Sheffield & Rotherham Clean Air Plan
Full Business Case
Local Plan Transport Modelling Tracking Table (T1)

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V1_FBC1	Draft for FBC
FBC Final	Final formatted version for FBC submission

Contents

Section 1 Transport Model Specification : Model Selection

Ref	Requirement	LA Proposal Description	JAQU Review Comments
1	**Transport model specification: Model Selection**		
1.1	Present year validation if the model is more than 5 years old (e.g. ANPR, journey times etc).	The **SRTM3B model has been used to test the options relating to the Sheffield and Rotherham CAZ scheme up to the Outline Business Case (OBC) stage**. The SRTM3 originally had a calibrated Base Year of 2008, with the underlying travel patterns based on 2005/06 data. SYSTRA used this to create a 2017 Base Year SRMT3B model using the best-available trip production (e.g. demographic) and trip attraction (e.g. employment) assumptions and have undertaken local 'verification' checks against available traffic count data and speed data in the vicinity of the key AQ hotspots. **This version of the model is used in this study and is called SCRTM1**. Between OBC and Full Business Case (FBC) stages the new Sheffield City Region Transport Model (SCRTM1) became available, so the modelling for FBC was undertaken using this version. It was envisaged that SRTM3B would be retained for the FBC, but due to the delay between OBC and FBC the new model was utilised. This was our preferred modelling option along offering the 'best value' and most pragmatic approach in minimising any additional costs whilst ensuring the required timescales are met and the most up to date modelling platform was used at all stages. In order to mitigate the risk about a potential mismatch between the two models A series of sensitivity tests were undertaken when SCRTM1 became available to ensure that similar results and conclusions were obtained from that model. Which they were. That was done directly after	

		that model became available the final version of the Preferred Option modelling described in **T3 and T4** has moved on from that position.	
1.2	The coverage of the transport model should be robust enough to capture if any route choice will be impacted due to the proposed measures.	The multi-modal SCRTM1 includes detailed highway and PT models which cover all of Sheffield and Rotherham area in sufficient detail to predict the impact of different policy measures designed to reduce traffic emissions. The benefit over the SRTM3B model used at OBC stage is that it also includes a detailed representation of the neighbouring authorities so the flows around the boundary of the two key authorities are considered much more robust. As with SRTM3B, the SCRTM1 Saturn-based highway traffic model covers all of the key routes past all of the current air quality problem locations in Sheffield and Rotherham – see the maps in Supporting Document **T1-SD01** for details of the transport model coverage and the Base Year (2016) air quality problem locations.	
1.3	Validation should be based on comparison between observed (i.e. from ANPR data) and modelled vehicle composition, flows (on links and across screenlines/cordons), traffic pattern and journey time within the study area (WebTAG Unit M3.1 [1]).	The Study team has access to a comprehensive database of ANPR data collected at a large number of ANPR sites across Sheffield and Rotherham (in both 2017 and 2019). This ANPR data has been used to provide a detailed break-down of the modelled traffic into relevant vehicle emissions categories (vehicle type, fuel, Euro category etc.), including any significant variation in this fleet profile compared to the national picture. With respect to SCRTM1, the underlying traffic patterns will be as modelled in the current version – i.e. we have not used the ANPR data to change the underlying base-year trip patterns in the model. Link-based 'current-year' (2016) traffic flows predicted by the model have been reviewed, to identify any weaknesses which may significantly affect the relevant emissions estimates at one or more of the main air quality hot-spots. Some matrix adjustments have been undertaken on key movements to obtain a better fit between the modelled data and the observed data. Annualisation factors have also been developed such that Annual flows are replicated at sub-aggregate levels of geography within the study area. The predicted Base	

[1] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/427124/webtag-tag-unit-m3-1-highway-assignment-modelling.pdf

