construction Stage – Short Term

Road widening requires the loss of roadside planting, due to the roundabout and underpass layout. An extension to the footprint of the road will mean the loss of planting in and around the Raith Junction. Land cover/ earthworks will take place in the fore / mid ground for SUDS and ditches and this will be an intrusive form on the landscape. The new Recreational Route overbridge and its associated landforms will be prominent and alter the skyline. There will be increased views to agricultural pastoral farmland on the horizon due to loss of planting. The magnitude of visual impact will be substantial due to the distance/ elevation/ of the receptors and the receiving landscape quality.

Operational Stage – (Scheme Open) – Mid Term

Initial planting mitigation to the nearside of Raith roundabout works to soften the new road development, most features are still prominent and highly visible. The new earth mounding for the SUDS will potentially screen intermittent parts of the Raith roundabout. Recreational Route overbridge is still an obvious feature, but planting on associated earthworks has begun to address visual effects. The permanent loss of planting within the Raith Roundabout opens distant views. The increased volume of traffic, lighting, and other vehicular visual effects are similar to existing scenario. The magnitude of visual impact will be moderate due to the distance/ elevation of the receptors and the receiving landscape quality.

15 years from Operation – Long Term

The wet woodland scrub, ornamental planting marginal wetland and scattering of trees in the foreground add to the parkland character of the space and has partially screened SUDS features. Mitigation planting has reached a standard that mimics the screening found in the current viewpoint. Main alteration in view would be the permanent loss of established vegetation within the Raith roundabout, which would allow for more open views to Strathclyde Country Park. The magnitude of visual impact will be moderate due to the distance/ elevation of the receptors and the receiving landscape quality.

Laighland Road

The individual dwelling of Laighland will have uninterrupted views of the enlarged Raith roundabout. (See Photo Viewpoint 8 & 9). The under section of the A725 passing under the M74/ Raith Junction and the addition of on / off slip roads will increase the road footprint of the road junction, due to the distance and elevation of the receptors, similar to those properties along Laighlands Road.

More limited views will be possible from Glebe Avenue. But as the existing landform rises from 35 to 55 metres above existing levels at Croftbank Gate, Croftbank Avenue and Fairfield Place, the properties here will experience more elevated full and partial views. (See Photo Viewpoint 10)

Construction Stage – Short Term

During the construction phase a high intensity of M74 roadside vegetation is lost, thus making the road highly visible. New construction of underpass, roundabout and road widening on slip roads will be obvious. In the foreground earth mounding and excavation works will be prevalent and of high regularity causing initial disturbance. Much of the more distant views, however, are not affected. There will be more open views on to more sensitive areas, such as the Country Park entrance and over a hotel, because of the loss of vegetation within Raith roundabout. The magnitude of visual impact will be moderate due to the distance/ elevation of the receptors and the receiving landscape quality.

Operational Stage – (Scheme Open) – Mid Term

Initial planting mitigation has begun to address obvious man-made features and has started to soften the earthworks or the SUDS pond and ditch wetland habitat. Views extending over M74 overbridge are still visible along with new Recreational Route overbridge, initial adverse effects of the development are being mitigated. The increased volume of traffic, lighting and other vehicular visual effects are similar to existing scenario. The magnitude of visual impact will be slight due to the distance/ elevation of the receptors and the receiving landscape quality.

15 years from Operation – Long Term

The wet woodland scrub, ornamental planting, marginal wetland and scattering of trees in the foreground add to the parkland character of the space and has partially screened SUDS features. Mitigation planting has reached a standard that mimics the screening found in the current viewpoint. Main alteration in view would be the permanent loss of established vegetation within Raith roundabout, which would allow for more open views to Strathclyde Country Park. The increased volume of traffic, lighting and other vehicular visual effects are similar to existing scenario. The magnitude of visual impact will be slight due to the distance/ elevation of the receptors and the receiving landscape quality.

Bothwell Park & Bothwell Park Farm

Potential receptors to the east of the M74 motorway route will be restricted to Bothwell Park (See Photo Viewpoint 1 & 3) and the Hotel (See Photo Viewpoint 4), situated at the entrance to the Country Park, this is because the preferred route option will involve the removal of a significant area of road side infrastructure planting at the Raith Roundabout,

Agricultural property at Bothwell Park Farm to the east of the M74 will have no views across to the Raith Junction. Bothwell Park House has very limited views towards the new Junction scheme, due to significant screening offered by the surrounding woodland. The A725 underpass, additional on/ off slips and other infrastructure will increase the visible footprint.

Construction Stage – Short Term

Road widening of the M74 is partially visible in mid-far distance. The new access road to Bothwell Park SINC will also involve land form and land cover changes. Retained roadside planting around the existing junction will limit views of road infrastructure. The magnitude of visual impact will be slight due to the distance/ elevation of the receptors and the receiving landscape quality.

Operational Stage – (Scheme Open) – Mid Term

Most visual effects are centred on the Junction (A725 underpass and Recreational Route overbridge) resulting in loss of roadside screening vegetation either side of the M74 Raith Roundabout. Retained roadside vegetation will be enhanced by woodland/ scrub planting. A new attenuation pond will continue the wetland character. The magnitude of visual impact will be slight due to the distance/ elevation of the receptors and the receiving landscape quality.

15 years from Operation – Long Term

Matured planting adjacent to the improved Junction helps to mask the majority of infrastructure and vehicular movement along the A725 (seasonal). The wetland character of the Bothwell Park and Laighland SINC is enhanced ecologically through appropriate conservation management reinforcing landscape quality. Lighting, signage and vehicular visual effects difficult to mitigate fully within the M74 corridor, similar to baseline scenario. The magnitude of visual impact will be none/ negligible due to the distance/ elevation of the receptors and the receiving landscape quality.

The under section of the A725 passing under the M74 / Raith Junction and the addition of on / off slip roads will increase the road footprint of the road junction. Due to the distance and elevation of the receptors, the magnitude of visual effects will be low/ moderate.

Strathclyde Country Park

Changes to views from the Park will affect the Hotel (See Photo Viewpoint 4), situated at the entrance to the Country Park, and the nearby camp site. Here the road is an obvious feature and the proposed scheme will involve the removal of a significant area of nearby road-side planting at the roundabout. The Recreational Route over-bridge will affect the skyline.

Construction Stage – Short Term

Earthworks and construction activity will be visibly intrusive due to loss of screening vegetation and the proximity of the Hotel to the junction. The magnitude of visual impact will be moderate, due to the distance/ elevation of the receptor and the receiving landscape quality.

Operational Stage – (Scheme Open) – Mid Term

Maturing planting will start to screen receptors. The magnitude of visual impact will be slight due to the distance/ elevation of the receptor and the receiving landscape quality. The existing tree and scrub planting will screen the road development and mitigation planting on the earth works will be beginning to soften the new structures.

15 years from Operation – Long Term

Existing planting adjacent to the improved junction will, by this stage, be helping to mask the majority of the infrastructure changes and vehicular movement along the southbound A725 (seasonal). The enlarged Roundabout and Recreational Route over-bridge are still prominent features within the locality, however mitigation planting soften the new features and also help to screen intermittent parts of the road development. Overall, maturing planting and earthworks and the road in cutting will largely screen receptors. The magnitude of visual impact will be slight due to the distance/ elevation of the receptor and the receiving landscape quality.

Orbiston

Properties within Orbiston to the north east, on the south west side (Mary Rae Road and isolated dwellings) will have very few/ no views over the main junction development area because of the existing dense screening vegetation cover. Noise mitigation barriers proposed as part of the scheme mitigation for these properties is likely to be the only feature of the development noticeable to the residents. Effects on visual amenity will be most apparent during construction and erection of barriers, and mature roadside planting will reduce other visual effects. The magnitude of visual impact will be slight due to the distance/ elevation of the receptors and the receiving landscape quality.

Isolated Dwellings – Douglas Cottages and Killamallie House

Both isolated dwellings are screened quite comprehensively from the proposed new access from the Country Park. The high sensitivity of the receptor along with its distance from the road proposal and retained tree screening means that this locations magnitude of visual impact will be none (negligible)

<u>Views from Recreational Areas</u>

Picnic Area and Strathclyde Loch Area

The scheme will not alter views from the picnic area (Photo Viewpoint 5). The wider recreational area at Strathclyde Country Park will be screened by existing woodland within the park and adjacent to the existing road network, M74 and A725 (Viewpoint 5). Due to the receptor's distance from the scheme and retained tree screening, means that the magnitude of visual impact will be none/negligible.

Recreational Access (Non-Vehicle)

The Clyde river valley accommodates and provides links to numerous rights of way; designated long distance paths/ national and regional cycle ways. The scheme includes provision for footbridges and accommodation bridges which maintain the continuity of recreational routes around the junction, and provides new links to the proposed route of National Cycle Network Route 74. The provision of a new and safer over-bridge for pedestrians and cyclists will provide benefits over and above the existing difficult and potentially unsafe crossing option.

Views from Transport Routes

The potential for visual effects on users of the local roads has been assessed, and should be read in conjunction with the Chapter 14, Vehicle Travellers. Views from roads are considered transient due to the nature of the receptors or users, who are generally travelling at speed. The following roads have been identified as crossing, or passing near to the preferred route and so are likely to experience visual effects as a result of the scheme.

M74

The M74 runs north/south across the site and the A725 intersects it at the existing Raith junction. The scheme extents will involve the A725 crossing the M74, 6-8m underneath the existing junction. Partial views of the proposed realigned A725 road either side of the M74 motorway will be possible. The introduction of the off slip road for vehicles travelling onto the A725, will add to the visible road infrastructure, when viewed from the vicinity of the junction. Vehicles will be travelling at such a speed that any changes will generally be less prominent. Associated mature roadside infrastructure planting within the centre of the roundabout and adjacent to the existing junction will be completely or partially removed by the construction of the scheme, but where the road is in cutting or screened by flood bunds, there will be reduced views of traffic movements (east/west). Vehicles turning onto the A725 southbound from the M74 northbound will have extensive views over the wetland SSSI at Raith Haugh, although this in time will be partially screened by maturing roadside planting. The receptors along this route due to distance and elevation from the development will result in a moderate magnitude of visual impact during construction and operational phase. The long term effect of the scheme will mean a slight magnitude of visual impact after 15 years (Photo Viewpoints 1, 3, 4, 7, 11 & 13). The changes are only a minor element of the overall view, and not that significant to the casual observer.

A725 (Connects East Kilbride and A8 Shawhead)

The A725 will cut beneath the M74, 6-8m underneath the existing junction to connect East Kilbride and Shawhead. The introduction of the off-slip road for vehicles travelling onto the A725/ M74, will add to the visible road infrastructure. Other features associated with the scheme – the Recreational Route overbridge, rebuilt M74 accommodation overbridge, SUDS pond and flood compensation storage areas - will also add new features to the views from the vicinity of the junction. However, vehicles will generally be travelling at such a speed that any changes will be less prominent. Mature roadside infrastructure planting within the centre of the roundabout and adjacent to the existing junction will be removed due to the scheme, but the road in cutting will reduce the extent of visible traffic movements (east/west). The receptors along this route due to distance and elevation from the development will result in a substantial magnitude of visual impact during construction and operational phase but would be moderate/slight in the long term (the proposals are noticeable in the view affecting visual components and features - Viewpoint 2, 3, 4, 6 & 11).

B7071 (Uddingston and Hamilton)

The B7071 currently runs from Hamilton to Uddingston parallel to the M74. Views from this road are limited to Bothwell Bridge (See Photo Viewpoint 6, 7 & 12). Associated mature roadside infrastructure planting will minimize the visual envelope towards the new junction layout although excavation for compensatory flood storage could prejudice the existing screening effect. The scheme extents alignment will closely follow the existing road, but some mature vegetation will be removed, adding to the visual disruption within the visual envelope. The receptors along this route due to distance and elevation from the development will result in a moderate magnitude of visual impact during construction and operational phase but would be slight in the long term (the proposals are noticeable in the view affecting visual components and features).

Accommodation Bridge Crossing M74

An accommodation overbridge north of the Raith junction that crosses the M74 requires re-construction because of the widening of the M74. From here there is an elevated view from Bothwell Park Road (which services Bothwell Park House and Bothwell Park Farm - Photo Viewpoint 1 & 13). Vehicle movements are limited, but the visual envelope does provide open views of the junction towards Strathclyde Country Park. The construction of the A725 in cutting under the junction and (long-term) maturing screening planting, will limit the visual effects. The receptors along this route due to distance and elevation from the development will result in a substantial magnitude of visual impacts during construction and moderate magnitude of visual impact during operational phase but would be slight in the long term (the proposals are noticeable in the view affecting visual components and features (few viewers affected and the changes are only a minor element of the overall view and likely to be missed by the casual observer).

Railway Lines

The route of the railway lines and the crossing of the A725 will remain unchanged, but the bridge structure for the A725 will be widened and a footpath/cycleway added. This alteration will be visible during the construction phase, but long-term effects will be virtually un-noticeable because there is only a small change to the existing conditions. Also due to the high speed at which trains will pass this point, here will only be very transient views. The magnitude of visual impact will be slight during the construction and operational stages, with negligible long-term impact.

11.7 Conceptual Mitigation Strategy

11.7.1 General

Mitigation measures look to avoid or minimise, where practicable, identified adverse effects as identified in the previous section. The purpose of mitigation is to avoid, reduce and, where appropriate, provide remediation/compensation to offset any significant negative effects associated with the proposed development. This section describes in general terms a range of possible landscape and visual mitigation measures that will be used to offset identified adverse effects arising from the scheme. Mitigation for landscape and visual effects are generally closely linked, and these aspects have therefore been addressed jointly in this section. The conceptual mitigation strategy is illustrated in Figures 20.1 to 20.7.

The central focus of landscape and visual mitigation is to achieve integration within the surrounding landscape where the proposed alignment deviates from the existing road corridor. The scheme context is essentially urban fringe, where existing mature vegetation is highly valued. Therefore, new planting of woodland and shrub/scrub areas is an important element of the mitigation strategy.

Figures 20.1-20.7 provides an overview of the Conceptual Mitigation Strategy. In summary the mitigation measures are focused upon primary and secondary measures;

Primary mitigation measures generally relate to basic design elements such as;

- Sensitive location and siting of road infrastructure including Sustainable Urban Drainage (SUDs features);
- Site layout and access during construction and operational stages;
- Choice of site level or vertical alignment;
- Appropriate form, materials and design of built structures;
- Lighting and signage;
- Ground modelling; and
- Protection of existing/proposed new planting.

Secondary mitigation measures (avoidance and reduction) seek to address significant negative effects of the final junction design as identified during the landscape and visual assessment and described within the Mitigation Strategy, which responds to the differing landscape context around the junction.

11.7.2 Mitigation Strategy

The following measures will be incorporated into the detailed specimen design for the scheme:

- Minimise identified potential adverse effects on the existing landform and avoid disruption of major topographical, ecological and other significant landscape features. Through a number of design iterations, the proposed scheme has been aligned to reduce as far as practicable any encroachment into the SSSI;

- Use the existing landform and retain existing vegetation (landcover) to good effect, thereby minimising the scale of earthworks and enhancement planting that is required;

- New structures (including gantries/signage) and slope profiles will follow existing natural topography where possible and new features will be integrated into the surrounding landscape context. (e.g. woodland, hedges, mature trees, surface water features);

- Retain the least amount of road land, where this does not conflict with the need to provide mitigation by planting, mounding, earth shaping and new surface water features;

- Use the existing landform to minimise noise and visual intrusion, for example by placing a road in a cutting or behind rising ground, to protect identified receptors;

- Develop new landforms, such as mounds and false cutting, to screen the road from the identified receptors, but balancing this with the need to avoid additional encroachment into designated habitats such as the SSSI; and

- Develop site restoration, landscape features and planting proposals that link with and reinforce positive features of the landscape character. The detailed landscape design will be in accordance with the Scottish Executive Landscape Design and Management Policy 'Cost Effective Landscape' : Working with Nature' to ensure that the landscape design will be fully integrated with the ecological requirements, biodiversity and contribute to sustainable development.

11.7.3 Natural Processes, Materials & Features

Re-use of stripped topsoil and of selected existing vegetation (grassland/wetland) where this is to be cleared (for example on embankments, around SUDS ponds respectively) will help conserve biodiversity and perpetuate existing seed banks.

Vegetation will be established on newly created cutting or embankment slopes primarily by means of seed application, probably on a hydra seeding basis in locations where steep embankments are left and an engineered soil solution is required as in the embankments either side of the M74 (as seen in Viewpoint 1 and 13). Aided by the process of regeneration those species most suited to the location will develop naturally to address the negative visual effects of this structure from the road users. Planted areas generally are intended to be established using plants of an older transplanted material typical of urban-style planting appropriate to respond to the road context. Within the more rural areas more large scale planting is intended to be smaller native stock which is more likely to establish quickly and survive the exposure and relatively hostile conditions of the site.

The proposed new planting consists mostly of native species appropriate to the locality; plants produced from seed of local provenance are likely to be most successful and will be used wherever possible. The availability of wild flower and grass seed of local provenance will also be explored in the interests of maximising ecological benefit.

Where not in conflict with road safety sight lines and other engineering requirements, disturbed areas around new junctions, will be stripped of topsoil and seeded with wild flower mixes direct into low fertility substrate material. Such variety of ground conditions will promote diversity of both sward and visual interest, permit more sustainable maintenance, and assist in consolidating existing fragmented habitat.

New cutting slopes and elevated road sections are potentially significant elements of the scheme; similar features within the existing locality that demonstrate the natural characteristics will look to be replicated on engineered slopes and offer a benchmark illustration of such treatment. Mitigation looks to respond better to the open agricultural character of the surroundings with grassland and ornamental planting. Tree and shrub planting as is incorporated in the scheme will have similar aspirations and be based on natural characteristics of informal arrangement and varied density.

The immediate environs of the road are characterised by planting which is mostly of scrub/woodland nature. Extensive new planting would be inappropriate and serve only to emphasise the road line in the landscape; the preferred objective is to introduce only modest planted areas of discontinuous character which will best reflect and complement the existing pattern.

The existing Raith junction, with its maturing vegetation cover, illustrates where good landscape planting design can achieve effective mitigation around elevated structures. This approach has been reflected within the mitigation proposals around the new recreational route over bridge and the vehicular over bridge when viewed from Viewpoint 1.

Planting generally will seek to introduce ecologically appropriate species whilst retaining an evergreen element for winter interest. In a wildlife context the scheme will aim to benefit long term any identified protected species found within the locality (for example planting of berry-bearing shrubs to contribute to local food resources).

Earthworks

Maximum use will be made of existing subsoil and topsoil both as landscape fill and as a finished surface for soft landscape treatment; no importation of soils is anticipated. As far as is reasonably practicable, stripped soils, especially from cutting slopes, will be stored (for as short a time as possible and such that the viability of the soil is maintained) in separate locations to assist in replicating particular habitats where required.

A principal design aim will be to achieve sensitive gradients in new earthworks to avoid the adverse effects of artificiality in landform. The softening effects of planting will be utilised as a mitigating technique where deemed to assist the environmental ‘fit’ of the proposed road.

11.7.4 Opportunities & Benefits

Visual Amenity

The essence of visual interest for road users lies in exploiting the potential for outward views. Where scenic views of the wider landscape are available, the objective here is to maximise opportunities for their enjoyment and avoid foreground obstruction, for example views out over the proposed flood compensatory storage area between A725 and B7071, the proposed wetland area in front of Bothwell residential area viewed from Raith roundabout. At a more local level, visual interest will be enhanced by the introduction of wild flower seeding to verge areas, ornamental shrub within the road corridor and more native species within the locality of the SSSI/ SINC/ Nature Reserves.

The effects of lighting upon the identified receptors and surrounding landscape resource relate to the preferred route alignment and new junction layouts. The baseline lighting conditions include provision along the main route of the M74 with additional ancillary lighting within the widened road footprint.

Modern lighting columns and lamp detailing will improve visibility for road users without significant light pollution. Lighting and planting mitigation strategy responds to the site context, within an urban environment where a precedent has been established, lighting provision will be considered to an acceptable standard for road safety and light pollution guidelines. Further consideration by the Contractor through the development of specimen design will be required with regard to a comprehensive mitigation strategy where lighting provision is required in line with national guidelines. Mitigation planting design here has looked to minimise adverse effects from light pollution whilst responding to visibility and road safety requirements.

11.7.5 Sustainability & Biodiversity

Design development recognises the principles set out in the Scottish Executive's Cost Effective Landscape: Learning from Nature and Trunk Road Biodiversity Action Plan documents. It aims to maximise sustainability and biodiversity both during construction and in the longer term.

The preferred scheme is anticipated to offer a number of long-term environmental benefits. In particular, the mitigation measures proposed as part of the scheme seek to develop a range of habitat types to offset any adverse effects arising from the scheme and to contribute in the longer term to local biodiversity.

Planting generally seeks to introduce ecologically appropriate native species, whilst retaining an evergreen element for winter interest. In a wildlife context the scheme will aim to reduce the habitat fragmentation effects of the scheme caused by severance through creating new linking planted areas and wetland habitat (SUDS ponds, new wetland scrapes and open ditches).

Design based on natural characteristics is expected to produce a more sustainable scheme in which the commitment to ongoing management is reduced. Long-term maintenance is intended to be minimal and in particular to avoid the need for continuation of frequent verge mowing except where road safety or visibility requirements need to be observed.

Excavations creating interesting cutting features or SUDS attenuation ponds, sensitively shaped, generally rounded topographical formation and with the species-rich or conservation grassland, which when combined with wet planting proposed for outer side slopes and wider verges leads to both ecological and landscape long-term benefits.

Potentially hostile growing conditions have been turned to advantage by discouraging unsuitable cosmetic treatment and focusing on the need for native species used in a manner which reflects the “natural” habitat in the vicinity, in particular sites in particular sites designated for their nature conservation value. New planting has been limited in certain areas to encourage natural regeneration, but provides an important enhancement of the existing vegetation resource. Where plant material is introduced it is substantially based on native species intended to be of local provenance thus optimising survival and growth prospects. The scheme includes the re-introduction of hedgerows to some of the new road boundaries, which have a valuable integrating/linking function.

In combination, all of these elements contribute to increased ecological variety, a more diverse landscape character, and greater visual interest around the junction without prejudice to existing outward views.

The natural characteristics of the scheme design will not only minimise the requirement for landscape maintenance, but also provide a varied series of grassland and scrub/ woodland and wetland habitats the value of which is increased by linkages throughout the scheme. In the long term it is expected that a road landscape environment will develop which is largely self-maintaining and the outer habitat features contributes to nature conservation and local biodiversity. Future liaison with local stakeholders will obviously influence the long-term strategy for aftercare and management.

11.7.6 Indicative Planting Schedule

Species mix within planting types intended to be locally variable to integrate with existing landscape elements and /or for different design objectives.

Semi Natural Woodland, 21,571 m²:

- Fraxinus excelsior (Ash);
- Quercus robur (Oak);
- Fagus sylvatica (Beech);
- Pinus sylvestris (Scots Pine);
- Prunus avium (Gean/Wild Cherry);
- Sorbus aucuparia (Rowan/Mountain Ash);

- Acer pseudoplatanus (Sycamore);
- Crataegus monogyna (Hawthorn);
- Ilex aquifolium (Holly);
- Ligustrum vulgare (Privet);
- Prunus spinosa (Blackthorn);
- Rosa canina (Dog Rose);
- Corylus avellana (Hazel); and
- Salix cinerea (Grey/Sallow)

Wet Woodland, 23,223 m²:

- Fraxinus excelsior (Ash);
- Alnus glutinosa (Common Alder);
- Betula pubescens (Downy Birch);
- Salix caprea (Goat Willow/Great Sallow);
- Salix pragilis (Crack willow);
- Salix viminalis (Osier); and
- Viburnum opulus (Guelder Rose)

Scrub / Shrub, 4,075 m²:

- Betula pubescens (Downy Birch);
- Sorbus aria (Whitebeam);
- Sorbus aucuparia (Rowan/Mountain Ash);
- Prunus padus (Bird Cherry);
- Salix caprea (Grey/Sallow);
- Crataegus monogyna (Hawthorn);
- Rosa canina (Dog Rose);
- Sambucus nigra (Elder);

- Prunus spinosa (Blackthorn);
- Corylus avellana (Hazel); and
- Salix viminalis (Grey/Sallow)

Hedgerow, (1,678 linear/m):

- Crataegus monogyna (Hawthorn);
- Prunus spinosa (Bird Cherry);
- Corylus avellana (Hazel);
- Rosa canina (Dog Rose);
- Fagus sylvatica (Beech)

Hedgerow and Specimen Trees, (51 in number):

- Fraxinus excelsior (Ash);
- Quercus robur (Oak);
- Prunus avium (Gean/Wild Cherry); and
- Fagus sylvatica (Beech)

Grass Seed Mixes

All seeded and herbaceous plant mixes should be of at least UK provenance and will be finalised in conjunction with the relevant Local Authority ecologist before work commences. Natural regeneration is to be encouraged. Planted areas will not be seeded.

Grass Verges

Road verges, visibility splays, and other areas intended for regular mowing as short grass are to be seeded onto 100mm topsoil at 20g/m2 with a minimum maintenance/wide tolerance grass mix including minimum 50% Fescues based on BSH mix A18 or equivalent.

Conservation Grassland

Cutting slopes, embankments and other informal road land not the subject of tree and shrub planting to be seeded onto low nutrient substrate or 100mm economy grade topsoil at 5g/m2 with grass and wildflower mix in an 80/20 combination based on BSH mixes A4 and WFG13 and including a high percentage of Fescues and at least a proportion of Yellow Rattle, Common Knapweed, Ribwort Plantain Yarrow, Ox-eye Daisy, Meadow Buttercup, and Red Campion.

Marginal Wetland

Where wet woodland/scrub planting is not proposed around SUD's attenuation ponds, 50% of the exposed excavated surface is to be seeded when there is least risk of flooding at 5g/m2 with a grass and wildflower mix in an 80/20 combination based on BSH mix WFG9 and including at least Greater Spearwort, Meadow Cranesbill, Purple Loosetrife, Water Speedwell, Greater Burnet, and Crested Dogstail and Meadow Fescue as grass components.

A further 25% of the available area will be randomly planted with informal groups of emergent marginal herbaceous plants at average 4/m2 selected from Common Reed, Marsh Marigold, Hard Rush, Jointed Rush, Soft Rush, Lesser Spearwort, and Purple Loosetrife. Excessively invasive plants such as Typha spp will not be included.

The remaining 25% of the exposed surface shall remain as bare earth to permit colonisation by indigenous pond edge plant communities.

Ornamental Planting, (13,262m²):

Selected from the following or their cultivars:

- Betula pendula (Silver Birch);
- Acer platanoides (Norway Maple);
- Carpinus betulus (Hornbeam);
- Tilia platyphyllos (Large Leaved Lime);
- Tilia platyphyllos (Large Leaved Lime);
- Sorbus aucuparia (Rowan);
- Sorbus aria (Whitebeam);
- Cornus alba (Dog wood);
- Cornus stolonifera (Dog wood);
- Cotoneaster ssp;
- Elaeagnus pungens;
- Prunus laurocerasus;
- Symphoricarpos chenaultii;
- Rosa spp;

- Pyracantha spp; and
- Viburnum tinus.

Woodland, scrub and shrub areas planted at 1m2 using minimum 1+1 transplants 400 – 600mm high and with feathered trees at average 5m c/c where appropriate. Hedgerows planted 6/m in double row with informally spaced feathered or standard trees. Specimen or ornamental trees minimum 8-10cm standards; ornamental shrubs minimum 2 litre pot grown at varying density according to species. Residual Landscape Effects

The mitigation strategy for the scheme is proposed to screen the road infrastructure and its traffic from the adjacent areas (business/recreational) and properties, and to effectively provide the best 'environmental fit' of the scheme into the surrounding landscape.

When mitigation measures proposed for the scheme have been taken into account the residual effects can be stated. For the purposes of this assessment a 'significant effect', either positive or negative is considered to be either moderate or substantial (see table 11.4 above).

Generally, the scheme has the greatest effects on landscape receptors central to the scheme, adjacent to Raith roundabout to the east and west within Bothwell, and lesser effects at the northern end (Orbiston), where construction activity should not affect any identified receptors. This relates to the sensitivity of the landscape resource receptors being affected and the scale or magnitude of effect on the receptors (see Figures 11.2 and 11.3 Landscape Appraisal/Landscape Quality & Appraisal Summary of Effects and Landscape Resource Assessment Tables 11.5 & 11.6).

Very prominent engineered structures include; the new overbridge to Bothwell Park, earth embankments engineered slopes and slipways at the new Raith Junction. It will be difficult to integrate these into the surrounding landscape in the short term, or to fully mitigate any adverse effects, long term. The majority of the proposed scheme footprint follows closely the layout of the existing junction and roads, and any effects are assessed within the context of the existing roads corridors and therefore of lower magnitude as the baseline landscape already includes existing roads and associated infrastructure. It is considered that there will be no significant changes to the wider landscape/landform, but localised changes will occur as described in Effects on Landscape Element above.

Mitigation measures will reduce the adverse impacts of these localised changes and the residual effect on the landscape resource effect in the long term (15 plus years) would be no more than slight adverse/negligible.

Bothwell Park

The changes within the Bothwell Park area will be most apparent during the construction phase when engineering works/ excavation for the proposed flood compensatory storage area, and wetland mitigation area (shallow scrapes and ditches) will be created. The extent of impact upon the landform will be limited to these features, and construction activity related to the remainder of the scheme will not take place within this area in order to protect the vulnerable wetland habitat that currently exists. There will be a loss of tree cover within the central reservation of the A725. In the long term, these new wetland features areas will complement the local landscape character and help to enhance local biodiversity. (Refer to Photo viewpoint's 1 & 3, Figures 11.4 and 11.6) The residual effect when mitigation planting and wetland areas has matured, will be slight beneficial in the long-term.

Strathclyde Country Park

During the construction phase, changes will be apparent adjacent to the A725, where road widening will remove screening vegetation at the north-west end of the park, currently occupied by the caravan park and hotel complex. This loss of vegetation cover and localised landform alteration will be adequately mitigated in the long term by new planting. The construction of a new access road will be apparent to the north of this area, but because of the intervening landform and landcover the proposed access road will have a minor impact for properties; Killmallie House and Douglas Park Cottages. (Refer to Viewpoint 2, 4, & 5) The residual significance of effects will be negligible in the long-term.

Raith Haugh

Raith Haugh SSSI is currently bounded at its northern end by the roundabout and A725. Land take for the scheme is restricted to the removal of boundary habitat – young trees and scrub vegetation. The scheme will not encroach into the core of the site, predominantly affecting the boundary which previously accommodated the footpath link. Residual effects are considered to be slight adverse in the long-term.

Whistleberry Toll

A considerable loss of young and semi-mature plantation woodland cover will occur between the A725 and B7071 where one of the two flood compensatory storage areas is to be situated. Some scattered tree cover will be retained through careful design of the shape and edge of the storage area. The loss of tree cover within the locality cannot be fully replaced as the flood storage area cannot be allowed to return to woodland. Instead the proposed mitigation has sought to complement and diversify local habitats using a species-rich mosaic of native species grassland and wildflowers, scrub and trees. (Photo viewpoints 6, 7 & 12) The subsequent significance of effects on landscape will be moderate adverse in the long-term.

Laighland

Currently the landform in this part of the study area is considered to be of poor landscape character. The proposed SUDS pond and re-aligned (un-named) Burn to be constructed adjacent to the enlarged roundabout will cause temporary adverse effects during the construction phase as earthworks and excavations are carried out (See Photo viewpoints 1, 8, 9 & 10). Over the long term as mitigation planting and the new wetland area matures, there will be a good fit with the local landscape and the significance of the residual effects is likely to be slight beneficial.

11.8 Landscape Summary

The proposed scheme alignment affects the differing landscape character areas directly in relation to the existing road infrastructure, between Bothwell and Orbiston at the Raith Junction. The widening of the M74 on / off roads and A725 corridor increases the footprint of the Raith Junction, however these are not major alterations. The scheme is predominantly within the existing road corridor, apart from the flood compensatory storage areas. Retention of significant roadside planting, sensitive slope design and the introduction of the A725 underpass provision has looked to minimise any significant adverse visual effects. The A725 will underpass the existing Raith Junction, allowing more free flowing traffic. Most of the existing Landscape Baseline has significant roadside tree cover, which will be retained. Where vegetation has been lost, every effort has been made to mitigate the shortfall to address the visual and ecological effects.

Predominantly the main alterations to the Raith Junction and associated roads are in cutting, minimising adverse visual effects. The road underpass for the A725, undercuts the existing Raith roundabout meaning this will not be visible. However, this will require a significant loss of established, valuable vegetation within the existing roundabout: Most significant are the elevated over bridges, vehicular and recreational routes, affecting views along the A725 and from the eastern edge of Bothwell. There is also the permanent loss of planting due to the location of a flood compensatory storage area. Mitigation measures work to address visual adverse effects and the remaining residual adverse effects will be limited to areas immediately around the road corridor.

The landscape effects of the scheme have been minimised by the preferred junction alignment which has sought to limit the adverse impact upon the baseline landform, significant vegetation and ecology of the area. Designated landscape areas of Green Belt, SSSI and SINC's are affected due to the necessary land take and there will also be short-term adverse impacts on roadside screening woodland. Extensive new planting, SUDS attenuation ponds, compensatory flood storage areas and seeding aimed at enhancement of landscape and biodiversity areas to continue the valuable wetland character of the SSSI and SINC within the extent of the new junction.

During the construction phases areas experiencing more moderate adverse effects are limited to the roads themselves and Raith Haugh (SSSI). Strathclyde Country Park is, for the most part, unaffected with areas nearer to the road development experiencing some slight adverse effects. Bothwell encounters some noticeable changes in terms of land cover and land form alterations, but its residual effects would be mitigated in such a way that this location would be considered to have a slight beneficial effect in the long term. The Bothwell Park area experiences moderately adverse effects during the constructional phase due to the location of the compensatory flood storage area. Once the area has been mitigated by appropriate planting/ seeding the residual effect would be considered slight beneficial, as this area will work to extend the wetland character currently found in the locality.

Land cover (vegetation and other features and natural habitats) contribute towards the recognised landscape character type and perceived scenic value around the existing Raith junction. The proposed scheme will remove a small area of land cover within Green Belt land, the designated SSSI and SINC and mature roadside planting. Mitigation measures, will over time, reduce the identified localised changes to the landscape, but the land-take within the footprint of the scheme remains a permanent, but relatively small-scale loss. Residual effects on landscape are considered generally to be slight adverse to slight beneficial and not significant, apart from the associated effects upon Whistleberry Toll, which are localised but moderate adverse due to the significant land cover change owed to the compensatory flood storage area adjacent to the River Clyde.

11.9 Residual Visual Effects

The visual effects associated with the proposed development established previously, highlights the 'magnitude of impact. When mitigation has been taken into account the associated significance of residual effects can be stated. Photo Viewpoints 1 – 13 (see Figures 11.4 – 11.16) outlines sensitivity; magnitude; nature of effect; mitigation and the residual significance of effect. The following section provides a comprehensive summary of the anticipated residual effects on the visual amenity within the study area.

The visual envelope of the scheme extents also relates closely to the surrounding landform and landcover.

The proposed scheme has been designed so as to minimise the likely visual effects by minimising the 'footprint' of the scheme and constructing the new section of A725 in cutting beneath the Raith Roundabout. A new elevated Recreational Route provides a beneficial effect for pedestrians and cyclists, but creates a new feature on the skyline which is difficult to fully screen. There is some permanent woodland loss and roadside screening vegetation (mainly east and west of the M74, along side the A725 and on the roundabout itself). Overall, this will affect the local landscape in terms of its value for screening and visual containment.

There are numerous National Monuments and Recorded Sites (NMRS) within the study area, which are shown on Landscape Effects – Baseline Landscape, Figure 11.1. The setting of one NMRS, Bothwell Park House, which overlooks the junction, would be affected to a negligible degree due to its restricted views over the junction, and hence limited sensitivity to changes at the junction itself.

Bothwell (Residential Area)

With mitigation in place, the residential area along the eastern boundary will have limited views of the improved junction and Recreational Route overbridge, due to the existing topography, intervening built form and the proposed wet woodland planting and scrub introduced around the SUDS pond (Photo viewpoints 8 and 9). Views from low lying properties on Laighlands Road will experience the most visual change. Here, due to the currently low landscape quality (See Figure 11.3, Landscape Effects, Landscape Quality); the long-term benefits of the maturing infrastructure planting and new bunds with the A735 partially in cutting under the roundabout, the residual effect would be moderate beneficial (See Viewpoint 8, Figure 20.5).

The topography of the east side of Bothwell means that properties on higher ground, such as those on Glebe Avenue and Clyde View (see Photo viewpoint's 10 and 12, Figures 11.13 and 11.15), have much restricted views over the junction due to the screening provided by the properties and vegetation in front of them. Due to the scale of the likely short-term effects and any long-term benefits of the maturing infrastructure planting, the residual effect would be slight beneficial. (See Viewpoint 10, Figure 20.6).

Strathclyde Country Park (Recreational)

Views into the Country Park from the western edge (Camp site and Caravan Park) are likely to have altered views due to the loss of roadside planting, established planting within Raith Roundabout and the introduction of the Recreational Route overbridge (see Photo Viewpoints 2 and 4). Due to the scale of the likely short-term effects and any long-term benefits of the maturing infrastructure planting, the residual effect would be slight adverse. (See Viewpoint 4, Figure 20.4).

Views from Strathclyde Country Park will be relatively unaffected by the development proposal. Mitigation planting in and around the roundabout will reinforce the existing seasonal screening to provide a similar view to existing (see Photo Viewpoint 5). Due to the scale of the likely short-term effects and any long-term benefits of the maturing infrastructure planting, the residual effect would be negligible change to existing.

Communication Routes

Road users have the most significant affected views around the junction. Those using the M74, (refer to Viewpoints 1 and 13) have a notable change in vista when travelling towards the Raith Roundabout, due to the loss of vegetation and enlarged road footprint within the location. However, when the vehicles are moving, because of their speed, the receptor is classed as transient. Alterations in the existing view would not be noticed, the route of the road has not changed, only a widening scenario of the existing footprint in certain locations has occurred. Views will be intermittently noticed by road users on other routes, such as those on higher ground travelling south on the A725 (refer to Viewpoint 3). Due to the scale of the likely short-term effects and any long-term benefits of the maturing infrastructure planting, the residual effect would be slight adverse.

The A725 corridor sees changes when travelling north and south within the development area. When travelling from the north a significant quantity of vegetation within the central reservation is lost because of the new underpass beneath the existing Raith Roundabout. Roadside planting is also removed initially because of the road widening of the existing footprint that has occurred (see Photo viewpoints 2 and 3). When travelling north towards the roundabout an obvious change in alignment will have occurred, a loss of roadside vegetation is noticeable, however, the introduction of planting where the road has been removed will assist in providing a more direct vista and help to screen properties in Bothwell on Clyde View (Refer to Viewpoint 7 and 11). Due to the scale of the likely short-term effects and any long-term benefits of the maturing infrastructure planting, the residual effect would be a moderate / slight adverse. (See Viewpoint 11, Figure 20.7).

The slight increase in lighting provision around the junction is likely to have a slight adverse effect, initially affecting the residential properties along the eastern boundary of Bothwell, but after mitigation the residual effect is likely to be negligible / none.

Footpaths Adjacent to Roads

The new Recreational Route is positioned east to west between Bothwell and Orbiston along the A725 and crosses the Raith Junction allowing a direct and safer access into Strathclyde Country Park. The feature becomes visible where it rises above the existing topography to concur with DDA design requirements, where earthworks elevate the path to allow it to meet its associated bridge structures visible on viewpoints 4, 8 & 10. Views to and from the recreational route will be limited due to mitigation planting along the route and on its associated earthworks. However, there will be difficulty in screening this feature fully e.g. from the entrance of Strathclyde Country Park. Due to the scale of the likely short-term effects and any long-term benefits of the maturing infrastructure planting, the residual effect would be a moderate / slight adverse. (See Viewpoint's 4, 8 and 10, Figure's 20.4, 20.5 and 20.6).

11.10 Visual Summary

Overall the visual effects are limited to the more elevated visually intrusive road elements of the road scheme and the improved recreational route between Bothwell and Orbiston via the Strathclyde Country Park, where mitigation measures can not fully screen the associated effects. Raith Junction the cumulative residual effects are likely to be slight adverse Overall within the. Together with the potential long-term ecological and landscape enhancement benefits, which the scheme is expected to promote, the scheme will provide free flowing traffic which will provide less pollution, less noise and less of a visually intrusive element.

11.11 References

Highways Agency, The Scottish Executive Development Department, The National Assembly of Wales and The Department of the Environment for Northern Ireland The Design Manual for Roads and Bridges Volume 11 Environmental Assessment (1993, amended and updated 1998/1999/2000/2001/2003)

The Landscape Institute, the Institute of Environmental Management & Assessment – Guidelines for Landscape and Visual Effects Assessment (Second Edition)

South Lanarkshire (Hamilton District) Local Plan, South Lanarkshire Council Planning and Building Control Services (Adopted August 2000)

Local Planning Issues for the Hamilton Area: Consultation Document, South Lanarkshire Council (May 2003)

Ordnance Survey Map Data

Scottish Natural Heritage (1999) 'No. 116: Glasgow and the Clyde Valley landscape assessment'

12 Traffic Noise and Vibration

12.1 Introduction

The objective of this chapter is to assess the noise impact of the proposed Scheme using the guidance contained within the Design Manual for Roads and Bridges Volume 11, Section 3, Part 7 Traffic Noise and Vibration (DMRB) for a Stage 3 assessment. The Scheme under assessment is that presented as Option D at the DMRB Stage 2 assessment.

This chapter firstly provides a brief Scheme description and provides an overview of the potential changes made during the design process. The chapter then proceeds to explain the basis of road traffic noise and vibration with an explanation of the scope of the study area and methods used for the assessment of noise and vibration, prior to presenting the findings of the actual assessment.

12.2 Scheme Description

This preferred scheme is fully described in Chapter 3. However, for those reading the noise and vibration chapter in isolation a short summary of the scheme follows.

Raith Junction is located at the intersection of the M74 and the A725, adjacent to Bothwell and Belshill. The scheme comprises a 3 level grade separated junction at Raith together with associated works on the A725, M74, Bellshill Road and the B7071.

