Supplementary Transport Appraisal

Sturry Relief Road, Canterbury, Kent

16-002-008 Rev A

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Contents

1 Introduction

1.1 Overview

1.1.1 This report has been prepared by C&A Consulting Engineers on behalf of Kent County Council. It sets out the methodology and results of an assessment of alternative junction design options undertaken within the framework of the Sturry Relief Road VISSIM model, with modifications to the coding of the network at the A28/A291 junction to reflect an alternative arrangement. Reporting on the network changes, as well as demand assumptions are presented followed by forecast results from the model and thus the traffic implications of the three design options.

1.1.2 This report supplements the original Transport Assessment, prepared by AMEY on behalf of KCC and reflecting the subsequent changes.

1.2 Modelling History

1.2.1 The work undertaken follows on from a series of earlier assessments undertaken by C&A Consulting Engineers to support the LEP business case for the Sturry Relief Road and latterly to inform the design of the link road and associated mitigation, inclusive of initial studies on options for the A28/A291 junction. Modelling work conducted to date has appraised the cumulative implications of both the proposed infrastructure, which forms this application, and the enabling local plan allocation housing developments of Land at Sturry and Land at Broakoak.

1.2.2 This report considers in more detail the altnerative junction design option that was tested within the VISSIM model framework and discussed in later in the report.

1.2.3 Network alterations considering alternatives to the A28/A291 junction, while retaining the rest of the network as found in previous modelling exercises, along with the rebased 2031 forecast demand have been used to form model scenario ‘S’.

1.2.4 Previous studies on the A28/A291 junction have been undertaken to inform optioneering exercises that had been reported on by C&A. That work, along with changes to the support housing development modelling, had resolved to a final model scenario ‘R’ which has provided the input to previous Transport Assessment and ES supporting the previous application for the project.

1.3 Report Structure

1.3.1 Section 2.0 of this report describes the methodology for the rebasing of the microsimulation model from 2015 to 2019 and forming the updated demand scenarios, now on referred to as rebased demand scenarios, for the 2031 Do Minimum forecast model as well as the alternative option (S) introduced in this report.

1.3.2 Following this, section 3.0 sets out in detail the alternative design considered for the proposed junction on A28 Island Road / A291 Sturry Hill and assessed under Scenarios 'S' which form the basis of this exercise.

1.3.3 After setting out demand and design parameters in previous sections, section 4.0 details the results of the testing for 2031 forecast models and, finally, section 5.0 summarises and concludes.

2 Rebasing to 2019

2.1 Overview

2.1.1 The forecast models used for previously submitted work, both for the DoMinimum and the DoSomething scenarios, were built upon the 2015 base model that was validated at the time and was considered to reflect the on-ground operation of the network. Accordingly, the base model was validated against a 2015 dataset that derived from surveyed traffic information of the same year, while observed flows were also used to generate origin and destination matrices that were inserted into the model.

2.1.2 The forecast demand matrices used for the assessment of the future year scenarios were subsequently built upon the 2015 OD information, with the application of the respective growth and the inclusion of committed development flows.

2.1.3 Due to the 2015 dataset sitting marginally outside the 5-year window recommended by DfT for use (before the dataset being considered obsolete), an update to a 2019 base model was carried out drawing flow information from the Canterbury Strategic model built within VISUM software.

2.1.4 This section of the report discusses the methodology applied for the rebasing of the forecast models from 2015 to 2019.

2.2 Rebasing Methodology

2.2.1 For the purposes of the rebasing exercise, 2019 output flows for the microsimulation (VISSIM) modelled network area were collected from the 2019 Strategic Model for Canterbury (SMC) – provided to C&A by KCC modelling consultant Jacobs - and compared to the 2015 observed flows. It is worth noting that, while the 2015 dataset is based on comprehensive surveys of the study area and provide a good understanding of the travel patterns through it, the SMC was calibrated and validated for a wider area and therefore while the overall patterns in and out the Canterbury area might be reliable, the route choice through smaller sections of the network may be less so.

2.2.2 This also appeared to be the case for the study network of this exercise. The 2019 flows obtained from the SMC indicated increased activity through minor/secondary routes at levels that on-street operation of the network rendered unrealistic.

