Norwich Western Link

Environmental Statement Chapter 5: Approach to EIA Appendix 5.1: Environmental Impact Assessment Scoping Report 2020 Part 3 of 3

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Contents

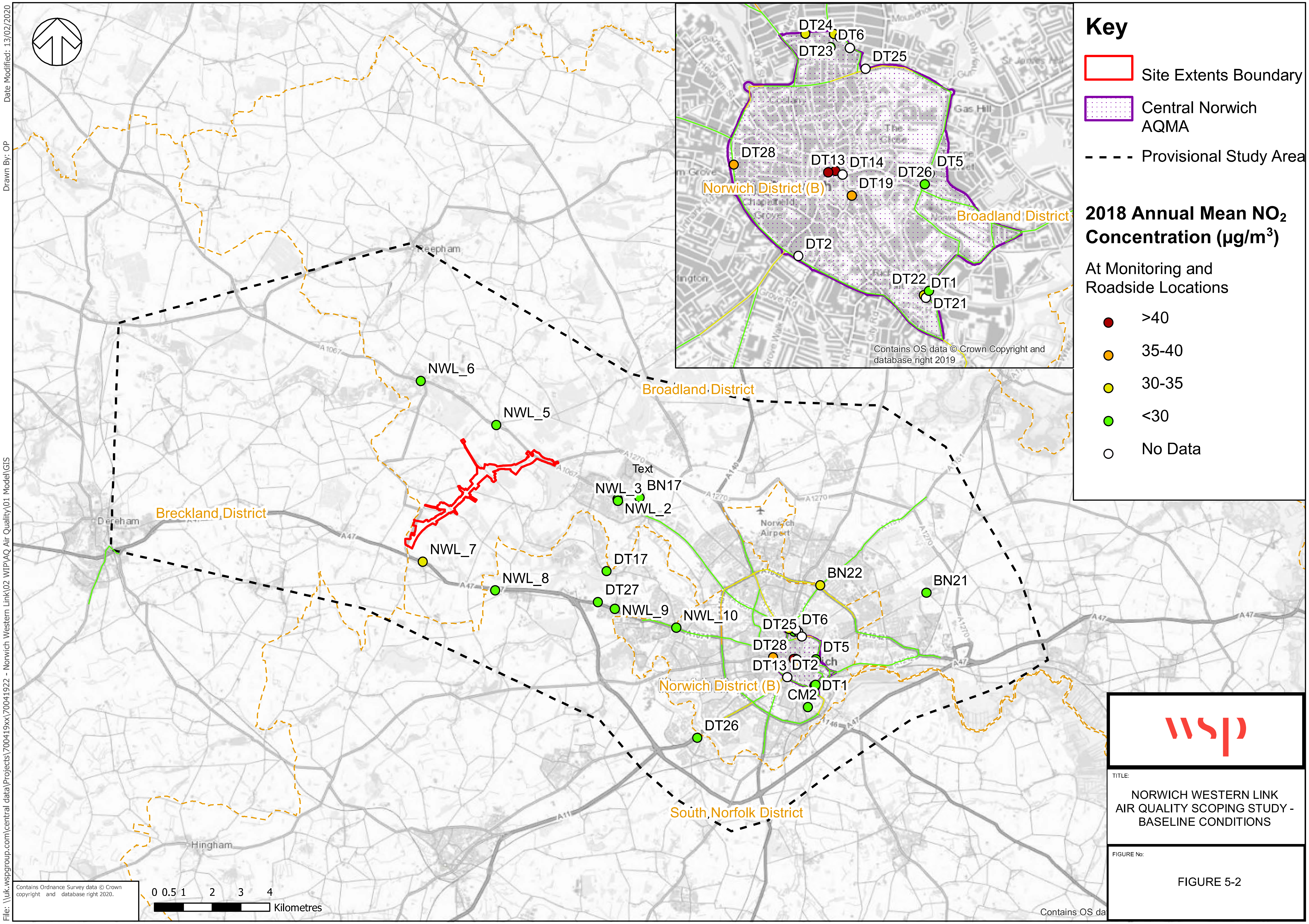
1 Introduction

1.1.1 The purpose of this report is to ensure that the subsequent ES is focused on the key impacts likely to give rise to significant adverse effects upon the environment, and to obtain agreement on the approach and scope of the assessments for each factor. This report also identifies those elements that are not considered necessary to assess further. This approach is in line with the general aim to undertake proportionate EIA, as advocated by industry best practice. Whilst this report seeks to establish the overall framework for the EIA in relation to the environmental factors and associated effects, the exact scope of the EIA will be influenced by the scoping opinion received, the on-going design evolution of the Scheme, and through on-going baseline data collection (field surveys). It is proposed that the following environmental factors, as listed under Article 3(1) of EU Directive 2014/52/EU, are included in the scope of the EIA:

- Population and Human Health;
- Biodiversity;
- Land, soil, water, air and climate; and
- Material assets, cultural heritage and the landscape

1.1.2 The factor-specific elements scoped in and out of further assessment are outlined in chapters 5 to 18 and are summarised in chapter 4.

1.1.3 We have included a summary of key information shown in this document in an accessible format. However, some users may not be able to access all technical details. If you require this document in a more accessible format please contact norwichwesternlink@norfolk.gov.uk.



TITLE:
NORWICH WESTERN LINK
AIR QUALITY SCOPING STUDY - BASELINE CONDITIONS

FIGURE No:
FIGURE 5-2

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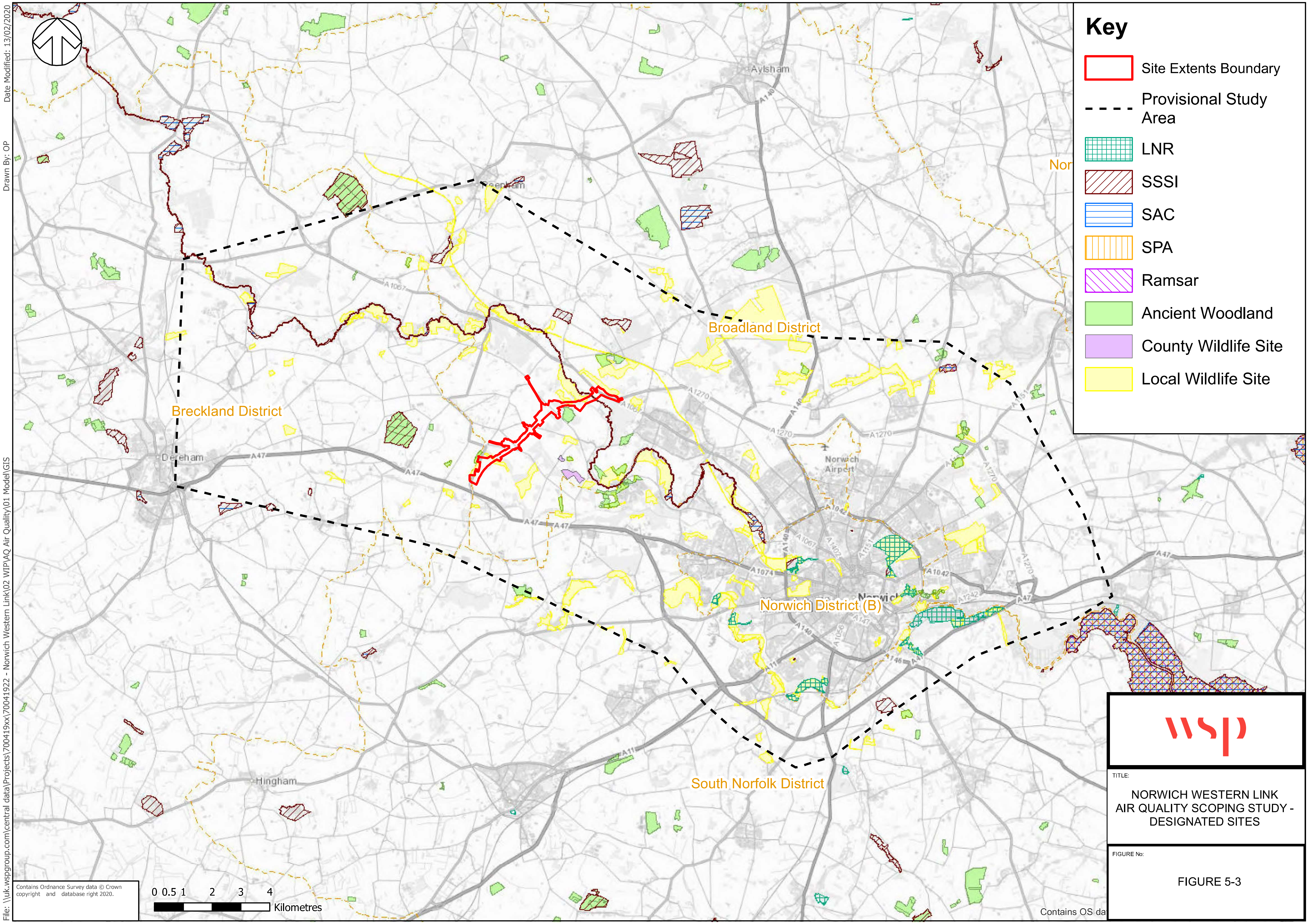
AIR QUALITY - DESIGNATED SITES



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Appendix E

MA&D LEGISLATION AND GUIDANCE

MAJOR ACCIDENTS AND DISASTERS LEGISLATION AND GUIDANCE

1.1 LEGISLATIVE FRAMEWORK

Legislation	Overview Description	Relevance to the EIA
Town and Country Planning (Environmental Impact Assessment) Regulations 2017 Schedule 4 Paragraph 8	The objective of these Regulations is to provide a high level of protection of the environment and to help integrate environmental considerations into the preparation of proposals for development to reduce their impact on the environment. The Regulations prohibit the granting of consent for development which is likely to have a significant effect on the environment unless an EIA has been carried out.	The Regulations require: • The assessment of the expected significant adverse effects of the Scheme on the environment arising from the vulnerability of the Scheme to risks of major accidents or disasters that are relevant to the project concerned. • A description of the measures envisaged to prevent or mitigate the significant adverse effects of major accidents and/or disasters on the environment and details of the preparedness for and proposed response to such emergencies.
Health and Safety at Work etc. Act 1974 (c. 37)	The Act provides the framework for the regulation of workplace health and safety in the UK. It places general duties on employers, people in control of premises, manufacturers and employees. The overriding principle is that foreseeable risks to persons will be reduced so far as is reasonably practicable and that adequate evidence will be produced to demonstrate that this has been done.	Provides a legal framework for the provision of safe plant and equipment and prevention of harm to people from occupation hazards present in a workplace, including emergencies which may affect those offsite, or visiting the site.

Legislation	Overview Description	Relevance to the EIA
Construction (Design and Management) Regulations 2015 (SI 2015 No. 51)	These regulations place legal duties on almost all parties involved in construction work. The regulations place specific duties on clients, designers and contractors, so that health and safety is taken into account throughout the life of a construction project from its inception to its subsequent final demolition and removal. Under the CDM regulations, designers have to avoid foreseeable risks so far as is reasonably practicable by: eliminating hazards from the construction, cleaning, maintenance, and proposed use and demolition of a structure, reducing risks from any remaining hazard, and giving collective safety measures priority over individual measures.	The Client, Designers and Contractors have to avoid foreseeable risks so far as is reasonably practicable by: eliminating hazards associated with the design, construction, operation and maintenance aspects of the Scheme. Therefore, the regulations ensure that mechanisms are in place to continually identify, evaluate and manage safety risks throughout the design, construction and operation phases of the Scheme. Many of the risks identified and managed out at the design phase also serve to eliminate or reduce the risk of a major accident (and therefore environmental consequence) occurring during the construction, operational and maintenance phases.
Control of Major Accident Hazards Regulations 2015 (SI 2015 No. 483)	The purpose of the COMAH Regulations is to prevent major accidents involving dangerous substances and limit the consequences to people and the environment of any accidents which do occur. The COMAH Regulations 2015 implement the majority of the Seveso III Directive (2012/18/EU) in Great Britain.	There are a number of COMAH sites close to the Scheme whose risk profile could be impacted by the Scheme and/or the Scheme falling within the Public Information Zone (PIZ) of a site. Those areas of the Scheme which fall within the PIZ of a COMAH site will need to ensure the onward communication of emergency information relating the MAH to relevant person, this will be particularly relevant during the construction phase when the transient workforce may spend significant time within a designated COMAH zone.

Legislation	Overview Description	Relevance to the EIA
Health and Safety at Work Act, etc. 1974	The Act sets down the core principles for managing H&S and goal setting duties for employers, employees, the self-employed and those controlling workplaces; including: - securing the health, safety, and welfare of persons at work; - protecting persons other than persons at work against risks to health or safety arising out of or in connection with the activities of persons at work; - controlling the keeping and use of explosive or highly flammable or otherwise dangerous substances, and generally preventing the unlawful acquisition, possession and use of such substances; and	Highways England, Contractors and sub-contractors have to avoid foreseeable risks so far as is reasonably practicable by: eliminating hazards associated with all work related activities related with the Scheme throughout its lifecycle both to their employees and others arising out of or in connection with the activities of persons at work. This is particularly relevant during the construction and maintenance phases.
Management of Health & Safety At Work Regulations 1999 (SI 1999 No. 3242)	The Regulations reinforce employer's duties to manage health and safety and apply to all work activities. The principal of risk based assessment provides the cornerstone for management of H&S and all employers are required to undertake risk assessments.	The regulations require the assessment and management of H&S risks and where required procedures for dealing with emergencies, which would include major accidents. Many of the risks identified and managed will serve to eliminate or reduce the risk of a major accident (and therefore environmental consequence) occurring during the construction, operational and maintenance phases of the Scheme.

Legislation	Overview Description	Relevance to the EIA
Occupier's Liability Act 1984 (c.3)	This Act amends the law of England and Wales as to the liability of persons as occupiers of premises for injury suffered by persons other than their visitors.	Provides a legal framework for the prevention of harm to people from occupational safety and health hazards present on premises under the control of the Occupier, including to those visiting the premises. The Scheme includes areas of land designated for marshalling of construction resources which attract visitors who could be impacted by MA&Ds whilst on/crossing those Drax controlled premises.
The Planning (Hazardous Substances) Regulations 2015 (SI 2015 No. 627)	These regulations transpose the land-use planning requirements of the European Seveso III Directive and relate to the way hazardous substances consents operate, and the way in which the planning system reduces the likelihood and impact of major accidents.	Hazardous Substance Consents (HSC) focus on ensuring the safety of the public around the consented site from potential major accident hazards. The Scheme might be impacted by a Major Accident at a HSC site and/or increase the risk profile of the HSC site.

Legislation	Overview Description	Relevance to the EIA
Pipeline Safety Regulations 1996 (SI 1996 No. 825)	The purpose of these Regulations is to ensure that pipelines are designed, constructed and operated properly to ensure their integrity and reduce environmental risks. The Regulations require the preparation of a Safety Report which demonstrates that the risks associated with the Gas Pipeline passing under the Proposed Development and which is to be modified are ALARP and prevent/minimise a potential major accident prior to construction and operation. Many of the risks identified and managed out at the design, pre-construction phases also serve to eliminate or reduce the risk of a major accident (and therefore environmental consequence) occurring during the construction, operational and maintenance phases of the Scheme.	The Scheme crosses within the consultation zones of a major high pressure natural gas pipeline.