The following gives an overview of the proposed works:

- **Raith Junction Lower Level, New A725:** The proposed scheme creates a new A725 link and makes provision for the A725 to bypass below the Raith Junction through 3 new underbridges.

- **Raith Junction Upper Level, M74 Alterations:** The proposed scheme requires modification to the M74 (N) diverge and merge slips and M74 (S) diverge slip with minor alteration to the M74 (S) merge slip.

- **Raith Junction Mid Level, Raith Junction:** The proposed scheme aims to follow the alignment of the existing Raith Junction, however the south section requires alteration to accommodate the dual carriageway link road southbound approach to the B7071.

- **Raith Junction, Associated Improvements:** Outwith the Raith Junction, A725 and M74 associated works are proposed to the Whistleberry Toll junction, B7071/Bellshill Road junction, the Orbiston private access.

12.3 Overview of Changes Made During the Design Process

During the course of the development of the Scheme design, various changes have been implemented. The digital terrain model and traffic model used for the acoustic modelling do not take account of these minor modifications and are based on a model of the original scheme. This is because a visual analysis of Raith 2d scheme geometry revisions, dated 02-10-06, revealed that the changes were not acoustically significant, in that the majority of the geometry changes are lane changes within the previously defined and modelled "blacktop" area and as such constitute relatively minor variations to the acoustic model. The changes can be summarised as follows:-

- **M74 Northbound off-ramp to South of Raith; 3rd lane on off-ramp extended Southward:** This was modelled as part of the original update to scheme to take account of ANI. This area fronts onto the existing wetland area and as such no properties which would be affected.

- **3rd lane added at main roundabout at Raith:** The added lane is to the inside of the roundabout and further away from any potentially affected properties of which there are very few (hotel and restaurant at Strathclyde Park).

- **M74 On / off ramps to main roundabout at Raith:** The junctions have been remodelled to have smaller radii, in most cases the resultant noise source is further away from any properties and the actual junction is far from any properties.

- **Changes to pedestrian pavements on the A725 North of Raith and Bellshill Road to accommodate better sight lines and pedestrian safety etc:** The actual positions of the noise source lines do not change. The geometry changes make the road level (circa) platform wider. It is considered that these changes are not significant in terms of the noise assessment.

- **Addition of lane from motorway service area at M74 Southbound, North of Raith:** There is one property in this area; however, the vertical alignment is such that the road is in substantial cut reducing southwards by which time it is more than 300m away from the aforementioned property.

- The various minor landscaping changes associated with the suds ponds etc which will not have a significant impact on the predicted noise levels as a consequence of their location relative to the road and the surrounding topography surrounding.

Ideally, the noise assessment would be based upon the most up to date traffic dataset and digital terrain model. However, the foregoing analysis indicates that the design changes will not impact on the previously predicted noise levels. Also, a detailed study has been carried out on the sensitivity of the acoustic model to these traffic data supplied by SIAS and analysis has shown that changes to the traffic data used for the noise predictions are maintained between the various traffic scenarios are such that the comparative impacts of any such changes are uniform for each scenario (Do-Minimum and Do-Something).

12.4 Traffic Noise and Vibration

The World Health Organisation (2000) has defined noise as unwanted sound, and sound is measured in terms of decibels (dB), however for the purposes of reporting no distinction is made and the terms are used interchangeably. The decibel is not an absolute unit of measurement. It is a ratio between a measured quantity and an agreed reference level. The measured quantity is the variation in atmospheric pressure and the reference level is taken as the lowest pressure to which the ear can respond, i.e. 2×10^{-5} Pa. However, although the audible frequency range extends from 20Hz to 20,000Hz, the ear does not respond equally across this range of frequencies and therefore corrections or "weightings" require to be applied to the measured linear levels to simulate the response of the ear. Consequently, the A-weighting is used to simulate the response of the human ear, so environmental noise is generally measured in terms of dB(A). With noise being assessed as a logarithmic ratio of pressure levels, i.e. decibels, it is sometimes helpful to consider the relationship between the subjective evaluation of noise and the actual objective levels. The following description may provide some assistance in understanding this relationship.

dB(A)	Description
120	Threshold of pain
95	Pneumatic drill (unsilenced); 7m distance
83	Heavy diesel lorry (40 km/h at 7m distance)
81	Modern Twin-engined Jet (at take-off at 152m distance)
70	Passenger Car (60 km/h at 7m distance)
60	Office Environment
50	Ordinary Conversation
40	Library
35	Quiet Bedroom
0	Threshold of hearing

A glossary of acoustical terminology is included as Appendix 12.1.

In terms of noise, road traffic can be separated into two components. The first is generated by the engine, exhaust system and transmission and is the dominant noise source when traffic is not freely flowing. This is particularly apparent from heavy vehicles, when accelerating, braking or changing of gears, and this contributes a significant proportion of low frequency noise. The second noise source component is generated from the interaction of tyres with the road surface. This is the dominant noise source under free flow traffic conditions at moderate to high road speeds and contributes a significant proportion of higher frequency noise.

The sound from a stream of traffic at a reception point is an aggregation of noise from each of a number of vehicles at various distances. The factors that influence the noise level experienced by any listener include the volume of traffic, vehicle speed, the composition of the traffic (i.e. the percentage of heavy goods vehicles (HGVs)), the gradient and the surface characteristics of the carriageway. In addition to the aforementioned variables there is the actual propagation of the sound from the source to the receiver to consider. The propagation is affected by characteristics, such as the distance of the receptor from the source, the topography and characteristics of the ground between the source and receptor, the presence of any screening or barrier effects, and the wind strength and direction.

12.4.1 Measurement of Traffic Noise

The DMRB reports that the A-weighting has been found to give one the best correlations with the perceived noisiness of vehicles. Therefore, road traffic sound is typically measured and predicted in terms of dB(A).

As the sound from a traffic stream is not constant and varies with time it is necessary to use an index of measurement that will be suitable for the assessment of this sound. An analysis of the statistical distributions of sound levels is a useful tool when assessing noise. For example, L_{90}, is the level exceeded for 90% of the measurement time, and L_{10} is the level exceeded for 10% of the measurement time period. The index adopted by the Government to assess road traffic noise is the $L_{A10(18hr)}$, which is the arithmetic mean of the noise levels exceeded for 10% of the time in each of the one hour periods between 06.00 hours and midnight. In general, environmental noise is described in terms of the equivalent continuous sound pressure level, L_{Aeq}.

12.4.2 Traffic Induced Vibration

Traffic-induced vibration is a low frequency disturbance, which can be transmitted through the air or ground. Air-borne vibration from traffic is produced by the drive-train of the vehicle, the engine and exhaust, whereas ground-borne vibration is produced by the interaction between rolling wheels and the road surface.

There are two effects of traffic vibration that need to be considered, these being the effects on buildings and the disturbance caused to occupiers of properties. Extensive research has been carried out on a range of buildings of various ages and types, and no evidence has been found to support the theory that traffic-induced ground-borne vibration is a source of significant damage to buildings (Watts 1990). Ground-borne vibration is much less likely to be the cause of disturbance to occupiers than air-borne vibration (Baughan and Martin 1981, Watts 1984).

However, it can be a source of annoyance to local people, causing vibration in flexible elements within the building, such as doors, windows and, on occasions, the floors of properties close to the carriageway. Neither is there any evidence that traffic induced air-borne vibration can cause even minor damage to buildings. This section, therefore, also addresses the issue of nuisance at properties caused by air-borne vibration.

Investigations have determined a relationship between the number of people affected by the traffic noise and those adversely impacted by air-borne vibration. It was found that the $L_{A10,18h}$ index was among the physical variables most closely associated with average vibration disturbance ratings. The relationships between the percentage of people affected by largely air-borne vibration and this noise exposure index are similar to that for noise nuisance. However, it is recommended in DMRB that the percentage of people bothered by vibration is 10% lower than the corresponding noise nuisance figure, and that at noise levels below 58dB $L_{A10,18h}$, it should be assumed that 0% would be affected.

As the method for assessing vibration is similar to noise nuisance it is subject to the same limitations as discussed previously. In general, when using DMRB Volume 11 to predict disturbance caused by air-borne vibration, it applies directly only to properties within 40m of the road which are un-screened. Outside these conditions, the results of the assessment are considered as only broadly indicative.

12.4.3 Requirements of a DMRB Stage 3 Assessment

Where alterations or improvements are made to the existing road network and where the nature of the changes triggers an assessment in terms of The Environmental Assessment (Scotland) Regulations 1999, an environmental impact assessment has to be undertaken. As part of this assessment the significance of the potential changes in traffic-generated noise has to be determined. In accordance with the requirements of DMRB Volume 11, Section 3, Part 7, a Stage 3 assessment comprises:

- identifying noise sensitive locations and calculating the ambient and proposed noise levels to determine possible noise changes due to the Scheme. As stated above, properties in the vicinity of the proposed road and side roads where traffic as a result of the Scheme increases by 25% or decreases by 20% have been assessed (+25% and -20% represent a 1dB change);
- identifying appropriate mitigation methods to reduce the impact of any adverse effects;
- undertaking a noise nuisance assessment for those properties which experience a noise change of 1dB(A) or more;
- a note on traffic induced vibration, where appropriate; and
- an estimate of the number of properties likely to be eligible in terms of NISR[21].

12.5 Scope of Study Area and Impact Assessment Methods

12.5.1 Scope of Study Area

The operational noise has been considered in terms of the Scheme Study Area. The Scheme Study Area comprises the Core Study Area and the Wider Study Area, with the area 300m either side of the scheme road centre line known as the Core Study Area (as shown in Figures 12.1(a) and (b) through to 12.4(a) and (b). Areas outwith 300m of the road centre line where road traffic flows will change (by +25%, or -20%) as a consequence of changes to traffic flows are known as the Wider Study Area. The Wider Study Area is shown in Figure 12.5 and 12.6.

[21] Noise Insulation (Scotland) Regulations 1975

12.5.2 Impact Assessment Methods

The proposed Scheme is one of three road upgrade proposals that are all closely linked; the other two being the M8 Baillieston to Newhouse, and the M8 Baillieston to Newhouse Associated Network Improvements (ANIs). Both of these other proposals are the subject of separate assessment, however, traffic modelling carried out as part of the assessment of the proposed scheme by SIAS indicates that the objectives and benefits of the Scheme will only be realised if the two other proposals also go ahead. Thus, if the noise assessment were based on traffic data which simulated the construction of the proposed Scheme in isolation, it is considered that this assessment would be based on an underestimate of the traffic flows and operational characteristics most likely to ultimately materialise for the Scheme. The road traffic model has therefore not been run to predict the impacts of the proposed Scheme against a future year baseline of the existing network.

In common with the other sections of this Environmental Statement that deal with impacts related to road traffic, a pragmatic approach has been taken in order to assess the impacts associated with the Scheme. The approach describes the noise impacts that the Scheme is likely to bring about, assuming that each of the other two proposals also goes ahead. It relies on assessing the with-Scheme scenario against an Enhanced Do-Minimum network (EDM), which is in this chapter termed the Raith Reference Case, or RMN, and is described in Chapter 2, for the Year of Opening (2010) and the Design Year (2020). The RMN road traffic model includes committed developments and also representations of both the M8 Baillieston to Newhouse and the ANIs. Thus, the with-Scheme (RAP) results predict the impacts with each of the three proposals in place. The difference between the RMN and the with-Scheme (RAP) is the impact attributable to the M74 Junction 5 Scheme alone.

Because each of the three separate road proposals will clearly influence the same road network, the opportunity has been taken to assess their cumulative impacts. This has been done by comparing the predicted with-Scheme (RAP) traffic flows against those associated with the Committed Do-Minimum (CDM) traffic network (which includes committed developments only). The difference between the CDM and with-Scheme will thus be the cumulative impacts of all three proposals together. The approach can be summarised thus:

- Scheme-only impacts = With-Scheme (RAP) minus RMN
- Cumulative impacts = With-Scheme (RAP) minus CDM

It should also be noted that the noise assessment is based on traffic growth predictions modelled under CSTM[22] using the high growth “Scenario 1”. It is thus a worst-case assessment which is considered unlikely to be achieved in reality. Scenario 2, representing a moderate growth prediction has been used as the basis of other aspects of the scheme design and assessment, but for the noise and vibration and air quality and

[22] Central Scotland Traffic Model

assessments (see Chapter 6 Air Quality), a precautionary approach assessing potential worst case conditions has been adopted in line with guidance set out in DMRB.

It is acknowledged that the DMRB states that the Design Year is considered to be 15 years after the Year of Opening, however, in this instance, traffic flow data were not available for the year 2025.

Road traffic noise has been predicted using the Department of Transport publication '*Calculation of Road Traffic Noise'* 1988 (CRTN) and levels are quoted at the façade unless otherwise indicated. A three dimensional model of the Core Study Area has been created using CAD and the CRTN methodology implemented by importing the CAD model into the Cadna® noise prediction software. All calculations are based on the predicted traffic flows and associated variables as supplied by SIAS. All traffic flows were supplied as 18-hour AAWT (Annual Average Weekday Traffic) flows. The speeds were modelled as am, pm and interpeak speeds and were corrected by SIAS for use with the 18-hour flow.

For the Core Study Area the traffic noise assessment has classified locations according to their ambient level, in bands of below 50 dB(A), 50 to <60 dB(A), 60 to <70 dB(A) and ≥70 dB(A) as required by DMRB. For each ambient noise band, the number of properties and other receptors subject to the following increases or decreases have been assessed: 1 to <3 dB(A), 3 to <5 dB(A), 5 to <10 dB(A), 10 to 15 dB(A) and over 15 dB(A).

Wider Study Area

For the Wider Study Area, which extends as shown in Figure 12.5 and 12.6, an assessment of the potential change in the noise level as a consequence of the Scheme has been made on the basis of changes in traffic flow, speed, percentage of HGVs and road surface and the consequent change in population annoyed (Scottish Transport Appraisal Guidance (STAG), see http://www.scot-tag.org.uk/stag/exec.htm). This is undertaken by a geographical analysis of population data to estimate the population within 50m of all identified links within the Wider Study Area. The links have been identified on the basis of a 25% increase or a 20% decrease in traffic flow arising as a consequence of the Scheme as required by DMRB Volume 11, Section 3, Part 7.

The Wider Study Area assessment is necessary because the introduction of a road where no road existed before, or significant changes to an existing route may result in changes to the traffic flows on the local road network at some distance from actual proposed/changed route and hence it may affect noise levels and the level of perceived annoyance experienced by some local residents already exposed to road traffic noise.

The STAG assessment of the difference in the estimated population who would be annoyed by noise when comparing the do-minimum and do-something scenarios is presented for the Year of Opening (2010) and Design Year (2020), respectively, for both the potential impacts: scheme-only impacts (RAP – RMN) and cumulative impacts (RAP – CDM). STAG requires an estimate of the number of people annoyed by noise in the longer term in the Do-Minimum and Do-Something, based on the population exposed to different noise levels ($L_{Aeq,18hr}$, in 3dB interval bands) multiplied by the Annoyance Response Function (expressed as percentage of the population that are highly bothered by noise).

12.5.3 Significance of Impacts

Whilst DMRB gives no guidance on assessing the significance of effects, this study determines the significance of noise impacts based on the predicted noise levels and magnitude of noise change and the sensitivity of noise receptors. The criteria used to classify the sensitivity of receptors with respect to impacts from noise for this Scheme are defined in Table 12.1. The magnitude of impacts is shown in Table 12.2 and the significance of impact in Table 12.3.

Table 12.1 Criteria used to Define Noise Sensitive[23] Receptors

Sensitivity	Description	Examples of Receptors
High	Receptors where people or operations are particularly susceptible to noise	Residential Quiet outdoor areas used for recreation Conference facilities Auditoria/studios Schools in daytime Hospitals/residential care homes
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance	Offices Restaurants
Low	Receptors where distraction or disturbance from noise is minimal	Residences and other buildings not occupied during working hours. Factories and working environments with existing high noise levels.

To facilitate an understanding of the magnitude of change it is necessary to appreciate that when considering two sounds of similar acoustic properties, i.e. similar spectral and temporal characteristics, a change of more than 3 dB(A) is regarded as being just perceptible to the human ear under normal conditions. The magnitude of impact can therefore be based on this acoustic 'rule of thumb', supplemented with the evidence contained within DMRB Vol. 11, Section 3, Part 7, Chapter 3, Paragraph 3.5. The latter highlights that "*people are more sensitive to abrupt changes in traffic noise associated with new road Schemes than would be predicted from the steady state evidence. In the period following a change in traffic flow, people may find benefits or disbenefits when the noise changes are as small as 1 dB(A)".*

The magnitude of impact has therefore been assessed by comparison between the increase or decrease in noise levels between the Enhanced Do-minimum and With-Scheme options as defined as shown in Table 12.2.

[23] Where people live or work

Table 12.2 Magnitude of Impacts due to Changes in Road Traffic Noise

Change in Noise Level	Magnitude of Impact
5 dB(A) and greater	High adverse
3 to < 5 dB(A)	Medium adverse
1 to < 3 dB(A)	Low adverse
0 to < 1 dB(A)	Negligible adverse
0 dB(A)	No impact
0 to < -1 dB(A)	Negligible beneficial
-1 to < -3 dB(A)	Low beneficial
-3 to < -5 dB(A)	Medium beneficial
-5 dB(A) and greater	High beneficial

The significance of noise impacts is determined according to the relationship between magnitude and sensitivity as shown in Table 12.3.

Table 12.3 Significance of Noise Impacts

Magnitude	Sensitivity		
	Low	Medium	High
High	Moderate	Moderate / Substantial	Substantial
Medium	Slight / Moderate	Moderate	Moderate / Substantial
Low	Negligible / Slight	Slight / Moderate	Moderate
Negligible	Negligible	Negligible / Slight	Slight
No Impact	None	None	None

Whilst all properties have been assessed in accordance with the DMRB, for discussion purposes some properties and locations have been selected as representative on the basis of one or more of the following principles:

- where it has been considered that buildings may qualify for sound insulation;
- where it has been anticipated that properties will experience significant changes in noise level; and
- where properties are representative of surrounding buildings and the effects of noise will be similar.

Mitigation will be considered where the significance of impact is identified as being "Moderate" or worse. It should also be noted that mitigation is primarily aimed at the ground floor of properties. This is because it is necessary that in all cases where mitigation is considered, the mitigation measures should comply with acceptable standards in terms of traffic, safety, environmental and economic terms (DMRB Vol 11, Sect 2, Part 3, Mitigation, paragraph 1.2(a). Obvious examples which could preclude their use are, disproportionate cost and unacceptable visual impact.

12.5.4 Determination of Ambient Noise Climate

To facilitate a nuisance assessment as required by DMRB it is necessary to know the existing ambient noise level within the area potentially affected by the scheme. DMRB advises that there are three basic types of ambient noise situations which can occur:-

(i) where the ambient noise is dominated by traffic noise;

(ii) where the ambient noise is comprised of a combination of several undefined sources such as might be encountered in low noise sites in rural settings; or

(iii) where the ambient noise is dominated by noise from non-road traffic sources such as aircraft or trains.

For condition (i) the ambient noise should be measured using L_{A10}. For condition (ii) it is advised that the L_{A10} may be inappropriate and suggests that while the L_{Aeq} parameter could be considered, the L_{A90} scale is a suitable alternative. For condition (iii) DMRB recommends the L_{A90}. The ambient noise climate is reported in Section 12.6.

12.5.5 Noise and Vibration Nuisance

DMRB states that a noise nuisance assessment should be carried out. However, DMRB makes clear that because of the variability in individual responses, practical research has moved from the idea of explaining individual attitudes or annoyance with noise and has instead adopted the concept of community annoyance ratings. It is therefore important to realise that the results of the nuisance assessment should not be related to individual annoyance response. The term ‘nuisance’ is assessed as the percentage of people bothered by traffic noise (i.e. those who say they are ‘very much’ or ‘quite a lot’ bothered on a four point worded scale).

DMRB details procedures for estimating changes in traffic noise nuisance when a new road scheme is planned. This procedure relies on the results from surveys which have examined the relationship between objective measures of road traffic noise outside residential properties and the percentage of people bothered by road traffic noise. The National Environmental Survey 1977 (Harland and Abbot, 1997), has shown that once people become accustomed to a change in noise, their general dissatisfaction with traffic noise does not alter until changes in level on the $L_{A10,18h}$ scale exceed at least 3 dB(A). However, in the period immediately following the completion of a road scheme, people may find appreciable benefits or disbenefits when noise changes are less than 3 dB(A). Recent research indicates that an abrupt change in traffic noise as small as 1 dB(A) may result in a 21% change in the number of people bothered very much or quite a lot by road traffic noise. A noise disturbance assessment is, therefore, made for all properties where the noise change is expected to be 1 dB(A) or greater within the Core Network and the can estimate of the change in the number of people likely to be annoyed for the Wider network undertaken as outlined in Section 12.5.2 . This change in noise level would be produced by a change in traffic flow of approximately +25%/-20% assuming that other factors, such as the average speed and the percentage of HGVs, remain unchanged.

DMRB defines a 'steady-state' relationship between noise exposure and noise nuisance and also shows a relationship between changes in noise nuisance (on the same nuisance scale) and changes in noise exposure. It shows that the change in nuisance soon after a sudden change in noise is much greater than would be predicted from the steady state curve. Noise nuisance predictions for the scheme are based on the highest nuisance levels expected during the first 15 years after opening. These assessments have been undertaken in accordance with the predictive technique presented in DMRB, although the method has limitations as discussed in the following paragraph.

The surveys on which the DMRB assessment method were based were conducted at sites where road traffic was the dominant noise source, noise levels ranged from 65 to 78 dB $L_{A10,18h}$, the changes in traffic noise were up to 10 dB $L_{A10,18h}$, and properties were up to 18m from the road. Therefore, it is only at these noise levels/changes and distance ranges that the method is strictly valid. The DMRB method is also valid only for noise changes caused by alterations in traffic flow variables. It will not necessarily give a good prediction if traffic noise changes are brought about by other means such as barriers or low noise road surfaces. As the nuisance assessment is based on changes in road traffic noise level it should be noted that where the ambient descriptor is L_{A90} and not L_{A10}, the nuisance assessment results are strictly not applicable. However, DMRB, Volume 11, Section 3, Part 7, Chapter 8 Paragraph 5.10 states that "*Strictly, the method should not be used outside the noise and distance ranges covered by the surveys, or when the ambient noise is not from traffic. However, it seems likely that the mechanisms underlying the survey results will operate outside these ranges. Until better information becomes available, it is recommended that the method is used to predict nuisance changes outside these noise and distance ranges, albeit with caution*".

The previous Stage 2 assessment required an assessment of the number of buildings likely to be exposed to perceptible vibrations along the route. However a Stage 3 assessment (which this is) only requires a note on traffic induced vibration where necessary. The vibration nuisance assessment presented in this chapter is for comparison only and is not indicative of individual responses. Also, only properties within approximately 40m of the centre line, which have predicted levels greater than 58dB $L_{A10(18hr)}$, have been included. This is because the DMRB's vibration bother relationship is only valid out to a distance of 40m. An estimation of vibration nuisance for the existing situation is given in Section 12.6.1

12.5.6 Noise Insulation

DMRB also requires an indication of the number of properties which are likely to be eligible for statutory insulation. The Noise Insulation (Scotland) Regulations 1975 provide for noise insulation to be offered in respect of residential properties. The qualifying criteria are detailed within the Regulations and within the Memorandum on the Noise Insulation (Scotland) Regulations 1975 (NISR), regulations 3 and 6: The qualifying criteria are as follows:

- the properties are situated within 300 metres of the new or altered carriageway;
- the properties lie within the triangular area at the terminal point of the new road, the apexes of which are 50m along the centre-line of the existing road from the terminal points and the bases of which extend from points 300m on either side of

the road to the nearest point on the carriageway at right angles to the centre line of the carriageway;

- a straight line can be drawn from any point of the property to a point on the carriageway without passing through another building;
- the use of the road causes or is expected to cause noise at a level not less than 68 dB(A); and
- the property will experience noise levels exceeding the ‘prevailing noise level’ by at least 1.0 dB(A).

The prediction method detailed within the aforementioned Memorandum has been improved over the years and the present methodology contained within CRTN is more accurate and detailed. While DMRB does allow for the use of the method detailed within the Memorandum the predictive tool employed in this assessment is Cadna® and it uses the predictive methods set out in CRTN to calculate noise levels. While the CRTN methodology is more detailed and accurate than that contained within the Memorandum, the NISR strictly requires that eligibility be assessed in terms of the Memorandum. Therefore, this assessment uses a CRTN predicted level of 65dB(A) as a preliminary indicator of the need to utilise the full Memorandum methodology assessment of eligibility where all the other qualifying criteria are met.

12.6 Baseline Conditions and Calibration of Noise Model

Site visits and measurements of existing baseline noise at sample properties were undertaken at the Stage 2 assessment and that information is reproduced in this chapter. The closest properties to the Raith Junction are those situated in Bothwell to the South West of the M74. The closest properties are in Bothwellpark Road, Laighlands Road, Langside Road and Clyde View. The properties in Clyde View and parts of Laighlands Road are sited on elevated ground. As the noise climate within this area is presently dominated by the M74, B7071 and the A725, the existing noise climate could, , have been determined by means of CRTN predictions as per the guidance in DMRB Volume 11, Section 3, Part 7 Chapter 5, Paragraph 5.6(i). However, the base year traffic flow data were not available for the Stage 2 assessment. However, factored 2005 traffic data are now available and the Stage 2 measurements have been used to calibrate the 3d model created for the Stage 3 assessment.

Measurements of the existing ambient free field noise levels were undertaken on 16th and 17th March 2005. The measured levels are presented in Table 12.4.

The instrumentation used for measurement and the calibration statement together with the meteorological conditions are included as Appendix 12.1. Free field (ff) means that the receiver location is taken as being at least 3.5m from the building façade and therefore does not account for a façade effect (+2.5dB(A) due to the sound pressure level doubling that is taken to occur when the incident sound is reflected from a façade). To compare free field and facade measurements a correction of +2.5dB(A) must be added to a free field level to facilitate comparison with a facade level.

Table 12.4 Existing Ambient Levels at Representative Sample Properties

Sample Receiver Location	Start Time	Elapsed Time	Equivalent Measured Ambient Level $L_{A10(T)}$dB* (ff)	Site Notes
24 Clyde View	14:27:33	00:15:00	61.2	Light precipitation though not enough for traffic to produce spray. Southerly wind 3.1m/s. Meter positioned 3.5m from garden wall. No cars passed by on Clyde View .
7 Clyde View	12:00:02	00:15:00	63.0	No precipitation. South Easterly wind 1.9m/s. Meter positioned parallel with Southerly gable 18m to east of house. 6m from kerb.
5 Laighlands Road	14:07:09	00:15:00	58.4	No precipitation. Southerly wind 5.1m/s. Meter positioned 1.8m from garden perimeter at kerbside – 5 cars passed by on road. Ambulance with siren on M74 for 75 seconds.
71 Olifard Avenue*	10:18:11	00:15:00	$L_{A90(18hr)}$ 47.4	No precipitation. Southerly wind 6.8m/s. Meter positioned at kerbside. 2 cars passed by on road. Power tool was being used some distance away for 28 seconds.
27 Laighlands Road≠	13:42:13	00:15:00	54.8	No precipitation. South Easterly wind 4.5m/s. Meter positioned 3.5m from garden wall at kerbside – 6 cars passed by on road.
Laighlands Road	11:32:39	00:15:00	56.4	No precipitation. Easterly wind 1.5m/s. Meter positioned 4.5m north and 7m west of western garage façade. Field of view of M74 was restricted to approx. 110 degrees by garage.
Summerhill, The Glebe	11:07:45	00:14:32	59.2	No precipitation. Easterly wind 2.8m/s. Meter positioned parallel with Easterly garden wall, 10m north. Measurement stopped short due to power tool being used.

*For the measurement location at 71 Olifard Avenue the existing level of road traffic did not dominate the noise climate. The measurement was made at the building facade facing away from the Raith Junction and, since the Stage 3 model assesses the façade closest to the Raith Junction the predicted 2005 $L_{A10(T)}$ will be used as being representative of the existing noise climate.

≠This measurement location was also significantly shielded from the Raith Junction and therefore the predicted 2005 $L_{A10(T)}$ will be used as being representative of the existing noise climate.

Whilst the existing noise climate, where road traffic noise dominates, can be determined using the methodology set out in CRTN, it should be noted that the DMRB does not expect perfect agreement between measured and predicted levels. It is stated in DMRB that with regard to the actual measured levels *"Care is needed in the interpreting of the levels of the $L_{A10,18h}$ recorded. These will vary from day to day during the year, depending on the influence of varying traffic and weather conditions and seasonal effects."* It is therefore recommended that where the ambient levels are determined by road traffic the predicted levels of $L_{A10,18h}$ provide a more reliable measure for an average day and these are therefore used in the assessment and the measured levels are used as a basis for calibration of the noise model. Where the existing noise climate is not determined by existing road traffic the existing ambient level will be described in terms of the measured L_{A90}.

Table 12.5 Existing 2005 Measured Levels vs Modelled Predicted Levels at Representative Sample Properties/Locations (1.5m above ground level)

Sample Receiver Location	Measured Ambient Level $L_{A10,15min}$dB* (ff)	Measured Ambient Level $L_{A10(15mins1}$B* (façade)	Predicted $L_{A10(18hr)}$ dB
24 Clyde View	61.2	63.7	66.2
7 Clyde View	63.0	65.5	66.7
5 Laighlands Road	58.4	60.9	63.5
27 Laighlands Road	54.8	57.3	64.7
Laighlands Road	56.4	58.9	61.1
***Summerhill, The Glebe**	59.2	61.7	65.6

*T= 14mins 32 seconds

Bearing in mind the DMRB advice in relation to the use of measured levels, with the exception of 27 Laighlands Road (see comment ≠ at Table 12.4), there is reasonable agreement between the short term measured and the predicted 18 hour noise levels.

In addition to the properties included in the Tables 12.4 and 12.5 there are also other noise sensitive areas worthy of note; namely:

- Pond, Laighlands Road
- Pond, Laighlands Road
- Pond, Bothwell Park Wood
- Pond, Bothwell Park Wood
- Pond, Strathclyde Country Park
- Rowing Club, Strathclyde Loch
- River Clyde, Near A726
- Playfield, Strathclyde Country Park
- Playfield, Strathclyde Country Park
- Park, Strathclyde Country Park
- Laighlands Stables, Laighlands Road
- Bothwell Park, Bothwell Park Road
- Woods , Bothwell Park Wood
- Plantation, Black Muir Plantation
- Park Buildings, Strathclyde Country Park
- Park Building, Bothwell Park Road
- Pavilion, Strathclyde Country Park

The predicted noise level for the above named amenity areas together with the associated significance of impact is reported in Figure 12.8.

The numbers of residential and commercial/industrial properties within the Core Study Area (300m either side of the With Scheme road centre lines) are shown in Table 12.6 together with the number of recreational/amenity areas, schools and farms. These implied uses are based on whether an address has an organisation associated with it. It should be noted that the study area is more defined than that undertaken for the Stage 2 assessment. The properties identified in the Stage 2 property count that are not included in Table 12.6 below are included in the Wider Network Assessment.

Table 12.6 Number of Properties within 300m Either Side of the Raith Junction Centre Lines as Existing (Core Study Area)

Distance Band	Residential	Industrial	Amenity	Farm	School	Sensitive	Unknown
0 – 50m	9	2	6	0	0	1	0
50 – 100m	109	3	6	0	0	3	4
100 – 200m	207	2	9	0	0	1	3
200 – 300m	213	2	4	0	0	1	5
Total	538	9	25	0	0	6	12

12.6.1 Estimation of Percentage of people Likely to be Bothered by Vibration for the Existing Situation

There are 7 properties contained within the Core Study Area that are within approximately 40m of the existing Raith Junction, which exceed the 58 dB $L_{A10(18hr)}$ threshold. However, only four of these are residential properties. Table 12.7 provides an estimation of the percentage of people likely to bothered very much or quite a lot by vibration, before any change in traffic.

Table 12.7 Existing Vibration Assessment (2005)

Sample Receiver Location	Predicted $L_{A10(18hr)}$ dB (Facade)	Estimation of Traffic Vibration Nuisance (% of people bothered by vibration)
5 Clydeview	66.6	15
7 Clydeview	66.7	15
22 Clydeview	65.6	13
24 Clydeview	66.2	14

12.7 Predicted Impacts

12.7.1 RAP, RNM and CDM for 2010 and 2020:Noise

DMRB requires that the Do-minimum and Do-something scenarios be assessed for both the year of opening and the worst year in the first fifteen years after the Scheme has opened. The fifteenth year following the Scheme opening is normally referred to as the design year. However, in this instance, as has been previously stated in Section 12.5.2, there is no traffic data available for 2025 and therefore data for 2020 has been used.

The predicted potential impacts include the effects of using low noise road surfacing throughout the scheme. Quieter road surfaces such as Stone Mastic Asphalt (SMA), or a pervious material, would be likely to reduce noise levels by approximately 2.5dB $L_{A1018hr}$ compared with conventional hot rolled asphalt surfacing. However, this benefit is related to the speed of the traffic on the road, and at speeds less than approximately 50kph the noise benefits will be insignificant. The roads on which quieter surfaces have been used in the noise model are shown in Figure 12.9. It should be appreciated that this is a conservative estimate of the likely extent of such surfaces.

The noise levels, predicted using the full three dimensional model, will vary from those used at the Stage 2 assessment. It must be stressed that these differences are not critical to the current assessment as Stage 2 was a relative comparison of scheme options. The predicted unmitigated noise levels for the Base Year, and for RAP, RMN and CDM for both 2010 and 2025, together with the associated significance of impacts for the with Scheme Options (RAP) for selected sample properties are presented in Table 12.8(a) and 12.8(b) for ground and first floors respectively. Figures 12.1(a) and (b) detail the noise levels and the RMN versus RAP 2010 and 2020 significance of impact for each of the sample receptor locations. Also included in these figures are the noise contours for 2020 With Scheme scenario.

In addition to the 2005 on-site measurements further receptors have been identified as being representative of other properties within the area potentially affected by the scheme, and as the noise climate at all of these receptors was dominated by road traffic noise, the existing noise level has been predicted in terms of $L_{A10(T),}$ using 2005 traffic flow data factored from the 2000 Base flows. The predicted and measured baseline noise levels are shown in Table 12.5. In order to facilitate a comparison between the measured and predicted modelled noise levels, +2.5dB correction must be added to the measured levels, since the modelled levels include this correction.

Although the following Tables present noise levels and significance of impacts for sample receptor locations only, an assessment has been undertaken for all 590 receptor locations within the Core Network Area.

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Table 12.8(a) Base 2005, RMN and CDM Predicted Noise Levels for 2010 and 2020 (Unmitigated) and Scheme Significance of Impact at 1.5m (Ground Floor)

Property	Base 2005	CDM 2010	CDM 2020	RMN 2010	RMN 2020	RAP 2010	RAP 2020	SOI* RMN vs RAP (2010)	SOI* RMN vs RAP (2020)
27 Laighlands Road	64.7	66.1	66.5	66.6	67.0	66.3	66.4	Slight Beneficial	Slight Beneficial
1 Farm Court	61.0	62.2	63.1	62.3	62.8	61.6	62.3	Slight Beneficial	Slight Beneficial
24 Clydeview	66.2	67.1	67.4	68.0	68.2	67.4	67.7	Slight Beneficial	Slight Beneficial
71 Olifard Avenue	64.7	66.4	67.0	66.5	67.1	66.5	67.0	No Benefit	Slight Beneficial
18 Wordsworth Way	67.2	68.9	69.7	68.9	69.6	69.2	69.9	Slight Adverse	Slight Adverse
58 Wordsworth Way	67.8	69.6	70.4	69.4	70.1	69.8	70.6	Slight Adverse	Slight Adverse
2 Glebe Hollow	55.9	57.5	57.9	57.8	58.3	57.5	57.7	Slight Beneficial	Slight Beneficial
Bothwellpark House, Bothwellpark Road	63.7	65.2	65.6	65.4	65.9	65.7	65.8	Slight Adverse	Slight Beneficial
7 Clydeview	66.7	67.6	67.9	68.1	68.3	67.9	68.2	Slight Beneficial	Slight Beneficial
Kirklands Hospital, Fallside Road	75.1	76.7	77.5	76.5	77.2	76.8	77.6	Slight Adverse	Slight Adverse
5 Laighlands Road	63.5	64.7	65.0	65.2	65.5	64.9	65.1	Slight Beneficial	Slight Beneficial
Summerhill, The Glebe	65.6	67.1	67.5	67.6	68.1	67.5	67.6	Slight Beneficial	Slight Beneficial
44 Laighlands Road	61.1	62.7	63.2	62.9	63.4	62.6	62.8	Slight Beneficial	Slight Beneficial
Strathclyde Park Inn, Hamilton Road	71.8	73.6	73.9	73.8	74.4	73.5	73.8	Slight Beneficial	Slight Beneficial
24 Brandon Place	62.7	63.2	63.5	63.2	63.3	67.6	67.8	Moderate/ Substantial Adverse	Moderate/ Substantial Adverse
Bothwell Park Farm Cottage	60.2	61.8	62.6	61.7	62.3	61.9	62.7	Slight Adverse	Slight Adverse

*SOI = Significance of Impact

Table 12.8(b) Base 2005, RMN and CDM Predicted Noise Levels for 2010 and 2020 (Unmitigated) and Scheme Significance of Impact at 4.5m (First Floor)

Property	Base 2005	CDM 2010	CDM 2020	RMN 2010	RMN 2020	RAP 2010	RAP 2020	SOI* RMN vs RAP (2010)	SOI* RMN vs RAP (2020)
27 Laighlands Road	65.3	66.7	67.1	67.2	67.6	66.9	67.0	Slight Beneficial	Slight Beneficial
1 Farm Court	62.9	64.1	65.0	64.1	64.6	63.4	64.1	Slight Beneficial	Slight Beneficial
24 Clydeview	66.6	68.4	68.7	69.3	69.5	68.6	68.9	Slight Beneficial	Slight Beneficial
71 Olifard Avenue	65.6	69.0	69.6	69.1	69.7	69.1	69.6	No Benefit	Slight Beneficial
18 Wordsworth Way	68.3	72.6	73.4	72.6	73.2	72.9	73.6	Slight Adverse	Slight Adverse
58 Wordsworth Way	71.9	73.7	74.5	73.6	74.3	73.8	74.6	Slight Adverse	Slight Adverse
2 Glebe Hollow	57.3	58.8	59.2	59.7	60.1	58.9	59.1	Slight Beneficial	Slight Beneficial
Bothwellpark House, Bothwellpark Road	64.2	66.0	66.4	66.2	66.7	66.3	66.4	Slight Adverse	Slight Beneficial
7 Clydeview	67.0	68.8	69.1	69.3	69.5	69.2	69.5	Slight Beneficial	No Benefit
Kirklands Hospital, Fallside Road	77.1	78.7	79.5	78.6	79.3	79.0	79.8	Slight Adverse	Slight Adverse
5 Laighlands Road	65.1	65.7	66.0	66.2	66.6	66.0	66.2	Slight Beneficial	Slight Beneficial
Summerhill, The Glebe	66.4	68.0	68.4	68.3	68.8	68.2	68.3	Slight Beneficial	Slight Beneficial
44 Laighlands Road	61.5	64.3	64.8	64.3	64.8	64.0	64.2	Slight Beneficial	Slight Beneficial
Strathclyde Park Inn, Hamilton Road	72.6	74.9	75.2	75.2	75.7	74.9	75.2	Slight Beneficial	Slight Beneficial
24 Brandon Place	64.7	66.3	66.6	66.3	66.4	72.1	72.3	Substantial Adverse	Substantial Adverse
Bothwell Park Farm Cottage	61.5	63.1	63.9	62.9	63.6	63.2	64.0	Slight Adverse	Slight Adverse

*SOI = Significance of Impact

Reference to Tables 12.8a) and 12.8(b) shows that only one property at Brandon Pace, which is representative of proprieties in the Bellshill area to the south east of the A725 at its junction with the B7070, has a significance of impact such that mitigation should be considered.

The results of the analysis in relation to the amenity areas area presented in Figure 12.8 where it can be seen that there are beneficial impacts as a consequence of the A725 being in cut close to the Raith junction. This is of significance as the only amenity areas to be adversely affected are the Pond area at Strathclyde Park, the River Clyde near the A726 and Bothwell Park Wood for 2020 with the Scheme in place. All of the other amenity areas listed underneath Table 12.5 will experience beneficial impacts.

12.7.2 RAP, RMN and CDM: Vibration

The assessment of the change in the percentage of people likely to be bothered by vibration as a consequence of the scheme is given in the DMRB summary tables included as Appendix 12.2, for both potential impacts: Scheme-only (RAP – RMN) and Cumulative impacts (RAP – CDM).

12.8 Mitigation

As was previously stated mitigation is to be considered where the significance of impact has been determined as Moderate Adverse or worse (RMN vs. RAP). Such impacts have been found to occur for the effective Design Year, i.e. 2020 within the area represented by Brandon Pace. This property is representative of other properties in the Bellshill area to the south east of the A725 at its junction with the B7070.

The recommended mitigation takes the form of 2m high acoustic screens relative to the ground level. The barriers must be at the very least 15kg/m^2 close boarded timber fencing. There must be no gaps in and between the timbers and this usually necessitates overlapping timbers. It is essential that there are no gaps between the base of the barrier and the ground on which it sits. The location and height of the acoustics screens are as shown on Figures 12.3(a) and (b) and Figures 12.4(a) and (b).

The resultant mitigated levels and the associated derived significance of impact are as presented in Section 12.9, which addresses residual impacts.

The extent of the 3-dimensional geometry was limited to the Core Study Area, as defined in Section 12.5.1. Therefore, it was not possible to fully evaluate the noise impacts and the effect of mitigation beyond this area. Yet, it is clear that the increase in traffic flows on the A725, east of the Raith Junction to the Bellshill Roundabout, is such that it is recommended that the aforementioned mitigation should be extended to the Bellshill Roundabout. The extent of the proposed mitigation is detailed in Figure 12.7.

12.9 Residual Impacts

Residual impacts, i.e. impacts after mitigation has been considered, are as reported in Tables 12.9(a) and 12.9(b) for ground and first floor respectively. The significance of impacts following mitigation is also reported in Tables 12.11(a) and 12.11(b).

