SPATS1-403

LST TRIAL EVALUATION 2018-19

PROJECT NOTE E3: LST INTERMODAL EFFECTS

PN-E3-V4-1
SEPTEMBER 2018

CONFIDENTIAL

SPATS1-403

LST TRIAL EVALUATION 2018-19

PROJECT NOTE E3: LST INTERMODAL EFFECTS

TYPE OF DOCUMENT (VERSION) CONFIDENTIAL

PROJECT NO. 70038230
OUR REF. NO. PN-E3-V4-1 FINAL

DATE: SEPTEMBER 2018

WSP
WSP House
70 Chancery Lane
London
WC2A 1AF
Phone: +44 20 7314 5000+44 20 7314 5000
Fax: +44 20 7314 5111+44 20 7314 5111
WSP.com

QUALITY CONTROL

Issue/revision	V1	V2	V3	V4-1
Remarks				
Date	Dec 2017	Feb 2018	May 2018	September 2018
Prepared by	Morag White	Morag White	Morag White Ian Brooker	Morag White Ian Brooker Paul Brand
Signature				
Checked by	Paul Brand	Paul Brand	Paul Brand	Helen Wilkinson
Signature				
Authorised by	Ian Brooker (For WSP) Paul Brand (For Risk Sol)	Ian Brooker (For WSP) Paul Brand (For Risk Sol)	Ian Brooker (For WSP) Paul Brand (For Risk Sol)	Ian Brooker (For WSP) Helen Wilkinson (For Risk Sol)
Signature				
Project number	WSP: 70038230 Risk Solutions: J000005	WSP: 70038230 Risk Solutions: J000005	WSP: 70038230 Risk Solutions: J000005	WSP: 70038230 Risk Solutions: J000005
Report number	PN-E3-v1	PN-E3-v2	PN-E3-v3	PN-E3-V4-1 FINAL
File reference				

Project Note Document Status and Confidentiality	
Status	This document is a Project Note as defined in the original proposal for the project. Project Notes are produced iteratively on work for which the scope and method are emergent. Each version describes the progress on the analysis to that point and proposes the direction and scope of the next step in the process. Where agreed by the client, that scope or direction may diverge from the thinking described in the original proposal. Project Notes, in their intermediate versions, are not formal deliverables under the contract. The final version of a Project Note may be a formal deliverable if the proposal states this.
Confidentiality	Project Notes are not normally for publication by any party, including DfT, as they contain discussion of work in progress during the development of an analysis. In this case, a final version of this project note (v4 only) has being 'upgraded' to publishable quality so that it can be issued with the main LST Trial 2017 Annual Report

CONTENTS

TABLES

FIGURES

EXECUTIVE SUMMARY

While LSTs could reduce the demands placed on key parts of the SRN, rail and sea also play a significant part in the national transport strategy. Greater use of rail and waterways is recognised through government policy as being an important driver of sustainability as well as offering greater modal choice for businesses.

This project note presents a study assessing the potential impact of Longer Semi Trailers (LSTs) on other freight modes, based on the most recent data as well as the learnings gained from the trial to date. The study included a desktop review, an in-depth meeting with Malcolm Logistics and stakeholder interviews. The further stakeholder discussions expanded the conversation to review operators' challenges with the use of rail.

In this project note we present:

- An overview of the 2011 impact assessment as it relates to intermodal effects, with analysis of: key market sectors, cost and other assumptions in the IA, the forecasting approach, the impact of LSTs and an alternative scenario where LSTs are transported by rail – we revisit the assumptions made and review objections that have been made
- A review of intermodal growth assumptions and corridors for rail, investigating a number of intermodal options; deep sea, channel tunnel and domestic intermodal
- Insights drawn from the Malcolm Logistics' experience
- A review of the availability of LST compatible rail wagons and other rail freight solutions based on the use of conventional containers.
- Themes from discussions with stakeholders.

Key findings include:

- The forecast in the pre-trial Impact Assessment of the impact of LSTs on rail freight was extremely sensitive to the assumptions used. In particular, the impact depended greatly on:
  - Take up of LSTs for road haulage
  - The assumptions made about the type of wagon used – both with and without LSTs
  - The willingness and potential for rail freight operators to invest in different equipment.
- The pre-trial IA forecast that rail would lose over 50% of its domestic intermodal freight by 2026 if rail did not adapt to carry LST units OR gain10% if rail responded and an LST+Rail option were created. **In this study, the key conclusion is that while a LST+Rail option is now available, this response will not allow rail to increase its forecast volume as suggested in the pre-trial IA. It is however effective enough, combined with consideration of other factors affecting intermodal decisions, to avoid rail losing potential traffic to LSTs**.
- The study identified four key themes for operators making decisions regarding LSTs and rail. Three of these limit rail use: (1) the limited number of rail-connected distribution centres (depots), (2) the highly variable demand for freight, which requires flexibility, and (3) collection and delivery time criticality. LSTs offer insufficient economic gain to overcome these other variables affecting modal choice (Theme (4)).
- Double decker road trailers present strong competition for rail, a shift to LST double decker trailers therefore may not result in any loss for rail freight as the goods already move by road where the use of double decks is possible.
- The longer term use of LSTs both within intermodal and indeed more generally requires significant change for some supply chains which will take time