2.2.3 Subsequently it was considered reasonable that instead of adopting the OD data directly obtained from the SMC, the travel patterns derived from the 2015 observed flows would be retained but the quantum of movement would be rebased to reflect the traffic levels of the 2019 dataset.

2.2.4 The origin and destination patterns from the 2015 dataset were retained, as they were based on comprehensive surveys in the study area. Therefore, the origin and destination matrices of the 2015 dataset were growthed appropriately to reflect the 2019 flows.

2.2.5 As a result, a growth of -0.5% was applied to the 2015 AM ODs and a factor of -5.3% was applied to the PM peak, indicating that overall flows in 2019 were at similar or slightly lower levels than the 2015 traffic levels.

2.2.6 Using the new 2019 base flows, forecast ODs were built with the application of the growth, committed developments and proposed development as was done previously.

2.2.7 Lastly, the coded network was also examined to make sure that no changes between 2015 and 2019 occurred on ground that should be modelled in the updated 2019 base. This was confirmed to be the case.

2.2.8 The rebased forecast scenarios of 2031 Do-Minimum and 2031 Scenario 'S' were assessed as necessary, with the results provided later in this report. It is worth mentioning that due to the rebasing exercise, the results provided are not directly comparable to results from previous Scenario 'R', due to the different demand datasets between previously submitted work and current rebased model runs. However, the differences noted above between the 2015 and 2019 based demand are sufficiently small so as to not invalidate some useful comparison.

2.2.9 It is important to note that this modelling exercise retains the same cumulative development assumptions as those of previous studies – namely that the 'do-something' Scenario 'S' tested here includes not only the proposed infrastructure, but also the associated Local Plan housing developments of Land at Sturry and Land at Broadoak. None of these are included in the 'do-minimum' such that the impact assessed here is the cumulative impact of all schemes. This has been retained despite the aforementioned housing development now being committed development which could reasonably included in the 'do-minimum'. Likewise, the 'link road' between the A291 Sturry Hill in the east and Shalloak Road in the west, but excluding the bridge crossing to the south, was consented as part of the aforementioned housing schemes and could therefore have also been included in the 'do-minimum', but for robustness has not been.

3 Modelled Junction Designs

3.1 Overview

3.1.1 As discussed earlier in the report, this modelling exercise follows on from earlier optioneering work in order to review the performance of the alternative junction design between Sturry Hill and Island Road. The design modelled is as selected by KCC and separately referred to as Option 1b, incorporated into modelled scenario S and discussed below. More details of the design selected and carried forward can be seen elsewhere in the application material, including the updated DAS.

3.2 Sturry Hill Junction Designs

Option 1b – As modelled in Scenario 'S' (SCS)

3.2.2 Scenario 'S' has been introduced in order to test an alternative design for the proposed junction on A28 Island Road / A291 Sturry Hill (Option 1b) that incorporates the previously preferred design option tested under Scenario 'R' along with the introduction of the left turn for general traffic coming from A28 Island Road into A28 Sturry Hill – thus forming an all-movements signalised junction arrangement. The Scenario S model incorporates these changes in design with the previously discussed changes to the demand..

3.2.3 The proposed design is shown indicatively in **Figure 3.1** below.

Figure 3.1 – Option 1b

3.2.4 For modelling the left turn of the A28 Island Road within Vissim the appropriate link and associated connectors have been coded in Scenario ‘R’, open to all traffic, allowing thus for the additional movement and forming Scenario 'S'.

3.2.5 For completeness, the elements defining Scenario ‘R’ that have been carried over to Scenario ‘S’ are:

1. HGV ban for the turn to/from Shalloak Road to/from Sturry Relief Road;
2. Pedestrian crossing on Link Road on the north arm of the junction with A28 Sturry Road
3. Design changes at A28 Island Rd/A291 Junction: a) introduction of a staggered signalised pedestrian crossing on A28 Island Road and b) moving of the stop-line on the south arm of A28 Sturry Hill south of the level crossing;
4. Alterations to the scale, land use distribution and access strategy for Land at Sturry development.

4 Assessment Results

4.1 Overview

4.1.1 This section of the report discusses the results of the assessment of SCS while also providing the results of the rebased to 2019 DoMinimum scenario for comparative reasons.