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Table 12. 9(a) Base 2005, RMN and CDM Predicted Noise Levels for 2010 and 2020 (mitigated) at 1.5m (Ground Floor)

Property	Base 2005	CDM 2010	CDM 2020	RMN 2010	RMN 2020	RAP 2010	RAP 2020	SOI* RMN vs RAP (2010)	SOI* RMN vs RAP (2020)
27 Laighlands Road	64.7	66.1	66.5	66.6	67	66.3	66.4	Slight Beneficial	Slight Beneficial
1 Farm Court	61	62.2	63.1	62.3	62.8	61.6	62.3	Slight Beneficial	Slight Beneficial
24 Clydeview	66.2	67.1	67.4	68	68.2	67.4	67.7	Slight Beneficial	Slight Beneficial
71 Olifard Avenue	64.7	66.4	67	66.5	67.1	66.5	67	No Benefit	Slight Beneficial
18 Wordsworth Way	67.2	68.9	69.7	68.9	69.6	69.2	69.9	Slight Adverse	Slight Adverse
58 Wordsworth Way	67.8	69.6	70.4	69.4	70.1	69.8	70.6	Slight Adverse	Slight Adverse
2 Glebe Hollow	55.9	57.5	57.9	57.8	58.3	57.5	57.7	Slight Beneficial	Slight Beneficial
Bothwellpark House, Bothwellpark Road	63.7	65.2	65.6	65.4	65.9	65.7	65.8	Slight Adverse	Slight Beneficial
7 Clydeview	66.7	67.6	67.9	68.1	68.3	67.9	68.2	Slight Beneficial	Slight Beneficial
Kirklands Hospital, Fallside Road	75.1	76.7	77.5	76.5	77.2	76.8	77.6	Slight Adverse	Slight Adverse
5 Laighlands Road	63.5	64.7	65	65.2	65.5	64.9	65.1	Slight Beneficial	Slight Beneficial
Summerhill, The Glebe	65.6	67.1	67.5	67.6	68.1	67.5	67.6	Slight Beneficial	Slight Beneficial
44 Laighlands Road	61.1	62.7	63.2	62.9	63.4	62.6	62.8	Slight Beneficial	Slight Beneficial
Strathclyde Park Inn, Hamilton Road	71.8	73.6	73.9	73.8	74.4	73.5	73.8	Slight Beneficial	Slight Beneficial
24 Brandon Place	62.7	63.2	63.5	63.2	63.3	64.4	64.6	Moderate Adverse	Moderate Adverse
Bothwell Park Farm Cottage	60.2	61.8	62.6	61.7	62.3	61.9	62.7	Slight Adverse	Slight Adverse

*SOI = Significance of Impact

Table 12. 9(b) Base 2005, RMN and CDM Predicted Noise Levels for 2010 and 2020 (mitigated) and Scheme Significance of Impact at 4.5m (First Floor)

Property	Base 2005	CDM 2010	CDM 2020	RMN 2010	RMN 2020	RAP 2010	RAP 2020	SOI* RMN vs RAP (2010)	SOI* RMN vs RAP (2020)
27 Laighlands Road	65.3	66.7	67.1	67.2	67.6	66.9	67.0	Slight Beneficial	Slight Beneficial
1 Farm Court	62.9	64.1	65.0	64.1	64.6	63.4	64.1	Slight Beneficial	Slight Beneficial
24 Clydeview	66.6	68.4	68.7	69.3	69.5	68.6	68.9	Slight Beneficial	Slight Beneficial
71 Olifard Avenue	65.6	69.0	69.6	69.1	69.7	69.1	69.6	No Benefit	Slight Beneficial
18 Wordsworth Way	68.3	72.6	73.4	72.6	73.2	72.9	73.6	Slight Adverse	Slight Adverse
58 Wordsworth Way	71.9	73.7	74.5	73.6	74.3	73.8	74.6	Slight Adverse	Slight Adverse
2 Glebe Hollow	57.3	58.8	59.2	59.7	60.1	58.9	59.1	Slight Beneficial	Slight Beneficial
Bothwellpark House, Bothwellpark Road	64.2	66.0	66.4	66.2	66.7	66.3	66.4	Slight Adverse	Slight Beneficial
7 Clydeview	67.0	68.8	69.1	69.3	69.5	69.2	69.5	Slight Beneficial	No Benefit
Kirklands Hospital, Fallside Road	77.1	78.7	79.5	78.6	79.3	79.0	79.8	Slight Adverse	Slight Adverse
5 Laighlands Road	65.1	65.7	66.0	66.2	66.6	66.0	66.2	Slight Beneficial	Slight Beneficial
Summerhill, The Glebe	66.4	68.0	68.4	68.3	68.8	68.2	68.3	Slight Beneficial	Slight Beneficial
44 Laighlands Road	61.5	64.3	64.8	64.3	64.8	64.0	64.2	Slight Beneficial	Slight Beneficial
Strathclyde Park Inn, Hamilton Road	72.6	74.9	75.2	75.2	75.7	74.9	75.2	Slight Beneficial	Slight Beneficial
24 Brandon Place	64.7	66.3	66.6	66.3	66.4	67.5	67.7	Moderate Adverse	Moderate Adverse
Bothwell Park Farm Cottage	61.5	63.1	63.9	62.9	63.6	63.2	64.0	Slight Adverse	Slight Adverse

*SOI = Significance of Impact

As can be seen, by comparing the ground floor levels for the year 2020 with and without mitigation, the properties represented by the sample receiver at 24 Brandon Place remain within the Moderate Adverse significance of impact category. However, reference to the actual predicted noise levels shows that the predicted noise level only exceeds the Slight Adverse categorisation by 0.3dB in the year 2010 and 0.1dB in the year 2020.

A review of all the properties within the area represented by 24 Brandon Place demonstrates the net gains that result from the specified mitigation. These net gains are detailed in Table 12.10

Table 12.10 Modelled Bellshill Area Net Gains Resulting from Specified Mitigation

Significance of Impact	2010 Benefits	2020 Benefits
Substantial Adverse	0	0
Moderate/ Substantial Adverse	-1	-3
Moderate Adverse	-31	-25
Slight Adverse	25	23
No Benefit	1	1
Slight Beneficial	6	4
Moderate Beneficial	0	0
Moderate/ Substantial Beneficial	0	0
Substantial Beneficial	0	0

12.10 Nuisance

DMRB makes it clear that because of the variability in individual responses, practical research has moved from the idea of explaining individual attitudes or annoyance with noise and has instead adopted the concept of community annoyance ratings. It is therefore important to realise that the results of the nuisance assessment should not be related to individual annoyance response. The “nuisance assessment” provided in the DMRB summary tables included as Appendix 12.2 allows a comparison of changes in reported community nuisance level only. The results should not be considered in terms of the response likely at individual properties.

12.11 Noise Insulation

Under the Noise Insulation (Scotland) Regulations 1975 some properties may be eligible for grant in order to further mitigate the impact of traffic noise due in part to the scheme. A count of (potentially) eligible domestic properties has been carried out and those meeting the proxy exposure level of greater than $L_{A10,18hour}$ 65 dB for the Do Something 2020 with mitigation, is 72 at ground floor and 127 at first floor.

12.12 Cumulative Impacts

As previously explained the cumulative assessment has been undertaken by comparing the predicted With-Scheme traffic (RAP) flows against the flows associated with the Committed Do-Minimum (CDM) traffic network (which includes committed developments only). This is, in effect, a comparison of different baselines with the 2020 With-scheme, with-mitigation scenario. The difference between the RMN and the CDM represents the cumulative impacts the proposals described in Section 12.5.2. The Cumulative Impact results and associated significance of impact are presented in Tables 12.11(a) and 12.11(b) for ground and first floor respectively.

Table 12.11(a) Cumulative Impacts: Comparison of RAP and CDM Significance of Impacts (with mitigation) for 2010 and 2020 at Ground Floor

Property	Unmitigated		Mitigated	
	SOI* CDM vs RAP (2010)	SOI* CDM vs RAP (2020)	SOI* CDM vs RAP (2010)	SOI* CDM vs RAP (2020)
27 Laighlands Road	Slight Adverse	Slight Beneficial	Slight Adverse	Slight Beneficial
1 Farm Court	Slight Beneficial	Slight Beneficial	Slight Beneficial	Slight Beneficial
24 Clydeview	Slight Adverse	Slight Adverse	Slight Adverse	Slight Adverse
71 Olifard Avenue	Slight Adverse	No Benefit	Slight Adverse	No Benefit
18 Wordsworth Way	Slight Adverse	Slight Adverse	Slight Adverse	Slight Adverse
58 Wordsworth Way	Slight Adverse	Slight Adverse	Slight Adverse	Slight Adverse
2 Glebe Hollow	No Benefit	Slight Beneficial	No Benefit	Slight Beneficial
Bothwellpark House, Bothwellpark Road	Slight Adverse	Slight Adverse	Slight Adverse	Slight Adverse
7 Clydeview	Slight Adverse	Slight Adverse	Slight Adverse	Slight Adverse
Kirklands Hospital, Fallside Road	Slight Adverse	Slight Adverse	Slight Adverse	Slight Adverse
5 Laighlands Road	Slight Adverse	Slight Adverse	Slight Adverse	Slight Adverse
Summerhill, The Glebe	Slight Adverse	Slight Adverse	Slight Adverse	Slight Adverse
44 Laighlands Road	Slight Beneficial	Slight Beneficial	Slight Beneficial	Slight Beneficial
Strathclyde Park Inn, Hamilton Road	Slight Beneficial	Slight Beneficial	Slight Beneficial	Slight Beneficial
24 Brandon Place	Moderate/ Substantial Adverse	Moderate/ Substantial Adverse	Moderate Adverse	Moderate Adverse
Bothwell Park Farm Cottage	Slight Adverse	Slight Adverse	Slight Adverse	Slight Adverse

Table 12.11(b) Cumulative Impacts: Comparison of RAP and CDM Significance of Impacts (with mitigation) for 2010 and 2020 at First Floor

Property	Unmitigated		Mitigated	
	SOI* CDM vs RAP (2010)	SOI* CDM vs RAP (2020)	SOI* CDM vs RAP (2010)	SOI* CDM vs RAP (2020)
27 Laighlands Road	Slight Adverse	Slight Beneficial	Slight Adverse	Slight Beneficial
1 Farm Court	Slight Beneficial	Slight Beneficial	Slight Beneficial	Slight Beneficial
24 Clydeview	Slight Adverse	Slight Adverse	Slight Adverse	Slight Adverse
71 Olifard Avenue	Slight Adverse	No Benefit	Slight Adverse	No Benefit
18 Wordsworth Way	Slight Adverse	Slight Adverse	Slight Adverse	Slight Adverse
58 Wordsworth Way	Slight Adverse	Slight Adverse	Slight Adverse	Slight Adverse
2 Glebe Hollow	Slight Adverse	Slight Beneficial	Slight Adverse	Slight Beneficial
Bothwellpark House, Bothwellpark Road	Slight Adverse	No Benefit	Slight Adverse	No Benefit
7 Clydeview	Slight Adverse	Slight Adverse	Slight Adverse	Slight Adverse
Kirklands Hospital, Fallside Road	Slight Adverse	Slight Adverse	Slight Adverse	Slight Adverse
5 Laighlands Road	Slight Adverse	Slight Adverse	Slight Adverse	Slight Adverse
Summerhill, The Glebe	Slight Adverse	Slight Beneficial	Slight Adverse	Slight Beneficial
44 Laighlands Road	Slight Beneficial	Slight Beneficial	Slight Beneficial	Slight Beneficial
Strathclyde Park Inn, Hamilton Road	No Benefit	No Benefit	No Benefit	No Benefit
24 Brandon Place	Substantial Adverse	Substantial Adverse	Moderate Adverse	Moderate Adverse
Bothwell Park Farm Cottage	Slight Adverse	Slight Adverse	Slight Adverse	Slight Adverse

Tables 12.11(a) and 12.11(b) illustrate that there are no significant differences between the cumulative impacts and the potential With-scheme impacts. In effect, the differences between the RMN and the CDM are not significant in terms of noise impacts, i.e. the differences between the RMN and CDM noise levels for each of the assessment years is generally less than 1dB.

12.13 Wider Network Assessment

The Wider Network assessment has been made on the basis of changes in traffic flow, and the consequent change in population annoyed by noise, as detailed within the Scottish Transport Appraisal Guidance (STAG). The extent of the Wider Network can be viewed in Figures 12.5 and 12.6. The assessment has been undertaken by a geographical analysis of population data to estimate the number of people living within 50m of all identified roads within the Wider Study Area. The roads were identified on the basis of a predicted 25% increase or a 20% decrease in traffic flow, as required by DMRB.

The roads which are predicted to experience a change of +25% or -20% in flow as a consequence of the scheme without the further mitigation, are shown in Figures 12.5 and 12.6 for RAP versus RMN and RAP versus CDM respectively.

The STAG assessment of the difference in the estimated population who may be annoyed by noise when comparing the do-minimum and do-something scenarios is presented in Tables 12.12 and 12.13 the RAP versus RMN and RAP versus CDM respectively. STAG requires an estimate of the number of people annoyed by noise in the longer term in the Do-Minimum and Do-Something, based on the population exposed to different noise levels ($L_{Aeq,\ 18hr}$, in 3dB interval bands) multiplied by the Annoyance Response Function (expressed as % highly bothered by noise).

Table 12.12a): Number of Households Experiencing RMN and RAP Noise Levels (given in dBL_{eq}) in Opening Year

	Do Something	<45	45-47.9	48-50.9	51-53.9	54-56.9	57-59.9	60-62.9	63-65.9	66-68.9	69-71.9	72-74.9	75-77.9	78-80.9	81+
Do Minimum															
<45		27	0	0	0	0	0	0	0	0	0	0	0	0	0
45-47.9		0	2	1	0	0	0	0	0	0	0	0	0	0	0
48-50.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
51-53.9		0	0	0	2	13	0	0	0	0	0	0	0	0	0
54-56.9		0	0	0	32	184	10	0	0	0	0	0	0	0	0
57-59.9		0	0	0	0	152	674	99	0	0	0	0	0	0	0
60-62.9		0	0	0	0	1	346	1762	166	0	0	0	0	0	0
63-65.9		0	0	0	0	0	3	512	2794	188	12	0	0	0	0
66-68.9		0	0	0	0	0	0	6	568	3438	166	2	0	0	0
69-71.9		0	0	0	0	0	0	1	4	391	2304	120	0	0	0
72-74.9		0	0	0	0	0	0	0	0	20	225	699	15	7	0
75-77.9		0	0	0	0	0	0	0	0	1	1	62	548	38	0
78-80.9		0	0	0	0	0	0	0	0	0	10	5	54	38	4
81+		0	0	0	0	0	0	0	0	0	0	3	5	1	3

Table 12.12b): Number of Households Experiencing RMN and RAP Noise Levels (given in dBL$_{eq}$) in Design Year

	Do Something	<45	45-47.9	48-50.9	51-53.9	54-56.9	57-59.9	60-62.9	63-65.9	66-68.9	69-71.9	72-74.9	75-77.9	78-80.9	81+
Do Minimum															
<45		29	0	0	0	0	0	0	0	0	0	0	0	0	0
45-47.9		0	1	0	0	0	0	0	0	0	0	0	0	0	0
48-50.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
51-53.9		0	0	1	60	23	0	0	0	0	0	0	0	0	0
54-56.9		0	0	0	14	260	27	0	0	0	0	0	0	0	0
57-59.9		0	0	0	0	187	850	153	0	0	0	0	0	0	0
60-62.9		0	0	0	0	5	373	1982	234	0	0	0	0	0	0
63-65.9		0	0	0	0	0	1	524	2982	240	12	0	0	0	0
66-68.9		0	0	0	0	0	0	1	601	3328	171	0	0	0	0
69-71.9		0	0	0	0	0	0	0	2	330	2011	56	0	0	0
72-74.9		0	0	0	0	0	0	0	0	2	96	729	23	0	0
75-77.9		0	0	0	0	0	0	0	0	0	6	26	318	32	0
78-80.9		0	0	0	0	0	0	0	0	0	0	7	2	19	0
81+		0	0	0	0	0	0	0	0	0	0	0	0	0	1

Table 12.13(a): Number of Households Experiencing CDM and RAP Noise Levels (given in dBL_{eq}) in Opening Year

Do Minimum	Do Something	<45	45-47.9	48-50.9	51-53.9	54-56.9	57-59.9	60-62.9	63-65.9	66-68.9	69-71.9	72-74.9	75-77.9	78-80.9	81+
<45		27	2	0	0	0	0	0	0	0	0	0	0	0	0
45-47.9		0	0	1	0	0	0	0	0	0	0	0	0	0	0
48-50.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
51-53.9		0	0	0	33	35	17	0	0	0	0	0	0	0	0
54-56.9		0	0	0	1	247	64	34	0	0	0	0	0	0	0
57-59.9		0	0	0	0	64	729	228	70	0	0	0	0	0	0
60-62.9		0	0	0	0	4	211	1865	438	87	0	0	0	0	0
63-65.9		0	0	0	0	0	12	250	2807	586	27	0	0	0	0
66-68.9		0	0	0	0	0	0	3	215	3212	627	19	1	1	0
69-71.9		0	0	0	0	0	0	0	2	152	2016	331	1	0	0
72-74.9		0	0	0	0	0	0	0	0	1	48	532	317	12	0
75-77.9		0	0	0	0	0	0	0	0	0	0	9	292	57	3
78-80.9		0	0	0	0	0	0	0	0	0	0	0	11	13	3
81+		0	0	0	0	0	0	0	0	0	0	0	0	1	1

Table 12.13b): Number of Households Experiencing CDM and RAP Noise Levels (given in dBL_{eq}) in Design Year

	Do Something	<45	45-47.9	48-50.9	51-53.9	54-56.9	57-59.9	60-62.9	63-65.9	66-68.9	69-71.9	72-74.9	75-77.9	78-80.9	81+
Do Minimum															
<45		29	0	0	0	0	0	0	0	0	0	0	0	0	0
45-47.9		0	1	0	0	0	0	0	0	0	0	0	0	0	0
48-50.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
51-53.9		0	0	1	56	28	0	0	0	0	0	0	0	0	0
54-56.9		0	0	0	18	282	46	0	0	0	0	0	0	0	0
57-59.9		0	0	0	0	152	814	123	2	0	0	0	0	0	0
60-62.9		0	0	0	0	13	364	2012	215	1	0	0	0	0	0
63-65.9		0	0	0	0	0	27	513	2990	140	12	0	0	0	0
66-68.9		0	0	0	0	0	0	12	607	3337	119	1	2	0	0
69-71.9		0	0	0	0	0	0	0	5	420	2048	28	1	0	0
72-74.9		0	0	0	0	0	0	0	0	2	109	755	44	0	0
75-77.9		0	0	0	0	0	0	0	0	0	8	25	294	34	0
78-80.9		0	0	0	0	0	0	0	0	0	0	9	2	16	0
81+		0	0	0	0	0	0	0	0	0	0	0	0	1	1

The results show that with the scheme in place the net results over the Wider Study Area, i.e. outwith the Core Study Area, the net annoyance change in the 10th year after opening will be that 187 fewer people out of a total of 37,097 will be annoyed by noise than would be annoyed with the RMN in place. Similarly, with the CDM option as the base there will be 248 fewer people out of a total of 37,097 who will be annoyed by noise. Clearly, statistically, the differences between the With-scheme and reference cases are not significant.

12.14 Summary

The noise impact of the proposed scheme has been assessed by means of the DMRB future year comparison; that is assessing the difference in the noise levels for the Year of Opening (2010) and the Design Year (2020) for the With–scheme (RAP) and the RNM (Do-minimum). In addition an assessment of cumulative impacts has been undertaken using the CDM as a Do-minimum option and comparing it with the RAP.

The network has been considered in terms of a Core and Wider Study Area, with the Core Study Area comprising a distance of 300m either side of the carriageway centrelines and the Wider Study Area covering all areas where 1dB(A) changes are predicted to occur (equivalent to +25%, -20% changes in traffic flow). The traffic variables were supplied by SIAS as described earlier in the text.

The sample receptors results have been reported in the foregoing text, however the summary results for the 566 classified receptors is as shown below in Table 12.14 for the With-scheme option. It has been previously demonstrated that there is no significant difference between the RMN versus RAP and the CDM versus RAP and therefore only the RAP effects are reported in Table 12.14.

Table 12.14Significance of Impact for all 566 Classified Receptors (RAP and RMN)

Number Of Affected Properties In Noise Categories		
Category Of Significance Of Impact	**Number At Ground Floor**	**Number At First Floor**
Substantial Adverse	0	0
Moderate/ Substantial Adverse	0	0
Moderate Adverse	53	58
Slight/ Moderate Adverse	0	0
Slight Adverse	239	222
Negligible/ Slight Adverse	0	0
Negligible Adverse	1	1
No Benefit	42	24
Negligible Beneficial	6	7
Negligible/ Slight Beneficial	11	10
Slight Beneficial	189	216
Slight/ Moderate Beneficial	4	4
Moderate Beneficial	21	23
Moderate/ Substantial Beneficial	0	0
Substantial Beneficial	0	1

It has been reported that under the Noise Insulation (Scotland) Regulations 1975 some properties may be eligible for double glazing in order to further mitigate the impact of traffic noise due in part to the scheme. A count of (potentially) eligible domestic properties has been carried out and those meeting the unshielded exposure level of greater than $L_{A10,18hour}$ 65 dB for the Do Something 2020 with mitigation, is 72 at ground floor and 127 at first floor.

Under the requirements of the DMRB, all properties that experience a change in noise level of 1 dB(A) or more must be classified into ambient noise level bands of below 50 dB(A), 50 to <60 dB(A), 60 to<70 dB(A) and ≥70 dB(A). This has been undertaken as is reported in Appendix 12.2. For this assessment there are no properties in the less than 50dB(A) ambient noise band. It is estimated that under the proposed scheme 24 more properties will experience an increase of 1dB or more with the scheme in place than with the RMN alternative. In terms of nuisance there is no difference. The properties that experience a noise increase are, in general, represented by Brandon Place. This is because the specified mitigation does not mitigate against the increase in noise resulting from the increase in traffic on the B7070 Hamilton Road.

As the preferred route results in a slightly greater number of properties experiencing an increased noise level when compared with the do-minimum option (RMN), it can be concluded that the preferred route results are marginally more adverse than beneficial impacts. However, it should be appreciated that these adverse impacts occur in a relatively small localised area and with further mitigation such as acoustic barriers (nominally 1.8-2m high close boarded timber fencing) along the B7070 these adverse impacts will be further reduced (the use of quieter road surfaces is not appropriate because of speeds).

Moreover, with the exception of the Pond area at Strathclyde Park, the River Clyde near the A726 and Bothwell Park Wood all amenity areas listed underneath Table 12.5 will experience beneficial impacts.

12.15 References

World Health Organisation, *Community Noise* 1999/2000

Watts, G.R. (1990) TRRL Research Report 246 *Traffic Induced Vibration in Buildings*

Baughan and Martin 1981, (see DMRB references)

Watts, G. R. (1984), *Vibration Nuisance from Road Traffic – results of a 50 site survey*

Design Manual for Roads and Bridges (DMRB); Volume 11, Section 3, Part 7 Traffic Noise and Vibration

Calculation of Road Traffic Noise (CRTN); Department of Transport Welsh Office, 1988

Scottish Transport Appraisal Guidance (STAG)
http://www.scot-tag.org.uk/stag/exec.htm.

13 Pedestrians, Cyclists, Equestrians and Community Effects

13.1 Introduction

The objective of this chapter is to report on the potential effects on pedestrians, cyclists, equestrians (NMU's) and the community of the proposed Raith Junction improvement scheme. The assessment is based on the conceptual design for the scheme as described in Chapter 3.

13.2 Method of Assessment

This chapter has been prepared in general accordance with the principles and techniques for Environmental Assessment as described in Volume 11 of the Design Manual for Roads and Bridges (DMRB).

The assessment was based on a study of relevant plans and other published documents listed at Section 13.7 and has been supplemented by walkover surveys to update and confirm site specific information. Consultation was also undertaken with the following bodies and organisations:

- North Lanarkshire Council (NLC)
- Strathclyde Country Park Managers
- South Lanarkshire Council (SLC)
- Strathclyde Passenger Transport (SPT)
- Scottish National Heritage (SNH)
- SUSTRANS
- Cyclist Touring Club (CTC)
- British Horse Society (BHS)

The assessment examines current 'non-motorised' accessibility by the local population to services and facilities adjacent to Raith Junction. In order to gauge the extent to which these services are most required reference has been made to the distribution of 'zero car households' identified for census output areas from the 2001 Census of Population, as shown in Figure 13.1.

The predicted impact of the proposed scheme upon these routes has been classified as either 'high', 'medium' or 'low' depending upon a combination of the following factors:

- Route status – i.e. national, regional, local/informal

- Observed level of use by non-motorised users
- Likely level of importance to local communities as a means of providing access to key facilities by non-motorised means.

13.3 Baseline Conditions

Figure 13.2 shows existing footpaths and cycleways as well as the locations of a number of key community facilities. There are no designated bridlepaths that cross the Raith Junction. The 2 main non-vehicular routes in the area are:

- A footway running from Bothwell to Bellshill and crossing the junction.
- The Clyde Walkway.

Strathclyde Country Park is located to the north east of the junction and is an important facility for the nearby communities of Bothwell and Bellshill. The community of Bothwell is required to cross the junction to access the park. The park offers a number of leisure activities including water sports, playing fields, a hotel, public house and an Amusement Park (M&Ds).

The junction currently provides the only formal means of NMU access between:

- The communities of Bothwell and Bellshill/ Orbiston
- Sections of the Clyde Walkway

As shown by Figure 13.1, the communities of both Bothwell and Bellshill enjoy high levels of car ownership suggesting relatively little dependence on non-motorised means of travel for access to key services. Hence, use of the NMU routes is unlikely to be required by these communities for essential travel and the routes are likely to be used primarily on a recreational basis.

Figure 13.1 also shows however, that areas of Blantyre are subject to relatively low levels of car ownership, suggesting that a significant amount of the local population in this community would depend on non-motorised forms of transport to access facilities across the junction.

Bothwell to Strathclyde Country Park and Bellshill

The existing route across Raith junction for NMU's is extremely difficult. For pedestrians and cyclists from the south of the junction to reach the signed route from Bothwell to Orbiston/Bellshill, they have to cross the Hamilton Road/Bellshill Road roundabout. Here, crossing times for NMU's may be high particularly for those wishing to cross the Hamilton Road from Hamilton, which typically sees two-way vehicle flows of up to 2600 during the peak hour. As the footways terminate on the Bellshill Road, just north of the first set of bus stops, this necessitates a crossing to the footway on the Bothwell side of the Bothwell Slip. No crossing facilities are provided for those wishing to cross from the Hamilton side of the Bellshill Road Dual carriageway at this point.

The footway on the western side of the A725(s) leads to a signed route across the Raith junction. To negotiate the signed route from Bothwell to Bellshill/Orbiston, requires users to negotiate the Raith junction and the following crossings points as described below:

- A signal-controlled crossing of the Bellshill Road to the central reserve. Then a second signal-controlled crossing of the circulatory carriageway to the central island of the Raith Junction. A third set of pedestrian signals is encountered as NMU's are required to cross the circulatory carriageway of the roundabout before passing beneath M74. This involves a relatively short wait for NMU's each time a crossing is called, collectively however the delay can be substantial.

- The crossing beneath the M74 is unpleasant in terms of darkness and noise.

- As Figure 13.2 shows, the pedestrian or cyclist encounters a more hazardous crossing of the M74 southbound (for Carlisle) on-slip. A set of pedestrian signals previously existed at this point. However, these signals have never been operational and have since been removed. This necessitates having to navigate a gap in the fast moving traffic to reach the far side of the slip. As well as presenting a safety risk this can lead to substantial delays.

- The final crossing point is the uncontrolled crossing of the western access to the Strathclyde Country Park. Drop kerbs and coloured surfacing exists at this point to indicate the presence of the crossing. During the week the crossing time required is considered negligible. At weekends and during events in the park, it is envisaged that more significant delays may be incurred.

Paths across the junction are narrow and often immediately adjacent to heavy flows of fast moving vehicles. In combination with the absence of pedestrian signals across the M74 south on-slip (noted above), these features, taken together, create a route across the junction that is difficult to negotiate and unattractive to users.

To the north of the junction the footway adjacent to the A725 rises steeply at 8% immediately adjacent to the southbound carriageway to a bridge over the West Coast Main Rail Line (WCML). The footway is not considered to be Disability Discrimination Act (DDA) 2005 compliant, as it does not comply with the 'Inclusive Mobility' guidelines,. However as the footway follows the existing topography and is required to cross above the WCML it is not practicable to alter the gradient significantly. This approach has been accepted during the Stage 3 consultations. The bridge over the WCML is partially blocked for NMU's at this point due to protective measures installed on the structure. The line of the path is broken by vehicular entrances to the Strathclyde Country Park and private properties. Although vehicular activity is likely to be low at these entrances, turning vehicles could present a danger to NMUs, especially to fast moving cyclists coming from the Bellshill direction down the steep slope. The path, once past the bridge then continues into Bellshill and to the turn off to the Mary Rae Road roundabout.

Clyde Walkway

The Clyde Walkway is a long-distance path along the River Clyde which connects various communities and facilities from Glasgow Centre out through the south-east of the conurbation to Motherwell, Lanark and beyond. As shown in Figure 13.2, the route runs along the border of Hamilton Low Parks Site of Special Scientific Interest (SSSI) between the A725 at Bothwell and the M74, an area subject to periodic flooding. The route as defined is designated to continue across the junction and then through Strathclyde Country Park, parallel and west of the M74. Clyde Walkway access across the junction shares the same route infrastructure described above. This section of the walkway is a significant diversion away from the banks of the Clyde which the route normally follows elsewhere.

Although the Clyde Walkway is designated to pass across the junction, at present there is no clear means of achieving this. It requires crossing either the A725 (s) or the M74 westbound off-slip road. Although traffic signal control is in operation across the M74 westbound off-slip, this does not include pedestrian signals. The alternative means of access would be across the A725 (s) approach but there is no crossing provided, signal controlled or otherwise. Combined with the current unattractive state of other parts of the route across the junction described above, the current Clyde Walkway is effectively severed as a continuous and safe route for non-motorised travellers in the vicinity of the junction.

The Clyde Walkway route through Strathclyde Country Park as shown on Figure 13.2 is proposed for designation by SUSTRANS as part of Route 74 of the National Cycle Network (NCN). This route continues along the Strathclyde Country Park access road approach to the Raith Junction where it would join the current route provision across the junction. NCN Route 74 is proposed to continue through Bothwell along Laighlands Road, off the A725 south of the Raith Junction. A number of short paths within Strathclyde Country Park are also available in the vicinity of the hotel on the approach to Strathclyde Loch.

Site observations suggest that existing NMU use of these routes is low, perhaps as low as 1-2 per weekday. This is consistent with the lack of major community facilities in the area with any significant travel-generation characteristics (e.g. hospitals and shops). It is also consistent with the difficulties imposed on pedestrians and cyclists wishing to cross the junction and associated roads as described above. These factors suggest that some potential non-motorised travel, for example to Strathclyde Country Park, between the communities of Bothwell and Bellshill and along the Clyde Walkway, is suppressed.

Consultations with SLC and NLC generally confirm these observations. SLC has also advised that they see the proposed scheme as providing an opportunity to address the shortcomings of the current provision with a view to encouraging more travel across the junction by pedestrians, cyclists, equestrians and other NMUs. The potential extent of additional non-motorised journeys that might be realised by an appropriate scheme design is not expected to be significant in terms of absolute numbers of person trips as both the communities closest to the junction, Bothwell and Bellshill/Orbiston enjoy relatively high car ownership levels and do not rely on pedestrian/cycle facilities. However, any such increase will be of value to the amenity and well-being of local communities, in particular Blantyre.

Public Transport

Bus stops as shown on Figure 13.2 are currently provided on either side of the Bellshill Road, approximately 100m north of the junction with Hamilton Road, and a single stop is provided approximately 35m north of the Bothwell Slip. The latter serves as the closest stop to Strathclyde Country Park. Passengers wishing to alight at these stops and travel north to Orbiston or the Country Park must also use the difficult NMU route across the junction as described above.

Summary

The preceding discussions present an assessment of the baseline conditions for non-motorised travel within the footprint affected by the proposed scheme, identifying the extent to which existing networks for non motorised users are sensitive to change with regards to route/ network status, current levels of use and importance to local communities as a means of providing access to key facilities Table 13.1 summarises this review.

Table 13.1 shows that the existing NMU route between Bothwell and Bellshill, despite its low use, is particularly sensitive to change as it is the only effective route between these communities and is therefore subject to a ‘High’ sensitivity to change. It is also the only reasonable route for communities of Blantyre and Bothwell to access what is considered a key facility, Strathclyde County Park. The route is considered to be particularly significant to the community of Blantyre which relies more heavily on the non-motorised modes.

Table 13.1 also shows that the level of use of the section of Clyde Walkway affected by the proposed scheme is low and although of regional importance, the currently effectively severed route will only be subject to a ‘Medium sensitivity’.

Table 13.1 Baseline Path Networks – Sensitivities to Change

Sensitivity	Area/ Route	Comment
High	Footway between Bothwell to Bellshill/ Orbiston and the Strathclyde Country Park	Route of local importance, connecting the communitu of Bothwell to Bellshill and the Strathclyde Country Park. Currently subject to low levels of use but with significant potential for more non-motorised trips.
Medium	Clyde Walkway	Route of regional importance that follows the River Clyde between the centre of Glasgow and the Falls of Clyde at New Lanark. Currently effectively severed at the Raith Junction is subject to low levels of use but with significant potential for more non-motorised trips.

13.4 Scheme Impact and Mitigation

The proposed scheme shown in summary in Figure 13.3 involves routing the A725 beneath the existing junction. Without mitigation measures in place to protect and maintain access and community amenity, the scheme has the potential to cause adverse impacts upon pedestrians, cyclists and community interests. It is considered that the scheme will have negligible impacts on equestrian users in the area.

The modifications to the junction have presented an opportunity to improve existing NMU facilities and effectively reconnect the Clyde Walkway. The works see the provision of two bridges as shown on Figure 13.3, removing the conflicts previously described in the existing situation. The proposals are shown in more detail in Figures 13.4 to 13.6 these should be cross-referenced against the conceptual design as listed in Table 13.2.

Table 13.2 Mitigation Proposals – Conceptual Designs

Figure Reference	Location
13.4	Hamilton Road/ Bothwell Link Road Junction
13.4/13.5	Bothwell Link Road Shared Foot/ Cycleway
13.5	A725 Off Slip/ Bothwell Slip/ Link Road
13.6	Footbridge 1
13.6	M74 Underpass
13.6	Footbridge 2
13.6	A725 (n) Shared Foot/ Cycleway

Mitigation and Access Improvements

The proposed scheme incorporates a number of measures designed to improve and facilitate NMU access across and around the junction. These measures both mitigate for the impact of the scheme on the existing routes, and provide positive enhancements to current conditions for NMUs. In summary the enhanced provision includes:

- Extra crossing points signals and bridges that will reduce or remove pedestrian/ cyclists and vehicle conflicts,
- Widened footway/ paths which will achieve DDA compliance, especially in terms of dual use paths, being 3m wide in accordance with the desirable minimum specified by Local Transport Note (LTN 2/04),
- Protective 2m wide verges between vehicular traffic lanes and pedestrian/ cycleways and paths, which are considered to provide a safety barrier and create a better environment for users,
- A clear signage strategy will be established for pedestrians/ cyclists crossing the junction,
- Improved lighting across the junction particularly in the existing M74 underpasses,
- A fully accessible design for the ramps and bridges, which meets the DDA standards. The existing gradient along the A725 (n) between the Strathclyde Country Park and the West Coast Main Line railway.
- Provision for the proposed NCN 74,
- Improved access to the Clyde Walkway.

A more detailed description of the access routes to be incorporated into the scheme is set out below.

Hamilton Road/ Bothwell Link Road junction

This junction will be converted from the current roundabout layout to a more NMU-friendly signalised layout. The modified junction shown in Figure 13.4 will incorporate advanced stop lines on Hamilton Road and signalised pedestrian crossing of the Hamilton Road from Hamilton and the new link road. Although small waiting times may be encountered for NMU's at crossing, off peak, during the peak hours it is anticipated that this layout will be much safer and result in more frequent crossing opportunities, particularly for those crossing the Hamilton Road from Hamilton the dominant traffic flow at the junction.

Figure 13.4 shows a new shared use foot/cycle way from this junction along the southeastern side of the Bothwell Link Road has also been proposed which links into the Raith junction crossing facilities and a new footway on the Bothwell side of the Link Road.

The shared use foot/cycle way will be separated from the main carriageway by a 2m verge.

A725 Off Slip/ Bothwell Slip/ Link Road

Heading north along the Bothwell Link Road, the next substantial crossing point encountered by NMU's will be at the Bothwell Slip/ A725 Off Slip signalised junction as shown on Figure 13.5. For NMU's on the new pedestrian/ cycleway along side the Bothwell Link Road, this will involve a single crossing of the A725 Off Slip direct to the new facilities across the Raith Junction. This route is far more expedient than the existing route from Hamilton Road which terminates at the existing bus stops on the B7071 Bellshill Road.

NMU's coming from the Bothwell side of the Bothwell link road as shown on Figure 13.5 will most likely follow a route which involves the crossing of the Bothwell Slip, the Link Road and the A725 Off Slip.

This location creates the opportunity for a future tie-in of the Proposed NCN74 at Langside Road, as shown on Figure 13.5. The proposed route of the NCN74 would pass by a new path to the rear of the houses on Clyde View to the Bothwell Slip; the existing tree belt would be partially retained between the housing and the path providing screening for the houses. It is anticipated that the crossing of the Bothwell Slip would not necessitate signalisation due to the low level of traffic flows. A cyclist or other NMU would then cross the Bothwell Link Road and the A725 Off Slip using the crossing points described above.

The dominant traffic flow at this point involves a vehicular movement of approximately 1400 during the peak hour in 2010, leaving the A725 northbound, turning right and joining the M74 westbound. The crossing provision at this point involves a two stage crossing facility where users cross the Link Road whilst the A725 Off Slip is clearing and then cross the A725 Off Slip (or vice versa). This means that non-motorised users can cross in safety while traffic on the A725 Off Slip is not subjected to excessive delays with consequential queuing back to the main A725 carriageway.

A number of alternative layouts were considered before the preferred crossing solution described above was arrived at. These are discussed briefly below.

1. Toucan crossing of the Bothwell Link Road – this would require the stopping of traffic on the A725 Slip Road for an unacceptable period of time, undermining the scheme objective of making improvements to traffic flows around Raith junction. During the peak period particularly, traffic on the A725 Off Slip would back up onto the A725, resulting in severe congestion and major safety concerns.

2. Staggered crossing. At this location such a design would comprise 3 traffic stages in the signal sequence; the NMU signal phases could only be run during 2 of these stages. This could lead to NMU's becoming stranded on the central island of the dual carriageway during a 3rd (traffic-only) signal stage until the next suitable phase. This would necessitate a large storage area on the central island being required, particularly as cycles are involved. The storage space required for

this could not be provided in the road design. During this waiting period the NMU's may also be tempted to cross the road without priority (a green man/ cycle symbol) and hence this was considered an unsafe solution. It is anticipated that this option would also lead to the A725 Off Slip being stopped for an unacceptable period of time which would again result in dangerous occurrences of vehicles queuing back onto the main A725. It is also anticipated that queuing on the southbound carriageway of the Bothwell Link Road may back up dangerously onto the proposed Raith Junction roundabout.

3. A pedestrian/cyclist overbridge - this would require large and visually intrusive embankments in order to provide ramped access in line with accessibility requirements of the DDA. The embankments would require additional construction in the floodplain and the loss of flood storage capacity could not realistically be compensated for by constructing new flood compensation storage areas due to the difficulty in finding suitable land, additional impacts on land-take and potential loss of locally valuable habitat (including potentially, locally designated Sites of Interest for Nature Conservation). The large abutments and the bridge itself would also be visually obtrusive to local residents.

   The embankments on the Hamilton side of the Bothwell Link Road would also be difficult or impossible to construct giving the confinements of this space. The tie in with the previously described proposed shared foot/ cycle way along the Bothwell Link Road would have required more bridges and ramps and their extra impact was also considered to be visually obtrusive.

4. A pedestrian/ cycle underpass was ruled out as it was considered that it would be liable to flooding given the positioning of the scheme, close to the River Clyde. In addition it is also perceived that underpasses are liable to result in a number of safety/ security issues for NMU's and perhaps lead to antisocial behaviour. .

Public Transport

It is proposed that new bus stops be provided just south of this junction on the Bothwell Link Road, as shown on Figure 13.3. The pedestrian/ wheelchair access to these stops will be much improved as compared to the existing provision. This is expected to result in time savings for these users between the stop and the Strathclyde Country Park and the bus stops.

Raith Junction

The proposed route in the vicinity of the Raith roundabout as shown in Figure 13.6, then ramps up to a NMU bridge over the circulating flow before ramping back down to go continue below M74 before rising to a second bridge over the circulating flow. It is anticipated that the design of the scheme, diverting the A725 beneath the roundabout, by reducing traffic flows beneath the M74 will also assist in creating a better atmosphere for NMU's. The ramps and bridges have been designed to be compliant with the Disability Discrimination Act. This ensures that the gradients of the ramps are gentle and resting places are provided for the less able individuals. After the second bridge ramps back down to ground level there is a new section of shared use path which runs parallel to the eastern edge of the A725 to Bellshill. A shared use path also runs from the base of the second footbridge in to the Strathclyde Country park. In addition to the ramps, steps are also being provided at locations shown on Figure 13.6, which may reduce journey times further for certain users.

The shared use path to Bellshill ties into the existing footway network at the bridge over the West Coast Main Rail Line and is again separated from the main vehicular carriageway by a 2m verge. It is proposed to strengthen the existing bridge parapet at this location which permits the removal of the existing protection and thereby increases the width available to NMUs.

The vehicular/ NMU accesses to the rear of Strathclyde Country Park to houses will be closed by the proposals and will result in a new access road being constructed within the park. This will lead to an approximate 1km detour for those NMU's entering/ exiting from the rear of the park, this however is not expected to be a large number given consultation with Park managers. This will lead to significant safety benefits for all users on the A725, especially with the presence of the proposed new cycleway, along side the east of the southbound carriageway.

