DfT Queries on LEB – 21/10/16

No	Comment	Response	Comment on Response
1	In the main scenarios, the benefit in the PM peak in 2033 is less than in 2017 – other time periods show an increase. Your latest note mentions an issue of 'impedance' being less of an issue with lower demand in 2033 PM – but how is the higher demand affecting the network with LEB more than the DN without the LEB?	Looking at the TUBA benefits from both Fixed and VDM Core, Low and High - all show reduction in benefits in 2033 against 2018 for the PM peak. Higher demands and distribution of demand in the PM peak likely results in greater use of the scheme and consequently greater levels of congestion and poorer levels of service along LEB in this period, resulting in the effect highlighted in the question. This will be investigated in further detail	…..the extra demand causes the benefits of the LEB in the PM 2033 and in the high growth scenario does not quite convince: that higher demand should cause even larger problems in the DN – compared to which the LEB should still provide a larger benefit. If this was not the case it should be possible to derive a level of growth at which the LEB actually makes things worse compared to the DN. I would not want to suggest this to ministers… Given both high and low growth reduce the benefits, it would appear that the LEB is perfectly optimised for just the level of demand forecast in the central assumption, any changes up or down reduce the benefits?
2	In the high/low scenarios the benefits in 2033 are lower than 2017 in **all time periods**… the tempro and VOT tests again behave as the central scenarios… Also the BCR falls both for the higher and lower demand compared with central – could you talk us through the detail what is causing this?	The low scenario benefits is lower than the core. This is expected as lower demand in the low scenario would result in lower traffic to the scheme, therefore less time saving. The high growth scenario should generate higher benefit than the core, all other things being equal. However, the excessive increase in demand in the high growth scenario could also detrimentally impact the benefits of the scheme as the alignment is only able to accommodate a finite volume of traffic. The excessive increase in demand would result in longer travel times via LEB thereby reducing the benefits. This aspect relates to the general volume of traffic demand rather than specific flows associated with development.	

		These are to be confirmed via analysis.	
3	Finally the off peak and weekend benefits rise to 2033 but by far less than the IP benefits. I though these periods used the IP model and just applied a smaller annualisation factor. Unless that factor varies with forecast year, I cannot see how increase can be different across – could this be due to different mix of users in those periods?	The Off-peak and weekend benefits use the IP model with smaller annualisation factors. For a conservative approach LGV and HGV were excluded from the the calculation of off-peak and weekend benefits as it was assumed that the proportion of LGV and HGV is insignificant for these periods. Therefore the TUBA benefits show smaller increase in 2033 against 2018 as compared to the increase in the IP benefits. This is an oversight in our reporting.	I am satisfied with the point about LGV's and HGV's being excluded for OP and WE benefits
	First of all (but not importantly) the text shoes different numbers to the tables for both the core and the VDM scenario. The VDM text, I think is simply copied and pasted from the core version. (I take it the tables are more reliable)	Typos to be clarified	
	But does VDM really turn a 19m benefit into a 19m cost? It would be good to add a bit of contextual analysis: are we seeing a reduction in accidents in the city centre in the core but then the VDM adds sufficient trips to the LEB that increased accidents here (potentially at higher speed) more than offset that initial benefit?	VDM impacts to reduce the disparity between scenarios and change the resultant impact. Decongested areas in the fixed model become more congested resultant from the VDM. This naturally results in a reduction of benefit. If the flow incidence on certain roads is changed, so is accident severity. These issues are at play and will be examined in more detail.	

Ongoing Commentary

The issue of "low benefits" in PM 2033 remains as does that of low benefits in 2033 in general. This is supplemented with a query on BCR reductions in both low and high scenario.

In this response the focus will be on core, high and low. The TEMPRO 7 test demonstrates similar patterns to the Core Low and therefore the issues will be simplified by exclusion.