4.2 Network performance results

4.2.1 In order to assess the performance of the network within Vissim, three key indicators are examined, with a comparison between the DoMinimum and DoSomething scenario outputs providing a first indication of the impact of the changes introduced in the latter. These key indicators are the average delay per vehicle, provided in seconds, the average speed, in mph and the total travel time of all vehicles within the network, in hours. The results of the DoMinimum and Scenario 'S' (SCS) are presented in **Table 4.1** below. Results of the previously tested Scenario 'R' (SCR) are also provided within the table, although not directly comparable due to the different base flows used, to provide a benchmark of how SCS operates compared to other modelled DoSomething scenarios.

Table 4.1: Network Performance Results

Performance Indicators / Scenarios	AM			PM		
	2031 DoMin	SCS	SCR*	2031 DoMin	SCS	SCR*
Average Delay Per Vehicle (s)	528	475	535	541	504	499
Average Speed (mph)	11	13	12	11	13	13
Total Travel Time (H)	1250	1364	1519	1548	1453	1545

4.2.2 As the results in the above table indicate, the network performs better in Scenario S than it does in the DoMinimum scenario, with reduced delays and increased speed, regardless of the overall higher flows through the network. Although, as already mentioned, a direction comparison to SCR would not be accurate, it appears that SCS performs slightly better in the AM peak and at comparable levels in the PM peak to SCR. The difference between SCR and SCS could however potentially be attributed to variations in the forecast demand, so care should be taken not to draw definitive conclusions from any such comparisons,

4.3 Flow outputs and Route Choice

4.3.1 The overall performance network indicators only tell a part of the story. Flow diagrams for both DoMinimum and SCS scenarios, for AM and PM peaks respectively, derived from the node output results of the respective models, are presented in **Figures 4.1** to **4.4** of this report to provide fuller picture of the forecast outcome of the changes.

4.3.2 Observations of the model runs for SCS were undertaken in order to provide an understanding on the way the proposals affect the overall operation of the model and the route choices taken.

4.3.3 In order to understand the model performance, it is imperative to comprehend the way microsimulation models reach a converged solution first. The convergence process that derives the solution is based on overall journey length and time and the model is converged when a solution finds similar overall results for origin-destination pair volumes in successive iterations. Taking both distance and time into consideration means that longer routes may be more preferable within the model if they are faster or of similar travel time to shorter alternatives.

4.3.4 However, when the routes are quite similar in both length and time, a relatively large shift in actual assignment between routes might not produce hugely differing iterative journey lengths and times - that can explain changes in patterns. This is less of a problem when comparing DM to DS because the network and routes have changed significantly. But it can be a more apparent factor in comparisons between multiple forecast 'do-something' scenarios where there have been multiple variables adjusted.

4.3.5 It is also worth noting that the flows shown in the figures are actual movements as recorded within the 1-hour period; meaning that they do not represent the demand flow but rather the number of vehicles that go through the network within this period. This point is quite relevant when comparing congested networks like the one discussed here, as flow comparisons between different model runs and different scenarios should also be considered in terms of performance at junction level and subsequent queuing in the network. Difference in flows between runs and scenarios in congested networks during the peak hours is likely to occur due to more traffic going through the network in one scenario than the other, even when the demand flows are the same or of similar level.

4.3.6 In terms of the performance and route choice of SCS; the main difference of Scenario S, and the respective design for the A28 Island Road / A291 Sturry Hill junction, from previously tested scenarios is that it introduces the left turn from A28 Island Road into A28 Sturry Hill, subsequently allowing for both the new link and the A28 Sturry Road to be used by general traffic for east-to-west movements.

4.3.7 As anticipated, this results in reduced traffic on the proposed link road, as now there are two alternatives available for the east-to-west movements, as well as the proposed junctions along this route. This does of course come at the cost of increases in traffic along the A28 south of the level crossing, relative to the previously modelled scenario, although there remain reductions relative to the do-minimum. Similarly, the Shalloak Road / Broadoak Road priority junction appears to perform well in SCS with no major queuing issues and vehicles able to unobstructedy turn left from Shalloak Road into the new link road with an eastbound direction.