The path into the Strathclyde Country Park from the southern end of the proposed A725 (n) shared pedestrian/ cycleway involves a 180 degree turn for the NMU, and passes back under the second bridge deck and into Strathclyde Country Park. In order to facilitate the 180 degree turn for NMU's, this point has been substantially widened. As previously stated in this chapter the path through the Park continues as the Strathclyde Walkway/ Proposed NCN route 74.

<u>Bothwellpark Farm Accommodation Bridge</u>

The scheme proposals will also involve the realignment of the Bothwellpark Farm Accommodation Bridge, also shown in figure 13.6. No non-motorised routes are currently designated to utilise this bridge over the M74 therefore the works are not anticipated to have an impact here upon non-motorised users.

<u>Clyde Walkway</u>

The previous stage of the Environmental Statement (stage 2) considered an addition to the proposed route, described previously, to accommodate the Clyde Walkway in a longer but less urban setting which may have encouraged recreational use. This involved a route that either ran along the western edge of the Hamilton Low Parks SSSI, close to original path or one which ran through the SSSI along the bank of River Clyde and under the M74 in to Strathclyde Country Park. To make the first route viable in terms of safety would necessitate the provision of a large footbridge and it was considered that this would be an unwarranted intrusion in the SSSI. Without the bridge, users would be left isolated at the northern end of the path and this could also result in additional personal safety issues. It is anticipated that the second route would be liable to periodic flooding, and that this in turn may lead to users becoming isolated or following a path which is temporarily blocked, resulting in a security risk for the individual. It also anticipated that an additional path may encourage an unwarranted intrusion into the protected wildlife habitat (the SSSI). Although the proposed scheme does not prevent the installation of such a route, it is included in the proposed scheme.

13.5 Construction Impacts

potential impacts may arise during the construction phase of the scheme, including:

- Severance of existing routes
- Temporary or permanent diversion or longer journey times
- Loss of amenity during use of routes (noise, dust etc)

Although the pedestrian/ cycle demand observed using the existing routes is low, severance of the route could potentially necessitate a substantial diversion via Hamilton (2.8km to the east) and the pedestrian underpass just west of M74, junction 6 before returning through the park, over 6km in total. As this is the only direct link between these areas, this would not be acceptable and would constitute a 'High' impact.

With this in mind any necessary diversions during the construction phase will be restricted to the immediate vicinity of various phases of work on or around the Scheme. Diversions to roads and associated pavements/footpaths and cycleways will be avoided where possible, but such diversions are likely to mean longer journeys and some temporary loss of amenity for pedestrians and cyclists while they occur. To mitigate this, the Contractor will be required to set in place appropriate measures to minimise the extent and duration of disruption as far as is practicable, including establishing temporary, suitable well signed and safe diversions around working areas and maintaining existing routes wherever possible.

Construction of the proposed scheme will also affect the route of the Clyde Walkway across the Raith junction given the observed lack of usage and the fact that it is already effectively severed the impact is considered to be 'Low to Medium'.

13.6 Residual Impacts Summary

Taking into account the mitigation proposals described above and shown in Figures 13.3 to 13.6 the residual impact of the proposed scheme upon Non Motorised Users is as summarised in Table 13.3. These are expressed as positive, neutral or negative in terms of route amenity and journey times.

Numerically the number of at grade crossing points and the types proposed are identical to that which exist currently, however as the uncontrolled crossing is on the minor Bothwell Slip Road instead of the M74 southbound on slip, it is anticipated that this route will be much safer and also offer time savings for the NMU.

Whilst the slight rises and falls in elevation may lead to some increase to NMU journey times across the junction, this is more than negated by the removal of the original at grade crossing points at the roundabout which also cause delays to NMU journey times and present a safety risk.

The section of the Clyde Walkway through the SSSI will also be removed by the proposed road design. NMU's will face a short diversion from the banks of the River Clyde, over the Raith junction and into Strathclyde Park. This clear route will effectively reconnect the Walkway, offer safety benefits and will lead to time savings for users of the Walkway who would have previously had to negotiate uncontrolled crossings of the Raith Junction.

The proposed scheme improvements will also accommodate SUSTRANS desires for the proposed NCN Route 74 over the Junction, between Langside Road and the Strathclyde Country Park.

Based on this qualitative balance of positive, neutral and negative residual effects of the proposed scheme, an overall positive effect is anticipated as all potential impacts for NMU's are addressed and existing routes are improved upon.

Table 13.3 Impact Significance and Residual Impacts after Mitigation

Figure Reference	MNU Route	Impact Significance	Residual Impacts
13.3/ 13.4/ 13.5/ 13.6	Bothwell to Bellshill	Significant	Positive
13.3/ 13.4/ 13.5/ 13.6	Clyde Walkway	Not Significant	Positive
Overall Residual Impact			**Positive**

13.7 References

Design Manual for Roads and Bridges (DMRB), Volume 11, Environmental Assessments 1993, Updated 1994, 1998, 1999, 2001 and 2003: *The Highways Agency, The Scottish Executive Development Department, The National Assembly of Wales and the Department of the Environment for Northern Ireland.*

Design Manual for Roads and Bridges (DMRB), Volume 2, Highway Structures: Design BD 29/04 Design Criteria for Footbridges.

North Lanarkshire (Monklands District) Local Plan, 1991 (Finalised First Alteration, September 1996): *North Lanarkshire Council Planning and Environmental Department.*

SmartWays – A Guide to Walker and Cyclist Friendly Routes Around North Lanarkshire (2004): *North Lanarkshire Partnership*.

14 Vehicle Travellers

14.1 Introduction

This Chapter outlines the assessment undertaken to determine the potential effects of the scheme on the quality of driving conditions for vehicle travellers. In this respect, the potential change to views from the road and effects of the scheme on driver stress are examined.

'View from the road' is defined as the extent to which travellers, including drivers, are exposed to the different types and quality of scenery through which a route passes.

'Driver stress' relates to three main components, namely frustration, fear of potential accidents and uncertainty relating to the route being followed. The level of stress incurred by a driver may be affected by many factors, including variations in skill, experience and knowledge of the roadway amongst others. Frustration may occur due to the driver's inability to drive at a particular desired speed consistent in terms of the general standard of the road, whilst the level of uncertainty may be raised by lack of route knowledge, the likelihood of pedestrians and poor signage or visibility.

14.2 Methods

14.2.1 Baseline Methods

Information regarding existing baseline conditions was gathered through a desk-based review of available data, specifically OS map data and a site visit, and in particular the landscape effects and conceptual landscape design proposals. Data collection was undertaken by way of familiarisation (principally by car from the surrounding minor roads and tracks), desk study and field survey on foot. This was undertaken in May 2006.

14.2.2 Impact Assessment Methods

This assessment has been carried out using the guidelines set out in DMRB Volume 11, Section 3, Part 9.

Possible effects upon vehicle travellers are considered in terms of both the route corridor landscape and visual value and the magnitude of impact.

14.2.3 Corridor Value

The value, or status, of the corridor through which the scheme extents will pass was determined as detailed in Table 14.1 below. With regard to views from the road, a number of aspects need to be considered in determining sensitivity including: the types of scenery and landscape; the extent of traveller's views; the quality of the landscape; and the presence of features of particular interest or prominence. This Chapter should therefore be read in conjunction with Chapter 11, Landscape Effects.

Table 14.1 Definition of Corridor Value for View from the Road.

Value or Sensitivity	Criteria
High	The traveller experiences extensive views of a high quality landscape, area of unique landscape character or prominent features of particular interest.
Medium	The traveller is exposed to partial/intermittent views of a high quality landscape (or extensive views of a moderate quality landscape), area of unique/distinctive landscape character or features of interest.
Low	The traveller is exposed to views of an area of low quality landscape/unremarkable or degraded landscape character or has heavily restricted views/no view of the surrounding landscape regardless of quality.

14.2.4 Impact Magnitude

The severity, or magnitude, of impact was assessed independently of the site value and assigned to one of the categories listed within Table 14.2 below.

Table 14.2 Impact Magnitude Criteria for View from the Road and Driver Stress.

Criteria	Definition
Major Positive or Negative	A major alteration in views from the road or in driver stress such that the driving experience is significantly affected.
Moderate Positive or Negative	An alteration in views from the road or in driver stress such that the driving experience would be diminished <u>or</u> enhanced to a noticeable degree.
Slight Positive or Negative	Minimal alteration in views from the road or in driver stress such that there would be a measurable change but this would not significantly affect the driving experience either positively or negatively.
Negligible	Very little appreciable change in views from the road or in driver stress and not considered to have any noticeable effect on the driving experience.

14.3 Baseline Conditions

14.3.1 Views from the Road

The context in which the existing road infrastructure has influenced the landscape has been illustrated within the Landscape Effects Chapter and accompanying supporting drawings Figures 11.1 – 11.16. (Landscape Effects –Baseline Landscape/Landscape Appraisal/Landscape Quality/ Photo Viewpoints 1-13). Generally the mature roadside planting adjacent to the M74, A725 and B7071 is very successful in screening the associated visual effects relating to vehicular movements and provides a strong framework of landscape features contributing towards the recognised character of the area. Please also refer to Figures 8.1 & 8.2.

The scheme extents is situated as follows; the settlement of Bothwell lies directly to the west of M74; Orbiston (approximately 1.2km from the junction) and Bellshill (approximately 1.6km from the junction) are located to the east, with existing vegetation and landform limiting views of these residential areas; isolated dwellings are positioned around Bothwell Park to the north; and Strathclyde Country Park is to the south east of the junction.

The existing Raith junction is located within a gently undulating landscape, shifting in local value from low to high. The route corridor has regionally designated landscapes; the entire area is designated as Greenbelt Land; the land to the south west of the junction is a Site of Special Scientific Interest (SSSI); the land to the south east of the junction is Strathclyde Country Park; the land to the north east and west of the junction contains Sites of Interest for Nature Conservation (SINCs); and there is a prominent area of ancient woodland to the north east of the junction (refer to Figures 11.1 to 11.3, Landscape Effects - Landscape Baseline, Landscape Appraisal and Landscape Quality).

The convergence of the M74 and A725 at Raith Junction is of local value due to its context within the urban fringe, in particular natural features and semi-natural vegetation, which contributes to its identified landscape character. Vehicle travellers have views across open and wooded countryside to Bothwell and some views of the edge of Orbiston. The corridor value is therefore determined to be *'Medium'*. A comprehensive narrative of the landscape and visual interest and value of the area, which encompass the Raith junction, is provided in Chapter 11, Landscape Effects.

<u>M74 Travelling South from Glasgow</u>

The existing road travelling over the Raith junction on embankment lies is predominantly flat between the north to the south of the scheme extents. Heading south towards Carlisle, driver views from the existing M74 are principally limited by mature roadside planting screening between the built up residential area of Bothwell to the west and the open farmland to the east. However, before reaching the junction, the M74 is elevated on embankments, which allows views over the junction itself and towards Strathclyde Country Park to the south east of the junction. The motorway on/ off slip roads at the Raith junction, allow partial views of the local nature reserve to the east and west (see Photo Viewpoint 1 Figure 11.4). Whilst travelling over the Raith junction driver views are limited due to the screening offered by mature roadside planting, apart from partial views towards Bothwell (to the right). Subsequently, once over the junction itself, driver views are once more restricted due to semi-natural woodland to the west of the road (Raith Haugh, part of Hamilton Low Parks SSSI)) and woodland screening adjacent to the east (Strathclyde Country Park), before reaching the River Clyde.

<u>M74 Travelling North to Glasgow</u>

Travelling on the M74 northbound, drivers experience very similar views to those travelling southbound. Before reaching the Raith junction the views to the east and the west of the roadside are heavily screened by planted features such as shrub and scrub planting within Strathclyde Country Park and Raith Haugh SSSI. Whilst travelling over the Raith roundabout itself, driver views momentarily open up over the A725. To the east open grassland, woodland and wetlands associated with Bothwell Park are visible, and to the west the ditch wetland, open fields and subsequently the residential settlement of Bothwell can be seen. Once over the junction driver views again become screened by roadside planting which continues to the end of the scheme extents where the road is in cutting where the combination of landform and land cover limit views. (See Photo Viewpoint 13, Figure 11.16)

A725 Travelling East, from Bothwell to Orbiston

Severe traffic problems exist at Raith Junction due to the interaction of heavy turning volumes from the A725 and the M74 onto the roundabout. (See Photo Viewpoints 6, 8 and 11, Figures 11.9, 11.11 and 11.14). Currently, vehicle travellers have to journey around the Raith junction roundabout to resume travelling on the A725. The A725 at present, travelling from Bothwell (west) to Orbiston (east) is flat before reaching the junction. The views that vehicle travellers experience whilst driving on the A725 are restricted to partial due to the existing roadside planting within the Strathclyde Country Park. Once the road reaches the Raith junction, views are again limited due to the screening presented by mature roadside planting within the existing roundabout, apart from partial views towards Bothwell. The final stretch of the scheme extents (back onto the A725 from the junction and heading towards Orbiston) again has similar driver views limited by the prominent landform and roadside woodland screening. After the junction roundabout the road rises from 25m AOD to 60m AOD whilst the open countryside (to the left) and the distant limited views of Robison residential areas engage driver views before entering or driving past it. Roadside planting successfully screens vehicular user's views within the context of Orbiston.

A725 Travelling West towards Bothwell

Driver views experienced whilst travelling on this stretch of road, although in the opposite direction, are not significantly different to those described above. The road, once out of Orbiston is elevated on embankment, which allows for further views across to the east and west and over the junction in the distance towards Bothwell. When the road drops in elevation after passing over the railway line the views open up briefly over towards the country park and towards Bothwell (see Photo Viewpoints 2 and 3, Figures 11.5 and 11.6) The mature planting within the central reservation and along the boundary of the country park limit views out with the road corridor.

B7071 Travelling from Bothwell towards the A725

The existing road layout, the B7071, or Bellshill Road, services Bothwell onto the A725 which subsequently feeds the M74. The vehicle traveller's views from the road are of a medium quality. Travelling from south to north, until reaching the Raith junction, the urban settlement of Bothwell is clearly visible to the west, with the landscaped screening of trees to the east before opening out into grassland views (see Photo Viewpoints 7 and 9, Figures 11.10 and 11.12). Ahead of the vehicle traveller the views form the road are dominated by the Whistleberry Toll roundabout where the A725 and the B7071 meet one another, before reaching the larger roundabout at the Raith Junction where the A725 meets the M74.

Existing Access Road to Kilmallie House & Douglas Park Cottages

At present Kilmallie House and Douglas Park Cottages, located to the west of the scheme extents, are accessed via the A725, which allows the vehicle traveller open, high quality views of the Strathclyde Country Park to the west and the open farmland to the north, with the urban settlement of Orbiston to the east once off, or before joining, the A725. See Photo Viewpoint 2, Figure 11.5.

Accommodation Road Bridge to Bothwell House

The introduction of an additional lane between Bothwell services and the Raith junction together with the modification on the M74 (N) merge requires additional land take and demolition of the existing private access road bridge to Bothwell house which passes over the M74. A new bridge and minor modifications to the existing access road will be provided, (see Environmental Mitigation Strategy, Figure 20.1). Vehicle travellers crossing over the bridge are screened by mature planting and trees either side of the M74, limiting views of Bothwell to the west, and open grassland and woodland to the east. (See Photo Viewpoint 1 & 13, Figures 11.4 & 11.16)

The following major and minor roads have been identified as crossing or passing near to the proposed scheme extents and are so likely to experience changed views as a result of the proposed junction improvements; (See Landscape Effects Baseline Landscape, see Figure 11.1).

- Accommodation road bridge to Bothwell House, which travels over the M74 to the north end of the scheme.
- Laighlands Road, which runs parallel to the M74 on the eastern edge of Bothwell.
- Langside Road, which runs out of Bothwell to meet the B7071, facing the redesigned A725.
- Bothwell Haugh Road, which runs through the Strathclyde Country Park to the south east of the scheme extents towards the Raith junction.
- Slip-roads which serve the A725 and the M74, around the existing junction roundabout, will experience a landscaped change to vehicle travellers. The slip roads will be realigned and altered due to the scheme and travellers upon them will experience changes to the immediate landscape. The wider landscape experience new flood protection areas and a SUDs pond which will be partially visible until mitigated planting matures.

As discussed in Chapter 11, Landscape Effects, the landscape surrounding the route corridor has been assessed as varying between low and high landscape quality (at a local level) at different locations. Higher quality landscape areas are largely situated to the south east of the existing M74 at the Raith junction (refer to Landscape Effects - Baseline Landscape, Landscape Appraisal and Landscape Quality drawings, Figures 11.1 to 11.3).

14.3.2 Driver Stress

Severe traffic problems exist at Raith Junction due to the interaction of heavy turning volumes from the A725 and the M74 at the signalised roundabout. Significant congestion occurs in and around both the AM and PM peak periods.

The combination of high traffic volumes and circulating traffic on the roundabout cause both the north and southbound exit slips from the M74 to block back as far as the main motorway, with queues forming on the motorway nearside lane. The A725 southbound traffic (from Bellshill) approaching Raith Junction also queues severely, as circulating traffic conflicts with the north-south traffic. The A725 northbound traffic (from East Kilbride) often blocks back to Whistleberry Toll roundabout, situated immediately south of Raith Junction. Whistleberry Toll is effectively an integral part of the Raith Junction and consequently experiences significant queuing on the A725.

Using the guidance provided in the DMRB Volume 11, Section 3, Part 9, Chapter 4, the combination of high traffic volumes and speeds at the existing junction is anticipated to relate to a '*High*' level of driver stress.

14.4 Predicted Impacts

14.4.1 Views from the Road

A summary of the impacts of views from the proposed road improvement at the Raith junction are set out below, divided into route sections as for the baseline description for ease of reference.

At identified points along the scheme extents, the proposed roads will cause a significant loss of vegetation and tree planting. Points where this loss of planting is likely to occur and driver views are altered will be referred to in the text below and can be seen in the associated Photo Viewpoints, Figure's 11.4 – 11.16.

<u>M74 Travelling South from Glasgow</u>

The driver views before reaching the Raith roundabout will remain the same, with views predominantly out over the Strathclyde Country Park. Most of the visual impacts from the M74 are centred on the junction (the A725 underpass and pedestrian and cyclist over-bridges), which result in a mimimal loss of roadside screening vegetation to the east and west of the carriageway. The existing roadside vegetation will be retained as far as is feasible, however, further woodland and scrub planting is proposed in mitigation to screen vehicle traveller views from the road mainly to the left towards the Compensatory Flood Storage Area (see Environmental Mitigation Strategy, Figure 20.1). However, whilst travelling over the junction itself, driver views will momentarily, but clearly see the new A725 underpass beneath them to the east and to the west.

<u>M74 Travelling North to Glasgow</u>

Views east and west of the M74 carriageway will be accentuated, as the road experiences minor widening, see Figures 11.4 and 11.16, Photo Viewpoints 1 and 13, for the new slip-roads at the junction. During the construction phase the new accommodation bridge over the M74 will dominate the view within the foreground of the northern section of the scheme extents. The realigned access road and M74 over bridge to Bothwell Park will involve landform and landcover changes to the east of the motorway (see Figure 11.4, Photo Viewpoint 1), there-by increasing views from the road over the fields to the east and Bothwell to the west before new landscape mitigation planting has time to mature around the SUDs pond and wetland habitat in front of the residential area of Bothwell.

A725 Travelling East, from Bothwell to Orbiston

The proposed improvements for the A725 at the Raith junction will change the view of the existing surrounding landscape at this location. The slip roads within the proposed junction design will predominantly remain at the existing elevation, although the road and roundabout footprint will be enlarged. The proposed scheme extents will alter the landform to create an underpass permitting the free flow of traffic on the A725 and as a consequence views from the A725 as it passes under the roundabout will be highly restricted.

Vehicle traveller's views from the road will be altered between the Clyde and the roundabout due to the required Flood Compensatory Storage Area located between the A725 and B7071. Within the direct footprint of the flood storage area woodland will be removed due to the proposed excavations. The retention of the peripheral mature tree planting to retain screening towards the B7071 reinforced with new woodland planting will assist to sensitively integrate into the landscape context. The existing views of open grassland and scrub to the east over Raith Haugh will remain; this character will be replicated to the west.

A new slip-road will be constructed from the A725 to connect the re-aligned B7071, travelling towards the Raith junction. The new recreational (pedestrian and cyclist) over-bridge structure will interrupt the views from the road to the east and west of the carriageway, which will in time be mitigated by woodland screening planting to either side when approaching the roundabout.

Approaching the roundabout on the A725, the road will decline in height to six to eight metres below the existing ground level, allowing vehicles to travel under the existing junction. Vehicle travellers' views from the road will become of very low quality for the short distance whilst under the junction; there will be no visibility of any landscape form, with views confined to the concrete wall structures. As outlined in the mitigation of the Noise Chapter (Chapter 12), a 2m high acoustic screen relative to the ground level (close boarded timber fencing) will be erected on the roadside, which successfully screens vehicular user's views within the context of Orbiston (the location and height of the acoustics screens are as shown on Figures 12.3(a) and (b) and Figures 12.4(a) and (b).

Once past the roundabout the A725 rises back up again to its original height, with planting on either side to screen the road from the countryside views and with the acoustic barrier directly on the right hand side of the roadside, before reaching Orbiston.

A725 Travelling West towards Bothwell

The acoustic barrier is visible to vehicle travellers to the left hand side of the A725 whilst travelling past Orbiston. Once past Orbiston, vehicle traveller's views differ significantly to those described above whilst travelling towards Bothwell as far as the roundabout itself. As the road in this section (just out of Orbiston) is elevated on embankment, there are more open views into the near distance, towards the junction itself, the open grassland to the north of the junction, Strathclyde Country Park to the south of the junction and to Bothwell in the distance. The new recreational over-bridge structure and ramps will interrupt the views from the road when approaching the entrance to the Strathclyde Country Park, which will in time, be mitigated by woodland screening planting to the left of view. Whilst driving past Orbiston the 2m high timber acoustic screen, in addition to roadside vegetative screening will impair vehicle driver's views of the area.

B7071 Travelling from Bothwell towards the A725

The B7071 will also be redesigned as part of the proposed scheme. This road will now run continuously to the Raith junction with a filter lane directly on to the M74 northbound, with the roundabout catering for access to the A725, local facilities such as Strathclyde Country Park and the M74 southbound. Views from the road experienced by vehicle travellers on this new alignment will differ extensively from the existing layout.

Travelling from south to north from the bottom of the scheme extents, the views from the road are of roadside screening of shrubs and trees to the west and wet woodland scrub and grassland in the long term (as before) to the east. The road travels continuously to the Raith junction, where views of semi-natural woodland and planted shrubs to the west and again to the east with intermittent sections of open grassland and with a view of the A725 which will run parallel to the new developed B7071. Views in the foreground will be predominantly of the Raith junction and the roads running over, under and through it. The slip-roads which adjoin the redeveloped scheme extents will be planted with woodland/scrub screening as part of the mitigation strategy, to block views onto the scheme extents. This planting in the short term will be immature and only offer partial blockage of views from the road, however, in the longer term and with the inevitable maturity of the shrubs planted, this will develop into full screening of views from the road (refer to Figure 20.1, Mitigation Strategy).

New Access Road to Kilmallie House & Douglas Park Cottages

As part of the proposed scheme, the road to Kilmallie House and Douglas Park Cottages will be re-routed to provide a safer access route. The re-routed right of way to these properties will run through Strathclyde Country Park and up to the Raith junction, allowing access from there to the M74, the A725 and the local road network. Therefore, the views from the road experienced by vehicle travellers will significantly alter. Vehicle travellers using the new route running through the Country Park will experience high quality landscape views, comprising, open grassland and fields to the south of the road and landscaped barriers, hiding the A725 to the north of the road (refer to Figure 20.1, Environmental Mitigation Strategy). The view of Orbiston to the east will remain unchanged for vehicle travellers within the proposed scheme extents. The acoustic screen, as described above and in Chapter 12 (Noise) on the A725 around Orbiston will be slightly visible to vehicle travellers on this route.

Accommodation Road Bridge to Bothwell House

There will be a new road bridge over the M74 to the north of the proposed scheme. The bridge will be repositioned marginally south of its existing position, with minor modifications to the existing access road. (See Environmental Mitigation Strategy, Figure 20.1). It is anticipated that views from the road will not change significantly; the landscaped views which run along either side of the M74 and the open view of the built-up area of Bothwell will remain.

A summary of the impacts on views from the road is set out in Table 14.3 below.

Table 14.3 Summary of Impacts on View from the Road

Area	Summary Of Impacts On View From The Road
M74	**Slight negative impact within a medium value landscape.** Loss of roadside planting along the existing M74 corridor and around the new junction will open up views from the roundabout and the M74.
A725	**Moderate positive impacts within a medium value landscape**. Within the roundabout area, short-range views will be affected by the construction of the new section of A725 as it passes under the roundabout and the M74. Construction of pedestrian/cyclist over-bridges and new slip-roads, will involve a loss of mature roadside planting.
B7071	**Slight positive impact within a medium value landscape.** The realignment and course of the road will allow for quicker and more direct journeys, with a minimal impact upon driver views as scheme opens up improved views from the road.
New Access Road to Kilmallie House & Douglas Park Cottages	**Major positive impact within a high value (local level) landscape.** Re-routed access through a higher quality landscape will alter and improve the views experienced by vehicle travellers.

Accommodation Road Bridge over M74 to Bothwell House	**Negligible impact within a medium value landscape.** Relocation will not have a significant impact upon vehicle traveller's views from the road.

14.4.2 Driver Stress

The scheme will relieve significant levels of peak hour congestion and hence driver stress at Raith junction by reducing fear of potential accidents and relieving frustration and uncertainty over journey times.

The overall effect of the scheme extents upon driver stress is likely to be beneficial compared with the existing situation and is assessed as '*low moderate positive*'.

During the construction phase, driver stress may increase for a temporary period where localised traffic management is set in place through working areas, primarily where lane closures are required, particularly on the M74. Traffic management may cause slower traffic flows, increase driver uncertainty with regard to journey times and heighten fears of vehicle break-down or accidents.

14.5 Mitigation

Mitigation of the potential impacts on driver views are also discussed in Chapter 11 Landscape Effects (see Environmental Mitigation Strategy, Figure 20.1), and may include:

- Appropriate and sensitive planting and landscape design – to make a positive contribution to local views from the road in the medium to longer term;
- Using earthworks design to mitigate the visual impact of new structures and to blend into the natural topography as far as practicable. This may include gently sloping embankments and variations in height and slope;
- Appropriate seeding/planting of earthworks to complement surrounding vegetation;
- Planting of hedgerows, and the establishment of tree screens where appropriate;
- Replacement planting of trees and shrubs lost due to the required land take for the scheme.
- Acoustic Barrier Treatment – sensitive approach to the aesthetic finish of the timber fence would look to minimise any visual effects.

Driver stress will also be ameliorated by appropriate design, landscaping and planting along the sections of new road and at the roundabout, along with suitable road layouts, street furniture, lighting and signage designed to improve confidence in route selection and decision making at junctions.

The scheme will improve journey times, facilitate intra-regional movement and local access, and will reduce driver stress and frustration on the approach roads to the junction.

14.6 Residual Impacts

14.6.1 Views from the Road

Whilst the gradual re-establishment of vegetation will reduce impacts on the natural environment, landscape and views for the scheme, the change in road alignment and the construction of sections of new road will have permanent effects in relation to driver views where the height of roads changes.

Existing roads unaltered in height or alignment will experience potentially adverse impacts due to views of new roads interrupting existing relatively open views, because of the scheme-related effects upon the visual baseline conditions (i.e. changes to landform and land cover). Drivers on the roundabout and on the M74 will have views of the surrounding countryside and of Bothwell interrupted by the intervening A725 underpass, SUDs pond and flood compensatory storage area construction.

The major change to the junction is the construction of the A725 underpass; however this will ultimately lead to less stress for drivers and less congestion at peak times. The adverse impacts on existing roads are minimal due to the retention of mature roadside planting and proposed mitigation will over time offset some of the adverse impacts on travellers using new roads, in particular where views are interrupted for a short section (500m) as the A725 passes beneath the roundabout and M74. Residual impacts on view from the road will therefore be slight adverse overall for the scheme.

The 2 metre high acoustic barrier will be visible but would not cause a significant effect due to its proposed scale and limited length of fencing required within the scheme.

14.6.2 Driver Stress

The scheme extents will result in a positive impact on driver stress on both local users and users of the new (A725) underpass and improved Junction design at Raith.

14.7 Summary Evaluation

Based on the local value of the route corridor, the proposed mitigation measures and the long term enhanced driver views, it is expected that the scheme extents will result in a net *positive impact* with regard to driver stress and for some specific views from the road once construction is complete. Views from the major roads will largely experience little significant long-term adverse change, minor interruptions to local views, opening up over grassland and fields only in the short term until mitigation planting has time to mature.

14.8 Reference

Highways Agency, The Scottish Executive Development Department, The National Assembly of Wales and The Department of the Environment for Northern Ireland *The Design Manual for Roads and Bridges Volume 11 Environmental Assessment* (1993, amended and updated 1998/1999/2000/2001/2003).

15 Road Drainage and the Water Environment

15.1 Introduction

This Chapter considers the proposed Raith Junction Improvements Scheme in the context of the existing surface water environment in the vicinity of the junction. Existing baseline conditions are established and potential impacts arising from the development are identified and assessed. Mitigation is then considered, where appropriate, to achieve a water management strategy which addresses water quantity, water quality, and flood risk. Potential impacts during construction are considered in more detail in Chapter 9 – Disruption Due to Construction and the groundwater regime is addressed more fully in Chapter 16 – Geology and Soils.

Two development scenarios are discussed, as follows:

Do nothing: no improvement scheme takes place, and existing drainage and hydrological patterns remain unaltered other than as a result of natural change or other development activities in the area. There are no mitigation measures. This provides a baseline scenario against which to compare the development.

Do something: this involves an improvement scheme for Raith Junction. In this scenario, drainage, hydrology and water quality impacts for the new junction have been assessed for the following two conditions:

- **Without mitigation**: No provision for mitigation measures for road surface runoff quality and quantity or potential flooding. This describes the level of impacts under worst case conditions and enables appropriate mitigation to be identified.

- **With mitigation**: Mitigation measures are provided to manage road surface runoff quality and quantity and potential flood risk. Residual impacts are identified.

15.2 Regulatory Controls

The Scottish Environment Protection Agency (SEPA) is the environmental regulator responsible for protecting ‘controlled waters’ in Scotland. It has statutory powers and duties for protection and monitoring of the quality of controlled waters. Controlled waters are defined in law and are essentially all waters, either above or below ground, which are neither in the drinking water supply pipe nor the sewerage network.

Regulatory pressure is being increasingly focused on engineering activities under the scope of the Water Framework Directive (WFD). The WFD, through the Water Environment and Water Services (Scotland) Act 2003, gives Scottish ministers powers to introduce regulatory controls over a wide range of activities in order to protect and improve Scotland's water environment.

The formal water environment regulatory controls were then introduced in the Controlled Activities Regulations (CARs), which came into effect on the 1st April 2006. SEPA proposes to adopt a risk-based approach to the implementation of the CARs. This is reflected in the varying levels of authorisation required; from compliance with a set of General Binding Rules for low risk activities, to a Complex Licence with site-specific conditions where multiple activities, or linked activities across a number of sites, are proposed.

The CARs and more general SEPA guidance have been used as drivers to inform the design process in relation to the water environment at Raith Junction. Potential impacts have been considered in terms of the authorisation hierarchy adopted by the Regulations to ensure that compliance with General Binding Rules is achieved where possible. Where impacts cannot be designed-out, alternative options are investigated to demonstrate the value of the accepted solution in terms of minimising environmental impact. Mitigation proposals have then been developed which counter the negative effects of the development and promote the best practicable environmental solution.

SEPA also has a duty under the Environment Act 1995 to offer advice to local authorities with regards to risk of flooding although it has limited statutory powers in this respect.

15.3 Assessment Methodology

15.3.1 Guidance Documents

The water quality and drainage assessment has been carried out in accordance with the Design Manual for Roads and Bridges (DMRB), (2006); Volume 11; Environmental Assessment, Section 3; Environmental Assessment Techniques, Part 10 (HA 216/06); Road Drainage and the Water Environment.

Surface water pollution prevention and mitigation measures have been developed based on discussions with SEPA and on current good practice guidance for road drainage including:

- DMRB (2006); Volume 4a; Geotechnics and Drainage, Section 2; Drainage, Part 1 (HA 103/06); Vegetated Drainage Systems for Highway Runoff

- Sustainable Urban Drainage Systems (SUDS) as set out in CIRIA Report C521 “Sustainable Urban Drainage Systems – Design Manual for Scotland and Northern Ireland”

- Guidance contained within the SEPA publications entitled: “Watercourses in the Community” and “Ponds, Pools and Lochans.”

The design of the culverts should conform to the design Guidance Booklet: ‘River Crossings and Migratory Fish’’ – A Consultation Paper produced by the Scottish Executive (April 2000). Culverts should be designed to encourage use by wildlife and ensure that all fish species associated with the watercourse can pass freely.

In consideration of national planning policy, the assessment of flood risk has been carried out in accordance with SPP7, Planning and Flooding, and Planning and Building Standards Advice on Flooding, Planning Advice Note 69 (PAN69).

The assessment of the road's physical structure within the floodplain has been carried out in accordance with DMRB (2006); Volume 4; Geotechnics and Drainage, Section 2; Drainage, Part 1 (HA 71/06); The Effect on Flooding of Highway Construction on Floodplains and HA 216/06.

15.3.2 Baseline Identification

Baseline conditions were identified through desk studies, a review of relevant data and published material relating to the local and wider hydrological environment, and site walk-over investigations. Discussions were also held with statutory consultees. The data collected and sources of information are listed in Table 15.1.

Table 15.1 Sources of Information for Hydrology and Surface Water Quality

Topic	Source of Information
Climate	
Rainfall	Flood Estimation Handbook CD ROM, 2000, The Centre for Ecology and Hydrology, Wallingford
Surface Water	
Water Quality	Historical water quality sampling, 2004, SEPA Discharge & Sewerage, 2004, SEPA
Hydrological Regimes	Recorded flow data, 2004, SEPA Raith Junction, 1 in 100 years flood Maps, 2004, The Institute of Hydrology Flood Study, 1 in 5 and 1 in 100 years Flood Inundation Maps, 1997, SLC. Flood Study, 1 in 5, 10, 25, 50, 100 and 200 year flood levels, 1997, SLC

15.4 Consultations

Consultations with SLC and SEPA were undertaken and the conclusions summarised as follows:

SLC **-** Consultation with SLC identified a number of aspects relating to hydrology and drainage. Their requirements included:

- A flood risk assessment in connection with the River Clyde and the proposed road improvement scheme.

- An assessment of possible loss of floodplain storage and provision of floodplain compensatory storage.
- A drainage impact assessment to examine the effect of the road surface runoff on local watercourses.
- The introduction of limited discharge and provision of attenuation storage at the road outfalls.
- Addressing requirements of WFD and CARs and the need to meet their conditions in relation to works to the existing watercourses or on the floodplain.

SEPA - Consultation with SEPA provided the information as detailed in Table 15.1. In connection with works to existing watercourses they made references to SEPA's publication entitled 'Ponds, Pools and Lochans' which provides advice on how to maximise ecological and the amenity potential of urban watercourses, particularly regarding SUDS. SEPA also referred to River Restoration Centre works and techniques. SEPA discourage culverting of the watercourses. However, if culverting is required design should be in accordance with best practice, which permits the passage of fish and other aquatic fauna under normal conditions. SEPA requires the free passage of fish at all times. In connection with construction on a floodplain, SEPA stipulates that proposals should be developed to take account of guidance in Scottish Planning Policy 7 (SPP7) - Planning and Flooding.

15.5 Assessment Criteria

The significance of scheme impacts on the water environment is described through a matrix relating the sensitivity of a water feature against the magnitude of any effect, using guidance given in HA 216/06 – Road Drainage and the Water Environment. Water features such as rivers, groundwaters and floodplains are assigned functional qualities describing their amenity, economic or habitat value. These 'attributes' support an assessment of the sensitivity of water features to impacts associated with the development. For example, pollution of a minor watercourse which feeds a designated conservation site will be more significant than if the watercourse were to discharge directly into a large urban river. The magnitude of any potential impact is considered in terms of water quality and quantity. The criteria used to assess water body sensitivity and the magnitude of the predicted impact is given in Tables 15.2 and 15.3. The significance of the predicted impact is then defined using a combination of the magnitude and sensitivity as described in Table 15.4. The tables are based on guidance given in Tables 5.1 – 5.5 of HA 216/06.

Table 15.2 - Criteria to Assess the Sensitivity of Surface Water Features

Sensitivity	Criteria	Definition
Very High	Attribute has a high quality and rarity on a regional or national scale.	Excellent and good water condition with pristine or near pristine water quality corresponding to Classes A1 and A2 respectively. It also includes water quality not affected by anthropogenic factors. Water quality does not affect the diversity of species of flora and fauna. Sites with Special Protection, Special Areas of Conservation, Ramsar Site, EC designated freshwater fisheries. All nature conservation sites of national importance designated by statute including Sites of Special Scientific Interest (SSSI) and National Nature Reserves. Floodplain extent increases significantly with water level and/or flood defences protect substantial areas of residential and commercial properties.
High	Attribute has a high quality and rarity on a local scale	Good water quality with a measurable degradation in its water quality as a result of anthropogenic factors corresponding to Class B. Water quality has only limited impact upon the species diversity of flora and fauna in the watercourse. Includes all non-statutorily designated sites of regional or local importance. Floodplain extent increases appreciably with water level and/or flood defences protect large areas of residential and /or commercial properties.
Medium	Attribute has medium quality	Fair water quality resulting from anthropogenic factors, corresponding to Classes C and D. Water quality has a significant impact on species diversity of flora and fauna. Floodplain extent increases only marginally with water level and/or flood defences protect limited residential or commercial properties.
Low	Attribute has low quality	Poor and seriously polluted water quality corresponding to class E. Extent of floodplain does not increase with flood level and there are no flood defences protecting either residential or commercial property.

Table 15.3 - Criteria to Assess the Magnitude of the Predicted Impact on Surface Waters

Magnitude	Criteria	Definition
Major	**Adverse:** Loss of attribute or quality and integrity of attribute.	Significant change in water quality baseline conditions (surface and groundwater) either through long-term effects or a serious discrete pollution incident. Contaminant loading exceeds EQS standards for both zinc and copper indicator metals, or risk of accidental spillage is greater than 2%. Includes for any impacts on a conservation site. Increase in peak flood levels resulting in increased flood risk to existing properties and infrastructure upstream or downstream of the proposed site.
	Beneficial: Removal of existing negative water quality or quantity features.	Removal of existing polluting discharge to either surface or groundwater receptors or removing the likelihood of polluting discharges occurring. Reduction in peak flood levels upstream or downstream of the proposed site.
Moderate	**Adverse:** Negative effect on integrity or loss of part of attribute	Appreciable change in water quality (surface or groundwater) on either a long-term or temporary basis. Contaminant loading exceeds EQS for zinc or copper or risk of accidental spillage is between 1 and 2%. Measurable increase in peak flood level resulting in a localised increased flood risk to existing properties and infrastructure.
	Beneficial: Appreciable improvement in attribute quality	Some reduction in spillage risk or polluting discharge where magnitude of existing impact is major or moderate adverse. Reduction in peak flood levels with a localised impact.
Minor	**Adverse:** Measurable impact on attribute quality	Small change in water quality baseline conditions (surface or groundwater) in the long-term or minor temporary impacts. Contaminant loading below EQS for indicator metals or risk of accidental spillage less than 1%. Nominal increase in flood levels with no increased flood risk to adjacent properties and infrastructure.
	Beneficial: Minimal improvement in attribute quality	Minimal reduction in spillage risk where the existing impact is minor. Reduction in flood levels where no adjacent properties or infrastructure is at risk.
Negligible	Affect on attribute is of insufficient magnitude to impact on use or integrity	The proposed scheme is unlikely to affect the integrity of the water environment. Accidental spillage risk less than 0.5%. Changes in 1% annual probability flood less than ±10mm

Table 15.4 - Criteria to Assess the Significance of the Predicted Impact on Surface Water Quality

Magnitude	Sensitivity			
	Very High	High	Medium	Low
Major	Very Large	Large/Very Large	Large	Slight/Moderate
Moderate	Large/Very Large	Moderate/Large	Moderate	Slight
Minor	Moderate/Large	Slight/Moderate	Slight	Neutral
Negligible	Neutral	Neutral	Neutral	Neutral

In some cases, the significance of an impact is shown as being one of two alternatives. In presenting a significance classification, a single description was decided upon through reasoned judgement.

15.6 Baseline Conditions

15.6.1 Site Description and Topography

The existing Raith Junction is situated about 600m north of the River Clyde and north-west of Strathclyde Loch on a relatively flat area which is considered to be part of the River Clyde floodplain, at a maximum elevation of around 25mAOD. The existing junction is the M74 Junction 5 and A725 trunk road Junction. The land is bounded by Bothwell Park, Site of Importance for Nature Conservation (SINC), to the north and Laighland open grassland to the west. Raith Haugh and Hamilton Low Parks, Site of Special Scientific Interests (SSSI) shown in Figures 8.1, 8.2 and 8.3, Chapter 8, lie to the south and an existing hotel and caravan park occupy land to the east and south east.

15.6.2 Site Hydrological Location

The existing Raith Junction falls within the catchment area of an unnamed Burn, which is a minor tributary of the River Clyde. Figure 15.1, Rev B shows the boundaries of the River Clyde catchment as far downstream as Raith Junction, containing the catchment of the unnamed Burn.

15.6.3 Rainfall

According to the FEH CD-ROM, the annual average rainfall for the location is about 1145mm.

15.6.4 Existing Surface Water Features

The following water bodies are situated within or near the scheme area. They are listed below and shown on Figures 15.1, Rev B and 15.2, Rev G.

- River Clyde
- Unnamed Burn (the Burn)
- Several local drainage channels and ponds.
- Strathclyde Loch

The River Clyde

The River Clyde is one of the major rivers in Scotland and drains large parts of central and southern Scotland. The River Clyde rises in the Lowther Hills area. Initially it flows in a north and north-easterly direction and then turns in a north-westerly direction towards Glasgow. The catchment area of the River Clyde as far downstream as the Raith Junction is about 1684km^2. The catchment consists of upland moorland and arable lowland with urban areas located on the lower part of the catchment. The Daer Reservoir is a significant feature on the upper reach in the Lowther Hills and there are a number of other upstream attenuation bodies.