		Year speeds in the city centre and on other key links across the model have been compared with available ANPR data of actual current speed estimates on these links. These comparisons have been found to be reasonable but in a few locations the model is faster than the observed speeds which has the potential to underestimate emissions in urban driving conditions. In addition analysis of where count sites for calibration or validation were available at observed non-compliant locations is shown in T2 section 3.4. This shows at those locations where data is available, the level of validation is very high.	
1.4	For light and heavy goods vehicles, validation will need to be reported for short screenlines using grouped counts to ensure a larger sample size.	The freight matrices in SCRTM1 were calibrated at the same time as the rest of the model and are described in **T2 Transport Model Validation Report** and also in supporting document **T1-SD02.** In addition the full set of counts used in the calibration and validation screenlines are tabulated in excel in **T1 SD04.** For heavy goods vehicles the assignment model matrices are split between rigid and articulated, this represents a departure from the previous OBC methodology where the splits based on ANPR counts and applied post assignment. The SCRTM1 model calibrates very well against LGV and HGV flows (see section 3,3.6 in T2) but for HGV tends to be slightly on the low side, whereas the SRTM3B model used at OBC tended to be slightly high.	
1.5	The assignment convergence meets WebTAG convergence criteria (WebTAG Unit M3.1, section 3.3, Convergence Measures and Acceptable Values).	The assignment convergence of SCRTM1 meets WebTAG convergence criteria.	

1.6	Vehicle disaggregation: the transport model must split modes (e.g. HGV, LGV) to provide capability to distinguish the impact of measures that are targeting different vehicle types, such as freight logistic or different classes or charging Clean Air Zones.	SCRTM1 contains all the key user classes required to model each type of CAZ within the assignment models, with the exception of Black Cab and Private Hire Vehicles (PHV). These have been separated from car link flows – post assignment – using representative factors derived from the ANPR data for different localities. Furthermore, the 2017 and 2019 ANPR data (and that commissioned by Rotherham MBC for the A630 Parkway) has also been used to inform the split of modelled flows into the relevant Euro vehicle emission categories.	
1.7	If modelling does not fully meet above requirements in the key study area, please provide mitigation measures/implications.	The main mitigation approaches are summarised above. No further key weaknesses have been identified through the modelling process.	

Section 2 Overall Model Assessment

2	**Overall model assessment**		
2.1	Base model fit.	The 2016 SCRTM1 model base year calibration and validation is described in the **T2 Transport Model Validation Report** and also in supporting document **T1-SD02.**	
2.2	Model calibration/ validation.	The 2016 SCRTM1 model base year calibration and validation is described in the **T2 Transport Model Validation Report** and also in supporting document **T1-SD02** Specifically each of the following demonstrates a good level of validation: • Overall and car validation (T2 section 3.3); • LGV / HGV Calibration (T2 section 3.3.7); • Screenline calibration (T2 section 3.3.8 - 3.39); and • Calibration at AQ hotspots (T2 section 3.4).	

		Individual count location calibration by vehicle type is presented in **T1 SD04.**	
2.3	Present year validation (if relevant).	The 2016 SCRTM1 model base year calibration and validation is described in the **T2 Transport Model Validation Report**. This represents the current base year for the transport modelling work.	
Section 3 Transport Model Methodology			
3	**Transport Model Methodology**		
3.1	Baseline forecast (demand growth assumption as per WebTAG guidance) including the review of committed schemes and local development plan.	The SCRTM1 model forecasting process including the review of committed schemes are detailed in reports **T2 Transport Model Validation Report** and **T3 Transport Modelling Methodology Report**. These documents give a detailed description of the methodology used in forecasting along with which development sites and committed schemes have been included in the modelling. More detail is provided on this in the SCRTM1 Forecasting report which is included a supporting document (T3-SD02) to T3. .	
3.2	An uncertainty log providing a clear description of the planning status of local developments.	SYSTRA and AECOM created an uncertainty log as part of the development work for SCRTM1 with clear descriptions of the local developments included in the forecasting. This uncertainty log is summarised in the **T3 Transport Modelling Methodology Report** (see section 2.6 which includes maps of the main development sites). More detail is provided on this in the SCRTM1 Forecasting report which is included a supporting document (T3-SD02) to T3.	
3.3	Description of the future year transport supply assumptions (i.e. planned road networks examined for the baseline, core	The schemes included in the forecast year Baseline situation are described in report **T3 Transport Modelling Methodology Report**. The forecast year Preferred Option is described in the **T4 Transport Model Forecasting report** (which also contains a summary of the Baseline coding).	