4.3.8 A side-effect of this is that in comparison to previously modelled scenarios, Shalloak Road now provides a more attractive alternative to the A291 Herne Bay Rd and link road. Vehicles navigating through the latter face additional delays at the proposed A291/link road roundabout which have been worsened relative to previous scenarios as a result of traffic from the more congested 'all-movements' signals at Island Road now blocking back to this roundabout on occasions, such as the closure of the level crossing, adding journey time delay to the route in comparison to the Sweechgate/Shalloak Road route.

4.3.9 This conclusion appears superficially to be unexpected. The introduction of all movements at the Island Road junction has allowed traffic to utilise the A28 route south of the railway line through Sturry village, evidentially reducing demand on the link road (principally in the east to west direction). However, this reduction in demand on the link road presents limited benefit to travellers heading north to west on the A291 and to the link road. In contrast, the increased delays for the latter movement created at the roundabout junction, from traffic more frequently blocking back from the signals and level crossing to the roundabout, does create journey time delay and make the relative attractiveness of the prepared route decrease.

4.3.10 The conclusion of this is that relative to the previous Scenario R (with the banned turn at the Island Road junction), there is forecast to be slightly more traffic through Broad Oak in the alternative Scenario S modelled here, although in the latter in remains lower than in the do-minimum scenario. Accordingly, this might be reasonably the termed as 'reduced benefit' being forecast on the Sweechgate/Shalloak Road route. This residual impact may be seen as a negative side effect of the other benefits derived from reverting the Island Road junction to all movements and the resultant overall network performance benefits discussed above. However, it is beyond the scope of this report to appraise and balance such competing objectives.

4.4 Potential Mitigation

4.4.1 When noting the above outcome, there is merit in considering how some of the residual outcomes from the alternative arrangement may be mitigated. A detailed modelling exercise on such mitigation has not been undertaken to ascertain the potential benefits and implications of further interventions. However, some limited iterative sample testing was conducted.

4.4.2 For clarity. the outcome of modelling whereby traffic volumes increase on the A28 south of the Sturry Level crossing are an inherent consequence of allowing movements at the Island Road junction. Accordingly, no attempt has been made to consider mitigation of the residual outcome.

4.4.3 With respect to the reduced benefit on Sweechgate/Shalloak Road route, as noted above this arises as a consequence of the relative attractive of this route as a compared to new route via the link road. Accordingly, a response to this would be to reduce the attractiveness of the Sweechgate/Shalloak Road route. At present, the route benefits from being fairly unobstructed and for a considerable distance, operating with a higher national speed limit.

4.4.4 Iterative sample testing with generic cost values to the route suggested that reasonably proactive measures would be required to more effectively discourage use of the route. Examples of this might be traffic calming or changes to the speed limits, appropriate for the local conditions. Such measures would be likely to reduce the effectiveness of this route and reassign more demand to the new link road. Of course, this approach would add traffic back to some of the other routes and would lead to a reducing of the overall performance of the network, so as before and decision needs to be made on balancing competing objectives.

5 Summary and Conclusions

5.1.1 This report has set out the methodology adopted for rebasing the forecast modelling for the VISSIM microsimulation model of Sturry Link Road study area. This approach adopted utilise newer 2019 base data from the recent Canterbury Strategic Model to rebase the 2031 forecast demand within the do-minimum and do-something scenarios, updating the previous demand data which has been derived from the 2015 data originally collected to validate the base model. This approach responds to concerns regarding the appropriateness of forecast demand data derived from base data in excess of 5 years old.