Contact name Ian Brooker

Contact details 020 7314 5198 | ian.brooker@wsp.com

1 INTRODUCTION

This project note relates to a special workstream of the wider "GB LST Trial Evaluation" project. The aim of this work stream is to assess the potential impact of LSTs on other freight modes, based on the most recent data as well as the significant learnings gained from the trial to date. This is the fourth issue of the project note.

Why consider intermodal effects?

To understand the potential role for LSTs and the implications of the trial for any future wider roll out, it is important to consider the impact on other freight modes. While LSTs could result in a reduction in the demands placed on key parts of the SRN, by reducing the number of HGV journeys taken, rail and sea also play a significant part in meeting national freight demands. Greater use of rail and waterways is recognised through government policy as being an important driver of sustainability as well as offering greater modal choice for businesses.

The 2011 pre-trial impact assessment base case, forecast a major shift of goods from rail to road once LSTs were available, unless the rail freight industry responded by accommodating longer intermodal units. In contrast, Annex 6 of the impact assessment forecast that, if the rail industry **did** respond by accommodating longer loads, rail market share could increase even beyond ambitious industry forecasts.

It is notable that these forecasts from the IA appeared to suggest that the volume of rail freight, particularly intermodal freight, would be extremely sensitive to the balance of costs between road and rail, and in particular to the introduction of, and response of freight operators to, LSTs.

The purpose of the study carried out during 2017 was to revisit the whole question of the impact, if any, of LST availability on the relative attractiveness of road/rail to operators, in the light of new information that was not available or was not considered in 2011

New evidence sources since the pre-trial impact assessment

The primary difference is that we now have actual LST experience in a range of operations

Since the pre-trial IA two important sets of rail freight forecasts have also been published:

- The 2013 Freight Market Study (FMS) from Network Rail (NR), which broadly concurred with earlier forecasts but with important differences that need to be understood
- The 2016 DfT Rail Freight Strategy, which included constrained rail freight forecasts that are significantly lower for some commodities than the NR forecast.

Network Rail has recently updated their forecast scenarios (Network Rail Freight Forecasts: Scenarios for 2023/24, 2017) and this is discussed in section 5. The modelling, however is based on the 2013 data.

Both forecasts continue to assume strong growth in rail freight, particularly in the intermodal sector. This is driven by increased volumes of containers arriving in ports and an assumption of dramatic growth in the availability of rail connected distribution parks leading to higher rail market share. Growth is focussed into two distinct markets:

- Movement of deep sea containers to and from ports – which may be immune to the impact of LSTs
- Movement of consumer goods in containers between inland distribution centres – which could be significantly impacted by LSTs

Since the IA, the rail freight industry has also had the opportunity to better understand the impact of LSTs and to prepare its response. In particular, Malcolm Group, a major rail and road freight operator, has participated in the trial and has developed a rail freight solution allowing LST compatible units on rail. At the same time, Risk Solutions are currently gathering views from all trial participants on their projections of their potential maximum LST uptake. Insights from these two developments are vital in updating the assumptions of the 2011 IA, which were drawn up before there was any experience of operating LSTs.

2 METHODOLOGY AND SOURCE DATA

2.1 METHODOLOGY

The scope of the study included:

- **A desktop review** covering:
  - The assumptions and modelling applied in the pre-trial analysis
  - The current forecasts of the intermodal freight market and corridors, and their relevance to the LST operations on the trial or in future
  - The trial experience in relation to any competition between rail and LSTs
  - The availability of rail wagons to carry 50ft (LST compatible) ISO units.
- **An in-depth meeting with Malcolm Logistics** around:
  - the role of LSTs in the intermodal market
  - the limitations of LST use in their operations – including customer response
  - competition for LSTs on rail
  - the challenges for intermodal freight and the future for LSTs.
- **A range of stakeholder interviews**, following up on themes developed from the desktop review and Malcolm Group discussions:
  - The selection of companies for these interviews included some operators who already use rail as part of their operations (but not yet with LSTs) and others chosen because their LST operational pattern included significant use of routes that included start and end points near to existing rail hubs
  - Beyond operators, the study consulted with a range of industry groups and a meeting with some members of the LST trial stakeholder group.

Note that the scope of the study was only to address the question of whether the availability of LSTs (and now, LST container + rail options) affected the decision of operators to consider rail as part of their operation. It was not to assess the wider policy and national infrastructure questions on the future of rail freight.