	scenario and variant scenarios).	The approach used to predict traffic, emissions and air quality in different future years (using interpolation between available modelled years) is summarised in the **T4 Transport Modelling Forecasting report** and in Supporting Document **T1-SD03**.	
3.4	Description of the travel cost assumptions as per WebTAG guidance (e.g. fuel costs, PT fares, parking).	The approach to forecasting within the SCRTM1 model is summarised in the model LMVR, in Supporting Document **T1-SD02**and in report **T4 Transport Model Forecasting report**. In particular the forecast Pence Per Minute (PPM) and Pence Per Kilometre (PPK) factors along with the PT parameters included in the model for forecasting are taken directly from TAG Databook v28.	
3.5	Description on how the options are modelled in transport models (e.g. timeframes, eligibility etc).	Four CAZ options for Sheffield and Rotherham were modelled at OBC stage and were described in the Transport technical documents submitted as part of the OBC submission. For the FBC the focus has been solely on the **Preferred Option.** In order to model the options at OBC and the Preferred Option at FBC stage, the transport model matrices have been segmented in to compliant and non-compliant vehicle types. Local Behavioural Research has been undertaken with key groups of vehicle owners to better inform levels of responses to a charge and these values have been used in the modelling work for the **Full Business Case (FBC)**. Furthermore, the Variable Demand Model (VDM) within SCRTM1 has been used where it is expected there will be a significant impact on car mode and destination choice responses.	
3.6	Description of forecasted vehicle composition assumptions, if deviating from EFT assumptions.	The EFT-based changes over time have been applied to the locally observed base year fleet profiles for non-car modes (maintaining the current age profiles in the Baseline scenario). This base year fleet has been developed from a full year local ANPR data set (Dec 16 to Nov 17). The relevant Baseline forecast and Do Something fleet assumptions have been described in **T4 Transport Model Forecasting Report**.	

		For car based modes a local fleet forecasting spreadsheet model has been developed which aims to better represent the local market, in particular the trends in petrol and diesel sales which are key source of uncertainty in EFT (pre-v10), this forecasting is also descried in **T3 Transport Modelling Methodology Report** (see section 4). More details on the local fleet spreadsheet model are contained in a Supporting Document to T3 (T3-SD03).	
3.7	What and how to interpret and implement behavioural responses to all measures replacing vehicle for compliance, avoiding zone, cancelling journeys, mode shift and other	Use of both local Behavioural Research and JAQU guidance on likely vehicle replacement responses has used in the development of the core options that were considered at OBC stage. For the **Preferred Option** the locally derived values have been used. These are described in the **T4 Transport Model Forecasting Report** in more detail (see section 3.8). In particular please refer to the Supporting document to T4-SD01 which describes this in more detail.	
3.8	Outline of methodology for user behaviour research, if undertaken.	The aim of this research was to help quantify the likely responses of Sheffield and Rotherham vehicle owners to the types of policy measure being considered by the feasibility study and to attribute perceived costs to these responses. This involved focus groups and a Stated Preference survey with the relevant vehicle owners. More detail on this research is contained in the **T4 Transport Model Forecasting Report.**	
3.9	Describe how the transport modelling implications are fed into the air quality modelling (e.g. speed, congestion etc.).	The Saturn-based traffic component of the SCRTM1 model is used to predict future traffic flows and speeds. SYSTRA's ENEVAL[2] software uses these flows and speeds and relevant future fleet assumptions (Baseline and Preferred Option) to estimate the	

[2] This is compliant with v8.0.1b of DEFRA's Emissions Factor Toolkit

		corresponding link based NOx emissions, which will be allocated to a geo-rectified mapping layer for input to the Air Quality modelling suite. These emissions are passed to Sheffield and Rotherham's Air Quality modellers, who will incorporate them (as 'line sources') into their Airviro-based dispersal model.	
Section 4 Overall Forecasting Methodology Assessment			
4	**Overall forecasting methodology assessment**		
4.1	Forecasting assumptions.	The forecasting assumptions made have been documented in the **T3 Transport Modelling Methodology Report.**	
4.2	Policy options and the implementation in the model.	SYSTRA developed the relevant forecasting assumptions during the OBC modelling work These assumptions are detailed for the forecast scenarios in the **T4 Transport Model Forecasting Report**.	
4.3	Modelling vehicles behaviour change that are affected by measures.	SYSTRA developed the relevant forecasting assumptions during the OBC modelling stage. These assumptions included how modelling would be undertaken in Tasks S1 ('Identify long list of policy options') and O1 ('Appraise the Short-list of Policy Options'). This methodology is included in the SCRTM1 Preferred Option and is described in the **T4 Transport Model Forecasting Report.** This takes account of relevant JAQU guidance (particularly on the modelling of the decision to upgrade vehicles from non-compliant to compliant).	
Section 5 Final Transport Forecasting Modelling			
5	**Final Transport Forecasting Modelling**		
5.1	The detailed vehicle fleet composition for each policy scenario and the baseline	A description of the Baseline fleet forecasts is contained in **T3 Transport Modelling Methodology** (see section 4). In the Base Year these have been developed from local full year ANPR data in Sheffield and	