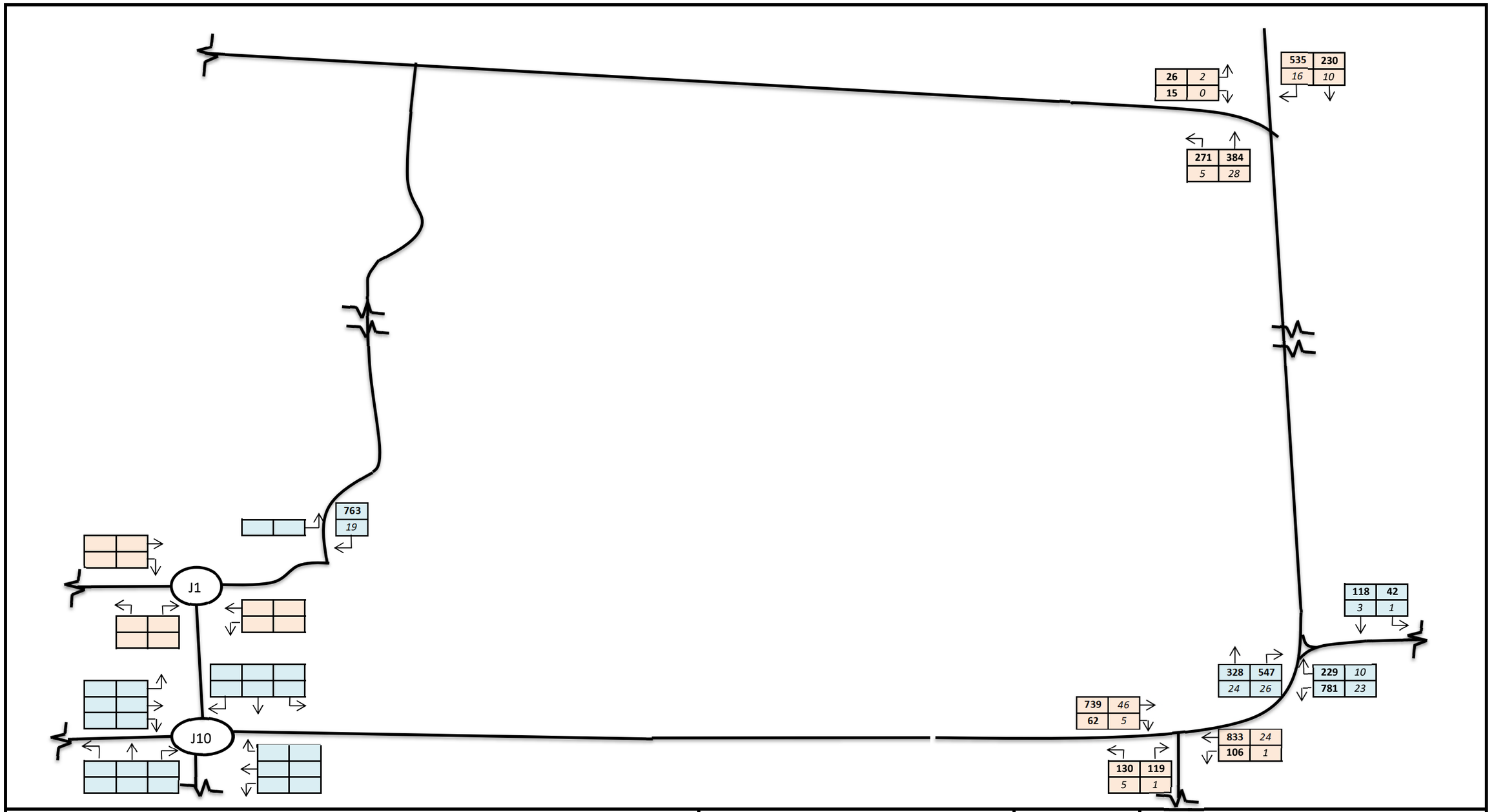
5.1.2 The do-something model has also been updated to reflect the proposed changes to the off-site mitigation proposals at the Island Road junction on the A28, in the vicinity of the Sturry level crossing. This designed, selected by KCC, is a response to a requirement for the junction to be all movements. Accordingly, it represents a refinement to the previous scheme which banned non-bus movements from east to south.

5.1.3 Overall network performance results of changes have been shown, confirming that the proposed cumulative implications of this infrastructure application and the delivering housing schemes remains better than the do-minimum. Although direct comparison should be made with care for the reasons outlined above, the results suggest performance is similar in overall terms to the previous restricted movement signal option at Island Road, although the differences may not be material.

5.1.4 A review of the more specific link flow outputs suggests changes in the pattern of movements across the network. Understandably, there is reduced benefit to traffic volumes on the A28 south of the Sturry level crossing.

5.1.5 However, a further residual impact of the changes has a reduction in benefit to traffic volumes on Sweechgate/Shalloak Road though Broadoak. It is likely that this impact could be mitigated through the use of appropriate and proportional interventions, such as speed limit changes and traffic calming on the aforementioned route.