Unnamed Burn (the Burn)

The unnamed Burn (here referred to as the Burn) is a minor tributary of the River Clyde with a total catchment area of about 1.04km^2.

The natural catchment drainage paths of the Burn have been altered over the years by housing development and construction of the local road network. The Burn rises to the west of the existing A725 trunk road and town of Orbiston. It flows in south-westerly direction and passes under the railway line connecting Uddingston and Motherwell. It then passes through an existing pond (Pond 5) west of the A725 and continues to flow parallel to the A725 in a south-westerly direction towards the Raith Junction, crossing the M74 motorway to the north of the junction. It then flows in a southerly direction before it passes beneath the A725 to the south-west of the junction. The Burn then continues south towards the River Clyde and discharges into the existing pond (Pond 1) situated in a Site of Special Scientific Interest (SSSI) south of the junction. There is no apparent overflow route from the pond into the River Clyde. However, it is envisaged that sub-surface hydraulic connectivity is achieved between the pond and the watercourse.

In sections, the Burn is heavily modified, reducing its ecological value. No evidence of fish was found during the ecological surveys of the watercourse. The ecological status of the Burn is discussed further in Chapter 10.

Ponds and Strathclyde Loch

There are several small ponds present within the catchment of the Burn whilst Strathclyde Loch is a significant water body adjacent to the existing Raith Junction. The minor ponds are extensively colonised by tall herb fen and swamp habitat and are therefore smaller in area than suggested on the most recent OS maps. Pond locations and references are shown on Figure 15.2, Rev G.

Ponds 3, 4, 5 and 6 form the Laighland/Bothwell Park Wetlands Sites of Interest for Nature Conservation (SINCs). The wetlands/ponds within the SINCs are important habitat features supporting a range of bird species and contributing to the reasons for designation of these sites.

North Lanarkshire SINC 75/1a lies within the southeast part of the survey area. The northern edge of the SINC at Strathclyde Country Park comprises Strathclyde Loch (which is artificial and managed for recreation and sport), its shoreline and a man-made island. Chapter 10 (Ecology) describes the SINCs in more detail.

The locations of the ponds and Strathclyde Loch are as follows:

- Pond 1 is a large water body in the SSSI designated area between the River Clyde and the existing junction (NGR 714, 578);
- Pond 2 to the west of the junction (NGR 710, 584);

- Ponds 3 and 4 (also referred to as Laighland Wetland 3) lie within an elongated area of wetland. The site is isolated from the rest of the SINC by the M74 as the ponds are located to the north west of the junction, west of the motorway (NGR 711, 588) and (NGR 712, 586);
- Pond 5 (also referred to as Laighland Wetland 1) is an area of wetland and wet woodland that forms the largest part of the SINC to the north east of the junction, west of A725 trunk road (NGR 716, 589).
- Pond 6 (also referred to as Laighland Wetland 2) is an elongated area of wetland to the north of the junction and south of Bothwell Park Wood (NGR 714, 591); and
- Strathclyde Loch is located to the south east of the junction covering an area of about 87ha. The loch was constructed during early 1970's. It is built on the floodplain of the River Clyde at the confluence with the South Calder Water.

All of the water bodies other than Strathclyde Loch and Pond 1 drain via the Burn to Pond 1, and ultimately to the River Clyde as described above. Strathclyde discharges to the Clyde around 300m upstream of the Bridge carrying the M74 over the River.

15.6.5 Existing Floodplain and Flooding

The hydrological map of the area produced by The Centre for Ecology and Hydrology at Wallingford (former Institute of Hydrology) shows the area to the south of the junction, including the SSSI area, may be inundated by a depth of water up to 2m during a 1% annual probability (100 year) flood event.

As part of a Flood Study Report by Babtie Consultants in 1997, the flood inundation map of the area was produced showing the predicted flood envelopes for the 20% annual probability flood (1 in 5yr) and the 1% (1 in 100yr) flood events. They also predicted the flood levels at various locations on the River Clyde including at Bothwell Bridge and Raith Haugh for various flood return periods as shown on Table 15.5

The flood envelopes confirm the extent of the River Clyde floodplain in the Raith junction area, which includes the SSSI area to the south and lowland area of the SINC to the north of the junction. Figure 15.3, shows the flood inundations for the predicted flood return periods.

Table 15.5 - Predicted Flood Levels

Location	Annual Probability Flood (%) Flood Return Period (yrs)					
	20 1 in 5	10 1 in 10	4 1 in 20	2 1 in 50	1 1 in 100	0.5 1 in 200
	Predicted Flood level (mAOD)					
Bothwell Bridge	21.40	21.71	22.22	22.52	22.89	23.57
Raith Haugh	21.76	22.11	22.67	22.97	23.39	24.12

Babtie, Flood Study 1997

15.6.6 Surface Water Quality

SEPA Classification

The Water Quality Classification is based on a five point scale and includes all rivers with a catchment area of 10km^2 or more and specific smaller rivers where known pollution problems exist. This is called the “classification network”. The classification network is divided into river stretches at confluences and pollution pressures. Every stretch is assigned a monitoring point where chemical and/or ecological surveys are taken and the aesthetic appearance recorded. The quality or “class” of a length of river is calculated from the monitoring point results. According to SEPA’s ‘River Classification 1996-2003’ the River Clyde at Bothwell Bridge is assigned as Class ‘B’ (good quality).

No water quality data exist under the “classification network” for the small watercourses in the vicinity of Raith Junction as their catchment areas are less than the required 10km^2. However, the land south of Raith Junction, between the A725 and the M74, is a Site of Special Scientific Interest (SSSI) – Hamilton Low Parks (NGR 714, 578). The SSSI covers 107.6 ha and has a specific biological designation referring to the flora and fauna located within the site boundary.

The area has been designated a SSSI since 31st January 1986 and is classified as a biological SSSI as its habitats support breeding bird species of national importance. Furthermore, the site also attracts significant numbers of wintering wetland birds. Most importantly, woodland that lies on the south bank of the River Clyde contains one of the largest heronries in Scotland. The ecological interest of the SSSI and other wetlands in the vicinity of the Junction is discussed further in Chapter 10 (Ecology).

The water environment within the SSSI can be considered relatively stable because the Wildlife and Countryside Act 1981 requires SNH to be notified of any “Potentially Damaging Operations” which are proposed in the vicinity of the site, and therefore offers protection against changes in land management. However, it is likely that some of the local road network discharges via the Burn and the wetland within the SSSI, although no outfalls have been identified. This will be an historic discharge and is likely to have been in place before the SSSI designation was assigned. It can therefore be assumed that the SSSI is not significantly detrimentally affected by any contaminant loading resulting from existing road runoff although there will certainly be no beneficial impact.

Environmental Quality Standard

The Environmental Quality Standard (EQS) is a benchmark criterion against which fresh and marine water quality can be assessed. These are principally ecological standards, specified for a range of parameters at levels required to protect aquatic life.

In the assessment of the impact of road runoff on the water environment, zinc and soluble copper are used as indicator metals to represent the potential for contamination. For zinc and soluble copper, the EQSs for freshwater vary with water hardness, as hardness affects the solubility of metals. The relevant EQS for the protection of freshwater aquatic life provided by SEPA are given in Table 15.6. The revised values given for zinc are not yet statutory but are used by Regulatory Authorities.

Table 15.6 - Environmental Quality Standards for the Protection of Freshwater Life

Parameter	Hardness	EQS
Copper (dissolved AA)	1-10 mg/l $CaCO_3$	1 µg/l
	10-50 mg/l $CaCO_3$	6 µg/l
	50-100mg/l $CaCO_3$	10 µg/l
	100-300 mg/l $CaCO_3$	28 µg/l
Zinc (total AA)	0-50 mg/l $CaCO_3$	8 µg/l
	50-100 mg/l $CaCO_3$	50 µg/l
	100-150 mg/l $CaCO_3$	75 µg/l
	150-200 mg/l $CaCO_3$	75 µg/l
	200-250 mg/l $CaCO_3$	75 µg/l
	>250 mg/l $CaCO_3$	125 µg/l

Source: SEPA, Technical Guidance Manual for Licensing Discharges to Water, Annex G, 2004.

Sampling and Testing

Groundwater and surface water sampling and testing was carried out as part of the Phase 4 Raith Ground Investigation (Chapter 16). Results show that there is localised contaminated groundwater. In addition, the ponds, the Burn and the River Clyde all show similar levels of heavy metals and PAH's to that present in the groundwater and the surface water quality is generally poor. For some specific contaminants, concentrations recorded in surface waters were greater than those present in the groundwaters and contaminants such as aluminium, copper and manganese exceed EQS values. The levels of contaminants do not pose a significant danger to human health. However, key potential receptors such as construction and maintenance workers should adopt best practice in terms of dermal contact and subsequent ingestion.

More details of the ground and water sampling exercises along with test results are provided in the Contamination Assessment Report M8MFJV/XX, the Raeburn Phase 4 Ground Investigation Report and Chapter 16, Geology and Soils in this document.

15.6.7 Hydrogeology/Groundwater

A detailed assessment of groundwater conditions has been made as part of the Raith Phase 4 Ground Investigation. Shallow groundwater has been identified across the site to depths of less than 1m bgl. Whilst the connectivity between ground and surface waters has not been fully established, the shallow groundwater could indicate that the Ponds 1 and 5, in particular, will be sensitive to groundwater variations. The BGS Hydrogeological Map of Scotland indicates that the aquifer beneath the site is moderately permeable and locally important. Further details relating to the local hydrogeological and groundwater conditions can be found in Chapter 16, Geology and Soils.

15.6.8 Contamination

A preliminary geotechnical Desk Study Report M74 Junction 5 – Raith Junction, identified a number of historic potentially contaminating land uses in the junction area (Chapter 16 Geology and Soils). However there are only very few instances of these potentially contaminated sites in the vicinity of the Hamilton Low Parks or the nearby tributaries of the Clyde. Based on the findings of the desk study report (Appendix 16.1 Contamination Report), a programme of chemical sampling and testing was carried out to provide information on the presence and distribution of potential contamination at the site. Samples were analysed for a range of possible contaminants including heavy metals and poly-aromatic hydrocarbons (PAH's).

Potentially contaminated land may impact on surface waters by migration of heavy metals and/ or hydrocarbons via groundwater flow. The response to potential contamination issues will be developed within the framework of contaminated land legislation. The Environmental Protection Act 1990, Part IIA Contaminated Land (Section 57 of the Environment Act 1995) and the Contaminated Land Regulations 2005 provide a basis on which to determine the risks and liabilities presented by a contaminated site. Contaminated Land is defined as:

"Any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land that-

(a) - Significant harm is being caused or there is a significant possibility of such harm being caused; or

(b) - significant pollution of the water environment is being caused or there is a significant possibility of such pollution being caused."

15.6.9 Existing Sewerage and Road Drainage Discharges

Sewerage Discharges

Information regarding consent to discharge in the scheme area was provided by SEPA. This indicated an existing discharge consent into the River Clyde in the vicinity of Raith Junction. There are two significant discharges at this location:

- A combined storm overflow at Bothwell Bridge (WPC/W/8758)
- Discharge of treated sewage effluent from Hamilton Sewage Treatment Works (WPC/W/13909)

Road Drainage Discharges

The existing Raith Junction drainage is via road gullies and carrier drains. The approach roads are drained by a similar arrangement. The M74 at the junction also drains via road gullies and carrier drains. The footpath around the roundabout is bounded by gravel strips in some places, indicating the use of filter drainage pipes. The location of any outfalls for the road drainage could not be confirmed at the time of site visits during January, October and December 2004 due to high water levels in the ditches and thick vegetative growth and no drainage records exist.

15.6.10 Surface Water Quantity

Flow calculations have been carried out in accordance with FEH methods. The river flow gauging station on the River Clyde at Blairston is situated at NS704 579. A pooling group containing gauged catchments from the FEH database similar to the catchment of the River Clyde at Blairston was created. The estimated Qmed (the median annual maximum flow, i.e. the flow which is exceeded once every two years on average) was calculated. The calculated growth curve was applied to the estimated Qmed of the River Clyde catchment at Blairston to calculate the 1% annual probability (1 in 100 year) and the 0.5% annual probability (1 in 200 year) peak flows at the site.

The MAFF Report No.5, which is considered to be more suitable for small catchments, was used to calculate the peak flows in the Burn.

Average 95 percentile flow (Q_{95}) for the River Clyde at the Raith Junction was obtained from the Hydrological data UK, Hydrometric Register and Statistics 1996-2000 published by Centre for Ecology and Hydrology-British Geological Survey at Wallingford.

Average 95 percentile flow for the Burn was estimated using the methodology set out in the “Institute of Hydrology, Report 108, Low Flow Estimation in the United Kingdom, 1992.

The estimated flows in the River Clyde and the Burn are summarised in Table 15.7.

Table 15.7 - Watercourse Flow Values

Name of the Site	Low Flow (Q_{95}) (m^3/sec)	Median Flow 2Year (Qmed) (m^3/sec)	1% (100Year) Peak Flows (m^3/sec)	0.5% (200Year) Peak Flows (m^3/sec)
River Clyde at Blairston	7.74	382.8	884.2	1008.0
The Burn	0.004	1.5	4.3	5.7

15.6.11 Sensitivity of Surface Water Features

The sensitivity of the surface water features in the vicinity of the proposed scheme has been determined using the assessment criteria in Table 15.2. Their sensitivity is influenced by associated sites of ecological importance with which they are closely connected.

River Clyde

According to SEPA's 'River Classification 1996-2003' the River Clyde at Bothwell Bridge is assigned as Class 'B' (good quality) and is thus considered to be of 'high' sensitivity.

The significant upstream catchment means that the relative proportion of additional development flows will be small. The Clyde can therefore be considered of 'medium' sensitivity with regards to water quantity.

River Clyde Floodplain

Removal of floodplain storage could result in increased flood risk in downstream urban areas. The sensitivity of the floodplain is therefore considered to be 'high'.

The Unnamed Burn

No classification has been attributed to the water in the Burn. However, the Burn discharges into an area of wetland located in the existing SSSI and is thus (as a conservative approach) considered to be of 'very high' sensitivity.

The Burn channel itself shows evidence of modification through historic land management practices and is therefore considered as 'high' sensitivity.

Site of Special Scientific Interest (SSSI)

The area of the SSSI lying north of the River Clyde includes a wetland that forms part of the mosaic of habitats for which the site is designated. The Burn is routed through this wetland before draining to the River Clyde through sub-surface hydraulic connection. The wetland is considered to be 'very high' sensitivity due to the SSSI designation.

Ponds/Wetlands and Strathclyde Loch

As SINC features, the ponds and wetlands in the vicinity of the Junction would ordinarily be considered to be 'high' sensitivity in terms of the criteria presented in Table 15.2. However, as all of the water bodies drain via the Burn, they are assigned 'very high' sensitivity as the impacts of any contamination in one pond or wetland could be transported downstream to the SSSI. This represents a precautionary approach to the assessment of the significance of water quality impacts.

In terms of their planform, any changes in the water area will have an impact on their habitat potential.

Strathclyde Loch is an artificial structure. However, its recreational uses suggest it should be considered to be 'high' sensitivity.

15.6.12 Climate Change

It is generally accepted that the future climate of the UK is likely to differ from present day conditions and that changes will vary from one part of the country to another. However, there is uncertainty over the magnitude of future climate change. In response to the lack of definitive projections, the UK Climate Impacts Programme (UKCIP) which is funded by the Department of the Environment, has been investigating the potential impacts of climate change in the United Kingdom. It has produced assessments of the potential impacts based on rates of increase in global greenhouse gas emissions consistent with the projections of the Intergovernmental Panel on Climate Change (IPCC).

In 1998 the UKCIP published their Technical Report No. 1 entitled "Climate Change Scenarios for the United Kingdom". Revised scenarios referred to as the UKCIP02 scenarios were published at the end of April 2002. The UKCIP02 scenarios are based on new global emission scenarios published in 2000 by the Intergovernmental Panel Report on Emission Scenarios, and utilise global climate modelling carried out by the Hadley Centre of the Meteorological Office, using their most recently developed climatic models.

In 2003, Babtie Group carried out a review of the implications of projected climate change in relation to the levels of protection offered by Scottish river and coastal flood prevention schemes. The work built on earlier work carried out by Babtie Group for the Scottish Executive (SE) using the UKCIP98 Climate Scenarios (Babtie Group, 2001), and updates the report from that study in the light of the information presented in the UKCIP02 Report on Climate Change Scenarios for the UK (Hulme et al, 2002).

In 2005, the SE published a report entitled 'Scottish Road Network Climate Change Study', (SRNCCS) which recommended that consideration should be given to revising the parameters for the design storm. The report stated that this could be done on an immediate basis by simply changing the design storm from 1 in 1yr to 1 in 2yrs for design and 1 in 5yr to 1 in 10yrs for surcharge, whilst continuing to take account of any available historical information.

In addition, no consideration is given to the potential impact of climate change on low flows in watercourses. However, the likely reduction in low flows can be related to reduced summer total rainfall predictions. Lower flows in watercourses could diminish their dilution capacity and result in increased contaminant loading. However, the reduction in total summer rainfall is likely to be countered by increased runoff in storm events due to increased peak rainfall and drier antecedent conditions. The overall effect of climate change in terms of contaminant loading can therefore be considered neutral.

Given the high levels of uncertainty associated with climate change prediction, a precautionary approach is generally recommended. The following design standards are thus recommended for adoption for this scheme and have been incorporated into the conceptual design:

- road drainage to be designed for 1 in 2 year rainfall event and checked for surcharge for 1 in 10 year storm event in line with SRNCCS recommendations;
- attenuation storage to be designed to cater for 1 in 100 year rainfall event. Further attenuation should be provided in the designed freeboard to accommodate a 1 in 200 year storm event.

15.7 Do-nothing Scheme Scenario

As described in section 15.1, the Do-nothing scenario involves no new scheme and existing drainage and hydrological patterns remain unaltered other than as a result of natural change or other development activities in the area. There are no mitigation measures.

Over time the catchment would be subject to the potential effects of other types of developments and associated drainage management systems. The effect of climate change is predicted to increase the flood frequency and hence the risk of flooding. The continued direct discharge of contaminated surface water runoff from the road is contrary to the objectives of environmental legislation such as the Water Environment and Water Services (Scotland) Act 2003 (WEWS Act) which aims to improve the quality of Scotland's watercourses over time. Thus, the do-nothing option may result in a gradual deterioration in water quality and a progressive increase in flood risk.

15.8 Do Something Scheme Scenario- Predicted Impacts WITHOUT mitigation

15.8.1 General

This section describes predicted impacts and effects of the scheme on water quality and drainage. The assessment has been carried out in accordance with DMRB, (2006), Volume 11; Environmental Assessment, Section 3; Environmental Assessment Techniques, Part 10 (HA 216/06); Road Drainage and the Water Environment. Drainage design will adopt current design standards and aim to achieve water quality objectives now applicable in the UK as a result of the WFD. Water quality and drainage impacts may be direct or indirect, temporary or long-term, and can occur during the construction phase (which is discussed further in Chapter 9 Disruption Due to Construction) and operation of the scheme. They may relate to:

- road surface runoff and impacts on the quality of receiving waters;
- Physical impacts of the scheme upon surface waters including any new structures within a watercourse and its floodplain.
- accidental spillages on the road (pollution risk);
- flooding; and
- groundwater flows (groundwater is addressed in Chapter 16).

15.8.2 Site Specific Considerations

Consultations with SNH highlighted the importance of the hydrological/drainage regime to the identified ecological interest and importance of the SSSI (Chapter 10 Ecology), and the assessment has given particular regard to the potential for adverse impacts on protected sites.

Due to road level limitations, the majority of the runoff from the proposed scheme cannot be drained by gravity. The proposed drainage layout will therefore comprise two distinct networks; one draining the A725 to the low point of the underpass, and the other carrying runoff from ancillary roads to the north and west of the roundabout. All discharge from the roads will then be routed through a pumping station, located within and accessed from the roundabout, before being discharged to the proposed SUDS facility.

Surface runoff without mitigation could potentially cause serious pollution downstream of the proposed outfall resulting in long-term effects on aquatic fauna and fishery interests as well as on any associated wetland and marginal habitats. Furthermore, the uncontrolled discharge of road surface runoff could increase the risk of flooding to the surrounding areas.

In order to drain the surface runoff from the proposed new Raith Junction, two alternative drainage options were considered and investigated; the first involved discharging to the Burn and the second into the River Clyde.

Discharge to The Burn

The first drainage outfall design option involves road outfall discharges into the Burn. The quality of water draining from the road is an important issue due to the presence of the SSSI. A fundamental requirement of the road runoff design is to prevent a decline in the water quality of the receiving water body (i.e. the Burn). This would require a high level of treatment of the road surface runoff prior to discharge into the Burn due to the low dilution capacity of the watercourse. However, preliminary investigations indicated that even with the introduction of mitigating measures, the adverse impacts of discharge to the Burn could not be sufficiently reduced to provide adequate protection to a watercourse running through a SSSI. Hence, this option was rejected at an early stage as being unacceptable.

Discharge to The River Clyde

The alternative and preferred drainage outfall design would direct road discharge into the River Clyde. The assessment assumes that there is no current road drainage from the existing Raith Junction into the River and therefore represents a worst-case scenario. A preliminary drainage design was devised in which runoff from the roads will be discharged into the River Clyde avoiding the existing SSSI. The impact of removing existing road drainage discharge from the ponds, wetlands and the Burn is discussed in section 15.8.9 – Water Balance.

15.8.3 Impacts during construction

There are potential adverse impacts associated with the various activities or events specifically associated with the construction phase, such as the risk of pollution of nearby watercourses and wetlands. The early establishment of temporary drainage facilities and contingency plans will help to avoid unforeseen problems during construction. The large-scale dewatering of groundwater resulting from the construction of the underpass will also have to be carefully controlled to ensure that there are no detrimental effects on the surface water environment. Construction impacts are more fully discussed in Chapter 9, Disruption Due to Construction.

15.8.4 Impacts of Contaminated Surface Water Runoff on the River Clyde

The Construction Industry Research and Information Association (CIRIA) Report 142 describes road surface runoff as a complex matrix of inter-related substances. It divides pollutants from road drainage discharges into the following six categories:

Sediments – '*Sediment is simply defined as material that settles to the bottom of a liquid'*

Hydrocarbons – 'In the report the term hydrocarbons is used to mean organic compounds containing only carbon and hydrogen, particularly the petrochemical derived group which includes petrol, fuel, oils, lubricating oils and hydraulic fluids'.

Metals – '*The above report indicates that the majority of studies on metals in highway runoff have concentrated on lead, cadmium, copper, zinc and iron'. Concentration on these metals is a function of their prevalence along with the relative ease with which they can be quantified.*

Salt and nutrients – '*Salt and nutrients are defined as those generally neutral materials that occur as soluble compounds and have a direct polluting effect upon vegetable matter either by reducing or extinguishing conditions conducive to propagation or by accelerating growth to the detriment of the balance of the environment'.*

Microbial – '*Microbial activity is mainly associated with the particulate material derived from the decay of organic matter or finely divided solids that harbour bacteria or viruses. Significant microbial populations are transported with wind blown soils'.*

Others – '*Substances which do not readily fit into the other classes. Examples of these material are pesticides and herbicides.'*

High concentrations of pollutants can accumulate during prolonged dry spells or drought, and are then released by rainfall and consequently adversely impact on the water quality due to minimum flows in the watercourses.

DMRB, HA 216/06, recommends a staged approach to the assessment of the impact of routine runoff on surface waters. Method A simply provides an indication of whether the risk of pollution should be explored in more detail or whether it is sufficiently low that no further investigation is required. The approach is based on CIRIA Report 142 and considers the dilution capacity of the receiving watercourse along with traffic flow as key descriptors in determining the impact of runoff. The methodology is sufficiently conservative that if the analysis indicates low risk, there is a high level of certainty that impacts will be minimal. If this is the case, no further analysis is required.

Method B is based on the more detailed assessment advocated in CIRIA Report 142. Using this approach, the impact of routine road runoff on water quality can be assessed based the concentrations of dissolved copper and total zinc in receiving waters. These metals have been used as indicators of the level of impact as they are known constituents of road runoff for which published Environmental Quality Standards (EQS) are available.

The Method B assessment requires data on the upstream concentrations of dissolved copper and total zinc in each watercourse, an indication of receiving water hardness, an estimate of the road surface area to be drained to each outfall, the runoff coefficient of the road scheme, traffic flow data and the 95 percentile flow (Q_{95}) for the receiving watercourse. In the absence of recorded flow data to calculate Q_{95}, the Q_{95} was estimated as described in section 15.6.10 and shown in Table 15.7.

The annual average daily traffic figures are for the 2020 traffic scenario 2 (low growth).

Table 15.8 below shows the impact of the total zinc and dissolved copper on the River Clyde. Detailed assessment of pollution impacts from routine runoff calculations are given in Appendix 15.1.

Table 15.8 - Predicted Impact of Total Zinc and Dissolved Copper on the River Clyde WITHOUT Mitigation

Outfall Label	Sensitivity	Parameter	EQS (µg/l)	U/stream Conc. (µg/l)	D/stream Conc. (µg/l)	Increase Due to Scheme (µg/l)	Impact Magnitude	Significance
Clyde	Medium	Copper	28	1.62	1.75	0.13	Minor	Slight
		Zinc	75	10.45	11.01	0.6	Minor	Slight

The runoff from the proposed outfall will discharge into the River Clyde between the existing A725 and Bothwell bridges. Based on SEPA's information the water quality of the River Clyde is assessed to be Class B (good). The water quality information obtained from SEPA for the River Clyde at Blairston Gauging Station downstream of the proposed outfall indicates the water hardness is 105 mg/l with the concentrations of dissolved copper and total zinc being 1.62 µg/l and 10.45 µg/l respectively.

For the purpose of this analysis, the upstream concentrations of dissolved copper and zinc were assumed to be similar. The EQSs, against which the river contaminant levels were compared, were taken to be 28µg/l for dissolved copper and 75µg/l for total zinc levels based on Table 15.6. The impacts are summarised in Table 15.9.

Table 15.9 – Summary of Impact WITHOUT Mitigation

	Impact	
Outfall Label	**Copper**	**Zinc**
Clyde	Slight Significance	Slight Significance

Preliminary investigations show that there would be a slight impact on the River Clyde water quality in terms of metal contamination without mitigation in place.

HA 216/06 also considers the impacts of routine road runoff discharge to groundwater (Method C) and provides assessment methodology to quantify the associated risk of contamination. However, the junction proposals involve isolating the surface water runoff from local groundwater, with discharge of treated road runoff to a single point outfall on the River Clyde. Therefore, no assessment of the impacts of routine road runoff or accidental spillage on groundwater has been undertaken in terms of the guidance given in HA216/06. Further discussion on the impact of the development in terms of groundwater is provided in Chapter 16.

15.8.5 Accidental Spillage on the Road

CIRIA Report 142 states that spillages resulting from individual accidents are potentially the most serious source of contaminants associated with roads. Accidental spillages can range from minor losses of fuel from vehicles to major losses from fractured tanker vehicles, but their effects can be serious because of the unpredictable nature of materials involved.

The report also explains that the liquids which are carried in large quantities present a high potential for serious pollution following accidental spillage. These include:

- Petrol, diesel fuel, oils, other liquid hydrocarbons and chemicals
- Acids and caustic solutions
- Toxic wastes
- Inert slurries
- Sewage sludge
- Products that can cause high biological loadings e.g. sugar and dairy products.

A risk assessment of a serious spillage causing pollution has been undertaken according to the Method D procedure outlined in HA 216/06 of the DMRB. Detailed calculations are provided in Appendix 15.1. The method is based on a number of assumptions, such as emergency services response times and road type risk factors, to provide an estimate of the risk. Predicted traffic flows are based on the 2020 Scenario 2 (Low Growth), 24 Hr AADT Flows. It is assumed that the emergency services would take less than 20 minutes to respond.

Spillage accident rates were estimated based on Table D.1 in HA 216/06 (page AI/12). The types of road were taken to be: an urban trunk road with no junction (serious accidental spillages per billion HGV km/yr = 0.31), and an urban trunk road within 100m of slip roads, side roads and roundabouts (serious accidental spillages per billion HGV km/yr = 0.36, 5.35 and 1.81 respectively). The proposed road dimensions in each category were determined from the layout drawings. Whilst individual road sections are considered independently to simplify the calculation process, the results are combined in a summary calculation to provide total pollution impact and accidental spillage for the proposed junction with a single outfall to the River Clyde.

The risk is defined as the probability that there will be an accidental spillage of a pollutant and that the pollutant will reach and impact on the water body and cause a serious pollution incident. In most cases the acceptable risk of a serious pollution incident occurring is where the probability is calculated to be less than 1%. Where road runoff drains to sensitive areas such as a SSSI a lower probability standard would be required. If mitigation measures are required to reduce the risk of a pollution incident occurring, these can be considered in terms of risk reduction factors in Table 7.1 of HA 216/06.

The results of the risk assessment are summarised in Table 15.10.

Table 15.10 – Summary of Spillage Risk Assessment, WITHOUT Mitigation

Category	Outfall Label	Threshold of Acceptability (% probability)	Calculation for Spillage Risk (% probability)	Within Acceptable Limits?	Impact
All other receiving watercourses	**Clyde**	1%	0.49%	Yes	Neutral Significance

The calculations show that even with no mitigation in place, the risk of spillage pollution to the Clyde is of neutral significance as the magnitude of the spillage risk has been determined to be negligible at less than 0.5% (reference criteria: Tables 15.2 – 15.4)

In addition, the decision to discharge all surface water drainage to the Clyde will significantly remove the potential for an accidental spillage event to affect the sensitive local surface water environment.

15.8.6 Flooding

Management of flood risk is addressed in HA 216/06 of the DMRB. The guidance offered borrows heavily from Planning and Policy Guidance Note 25: Development and Flood Risk which is applicable in England. For application in Scotland, reference is made to the equivalent publication, Scottish Planning Policy 7: Planning and Flooding (SPP7).

SPP7 details a Risk Framework, which characterises areas subject to Coastal, Tidal and Watercourse flooding for planning purposes. These are as follows:

- Little or no risk area (Annual probability of flooding less than 0.1% (1 in 1000year))
  No general constraints.

- Low to medium risk area (Probability 0.1% to 0.5% (1 in 1000year – 1 in 200year))

  It will not usually be necessary to consider flood risk unless local conditions indicate otherwise. It is suitable for most development. A flood risk assessment may be required at the upper end of the probability range (i.e. close to 0.5%, 1 in 200 year) or where the nature of the development, or local circumstances, indicate heightened risk.

  Subject to operational requirements, including response times, these areas are generally not suitable for essential civil infrastructure, such as hospitals, fire stations, emergency depots etc. Where such infrastructure has to be located in these areas or is being substantially extended, they must be capable of remaining operational and accessible during extreme flooding events.

- Medium to high risk area (Probability greater than 0.5% (1 in 200year))

Annual probability of watercourse, tidal or coastal flooding: greater than 0.5% (1 in 200year). Generally not suitable for essential civil infrastructure and ground based electrical and telecommunications equipment. The policy for development on functional floodplains applies. Land raising may be acceptable.

In built-up areas with flood prevention measures, most brownfield development should be acceptable excepting essential civil infrastructure. Undeveloped and sparsely developed areas are generally not suitable for additional development, including residential, institutional, commercial and industrial development. Exceptions may arise if a location is essential for operational reasons, e.g. for navigation and water-based recreation uses, agriculture, transport or some utilities infrastructure, *and* an alternative lower risk location is not achievable. Such infrastructure should be designed and constructed to remain operational during floods. Exceptionally, if built development is permitted, flood prevention and alleviation measures are likely to be required and the loss of storage capacity minimised. Proposals should involve the use of water resistant materials and forms of construction as appropriate.

Authorisation for the use of an existing hydraulic model of the River Clyde was obtained from Glasgow City Council during the Stage 3 assessment of the preferred option for the new Raith Junction. Using updated hydrology the modelling results validated the findings of the 1997 Babtie study, which are summarised for the purposes of this assessment in Section 15.6.5 above. A flood risk assessment report detailing the approach taken in the validation of the Babtie Study has been preparared.

The predicted 0.5% annual probability flood water levels are thus higher than the proposed finished road levels on part of the roundabout, the M74 southbound and northbound on-slip roads and the A725 underpass as shown on Figure 15.2, Rev G. This suggests that the proposed junction should be protected against a 0.5% annual probability flood with an appropriate freeboard. The freeboard was determined using guidance in the Environment Agency R&D Technical Report W187, Fluvial Freeboard Guidance Note.

Development within the floodplain and any associated flood protection will reduce the volume of storage available in a flood event and may result in increased flood risk downstream.

Table 15.11 shows the estimated volume of floodplain loss due to the development of the new Raith Junction for different return periods if the junction and associated roads are protected against the relevant flood return period.

Table 15.11 – Floodplain Volume Loss for Various Flood Return Periods

Annual Probability Flood (%)	Flood Return Period (years)	Estimated Volume of Floodplain Loss (m^3)
20	5	10,900
10	10	17,700
4	25	30,700
2	50	38,400
1	100	49,800
0.5	200	72,200

In relation to flood risk and SPP7 requirements, Raith Junction could be categorised as non-essential infrastructure. This is due to the fact that the areas on either side of the junction and the River Clyde can be reached using other roads. In accordance with SPP7 the proposed junction would therefore be assessed against the medium to high risk category (0.5% or 1 in 200year) presented in the risk framework guidance given in the planning policy. These areas are generally not suitable for additional development. However, exceptions may arise if a location is essential for operational reasons and an alternative lower risk location is not achievable. Such infrastructure should be designed and constructed to remain operational during floods. Exceptionally, if built development is permitted, flood prevention and alleviation measures are likely to be required and the loss of storage capacity minimised. Proposals should involve the use of water resistant materials and forms of construction as appropriate.

The existing floodplain loss during the same event due to the existing roads is estimated to be in the order of 176,000m^3. The predicted volume of floodplain storage loss would be additional to the existing floodplain loss.

15.8.7 Uncontrolled Drainage Discharges

The uncontrolled discharge of surface runoff from road drainage to existing watercourses during storm events has the potential to cause localised flooding and increase the risk of flooding downstream with consequential damage and disturbance to residential and commercial properties as well as to natural features.

During consultation with South Lanarkshire Council (SLC), a 1 in 2 year greenfield 'allowable' discharge was recommended. This concept involves attenuating runoff from impermeable developed areas to reduce peak discharge to that which would result from the same area as an undeveloped site.

The 'allowable' discharge rate for the Burn Catchment was estimated using the various empirical methods as shown in Table 15.15. This rate was then used to estimate the greenfield runoff for the proposed junction and therefore, the required attenuation storage. This method was adopted rather than estimating greenfield runoff for the River Clyde at this point to take account of the likelihood of existing road runoff discharging directly to the smaller watercourse.

Table 15.12 shows the road length and area and compares the 1 in 2 year greenfield runoff for the catchment and 1 in 2 year peak flow with 1 in 5 year peak flow of the surface runoff at the proposed outfall location.

Table 15.12 – Surface Runoff Details

Outfall Label	Road Drainage Length (m)	Road Drainage Area (ha)	1 in 2 year Peak Greenfield Runoff (litres/sec)	1 in 2 year Peak Flow (litres/sec)	1 in 5 year Peak Flow (litres/sec)
Clyde	8600	10.3	43	1120	1430

The table indicates that the impact of the runoff from the junction will have negligible impact on the River Clyde even in the unlikely event that the peak flows coincide. In higher return period events the relative runoff from the road will be reduced as the water levels in the Clyde will restrict the discharge at outfall. The SUDS facility, detailed in section 15.9.3, has provision to retain road discharge for the duration of the critical flood event in the Clyde.

15.8.8 The Unnamed Burn Diversion

The proposed road scheme will impact on the alignment of the Unnamed Burn. The route of the watercourse diversion itself will necessarily impact on the outline of Pond 3, marginally reducing the surface area of the latter water body.

Due to the necessary alignment of the proposed junction, the existing Burn to the north and west of the junction will require diversion as shown on Figure 15.2, Rev G and summarised in Table 15.13 below. Although the proposed junction has no direct impact on any of the local surface water ponds, the Burn diversion and proposed flood embankment will encroach marginally into Pond 3. The percentage reduction in the surface area of the existing Pond will be 16% based on the surveyed extent of the water body. The Pond currently discharges into the Burn and this hydraulic connectivity will have to be maintained particularly as the Pond is likely to form part of the natural flood storage for the watercourse.

The morphology of the Burn will be altered due to the increased length of channel. However, as the existing gradient of the channel is extremely shallow the proportional reduction in slope due to the diversion is nominal. The existing channel shows evidence of modification through historic land management practices and proposals would involve adopting best practice restoration principles to maximise habitat potential. Although there is already evidence of sedimentation in the watercourse, clear identification of future maintenance responsibilities should improve the overall hydraulic performance of the channel.

Table 15.13 - Physical Impact

Total Length Affected (m)	Length of Diversion (m)	Length Culverted (m)
700	732	269

15.8.9 Water Balance

It is understood that runoff from the existing Raith Junction road network discharges to the local water environment, contributing flow to ponds, wetlands and the Burn. Any discharge to the ponds or wetlands will be attenuated and will increase water levels relative to those resulting from the natural catchment contribution. This may have some benefits in terms of the habitat potential of the greater water surface. However, the road runoff will be a sporadic input to the local water features due to the short time of concentration between the rainfall event and water discharging from the road drainage network resulting from the high permeability of the ground surface. As such, there is no baseflow contribution from the road drainage and this is particularly relevant for the Burn.

Whilst a storm event carried by the existing road drainage network could have an impact in terms of increased flood risk in the Burn, low flow conditions in the watercourse and associated poor environment for flora and fauna, will not be mitigated by a single, short-term discharge from the road. In a catchment as small as that contributing to the Burn, it is likely that rainfall on the road will also be experienced across the natural catchment and the flows in the Burn will eventually rise to reflect this. However, the road runoff itself will not result in an improvement to the low flow situation in the Burn.

The additional area lost to the natural catchment through the development proposals represents less than 5% of the Burn catchment as a whole.

When the water quantity implications of uncontrolled discharge of existing road runoff are considered along with the detrimental quality impact that this represents to the local water environment, there are no appreciable negative environmental impacts to discharging the proposed road to the River Clyde. The proposals should, in fact, improve the condition of the Burn, ponds and wetlands in terms of water quality. As such, no further water balance analysis has been carried out to quantify the effect of removing existing road runoff for the local Raith water environment.

15.8.10 Groundwater

The initial hydrogeological assessment and subsequent Groundwater Assessment for Construction of Underpass, OGI (August '06), indicate that there is a degree of existing interaction between local surface water features and groundwater. The influence of groundwater is potentially particularly relevant for Ponds 1 and 5. However, the shallow depth of the water table across the site suggests a narrow interface between surface and sub-surface waters such that any sub-surface drainage works could contribute to a 'draw-down' effect, reducing the water table level and impacting on surface water features. In addition, at any interface, surface runoff from the proposed junction could have an adverse effect on groundwater quality. Testing of groundwater samples has shown that it is already locally contaminated as a result of historic land use impacts. However, groundwater is considered to be a controlled water and as such, must be protected from potentially polluting activities. Groundwater issues are discussed in more detail in Chapter 16, Geology and Soils.

The dewatering proposals developed to achieve construction of the underpass are described in more detail in Chapter 9, Disruption Due To Construction. Essentially, the proposals involve discharging dewatered effluent to the River Clyde, avoiding the sensitive water environment draining to the SSSI. Remediation will be required prior to discharge and both physical and chemical treatment processes may be adopted. Water levels in the ponds and wetlands around the junction will be monitored to identify any drawdown effect. Where drawdown is identified, recharge will be required. This may be achieved using a proportion of the dewatered effluent, which may require treatment additional to that already proposed due to the low dilution capacity of the receiving waters relative to the Clyde. It may also be necessary to recharge from alternative sources such as remote groundwater of better quality. Sampling and monitoring throughout the dewatering operations and full consultation with SEPA will ensure the effectiveness of the water quality measures and drawdown response. Discharge consents will be sought from SEPA where required.

15.9 Do-something Scheme Scenario–WITH Mitigation and Residual Impacts

This section describes the mitigation measures proposed to address road surface runoff quality and quantity along with flood risk from the River Clyde based on the identified impacts of the scheme as currently proposed and residual impacts if any.

15.9.1 General Drainage Mitigation for the Proposed Road Scheme

The overall drainage strategy has been developed in accordance with DMRB and Sustainable Urban Drainage (SUDS) Design Manual and Planning Advice Note (PAN) 61 advice on good practice and other relevant information. The drainage for the new junction should be designed with a view to avoiding any adverse effects on water quality and habitats within the adjacent SSSI area and wetlands.

The approach used is to treat and control runoff as near to the source as possible thus protecting downstream habitats. The objective of the mitigation measures is to convey surface water runoff from the road surface to a receiving watercourse without an increased risk of flooding downstream or any detrimental effect on water quality and associated ecosystems. Mitigation measures include those that aim to prevent, reduce or offset potential effects using SUDS.

The road drainage strategy will be the positive integration of SUDS features, with the three principal objectives of SUDS, including:

- **Amenity and wildlife -** to integrate with the overall habitat and environmental strategies.
- **Water quantity -** to control the effects of road runoff on the receiving watercourses and therefore mitigate the downstream flood risk.

- **Water quality** - to protect receiving water from point source, diffuse and accidental contamination.

All proposals for drainage will be agreed with SEPA, to meet their requirements in terms of the Controlled Activities Regulations.

At present the existing M8/A725 and junction road surface runoff discharges into the watercourses with no treatment. The proposed road development will reduce the extent direct drainage discharge into the watercourses from the existing paved areas by providing drainage controls and treatment for runoff. Introduction of a SUDS facility will improve the overall quality of the surface runoff discharge.

15.9.2 Sustainable Urban Drainage Systems (SUDS)

In terms of treatment, the 'management train approach' would be central to the proposed road surface water drainage strategy. The main objective is treatment and control of runoff as near to the source as possible, thereby protecting downstream habitats.