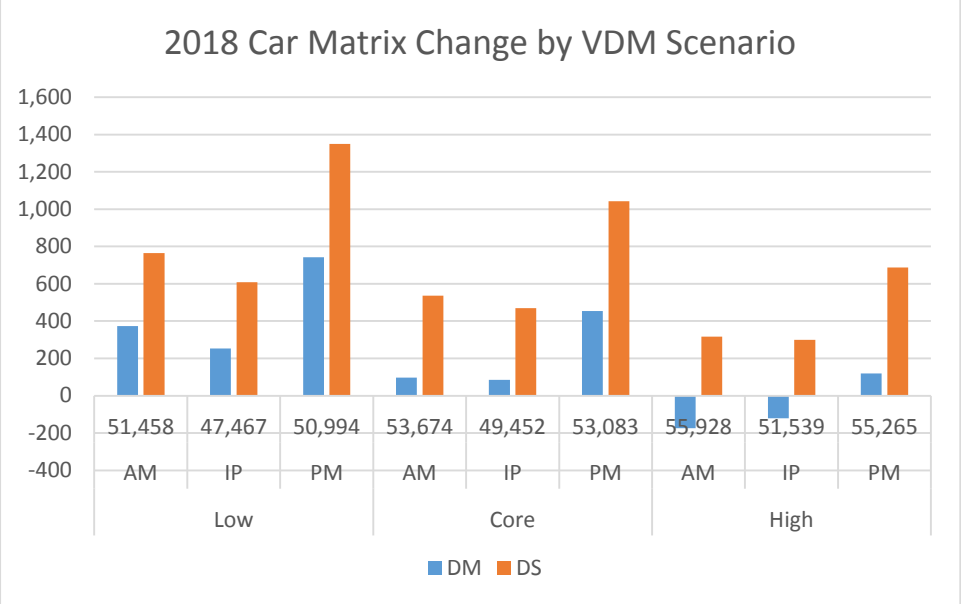
The PM 2033 benefits (Core) are around 70% of the values demonstrated in 2018. Other time periods do not demonstrate this reduction in benefit to the same extent.

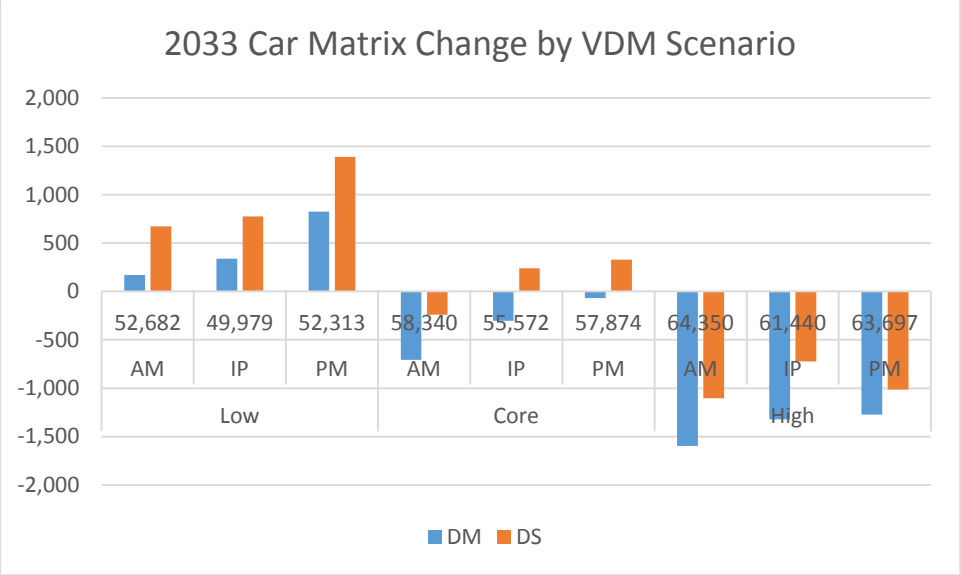
The reasoning suggested for this in our response was congestion levels on the LEB. The further comment from DfT was that the DN (DM) would experience similar effects leading to a net benefit of an appropriate magnitude.

This is correct in the context of the fixed demand modelling, where the benefits are simply the effects of traffic routeing, without taking into account the change in frequency and re-distribution of trips as a result of the scheme. With the variable demand modelling, however, the excessively congested network in the DN would result in trips being suppressed re-distributed in response to highly congested network. This would result in less congested network in the VDM compared against the fixed assignment. In the DS, since extra capacity is added on the network (i.e. the scheme), traffic rerouting via the LEB would result in a reduction of traffic in the town centre resulting in a less congested network. Therefore this result in trips being induced/less suppressed.

As a consequence the network demonstrates less congestion in the town centre in the DN. More delays on the LEB scheme (as explained in the subsequent section) will result in less benefit that can be claimed for the scheme.

The graph below shows the VDM impacts across scenarios.