	(broken down by vehicle type and Euro standard) so that changes to the fleet are clear.	Rotherham (to create the 2017 base). The forecasting is based on the 2019 ANPR data and the corresponding assumptions within the DEFRA Emission Factor Toolkit plus the car-based changes from the SYSTRA developed spreadsheet fleet model (T3-SD03). This is then implemented in the modelling using SYSTRA's ENEVAL software (T3-SD01). In the **Preferred Option**, the fleet changes are covered in the **T4 Transport Model Forecasting Report** (section 6.5) this takes account of JAQU Guidance and local behavioural research, and includes a discussion around how the elements of the scheme will affect the relevant fleets. In addition the • Changes in compliant and non-compliant vehicle kilometres outside the CAZ are reported in T4 section 7; and • Details on changes in forecast Euro Standards and the assumptions around that are reported in T4 section 6.5.	
5.2	Details of modelling methodology.	**SCRTM1 is being used for all modelling within the FBC**. More detail on this is included in response 1.1	
5.3	Forecast assumptions: demand growth, network changes and transport costs growth.	The forecast assumptions are detailed in the **T3 Transport Modelling Methodology Report.**	
5.4	Baseline forecast.	The Baseline forecasts are described in the **T4 Transport Model Forecasting Report**. The schemes and the developments included in this scenario are detailed in **T3 Transport Modelling Methodology Report**.	
5.5	Scenario testing (policy options).	The scenario testing was initially undertaken for the OBC using SRTM3B. At that point 4 options were considered. Since then only the **Preferred Option** has been taken forward and modelling work has progressed on that basis towards the **Full Business Case (FBC)**. Details and results	

		from that modelling are contained in the **T4 Local Plan Transport Model Forecasting Report.**	
5.6	What and how to implement transport modelling forecast to air quality modelling.	Details of the interface between the transport model and the air quality model are included in the **AQ2 Air Quality Methodology Report**. Use of ENEVAL tool provides an automated and detailed method of transferring the data from model to AQ models. In terms of the use of ENEVAL in interpolation, as used to obtain the 2022 modelled year a discussion around this has been included in T3 section 3.5.3	
5.7	Impact analysis and key findings.	The modelling work undertaken for the **Full Business Case (FBC)** is described in the **T4 Local Plan Transport Model Forecasting Report**. This report also contains the impact analysis and key findings from both the Baseline and the Preferred Option tests. This includes: • Summary of behavioural response to the CAZ charge by vehicle type and to/from CAZ and through trips; • Change in vehicles kilometres by vehicle and compliance type; • Discussion around the impacts of non-charging measures; and • Discussion around rerouting of non-compliant vehicles.	
Section 6 Overall Forecasting Assessment			
6	**Overall forecasting assessment**		
6.1	Forecast assumptions.	The forecasting assumptions are detailed in the **T4 Local Plan Transport Model Forecasting Report** which is submitted as part of the evidence submission for the FBC.	

6.2	Policy option modelling.	The modelling of policy options for the CAZ scheme are detailed in the **T4 Local Plan Transport Model Forecasting Report** which is submitted as part of the evidence submission for the FBC.	
6.3	Impact analysis and further application to AQ modelling.	The impact analysis of the Preferred Option scheme in terms of the impact on the highway network are detailed in the appendices of **T4 Local Plan Transport Model Forecasting Report** which is submitted as part of the evidence submission for the FBC. The impacts on Air Quality are described in the **AQ3 Local Air Quality Modelling Report** and the Distributional Impacts are covered in the FBC business case section.	

Supporting Documents

1 Maps Showing the Coverage of SCRTM1 and the current AQ Hotspots
2 Calibration and Validation Report for SCRTM1
3 Interpolation between Modelled Years
4 Individual Count Site Calibration