Figures



Notes

???	All vehicles
???	% HGVs

Not to Scale
Not all Roads and Routes are Shown

Job Title: Land at Sturry	Job No: 16-002
Drawing Title: Figure 4.1 Turning Movements - Do Minimum AM Peak	Date: May-21

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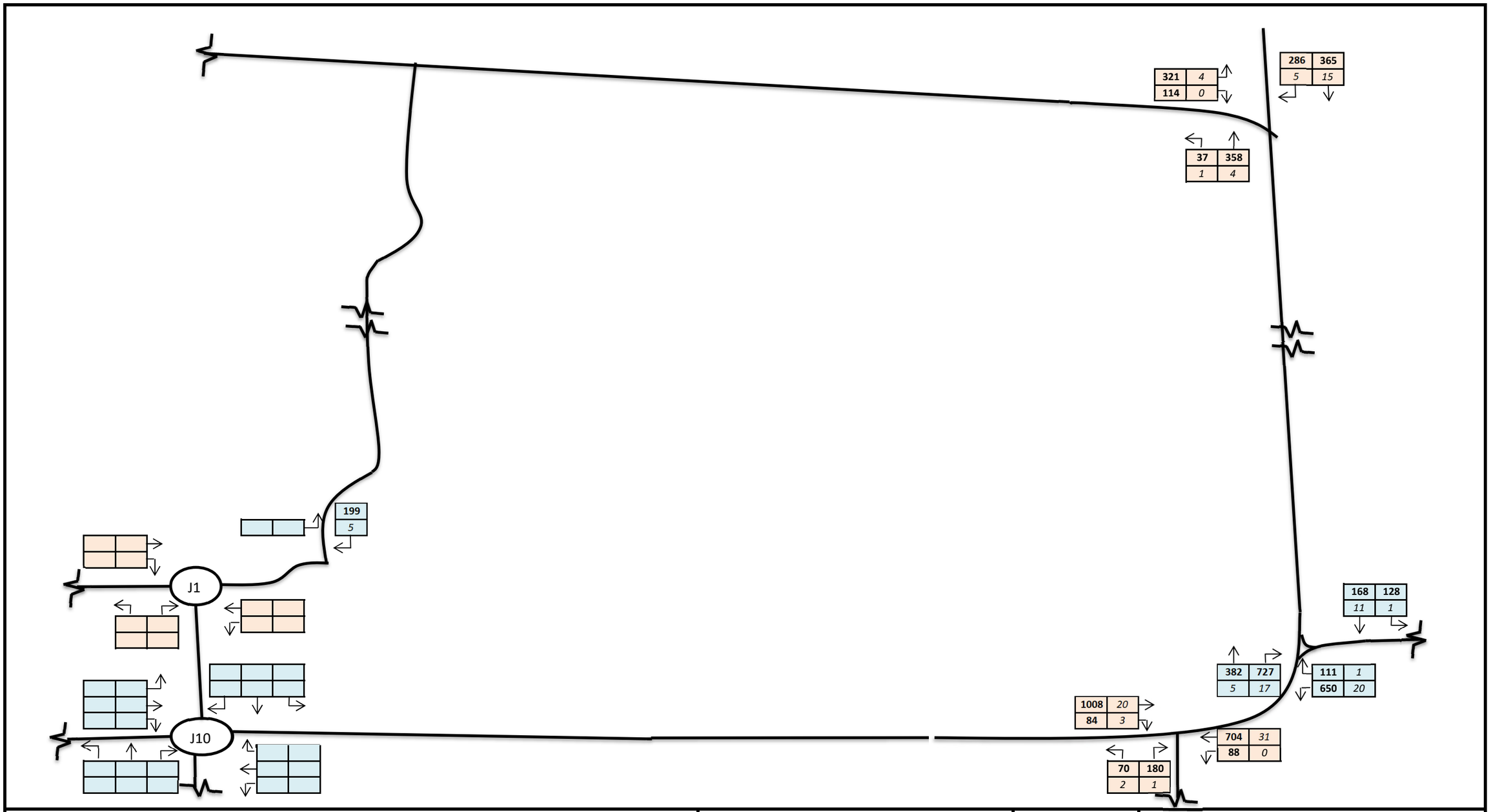

Notes

??? All vehicles
??? % HGVs

Not to Scale
Not all Roads and Routes are Shown

Job Title: Land at Sturry	Job No: 16-002
Drawing Title: Figure 4.2 Turning Movements - Do Minimum PM Peak	Date: May-21