1.2 GUIDANCE

Guidance	Description
Defra (2011) 'Green Leaves III' Guidelines for Environmental Risk Assessment and Management	These guidelines provide generic guidance for the assessment and management of environmental risks. A cyclical framework for risk management is provided which identifies four main components of risk assessment: 1. formulating the problem; 2. carrying out an assessment of the risk; 3. identifying and appraising the management options available; and 4. addressing the risk with a risk management strategy. A source-pathway-receptor model is suggested as a tool to assist in risk screening and an example is provided of applying the following filters to prioritise significant hazards for further investigation: ▪ the plausibility of linkages between the source of a hazard and a receptor; ▪ the relative potency of a hazard, availability of a pathway, or vulnerability of a receptor; ▪ the likelihood of an event, on the basis of historic occurrence or of changed circumstances; or ▪ a view on the performance of current risk management measures that, if they were to fail, may increase the potential for future harm.

Guidance	Description
Chemical and Downstream Oil Industries Forum, (2013), Guideline – Environmental Risk Tolerability for COMAH Establishments	These guidelines provide a common screening methodology for carrying out an environmental risk assessment under the COMAH Regulations. Amongst other things, the guidance: ▪ defines the types of harm that should be considered in an environmental risk assessment, and how the harm should be characterised for the assessment; ▪ defines the risk criteria to be used in assessing tolerability of the environmental risk from an establishment, and where appropriate, individual scenarios; and ▪ explains how risks may be evaluated. The guidelines present a series of thresholds that can be used to 'screen' the potential for a Major Accident to the Environment (MATTE) to relevant environmental receptors. The thresholds have been developed based on the criteria for reporting a major accident to the European Commission defined in the Seveso III Directive and COMAH Regulations, and to guidance on MATTE issued by the then Department of the Environment, Transport and the Regions in 1999235. The thresholds are presented in two dimensions, namely (i) extent and severity and (ii) duration of harm; and thresholds for both dimensions must be exceeded for the scenario to be considered a potential MATTE.
The International Standards Organization's ISO 31000: 2009 Risk Management – principles and guidelines	This guideline identifies a number of principles that need to be satisfied to make risk management effective. If the standards are adopted and applied the management of any risk should help minimise losses, improve resilience, improve controls and improve the identification of opportunities and threats. The ISO standard states that when defining risk criteria the following factors should be considered: ▪ the nature and types of causes and consequences that can occur and how they will be measured; ▪ how likelihood will be defined; ▪ the timeframe(s) of the likelihood and/or consequence(s); ▪ how the level of risk is to be determined; ▪ the views of stakeholders; ▪ the level at which risk becomes acceptable or tolerable; and ▪ whether combinations of multiple risks should be taken into account and, if so, how and which combinations should be considered.

Appendix F

TRANSPORT ASSESSMENT SCOPING STATEMENT

Norfolk County Council

NORWICH WESTERN LINK

Transport Assessment (TA) Scoping Statement

TASS
APRIL 2020

CONFIDENTIAL

Norfolk County Council

NORWICH WESTERN LINK

Transport Assessment (TA) Scoping Statement

TYPE OF DOCUMENT (VERSION 1.0) CONFIDENTIAL

PROJECT NO. 70061370

OUR REF. NO. TASS

DATE: APRIL 2020

Norfolk County Council

NORWICH WESTERN LINK

Transport Assessment (TA) Scoping Statement

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QUALITY CONTROL

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Remarks	Draft	V2	V3 WSP Team comments	V4 NCC Comments
Date	29/01/20	24/02/2020	03/03/2020	08/04/2020
Prepared by	Adrian McHale	Adrian McHale	Adrian McHale	Adrian McHale
Signature				
Checked by	Paula Cuthbertson	Paula Cuthbertson	Paula Cuthbertson	Paula Cuthbertson
Signature				I have reviewed this document 2020.05.12 12:31:12 +01'00'
Authorised by	Paula Cuthbertson	Paula Cuthbertson	Paula Cuthbertson	Paula Cuthbertson
Signature				I am approving this document 2020.05.12 12:31:53 +01'00'
Project number	70061370	70061370	70061370	70061370
Report number	1	1	1	1
File reference	TASS	TASS	TASS	TASS

CONTENTS

FIGURES

1.1. INTRODUCTION

1.1.1. WSP has been appointed to produce a Transport Assessment (TA) on behalf of Norfolk County Council (NCC) to support the planning application for the proposed Norwich Western Link (NWL) scheme. Within this document WSP set out the proposed Scope of the Transport Assessment for the NWL.

1.1.2. The proposed NWL dual carriageway link has been identified as a key 'missing link' in the Major Road Network around Norwich and is regarded by NCC and as one of the top infrastructure priorities for the Council. Following a series of early stage feasibility studies, public consultation and Option Assessment, a Preferred Route Announcement (PRA) was approved by Cabinet in July 2019.

1.1.3. The NWL, located to the west of the City of Norwich, will connect an upgraded and dualled A47 trunk road (due March 2024) near Wood Lane, Honingham to the A1067 Fakenham Road circa 400m west of the western end of the A1270 Broadland Northway. The 400m long section of the A1067 between the NWL and the A1270 Broadland Northway will also be upgraded to a new dual carriageway. The proposed NWL dual carriageway is shown indicatively by Figure 1.

1.1.4. Further to this, WSP will actively share information with Highways England (HE) seeking to deliver efficiencies, working towards successful integration of the A47 and NWL schemes.

Figure 1 - NWL Location Plan

1.1.5. The TA will consider items under the following headings:

1.2. SCHEME PROPOSALS

1.2.1. This section of the TA will outline fully the NWL scheme and its proposed construction. This chapter will include information on the proposed highway alignment, treatment of sideroads and existing PROW links crossing the scheme, construction phasing and access, and proposed works to A1067 and A47 to create new junctions with the connecting strategic and radial routes into central Norwich.

1.2.2. A summary of potential scheme benefits and the proposed mitigation package in the form of a Sustainable Transport Strategy that accompanies the scheme, seeking to encourage mode shift for shorter distance trips will also be included.

1.3. POLICY REVIEW

1.3.1. An extensive review of adopted and emerging transport and development policy will be carried out – at both national and local levels, particularly bespoke to the NWL area. This would include the following documents:

- National Planning Policy Framework (NPPF) 2019;
- Planning Practice guidance (PPG), 2018;
- The DfT Circular 02/2013 -
- The Strategic Road Note (SRN) 'Planning for the Future' (2015);
- Connecting Norfolk, Norfolk Local Transport Plan 2011-2026;
- Norfolk Strategic Framework – Shared Spatial Objectives for a Growing County (July 2017);
- Norwich Area Transportation Strategy (October 2004);
- Norfolk Strategic Infrastructure Delivery Plan (2018-2028);
- Safe, Sustainable Development (SSD, revised November 2019);
- The Current Broadland District Council (BDC) Local Plan and sub documents;
- Norwich City Council Local Plan;
- South Norfolk District Local Plan;
- Breckland District Council Local Plan;
- The emerging Norfolk County Council Transport Plan 2020 – 2036; and
- The emerging Greater Norwich Local Plan (GNLP) 2018-2038.

1.4. EXISTING CONDITIONS

1.4.1. A detailed review of the local walking, PROWs (Public Rights of Way), cycling and public transport networks and road safety in the vicinity of the NWL scheme would be undertaken in the TA.

EXISTING ACCESSIBILITY REVIEW

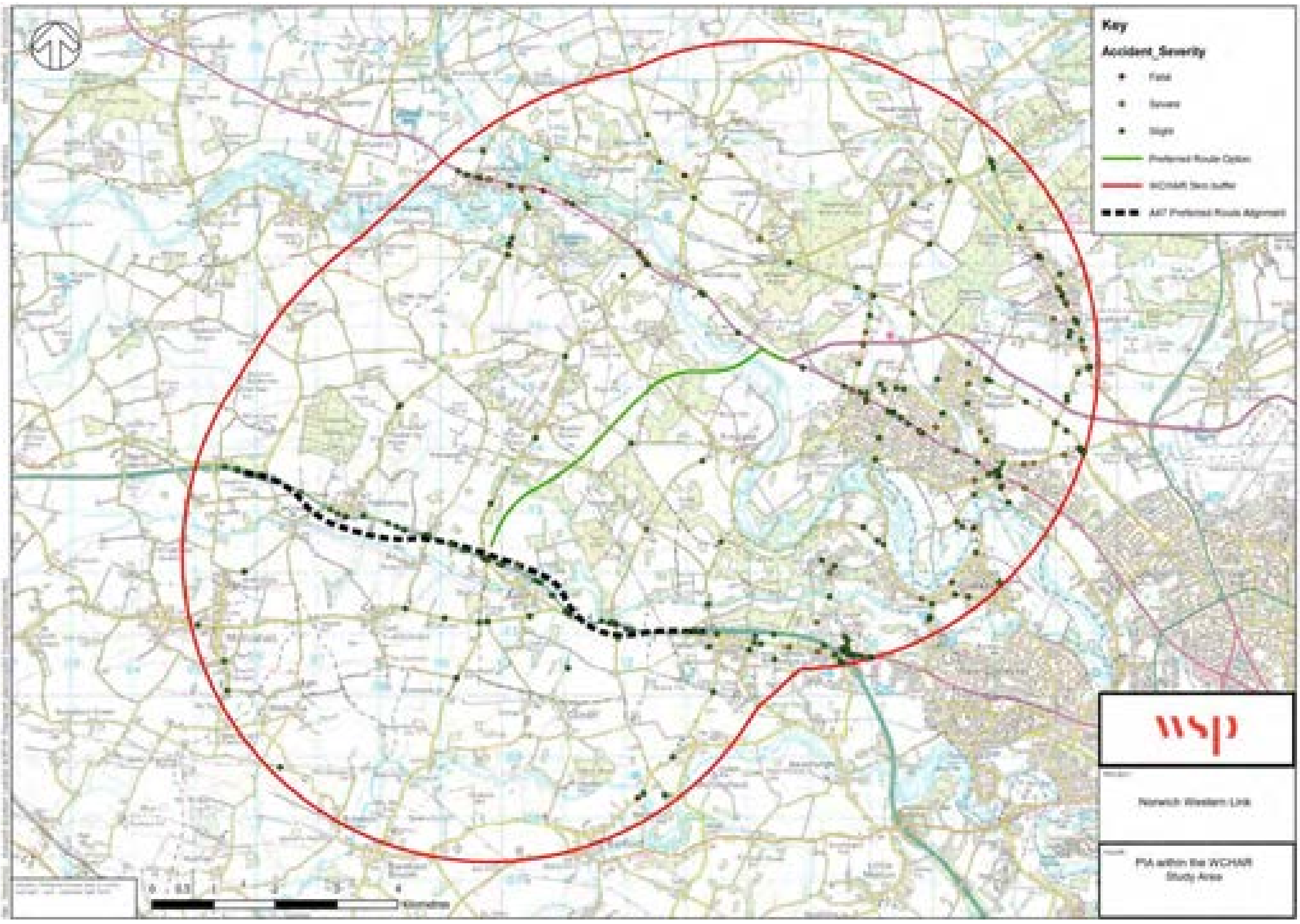
- Existing Walking, Cycling and Public Transport networks in the vicinity of the NWL scheme will be reviewed;
- Isochrone analysis will be used to assess accessibility, both with and without the proposed development, to see how accessibility will change in the vicinity of the site as a result of the proposed development and benefits that can be brought by new access routes through the site.
  - For walking, a 25-minute time catchment based on an average walking speed of 80m/minute would be assumed, with isochrones shown in 5-minute distance bands;

- For cycling, a 25-minute catchment would be considered based on average cycle speeds of 200m/minute; and
- For bus access, 400m isochrones around existing bus stops would be considered.

PERSONAL INJURY ACCIDENT (PIA) DATA

- To assess the safety of the existing road network WSP has obtained the latest 5 years of Personal Injury Accident (PIA) data for the local area from NCC. PIAs which occurred between 01/08/2014 and 11/07/2019 have been obtained for the area shown within a 5km radius around the NWL route as shown in Figure 2 (this is consistent with the study area for the WCHAR study area).

Figure 2 - PIA Study Area



- From analysis of the data ‘accident clusters’, areas classified as a ‘high risk accident area’ or patterns if present will be identified.
  - An NCC ‘accident cluster’ being where 5 or more PIAs have occurred in a 3-year period are within a 50m radius (urban) or 100m radius (rural);
    - Where ‘Urban’ is defined as an area with a 40mph speed limit or less and ‘rural’ is an area with a speed limit of 50mph or more; and
  - A ‘high risk accident route’ is a route with higher than normal accident rate that NCC has identified for an ‘Accident Reduction Scheme’ or ‘Route Safety Scheme’;

1.5. BASELINE CONDITIONS

1.5.1. This section will detail the baseline transport conditions forecasting to the future design year of assessment (2040). Where junctions are shown to exceed 0.85 RFC or 90% Degree of Saturation (for signalised junctions) in 2040, the network conditions will also be considered in the expected opening year of the NWL (2025). The section will consider:

NORWICH AREA TRANSPORTATION STRATEGY (NATS) TRANSPORT MODEL

- The TA will utilise an updated version of the Norwich Area Transportation Strategy (NATS) 2015 transport model which has been used in the Strategic Outline Business Case (SOBC). The update of the model to a 2019 base year is currently being undertaken based on comprehensive traffic counts across the whole of Norwich in October 2019. The current model which has a 2015 base year was developed in line with DfT's TAG guidance and is calibrated and validated within acceptable industry recognised standards. Localised enhancements to the model were made to validate minor rural road links in close proximity to the NWL route to make the model suitable for use in the NWL study.
- NATS model consists of the following sub-models:
  - Highway model
  - Public Transport (PT) model
  - Variable Demand Model (VDM).
- The forecasting includes a 'core' central growth scenario developed with district-wide demographic growth constrained to TEMPro version 7.2. TEMPro and NRTF factors have been assigned to the origin and destination totals for each base year zone and increased appropriately in accordance with TAG Unit M4: Forecasting and Uncertainty.
- Forecast models are available for 2025 (proposed NWL opening year), 2040 (Design Year) and 2050 (Horizon Year) have been produced with core growth demand matrices. These are the 'Do Minimum' (DM) scenarios for 2025, 2040 and 2050 and contain a network without NWL infrastructure but includes the proposed Highways England A47 upgrade schemes. A 'Do Something' (DS) scenario has been developed which includes the proposed NWL highway link in addition to the Do Minimum assumptions.
- The NATS 2015 base models were validated prior to the opening of the A1270 Broadland Northway (formerly known as the NDR). However, 2018 Present Year Validation (PYV) has been undertaken to determine the model's fitness for purpose after the full opening of the A1270 Broadland Northway. A set of independent 2018 counts provided by NCC served as the basis for a PYV exercise. The transport model has been run in a forecast mode for the 'present year' 2018 and 2018 transport model forecasts were compared with 2018 traffic counts. The link flow and journey time comparisons showed a reasonably close match between modelled and observed values with the majority of links and journey time routes meeting DfT's criteria. It was concluded that the PYV is acceptable and the model is satisfactory for forecasting traffic flows for the purpose of NWL optioneering and option selection stages.
- DfT have approved the 2015 NATS model as suitable for use in the NWL study for the purposes of preparing an SOBC (Strategic Outline Business Case) and Option selection. A new model with 2019 base year will be required for the OBC (Outline Business Case) stage of the study. A model specification report has been agreed with DfT setting out the model update requirements, a copy of the agreed report can be found in Appendix A.

- New traffic surveys were carried out in October 2019 and the NATS traffic model is currently being refreshed with this data and all further analysis to inform the TA will be undertaken using data from this new base year validated model. Associated updated forecast models are developed.
- Data will be extracted from the new model for each of the junctions within the agreed scope of assessment. Observed data on queues or delays will be used for calibration of individual junction models.