2.2 SOURCE DATA

- Review of Government proposals for Longer Semi Trailers (LSTs)- Metropolitan Transport Research Unit, June 2011
- Consultation on Possibility of Allowing an Increase in the length of Articulated Lorries - Response from Rail Freight Group, June 2011
- Final Impact Assessment on which the trial was based (September 2011) (primarily considering the intermodal analysis and discussions)
- The Freight Market Study, 2013
- MDS Rail Freight forecasts final report, April 2013
- DfT Rail Freight Strategy, 2016
- Network Rail Freight Forecasts: Scenarios for 2023/24, 2017
- Rail Freight's role in the Government's emissions reduction plan- Freight on Rail- Philippa Edmunds, July 2017
- Qualitative interview with Malcolm Group, 2017
- Updated Network Rail Freight Market Forecast (provided in confidence by DfT) 2017
- LST trial data, 2016-17
  - Quantitative analysis of operational data
  - Qualitative data on the experience of adopting LSTs and potential maximum future uptake

3 REVISITING THE PRE-TRIAL INTERMODAL ANALYSIS

The 2011 impact assessment was based on a forecast that rail would lose over 50% of its forecast domestic intermodal freight by 2026 if rail did not adapt to carry LST (50ft) units. On the other hand, if rail did adapt, its forecast volume was estimated as potentially 10% higher than in the 2013 FMS. These estimates had a significant effect on the overall impact assessment results that led to the launch of the trial. However, they were based on estimates and modelling carried out before there was any real world experience in operating LSTs and so required a set of fairly broad assumptions. To explain (later in this note) where this new study has taken a different approach and used additional information, we need to first explain the core steps in the pre-trial work.

This review is based on “Impact Assessment (IA) of Longer Semi-Trailers (updated post-consultation)” dated 1st September 2011.

3.1 THE IA LST DESIGN OPTIONS

The IA considered 7 different options for LSTs based on different combinations of trailer length and axle steering technology, there being at the time only one or two demonstrators built and a significant amount of uncertainty about what the final designs would be.

The options were

Base Case (13.6m trailers)

1) 14.6m Fixed Axles
2) 14.6m 1 x Self-steer Axle
3) 14.6m Active Steering
4) 15.65m 2 x Self-steer Axles
5) 15.65m 1 x Command-steer Axle
6) 15.65m 2 x Command-steer Axles
7) 15.65m Active Steering

Once the trial began, the demand for LSTs settled on two designs that account for the vast majority of all the trailers subsequently built:

- 15.65m 1 x Self-steer Axle — Not in the options consider by the 2011 IA
- 15.65m 1 x Command-steer Axle — Option 5

The reason for this disparity between the options modelled and the actual designs that emerged was simply the design uncertainty at the time of the pre-trial work. In 2011 the manufacturers knew they could build a 1 x command steer LSTs that would meet the DfT turning circle requirements, but they were not sure that they could do so with a single self-steer axle for a 15.65m trailer and so the option was not included in the IA list of test options.

It is also worth noting that pre-trial and indeed during the first 12-18 months of the trial, the same uncertainty about whether the longer LSTs would require more than a single self-steer axle led some operators to “play safe” and order 14.6m LSTs. Once the trial started to grow, designs for 15.65m self-steer trailers became available and it was clear they were very manoeuvrable, orders for 14.6m LSTs reduced significantly.

The two ‘Active Steer’ options (3 and 7) have never been requested by operators, although the technology is available.

A point to note here is that the options modelled in the IA, and that are discussed in what follows, included a whole range of designs that were treated as equally likely to come into use. In fact, most of them were either never built or only produced in small numbers and so future modelling will not need to account for them.

3.2 KEY MARKET SECTORS

The IA assumes that most bulk freight traffic[1] would not benefit from the use of LSTs because this traffic already generally reaches maximum weight limits within the existing envelope of vehicle lengths.

Having eliminated bulk operations, the IA concludes that this effectively leaves shippers of lighter weight palletised consumer goods (including goods in roll cages), general cargo and mail/parcels as the market sectors that potentially would take advantage of the additional cargo capacity longer semi-trailers will provide. Within this sector of the market, operators generally use existing maximum length goods vehicles, either curtain-sided, box-body (including refrigerated or chilled) or double-deck.

In particular, the IA assumes that the following types of flows might benefit from the use of LSTs (referred to as targeted markets below):

- Factories to National Distribution Centres (NDCs) and Regional Distribution Centres (RDCs)
- Flows between NDCs and RDCs;
- From NDCs to retail stores;
- From RDCs to retail stores;
- Mail/parcels;
- Palletised trunking operations; and
- Low density industrial products moving between factories.

Further IA analysis estimated that haulage of non-bulk commodities in articulated HGVs accounts for 24% of all HGV tonnes lifted and 39% of tonnes moved by road – indicating the longer average distance hauled for this type of traffic.