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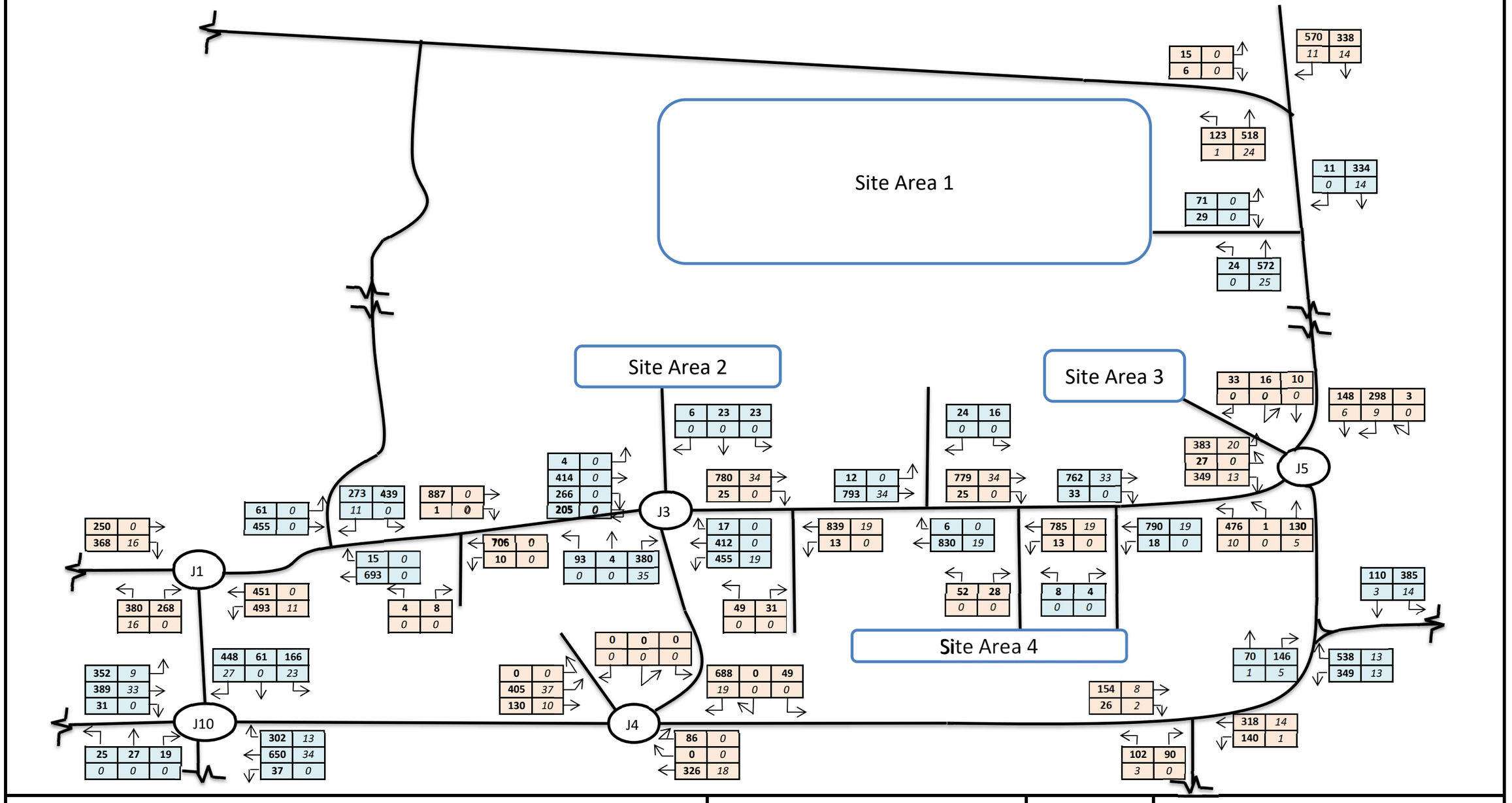

Notes

??? / ??? — All vehicles / % HGVs

Not to Scale

Not all Roads and Routes are Shown

Job Title: Land at Sturry	Job No: 16-002
Drawing Title: Figure 4.3 Turning Movements - Do Something AM Peak	Date: May-21