TRAFFIC GROWTH, COMMITTED DEVELOPMENTS AND COMMITTED INFRASTRUCTURE

1.5.2. The assessment will consider other major developments in close proximity, as set out within the agreed Uncertainty Log for the model update.

1.5.3. All major developments that are certain or near certain identified within the GNDP emerging local plan to 2038 would be included in the updated NATS model baseline forecasting Core scenario for 2040. In the vicinity of the Scheme, this is expected to include a 1,400 home development at Taverham.

1.5.4. Other major developments that are less certain would be included in the High Growth scenario only which would provide a sensitivity test in the TA. This includes a 6,000 home new settlement at Honingham and circa 1,000 dwellings at Costessey. (It should be noted that both of these developments were included in the current 2015 NATS model baseline forecasting, therefore the model results used for scoping purposes are expected to be robust).

1.5.5. Two further non-residential developments to be considered within the ES chapter are as follows:

- A47 Dualling – this would double the capacity of the stretch of A47 to the south of NWL from North Tuddenham to Easton, with two new grade separated junctions – one at Blind Lane/Taverham Road junction and another at Wood Lane/Berrys Lane (which would also provide connectivity with the Scheme). This would also improve safety and efficiency of operation by removing existing at grade crossroad junctions and remove the Easton roundabout. The Scheme would lead to an increased volume of traffic on A47 to the south but would enhance journey times for strategic traffic. The scheme is fully funded and due to be submitted for DCO in late 2020. All scenarios for the Scheme are therefore to be modelled with A47 dualling in place within the baseline forecast.
- Food Enterprise Zone (FEZ) at Easton – A Local Development Order (LDO) is in place and already under construction. The LDO would permit a substantial development of agribusinesses to the south of A47 which would take access via Blind Lane. Due to the nature of the businesses proposed, this would be likely to increase commercial vehicle traffic on the Strategic and Major Road Network around Norwich, in particular the A47. With the A47 scheme also in place, FEZ traffic is assumed to access the strategic road network via the south arm of the Highways England A47 proposed grade separated junction at Blind Lane/Taverham Road.

1.5.6. These nearby significant developments would be included in the baseline of the updated NATS model and assumed to be open by 2025 in the NWL opening year of assessment. It is also expected that the timescales for construction would overlap with NWL. The TA and ES chapter will consider the combined effects on all travellers of the developments outlined above being under construction simultaneously with the Scheme.

1.6. TRAVEL DEMAND

1.6.1. This chapter will outline the approach adopted to forecasting travel demand along the proposed NWL in addition to anticipated changes in travel patterns on the wider highway network established in the previous Baseline chapter. These forecasts are integral to the design of the scheme and form a key part of the Planning Application.

Specifically, this chapter will specifically cover:

- Modelled demand forecasts for the NWL in terms of AADT two-way flows and peak hour directional flows in the design year of 2040
- The origins and destinations of trips using the NWL identified via select link analysis
- Traffic flow changes as a result of the scheme on local and strategic roads in the west of Norwich
- Re-distributional effects of traffic in response to the availability of the NWL 'missing link'

1.7. IMPACT ASSESSMENT

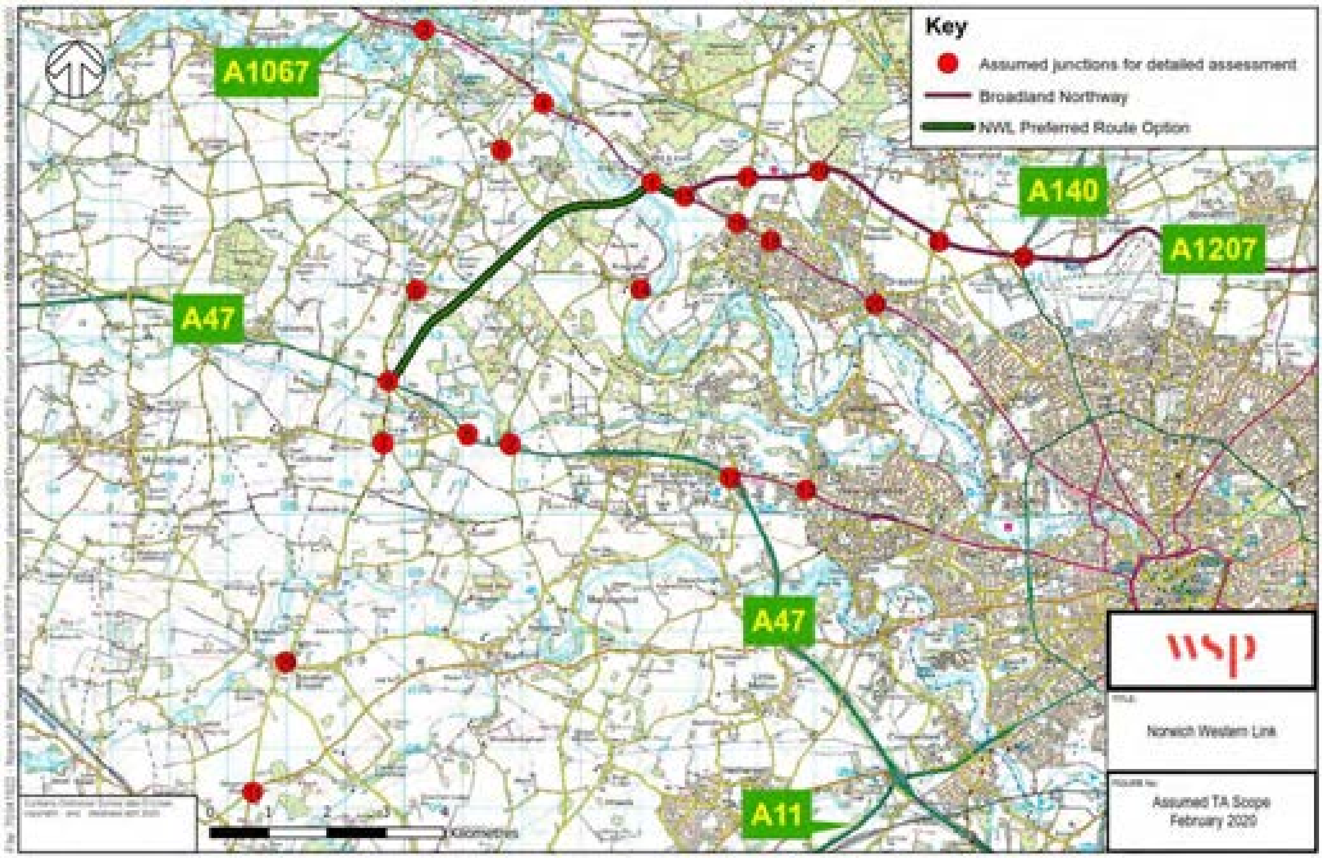
IMPACT ON NON-MOTORISED USERS (NMU'S)

- This section will review the existing sustainable transport provision for Non-Motorised Users (NMUs) in the NWL study area. This will include a detailed review of walking, cycling, equestrian and public transport user networks and activity within the study area and surrounding highway network derived from the WCHAR study. The aim is to identify how the provision of the NWL may impact upon these sustainable transport users and whether any facilities will be required for them.
- The impact of the proposed NWL scheme will also be considered on each of the existing Public Rights of Way (PRoW), permissive paths and cycleways which will be intersected by the NWL, and where relevant any measures to address the severance of paths will be described.
- Potential accessibility and severance effects of the proposed Non-Motorised User (NMU) strategy localised to the scheme will be evaluated using GIS isochrone mapping analysis to show the existing and proposed situation with and without the scheme.
- The chapter will also consider wider effects of the scheme in terms of access to bus services, facilities and services as well as impacts on NMUs crossing existing roads due to increases or decreases in traffic as a result of the new highway link.
- Reference will also be made to the wider WCHAR study carried out covering a 5km radius around the NWL route and the final package of sustainable transport interventions and opportunities for improvement taken forward as complementary measures to support the scheme, seeking to achieve mode shift on shorter journeys.

ROAD TRAFFIC IMPACT

- Following discussions with NCC and consideration of the NATS traffic model results presented in the OSR (Option Selection Report, dated July 2019) it has been determined that the traffic impact assessment should consider the following junctions shown in Figure 3.

Figure 3 - Junction Impacts



- (1) Northern NWL/ A1067 Fakenham Road roundabout;
- (2) Southern NWL/ Upgraded A47 (Honingham) roundabout;
- (3) B1535 Western Hall Road/ A1067 Fakenham Road/ Porter's Lane crossroads;
- (4) B1535 Mart Hill/ A1067 Fakenham Road 'T' junction;
- (5) B1535 Mart Hill/ B1535 Church Street/Morton Lane (Weston Longville) crossroads;
- (6) B1535 Western Hall/ B1535 Wood Lane/ B1535 Paddy's Lane 'T' junction;
- (7) Berrys lane/ Barnham Broom Road/ Mattishall Road crossroads (Honingham);
- (8) Mattishall Road/ Upgraded A47 junction;
- (9) Berrys Lane/ Wood Lane/ Upgraded A47 junction;
- (10) Mill Road/Honingham Road/ Norwich Road/ Bell Road crossroads (Barnham Broom);
- (11) B1108 Norwich Road/ Bell Road 'T' junction;
- (12) A47 Norwich Southern Bypass/ A1074 Dereham Road/ William Frost Way/ Long Lane grade separated junction;
- (13) Longwater Lane/ A1074 Dereham Road/ Bawburgh Lane signalised crossroads;
- (14) The Street/ Weston Road/ Field Road crossroads (Ringland);
- (15) A1067 Fakenham Road/ A1270 Broadland Northway roundabout;
- (16) A1067 Fakenham Road/ Fir Covert Road/ Beech Avenue staggered crossroads;
- (17) A1270 Broadland Northway/ Fir Covert Road roundabout;

- (18) A1067 Fakenham Road/ Sandy Lane/ Breck Farm Lane crossroads;
- (19) A1270 Broadland Northway/ Reepham Road roundabout;
- (20) A1067 Fakenham Road/ Costessey Lane/ School Road signalised junction;
- (21) A1270 Broadland Northway/ Brewery Lane/ Drayton Lane roundabout; and
- (22) A1270 Broadland Northway/ A140 Holt Road grade separated junction.

- Flows for the above junctions will be extracted for 2019, 2025 and 2040 from the validated 2019 NATS traffic model and analysed in detail using the appropriate local junction modelling software (Junctions 9 for priority junction or LinSIG for signalised junctions).
- 2019 and 2040 analysis results will be presented for all of the listed junctions.
- At priority junctions (‘T junctions, crossroads and roundabouts) where The Ratio of Flow to Capacity (RFC) in 2040 exceeds 0.85 the 2025 results will also be presented.
- Similarly, at signalised junctions where the Degree of Saturation (DOS) exceeds 90% 2025 results will also be presented.
- In addition to the above, qualitative comparisons will be carried out for those junctions where the NWL shows a beneficial impact to demonstrate the benefits of the scheme.
- Results will be compared with the baseline forecast results for the same modelled year to understand the impact of the scheme and need for traffic mitigation.
- AADT Link flow changes will also be used to consider and assess requirements for traffic management measures across the wider network. Areas expected to require consideration in this respect include routes to the north of A1067 via Felthorpe and to the south of A47 between Wymondham and Honingham.

ROAD SAFETY IMPACT OF THE SCHEME

- This section of the report will provide a qualitative assessment of the impact of the NWL on the road safety of all users both Non-Motorised and Motorised. It is envisaged that this impact will be mainly positive as a result of traffic relief to other routes. However, the need for additional safety improvements will be considered in locations where traffic significantly increases as a result of the NWL proposals.

MITIGATION

- For all junctions assessed in detail within this TA and rural link roads that show significant negative effects as a result of the NWL proposals, mitigation measures will be considered and presented as necessary. Furthermore, mitigation measures may be required for NMUs where an impact has been identified through qualitative assessment for example where severance issues reduce opportunities for crossing existing roads.
- Sustainable Transport Interventions (covering NMU enhancements in the vicinity of the proposed scheme, wider non-car interventions and traffic management measures) will be developed seeking to enhance opportunities for non-car travel in the study area west of Norwich.

CONSTRUCTION TRAFFIC IMPACT

The construction programme and its phasing which will be produced for ES purposes and will be reviewed with regards to impacts on the transport network. Assumptions about site access and traffic management will be discussed with the County Council and their contractor with the aim to minimise any construction related impacts. A draft Construction Environmental Management Plan (CEMP) has been prepared and will be submitted as part of the ES.

Appendix A

MODEL SPECIFICATION REPORT

Appendix to TA Scoping Statement

INTERNAL

Norfolk County Council

NORWICH WESTERN LINK

Model Specification Report

70061370-WSP-MSR
JANUARY 2020

CONFIDENTIAL

Norfolk County Council

NORWICH WESTERN LINK

Model Specification Report

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DATE: JANUARY 2020

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CONTENTS

TABLES

FIGURES

GLOSSARY

Acronym	Meaning
AADT	Annual Average Daily Traffic
AAWT	Annual Average Weekday Traffic
AMCB	Analysis of Monetised Cost and Benefits
AQMA	Air Quality Management Area
ASR	Appraisal Specification Report
ATC	Automatic Traffic Count
BCR	Benefit to Cost Ratio
CO_2	Carbon Dioxide
COBALT	COst and Benefit to Accidents – Light Touch
DfT	Department for Transport
DI	Distributional Impacts
DIADEM	Dynamic Integrated Assignment and Demand Model
DMRB	Design Manual for Roads and Bridges
EAST	Early Assessment and Sifting Tool
FBC	Full Business Case
GEH	Geoffrey E. Havers
GDP	Gross Domestic Product
GIS	Geographical Information Systems
HGV	Heavy Goods Vehicle
LCWIP	Local Cycling and Walking Infrastructure Plans
LDO	Local Development Order
LGV	Light Goods Vehicle
LMVR	Local Model Validation Report
LPA	Local Planning Authority
LSOA	Lower Super Output Area
LTP	Local Transport Plan
MCC	Manual Classified Count
M_E	Hourly Observed Flow Data
M_G	Hourly Saturn Modelled Flows

Acronym	Meaning
MRN	Major Road Network
NATS	Norwich Area Transport Strategy
NCC	Norfolk County Council
NDR	Northern Distributor Road *(now named A1270 Broadland Northway)*
NMU	Non-Motorised User
NPPF	National Planning Policy Framework
NRTF	National Road Traffic Forecasts
NTEM	National Trip End Model
NWL	Norwich Western Link
NWQ	Norwich Western Quadrant
OAR	Option Assessment Report
OBC	Outline Business Case
OGV	Ordinary Goods Vehicle
PA	Production Attraction
PCU	Passenger Car Unit
PT	Public Transport
RIS	Road Investment Strategy
SATURN	Simulation and Assignment of Traffic to Urban Road Networks
SERTM	South East Regional Transport Model
SHMA	Strategic Housing Market Assessment
SOBC	Strategic Outline Business Case
SRN	Strategic Road Network
TEMPro	Trip End Model Presentation Program
TUBA	Transport User Benefit Appraisal
UEA	University of East Anglia
VDM	Variable Demand Model
VfM	Value for Money
VOC	Vehicle Operating Costs
VOT	Value of Time
WebTAG	Transport Analysis Guidance
WebTRIS	Highways England Traffic Information System

1

INTRODUCTION

1 INTRODUCTION

1.1 PURPOSE OF THE REPORT

1.1.1. WSP has been commissioned by Norfolk County Council (NCC) to develop a transport model in support of the Norwich Western Link (NWL) Outline Business Case. This report will detail the update to the existing Norwich Area Transport Strategy (NATS) model.