The patterns demonstrate the change from reference car matrix (comprising trip purpose matrices) in the AM IP and PM periods for 2018 and 2033. The low scenario demonstrates increasing induction over the time through the day in the DM, and more so in the DS. In the core 2033 scenario there is reduced suppression through the day, with effective induced traffic in the PM peak. By the 2033 high growth scenario trip suppression occurs in both the DM and DS, although to a lesser extent in the DS. The low delta difference is based on the LEB operating at a reduced level of service.

This can also be demonstrated via the LEB level of service by link category.

The LEB comprises of 5 links with Section 2 spanning the railway and the River Witham. Flows on this section are consistently metered based on the v/c ratio. At ratios exceeding 0.85 delay increases in an exponential manner as flow starts to break down, leading to less use of the road. It should be noted that as LEB has been value engineered to a single c/w this starts to occur

The tabulation below shows the V/C ratio for the Central LEB section in 2018 and 2033

2018	AM	IP	PM
Low	74%	67%	86%
Medium	75%	70%	88%
High	78%	73%	89%
2033	**AM**	**IP**	**PM**
Low	79%	74%	91%
Medium	83%	81%	95%
High	87%	86%	96%

The opening year presents a minimal capacity problem in the PM peak. In the design year the PM time period in all scenarios and all time periods for the high scenario, flow breakdown (>85%) occurs. Under these conditions LEB no longer offers any time saving benefit. Hence the lower performance in 2033 in general, and in 2033 PM peak in particular.

It is appreciated that one level of assurance for DfT is that the change from low through high growth produces a continuum of plausible benefits. Presently the high growth PVB is lower than the core.

TO assure that the model operates correctly we propose reducing the growth of the high case to a value which limits the over-capacity nature of the LEB.

Presently the p value of the high growth test is set to p=2.5 which generates around 10 % growth over the core scenario. We are testing a reduction of this to p=2.0 which is designed to test the network but limit the stress on the LEB.

Accidents

The tables are the most reliable source of the accidents and represent a change of £19.84 million to £-19.56 million.

The accident parameters which drive this are shown below.

The tabulations show the net saving in accidents and casualties by severity by modelled year and over the evaluation horizon.

	Accident Savings				Casualty Savings			
VDM	Fatal	Fatal	Fatal	Fatal	Fatal	Serious	Slight	Total
2018	0	-1	-5	-6	0	-2	-10	-12
2033	0	0	1	0	0	-1	-2	-3
60 Yr	-8	-23	3	-28	-15	-46	-145	-206

	Accident Savings				Casualty Savings			
Fixed	Fatal	Serious	Slight	Total	Fatal	Serious	Slight	Total
2018	0	0	9	9	0	0	8	8
2033	0	0	11	11	0	1	12	12
60 Yr	-4	20	618	634	-7	48	649	690

Under the VDM scenario the relative number of accidents and casualty savings is much reduced (to a net increase) as induced traffic serves to congest up the network and the vehicle km travelled increases.

We note that accident analysis has been based on demand flows, ie what would like to travel. The assumption is that all traffic is satisfied over a longer time period, as queues dissipate and metered traffic is released. This may or may not accord with the DfT's views

An alternative approach is to use actual flows. We have revisited the analysis from this perspective. Under this approach the benefits are -£25million for VDM and -£4million for fixed matrix.

These are obviously lower, of the same sign and closer together. VDM still reduces benefit significantly for the same reason as above.

The accidents and casualty changes are shown below. In the fixed case the impact of the fatal and serious categories (a net loss in benefit) outweigh the impacts in the slight columns.

VDM	Accident Savings				Casualty Savings			
	Fatal	Serious	Slight	Total	Fatal	Serious	Slight	Total
2018	0	-1	-6	-8	0	-2	-12	-14
2033	0	0	-1	-2	0	-1	-4	-5
60 yrs	-9	-29	-89	-127	-16	-61	-263	-340

Fixed	Accident Savings				Casualty Savings			
	Fatal	Serious	Slight	Total	Fatal	Serious	Slight	Total
2018	0	0	4	4	0	0	2	2
2033	0	0	4	4	0	0	3	2
60 yrs	-7	-6	238	226	-12	-12	158	134

The impact of using actual flows would reduce the VDM NPV by £6million in the core scenario, with a commensurate minor reduction in the BCR.

The specific impact of accidents by location will be produced and provided as an additional document.