Table 15.14 - Surface Water Management Train for Raith Junction

Treatment	Surface Water Management Technique
Management and Prevention	Good Housekeeping
Active Intervention	Spillage Containment Settlement Flow balancing Biofiltration

The objective of the mitigation measures outlined below is to convey surface water runoff from the road surface to a receiving watercourse without detrimental effect on water quality and associated ecosystems. Mitigation measures include those that aim to prevent, reduce or offset potential adverse effects.

Mitigation measures to prevent adverse impacts comprise solutions aimed at the source of the impact. The risk of causing a deterioration in water quality can be controlled by using SUDS, as well as designing the route alignment to avoid possible impacts on important/sensitive areas such as the existing SINC and SSSI areas.

In addition, where necessary, measures will be set in place to safeguard against the potential for adverse impacts on groundwater. This would include a lined drainage system to isolate road drainage from groundwater.

The SUDS facility for the new junction has been developed using guidance in CIRIA Report C521 "Sustainable Urban Drainage Systems – Design Manual for Scotland and Northern Ireland" and DMRB recommendations for attenuation and treatment.

15.9.3 SUDS Proposals

Settlement, flow balancing and biofiltration will be used for the control and treatment of runoff from roads. These features will be incorporated into a single SUDS facility to the west of the junction as shown on Figure 15.2, Rev G. This will be designed to retain water for a prolonged period during and after storm events, providing attenuation of stormwater runoff along with treatment.

During consultation with South Lanarkshire Council (SLC), a 1 in 2 year greenfield 'allowable' discharge was recommended. References were also made to the current standards required from developers for flood prevention in terms of surface runoff along with Scottish Water standards and criteria. In response, SLC has been informed that the drainage design for the scheme will be in accordance with the DMRB (2006); Volume 4a; Geotechnics and Drainage, Section 2; Drainage, Part 1 (HA 103/06); Vegetated Drainage Systems for Highway Runoff, the design will adopt current road drainage design standards including Sustainable Urban Drainage Systems (SUDS); and none of the proposed drainage systems will be adopted by Scottish Water.

For the preliminary design, peak discharge rate was limited to the 1 in 2 year 'greenfield' runoff. In accordance with DMRB the attenuation was sized to cater for the 1% annual probability flood (1 in 100yr flood event). A freeboard has been provided to accommodate 0.5% annual probability (1 in 200yr event) without flooding. Overland flood routes will be provided for more extreme events allowing safe discharge of runoff towards the watercourse.

The 1 in 2 year greenfield runoff was determined for the Burn catchment using a variety of empirical methods as detailed in Table 15.15.

Table 15.15 – Various Methods of Calculation for 1 in 2 year Greenfield runoff for the Burn Catchment.

Method	Greenfield Runoff (l/sec/ha)
Poots and Cochrane	4.67
FSSR No6 Institute of Hydrology	4.31
Report No124, Institute of Hydrology	4.22
Modified Rational Method	4.56
FEH QMED	5.17
MAFF Report No. 5	4.18

Comparing the above results, a 2 year greenfield runoff rate of 4.18 litres/sec/ha from MAFF Report 5 method was used as a conservative approach to estimate the required volume of the storm attenuation. The use of the Burn catchment greenfield runoff reflects the relatively small drainage area represented by the road. The critical event for which the drainage and attenuation is designed will be of considerably shorter duration than the critical event in the Clyde catchment and the probability of coincident peaks is low. Where the Clyde critical duration event occurs over the Junction, the attenuation capacity will not be used in full and the head-dependant discharge potential of the control structure will not be required.

The inclusion of a permanent treatment volume will provide an opportunity to create new wetland habitat whilst forming an integral part of the landscape. This is in line with SEPA's Habitat Enhancement Initiative which promotes the use of ponds within SUDS to protect and conserve biodiversity. The SUDS facility will also include a settlement forebay to achieve removal of suspended solids from the effluent.

The overall structure will be designed to sit above the water table and should be lined to ensure that no migration of contaminants to groundwater occurs through infiltration.

The DMRB HA 103/06 provides guidance on the removal efficiency that can be achieved using various treatment systems. Table 3.3 of HA 103/06 gives an expected performance rating for each vegetative system component of a surface water management scheme. These ratings are then related to approximate removal efficiency percentages for different runoff constituents. These removal efficiency categories were used in assessing the impact of the proposed mitigation.

The application of SUDS to the design of the drainage system will reduce the concentrations of pollutants and suspended solids entering the watercourses as outlined in Section 15.8. Guidance on the pollutant removal performance of different vegetated treatment systems is given in DMRB, Volume 4, Section 2, Part 1 (HA 103/06), 3 – Runoff Constituents and Treatment Processes, paragraph 3.17 and Table 3.3. As the current scope of information on removal efficiency is limited, a relative assessment of different treatment elements is provided in Table 3.3. However, broad removal efficiency percentages are also given. Interpretation of the guidance presented in the DMRB, and adopting a precautionary approach, indicates that 10 and 20% removal efficiency could be expected for biofiltration and sedimentation elements of the SUDS facility respectively. The predicted residual impacts on water quality with the mitigation measures in place are given in Table 15.16 and the calculations are shown in Appendix 15.1.

Table 15.16 - Predicted Residual Impact of Total Zinc and Dissolved Copper on the River Clyde WITH Mitigation

Outfall Label	Sensitivity	Para-meter	EQS (µg/l)	Upstream Conc. (µg/l)	Conc. With Mitigation (µg/l)	Increase Due to Scheme (µg/l)	Impact Magnitude	Significance
Clyde	Medium	Copper	28	1.62	1.71	0.09	Minor	Slight
		Zinc	75	10.45	10.61	0.16	Minor	Slight

Table 15.16 shows that with the proposed mitigation measures, the predicted concentrations of dissolved copper and total zinc would be reduced compared to those without mitigation. The impacts are summarised in Table 15.17 below.

Table 15.17 - Summary of Residual Impact WITH Mitigation

	Impact	
Outfall Label	**Copper**	**Zinc**
Clyde	Slight significance	Slight significance

The proposed SUDS facility is also an important factor in mitigating against the possible effects of an accidental spillage resulting in pollution of a receiving water body. Where appropriate controls are introduced, the settlement forebay and attenuation can be considered as containment facilities which provide an additional safeguard against accidental spillage.

Table 15.18 - Summary of Spillage Risk Assessment, WITH Mitigation

Category	Outfall Label	Threshold of Acceptability (%probability)	Calculation for Spillage Risk (% probability)	Within Acceptable Limits?	Impact
All other receiving watercourses	**Clyde**	1%	0.18%	Yes	Neutral

15.9.4 Pumping Station Operation

The pumps will be designed to cope with design peak flows in the drainage network along with long duration, high volume rainfalls. The proposed sump would be designed to cope with oil residuals as well as providing a spillage containment volume. The volume provided would be required to eliminate the risk of oil or chemical spillage from collisions or accidents involving transport tankers, from reaching the watercourse.

The pumping station will include a pump which would be used for oil residual discharge and in response to an accidental spillage event enabling contaminated effluent to be pumped into a tanker for safe transportation and disposal. Pumps will be manufactured to a standard suitable for risk of occasional flammable vapour within the pump chamber.

If the pumps were to fail to operate, water would back up in the drainage network and inundation of the A725 underpass could ensue with associated safety and loss of infrastructure implications. The initial assessment, based on 11m static head with 130m long rising main and a 600mm delivery pipe, indicates the use of four pumps with a minimum sump capacity 50 m^3.

15.9.5 Lined Drainage

The drainage systems below high winter water table, along with the SUDS facility, will be lined to isolate the road drainage from the groundwater at all times.

15.9.6 Catchpits

Catchpits consist of manholes with shallow depth (about 200mm) sumps. They are designed to trap sediments and other debris whilst retaining a proportion of the suspended solids present in the runoff and settling out some hydrocarbons and metals. Catchpits will be located at regular spacing of up to 100m, with longer intervals in exceptional circumstances, along any filter drains and at the junctions of carrier drains.

15.9.7 Road Gullies

Road gully pots will be used at the kerbed sections of the roads. Gully pots function in a similar manner to catchpits and consist of an inlet grill at road level, a pot and an outlet pipe. The pot extends below the level of the outlet pipe. Road gullies and carrier drain systems would filter out a proportion of pollutants such as zinc, copper, iron, lead, suspended solids and hydrocarbons.

15.9.8 Erosion Protection

Where required, erosion protection will be used to minimise damage to the banks and bed of receiving watercourse at the drainage outfall. Soft engineering techniques will be introduced to minimise possible impacts.

15.9.9 Health and Safety Considerations

Health and safety risk assessments would be carried out on the SUDS facility in relation to the road operators and those implementing the design. Public access will be discouraged through incorporating visual and physical barriers such as fencing in accordance with best practice advocated in the Royal Society for the Prevention of Accidents 'Water Safety Guidelines'.

15.9.10 Site Controls at Outfalls

Table 15.19 shows details of site controls at the proposed outfall location.

Table 15.19 Details of Site Controls

Outfall Label	Road Drainage Length (m)	Road Drainage Area (ha)	Runoff Coefficient	Settlement Forebay (m^3)	200year Attenuation Storage (m^3)	Treatment Volume Vt (m^3)	Allowable 2 year Greenfield Discharge (l/s)
Clyde	8600	10.3	0.75	905	3955	1150	43

15.9.11 Flood Mitigation

The predicted 0.5% annual probability flood water level in the existing conditions would affect part of the existing Raith Junction as shown on Figure 15.3. In addition, sections of the proposed road, including the proposed roundabout and the A725 underpass, will lie below the 200yr flood level.

Flood mitigation proposals involve the provision of embankments around vulnerable sections of road. The embankments will be designed to protect against the 200yr flood event with an added freeboard allowance. The construction of flood embankments will remove road areas at risk of flooding from the floodplain and the attenuation benefit of these areas will be lost.

In accordance with the DMRB and SPP7, floodplain compensatory storage should be provided to replace storage lost through development. Figure 15.4, Rev F shows the proposed locations of floodplain compensatory storage Areas 1 and 2.

Table 15.20 shows the estimated volume of floodplain compensatory storage available during 0.5% annual probability (1 in 200 year) flood event. The location of the storage areas was determined through their proximity to the areas of floodplain lost and the requirement that they should be deployed at the same levels as the existing storage. Alternative locations were discounted where land rises steeply from the existing floodplain because the proportion of compensatory storage achieved against excavated volume was uneconomical.

Table 15.20 – Floodplain Loss Compensatory Storage Available

Estimated Volume of Floodplain Loss (m^3)	Volume of Compensatory Storage Available (m^3)		
	Area 1 South, near River Clyde	Area 2 North of Junction	Total
72,200	38,000	35,700	73,700

The compensatory storage should have the same effect as that of the lost storage volume, coming into effect at the same time during a flood event.

Area 1 - South near River Clyde
The volume of compensatory floodplain storage to the south of the junction will be achieved by excavating an area of land adjacent to the River Clyde (Figure 15.5). The excavated area will comprise grassland and scrub/wet woodland habitat. It will periodically fill with water and thereby provide flood storage capacity. As flood levels subside, the water so stored will drain back into the River Clyde. The storage area acts through a direct hydraulic link with the adjacent River.

Area 2 North of Junction
The volume of compensatory floodplain storage to the north of the junction will also be achieved by excavating an elevated area of land. In addition, to provide further wetland

habitat, deeper excavation is proposed, taking advantage of the high water table in this area. It is proposed to excavate 1m below the existing ground to expose the groundwater and create a wetland area. (Figure 15.5) This will not affect the volume of the proposed compensatory storage as the water table would remain at its existing level. The compensatory storage volume will then be provided above the permanent level of the water. The storage area will come into force through the hydraulic connectivity offered by local drainage channels and culverts which 'back-up' in a flood event in the Clyde. This is a less direct hydraulic link with the Clyde than Area 1 and there is likely to be a lag in the rise and fall of water levels in the storage area compared to those in the watercourse. However, this reflects the existing situation in areas remote from the River and from which existing flood storage will be removed as a result of the development proposals. Stored floodwater will be drained back to the River through the existing Burn.

Operational procedures should be implemented which allow for monitoring of the flood embankments and water levels during a flood event. If there is any indication that the integrity of the defences is compromised or design water levels are exceeded due to the severity of the flood event, consideration should be given to diverting traffic from the junction.

15.10 Water Quality and Drainage Summary

In terms of the physical effects of the scheme, it has a relatively small footprint and much of the proposed junction replaces sections of existing road.

A length of the Burn will require to be diverted and this will impact marginally on one of the existing ponds although the proposed road alignment itself will not directly encroach on any of the existing ponds. In addition, the impact on the floodplain of the River Clyde and the SINC area is minimal.

The proposed development is affected by the floodplain of the River Clyde. However, any potential impacts can be negated through the provision of appropriate flood protection and compensatory storage measures.

The scheme shows negligible effect in terms of the impact on the contaminant concentration in the River Clyde. The provision of spillage containment facilities further reduces the potential for ecological or habitat damage.

A summary of the potential impacts of the development on the water environment is given in Table 15.21

Table 15.21 – Summary of Impacts on Water Environment

Potential Impacts	Receptor	Receptor Attribute	Sensitivity	Magnitude	Significance Without Mitigation	Mitigation	Significance With Mitigation
Increased Runoff	River Clyde	Water Quantity	Medium	Minor	Slight -ve	Flow balancing capacity of the SUDS facility provides attenuation of road runoff prior to discharge to the watercourse. As the existing junction ultimately drains to the Clyde without attenuation, the effect of the proposals will be positive.	Slight +ve
Contaminated Runoff	Groundwater	Water Quality	Medium	Minor	Slight -ve	Lined road drainage network and SUDS facility. Existing road runoff, to surface water features which may interact with groundwater, removed.	Neutral

Potential Impacts	Receptor	Receptor Attribute	Sensitivity	Magnitude	Significance Without Mitigation	Mitigation	Significance With Mitigation
	River Clyde	Water Quality	High	Minor	Slight -ve	Gullies and catchpits trap sediments and other debris whilst retaining a proportion of suspended solids. Pump sump provides containment of harmful liquids such as chemicals etc. which would could otherwise impact on the water environment through accidental spillage. Permanent signage to indicate the presence of Pollution Control Device (pump sump) Sedimentation forebay provides conditions for settlement of suspended solids. SUDS facility provides treatment of the road runoff prior to discharge into the watercourse.	Slight -ve
	Burn/Ponds/ SSSI	Water Quality	Very High	Minor	Moderate -ve	Existing road runoff to local surface water features removed.	Moderate +ve
Groundwater Drawdown	Groundwater	Water Quantity	Medium	Minor	Slight -ve	Lined road drainage network	Neutral
Reduced Flows	Burn/Ponds/ SSSI	Water Quantity	Very High	Negligible	Neutral	Flow will be reduced only marginally due to the low proportion of the road area relative to the natural catchment. Existing road drainage flows do not contribute to baseflow conditions. The removal of the existing road runoff	Neutral

Potential Impacts	Receptor	Receptor Attribute	Sensitivity	Magnitude	Significance Without Mitigation	Mitigation	Significance With Mitigation
						reduces the pollutant potential and the dilution capacity of the watercourse is less critical.	
Flood Risk	Road Network	Maintain Traffic Flows	High	Major	Large -ve	Flood bunding will be provided to protect vulnerable sections of road.	Slight -ve
Compensatory Storage	Removal of elevated ground	Habitat	High	Moderate	Large -ve	The northern compensatory storage will be excavated below the ground water table to provide wetland habitat.	Slight -ve
Development Footprint	Burn/Pond 3	Habitat	High	Major	Large -ve	The total length of the watercourse diversion will be greater with associated enhanced habitat potential. The hydraulic connectivity between the Pond and watercourse will be maintained to ensure existing interaction over a range of events will be maintained. Culverts represent extension or replacement of existing structures which already act as barriers to wildlife movement. Water depth and low flow velocities should ensure that the culverts and diversion do not present a barrier to fish passage.	Slight -ve
		Morphology	High	Minor	Moderate -ve	Introduction of a low flow channel should maintain flow velocities whilst clear identification of maintenance responsibilities will address existing	Slight +ve

Potential Impacts	Receptor	Receptor Attribute	Sensitivity	Magnitude	Significance Without Mitigation	Mitigation	Significance With Mitigation
						sedimentation issues.	
	Floodplain	Storage	High	Minor	Moderate -ve	The removal of floodplain attenuation will be countered through the provision of compensatory storage.	Neutral
Erosion	River Clyde	Stability	Medium	Minor	Slight	Erosion protection at outfall to minimise damage resulting from drainage discharge.	Neutral

15.11 References

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16 Geology and Soils

16.1 Introduction

This chapter outlines the assessment undertaken to determine the potential impacts on geology and soils associated with the proposed scheme option during operation. Potential impacts upon geology and soils during the construction phase are considered in Chapter 9 – Disruption Due to Construction.

Road schemes have the potential to impact upon the geology and soils of an area through direct and indirect impacts on sites of importance or scientific interest, loss or sterilisation of mineral deposits or soil resources, disturbance of contaminated land or surcharging of ground which may accelerate erosion and subsidence.

It should be noted that this section does not discuss the value of the soil resources in terms of agriculture or other potential land uses as this has already been covered in Chapter 8 – Land Use.

16.2 Methods

16.2.1 Baseline Methods

A theoretical 3-dimensional ground model has been developed for the area around Raith Junction. This model incorporates historical ground investigation data for the area as well as more recent information from investigations for the M8 Baillieston to Newhouse and Associated Improvements (Phase 1B (Raith) Ground Investigation, completed in March 2005 and Phase 4 (Raith) Ground Investigation completed in 2006)

The ground model allows digital manipulation of the ground investigation information and facilitates interpretation of the data; for example to produce drawings that illustrate ground conditions in plan and profile. Relevant information such as laboratory test results and known areas of potential contamination may also be superimposed. By interpreting the model, it is possible to predict the prevailing soil types present beneath the proposed alignment and to establish the broad engineering properties of each soil horizon.

16.3 Impact Assessment Methods

16.3.1 Guidance Documents

The impact of the proposed junction improvement scheme on the geology and soils of the area has been considered in accordance with the Design Manual for Roads and Bridges (DMRB), (1998); Volume 11; Environmental Assessment, Section 3; Environmental Assessment Techniques, Part 11; Geology and Soils.

16.3.2 Impact Assessment Criteria

In order to determine the impact that the preferred scheme option would have on sites of geological significance, a hierarchy of importance and magnitude has been devised for sites and impacts respectively. Significant geological sites may be classified into those of national importance/value, regional importance/value and those not considered worthy of protection as detailed in Table 16.1. The magnitude of the impact may be determined by predicting the extent of the change in baseline condition resulting from route development, as detailed in Table 16.2. Each potential impact is assessed in order to establish its overall significance by drawing a comparison of the magnitude of impact against the importance/value of the affected site as detailed in Table 16.3.

Table 16.1 - Criteria to Assess the Geology and Groundwater Sensitivity

High	Areas containing geological or geomorphological features considered to be of a national interest, for example, Sites of Special Scientific Interest. Designated sites of nature conservation importance dependent on groundwater. Presence of extensive areas of economically important minerals valuable as a national resource.
Medium	Areas containing geological features of designated regional importance, for example geological SSSI, Regionally Important Geological Sites (RIGS), considered worthy of protection for their educational, research, historic or aesthetic importance. Exploitation of local groundwater is not extensive and/or local areas of nature conservation known to be sensitive to groundwater impacts. Presence of areas of economically important minerals of regional value.
Low	Geological features not currently protected and not considered worthy of protection. Poor groundwater quality and/or very low permeabilities make exploitation of the aquifer(s) unfeasible. Changes to groundwater not expected to impact on local ecology. Absence of mineral areas or minimal areas of local economical value only.

Table 16.2 - Criteria to Assess the Magnitude of the Predicted Impact on Geology and Groundwater

Major	Partial (greater than 50%) or total loss of a geological site, or where there would be complete severance of a site such as to affect the value of the site. Major permanent or long term change to groundwater quality or available yield. Existing resource use is irreparably impacted upon. Changes to quality or water table level will impact upon local ecology.
Moderate	Loss of part (between approximately 15% to 50%) of a geological site, major severance, major effects to the setting, or disturbance such that the value of the site would be affected, but not to a major degree. Changes to the local groundwater regime are predicted to impact slightly on resource use but not rule out any existing supplies. Minor impacts on local ecology may result.
Slight	Minimal effect on the geological site (up to 15%) or a medium effect on its setting, or where there would be a minor severance or disturbance such that the value of the site would not be affected. Changes to groundwater quality, levels or yields do not represent a risk to existing resource use or ecology.
Negligible	Very slight change from baseline condition. Change hardly discernible, approximating to a ‘no change’ condition.

Table 16.3 - Criteria to Assess the Significance of the Predicted Impact on Geology and Groundwater

Magnitude	Sensitivity		
	High	Medium	Low
Major	Major (significance)	Major - Moderate	Moderate
Moderate	Major - Moderate	Moderate - Slight	Slight
Slight	Moderate	Slight	Slight
Negligible	Negligible	Negligible	Negligible

16.4 Baseline Conditions

16.4.1 Topography & Geomorphology

The Stage 2 Environmental Impact Assessment Report identified no topographical or geomorphological features within the study area that were considered worthy of protection.

Since the production of the Stage 2 Report a significant volume of data has been obtained during the M8 Baillieston to Newhouse and Associated Improvements Phase 4 (Raith) Ground Investigation. This information has been incorporated into the ground model and has been used to more accurately define ground conditions generally. However, no sites of geomorphological interest have been identified during this process.

Topographical features and geomorphological resources are therefore concluded to be of low sensitivity.

16.4.2 Geology

The following information summarises the interpreted soil profile as obtained from historical and recent intrusive ground investigations.

Drift Geology
The recent intrusive ground investigation has provided a significant volume of information on the drift deposits within the study area. This has generally confirmed the complex nature of the superficial strata in the vicinity of Raith Junction.

In general, made ground, comprising a stony cohesive material, blankets the site and is associated principally with the existing road infrastructure. Typically, it is around 1.0-4.0m in thickness but locally reaches a maximum of between 7.0-12.8m (incorporating the M74 road embankment).

The made ground is underlain by a mix of sand and gravel with layers of mainly silt and clay material in a complex arrangement of often laterally discontinuous horizons.

Glacial till occurs generally at varying depths beneath the entire area, although it is relatively thin, and sometimes absent over the southern section. Over the northern half it approaches thicknesses of up to 8m. Overall the thickness of drift deposits ranges from between around 10m in the north to around 30m beneath the base of the M74 embankment.

The Stage 2 Environmental Impact Assessment Report identified no drift deposits within the study area that were of economic importance. Information acquired since the production of that report has allowed refinement of the ground model but has not uncovered any economically important drift materials. This baseline condition is therefore classified as low sensitivity.

Solid Geology

A number of rotary boreholes have been drilled within the study area as part of the Phase 4 (Raith) Ground Investigation. Results of these exploratory holes generally confirm the interpretation of solid geology that was made at Stage 2.

Rock comprises interbedded sandstones, siltstones and mudstones and has been encountered at a maximum depth of around 37m (-8.5m AOD) beneath Raith Junction getting progressively shallower moving north (reaching its highest level of +8.5m AOD).

No sensitive sites associated with solid geology have been identified in the area and this baseline condition therefore remains low sensitivity.

16.5 Loss of Economic Deposits

The Stage 2 assessment of economic deposits beneath the study area was based on Coal Authority Reports (Refs: 00157775-04 and 00157645-04) which record historical mining at depths in excess of 150m below ground level (bgl). It has not been necessary for recent ground investigations to investigate to such depths and therefore no new information is available. Accordingly, the Stage 2 appraisal remains unchanged.

Reserves of coal are understood to remain in the locality and could potentially be worked in the future subject to feasibility, licences and planning consents. This resource is considered to be of national importance and the loss thereof is judged to indicate high sensitivity.

16.6 Ground Surface Stability

As part of the Phase 4 (Raith) Ground Investigation the mineral position at shallow depth beneath the study area has been investigated and the absence of shallow mine workings has been confirmed. However, the presence of mineworkings at greater depths (in excess of 150m) is known from the Coal Authority Reports. Collapse of certain forms of abandoned workings may occur as mine supports or mine roof rocks deteriorate over time. The void created by original mine workings can migrate upwards to the surface and cause instability at ground level. It is recognised, therefore, that where abandoned mineworkings exist there is the potential for ground instability at the surface.

In terms of the value of a site for development, stable ground is of extreme importance and, for the purposes of this baseline condition, assessment ground stability may be classified as being of high significance.

16.7 Hydrogeology/Groundwater

The Phase 4 (Raith) Ground Investigation has included a detailed assessment of the hydrogeology and groundwater conditions beneath the study area. A significant volume of data has been collected to establish both the general groundwater regime in the area and also to determine the probable effects of the proposed junction modification on the surface and sub-surface water.

Standpipes were regularly monitored using long term in-ground monitoring devices to observe any groundwater changes. Shallow groundwater has been recorded generally across the site, usually at depths less than 1m bgl, although in the SSSI, south-west of the roundabout, groundwater appears to be slightly deeper at between 1m and 2m depth bgl. Artesian conditions have been encountered to the north-east of the M74 often with pressure heads greater than 2m above ground level.

There are wetland areas around Raith Junction to the north, north-west and south. Whilst the precise degree of connectivity between local surface water features and sub-surface water has not been fully established it is considered possible, given the presence of particularly shallow groundwater (and consequent narrow interface with the surface ponds) , that without any mitigation the surface waters could be sensitive to groundwater variations.

The BGS Hydrogeological Map of Scotland indicates that the aquifer beneath the site is moderately permeable and locally important. The Hamilton Low Parks Site of Special Scientific Interest (SSSI) and Laighland/Bothwell Park Wetlands Site of Importance for Nature Conservation (SINC) that are potentially sensitive to groundwater fluctuations are also situated local to the study area and with reference to Table 16.1 the hydrogeology baseline condition may therefore be classified as being of medium to high sensitivity.

16.8 Sensitive Land Uses/Designated Sites

A number of environmentally sensitive sites are present around Raith Junction, including the SSSI and SINC. Environmentally sensitive sites are described in more detail in Chapter 10, Ecology and Nature Conservation and are therefore not considered any further in this chapter. No geologically sensitive sites have been identified within the study area and this baseline condition is therefore classified as low sensitivity.

16.9 Contamination

At the time of the Stage 2 Environmental Impact Assessment Report little information was available on the extent and nature of contamination at the site other than the location of potentially contaminated sites identified in the desk study report. An intrusive contamination assessment of soils and groundwater has recently been completed as part of the Phase 4 Ground Investigation. Made ground is located north and east of the roundabout along the line of a historical railway and also randomly across the site. Results indicate that the made ground contains low levels of contamination likely to be associated with the historical railway, the construction of road infrastructure and other historical land uses. The locations where contamination has been identified are shown on Figure 16.1.

Groundwater and surface water samples have also been tested for contamination and both have been found to be contaminated with metals, inorganics, petroleum hydrocarbons and poly-aromatic hydrocarbons. Test results indicate that the quality of the groundwater is generally poorer than the quality of the surface waters. It is thought that contaminants within controlled waters are likely to be attributable to former off-site sources such as collieries in the surrounding area. A full assessment of the contamination at the site is presented in Mouchel Fairhurst JV, M74 Junction 5 - Contamination Assessment Report, MFJV 2006. (Appendix 16.1)

Those areas where contamination has been confirmed are potentially of regional significance and may, for the purposes of this assessment, be classed as medium sensitivity.

16.10 Summary of Baseline Conditions

Baseline Condition	Sensitivity of Geological Interest
Topography and Geomorphology	Low Sensitivity
Drift Geology	Low Sensitivity
Solid Geology	Low Sensitivity
Loss of Economic Deposits	High Sensitivity
Ground Surface Stability	High Sensitivity
Hydrogeology / Groundwater	Medium to High Sensitivity
Sensitive Land Uses / Designated Sites	Considered in Chapter 10
Contamination	Medium Sensitivity

16.11 Predicted Impacts

16.11.1 General

This section discusses the potential impacts on baseline geology and soil conditions that may result from completed development of the proposed scheme without any mitigation measures. Only those geological conditions that have been identified as being of a greater than “low” sensitivity within Section 16.10 have been considered in this section. The potential impact has been assessed for two possible scenarios, described below:

- Do-nothing Scenario

  Under the conditions of a “do-nothing” scenario, i.e. the proposed scheme did not go ahead, baseline conditions would only be affected by the occurrence of natural geological processes over time and would therefore remain largely dependant on external changes such as natural evolution of the wetland ponds and variation in groundwater (eg. due to minewater rebound). Other development may occur in the area with potential implications on geological and soil resources, however, no such significant development has been identified as part of this assessment.

- Development of the proposed Scheme

  The proposed junction improvements include the establishment of an underpass beneath the existing M74. This will carry traffic on the A725 beneath Raith Junction.

16.11.2 Loss of Economic Deposits

Coal is present at deep levels beneath the site and has been historically extracted by underground mining. The quantity of residual coal present beneath the site has not been estimated but the geological conditions (major faulting), diverse land use, and sensitive infrastructure in this area would likely restrict future coal extraction operations in the vicinity. Also, given that a large proportion of the deposit has already been extracted, it is considered unlikely that deep mining of the residual coal would be viable in the foreseeable future.

As the proposed junction layout is generally situated within the boundaries of the existing infrastructure, the additional land sterilised following completion of the junction modification will be insignificant.

The magnitude of the impact and significance of scheme development on the loss of economic deposits may therefore be classed as negligible.

16.11.3 Ground Surface Stability

The later collapse of abandoned workings is usually a result of deterioration of mine supports or mine roof material associated with old “stoop and room” workings. Where the void created by original mine workings migrates upwards to the surface, instability can be caused at ground level. Mining-related subsidence has been assessed in accordance with the criteria outlined in DMRB, BD 10/97 and as the absence of recorded workings or workable coal seams within 30m of rockhead was confirmed during recent intrusive investigation, the risk of potentially damaging instability associated with mineworkings collapse is considered to be low. It follows that the predicted impact under a do-nothing scenario is negligible.

As the principal mechanism for mineworking collapse is unrelated to surface activities it is considered unlikely that construction of the proposed route option would have any significant effect on surface stability. Therefore, with reference to Table 16.2, the magnitude of the predicted impact on ground stability under both a do-nothing scenario and following scheme development is considered to be negligible. In this case, with reference to Table 16.3 the significance of scheme development on potential ground instability is negligible. Possible ground disturbance during construction is addressed in Chapter 9.

16.11.4 Hydrogeology / Groundwater

As described in the Stage 2 Environmental Impact Assessment Report groundwater levels can naturally vary both locally and regionally due to seasonal, short term and long term climatic variations and to cessation of mining. The impact of a do-nothing scenario would be dependant on these external influences.

Construction of the proposed scheme will involve a deep excavated underpass in water-bearing soils beneath the junction. A comprehensive groundwater investigation and assessment has been carried out and the impacts on the local hydrogeology have been addressed in the Contamination Assessment Report. Given the shallow groundwater in this area and the artesian conditions that have frequently been encountered it is likely that scheme development will require localised temporary de-watering. As described in OGI Report, M74 Junction 5, Raith - Groundwater Assessment for Construction of Underpass, July 2006 (Appendix 16.3), the groundwater system in the area is dynamic and is fed by a large catchment. On completion of the construction phase and cessation of the local and temporary pumping, groundwater levels are expected to gradually return to normal and no permanent dewatering is considered necessary.

The construction phase dewatering scheme will clearly impact on the controlled waters in the vicinity of Raith Junction and this is considered fully in Chapter 9, Disruption due to Construction. Nevertheless it has been concluded that the wetland areas around Raith Junction will be unaffected by the completed infrastructure and reference to Tables 16.2 and 16.3 indicates that the magnitude and significance of scheme development on hydrogeology/groundwater is negligible.

The implications of the permanent road drainage are separately assessed in Chapter 15.

16.11.5 Contamination

Sampling and laboratory testing for contamination has been undertaken as part of the Phase 4 Ground Investigation and it has been established that locally contaminated soil, groundwater and surface water exists at the site. Under a do-nothing scenario it is expected that there would be no discernible change to the baseline condition and this impact is considered to be negligible.

The establishment of the proposed modified junction will introduce a sealed box structure with separation of the drainage run-off thus reducing surface water infiltration and lowering the risk of contaminants being mobilised beneath the carriageway. The implications of the road drainage itself is discussed in Chapter 15.

Completion of the underpass will create a barrier between contaminated material and humans. However a potential impact on maintenance workers will be introduced as they may come into contact with contaminated material through touch, inhalation or ingestion during maintenance activities. This impact, without protection or mitigation, is therefore considered to be moderate.

The significance of scheme development on contamination is therefore assessed to be moderate to slight. Possible construction phase impacts are addressed in Chapter 9.

16.11.6 Summary of Significance of Predicted Impacts

Baseline Condition	Sensitivity of Geological Interest	Magnitude of Impact	Significance of Impact
Loss of Economic Deposits	High	Negligible	Negligible
Ground Surface Stability	High	Negligible	Negligible
Hydrogeology / Groundwater	Medium to High	Negligible	Negligible
Contamination	Medium	Moderate	Moderate to Slight

16.12 Mitigation

16.12.1 Do-nothing Scenario

Under the conditions of a “do-nothing” scenario mitigation measures would be unnecessary.

16.12.2 Development of the Scheme

The only significant impacts of the completed scheme that have been identified (in relation to geology and soils) result from the disturbance of contaminated ground. Mitigation measures to address this impact are discussed below. Impacts associated with the construction phase of the works, particularly with respect to hydrogeology, are discussed in Chapter 9 – Disruption Due to Construction.

16.12.3 Contamination

Current waste management regulations and sustainability objectives and guidance encourage the retention on site of all materials, even those which are contaminated. Characterisation of the excavated soils, has concluded that they do not constitute a hazardous waste in accordance with current waste management legislation and guidance and therefore arising soils may be re-used on site. Further details of this characterisation can be found in the Contamination Assessment Report (Appendix 16.1).

It is considered that there is no potential pollutant linkage of significance between any residual source of contamination and humans, other than maintenance workers. Remediation therefore is unlikely to be necessary and preliminary discussions have been held with the appropriate regulatory authorities to seek agreement with this assessment.

As with any construction site, the risk to maintenance workers from mobilisation of and exposure to contaminants can be reduced to acceptable levels by ensuring standard health and safety procedures are followed, including the use of personal protective equipment (PPE), in line with the finalised design statements and risk assessments.

Construction methodologies for excavating and handling contaminated material are outlined in Chapter 9, Disruption Due to Construction. By applying the mitigation measures detailed above the risks and associated impacts may be reduced to acceptable levels.

16.13 Residual Impacts

With appropriate mitigation measures adopted during the design, construction and operation of the preferred scheme, potential effects associated with the disturbance of contaminated ground will be reduced so as not to pose significant risks to the development, existing water bodies and infrastructure, site workers or the general public.

16.14 References

The following information sources have been consulted where appropriate to provide baseline information:

Mouchel Fairhurst JV, Geological Long-Section, Raith.

Mouchel Fairhurst JV: M74 Junction 5,Raith - Geotechnical Interpretative Report on Construction of Underpass, 2006 (Appendix 16.2).

Mouchel Fairhurst JV, M74 Junction 5, Raith - Contamination Assessment Report, 2006 (Appendix 16.1).

Mouchel Fairhurst JV, Basis of Design Statements – Contamination Risk Assessments

Mouchel Fairhurst JV, Stage 2 Report: Environmental Impact Assessment Report

Mouchel Fairhurst JV: Preliminary Hydrogeological Assessment Report 2006 (Appendix 16.4).

The Coal Authority, Coal Mining Report, M74 Junction 5, Strathclyde - Report Ref: 00157775-04 and 00157645-04

Hydrogeological Map of Scotland, Scale 1:625000

Design Manual for Roads and Bridges Volume 11 Environmental Assessment (1993, amended and updated 2003),

Design Manual for Roads and Bridges Volume 1, Section 3, Part 14, BD 10/97, Design of Highway Structures in Areas of Mining Subsidence

Raeburn Drilling & Geotechnical, M8 Baillieston to Newhouse and Associated Improvements, Phase 4 Ground Investigation, Raith - Report on Ground Investigation. Contract No: 18622-04, May 2006

OGI, M74 Junction 5, Raith - Groundwater Assessment for Construction of Underpass, July 2006 (Appendix 16.3)

Health and Safety Executive Guidance, HS(G) 66 – Protection of Workers and the General Public During the Development of Contaminated Land, 1991

SEPA, Pollution Prevention Guidelines: Works In, Near or Liable to Affect Watercourses: PPG5

17 Policies and Plans

17.1 Introduction

This report provides a Stage 3 overview and appraisal of the strategic and local planning context of Raith Junction linked to the M8 up-grade. The report sets out the Strategic Policies and their implications for the finalised improvement option for Raith Junction, looking at current guidance in the form of National Planning Policy Guidelines (NPPGs) and more recent Scottish Planning Policy (SPPs), before addressing the relevant structure and local plan policies and the context these set for the motorway junction improvements and consequential works.

17.2 Planning Policy Context

The following section examines the current planning policies relating to the proposed improvements to Raith Junction and linkage to the M8 up-grade. The National, strategic and local planning policies, where applicable, have each been examined and are discussed below in detail.

17.2.1 National Planning Policy Guidelines (NPPGs) and SPPs

National Planning Policy Guidelines (NPPGs) and Scottish Planning Policies (SPPs) are prepared by the Scottish Executive and provide a statement of Government policy on land use and other planning related issues, which are considered to be of national importance. These statements of Government policy may, where appropriate, be material considerations that should be taken into account in the development control process. The most recent policy review has seen the introduction of SPP 17 Planning for Transport which has replaced NPPG 17.

The relevant Frameworks: NPPGs and SPPs to this policy review are:

- The Scottish National Planning Framework (2004);
- SPP 17 Planning for Transport;
- SPP2 Economic Development;
- NPPG 18 Planning and the Historic Environment;
- NPPG 5 Archaeology and Planning;
- SPP 7 Planning and Flooding; and
- NPPG 14 Natural Heritage.

17.2.2 The Scottish National Planning Framework (2004)

The National Planning Framework is a planning document that analyses the underlying trends in Scotland's territorial development, the key drivers of change and the challenges. It is one of the factors taken into account in coming to decisions on policy and spending priorities as well as providing a context for development plans and planning decisions.

The Framework sets the strategic context for the Raith Junction up—grading. The transport policy is based on supporting the promotion of economic growth, promoting social inclusion and accessibility, while ensuring that the development of transport is sustainable and minimises the environmental impact of travel.

The Raith Junction up-grade improvements fit in with the documents targeted improvements of the motorway and trunk road network by tackling some of the critical congestion spots. This issue is highlighted further in the "Key Issues and Drivers for Change Section" , which identifies that In parts of urban Scotland, the trunk road network and public transport systems require investment to address problems of congestion and unreliability to match Scotland's needs and potential.

The "Scotland 2025 Section" sets out the priorities for spatial development and investment under "A Better Transport System". The Executive's transport infrastructure commitments to 2010 include the completing the Central Scotland motorway network and incorporates upgrading the M8 as part of a range of works that include up-grading the M80 and building the M74 Northern Extension) and the Aberdeen Western Peripheral Route. The Raith Junction improvements can be viewed as an important component of the improvement to the efficiency of the M8 which is one of the strategic improvements whose delivery has the full commitment of the capital investment plan for the next decade.

The Section on "Spatial Perspectives" sets a strong supporting context for the Raith Junction improvements with the up-grade works playing an important role in improving the relationship between Edinburgh and Glasgow which is identified as being of key importance. The Framework identifies the complementary relationship between the two as important to the Central Belt and the Scottish economy as a whole because Central Scotland is viewed as a destination for business investment, living and tourism in both the European and global contexts. The document states "from this perspective, Edinburgh and Glasgow should be seen as two economic and cultural anchors linked by a fast, efficient, high quality transport system (paragraph 147)." The M8 Raith Junction up-grade is also important in terms of the supportive role it will bring to key strategic development projects to the West of Edinburgh, the Clyde Waterfront defined growth corridor and the Clyde Gateway East of Glasgow.

17.2.3 SPP 17 Planning for Transport: Consultation (January 2004)

Scottish Planning Policy (SPP) 17 Planning for Transport has replaced NPPG 9 the Provision of Roadside Facilities on Motorways and Other Trunk Roads in Scotland, NPPG 17 Transport and Planning and SPP 17 Planning Maximum Parking Standards Addendum to NPPG17. It is also has accompanying guidance Planning Advice Note 57 Transport and Planning.

The SPP sets out the national focus on transport, which is now on delivery of transport projects and the positive role land use and transport planning takes in supporting and building upon the Scottish Executive's transport delivery agenda and states:

"The overall vision is of a Scotland where the economy can flourish and communities can function without environmental and social problems arising from car dependency, traffic congestion and pollution."

The SPP Transport vision uses the four aims of the Scottish Executive "Partnership for a Better Scotland (2003)" these are:

- Growing the economy;
- Delivering excellence in public services;
- Supporting strong communities; and
- Developing an ambitious and confident Scotland.

The main emphasis of SPP 17 is an integrated approach to land use, economic development, transport and the environment based on the following objectives:

- To meet European and UK government commitments and targets of greenhouse gases, and local air quality;
- To maintain and enhance the quality of urban life, particularly the vitality and viability of town centres;
- To reinforce the rural economy and way of life;
- To enhance and maintain the natural and built environment, through avoiding or mitigating adverse environmental impacts, minimising environmental intrusion, and retaining, improving and enhancing areas of biodiversity;
- To ensure the impact of development proposals on transport networks does not compromise their safety or efficiency.

The Raith Junction up-grading will contribute to the overall improvement to the M8 and play in turn an important role in establishing a corridor of growth between Edinburgh and Glasgow benefiting the towns, communities and business activities along its route, it will in particular aid with the efficiency of the transport network by reducing congestion. This role meets with Paragraph 15 Major Strategic Projects, which states:

"Maintaining and improving transport infrastructure has an important role to play in growing Scotland's economy. Congestion has a major impact on the economy and environment of Scotland".

A further benefit of the Raith Junction improvements is they will aid regeneration by improving access to regeneration sites on the M8 corridor this relates to Paragraph 17:

"Proposals for development and regeneration should support and build upon the capacity of the transport network, giving greater weight to locations able to be well integrated in to effective networks. "

The proposals for Raith Junction are important to the up-grading of the M8 which as already mentioned identified as a key corridor for economic growth. This means the proposals are in keeping with Paragraph 22 under the heading "Planning for Strategic Roads" which states:

"There is a general presumption against new motorway or trunk road junctions. The Scottish Executive will consider the case for such junctions where nationally significant economic growth or regeneration benefits can be demonstrated."