1.1.2. This Model Specification Report is intended to inform the following bodies or organisations:

- Norfolk County Council (NCC), the promoters of the scheme
- Transport East as part of the Regional Evidence Base
- Department for Transport (DfT), to whom NCC are submitting the Outline Business Case
- WSP, the scheme development consultants
- Stakeholders.

1.1.3. Currently the scheme is at Stage 2 of the DfT Business Case guidance - https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/85930/dft-transport-business-case.pdf. An Options Appraisal Report (OAR) has been completed, which sets out the long list of options, the sifting and the final shortlisted options to be taken forward for assessment. The SOBC has been completed setting out the assessment undertaken for the shortlisted options and the preferred route has been determined as set out in the Options Selection Report.

1.2 NORWICH WESTERN LINK

1.2.1. The city of Norwich performs a regional role in delivering growth and as a major employment, shopping and service centre, and a focus for transportation. Following the completion of the Northern Distributor Road (NDR) now known as the A1270, which was subsequently designated as an A-Road in the route hierarchy (A1270) and named Broadland Northway, there have been calls to complete the 'missing link' between the A47 and A1067.

1.2.2. The Norwich Western Link (NWL) would provide a higher standard route between the western end of Broadland Northway and the A47 and significantly improve travel between these two major roads. Traffic congestion, rat-running and delays to journeys are all significant issues on minor roads to the west of Norwich and there is strong support from the public, the business community, emergency services, local councils and MPs for a link road to be created.

1.2.3. NCC have now published a preferred route for the NWL as shown in Figure 1-1.

1.2.4. The new 3.9 mile dual carriageway road links from the roundabout at the western end of Broadland Northway and extends for around 350 metres along the A1067 Fakenham Road before turning in a south-westerly direction via a new junction. The road crosses the River Wensum on a viaduct and then continues at or near ground level for the remainder of its length. It links to the A47 via a new junction at Wood Lane (B1535), which forms part of Highways England’s plan to dual the A47 between North Tuddenham and Easton.

1.2.5. Together with the dualling of the A47 between North Tuddenham and Easton, due to get underway in early 2022, delivering Option C as the preferred route would create a fully dual carriageway orbital route around the city.

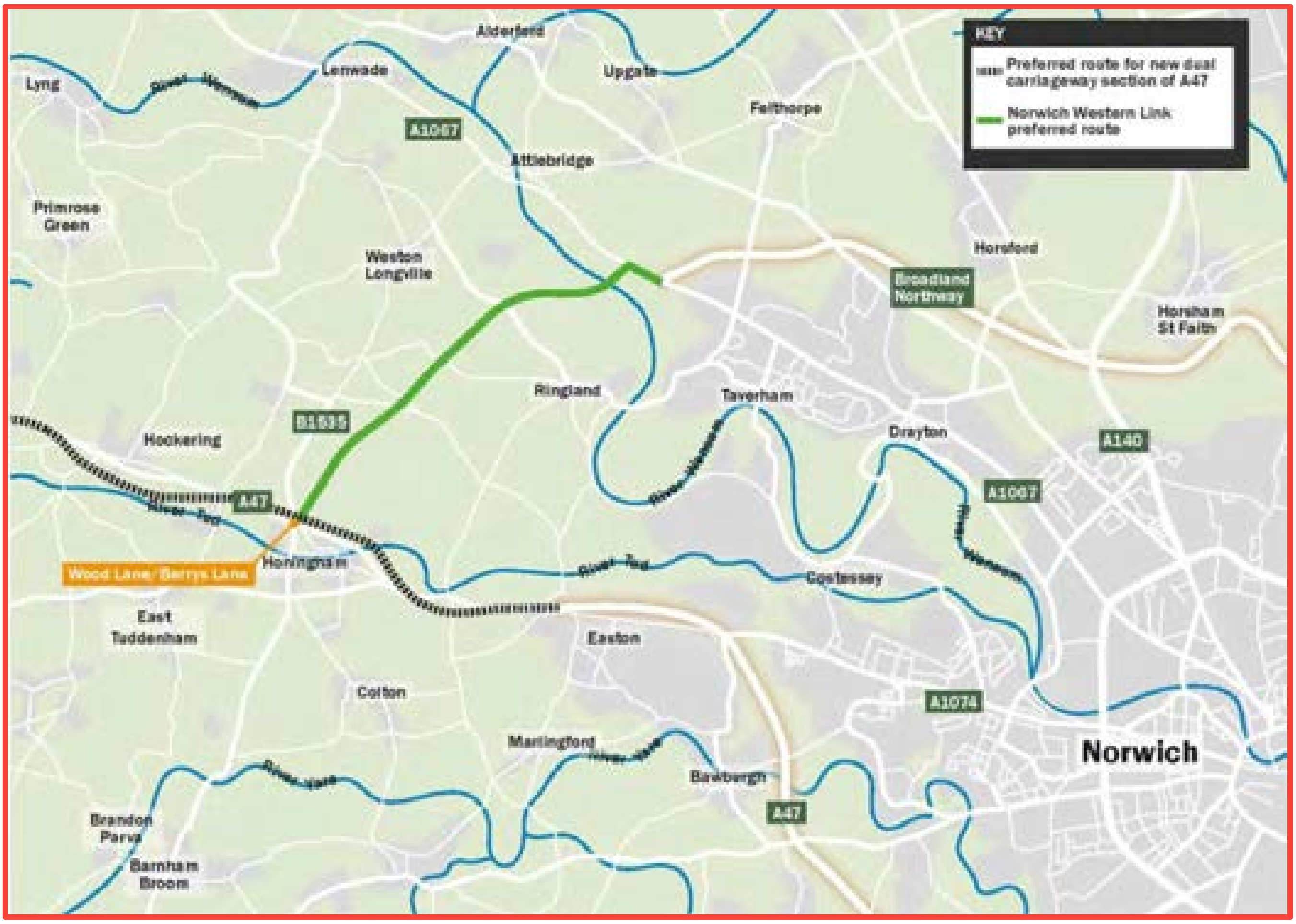

Figure 1-1: NWL Preferred Route

1.3 PROPOSED USES OF THE MODEL

1.3.1. Though the main focus of the model update is to produce a robust and up to date basis for the assessment of NWL, there is also an intention for the model to become an all-purpose tool for NCC to test a range of potential schemes or policies. These may include:

- Highway scheme appraisal
- Inputs for transport business cases and funding applications
- Inputs for environmental appraisal
- Local plan/core strategy assessment
- Smarter choices assessment
- Development impact assessment.

1.3.2. A major update to NATS has been proposed that includes the collection of data to update the model to 2019 traffic conditions. This note will provide a summary of the NATS and the details of the data that is to be collated.

2

KEY FEATURES

2 KEY FEATURES

2.1 MODELLED AREA

2.1.1. The Fully Modelled Area, formerly referred to as study area, of the updated model is shown in Figure 2-1. The Fully Modelled Area encompasses the area of Norfolk between King's Lynn in the west and towards Lowestoft in the South-East. The model will represent full detail of the highway network within the Norwich urban and surrounding areas. The highway network will be represented in less detail the further away from Norwich with only the strategic links represented on the periphery of the model.

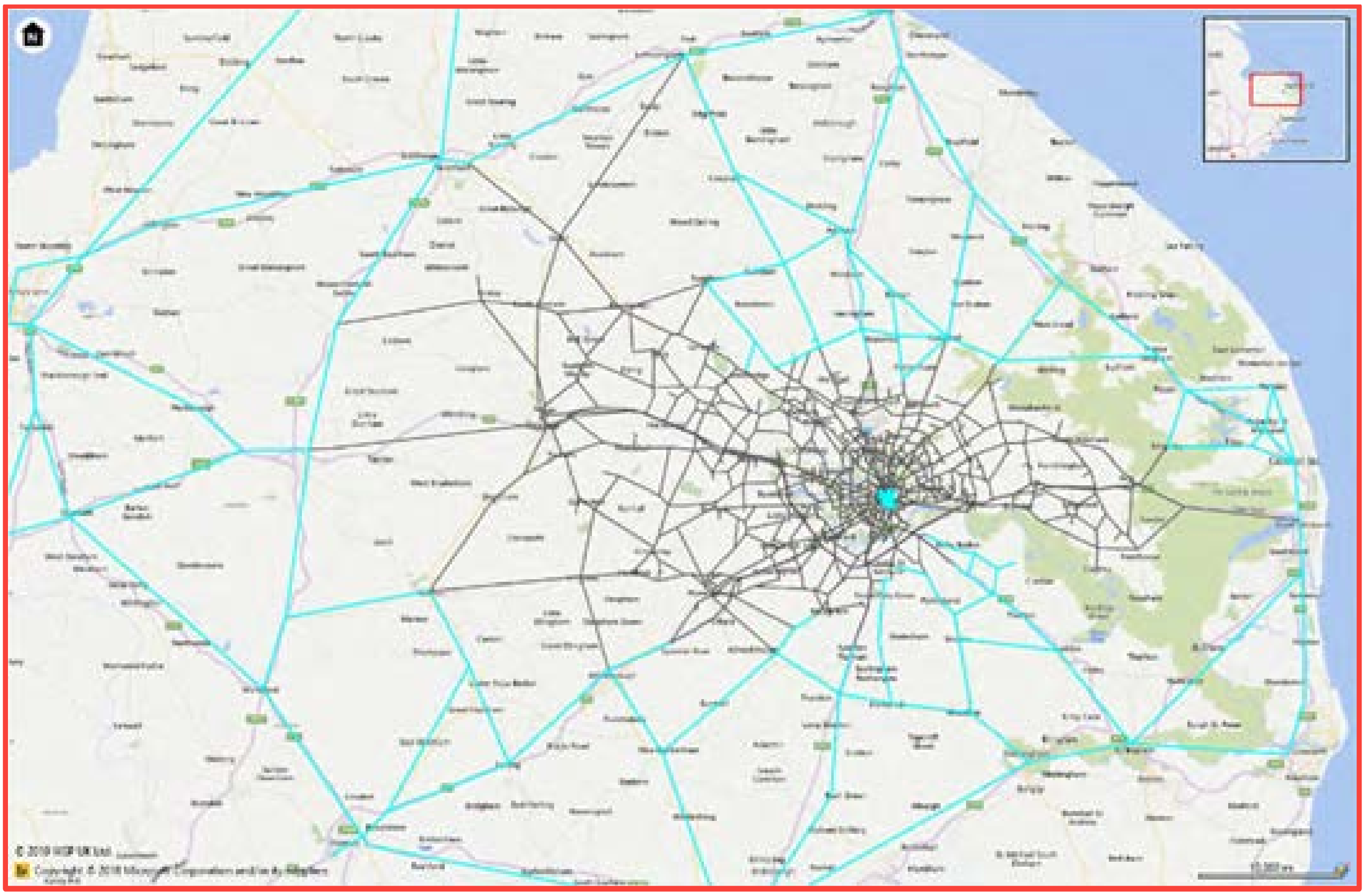

Figure 2-1: Fully Modelled Area

2.1.2. The Fully Modelled Area is chosen to build a traffic model that covers a sufficient area to accurately model the reassignment and redistribution effects that are likely to be produced by new development and infrastructure schemes in Norwich and more specifically the Norwich Western Link Road.

2.1.3. To determine the potential area of impact for the NWL, a comparison was made between the highway only models for a with and without NWL scenario (using the 2050 models as the worst scenario, which informed the NWL SOBC).

2.1.4. The models behind the flow diagrams shown below were utilised from the Highways England updated Norwich Area Transport Strategy (NATS) 2015 transport model.

2.1.5. The results of that comparision are shown in Figure 2-2 and Figure 2-3; green bandwidths show an increase in traffic and blue bandwidths show a reduction in traffic. The choice of the fully modelled area confirms that its extent is sufficient enough to cover the likely impact of the NWL because the changes do not extend beyond the fully modelled area.

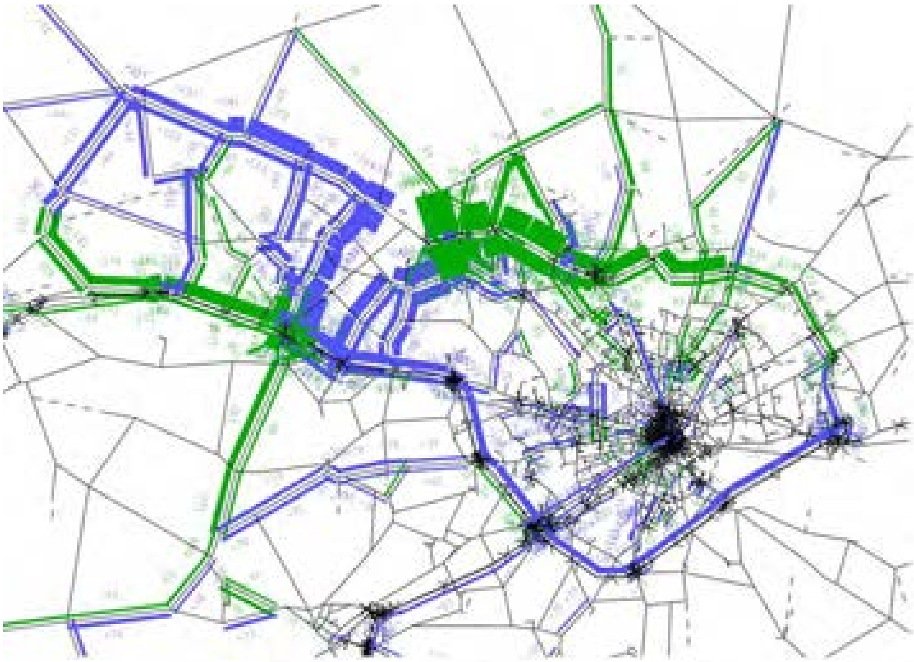

Figure 2-2: With NWL minus without NWL, 2050 AM peak

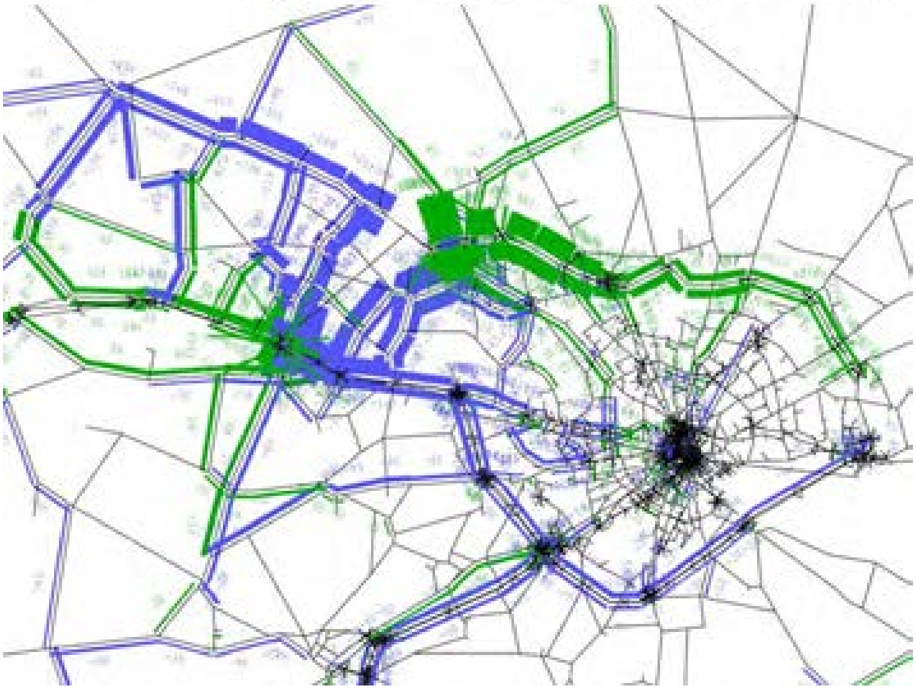

Figure 2-3: With NWL minus without NWL, 2050 PM peak

2.1.6. The fully modelled area is further subdivided into:

- Area of Detailed Modelling as shown in Figure 2-4. This is the area over which significant impacts of interventions are certain. Modelling detail in this area would be characterised by representation of all trip movements, small zones, very detailed networks and junction modelling. The area has been derived by analysis the impact of the scheme in Figure 2-2 and Figure 2-3. This area will have sufficient model network and zoning detail to be able to assess the likely impact of the scheme to an appropriate level for the purposes of the scheme appraisal;
- Rest of the Fully Modelled Area. This is the area over which the impacts of interventions are considered to be quite likely but relatively weak in magnitude. It would be characterised by: representation of all trip movements, somewhat larger zones and less network detail than for the Area of Detailed Modelling, and speed/flow modelling (primarily link-based but possibly also including a representation of strategically important junctions)
- The rest of the UK represents the External Area. In this area impacts of interventions are likely to be negligible. The External Area is characterised by skeletal networks and simple speed/flow relationships or fixed speed modelling and a partial representation of demand (trips to, from and across the Fully Modelled Area).