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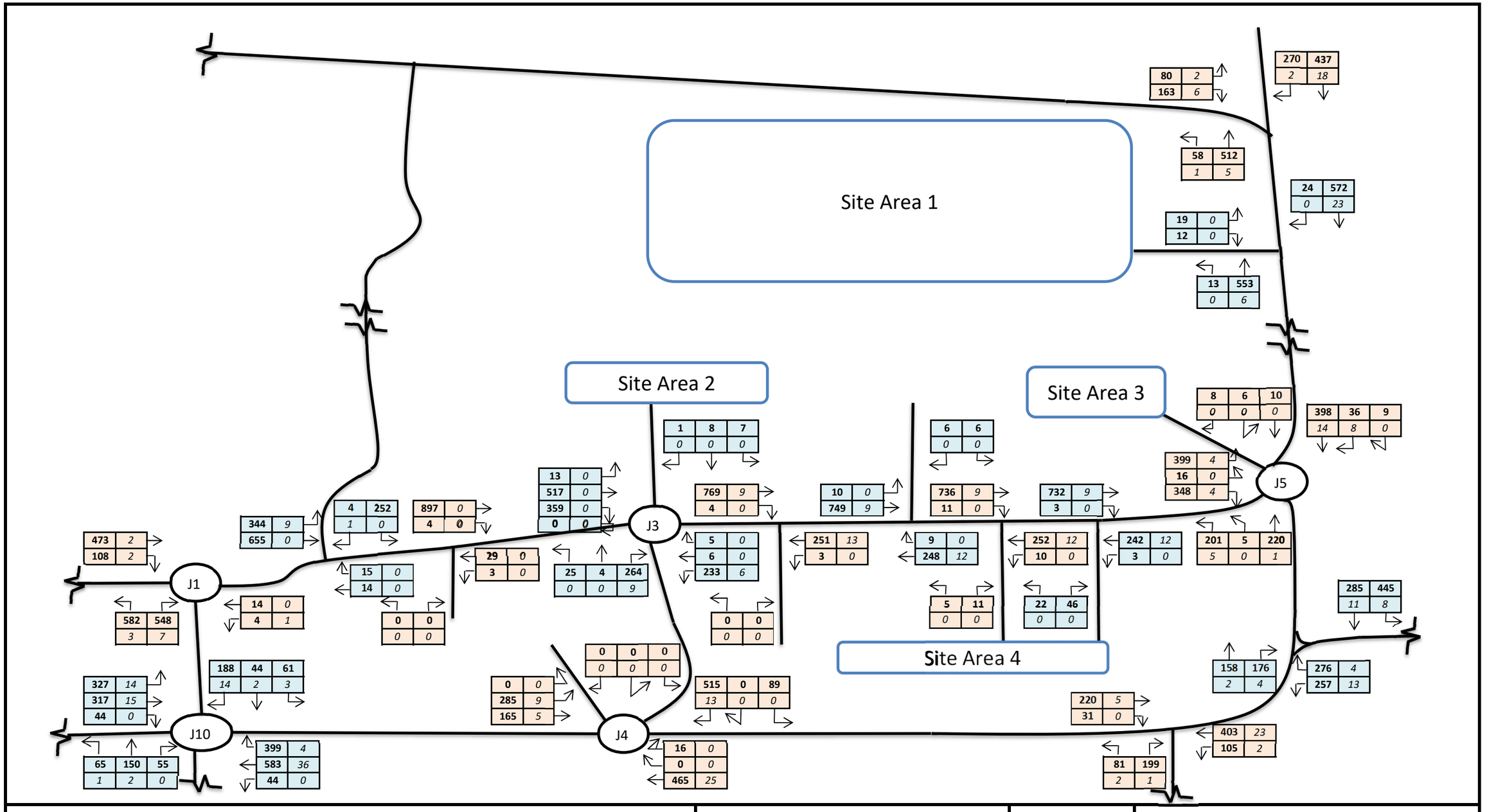

Notes

??? All vehicles
??? % HGVs

Not to Scale
Not all Roads and Routes are Shown

Job Title: Land at Sturry	Job No: 16-002
Drawing Title: Figure 4.4 Turning Movements - Do Something PM Peak	Date: May-21

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