SPP 17 compared to the previous NPPG 17 places a strong emphasis on new developments and their impact on the Road Network under the heading "Assessing Development Proposals" where a range of guidance is set out. This guidance relates to trip generating activity rather than road and junction improvements or development.

The policy section "Development Affecting Trunk and other Strategic Roads" sets out guidance on developments requiring new junction improvements. Much of the guidance is not relevant to the Raith Junction improvements itself but the guidance does states:

"Strategic roads are often barriers to walking and cycling and development should seek to make the barrier more permeable through inclusion of pedestrian and cycle crossings".

The issue of existing access and by pedestrian and cycle movement will accounted for in the detailed design of the junction if proved a necessity.

The Planning Advice Note 66 Best Practice in Handling Planning Applications Affecting Trunk Roads (2003) sets out good procedural aspects of trunk road development management process. These have been fully accounted for in the preparation of the Raith Junction layout.

17.2.4 The Roads Act (Scotland 1984)

The Roads Act (Scotland 1984) is the statutory basis for consideration and determination of trunk roads and motorway proposals in their wider planning and environmental context. It states:

"Structure plans and Local Transport Strategies should be co-ordinated to assess the wider environmental and transport implications of new development, the general location of significant individual developments and to indicate where and when broad levels of constraint are necessary."

The key details in relation to the Raith Junction Improvements are:

- Trunk roads which includes all motorways have an important strategic role to play in carrying long distance traffic between major centres;
- There is likely to be little scope to alter priorities within the trunk road programme with local planning priorities even if these place particular pressure on a trunk road link or junction;
- Plans should reduce the need to use trunk roads or other through routes for short journeys;
- They should identify those routes which are reserved as corridors for movement where development seeking access would be resisted;
- The impact of developments on trunk roads at or near capacity should be mitigated to achieve "no net detriment" to the carrying capacity of the trunk road;

- Direct access to a motorway or slip road is not allowed from private development other than a motorway service area approved by the Scottish Office;
- Safe and appropriate access design should reflect the type of road involved, the scale of development, the nature of the area, and the volume and character of likely traffic using the access and road;
- Developers are responsible to carry out major road or junction improvements if the volumes of traffic or type of road warrant it;
- Land use and transport planning needs to account for impact on the landscape and use of the Countryside. This in particular relates to policy on Green Belt set out in SDD Circular 24/1985 and on agricultural Land in SDD Circular 18/1987; and
- Planning authorities have a general duty under Section 46 of the Countryside (Scotland) Act 1968 to protect, keep open, and free from obstruction or encroachment any public right of way.

17.2.5 SPP 2 Economic Development

SPP 2 Economic Development was issued in November 2002 and sets out existing government policy in relation to Economic development.

In accordance with SPP 2, local planning authorities are required to have regard to the following objectives:

- Ensure existing business locations are able to meet the anticipated changes in the economy and provide choice for a diverse range of economic development;
- Provide special sites, particularly those of National significance and those which support the knowledge based economy;
- Respond positively to firm proposals for corporate headquarters;
- Support existing and new businesses;
- Provide for small towns and rural areas;
- Secure and support the delivery of sites for economic development in sustainable locations by identifying key locations that are highly accessible by public transport;
- Promote the re-use of previously developed sites in sustainable locations and meet the requirements of particular sectors;
- Work with the enterprise networks to provide a framework that links key business locations more closely with public transport and other development activity.

In relation to the above, the proposed improvements Raith Junction is generally in compliance with these objectives as they would act as an important facilitator of physical and economic development, justification for this position is outlined below:

- the proposed improvements to Raith Junction will help support the development of a number of high quality employment/mixed use development opportunities in two Local Planning Authority areas, which will enable employment creation, as well as contribute to the overall economic development of the central belt of Scotland;
    - the proposed improvements will enhance the marketability of a number of existing quality sites for business and industry use rather than damage, the environmental characteristics of development sites and surrounding environs;

- the Junction improvements will enhance accessibility for business and industry by both public and private modes of transport; and
- the junction improvements and the M8 up-grading support a wide range of government policies, including those relating to sustainable development. The improvement of accessibility to the M8 and the strategic road network will contribute towards meeting the needs of all businesses whether inward investing or indigenous companies.

17.2.6 NPPG 18 Planning and the Historic Environment

National Planning Policy Guideline 18 (NPPG 18) deals primarily with listed buildings, conservation areas, world heritage sites, historic gardens, designed landscapes and their settings. It complements NPPG5 Archaeology and Planning, which sets out the role of the planning system in protecting ancient monuments and archaeological sites and landscapes.

Central to the Government's approach is the need to secure preservation whilst accommodating and remaining responsive to present day needs.

In relation to the NPPG 18, the Raith Junction Improvements are in general compliance with these objectives, as outlined below:

- No impact on designated Listed Buildings;
- No impact on designated Conservation Areas; and
- No impact on Historic Gardens of designated landscapes.

17.2.7 NPPG 5 Archaeology and Planning

National Planning Policy Guideline 5 (NPPG 5) sets out the Government's planning policy on how archaeological remains and discoveries should be handled under the development plan and development control systems, including the weight to be given to them in planning decisions and the use of planning conditions.

The guidance is aimed at planning authorities in Scotland, and is also of direct relevance to developers, owners, statutory undertakers, government departments, conservation organisations and others whose actions have a direct physical impact upon the natural or built environment.

The aim is that positive planning control, as well as development plans, can help to reduce possible conflict between development and preservation, and to indicate ways of preserving archaeological resources without unnecessarily delaying development. The ultimate objective is to secure the best possible treatment of the archaeological heritage while at the same time accommodating the need for development. Relating specifically to road projects such as Raith Junction up-grading, the Policy states that because of their extent, certain activities, such as forestry planting, roads and mineral extraction, may have particularly significant consequences for archaeological remains. Within the definition of how particular types of development should respond to the issues raised in NPPG Raith Junction improvements need to attention to:

> *"….in the principle recently adopted by government departments of directly funding necessary archaeological investigations from project costs, for example in trunk road schemes."*

The preservation of ancient monuments and their setting is a material consideration in determining planning applications and appeals, whether a monument is scheduled or not. Therefore the archaeological implications of development proposals should be considered at the outset of the development control process. In considering applications for planning permission, which involve, or may have implications for, archaeological remains, planning authorities should:

- encourage prospective developers to seek early discussions;
- consult the Regional Archaeologist at the outset of the process;
- ensure, where appropriate, that the prospective developer arranges for an archaeological assessment and, if necessary, a field evaluation; and

ensure that relevant information on the cultural heritage, including archaeological resources, is taken into account in any environmental assessment that may be necessary in relation to the application for planning permission.

Consultation would involve not only the local authority but also in some circumstances the Secretary of State for Scotland and Historic Scotland.

17.2.8 SPP 7 Planning and Flooding

This SPP is aimed at helping all the parties to consider flooding issues properly, especially in the light of climate change predictions, and so prevent additional land and development being put at risk from flooding.

The central purpose of this Scottish Planning Policy (SPP) is to prevent further development, which would have a significant probability of being affected by flooding or which would increase the probability of flooding elsewhere.

Many parts of Scotland have a legacy of development at risk of flooding from watercourses, the sea, groundwater and inadequate drainage. Climate change is predicted to worsen the situation. The Scottish Executive expects developers and planning authorities to err on the side of caution in decision making whenever flooding is an issue. Flood risk will be a material consideration in a range of cases. The key objectives of the guidance are:

- New development should not take place if it would be at significant risk of flooding from any source or would materially increase the probability of flooding elsewhere. SEPA have issued planning authorities with indicative flood risk maps. The Scottish Executive Environment and Rural Affairs Department has commissioned SEPA to prepare a 2nd generation flood map which will provide a better basis for identifying the risk areas;
- The storage capacity of functional floodplains should be safeguarded, and works to elevate the level of a site by landraising should not lead to a loss of flood water storage capacity;

- Developers and planning authorities to deal very seriously with flooding, to take an informed approach to decision making and err on the side of caution where flood risk is an issue;
- Developers must regard the probability of flooding and the associated risks;
- Where built up areas already benefit from flood defences, redevelopment of brownfield sites should be acceptable but greenfield proposals will extend the area of built development at risk and should preferably be considered in the light of alternatives through the development plan process;
- Generally, drainage will be a material consideration and the means of draining a development should be assessed;
- Sustainable drainage will be required whenever practicable and watercourses should not be culverted; and
- Flood prevention and alleviation measures should respect the wider environmental concerns and appropriate engineering solutions recognise the context provided by the development plan.

The policy in this SPP is based on the following principles:

- Developers and planning authorities must give consideration to the possibility of flooding from all sources;
- New development should be free from significant flood risk from any source (see paragraph 40);
- In areas characterised as ‘medium to high’ flood risk for watercourse and coastal flooding (see paragraph 34 and the Risk Framework) new development should be focussed on built up areas and all development must be safeguarded from the risk of flooding and
    - New development should not:
    - materially increase the probability of flooding elsewhere;
    - add to the area of land which requires protection by flood prevention measures;
    - affect the ability of the functional flood plain (see Glossary) to attenuate the effects of flooding by storing flood water;
    - - interfere detrimentally with the flow of water in the flood plain; and
    - - compromise major options for future shoreline or river management.

For coastal and watercourse flooding, a Risk Framework characterises areas for planning purposes by their annual probability of flooding and gives the planning response:

- Little or no risk area (less than 0.1% *(1:1000)*) – no general constraints;
- Low to medium risk area (0.1% to 0.5% *(1:1000 – 1:200)* – suitable for most development but not essential civil infrastructure and
- Medium to high risk area (0.5% *(1:200)*) or greater – in built up areas with flood prevention measures most brownfield development should be acceptable except for essential civil infrastructure; undeveloped and sparsely developed areas are generally not suited for most development.

In relation to the above, the Raith Junction Improvements are in general compliance with these objectives, as outlined below:

- The development is free from significant flood risk (NB in Revised Draft this statement to be amended based on further hydrological information and assuming mitigation is acceptable to SEPA and set in place);
- Full account has been taken of potential flood impacts of the junction improvement proposals and SEPA indicative flood risk maps analysed;
- Flood plain impact will be minimal and impact on water course flood plains has been fully assessed
- A precautionary approach has been taken on areas of potential flood risk in all development options;
- Drainage from the motorway has been a fundamental part of the option development and will be fully accounted for in final design proposals;
- Sustainable drainage systems (SUDS) will be used where practical in the design of final adopted option; and
- The annual probability of flooding of road sections will be fully assessed during the development of preferred design option.

17.2.9 NPPG 14 Natural Heritage

National Planning Policy Guideline 14 (NPPG14) gives guidance on how the Government's policies for the conservation and enhancement of Scotland's natural heritage should be reflected in land use planning.

This NPPG:

- sets out national planning policy considerations in relation to Scotland's natural heritage;
- summarises the main statutory obligations in relation to the conservation of natural heritage;
- explains, as part of a wider framework for conservation and development, how natural heritage objectives should be reflected in development plans;
- describes the role of the planning system in safeguarding sites of national and international importance;
- provides guidance on the approach to be adopted in relation to local and non-statutory designations; and
- draws attention to the importance of safeguarding and enhancing natural heritage beyond the confines of designated areas.

The guidance incorporates elements from the wider framework for sustainable development, which takes the position that the Government's objectives for Scotland's natural heritage are to conserve, safeguard and, where possible, enhance:

- the overall populations and natural ranges of native species and the quality and range of wildlife habitats and ecosystems;
- geological and physiographical features;

- the natural beauty and amenity of the countryside and the natural heritage interest of urban areas; and
- opportunities for enjoying and learning about the natural environment.

A key role of the planning system according to the NPPG is to ensure that society's land requirements in terms of housing, economic activity; transport infrastructure and recreation are met in ways which do not erode environmental capital. The protection of natural heritage may sometimes impose constraints on development. However, conservation and development can often be fully compatible and, with careful planning, the potential for conflict can be minimised. Scotland's natural heritage is important to us all, both for its intrinsic environmental value and because of the opportunities for social and economic development which it offers.

The NPPG takes the view that the scale, siting and design of new development should take full account of the character of the landscape and the potential impact on the local environment. Particular care is needed in considering proposals for new development at the edge of settlements or in open countryside.

Under the section “statutory designations” it states “Designation does not imply prohibition on development. Sites are designated for a variety of different purposes and development proposals require to be assessed for their effects on the natural heritage interests which the designation is intended to protect. The Guidance covers a vast array of designations many of which are not directly relevant to the Raith Junction improvements:

National Designations

- National Scenic Areas
- Sites of Special Scientific Interest
- National Nature Reserves
- National Parks
- Natural Heritage Areas

International Designations

- RAMSAR Sites
- Special Protection Areas
- Special Areas of Conservation
- Natura 2000 Areas

The section on “the wider natural heritage” provides a broader definition of the extent to which natural heritage requires to be protected and states:

“Planning authorities should seek to safeguard and enhance the wider natural heritage beyond the confines of nationally designated areas. The effect of a development proposal on the natural heritage can be a material consideration whether or not a designated area is likely to be affected, though the level of protection afforded to natural heritage interests

outwith designated areas will not normally be as high as that afforded to sites of national or international importance."

The section provides further guidance on features, which may be of a value and need to be accounted for in assessing development impact on the natural habitat:

- Trees and woodlands
- Lochs, Ponds, Watercourses and Wetlands
- Environmentally Sensitive Areas

All of those features relevant to the improvements to Raith Junction will be accounted for in the detailed design of the junction and any loss of habitats will be supplemented by high quality landscaping.

In addition to the national and international designations there are a number "regional and local designations" that development proposals must account for, the section under this heading sets out the following habitat designations:

- Areas of Great Landscape Value;
- Local Nature Reserves;
- Wildlife Sites; and
- Regionally Important Geological/ Geomorphological Sites.

None of these designations are impacted upon by the Raith Junction improvements.

The section under "Development Control and Implementation" provides the basis by which habitat protection will be assessed in approving development proposals stating:

"Planning authorities should have full regard to natural heritage considerations in determining individual applications and contributing to the implementation of specific projects….They should always encourage the retention and enhancement of features of natural heritage interest and seek to avoid the fragmentation or isolation of habitats."

The Raith Junction development would not create any fragmentation of existing natural habitats.

The section on Conditions and agreements goes on to say:

"Conditions can be used to prevent or mitigate adverse effects on the natural heritage or to secure measures directly related to the development which offer positive environmental benefits.

Where conditions do not appear appropriate to control the use of land, authorities may consider the use of an agreement under Section 75 of the Town and Country Planning (Scotland) Act 1997.

Where the primary concern relates to land management or access to natural heritage resources, authorities should consider whether mechanisms other than those provided under planning legislation might provide the best means of securing their objectives."

All effort will be made during the detailed design of the junction to mitigate against any damage to the natural heritage of the surrounding environment.

An important factor in assessment of development proposals is what is defined as "The Precautionary Principal" which states:

"While much can be done to mitigate the environmental effects of development through the use of conditions or agreements, there may be instances where the scientific evidence is inconclusive but the potential damage could be significant. In view of the importance of safeguarding biodiversity, the Government is committed to the application of the precautionary principle where there are good scientific grounds for judging that a development could cause significant irreversible damage to our natural heritage."

NPPG 14 also places an emphasis on the centrality of environmental assessment to consideration of development proposals and the section states:

"The EC Directive on Environmental Assessment (85/337/EC) as amended by Directive 97/11/EC seeks to ensure that where a development is likely to have significant effects on the environment the potential effects are systematically evaluated in a formal environmental statement. The Environmental Assessment (Scotland) Regulations 1999 brings the amended directive into force.

For any given development proposal, the more environmentally sensitive the location, the more likely it is that environmental effects will be significant and will warrant assessment. Where a project listed in Annex II of the Directive is likely to have significant effects on the special character of a protected area or site an environmental assessment must be carried out. The views of SNH should be sought and taken into account where the planning authority is uncertain about the significance of the likely effects of a project on the natural heritage."

The finalised Raith Junction Development proposal is the result of a three stage process of development fully in line with The EC Directive on Environmental Assessment (85/337/EC) as amended by Directive 97/11/EC and The Environmental Assessment (Scotland) Regulations 1999.

17.2.10 Glasgow and the Clyde Valley Joint Structure Plan (Approved May 2002)

The Scottish National Planning Framework sets the national context for the Structure Plan in spatial terms. A key concept is the creation of a "corridor for growth" in which the M8 plays an important role in connection of key development areas across local authority boundaries. Under the section "Collaborating for Success" it states:

"Transport Networks: better access is important in achieving social and economic cohesion both within the area and beyond."

One of the 4 key aims of the Structure Plan is

"to integrate land uses and transportation with a key issue being that some recent greenfield industrial and business development is poorly linked to areas of high unemployment….and there is a growing linkage between urban and rural areas and the rest of Scotland ".

The Raith Junction improvements will contribute to the positive impact of the upgrade of the strategic road network, and will play an important role in the development of the corridor of growth concept. It will support the M8 up-grading and its role as the main east-west road artery. Further, this will link to a number of key aims as set out in paragraph 5.9 of the Plan, which are:

- The promotion of key renewal opportunities within or related to the corridor;
- The enhancement of the key centres of business, education and commerce;
- The improvement of public transport access along, across and into the corridor; and
- The completion of the road and rail network serving the corridor.

The Chapter on the Integrated Land Use and Transportation Framework identifies the M8 between Newhouse – Baillieston in schedule 3 (b), Priority Corridors for Management, Central corridor as a priority, which should be given to Transport Strategies on main transportation corridors. This is emphasised by the A8/M8 Upgrade (East) being included under Schedule 4 Strategic Transport Network Development Proposals under part (iv) Road Schemes.

The investment in the Raith Junction improvements will play an important supporting role in improving the strategic road network. It would in particular improve links to the M8, and be beneficial to the efficiency of freight movement across the road network and is a positive response to the aims of the freight movement strategy.

17.2.11 Local Planning Context

Raith Junction improvements and other consequential works are covered by two local authorities namely North Lanarkshire and South Lanarkshire, which have two different local plans and separate policies which will have direct relevance to the proposed Junction development. The relevant local plans are:

- North Lanarkshire Council: Southern Area Local Plan –Finalised Draft (Modified 2005); and
- South Lanarkshire: Hamilton District Local Plan (Adopted August 2000).

The main impacts of the Raith Junction development will be experienced in both the immediate junction development are and a broader strategic area. The impacts will fall into the following policy areas:

- Transportation;
- Industry and Business; and
- The Environment

Indirect impacts relate to:

- Housing; and
- Retail and Commerce; and
- Leisure and Tourism.

The junction development has a varying level impact on the policies within the plans and in some cases results in infringements on different planning designations, which will require tackling through detailed design.

17.2.12 South Lanarkshire Council (Hamilton District) Local Plan

Raith Junction is primarily covered by the South Lanarkshire Council (Hamilton District) Local Plan.

The wider strategic impacts of the M8 Corridor development have implications for the improvements to Raith Junction. These would have potentially positive impacts upon Hamilton, Bothwell and Uddingston in terms of accessibility to the strategic road network; all of these settlements are within the South Lanarkshire Council (Hamilton District) Local Plan.

The chapter on Movement creates the context for up-grading of both the M8 and related junctions stating:

"At the same time there has been lobbying for improvements to the A73/A71 from the M8 motorway to the M74 motorway at Canderside as a better option to a more southerly route. Clearly the development of the "fast link" could have some transportation benefits, in terms of a potential reduction of traffic on the A71."

The plan is shortly to be replaced by the South Lanarkshire Local Plan which has been through Inquiry and will be published in August 2006.

17.2.13 North Lanarkshire Council: Southern Area Local Plan

The North Lanarkshire Council: Southern Area Local Plan covers the area to the South of the M8. The Local Plan Development Strategy highlights the importance of the M8 corridor taking up the theme of the "Corridor for Growth" and one of the fundamental considerations influencing the Plan's direction and Content is under the heading "Industry and Business" which states:

"Advantage must be taken of the areas strategic location on the M8/A8 corridor. The success of the Strathclyde Business Park, Eurocentral and the Enterprise Zone sites as key business locations requires to be built upon to compensate for the problems associated with economic restructuring. Longer term opportunities to identify new business locations require to be assessed to ensure that future land requirements can be met".

Table 17.1 Summary of Compliance with Policies

Glasgow and Clyde Valley Joint Structure Plan		
Policy Number	**Policy Content**	**Compliance with Policy**
Schedule 4 Strategic Transport Network Development Proposals - Road Schemes	"The sustainable development of Glasgow and Clyde Valley Metropolitan Area will be supported through the development of the Strategic Transportation Network as identified on Key Diagram Inset B and in Schedule 4." Road Schemes: A8/M8 Up grade	Fully compliant
South Lanarkshire: Hamilton District Local Plan		
Policy Number	**Policy Content**	**Compliance with Policy**
Policy M8 Alternatives to Road Construction and New Roads	The Council will promote innovative approaches to addressing improvements to the primary road network and discourage significant road construction.	Fully compliant The detailed design of the chosen option and an environmental,

	New roads will be expected to meet the overall objectives of the plan and an environmental, movement and economic assessment will be required to ensure that all possible options are fully assessed.	movement and economic assessment will be undertaken.
Policy ED2 Industrial Proposals	"The Council acknowledges that the Whistleberry Corridor and South Larkhall are the prime industrial locations and will seek to promote them for major industrial locations and will seek to promote them for major industrial investment. Within the strategic context and to meet more local demands, it will further support the development for industrial purposes the site detailed below and identified on the proposals map. Location area (ha) <u>Stonehouse</u> East Mains 4.4 Given the economic importance of the Whistleberry corridor and south Larkhall areas, it is recommended that sites in Blantyre (Craighead Retreat) and Larkhall (Carlisle Road) be investigated for their long term	The junction improvements will have a direct impact on the relationship between the M74 and M8 while also enhancing the accessibility to a wide range of economic development sites.

	industrial potential".	
ED12b Hamilton College/ Bothwell Road STW	The Council does not anticipate development proposals resulting in the change of use of Hamilton College and Bothwell Road sewage Treatment Works. However, should the existing uses cease the Council will be prepared to consider favourably proposals which complement adjacent uses particularly within Hamilton Park Racecourse and respect the environmental qualities of the surrounding landscape.	The junction improvements will have no impact on designated areas.
ED3 Industrial Relocation	The Council, in consultation with local communities, will monitor the operation of established industrial uses located outwith the main industrial area and, where these adversely affect the amenity of the surrounding area by creating adverse traffic or environmental conditions, will control their further expansion and/or development and will work with its partners to seek opportunities for relocating businesses. The subsequent redevelopment of these sites is encouraged and any proposals should conform to the appropriate policies of the district local plan.	The Junction Improvements will be supportive of the policy on the basis of enhancing the accessibility to existing sites and improving the prospects of future identified industrial and business land.
ED 25 Bothwell Visitor Attraction	The council recognises the potential of Bothwell as a visitor attraction and will support proposals for the development of appropriate facilities within the village.	Compliant with policy as improvements would improve access to Bothwell as a potential visitor attraction.

	Specific locations which are suitable for such developments are: • Bothwell Parish Church • Covenanters' Field • Memorial at Bothwell Bridge The Council will co-operate with the relevant bodies to realise the potential of these sites and will promote the development of a Covenanters' Trail centred on Bothwell.	
Policy EN1a Greenbelt	Within the area designated as Greenbelt there will be a strong presumption against development.	The proposals would be in conflict with this policy. But high quality landscaping will mitigate against the visual and physical impacts.
Policy EN1b Prime	The council will resist proposals which will result in the	The Junction development to the north results in a low level of land take of non-prime agricultural land that can produce only a narrow range or

Agricultural Land	loss of prime agricultural land.	crops. To the south it results in the small amount of land take of unclassified land. The scheme is therefore not in conflict with this policy.
Policy EN1c Areas of Great Landscape Value	Within areas identified as being of great landscape value, the Council will exercise particular care in assessing any proposals, even where they conform with Greenbelt policy as set out above. The Council believes that some areas of particular landscape quality make an additional contribution to the environment, provide valuable habitats for flora and fauna and are environmentally sensitive. Consequently, their protection and enhancement are of prime importance	The proposals would be in conflict with this policy. The impact will be reduced by an associated high quality landscape regime incorporated into the detailed design.
Policy EN6: Nature Conservation - Local Nature Reserve Site	The Council will co-operate with the relevant bodies to prepare a nature conservation strategy for the District Local Plan which will provide information on wildlife and nature conservation and promote a greater awareness and understanding of wildlife. In the interim, the council will normally have a presumption against development which will impinge	The proposal for the up-grade of Raith Junction will conflict with this policy in the north-east and north-west of the junction development area. To mitigate against this problem high quality landscaping will be included in the detailed design. The junction proposal will have a minor impact on the northern edge of Strathclyde Country Park. To mitigate against this problem high quality landscaping will included in the design detailing.

	on or adversely affect land designated as: a) A Site of Special Scientific Interest or a Local Nature Reserve. b) A Site of Importance for Nature Conservation. c) Wildlife Corridors. In addition to the above, the council will normally have a presumption against development that would adversely affect parks, open spaces, countryside and potential wildlife links, so as to conserve an integrated system of wildlife habitats.	.
EN3a	The council will undertake a review of the Areas of Great Landscape Value in terms of the area designated, criteria for any development within its boundaries and any other relevant matters. This is because the Council wishes to ensure that the urban fringe and semi-rural landscape are of the	The proposal will have no impact on this policy.

	highest possible aesthetic standard. Furthermore the Council wishes to encourage appropriate recreational use of these areas.	
EN3b Landscape Quality/ Urban Fringe	The Council in consultation with local communities will continue to tackle problems of dereliction and under use of land in the urban fringe, promote appropriate rural leisure uses, and in areas of low quality/degraded landscape give priority to implementing improvement schemes.	The proposal will have no impact on this policy.
EN25 Heritage Preservation	The council recognises that the physical heritage of the district should be safeguarded and this will be taken into account when considering applications for development. The council will operate a general presumption against development that would destroy, adversely impinge or significantly damage any heritage feature; including ancient monuments, listed buildings, conservation areas, historic gardens, designed landscapes and ancient woodlands etc.	The proposal will have no impact on this policy.
EN7 Tree Preservation	The Council will seek timeously to protect important trees or groups of trees by using the various statutory means at its disposal, will promote and encourage the planting of trees and, where justified, insist on tree planting proposals as a condition of planning consents. Particular importance is attached to the	The Junction Improvement proposal will be in conflict with this policy. All future works will be subject to a tree survey and replacement planting will be undertaken to mitigate against any loss of trees.

	urban fringe and to villages. The most suitable species will be required in any planting scheme but in general, the Council will promote the use of deciduous species.	
EN9 Environmental Improvements	The Council will continue its programme of improving the environment through a wide of schemes and, subject to finance, will promote and implement environmental improvements on a comprehensive basis within major settlements and within specific areas identified as requiring treatment, based on the following: Major corridors, commercial centres, visitor attraction and tourist infrastructure, key industrial areas, industrial improvement areas, potential housing initiatives, key image/townscape improvements, development opportunities, settlement packages.	The up-grade proposal will support this policy by improving the efficiency of a major transport corridor.
CU1a Sports/ Leisure Facilities – Reserve Sites	The Council will safeguard existing sports and leisure facilities and will promote the development of new facilities in accordance with recognised needs, demands and shortfalls.	The junction proposal will have no impact on this policy.
CU2 Parks – Policy on Future Development	The Council will safeguard existing parks from development. Proposals which enhance or expand the recreational role of a park may be approved provided they are appropriate in scale, use and design to the existing character of the park and will not introduce	The Junction improvement proposal will impact upon the Northern boundary of Strathclyde Country Park and measures will be taken to mitigate the externalities related to the road improvements. Through high quality landscaping.

	adverse traffic conditions.	
M1 Transportation Network s / Access for People with Disabilities	The Council will review, on a regular basis, the operation of the transportation network and will identify solutions to any problems that might arise. In particular, the council will seek to identify priority traffic management schemes in accordance with agreed criteria and will seek to implement these with appropriate funding from other agencies.	The junction proposal will contribute to the policy aim of improving the efficiency of the transport network.
DC1 Development Control General	All applications for planning permission shall take fully into account the local context and built form – i.e. development should not take place in isolation and must take cognisance of scale, position and materials of adjacent buildings and surrounding streetscape. Proposals should also aim for the best possible quality of external materials. In particular, type of material chosen, colour and texture are crucial when choosing external finishes especially for brick, stone and roofing. All new developments should aim to enhance the quality of the local environment and where appropriate of new or improved landscaping shall be required as an integral part of the development. Hence in determining applications for development, the Council	The Junction improvement proposal will adhere to the highest quality of design to fit with the natural environment through high quality landscaping being a key element in the detailed design.

	will have regard to: a) the local context b) accessibility c) safety and security d) layout and form e) exterior evaluations f) landscape treatment g) environmental impact h) any extant design guidance prepared by the council.	
DC6 Movement	All development will require adhering to standards of road design, parking and servicing provision set out in the Guidelines issued by the Roads Department and be justified through a Traffic Impact Analysis and Safety Audit, if required. Proposals for a new development will be assessed	The Junction proposal will be in agreement with this policy and the detailed design will adhere to the highest quality of road design as set down in national guidance. A full Traffic Impact Analysis and safety audit has been undertaken to fit with all appropriate criteria set down under the policy.

	where appropriate, against the following criteria: a) achievement of high road safety standard b) safeguarding of strategic and local transport proposals c) provision of facilities for public transport and for early introduction of public transport services in new development d) provision of an adequate access into the existing road network having regard to safety and environmental considerations. e) Avoidance of the introduction of traffic of excessive volumes, size or weight onto unsuitable roads or into residential and other environmentally sensitive areas. f) Provision of off-street parking, servicing and loading in accordance with the standards set out. g) Provision of a balance between convenience, safety and environment whilst still giving access for servicing and emergency vehicles. h) Provision of facilities for cyclists and	

	pedestrians. i) Provision of traffic calming measures. j) Provision of funding of appropriate transport improvements to overcome unsatisfactory transport conditions created or exacerbated as a direct result of the development. k) Provision of facilities within the development supporting all forms of transport including access, showers, locker rooms, ramped access etc.	
DC8 Conservation Area	All development proposals within Conservation Areas will require a high standard of design in keeping with the quality and character of the local built environment. The Council requires that all applications within Conservation Areas shall be detailed submissions and must be accompanied by sufficient information to allow a full assessment of the proposal. No trees within Conservation Areas shall be lopped, topped, pollarded or felled without the prior written approval of the council.	The proposal has no impact on this policy.

North Lanarkshire Council: Southern Area Local Plan		
Policy Number	**Policy Content**	**Compliance with Policy**
ENV 6 Green Belt	The Council will safeguard the character and function of the green belt, as defined by the Proposals Map, within which there will be a presumption against development or change of use other than that directly associated with and required for agriculture, forestry, generation of power form renewable sources, outdoor leisure and recreation, telecommunications or other appropriate rural uses. Mineral extraction may also be acceptable where proposals accord with other relevant policies within the plan. Proposals to extend established industrial and business uses will be acceptable only where the development would not result in the adverse effect on the character and function of the Green Belt.	The Junction layout proposals will impact on the Greenbelt policy due to loss of designated land but will not have an adverse effect on the character and functioning of the greenbelt. Adverse visual and environmental impacts will be tackled through detailed design in form of high quality landscaping.
Policy L8 Strathclyde Country Park	The Council will continue to maintain and further enhance facilities at Strathclyde Country Park consistent with The Park Development Strategy and	The Junction proposal reacts positively to the policy by improving existing access arrangements which is support is supported by the

	the policies of the Local Plan. The plan then goes on in supportive text to state: "Strathclyde Country Park represents a regionally significant leisure and tourism resource which attracts a wide range of visitors to the Plan area each Year." and "It is important that all proposals are carefully considered to ensure that the nature of the park is not undermined by inappropriate forms of development, and so proposals will be assessed against other relevant policies in the Plan, particularly those concerned with the protection of the natural environment." (Para 8.51)	following local plan statement: *"Access is a problem at Strathclyde Country Park therefore any additional facilities created within the Park will need to take Traffic Management Measures and the impact upon the adjacent strategic road network into account."* (Para 8.53) The Junction design proposal will impact adversely upon the northern boundary of Strathclyde Country Park and the negative impacts will be tackled through the detailed design stages for the Junction which incorporates high quality landscape design.
Policy IND 1 Industrial	The Council will seek to maintain a 10 year supply of	The Junction Improvements will be supportive of the policy on the basis

and Business Land Supply	marketable land for industrial and business development in each category of the land supply (High Amenity, Prestige, Local and Low Amenity) promoting where possible the re-use of vacant and derelict urban land. It will support, in principle, the development of those sites listed in Schedule IND 1 and shown on the Proposals Map, including Newhouse West, Mossend Enterprise Zone and Newhouse Industrial Estate. Where industrial and business land is identified which is surplus to the area's long term requirements, the council will encourage its allocation to appropriate alternative uses.	of improving the accessibility to existing sites and improving the prospects of future identified industrial and business land.
Policy IND 3 Constrained Sites	"The Council with the assistance of Scottish Enterprise Lanarkshire and private developers will seek to rehabilitate any constrained industrial sites that may be identified during the plan period for industrial and business development, where appropriate".	The Junction Improvements will be supportive of the policy on the basis of improving the accessibility to existing sites and improving the prospects of future identified industrial and business land.
Policy IND 5 Business Development (Class 4)	The Council will seek to encourage business developments defined under Class 4 of the Town and Country Planning (Use Classes) (Scotland) Order 1997 to locate within High Amenity and Prestige industrial and business locations, including: Tannochside Park, Uddingston Newhouse West,	The Junction Improvements will be supportive of the policy on the basis of improving the accessibility to existing sites and improving the prospects of future identified industrial and business land.

	Woodhall Park Class 4 developments will also be supported within or adjacent to Town Centre Areas, Secondary, Village and Neighbourhood commercial Areas subject to their compatibility with other Policies contained within the Local Plan.	
Policy IND 6 Ravenscraig Regeneration/ Former Steelworks Site	The Council in association with Scottish Enterprise Lanarkshire and Corus will pursue the redevelopment of the former Ravenscraig Site as identified on the Proposals Map and within the Glasgow and the Clyde Valley Structure Plan which recognises it is part of a Metropolitan Flagship Initiative.	The Junction improvement proposal will fully support this policy on the basis of improving the accessibility and functioning of the strategic road network and bring benefits to strategic business sites.
Policy IND 7 Improvement of Industrial and Business Areas	The Council will seek to maintain and enhance the quality of industrial and business areas.	The Junction Improvements will be supportive of the policy on the basis of improving the accessibility to existing sites and improving the prospects of future identified industrial and business land.
Policy IND 8 Established Industrial and Business Areas	The Council will seek to retain the existing character of Established Industrial and Business Areas by safeguarding existing uses and supporting the development of General Industrial, Distribution, Storage or Class 4 Business Uses where appropriate.	The Junction Improvements will be supportive of the policy on the basis of improving the accessibility to existing sites and improving the prospects of future identified industrial and business land.
Policy IND 10 Assessing Other	In determining applications for non-industrial development within Established Industrial and	The Junction Improvements will be supportive of the policy on the basis of improving the accessibility to existing sites and improving the

Developments on Industrial and Business Land	Business Areas or on sites which form part of the industrial land supply the council will consider, amongst other things, the following: 1) the extent to which there is a surplus in the land supply for industry and business, 2) whether development would undermine the attractiveness of a location for industry and business, 3) whether there is a specific locational requirement for the proposal, 4) whether the proposal would result in significant economic benefit to the Plan area, 5) the existence of suitable alternative sites, 6) the potential impact on travel patterns and accessibility by public transport, and 7) In the case of Established Industrial and Business Areas, whether their redevelopment would lead to the re-use of vacant or under utilised industrial land.	prospects of future identified industrial and business land.

Policy TR 1 Overcoming Access Constraints	The Council will encourage measures to overcome identified access constraints and to enable the realisation of the development proposals contained within the Local Plan.	The Junction Improvements will be supportive of the policy on the basis of improving the accessibility to existing sites and improving the prospects of future identified industrial and business land.
Policy TR 5 Development of Strategic Routes	The Council seeks to improve the efficiency and effectiveness of the strategic road network serving the Plan area by: 1) Recommending that the Scottish Executive gives priority to up-grading the A8 to motorway standard between Baillieston and Newhouse interchanges. 2) Supporting the upgrading of the Chapelhall Junction on the A8, to improve accessibility to the Ravenscraig site.	The Junction improvements proposal will be supportive of the policy.
Policy TR 12 Cycling – relates to long distance route	The Council will seek to improve facilities for cyclists by: 1) Taking account of the needs of cyclists in the design of new roads proposals and traffic	The proposal will have no impact on this policy

	management schemes. 2) Supporting the development of the Glasgow to Edinburgh cycle route. 3) Identify and develop, where funds are available, safe routes for cycling, and 4) Requiring developers to include facilities for cyclists as part of their development proposals where appropriate.	
Policy TR 13 Assessing the Transport Implications of Development	In determining applications for new development, the council will consider amongst other things, the following transport criteria: 1) the level of traffic generated and its impact on the environment and adjoining land uses, 2) the scope to integrate development proposals with existing public transport facilities, 3) Impact of the development on road circulation and safety, 4) The provisions made for access, parking and	The Junction proposal will be subject to a Transport Assessment and fit with the criteria set down in the policy

	vehicle manoeuvring, and 5) The extent to which development promotes "access for all", particularly for those with impaired mobility. In appropriate circumstances the council will require the provision of a Transport Assessment to accompany development proposals.	
ENV 1 The Environment	The Council supports sustainable development by seeking to maintain and enhance the quality of the environment of the plan area through promoting the long term environmental interest and reducing, where appropriate, the damaging effects of development on this long term interest.	The Junction proposal supports this policy as it will help to optimise the functioning of the road network and reduce congestion.
ENV 3 Vacant and Derelict Land	The Council will promote the re-use of vacant and derelict land particularly within the urban area by: 1) facilitating a programme of land reclamation where appropriate in partnership with other agencies and private landlords. This includes working with, and encouraging Scottish Enterprise Lanarkshire, through the work of	The Junction Improvements will be supportive of the policy on the basis of improving the accessibility to existing sites and improving the prospects of future identified industrial and business land

	the Partnership Task Group, to bring forward Priority Sites in accordance with the agreed Derelict Land Strategy. 2) identifying appropriate after-uses for vacant and derelict sites, including the retention and creation of wildlife habitats and biomass production where appropriate, and 3) encouraging developers to utilise, where appropriate, the development opportunities arising on vacant and derelict sites, including those identified in Schedule ENV 3, while playing due regard to other Local Plan Policies.	
ENV4 Contaminated Land	The Council will require developers to investigate the site conditions of land which is known or suspected to be contaminated prior to the development being implemented. Such investigations should identify the nature of the contamination and detail the remedial measures to be undertaken to treat or remove the contamination in accordance with the best practicable environmental option appropriate to the proposed development and the nature of the site. In some circumstances this investigation will be required prior to the granting of an outline or detailed planning	The Junction Improvements will be supportive of the policy on the basis of improving the accessibility to existing sites and improving the prospects of future identified industrial and business land

	permission.	
ENV 5 Assessment of Environmental Impact	In determining applications for development, the council will address the likely impact on the environment by considering, amongst other things, the following criteria: 1) the suitability of a proposal to the character of the area in which it is set, 2) the landscape and visual impact of the proposal, 3) the extent of traffic generation, noise, dust, pollution, flooding risk and interference, 4) the loss of natural habitats, protected species and areas designated for their natural heritage value, 5) the loss of urban open space, 6) the extent to which derelict land is regenerated the Environmental Impact Assessment (Scotland) Regulations 1999 Planning Advice Note 58: Environmental	The Junctions proposal will be subject to a full Environment Impact Assessment fully in keeping with Government guidance.

	Impact Assessment; and 7) the need for specific measures to ensure satisfactory decommissioning, particularly of renewable energy developments. There will only be a presumption in favour of development where it can be clearly demonstrated that the proposal is not likely to inflict an unacceptable impact on the environment. Proposals will be assessed with reference to mitigating measures.	
ENV9 Flooding	Where development is proposed in areas with a history of, or potential for, flooding, the Council will require a statement from the applicant showing measures to ameliorate the effects of flooding, both with the sites and in other areas where flooding is likely to be aggravated by the development. This statement will not normally be permitted where it would create or intensify an unmanageable risk of flooding.	The Junction proposal will be subject to assessment of flood risk and measures will be included as necessary in the detailed design to tackle any problems.
ENV10 Trees and Woodland Management	The council will encourage the protection and enhancement of the plan area's tree and woodland resource by: 1. resisting development proposals which could	The Junction Improvement proposal will be in conflict with this policy. All future works will be subject to a tree survey and replacement planting will be undertaken to replace any loss of trees.

	adversely affect woodland areas. 2. promoting the planting of sustainable woodlands at appropriate locations, 3. encouraging the sustainable management of woodlands, where appropriate, in accordance with a Woodland Management Plan, and 4. declaring Tree Preservation Orders where appropriate.	
ENV11 Protected Urban Woodland	The Council will protect and enhance those areas of urban woodland identified on the Proposals Map by: 1. resisting development proposals which could adversely effect them, encouraging the sustainable development of the woodlands in accordance with the woodland management plan, and 2. ensuring that these areas are, where appropriate, made available for recreational and educational use by the public.	The Junction Improvement proposal will be in conflict with this policy. All future works will be subject to a tree survey and replacement planting will be undertaken to mitigate against any loss of trees.
ENV13 Biodiversity	The Council will seek to maintain the nature resources of the plan area by the protection of habitats, species and natural features which are vulnerable and/or specifically protected, and by a requirement to take	The Junction improvements will impact on Policy ENV 13 because Hamilton Low Park's SSSI is within the immediate area of the junction layout. Detailed design of the Junction will take all necessary steps to minimise this impact through high quality landscaping and habitat

	account of the needs of wildlife where new development is proposed. The creation of new habitats will also be encouraged as part of development proposals or as stand alone projects. The council Biodiversity Action Plan and associated Habitat and Species Action Plans will form an important consideration.	protection.
ENV 14 Nature Conservation Sites	The Council will protect and enhance the natural resources, including Sites of Importance for Nature Conservation (SINCs) and Wildlife Corridors. 1) The council will not permit development proposals which would significantly affect a Site of Importance to Nature Conservation or a Wildlife Corridor and where the nature conservation interest in the site cannot be accommodated within the development proposals to the satisfaction of the Council conservation staff.	The Junction improvements will impact on Policy ENV 14 because Hamilton Low Park's SSSI is within the immediate area of the junction layout. Detailed design of the Junction will take all necessary steps to minimise this impact through high quality landscaping and habitat protection.
ENV20 Historic Gardens and Designed Landscapes	Any development proposals which would harm the character of a Historic Gardens or Designed Landscapes included in the inventory of Gardens or Designed Landscapes or proposed for inclusion during the plan period, will be resisted. Proposals of the management or enhancement of Inventory Sites shall be encouraged to ensure that changes in planting or management are in keeping with the	The Junction Improvements proposal will have no impact on this policy.

	historic layout, character and planting of these sites.	
ENV21 Archaeology	The Council will not normally allow development which would have an adverse impact on Scheduled Ancient Monuments, other archaeological sites and industrial archaeological resources and their settings. Where development affecting sites of archaeological importance is permitted, conditions will be attached to the planning consents to allow for the excavation and recording before or during development. The Council will require developers to fund such works.	The Junction Improvements proposal will have no impact on this policy.
L4 Public Rights of Way and Access	The Council will maintain and protect the Network of Public Rights of Way and other permitted access routes. The development, promotion, and management of quality public access, will be guided by the North Lanarkshire Public Access Strategy and at least one local access forum.	The Junction Improvements proposal will have no impact on this policy.