Figure 2-4: Area of Detailed Modelling

2.2 ZONING SYSTEM

2.2.1. Traffic loads onto the model network from zones via centroid connector links. The centroid zone connectors in the NATS model within the NWL study area will be reviewed and refined to more realistically represent the way in which traffic joins the minor road network, prior to accessing strategic roads. As far as possible, specific access roads from residential and commercial areas will be used as a basis for connecting zones to the network via centroid connectors.

2.2.2. The zoning system as shown in Figure 2-5 will be revised, with local zones within the NWL study area disaggregated to better reflect the local area and to allow for more accurate loading of existing traffic onto the local road network. The NATS zoning system in the Area of Detailed Modelling will be refined to allow for more accurate assignment of the traffic flows.

2.2.3. The zoning system will be revised by initially using the Census Middle Super Output Areas (MSOA). These areas will then be altered depending on whether they are located within the Detailed Model Area or outside in the model buffer network. Within the detailed model area, the MSOAs will be split to provide a suitable representation of land use that enables the model to load trips onto the network appropriately. This enables a more detailed representation and enhances the model calibration and validation. The further away from the Norwich urban area and scheme impact rea the zones are located the larger the area they represent. MSOAs will be grouped together for areas that are a significant distance away from the study area e.g. North of England and Scotland.

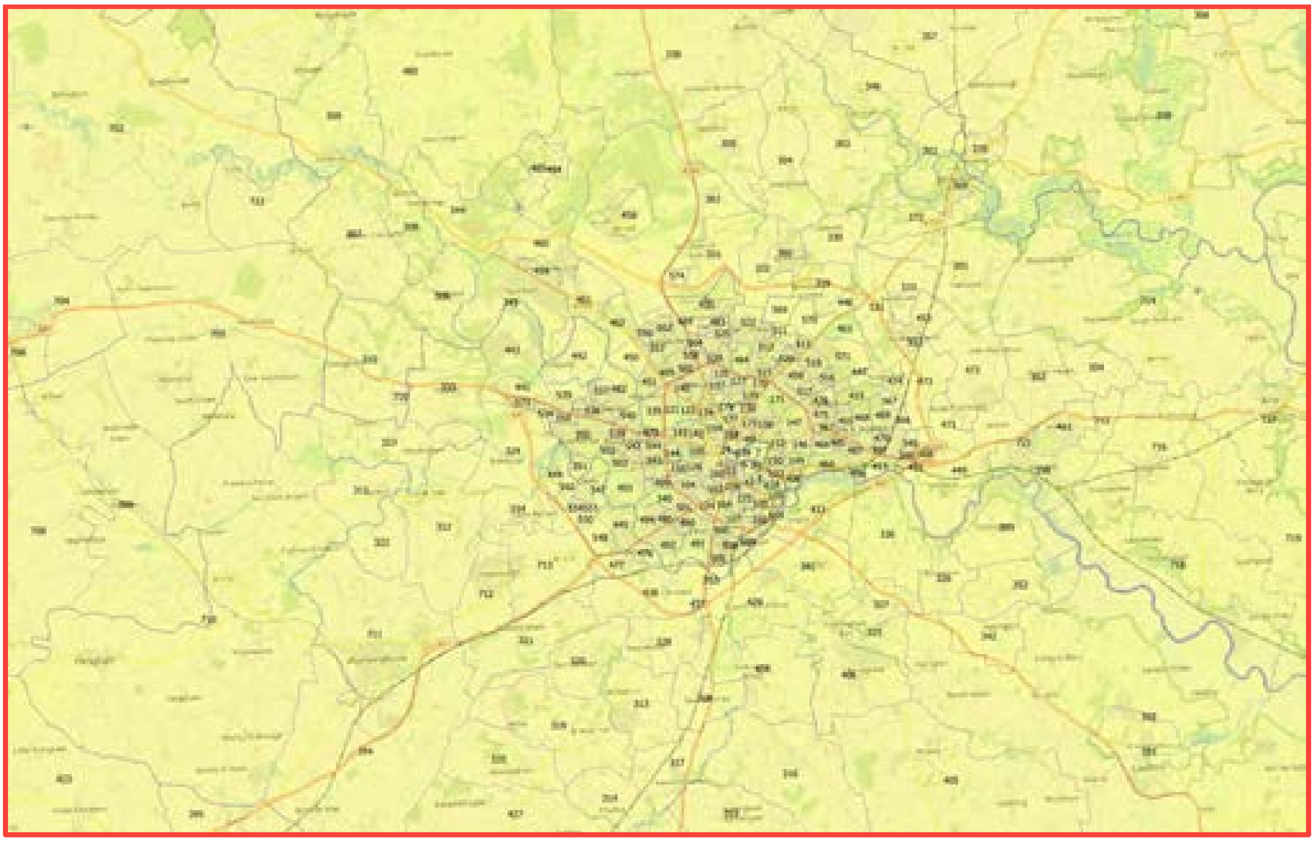

Figure 2-5: Zoning System Around Norwich

2.3 SECTORING SYSTEM

2.3.1. The model zone system will be aggregated into model sectors. The sector system will enable data to be extracted and summarised into more strategic datasets. The sector system will be used to demonstrate how the model is fit for purpose and is representative of traffic movements between these sectors. The sector system will be used during the matrix estimation process and for economic analysis. The sector system is shown below in Figure 2-6.

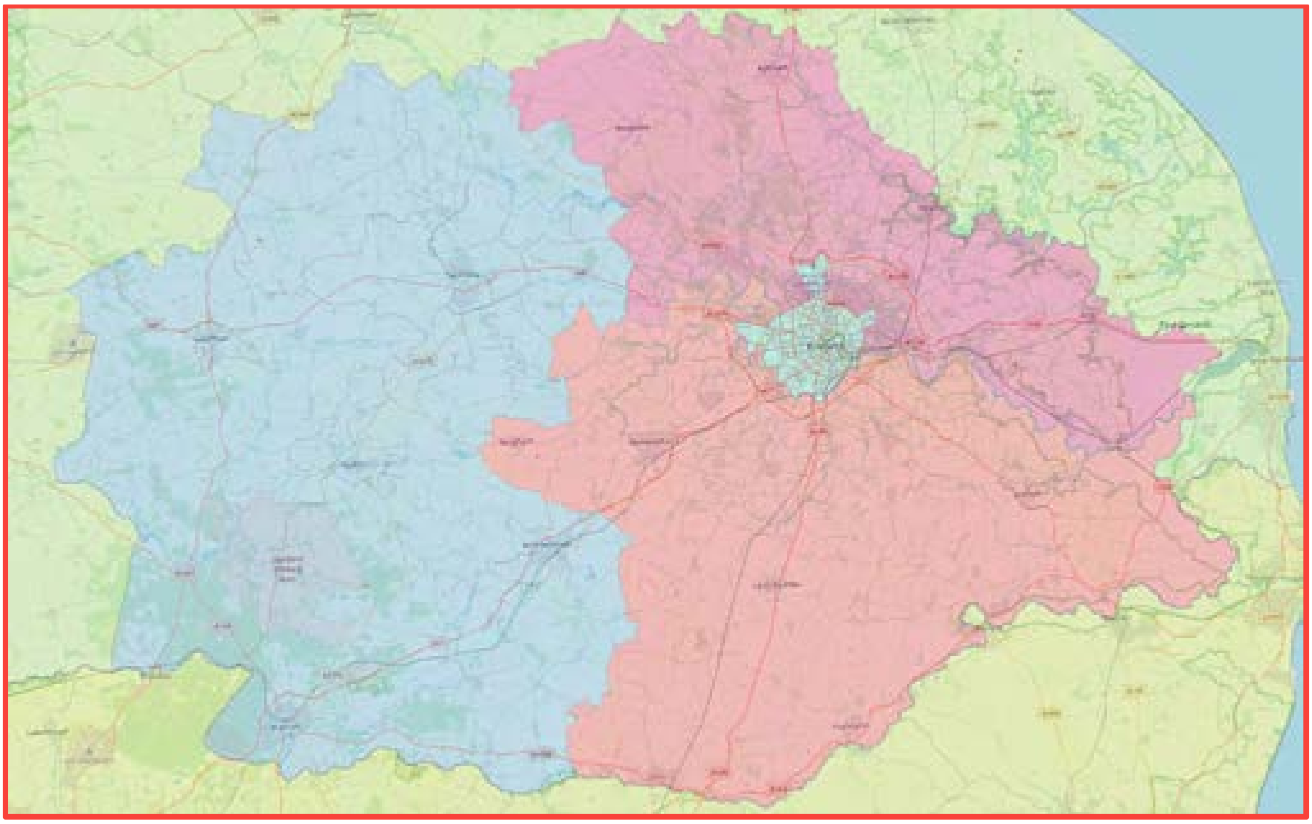

Figure 2-6: Sector System

2.3.2. There are twelve sectors in total. The initial four represent the local areas around Norwich, two represent the north and south hinterlands of Norfolk and the remaining six sectors represent the rest of Britain. This sectoring system will be reviewed prior to model development and will be updated accordingly. The specific details of the locations covered are displayed in Table 2-1.

Table 2-1: Table of Sectors

Sector	Location
1	Broadland
2	Breckland
3	South Norfolk
4	Norwich
5	North Norfolk
6	Cambridgeshire
7	West Midlands
8	North East
9	London
10	Scotland
11	South West
12	Wales

2.4 MODEL YEARS

2.4.1. The base year of the updated model is 2019.

2.4.2. The following model forecast years have been identified:

- 2019: Base Year
- 2025: Opening year
- 2040: Design year
- 2050: Horizon year

2.5 TIME PERIODS

2.5.1. The base year models will be developed for the following time periods:

- average Weekday (Monday to Thursday) AM peak hour (08:00 - 09:00)
- average Weekday (Monday to Thursday) Inter peak hour (average 10:00 – 16:00)
- average Weekday (Monday to Thursday) PM peak hour (17:00 - 18:00).

2.5.2. The modelled time periods will be confirmed will represent the busiest hours within the Fully Modelled Area and will be confirmed using the newly collected ATC data.

2.6 MODEL STRUCTURE AND DEMAND SEGMENTATION

2.6.1. NATS will inherit the model structure from the previous model, which consists of the following sub-models:

- Highway model
- Public Transport (PT) model
- Variable Demand Model (VDM).

2.6.2. The existing 2015 Public Transport (PT) model developed in VISUM has the purpose of providing journey generalised cost information to be input within VDM. It is intended that the updated PT model will be used for the same purpose and will not be used for testing any PT transport schemes or strategies in Norwich. Therefore, the scope and the data collection for the PT model development will be proportionate to the intended application of the model. This model requires information on the following:

- timetables
- service restrictions
- alignments
- stopping patterns
- passenger demand
- Rail station, rail service, bus station and bus service usage

2.6.3. The highway model will include five user classes:

- Car Work
- Car Commuting
- Car Other
- LGV
- HGV.

2.6.4. This is consistent with advice presented in Section 2.6 of TAG Unit M3.1 (January 2014).

2.6.5. The PT model user classes will include:

- PT Work
- PT Commuting
- PT Other.

2.6.6. All PT matrices will be split by car availability i.e. into car available (CA) and non-car available (nCA).

2.6.7. To summarise, the trip matrices will be segmented as indicated below:

- Time period: AM peak hour, Inter-peak period, and PM peak period
- Mode: Private vehicle and Public transport
- Vehicle types: Light vehicles and Heavy vehicles
- Purpose: Work, Commuting and Other
- Car availability: Car available and No car available (public transport only).

2.7 DATA COLLECTION

2.7.1. The update of the model will require the following datasets:

- Automatic Traffic Counts (ATC)
- Manual Classified Turning Counts (MCTC)
- DfT TrafficMaster Origin Destination and Journey Time Data
- Mobile Network Data
- INRIX Origin Destination and Journey Time Data.

2.7.2. The ATC and MCTC data sets will enable the highway model calibration and validation and will be used within matrix estimation. The ATC and MCTC data collection is taking place in October 2019 and is fully described in the Norwich Transport Model Data Specification Brief[1].

2.7.3. The journey time data is used for validating the model journey times.

2.7.4. The mobile network data and the GPS origin-destination data will be used within the trip matrix development stage. This is detailed in Section 5 of this report.

2.7.5. To adhere to the principle of proportionality, no on-site public transport data will be collected. Instead, existing data will be utilised as much as possible, for example, local bus counts, rail station annual patronage and rail service passenger loading derived from Moira.

[1] Norwich Transport Model Data Specification Brief – 1 October 2019

3

HIGHWAY ASSIGNMENT MODEL

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3 HIGHWAY ASSIGNMENT MODEL

3.1 OVERVIEW

3.1.1. The Norwich Area Transport Strategy (NATS) model originally developed has been updated on numerous occasions and has been used in the assessment of several variations of the NDR and NWL. The existing NATS model consists of a highway assignment model developed in Simulation and Assignment of Traffic to Urban Road Networks (SATURN) modelling software, which is an industry standard tool.

3.1.2. In updating the model the latest, relevant guidance in DfT WebTAG Unit M3.1 Highway Assignment (January 2014) is to be followed, referenced throughout this report as 'TAG Unit M3.1'.

3.2 SOURCE MODEL

3.2.1. Highways England updated the base year and locally enhanced the transport networkto satisfactorily model A47 RIS scheme beyond the Norwich area.

3.3 MODELLING SOFTWARE

3.3.1. The Highway Assignment Model will be developed using the latest (non-beta) versions of the software suite of programs in SATURN. The current version of SATURN is version 11.4.07H.

3.4 NETWORK DEVELOPMENT

3.4.1. The model network development will involve updating the previous version of the NATS model. The update will involve reviewing the highway layout and including any highway schemes that have been built since the last update. The review will cover the following items of the network:

- Network structure;
- Signal Timings;
- Link speeds (cruise speeds and speed flow curves);
- Link and junction saturation flows;
- Link distances;
- Give-way priority and flare length markers; and
- Number of lanes.

3.5 APPROACH TO CALIBRATION AND VALIDATION

3.5.1. Calibration and validation will be undertaken for the four main components of the model:

- Network calibration and validation
- Route choice calibration and validation
- Trip matrix calibration and validation
- Assignment calibration and validation.

3.5.2. Each of the tasks above is linked with each other and it is often a combination of all that are required to address each problem identified by the calibration and validation process. Each of the tasks is considered further in this section in turn.

3.6 NETWORK CALIBRATION

3.6.1. An initial assignment will be carried out prior to any adjustment of the demand matrices. The results will be compared against observed flows, speeds and delays to identify any further areas which may require adjustment to the network coding. The following instances will be checked:

- Turn / link capacity is less than observed count
- Calculated delays significantly greater than observed delays
- Modelled flows significantly above observed flows
- Modelled delays unacceptably lower than observed delays.

3.6.2. Remedial action on the network coding will be undertaken where the above is identified; changes will only be made that are in accordance with direct observations of actual network properties.

3.7 NETWORK VALIDATION

3.7.1. High level checks of the network will be undertaken and will focus on the strategic movements of trips across the area and the model journey times on key routes.

3.7.2. Network validation will be confirmed through presentation of time/distance graphs for each modelled journey time route, as discussed below.

3.8 ROUTE CHOICE CALIBRATION

3.8.1. At various stages of model development, the minimum cost routes for a range of selected O-D pairs will be plotted and checked for plausibility. Modelled route choice depends on:

- Zone size
- Network structure
- Centroid connectors
- Trip matrix accuracy
- Representation of speeds and delays
- Junction coding accuracy.

3.9 ROUTE CHOICE VALIDATION

3.9.1. Sense checks will be carried out on a number of strategic and local routes across the study area.

3.9.2. Following calibration and validation of the model, information will be presented for a selected number of origin-destination pairs to demonstrate that the routing is logical. To some extent this is not true validation, as there is no empirical data to act as a benchmark, but selected routes plotted from SATURN will be compared to equivalent routes prepared using Google Maps, supported by a commentary discussing the feasibility of each route.

3.9.3. Routes selected will focus on important centres of population or employment, or through key intersections. They will:

- Relate to significant numbers of trips
- Are of significant length
- Pass through key areas of interest
- Include both directions of travel
- Link different compass areas
- Coincide with journey time routes, where appropriate.

3.10 TRIP MATRIX CALIBRATION

3.10.1. Following the development of the prior trip matrices, matrix estimation will be undertaken.

3.10.2. Matrix estimation will be used on all screenlines, using counts that have been allocated to the calibration process. Counts on cordons and screenlines will be constrained and monitored within the process so the model build conforms to TAG criteria.

3.10.3. Guidance presented in section 8.3 of TAG Unit M3.1 (January 2014) will be followed. In particular:

- Counts used in matrix estimation will be derived from a minimum 2-week ATC
- Count constraints will be grouped at a screenline level
- Constraints will be only applied to directly observed counts, e.g. all car user classes will be grouped to a single "car" constraint.

3.10.4. To ensure that matrix estimation is a controlled process, due care and attention will be given to the requirements set out in TAG to monitor the impacts of matrix estimation. Information will therefore be presented on:

- Regression statistics at trip end level
- Trip length distributions with means and standard deviations.

3.11 TRIP MATRIX VALIDATION

3.11.1. Information will be presented for both the prior and post matrix estimation matrices on the following:

- Screenlines and cordons of counts used in matrix estimation
- In accordance with the requirements presented in section 3.2 of TAG Unit M3.1 (January 2014), screenline totals will be presented for each vehicle type. Total modelled flows across screenlines for each vehicle type should be within 5% of observed flows. TAG recommends that this should apply to "all, or nearly all" screenlines. We will apply a threshold of 85% of screenline totals to meet this criterion

3.11.2. From the data that is available, the following screenlines will be used, which are llustrated in Figure 3-1.

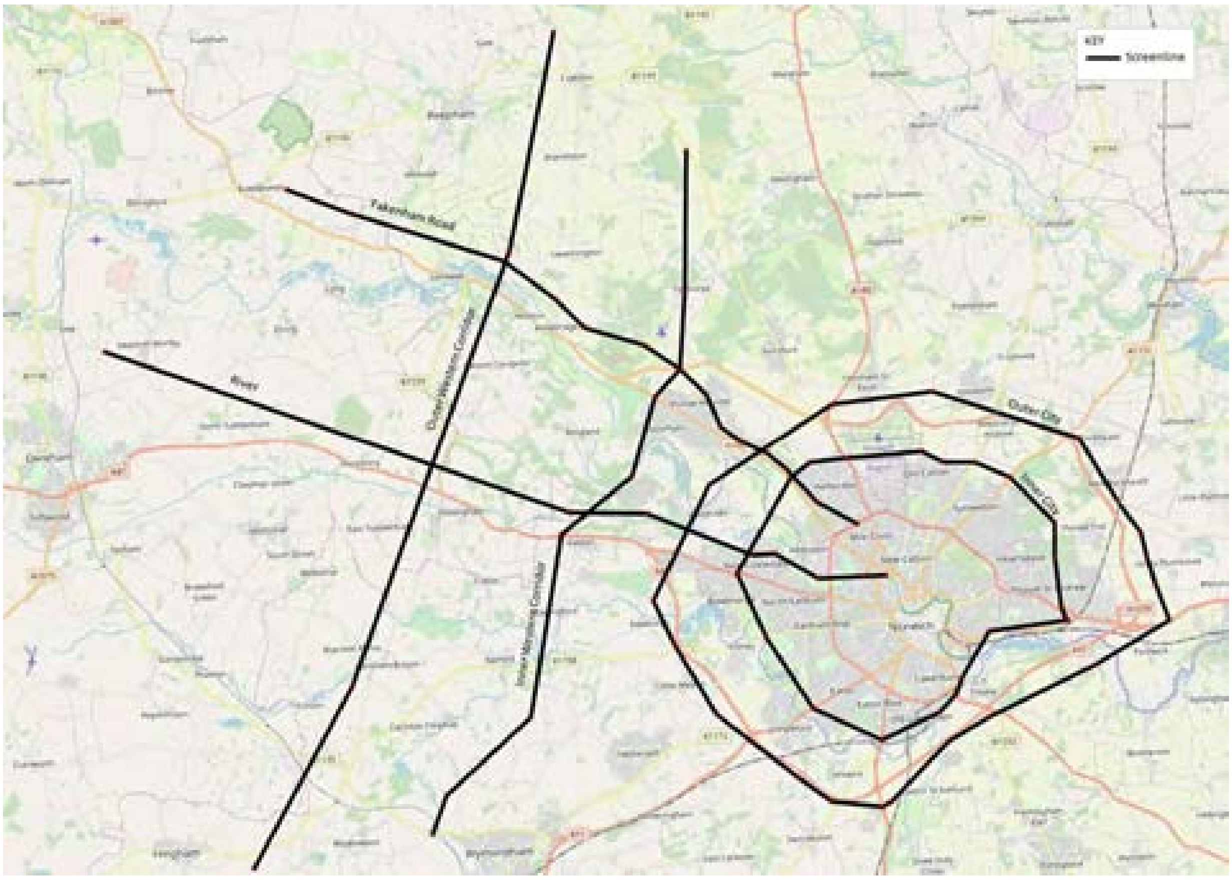

Figure 3-1: Highway Model Cordons and Screenlines

3.12 ASSIGNMENT CALIBRATION

3.12.1. Assignment calibration simply involves further steps to identify any issues that are preventing an acceptable level of calibration of the network, route choice and trip matrix, as outlined above. This will include:

- Checking appropriateness of centroid connectors
- Production of forests to understand the nature of competing routes between OD pairs
- Checking representation of queues on surveyed journey time routes.

3.12.2. Any additional changes required to signal times, saturation flows, lane use, etc. to resolve the assignment calibration issues will be highlighted and reported accordingly.

3.13 ASSIGNMENT VALIDATION

3.13.1. In addition to the calibration/validation aspects described above, the final validation of the model will be confirmed through presentation of modelled and observed data for the following:

- Traffic flows on links – In addition to the screenline information flows will be presented on individual links for cars, LGV and HGV
- Journey times – Information will be presented along whole routes, with means and 95% confidence intervals, supplemented with time/distance graphs
- Turning movements – Information will be presented for key junctions, aggregated across all vehicle types.

3.14 VALIDATION CRITERIA AND ACCEPTABILITY GUIDELINES

3.14.1. The validation criteria and acceptability guidelines as specified in TAG M3.1 are shown in Table 3-1 below. The observed flow and screenline flow criteria are applied to "all vehicles" and "cars/LGVs".

Table 3-1: Acceptability Guidelines

Criteria and Measure		Acceptability Guideline	
Flow Difference Criteria			
1	Total Screenline flows (normally > 5 links) to be within +/- 5%	All (or nearly all) screenlines	
2	Observed (individual) link flow < 700 vph	Modelled flow within +/- 100 vph	> 85% of links
	Observed (individual) link flow 700 to 2700 vph	Modelled flow within +/- 15%	> 85% of links
	Observed (individual) link flow >2700 vph	Modelled flow within +/- 400 vph	> 85% of links
GEH Criteria			
3	GEH Statistic for individual link flows <5		> 85% of links
Journey Time Validation			
4	Modelled times along routes should be within 15% (or 1 minute, if higher)		> 85% of links

3.14.2. The GEH statistic will be used to compare the observed and assigned flow. The statistic uses the following formula to calculate a value for the difference between observed (survey data) (M_E) and modelled (M_G) (SATURN flow) traffic flow:

$$\text{GEH Statistic} = \sqrt{\frac{(M_E - M_G)^2}{0.5\,(M_E + M_G)}}$$

3.14.3. The GEH statistic takes account of the fact that when traffic flows are low the percentage difference between observed and modelled flow may be high but the significance of this difference is small and conversely, a small percentage difference on a large base might be important.

3.14.4. A GEH value greater than 10 indicates that closer attention is required, as the match between observed and modelled flows is poor, while a GEH less than 5 indicates a very good fit. The aim is to achieve at least 85% links and turns with a GEH less than 5 as specified in TAG Unit M3.1.

3.15 CONVERGENCE CRITERIA AND STANDARDS

3.15.1. To ensure a satisfactory model convergence, TAG M3.1 recommends the criteria shown in Table 3-2.

Table 3-2 Convergence

Criteria	Type	Acceptable values
Delta and %GAP	Proximity	Less than 0.1% or at least stable with convergence fully
Percentage of links with flow change (P) < 1% or Percentage of links with cost change (P2) < 1%	Stability	Four consecutive iterations greater than 98%

3.16 TRIP MATRIX CHANGES

3.16.1. TAG M3.1 recommends that the changes brought about by matrix estimation should be carefully monitored by the following means:

- Scatter plots of matrix zonal cell values, prior to and post matrix estimation, with regression statistics (slopes, intercepts and R2 values)
- Scatter plots of zonal trip ends, prior to and post matrix estimation, with regression statistics (slopes, intercepts and R2 values)
- Trip length distributions, prior to and post matrix estimation, with means and standard deviations
- Sector to sector level matrices, prior to and post matrix estimation, with absolute and percentage changes.

3.16.2. The changes brought about by matrix estimation should not be significant. The criteria by which the significance of the changes brought about by matrix estimation may be judged are given in Table 3-3.

Table 3-3: Significance of Matrix Estimation Changes

Criteria and Measure	Significance Criteria
Matrix zonal cell levels	Slope within 0.98<Slope<1.02, Intercept near zero, R^2 in excess of 0.95
Matrix zonal trip ends	Slope within 0.99<Slope<1.01, Intercept near zero, R^2 in excess of 0.98
Trip length distributions	Means within 5%, Standard deviations within 5%
Sector to sector level matrices	Differences within 5%

4

PUBLIC TRANSPORT MODEL

4 PUBLIC TRANSPORT MODEL

4.1 OVERVIEW

4.1.1. The latest, relevant guidance in DfT TAG Unit M3.2 Public Transport Assignment (January 2014) is to be followed, referenced throughout this report as: 'TAG Unit M3.2'. As discussed earlier the main purpose of the updated PT model will be as a prime source of journey generalised cost information to be input within VDM. The model is not intended to be used for testing any PT transport schemes or strategies in Norwich. Therefore, the scope of the PT model development is proportionate to the intended application of the model.

4.1.2. The PT model should achieve the validation acceptability guidelines specified in TAG Unit M3.2. As indicated in TAG Unit M3.2, the PT model validation includes:

- Validation of the trip matrices
- Network and service validation
- Assignment validation.

4.2 TRIP MATRIX VALIDATION

4.2.1. TAG Unit M3.2 states that "Wherever possible, a check should be made between the annual patronage derived from the model and annual patronage derived by the operator".

4.3 NETWORK AND SERVICE VALIDATION

4.3.1. The PT model bus network will be identical in structure to the validated highway network. The coding of bus services will be verified by checking the modelled flows of buses by route against available bus count data.

4.3.2. Modelled bus journey times will be compared against published timetables. TAG Unit M3.2 does not contain a specific target for the accuracy of modelled journey times. However, for the model validation, an acceptability target of +/-15% will be used, which is consistent with highway model journey time validation criteria.

4.3.3. The rail network will be checked using industry accepted network diagrams to ensure distances between stations are accurate. Rail service station to station run times will be explicitly included in the transit lines coding.

4.4 ASSIGNMENT VALIDATION CRITERIA

4.4.1. TAG Unit M3.2, paragraph 7.1.5 states that the validation of the assignment should involve comparing modelled and observed:

- Passenger flows across screenlines and cordons
- Passengers boarding and alighting in urban centres.

4.4.2. The criteria in TAG Unit M3.2 states that "across modelled screenlines, modelled flows should, in total, be within 15% of the observed values. On individual links in the network, modelled flows should be within 25% of the counts, except where the observed flows are particularly low (less than 150)". The GEH statistic, as defined in Section 2, should be used to give a measure of the fit of the model to counts less than 150. A GEH of less than 5 indicates a good fit of the modelled link flow to the observed count on low volume links, as specified in highway model validation criteria.

5

TRIP MATRIX DEVELOPMENT

5 TRIP MATRIX DEVELOPMENT

5.1 INTRODUCTION

5.1.1. The trip matrix for the model will be built up from a series of data sources, using Mobile Network Data as the primary source with other sources filling in or adjusting locations where the Mobile Network Data is not able to predict trip ends accurately.

5.1.2. Mobile network data is a rich data source, but one that is likely to have inherent problems due to the way the data is captured. Until the data is received from the mobile network provider and verified against other data sources it is difficult to specify the exact process that will be applied to turn the MND into a prior matrix. This matrix development chapter is therefore a discussion of the verification that needs to occur and the likely corrections that might be needed based off previous experience of working with mobile network data, and how the matrix will be calibrated for use in the model.

5.1.3. The DfT's TAG sets out that the matrix development chapter of a model specification report should discuss travel demand data, partial trip matrices from surveys, trip synthesis and merging data from the surveys. In the case of using MND the 'observed' data is much more complete than in a typical model build, and therefore the usage of synthetic data is more limited.

5.2 MOBILE NETWORK DATA

Mobile Network Data Providers

5.2.1. There are a range of mobile network data providers, each of which processes their data in a different way and provides an output that is different from one another. This introduces problems in trying to determine the exact methodology used to process the MND into a trip matrix at this stage of the project where it is not certain which provider is to be used.