17.3 Compliance with Planning Policy

It is considered that the finalised option for Stage 3 Raith Junction improvements, which are key supportive components to the overall upgrading of the M8 Corridor between the Baillieston and Newhouse junctions, will generally comply in principle with the relevant planning policies and guidance at national, structure plan, and local plan levels, as outlined above.

17.4 Benefits of the Development Proposals

The Stage 3 proposal for Raith Junction will contribute to the improvement in the national road and transport infrastructure, and assist in promoting visibility, access, and marketability of employment land, and contribute to economic development and regeneration. Further, the Junction impro9evmnest will be compatible with policy by reducing congestion on the route network and assist in increasing the competitiveness of both the Lanarkshire area and wider Central Scotland economy.

17.5 References

Scottish Planning Policy 17 (SPP 17) Planning for Transport. The Scottish Executive Development Department (August 2005)

The Scottish National Planning Framework (2004)

SPP 2 Economic Development. The Scottish Executive Development Department (November 2002)

NPPG 18 Planning and the Historic Environment. The Scottish Office (April 1999)

NPPG 5 Archaeology and Planning. The Scottish Office Environment Department (1994).

SPP 7 Planning and Flooding. The Scottish Executive Development Department (February 2004).

NPPG 14 Natural Heritage. The Scottish Office Development Department (1999).

Glasgow and the Clyde Valley Joint Structure Plan (Approved April 2002)

North Lanarkshire Council: Southern Area Local Plan –Finalised Draft. North Lanarkshire Council (Modified 2005).

South Lanarkshire: Hamilton District Local Plan. South Lanarkshire Council (Adopted August 2000).

18 Cumulative Impacts

18.1 Introduction

This chapter summarises the potential for cumulative impacts to occur in relation to the scheme. Cumulative impacts may be broadly defined as impacts that result from the accumulation of a number of individual impacts (EC, 1999), for example:

a) different individual impacts arising from the scheme itself (ie 'within-scheme' cumulative impacts); and,

b) the interaction between the scheme and other activities or developments in the vicinity of the scheme.

In order to consider the latter type of interaction, it has been necessary to make certain assumptions and to limit the scope of what other developments will be considered. As a result, developments beyond 1km from the scheme have not been included in this assessment, as there is considered to be insufficient information available to make a meaningful assessment, and demonstrating likely cumulative effects is likely to be difficult. Also, only those developments already with planning approval or within the Local Plan developments are included.

18.2 Baseline Conditions

Much of the land surrounding the scheme is designated for environmental or amenity value, including Hamilton Low Parks SSSI, Strathclyde Country Park, Laighlands/Bothwell SINCs and Green Belt land. The green belt and SINC designations to the north east and north west of Raith Junction are under pressure for new development, particularly housing. The site at the junction of Hamilton and Bellshill Road in Bothwell to the south west of the proposed scheme is also under pressure for new development. As indicated on Figure 8.1, these areas have been designated as pressure for change sites.

Committed developments likely to interact with the scheme are other road schemes such as the M8 Baillieston to Newhouse and Associated Network Improvements on the M73/M74. These road and concurrent committed commercial developments in the area form part of the 2010 baseline scenario for the modelling of Raith and surrounding network traffic flows.

18.3 Predicted Impacts

Within scheme impacts and cumulative impacts associated with each of the individual topic areas are discussed in Chapters 6-16 and are identified if significant. At this time, detailed information on the location, layout, timing and accompanying proposed environmental mitigation (if any) of all the possible developments in the vicinity of the scheme is not available. For this reason, the potential cumulative impacts are considered on a qualitative rather than a quantitative basis.

The green space surrounding Raith junction provides a positive ecological and landscape and visual contribution to the area. The proposed scheme requires a small area of land take which in itself will have minimal impact on the ecological functioning of the SSSI and associated habitats. Similarly, the layout of the scheme, aligned closely to the existing motorway and junction, will have relatively low impacts on landscape and visual amenity with mitigation planting in place. The loss of flood plain capacity due to construction of the scheme will be mitigated through the creation of two flood compensation storage areas. All of these aspects have been addressed in separate chapters of this report.

The cumulative noise and vibration and air quality impacts related to the proposed improvements to Raith junction in association with other committed road schemes have been addressed in Chapters 6 and 12 respectively. For air quality, as with the Scheme-only impacts, improvements are expected at some locations and deteriorations are expected at others. The wider-scale cumulative impacts of the three schemes (M74 Junction 5, Raith, M8 Baillieston to Newhouse and Associated Network Improvements) together would cause an extremely small increase in the total emissions of relevant air pollutants across the road network. In context, this increase is judged to be negligible.

For noise, the assessment shows no significant differences between the cumulative impacts and the potential With-scheme impacts.

Improvements to the footpaths and cycleways around and across the junction as part of the scheme will benefit pedestrians and cyclists. By improving the opportunity for a future tie-in to the proposed NCN74, there is potential for some beneficial cumulative impacts on the wider non-motorised access network when new national cycleway links are established.

Further development in the green space surrounding the junction would have impacts related particularly to land take and loss of habitat and flood plain capacity. The cumulative impact of additional land take, changes to views and local landscape would generally be negative as the capacity for mitigation would decrease with the loss of available green space. There would be cumulative adverse impacts on the SSSI as the ornithological interest of the site is also associated with the adjacent habitats around the junction. Development may however have positive impacts with regard to the provision of housing or local employment.

Adverse short-term cumulative impacts are most likely to occur at a local level when the construction phases of different developments coincide, causing excessive levels of nuisance, disruption and localised congestion if not considered (and controlled) in combination with other contributory works.

18.4 Conclusions

Cumulative impacts arising from the current scheme in combination with other developments are not likely to be significantly adverse overall so long as appropriate mitigation and control mechanisms are set in place, in particular with regard to loss of habitats associated with the ecological functioning of the SSSI, and with open land which is within the floodplain.

18.5 References

European Commission DG XI (1999) Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions, OOPEC, May 1999

19 Summary of Key Issues and Environmental Impact Tables EITs

19.1 Introduction

This chapter presents a summary of the key environmental impacts associated with the scheme.

19.2 Environmental Impacts Table

An Environmental Impacts Table (Table 19.1) has been prepared for the preferred scheme, the purpose of which is to present the predicted residual impacts associated with the conceptual design (taking account of agreed mitigation measures) in summarised form.

The table includes the following:

- description of the potential impact;
- sensitivity/value of the receptor;
- significance of impact without mitigation;
- description of any mitigation and its objective in addressing a specified impact;
- significance of the impact with mitigation in place; and
- likely duration of the impact.

The likely effects of the 'do nothing' situation, should the Scheme not be developed mainly comprises a no change situation for the existing site conditions.

The mitigation measures summarised in Table 19.1 are described in more detail in Chapters 6 – 16 (no mitigation measures are proposed for Chapter 17 Policies and Plans) and summarised in Table 20.1 Schedule of Environmental Commitments (Chapter 20).

Key to Table 19.1

Sensitivity / value of receptor	Magnitude of Impact with mitigation			
	High (adverse or beneficial)	**Medium (adverse or beneficial)**	**Low (adverse or beneficial)**	**Negligible**
High	Significant	Significant	Not significant	Not significant
Medium	Significant	Significant	Not significant	Not significant
Low	Not significant	Not significant	Not significant	Not significant
Negligible	Not significant	Not significant	Not significant	Not significant

Table 19.1 Environmental Impacts Table (EIT)

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
AIR QUALITY					
Construction Phase: Construction dust and emissions from construction vehicles and plant. Disbenefit.	High	A package of measures to be implemented that are commonly regarded as "good practice" on construction sites. The precise measures are set out in the mitigation schedule.	Medium adverse	Significant where close to working area	Short term
Local Air Quality: Improved air quality at some locations and deteriorated air quality at others. Overall essentially neutral.	High	No mitigation necessary.	High beneficial to high adverse	Significant (both beneficial and adverse)	Long term
Air Quality Impacts on Vegetation: Improvements predicted at the three SSSIs potentially affected. Benefit.	High	No mitigation necessary.	Medium to extremely small beneficial	Not significant	Long term
Wider-Scale Impacts: Net increase in total vehicle emissions due to the Scheme. Disbenefit.	High	No mitigation necessary.	Extremely low adverse	Not significant	Long-term
CULTURAL HERITAGE					
Physical damage to/ loss or severance of sites or remains of cultural heritage value.	High (unknown for undiscovered remains)	No known sites or remains. Contractor will set in place contingency measures and actions to be enacted should new remains be uncovered.	Low adverse	Not significant	Permanent
Disturbance due to compaction, vibration or subsidence	Low	No features in area likely to be affected in this way.	Negligible	Not significant	Permanent

Table 19.1 Environmental Impacts Table (EIT)					
Description of Potential Impact	**Sensitivity /Value of Receptor**	**Mitigation Measure**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Duration of Impact (long, medium or short term)**
Effects on setting and amenity	Low	No designated or historic settings considered to be affected. No special measures required.	Negligible	Not significant	Temporary during construction Permanent during operation.
Effects on unrecorded features.	Unknown	Consultation with Historic Scotland and recording of features and/or excavation if found and need to be removed. Trial trenching if required. Discovery of new features due to excavation and earthworks, adding to archaeological knowledge of area.	Negligible	Not significant	Permanent
LAND USE					
Land take for the scheme Total land requirement 63 ha of which 53.2ha currently in Scottish Ministers' ownership (including existing road)	Non-Prime land. Dependent on user perception	Change minimised through scheme design; and opportunities for habitat enhancement.	Low beneficial	Not significant	Long Term
Agricultural land: Unclassified Land take 35.3 ha Non-Prime Agricultrual Land Take	Low	Overall enhancement of poor grazing land to wetland/reedbed habitat within the Compensatory Flood Storage Area and associated wetland habitat linkages.	Low beneficial	Not significant	Long Term

Table 19.1 Environmental Impacts Table (EIT)					
Description of Potential Impact	**Sensitivity /Value of Receptor**	**Mitigation Measure**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Duration of Impact (long, medium or short term)**
Grade 4.1 28.7 ha Note: active agricultural use estimated at 46% of total classified land area.					
Severance of agricultural land and operational disturbance	Low	Landowner access to land maintained without severance during construction and operation phases. No other specific measures required. Restoration and upgrading of general access around junction (with associated NMU benefit). Landscape and habitat benefit from new tree and hedgerow planting	Low beneficial	Not significant	Short to medium term
Demolition/relocation of private property and loss of private land.	Low	Demolition/rebuilding of stables; small amount of land take.	Low adverse/ negligible	Not significant	Long term
Loss of community land	High	Identified as minor encroachment at one site only (Strathclyde Country Park). Compensatory access and boundary improvements.	Low adverse	Not significant	Long term
Loss of SSSI/SINC/Green Belt and protected landscape features SSSI 2.3 ha SINCs 2.2.ha	High	Compensatory ecological 'set aside area' , new habitat creation and enhancement.	Low adverse	Not significant	Permanent
DISRUPTION DUE TO CONSTRUCTION					
Construction dust and emissions from construction vehicles and	High	A package of measures to be implemented that are commonly regarded as "good practice" on construction sites. The precise measures are	Medium adverse	Significant where close	Short term

Table 19.1 Environmental Impacts Table (EIT)

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
plant. Disbenefit.		set out in the mitigation schedule.		to working area	
Discovery of previously unrecorded cultural heritage remains during construction	Unknown	Contingency measures set in place by Contractor and consultation with Historic Scotland if required. Record or protect remains as advised – thereby adding to cultural heritage records for the area.	Negligible	Not significant	Permanent
Disruption to or diversion of public or landowner access routes during construction	Low -High	Temporary alternative routes provided if required. Safe access to and along all routes during construction phases. Minimise time-period of any disruption through planning and phasing of work.	Low adverse	Not significant	Short-term
Visual intrusion due to vehicles and machinery, earthworks; vegetation removal, soil stripping and excavation; creation of temporary spoil mounds, materials storage areas and compounds; and transient features such as fencing, lighting and signage.	High (where working areas overlooked by residential properties). Low elsewhere	Good practice measures set in place by the Contractor and described in the Schedule of Environmental Commitments, including the use of screening, careful placement of storage areas and managed vegetation retention to limit views of working areas..	Low--medium adverse	Not significant	Short term
Disruption to or loss of use of private land during construction	High (private users/owners)	Land restricted to the minimum necessary for construction of the scheme and ancillary works Contractor to maintain good lines of	Low adverse	Not significant	Short term

Mouchel FAIRHURST

Table 19.1 Environmental Impacts Table (EIT)					
Description of Potential Impact	**Sensitivity /Value of Receptor**	**Mitigation Measure**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Duration of Impact (long, medium or short term)**
period		communication with any affected landowners, local residents or businesses. Temporary access provided. Access arrangements to properties to be fully considered prior to works on site and necessary facilities constructed before any works that may cause disruption are undertaken.			
Noise and vibration nuisance from vehicles and machinery, earthworks and construction of structures etc.	High	Noise mitigation will follow statutory guidance and requirements agreed and set in place in agreement with the Scottish Executive and relevant local authorities.	Low adverse	Not significant	Short term
Increased driver stress from traffic management during construction period. Altered views from roads overlooking construction areas.	High	Impacts on driver stress and views from road alleviated through clear signage and road markings, careful positioning and screening of site compounds and storage areas and other measures as described for mitigation of visual impacts.	Low adverse	Not significant	Short term

Table 19.1 Environmental Impacts Table (EIT)					
Description of Potential Impact	**Sensitivity /Value of Receptor**	**Mitigation Measure**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Duration of Impact (long, medium or short term)**
Temporary disruption to hydrological flows during construction (i.e. through proposed; Groundwater drawdown and changed surface water levels Risk of accidental spillage/mobilisation of sediments into local watercourses; Risk of accidental spillage of liquid contaminants into local watercourses; and/or Risk of inputs of leachate derived from on-site stored construction materials.	Medium –High (flows into SSSI)	All works carried out in line with best practice guidelines, including the SEPA's Special Requirements and Pollution Prevention Guidelines. Clearly defined 'no access' areas adjacent to sensitive wetland areas, and protective fencing to prevent unauthorised access. Monitoring of surface water levels/conditions before, during and after construction. Contingency procedures in case of emergencies/unforeseen events to be set in place by the Contractor as part of the Environmental Management Plan (EMP).	Low adverse	Not significant	Short – medium term

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Table 19.1 Environmental Impacts Table (EIT)					
Description of Potential Impact	**Sensitivity /Value of Receptor**	**Mitigation Measure**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Duration of Impact (long, medium or short term)**
Disturbance to geological and soil attributes.	Medium	Limitation of the extent and location of working and storage areas. Implementation of erosion and sediment controls. Appropriate handling and storage of spoil. Re-use of excavated materials as part of the in scheme landscaping strategy wherever possible. Removal of surplus material off-site to be re-used on other schemes or to a suitable disposal facility.	Negligible	Not significant	Long term
ECOLOGY AND NATURE CONSERVATION					
Habitat loss within SSSI (estimated 2% of total designated area)	High	Minimise landtake through scheme design and construction. Provide compensatory set aside area, create new and enhance existing habitat . Protect SSSI by fencing, monitoring of surface waters and through Environmental Management Plan (EMP).	Low Adverse (based on habitat area and quality)	Not Significant	Permanent
Loss of locally designated SINC habitat.	Medium	Minimise landtake through scheme design and construction. Provide mitigation through new habitat creation and planting. Protect SINCs by fencing, monitoring of surface waters and through Environmental Management Plan (EMP).	Low adverse (local)	Not Significant	Permanent

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Table 19.1 Environmental Impacts Table (EIT)

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Disturbance due to human activity noise, light etc	Low	Screening planting. Creation of a planted 'buffer zone' between SSSI (and other sensitive habitats) and the road.	Negligible - Low adverse	Not significant	Long term

Table 19.1 Environmental Impacts Table (EIT)

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Direct/Indirect impacts on wetland habitats through changes to water flows and quality:	High (flows through SSSI)	Surface and groundwater protection measures (as set out in Chapter 15) Development of new wetland habitat as part of SUDs design, flood compensation storage area and creation of new scrapes.	Low adverse – Low beneficial (local)	Not significant	Medium term
Wildlife mortality on roads	Low – High (protected species)	Prevent collision risk with vehicles and deer by installing deer fencing at boundary of scheme and SSSI.	Low adverse	Not significant	Permanent
LANDSCAPE AND VISUAL EFFECTS					
Alteration to landscape during construction and operation phases:-		Conceptual landscape strategy developed as part of scheme including new wetland, tree, scrub/shrub and hedgerow planting. Extent of scheme and associated land-take kept to the minimum required for the safe construction and operation of the road. Good practice measures included as part of Contractual requirements to minimise adverse impacts during construction of the scheme.			
Bothwell Park	Low - High		Low beneficial	Not significant	Long term
Strathclyde Country Park			Negligible	Not significant	Long term
Raith Haugh (Hamilton Low Parks) SSSI			Low adverse	Not significant	Long term
Whistleberry Toll			Medium adverse	Significant	Long term
Laighland			Low beneficial	Not significant	Long term
Alterations to views from Bothwell			Low/ Medium beneficial	Not significant - Significant	

Table 19.1 Environmental Impacts Table (EIT)					
Description of Potential Impact	**Sensitivity /Value of Receptor**	**Mitigation Measure**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Duration of Impact (long, medium or short term)**
Alterations to views from Strathclyde Country Park			Negligible/ Low adverse	Not significant	
Alterations to views from Communication routes			Negligible/ Medium adverse	Not significant - significant	
Alterations to views from Footpaths adjacent to roads			Medium / Low adverse	Significant – not significant	
TRAFFIC NOISE AND VIBRATION					
Changes to traffic induced noise or vibration impacts on properties	High	Installation of acoustic screens where required.	Low beneficial to Medium adverse	Not significant - significant	Long Term
NON MOTORISED USERS & COMMUNITY SEVERANCE					
Altered journey times and amenity of routes currently used by pedestrians, cyclists and other non-motorised users. Bothwell to Bellshill Clyde Walkway	– High Medium	Create new fully accessible crossing route across the junction, reinstating currently severed link across the roundabout and to the Clyde Walkway, and linking to the National Cycle Network. Create safer access route across junction. Maintain continuity of Clyde Walkway (but diverted for a section). Replace and improve bus stop accesses.	Medium/ Low beneficial	Significant Not significant	Permanent
VEHICLE TRAVELLERS					

Table 19.1 Environmental Impacts Table (EIT)

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Altered driver stress.	High	Positive impact on driver stress due to reductions in congestion, better journey time predictability, clear signage	Low/ Medium beneficial	Not significant	Long term
Visual amenity effects such as loss of landscape elements, including trees and hedgerows.	High – low	Appropriate and sensitive design of all new structures to enhance views from the road where possible. Landscaping to reinstate/ enhance existing features. Landscaping to mitigate impact of proposed structures, cuttings and embankments and acoustic barriers.	Low adverse	Not Significant	Medium – long term
Altered views from M74	Medium		Low adverse	Not significant	Long term
Altered views from A725	Medium		Medium beneficial	Significant	Long term
Altered views from B7071	Medium		Low beneficial	Not significant	Long term
WATER QUALITY AND DRAINAGE					
Increased run-off into watercourses leading to the River Clyde	Medium	Flow balancing capacity of the SUDS facility provides attenuation of road runoff prior to discharge to the watercourse. As the existing junction ultimately drains to the Clyde without attenuation, the effect of the proposals will be positive.	Low beneficial	Not significant	Long term
Contaminated Runoff (groundwater)	Medium	Lined road drainage network where required and treatment through SUDS facility Existing road runoff to surface water features, which may interact with groundwater, removed.	Negligible	Not significant	Long term

Table 19.1 Environmental Impacts Table (EIT)					
Description of Potential Impact	**Sensitivity /Value of Receptor**	**Mitigation Measure**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Duration of Impact (long, medium or short term)**
Contaminated Runoff (River Clyde)	High	Gullies and catchpits trap sediments and other debris whilst retaining a proportion of suspended solids. Pump sump provides containment of harmful liquids such as chemicals etc. which could otherwise impact on the water environment through accidental spillage. Permanent signage to indicate the presence of Pollution Control Device (pump sump) Sedimentation forebay provides conditions for settlement of suspended solids. SUDS attenuation with wet pool provides treatment of the road runoff prior to discharge into the watercourse.	Low adverse	Not significant	Long term
Contaminated Runoff (Burn / Ponds / SSSI)	High	Existing road runoff (and risk of pollution) to local surface water features removed.	Medium beneficial	Significant	Long term
Groundwater Drawdown	Medium	Lined road drainage network	Negligible	Not significant	Long term
Reduced Flows (through SSSI/SINCs/Burn)	High	Flow will be reduced only marginally due to the low proportion of the road area relative to the natural catchment. Existing road drainage flows do not contribute to baseflow conditions.The removal of the existing road runoff reduces the	Negligible	Not significant	Long term

Table 19.1 Environmental Impacts Table (EIT)

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
		pollutant potential and the dilution capacity of the watercourse is less critical.			
Flood risk to road network	High	Flood bunding will be provided to protect vulnerable sections of road.	Low adverse	Not significant	Long term
Compensatory storage (removal of elevated ground/habitat)	High	Compensatory habitat created.	Low adverse	Not significant	Permanent
Development Footprint (Burn / Pond 3)	High	The total length of the watercourse diversion will be greater with associated enhanced habitat potential. The hydraulic connectivity between the pond and watercourse will be maintained . Culverts represent extension or replacement of existing structures which already act as barriers to wildlife movement. Water depth and low flow velocities should ensure that culvert diversion does not present a barrier to the passage of fish.	Low adverse	Not significant	Long term
Development footprint (Morphology)	High	Introduction of low flow channel should maintain low flow velocities. Identification of maintenance responsibilities will address existing sedimentation issues.	Low beneficial	Not significant	Long term

Table 19.1 Environmental Impacts Table (EIT)

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Development Footprint (Floodplain)	High	The removal of floodplain attenuation is countered through the provision of compensatory storage.	Negligible	Not significant	Long term
Erosion	Medium	Erosion protection at outfall to minimise damage resulting from drainage discharge	Negligible	Not significant	Long term
GEOLOGY AND SOILS					
Disturbance of contaminated material resulting in risk to humans, controlled waters or building materials	Medium	Controlled excavation and handling of contaminated material.	Low adverse	Not significant	Short term
Loss of economic deposits	High	No specific measures required	Negligible	Not significant	Long term
Ground surface stability	High	No specific measures required	Negligible	Not significant	Long term
Changes to hydrogeology/groundwaters	Medium/High	No special measures identified. Monitoring of surface waters before, during and after construction of the scheme.	Negligible	Not significant	Medium term

20 Schedule of Environmental Commitments

20.1 Introduction

In order to ensure compliance with environmental commitments, all mitigation measures identified in the Environmental Statement necessary to protect the environment prior to, or during construction, or during operation of the proposed scheme will be incorporated in Contract documents, the Environmental Management Plan (EMP) to be drawn up by the Contractor, and specific Method Statements as appropriate. Legal and other environmental requirements will be defined (including licensing), and responsibilities and requirements established to ensure, firstly, their implementation, secondly, monitoring procedures to check their implementation and thirdly, any specific consultation requirements to ensure that mitigation measures are implemented and appropriately adhered to.

20.2 Schedule of Environmental Commitments

The purpose of the Schedule of Environmental Commitments (Table 20.1 below) is to collate and summarise mitigation measures identified throughout the Environmental Statement for ease of reference. It provides a record of commitments that the Contractor will be obliged to adhere to throughout the Contract period, although it is recognised that there may be a need to revise or supplement the commitments by agreement between the Contractor, the Scottish Executive and other interested parties. Specifically, the following are tabulated:

- location of the proposed measures;
- description of the mitigation measure;
- comments on the timing of the measures;

Figure 20.1 illustrate the conceptual environmental mitigation proposed as part of the scheme. Figures 20.2 and 20.3 illustrate the conceptual design of the Flood Compensatory Storage Areas. Should any significant modifications to the scheme be proposed (i.e. design, construction or operational requirements), there may be additional environmental impacts arising to those identified as part of this DMRB Stage 3 EIA process. These impacts would likely require the implementation of appropriate mitigation measures. If this were the case, there would be a requirement to publish an addendum to the Environmental Statement, within which appropriate impacts and mitigation measures would be described. This addendum would include a revised Schedule of Environmental Commitments.

It should be noted that the Schedule of Environmental Commitments provides a summary of mitigation measures developed at this stage in the design process. The measures outlined in Table 20.1 are likely to require further consultation and specification by the Contractor during the development of the specimen design. Both operational and construction stage impacts are considered under each environmental parameter and therefore a separate Disruption due to Construction heading has not been included in the table. No specific mitigation is proposed in relation to policies and plans (Chapter 17) as this aspect is picked up in the relevant topic chapters.

Table 20.1 Schedule of Environmental Commitments				
Mitigation No.	Chainage/ location	Purpose	Proposed Mitigation Measure	Timescale
Air Quality				
6.1	Throughout	Prevent dust being raised during construction phase	Locating any unpaved haul routes as far as possible from occupied residential properties.	Throughout construction period
6.2	Throughout	Prevent dust being raised during construction phase	Use of water-sprays to ensure that any unpaved routes across the site are maintained in a damp condition when in use.	Throughout construction period where appropriate
6.3	Throughout	Prevent dust being raised during construction phase	Imposition and enforcement of a 5 mph speed limit on unpaved ground.	Throughout construction period where appropriate
6.4	Throughout	Prevent dust being raised during construction phase	Sheeting of lorries carrying dusty material on and off site.	Throughout construction period where appropriate
6.5	Throughout	Prevent dust being raised during construction phase	Early sealing of open ground with vegetation.	Throughout construction period where appropriate
6.6	Throughout	Prevent dust being raised during	Locating any concrete crushing plant well away from	Throughout construction period

Table 20.1 Schedule of Environmental Commitments

Mitigation No.	Chainage/ location	Purpose	Proposed Mitigation Measure	Timescale
		construction phase	residential areas.	where appropriate
6.7	Throughout	Prevent dust being raised during construction phase	Location of stockpiles of potentially dusty material as far from sensitive locations as possible.	Throughout construction period where appropriate
6.8	Throughout	Prevent dust being raised during construction phase	Regular use of a water-assisted dust sweeper on local roads if necessary, to remove any material tracked out of the site.	Throughout construction period where appropriate
6.10	Throughout	Prevent dust being raised during construction phase	Regular cleaning of paved areas on-site.	Throughout construction period where appropriate
6.11	Throughout	Prevent dust being raised during construction phase	Use of a jet-spray vehicle and wheel wash for all vehicles leaving the site.	Throughout construction period where appropriate
6.12	Throughout	Prevent dust being raised during construction phase	Use of water suppression during any demolition works near to occupied residential properties.	Throughout construction period where appropriate
6.13	Throughout	Prevent dust being raised during	Use of water suppression during any cutting of stone or	Throughout construction period

Table 20.1 Schedule of Environmental Commitments

Mitigation No.	Chainage/ location	Purpose	Proposed Mitigation Measure	Timescale
		construction phase	concrete.	where appropriate
6.14	Throughout	Prevent dust mitigation measures causing watercourse contamination	Where mitigation measures rely on water, it expected that only sufficient water will be applied to damp down the material. There should not be any excess to potentially contaminate local watercourses.	Throughout construction period where appropriate
6.15	Throughout	Reduce impacts should other mitigation measures not be fully implemented or should they temporarily break down	During all stages of the construction works there will be close liaison with the local community, including the setting up of a well-publicised hotline, together with a rapid response to concerns that may arise.	Throughout construction period where appropriate
6.16	Throughout	Prevent contaminated materials becoming airborne	Any contaminated materials should be dealt with following standard procedures.	Throughout construction period where appropriate
Cultural Heritage				
7.1	Throughout	Minimise damage/disturbance to as yet unknown	During site clearance and construction, the Contractor will be made aware of the possibility of unrecorded finds and careful construction techniques will be employed. If any features are uncovered by the Contractor during	Throughout construction period where appropriate

Mitigation No.	Chainage/ location	Purpose	Proposed Mitigation Measure	Timescale
		archaeological sites.	excavation works that may be of cultural heritage significance, works should be halted to enable Historic Scotland to determine whether any archaeological recording or removal is required.	
Land Use				
8.1	Throughout	Maintain access to agricultural/private land during construction and operation phases of scheme.	Provide temporary and permanent accommodation works.	Part of construction phase.
8.2	Laighlands	Compensate for demolition, land loss, fragmentation and severance of privately owned land	Rebuild and relocate stables	To be agreed with owner
8.3	SSSI	Compensate for loss of land within SSSI	Provide compensatory ecological set aside area and habitat enhancement in the vicinity of flood compensation storage area 2 north of A725, including new wetland features.	Part of construction phase

Table 20.1 Schedule of Environmental Commitments

Table 20.1 Schedule of Environmental Commitments				
Mitigation No.	Chainage/ location	Purpose	Proposed Mitigation Measure	Timescale
			Investigate feasibility (with SLC and SNH) of creating shallow wetland scrapes in SSSI to increase habitat value.	
Ecology and Nature Conservation				
10.1	Throughout	Maximise biodiversity value of new and existing habitats	Ecologists will provide input to designs for new drainage arrangements and site landscaping. If possible will recover propagules of nationally scarce plant mudwort and grey club-rush plants from affected ponds to attempt to establish in newly created wetland habitats. Install bat boxes at appropriate locations in the vicinity (in consultation with Country Park Rangers)	In advance of and during construction
10.2	Wetland areas	Compensation for loss of habitat	Create new wetland habitats in mitigation area including flood compensation storage area 2 and wetland scrapes. Increase local habitat diversity ustilising new SUDS pond, ditches and re-aligned Burn. Provide vehicular access in to SSSI for essential habitat management works as requested by SLC.	Part of construction phase

Table 20.1 Schedule of Environmental Commitments

Mitigation No.	Chainage/ location	Purpose	Proposed Mitigation Measure	Timescale
10.3	SSSI	Protect the important wetland habitats within the SSSI and reduce potential disturbance to birds	Early establishment of a planted buffer zone between the road and the SSSI.	Prior to construction
10.4	Throughout	Minimise environmental risk	Contractor to use the Environmental Management Plan (EMP) with Construction Method Statements for activities in areas of sensitivity.	Create in advance of site clearance and maintain /update throughout construction period
10.5	Throughout	Protection of water quality and aquatic species/habitat.	See Road Drainage and the Water Environment below. Dewatering and drainage management works will be subject to specific Method Statements. Arrangements for dewatering, Burn diversion and culvert reconstruction will be agreed with SEPA and SNH and implemented under licence as required.	In advance of site clearance and maintained/updated throughout construction period
10.6	Throughout	Protection of aquatic habitats	On-going monitoring of surface pond levels. Identification of ‘trigger levels’ indicating that mitigation measures are required.	Before, during and after construction

Table 20.1 Schedule of Environmental Commitments

Mitigation No.	Chainage/ location	Purpose	Proposed Mitigation Measure	Timescale
10.7	Throughout	Compliance with protected species legislation: monitor change	Protected species surveys updated in advance of construction, to inform Contractor's specimen design and any requirements for additional mitigation, consultation and/or licences.	Surveys to be updated in the correct survey season prior to the commencement of works and thereafter where appropriate
10.8	Throughout	Compliance with protected species legislation: licences for faunal species including otter, badger, bats, breeding birds and (possibly) amphibians	Where pre-construction surveys indicate that there will be impacts on protected species, detailed mitigation schemes will be agreed with SNH and/or the Scottish Executive and appropriate licences obtained before works to disturb those species can be lawfully implemented by the Contractor.	Obtain licences in advance of works allowing sufficient time for any pre-construction mitigation requirements to be set in place.
10.9	Throughout	Protection of biodiversity resource	All working areas will be kept to a minimum, and their boundaries clearly marked at commencement of works. Sensitive habitats to be avoided when placing construction compounds, etc. using information provided in the Environmental Statement and any subsequent surveys. Areas defined in the EMP as requiring protection from	Planned during detailed specimen design and implemented throughout construction period

Table 20.1 Schedule of Environmental Commitments

Mitigation No.	Chainage/ location	Purpose	Proposed Mitigation Measure	Timescale
			accidental damage or disturbance, will be securely fenced prior to commencement of works. Fencing will be fit for purpose and be clearly visible to drivers of large construction vehicles. No materials storage will be permitted within the fenced areas. Topsoil will be removed and stored separately from subsoil in piles less than 2m high. Topsoil, in particular, should be stored for as short a time as possible.	
10.10	Throughout	Compliance with legislation: control and prevention of spread of invasive plant species	Checks for and control of Japanese knotweed and other invasive weed species will form part of the Employer's Requirments and EMP and will be carried out in accordance with the requirements of SEPA.	Surveyed in advance of site clearance and maintained/updated throughout construction period
10.11	Throughout	Compliance with legislation: reasonable measures to minimise impact to breeding birds (other than specially protected species, which	Minimise the potential for damage to nests, eggs and young by removing vegetation likely to be used by breeding birds outside of the season if at all possible. Special measures may be required for ground-nesting species. Alternatively, a search of vegetation by the site ecologist	Throughout construction period

Table 20.1 Schedule of Environmental Commitments				
Mitigation No.	Chainage/ location	Purpose	Proposed Mitigation Measure	Timescale
		are considered above)	immediately prior to clearance is recommended, so that breeding sites can be identified and their clearance delayed until any young have fledged.	
10.12	Ponds/ Ditches Throughout	Minimise impacts to Amphibians (and fish, where present)	Procedures for dewatering and drainage management will be agreed with SEPA and SNH and license(s) obtained if required for fish rescue.	Throughout construction period
10.13	Throughout	Minimise animal casualties through provision of safe crossing points allied with fencing to prevent access to the road at key locations.	Deer fencing, where it is to be provided, must be in place before the new road is opened. Measures will be put in place to ensure that fencing is checked and maintained as appropriate, on an ongoing basis.	Prior to commencement of operation.
10.14	Created wetlands	Long-term, sustainable management of the mitigation areas	A management plan will be drawn up for the created wetlands/ecological set aside area.	Post construction
Landscape and Visual Impacts				
11.1	Throughout	Reduce visual intrusion during construction and	Retain existing vegetation as far as practicable to provide screening during works.	Throughout

Table 20.1 Schedule of Environmental Commitments

Mitigation No.	Chainage/ location	Purpose	Proposed Mitigation Measure	Timescale
		operation phases as far as practicable.	Contractor to limit size and extent of working and storage areas within land made available for the scheme. Time and phase works to minimise the duration of impacts at any set of visual receptors. Use fencing to define working areas. Good housekeeping of construction site and storage areas. Use temporary floodlighting only when necessary; lighting and night-time working to be in line with Local Authority requirements. Careful selection and placement of site compounds, material storage areas and spoil heaps to reduce visual intrusion and landscape impacts. Contractor to use spoil/topsoil storage bunds to create temporary screening of working areas/compounds. Early planting of trees, shrubs and grassed areas as well as new ponds and wetland creation to establish the structure of the longer-term visual and landscape mitigation.	construction period
11.2	Throughout	Screen new roads and associated junctions and earthworks and integrate scheme into the	Reduce vegetation removal to the minimum necessary for the safe construction and operation of the scheme. Contractor to use the landscape/planting strategy as the minimum required for the scheme. New areas of woodland	During construction phase.

Table 20.1 Schedule of Environmental Commitments

Mitigation No.	Chainage/ location	Purpose	Proposed Mitigation Measure	Timescale
		surrounding landscape	and scrub/shrub planting will help to screen new road features and integrate new earthworks into the landscape as the planting matures.	
Noise and Vibration				
12.1	Throughout working areas and particularly near to residential/built-up areas	Mitigation of noise impacts on sensitive receptors (construction phase)	Noise mitigation will follow statutory guidance and requirements agreed and set in place with the Scottish Executive and relevant local authorities. These may include restrictions on workings hours, avoidance of unsocial hours where working closest to residential areas, and use of noise screening. These limits will be detailed within the Employer's Requirements and the Environmental management Plan.	Throughout construction period
12.2	Where required	Mitigation of noise impacts on sensitive receptors (operational phase)	2m high acoustic screens relative to the ground level. Example specification would be barriers at the very least 15kg/m^2 close boarded timber fencing. The location and height of the acoustics screens are as shown on Figures 12.3(a) and (b) and Figures 12.4(a) and (b).	During construction
Pedestrians, Cyclists, Equestrians and Community Effects				
13.1	Hamilton Road/ Bothwell	Improved, Non-Motorised User-friendly,	Incorporate advanced stop lines on Hamilton Road and signalised pedestrian crossing of the Hamilton Road from	Part of scheme

Table 20.1 Schedule of Environmental Commitments				
Mitigation No.	Chainage/ location	Purpose	Proposed Mitigation Measure	Timescale
	Link Road junction	signalised layout	Hamilton and the new link road.	
13.2	Hamilton Road/ Bothwell Link Road junction	Improved and safer linkages	Shared use foot/cycle way from this junction to link into the Raith junction crossing facilities and a new footway on the Bothwell side of the Link Road. The shared use foot/cycle way will be separated from the main carriageway by a 2m verge.	Part of scheme
13.3	A725 Off Slip/ Bothwell Slip/ Link Road	Improve existing route	New pedestrian/ cycleway along side the Bothwell Link Road, will involve a single crossing of the A725 Off Slip direct to the new facilities across the Raith Junction.	Part of scheme
13.4	Junction on Bothwell Link Road	Improve pedestrian/wheelchair access. Also reduce journey time	New bus stops to be provided just south of the junction on the Bothwell Link Road. The pedestrian/ wheelchair access to these stops will be much improved as compared to the existing provision.	Part of scheme
Vehicle Travellers				

Table 20.1 Schedule of Environmental Commitments

Mitigation No.	Chainage/ location	Purpose	Proposed Mitigation Measure	Timescale
14.1	Throughout Scheme	Reduce adverse changes to driver views and to enhance driver views of open countryside. Ameliorate driver stress	Appropriate and sensitive planting and landscape design – to make a positive contribution to local views from the road in the medium to longer term. Use earthworks design to mitigate the visual impact of new structures and to blend into the natural topography as far as practicable. Appropriate seeding/planting of earthworks to reflect surrounding vegetation. Planting of hedgerows, and the establishment of tree screens where appropriate. Replacement planting of trees and shrubs lost due to the required land take for the scheme.	Part of scheme

Table 20.1 Schedule of Environmental Commitments				
Mitigation No.	Chainage/ location	Purpose	Proposed Mitigation Measure	Timescale
Road Drainage and the Water Environment				
15.1	River Clyde	Prevent increased run-off	Manage road runoff via SUDs drainage system, attenuating runoff prior to discharge to the watercourse.	Part of scheme
15.2	Groundwater ,Burn/Ponds/ SSSI	Prevent contamination of groundwater/surface water from construction phase or operationalrun-off	Lined road drainage network and SUDS basin. Route road runoff via SUDs drainage management system, to River Clyde outfall, avoiding surface water drainage through SSSI wetlands.	Part of scheme. During construction of the A725 underpass
15.3	River Clyde	Maintain water quality	Gullies and catchpits to trap sediments and other debris. Pump sump to provide containment of harmful liquids such as chemicals etc. due to accidental spillage. Permanent signage to indicate the presence of Pollution Control Device (pump sump) Sedimentation forebay for settlement of suspended solids. SUDS attenuation with wet pool provides treatment of road runoff prior to discharge.	Part of scheme
15.4	Throughout	Prevent risk of flooding of low lying sections of	Flood bunds to protect vulnerable sections of road.	Part of scheme

Table 20.1 Schedule of Environmental Commitments

Mitigation No.	Chainage/ location	Purpose	Proposed Mitigation Measure	Timescale
		road		
15.5	Area 1 south of junction Area 2 north of junction	Prevent flooding in the wider area.	Excavate flood compensation storage areas, designed to provide water storage capacity during flood events, equal to the area of flood plain taken for the scheme..	Part of scheme
15.6	Burn/Pond 3	Minimise impacts to Pond 3 and enhance local wetland habitat	Align diverted Burn to minimise loss of pond area. Detail at Specimen Design stage the method by which construction will occur. Create a naturalistic Burn and ditch profile to encourage habitat micro-diversity.. Maintain hydraulic connectivity between pond and watercourse.	Part of scheme
15.6	Outfall to the River Clyde	Erosion and bankside habitat protection	Erosion protection at outfall to minimise damage resulting from drainage discharge Minimise vegetation removal along river banks. Pre-construction ecological survey to update records and ensure impacts on protected species are avoided.	Part of scheme
Geology and Soils				
16.1	All	Protect site workers and general public from risk	Agree any necessary protective measures with the	In advance of construction activity

Table 20.1 Schedule of Environmental Commitments

Mitigation No.	Chainage/ location	Purpose	Proposed Mitigation Measure	Timescale
		of exposure to contaminated water or soils	appropriate regulatory authorities in advance of work. Ensure appropriate personal protective clothing and equipment is adopted and standard health and safety procedures are followed as required.	on site and ongoing during construction phase. Ongoing during operation phase specifically for maintenance workers

Figures

List of Figures