Verification of Data

5.2.2. No matter which provider is used, the data provided will need to be compared against other datasets which are trusted to one extent or another. The verification process is necessary to see how the MND differs from datasets such as Census data, although only some elements of the data can be compared. For example, the Census data provides travel to work journeys, and these often need interpretation when compared to the subset of travel to work trips in the MND due to there being other trips mixed in to the MND such as education trips or other trips that look like travel to work to the mobile network data provider and therefore they are not able to be filtered out.

5.2.3. The verification will need to be completed prior to building a trip matrix, and adjustments to the methodology for building the trip matrix may need to be put in place to account for the problems found during the verification process.

5.2.4. One of the common issues with Mobile Network Data which will be confirmed during verification is shortfalls in short trips. The definition of a trip within the data is for a phone to change which mast it is using, and this is reliant on them moving out of range of one mast and into range of another. Masts often service different sizes of areas depending on where in the country they are and how urban an area is. The infill of these trips may therefore need to be dynamic depending on the area of the matrix that is being considered.

5.2.5. Table 5-1 sets out the common verification tests undertaken. These tests are often undertaken at different spatial and temporal levels depending on what data is available for the data source being compared against. Care needs to be taken when comparing some of these data sources as the years that they are valid for will be different e.g. Census data is a snapshot from 2011 while MND will be closer to the current year, and there will be inherent differences as a result of this. The purpose of the verification is not to ensure the data matches exactly, but just to verify the MND does not have major flaws that need correcting in some way.

Table 5-1: Common Verification Tests Summary

Verification Area	Data Sources	Objective
Baseline data comparison	▪ 2011 National Trip End Model (NTEM) 7.2 Home-Based Work (HBW) ▪ Census Journey To Work (JTW)	▪ Check how the baseline data sources compare against each other
Rail Trip Removal	▪ Mobile Network Data (MND) HBW Census JTW	▪ Check rail trips have been removed by the MND provider correctly
Trip Rates	▪ MND home and workplace locations Census populations	▪ Test trip rate plausibility against population values
Trip Ends	▪ MND home and work Census JTW NTEM	▪ Test spatial accuracy
Trip Purpose	▪ MND National Travel Survey (NTS) NTEM	▪ Investigate whether purposes are split correctly, or exactly what each purpose appears to contain if further splitting required
Symmetry	▪ MND	▪ Confirm balance of inbound versus outbound trips
Trip Distribution	▪ MND Census JTW	▪ Veracity of HBW distribution against Census
Trip Length Distribution	▪ MND NTS	▪ Veracity of trip length distribution
Daily Profile	▪ MND NTS	▪ Compare trip start time profile

Previous Experience – Corrections for Trip Ends

5.2.6. There are a few issues with the exact position of trip ends that have arisen during previous projects where MND has been used. These are due to the exact nature of the MND, where it records trips from their person-trip origin to person-trip destination, while often we want to use some portion of that trip for the model we are building. In the case of a highway model, we are looking at those trips using the highway network, and this means that only the portion of a trip where a person is using a car is relevant.

5.2.7. In the case of a rail trip we may therefore need to split out a section of the trip as the person drives to the station, or in the case of a park and ride trip we need to remove the section where the person is on a bus. These corrections are difficult to do accurately due to a lack of knowledge about the trip specifically.

5.2.8. For rail trips, the MND operator may be able to tell us that a trip used the rail network but not convey which station they used at each end of the trip. It's easy to identify where trips must not have originated at a station (as the origin is not located in the same area as the station) but correcting for this may require certain assumptions to be made as to which station is the most likely for the person to have used. On previous projects this has been carried out through use of a gravity model, taking in to account data for stations such as how much car parking is available and how frequent trains are at the station.

5.2.9. For city centre trips where users travel to workplaces but do not park at the workplace due to a lack of parking, a correction should be made to account for the difference in highway trip end and person trip end. These discrepancies have been noticed on previous projects but have been minor in the context of the model as a whole and not corrected for; for this model these discrepancies are likely to have a more significant effect on the operation as the scope of the model is more urban in nature. Further investigation of these effects will be carried out during the verification stage for the MND and corrections will be discussed at that stage depending on how much of an error it is determined there might be.

Trip Density and Network Detail

5.2.10. The mobile network data provides every trip in the area where data is required. The model network needs to provide enough detail within that area that problems do not arise due to lack of alternative routes.

5.2.11. For example, in a rural area there may be a number of small villages or hamlets connected by a reasonably disaggregate network of highways links, while in the model this is represented by a single zone with a single link travelling through that area connecting them to more major links. The MND will provide every trip within this area, and if the links that are modelled are modelled as if they are individual highway links of a standard of the single highway links in the real area, they may not cope with the volume of traffic the zone produces.

5.2.12. There needs to be enough capacity on feeder links to cope with the level of trips being produced especially in more rural areas of the model where there may be multiple real ways of travelling between places, but only one or two modelled routes.

5.3 EXAMPLE DEVELOPMENT PROCESS

5.3.1. As an example of the matrix development process, Figure 5-1 is an extract from the Suffolk County Transport Model Local Model Validation Report. The flow chart shows the major steps used to develop a prior matrix for matrix estimation. The matrix development process for this model is likely to follow a similar path at this high level, however the detail of each step (or even the data sources used for each step) may vary, depending on the exact nature of the data received from the mobile network data provider and how this data verifies against other data sources.

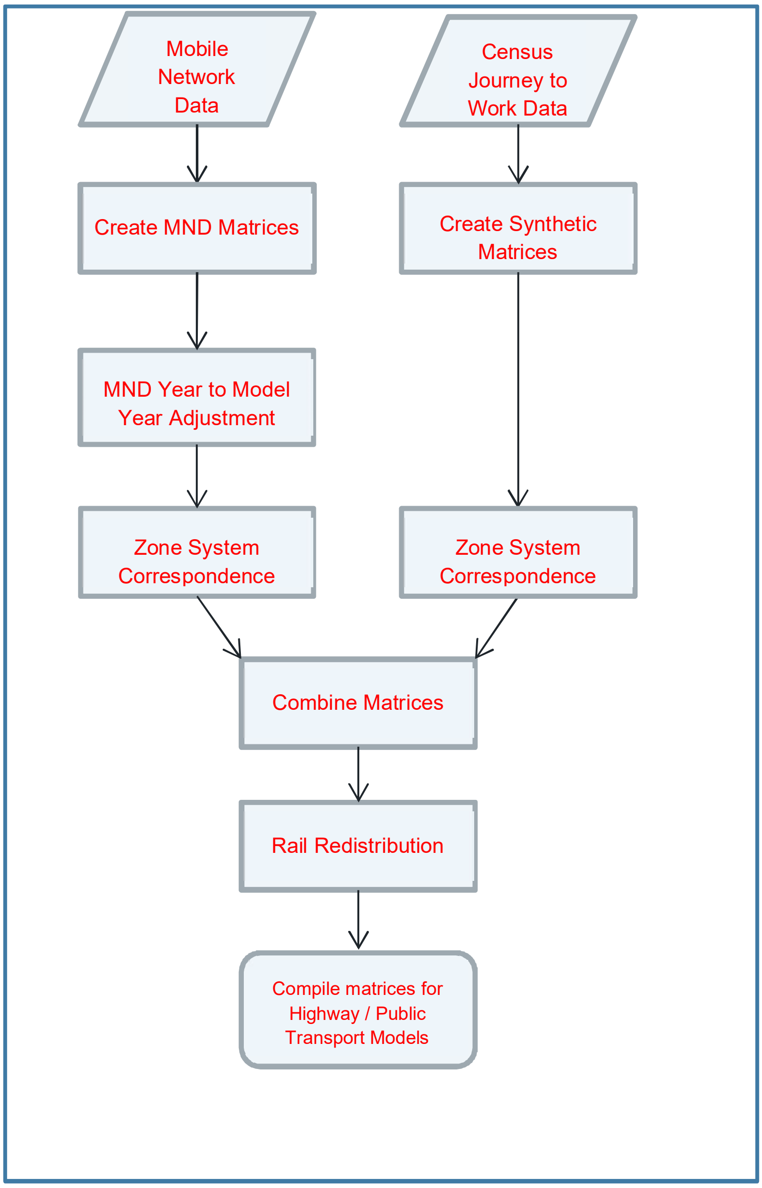

Figure 5-1: Example Matrix Development Outline

5.4 TRIP SYNTHESIS

5.4.1. The infill of data from the MND matrix where shortfalls in the verification are found will likely require some alternative data source to fill in. The creation of an alternative matrix from non-observed data sources is typically called a 'synthetic' matrix, utilising data such as the data that lies behind the National Trip End Model (CTripEnd). Further discussion of this will need to be carried out once the specifics of the MND are determined as the synthetic matrix will need to be tailored to what it is required for.

5.5 MERGING MOBILE NETWORK DATA AND TRIP SYNTHESIS

5.5.1. The exact merging mechanism will need to be discussed as part of the verification of the MND as the level of verification shown may affect how the process needs to be carried out.

5.5.2. It is likely that there will be a shortfall in short trips, and therefore, at a minimum, the synthetic matrix will need to infill this part of the matrix. The mechanism proposed to apply the synthetic matrix is to replace those trips shorter than a certain length from the MND generated matrix with those trips in the synthetic matrix. Trip length distributions will need to be compared in both cases to verify that this process is appropriate.

5.5.3. It may be necessary to vary the trip length that is replaced depending on the nature of the zone. On previous projects this has been replaced based on urban or rural zoning, where urban to urban trips have a shorter cut-off for replacement than rural to rural trips, due to the MND better replicating short trips in urban areas due to higher mobile mast density.

5.6 TRIP MATRIX ESTIMATION

5.6.1. It is likely that matrix estimation will be required to adjust the matrix so that it matches the observed data more closely. Matrix estimation is the process of taking a matrix (the 'prior' matrix) and adjusting it using routing data and survey data in an iterative process to generate a new matrix that better matches the count data.

5.6.2. The matrix estimation process should be used to inform the matrix build, and should not be used in isolation as a process to 'fix' the output from the prior matrix. Investigating the changes that matrix estimation is doing to the prior matrix and fixing the problems that this identifies will result in a better matrix overall. One of the key elements to get right in the estimation process is to check that the data sources used for survey data are consistent, as inconsistency will result in the matrix estimation being unable to come up with a solution and therefore the process will corrupt the matrix in one way or another when trying to solve what it's been given.

5.6.3. The matrix estimation process is also reliant on the routing information being correct, which in turn is reliant on the model network being as accurate as possible. If the model network is not accurate or has clear discrepancies with the real network, it is unlikely matrix estimation will change the matrix in the right ways.

5.6.4. Due to the issues with finding consistency in the surveyed data, and making sure the routing is correct based on the model network, the matrix estimation process should be restarted from the start often, and the changes that are made to the matrix should be closely monitored to ensure the estimation process is not substantially warping the matrix without good reason. The estimation process will be reviewed against the criteria set out in Table 5 of TAG Unit M-3.

5.7 TRIP MATRIX CALIBRATION / VALIDATION

5.7.1. Calibration of the matrix will be carried out to observed count data, with this data used in the matrix estimation process. Some count data will be reserved to validate the model operation as independent checks.

6

DEMAND MODEL

6 DEMAND MODEL

6.1 INTRODUCTION

6.1.1. The principles of demand modelling are all set out in DfT TAG Unit M2 (March 2017). This chapter does not attempt to replicate the information contained in this TAG unit but aims to represent the approach to developing a NATS demand model.

6.1.2. Chapter 2 of TAG Unit M2 (March 2017) elaborates the steps required to specify the scope of a variable demand model. The guidance encourages adopting a hierarchical model structure, with the least sensitive responses placed first in the hierarchy, and the most sensitive placed last.

6.1.3. Chapter 4 of TAG Unit M2 (March 2017) gives specific guidance on four of the variable demand mechanisms:

- Trip frequency
- Mode choice
- Trip distribution
- Time of day choice.

6.1.4. The guidance notes that the decision to include any of the above responses in a demand model depends on:

- The availability of data
- Circumstances and policy interests of the assessment
- The amount of effort justified for a particular application.

6.1.5. The input files from the SATURN highway supply models will include:

- Assigned validated base year highway networks (to pivot off the base)
- Assigned DM highway networks (if running the DS and pivoting off the DM)
- Forecast year reference highway trip matrices
- Forecast year/scenario (e.g. 2025 Do-Minimum) network data files.

6.1.6. To maintain consistency with the existing structure of the model, the DfT DIADEM (Dynamic Integrated Assignment and Demand Modelling) software will be used as it provides simple hierarchical structure of trip frequency, mode choice, distribution, time of day choice and a direct interface with the SATURN assignment.

6.2 DEVELOPMENT OF THE VARIABLE DEMAND MODEL

6.2.1. There are two methods of presenting demand for travel within a transport model:

- Production/Attraction (P/A) form considering 'tours' (any round trip, starting and finishing at home, potentially containing stops at several different destinations)
- Origin/Destination (O/D) form considering individual trips between start and end points, not necessarily related to each other.

6.2.2. TAG Unit M2, Variable Demand Modelling, recommends the use of P/A where possible. The three main options to address this issue are as follows:

- Create P/A Matrices from Survey Data.

6.2.3. A 'first principles' approach of returning to the original data to derive P/A form matrices is the first option.

6.2.4. The data required for this approach was only collected for a relatively small sample of trips in the study area (those observed by the roadside interviews and car park surveys) with responses only providing a guide to the return period. This data was not considered to be sufficiently reliable to allow P/A matrix construction for this study.

- Create P/A Matrices from O/D Peak Matrices.

6.2.5. By employing synthetic trips and matrix estimation, the O/D matrix build process outlined above has broken the link between outbound and return trip legs, making direct conversion to P/A impractical.

6.2.6. The process could be attempted, but the derived P/A matrices are likely to return O/D peak matrices which are essentially the same as the original inputs; too many of the parameters would need to be inferred from the O/D peak matrices to constitute an independent process.

- Retain O/D Matrix Format.

6.2.7. The demand matrices already exist in this form and are sufficient for running VDM with DIADEM.

6.2.8. The appropriate method will be discussed later and presented to NCC for comment.

Time Periods

6.2.9. The following time periods will be modelled, consistent with advice presented in section 5 of TAG Unit M3.1:

- AM peak hour (08:00-09:00) (AM)
- Average interpeak hour (10:00-16:00) (IP)
- PM peak hour (17:00-18:00) (PM)
- Average off-peak hour (19:00-07:00) (OP).

6.2.10. TAG Unit M2 (March 2017) advises that the demand model should operate at a 24-hour level in production-attraction format, so it is therefore necessary to represent costs in the off-peak period. However, validated base assignment models of the off-peak period have not been built.

6.2.11. Instead, the off-peak model will be developed by running the Inter Peak model with a reduced demand. The level of reduction can be determined by analysing the traffic survey data used to calibrate and validate the NATS base year transport model.

6.2.12. This off-peak model will only be created for the purpose of running the variable demand model, and will therefore not be used in further economic analysis.

Demand Segmentation

6.2.13. Traffic demand is split into various demand segments in order to generate the correct responses in the demand model.

- Home-based work (HBW)
- Home-based employer's business (HBEB)
- Non-home-based employer's business (NHBEB)
- Home-based other (HBO)
- Non-home-based other (NHBO).

6.2.14. LGV and HGV are not included in the demand model, as growth in these vehicles is driven by factors other than those affecting the generalised cost of travel.

6.2.15. The user class structure will also incorporate user classes from the PT model. The structure will be set up to include car availability to allow for mode shift.

Model Form

6.2.16. In keeping with guidance in TAG Unit M2 (March 2017), the preferred demand model form is a nested hierarchical logit model. The model uses an incremental formulation, in which each stage of the model is forecast based on the relative cost changes compared to the validated base model. The standard functional form is:

$$P_p = \frac{exp(\theta \Delta U_p)}{\sum_q exp(\theta \Delta U_q)}$$

Where:

- Pp is the proportion of travellers choosing alternative p from the set of possibilities q
- Up is the disutility of option p
- ΔUp is the change in disutility of option p
- Θ is a scaling, or sensitivity, parameter, which changes depending on the stage of the model.

6.2.17. Disutility is represented by a form of generalised cost, and the treatment of these is discussed in section 6.2.25.

6.2.18. Doubly constrained models are used for commuting. This reflects the relative confidence in the measures of attraction (employment) for commuting trips, as well as the relatively fixed nature of these attraction values in the short term. Other purposes such as employer's business and others are production-end constrained. For these purposes, the trip end factors reflect the attraction of destinations, not the actual numbers of trips attracted and ideally the availability of intervening similar destinations between the origin zone and the zone in question.

6.2.19. Journey purposes with a home-based trip end are assumed to form a simple 'tour' comprising on the outbound leg and a return leg, therefore all those segments are modelled in PA matrix format according to the WebTAG criteria. Non-home-based demand segments are still in OD format without any conversion.

Generalised Cost

6.2.20. Generalised cost is a measure of the factors that affect each individual's decisions on transport choices. It is measured in generalised minutes and its definitions for car and public transport users are set out in section 6.2.25

6.2.21. People's travel choices depend on both the monetary and time costs of the alternatives available to them. In the NATS demand model, the generalised costs associated with each mode are all formulated as recommended in section 3 of TAG Unit M2 (Variable Demand Modelling, March 2017).

6.2.22. The generalised costs of travel in the demand model are expressed in units of time (in minutes) and include both the times and monetary costs associated with each trip.

6.2.23. The generalised costs have been derived using variables relating to the trips under consideration and others relating to the choice-making individuals.

6.2.24. The generalised costs will be extracted from the highway assignment model all highway trips with the public transport generalised being extracted from the PT VISUM model.

Car Generalised Cost Formulation

6.2.25. The car generalised costs for a specific OD pair, time of day and demand stratum are calculated in the demand model as follows:

$$G_{car} = t_{ride} + \frac{d * VOC}{occ * VOT}$$

Where:

- G_{car} is the car generalised cost (in min)
- t_{ride} is the journey time spent in the car (in min)
- d is the journey distance travelled in the car (in km)
- VOC is the vehicle operating cost per km for the trip purpose (in p/km)
- occ is the number of people in the car (who are assumed to share the cost)
- VOT is the value of time for the demand stratum (in p/min).

6.2.26. The t_{ride} and d values are exported as skim matrices from the calibrated base year highway assignment model for each time period and each assigned demand segment.

Cost Damping

6.2.27. In most models, using generalised costs directly in mode split and distribution results in the model's elastic response to car fuel price changes being dominated by very long trips in a way that does not seem to accord with actual experience. According to Section 3.3 of TAG Unit M2 (Variable Demand Modelling, March 2017), there is also evidence that the impact of changes in generalised costs on demand responses reduces with increasing trip length. It is therefore common practice to apply some form of cost damping to long trips in order to reduce the elasticity of response and get satisfactory realism test results.

6.2.28. The NATS demand model applies the damping function below to car generalised costs:

$$G' = \left(\frac{d}{k}\right)^{-\propto} \cdot (t + \frac{c}{VOT})$$

6.2.29. Where:

- G' is the damped generalised cost
- $t + \frac{c}{VOT}$ is the generalised cost
- t, c are the trip time and monetary cost
- VOT is the value of time
- d is the trip length
- $\propto$ is the adjusting parameter of cost dumping formula
- k is the average trip distance according to the national averages.

6.2.30. Cost Damping Parameters are the same across all time periods and modes but they vary by purpose and these are provided in Table 6-1.

Table 6-1: Cost Dampening Parameters

Parameter	Home Based Work	Home Based Employer's Business	Non-Home Based Employer's Business	Home Based Other	Non-Home Based Other
α	0.50	0.50	0.50	0.50	0.50
κ	30	30	30	30	30

6.2.31. Cost dampening scaling parameter is the same for all purposes.

6.3 REALISM TESTING

6.3.1. Realism testing will be undertaken in accordance with TAG Unit M2 to demonstrate that the model has suitable fuel cost and journey time elasticity, in line with elasticity ranges given in WebTAG. Where a model has an elasticity value that is outside of the ideal range, adjustments will be made to the model sensitivity parameters or by introducing and adjusting parameters associated with cost damping.

7

FORECASTING

7 FORECASTING

7.1 OVERVIEW OF DEMAND FORECASTING PROCEDURE

7.1.1. The demand forecasting procedure involves interrogation of local planning documents to identify developments to be point loaded to specific zones within the model. Once all developments have been identified and point loaded, the forecast growth achieved is compared to TEMPro version 7.2 projections at the district level. The overall level of growth for each Tempro district will be constrained to Tempro using an adjustment factor.

7.1.2. “Fixed Demand” refers to future trip demand related to changes in demography, land use and changes in car ownership and trip rates. It assumes trip costs at base year levels, and it does not allow for changes in travel times; perceived value of time; the cost of fuel and other car operating costs. Figure 7-1 shows an overview of the process that will be used to develop the forecast demand.

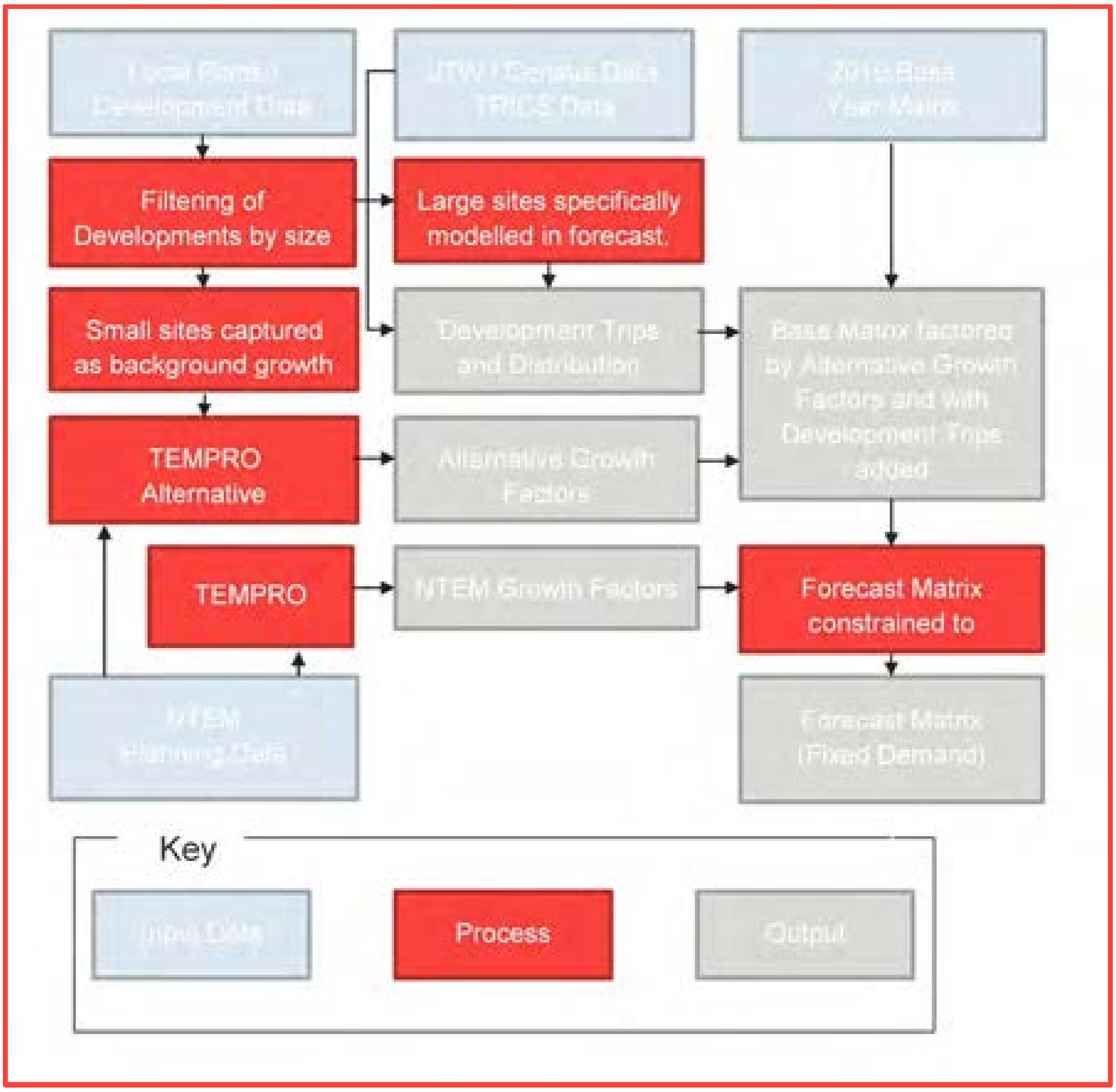

Figure 7-1: Fixed Trip Matrix Development Methodology

7.1.3. Fixed demand matrices will then be input into VDM to produce the final forecast matrices.

7.2 CORE SCENARIO

7.2.1. The core scenario forms the most suitable basis for decision making given current evidence. It is to be based on more certain, unbiased assumptions and that are the most consistent. The core scenario is to include:

- NTEM growth in demand, at a suitable spatial area
- Sources of local uncertainty that are more likely to occur than not
- Appropriate modelling assumptions.

7.2.2. The amount of development to be specifically modelled will be detailed in the uncertainty log that will be obtained from and agreed with NCC. The developments to be included in the core scenario will have a certainty of more than likely (MTL) and near certain (NC).

7.3 ALTERNATE GROWTH ASSUMPTIONS

7.3.1. The further into the future modelling scenarios are, the less certainty there is over the accuracy over the projections and assumptions used in the process. Therefore, it is best to test the uncertainty by modelling low and high growth assumptions in addition to the core scenario. This provides an assessment of the impact the uncertainty has upon future year forecasting and appraisals.

7.3.2. The low and high growth scenarios are to be based upon guidance set out by WebTAG. The method essentially uses a parameter that reflects the uncertainty surrounding the National Transport Model (NTM). It is used to calculate the level of base year demand that is added or subtracted from the core scenario forecast.

7.3.3. Further alternative growth scenarios will also be developed that reflect the different assumptions on the uncertainty log. A pessimistic scenario assumes all development listed in the uncertainty log are to be built and an optimistic growth scenario that assumes the minimum amount of development is to be built. This essentially provides a best and worst-case scenario in terms of trip generation within Norwich.

7.4 FORECAST MODEL DEVELOPMENT

7.4.1. It is proposed that forecast models are developed for the following years:

- 2019: Base Year
- 2025: Opening year
- 2040: Design year
- 2050: Horizon year.

7.4.2. Forecast year networks will be prepared which will include committed highway schemes for the forecast years of 2025, 2040 and 2050. These will only include schemes classified as 'near certain' or 'more than likely' as outlined in WebTAG Unit M4 *'Forecasting and Uncertainty'* (July 2017).

7.4.3. High and low growth sensitivity tests will be carried out for the forecast years of 2025, 2040 and 2050 in accordance with the specifications set out in Table 7-1.

Table 7-1: Summary of High and Low Growth Scenarios

Scenario	Supply	Demand
Core Scenario	Near Certain and More Than Likely Schemes	Near Certain and More Than Likely Developments
High growth Scenario	Near Certain and More Than Likely Schemes	Near Certain and More Than Likely Developments
Low Growth Scenario	Near Certain and More Than Likely Schemes	Near Certain and More Than Likely Developments

7.4.4. The high and low growth sensitivity tests will be developed based upon the guidance for the high and low growth scenarios set out in WebTAG 4.1, whereby forecast scenarios are subject to an increase or reduction of +/-2.5% of the base year demand multiplied by the square root of the number of years from the model base year (to a maximum of +/-15% for 36 years).

7.4.5. A summary of each of the proposed forecast scenarios is provided in Table 7-2.

Table 7-2: Forecast Year Scenarios

	Forecast Year		
	2025	2040	2050
Purpose	Scheme opening Year	Scheme design Year	Horizon Year
Matrix development	Point loaded development for sites categorised as *'near certain'* or *'more than likely'* and anticipated to be completed by 2025; constrained to TEMPro	Point loaded development for sites categorised as *'near certain'* or *'more than likely'* and anticipated to be completed by 2040; constrained to TEMPro	Point loaded development as per 2040 matrices, TEMPro growth for 2040-2050; constrained to TEMPro
Network development	Only schemes committed up to 2025	Only schemes committed up to 2040	Only schemes committed up to 2050
High and low growth scenarios?	Yes	Yes	Yes

8

SUMMARY

8 SUMMARY

8.1 SUMMARY OF MODEL DEVELOPMENT

8.1.1. This report describes the proposed development, calibration and validation of the NATS to a 2019 base year. It describes how the base year models will be calibrated to represent current travel conditions and validated against recent observed data.

8.1.2. New trip matrices will be built based on a number of new data sources and existing data.

8.2 SUMMARY OF STANDARDS

8.2.1. The new model will comply with the recognised standards as set out in WebTAG, specifically:

- Highway Assignment Model: TAG Unit M3.1 Highway Assignment (January 2014)
- Public Transport Model: DfT TAG Unit M3.2 Public Transport Assignment (January 2014)
- Demand Model: DfT TAG Unit M2 Variable Demand Modelling (March 2017).

8.3 MODEL REPORTING AND OUTPUTS

8.3.1. A final data report will be required to document all data used in the model update.

8.3.2. For the highway and public transport model a Local Model Validation Reports (LMVR) will be produced containing the following information:

- Data sources
- Network development
- Matrix development
- Model calibration and validation.

8.3.3. This will include reporting of model validation against the required standards. Model outputs for the PTAM will include assignment summary statistics for each transit line and network totals.

8.3.4. For the Demand Model, a Development Report will be produced describing:

- The Demand Model structure
- Model parameters and factors
- Model calibration – realism tests and convergence.

Appendix G

PROPOSED STRUCTURE OF THE ENVIRONMENTAL STATEMENT

List the structure of Environmental Statement or EIA Report e.g. below. Add in chapters and volumes in line with what you have scoped into your EIA.

Volume 1 – Main Report

<u>Front End</u>

- Chapter 1: Introduction
- Chapter 2: The Project
- Chapter 3: Approach to EIA
- Chapter 4: Environmental elements scoped out

<u>Technical Chapters</u>

- Chapter 5: Air Quality
- Chapter 6: Noise and Vibration
- Chapter 7: Cultural Heritage
- Chapter 8: Landscape and Visual Effects (including Arboriculture)
- Chapter 9: Biodiversity
- Chapter 10: Road Drainage and the Water Environment and Groundwater
- Chapter 11: Geology and Soils
- Chapter 12: Material Assets and Waste
- Chapter 13: Climate
- Chapter 14: Population and Human Health
- Chapter 15: Arboriculture
- Chapter 16: Major Accidents and Disasters
- Chapter 17: Traffic and Transport
- Chapter 18: Cumulative Effects

<u>Concluding Chapters</u>

- Chapter 19: Summary

Volume 2 – Technical Appendices (non-exhaustive list included below)

- Flood Risk Assessment
- Draft Construction Environmental Management Plan (CEMP)
- Ground investigation reports
- Ecological survey reports

Volume 3 – Figures

Non-Technical Summary

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