An issue arising from the IA analysis is that draw bar trailer combinations already offer a similar cube (volume) and length payload to longer semi-trailers, but take up of draw bar trailers is very small in the UK (only <2% of non-bulk HGV movements). Draw bar trailers are not favoured for general distribution in the UK, especially for flows between distribution centres where end loading is the norm.

The IA analysis made use of data from the DfT Continuous Survey of Road Goods Transport (CSRGT) to consider the proportion of vehicles which are weight constrained or space constrained (see later discussion).

3.3 COST AND OTHER ASSUMPTIONS IN THE IA

The IA used operating costs for road and rail contained in the GB Freight Model, which is the model generally used for freight forecasting by the DfT and Network Rail.

A standard approach was used to estimate existing / base line costs per vehicle km for road and rail.

3.4 BASE CASE IN THE IA

The IA mentions that in the base case the rail freight demand forecasts were already 25% below the forecasts developed by Network Rail and available at the time the IA work was performed. (Network Rail themselves revised freight forecasts in October 2013.)

"Under the Base Case option, the in-scope market grows by 32.4 million tonnes or +7.5% between 2009 and 2025. Domestic intermodal rail freight is estimated to grow by 732% to 14.3 million tonnes-lifted by 2025 (from 2.0 million tonnes in 2009), with road freight to grow by 4% increasing from 430.8 million tonnes-lifted (in

---

[1] There is one class of bulk goods where LSTs have proved viable, which is low density wood-chip fuel, which is sufficiently light to allow a fully loaded LST to operate within the 44T limit. However, this is a very small part of the national freight traffic and is comparable to moving other, low density industrial products but using slightly reinforced box-trailers, loaded via the roof.

2009) to 450.9 million tonnes lifted by 2025. 99.5% of in-scope freight is road based in 2009 and 96.9% is road based in 2025."

The large growth in domestic intermodal rail freight forecast under the Base Case option by 2025 was primarily due to the assumed development of distribution centre floor-space at rail-linked sites with several opening each year throughout the forecast period. While there are a number of pipeline rail connected sites, this is not at the level expected. The table below shows which locations were assumed, however, not all of these have come to fruition and have been taken out of the new forecasts.

Table 1: Source: MDS Rail Freight forecasts, April 2013

Rail connected warehousing sites assumed in rail freight forecasts (Oct 2012)		Thousand square metres				Proportion NDC	Status of planning
Site	**County**	**Current**	**2023/4**	**2033/4**	**2043/4**		
DIRFT	Northants	500	828	1,193	1,601	60%	Consent sought for extension
London Gateway	Essex	-	403	726	1,029	80%	Being constructed
Rossington	S Yorks	-	112	355	572	50%	Secured
Burnaston X / Etwall	Derbyshire	-	149	371	572	50%	Yet to be applied for
Corby	Northants	-	269	422	572	60%	Part secured, part sought
Four Ashes / F'stone	Staffordshire	-	119	297	457	60%	Yet to be applied for
Bicester	Oxfordshire	-	119	297	457	70%	Speculative
Milton Keynes	Bucks	-	179	322	457	70%	Yet to be applied for
South Northampton	Northants	-	179	322	457	70%	Yet to be applied for
Kegworth	Leics	-	179	322	457	70%	Consent being sought
Sevington	Kent	-	179	322	457	80%	Yet to be applied for
Hams Hall	West Mids	300	390	400	457	60%	Secured
Avonmouth	Avon	-	179	322	457	20%	Speculative
Wakefield	W Yorks	350	350	350	400	20%	Exists
Radlett	Herts	-	148	266	377	10%	Awaiting Sec of State
Port Salford	Gt Manchester	-	134	242	343	0%	Secured
Immingham	Humberside	-	134	242	343	80%	Consent being sought
Mossend	Strathclyde	100	160	248	343	0%	Secured
Ditton	Cheshire	-	269	300	343	20%	Part secured, part sought
Tees	Cleveland	120	147	187	240	80%	Secured
Seaforth	Merseyside	-	60	148	229	50%	Yet to be applied for
Gartcosh	Strathclyde	-	60	148	229	0%	Consent being sought
Castle Donington	Leics	-	60	148	229	70%	Being constructed
Luton	Bedfordshire	-	60	148	229	70%	Consent being sought
Barking	Essex	-	90	161	229	0%	Yet to be applied for
Stoke	Staffordshire	-	90	161	229	20%	Speculative
Birch Coppice	Warwickshire	60	114	169	229	60%	Secured
Dartford (Howbury P)	Kent	-	179	200	229	0%	Secured
SIFE	Berkshire	-	170	190	217	10%	Consent being sought
Grangemouth	Central	50	80	124	172	0%	Secured
Coventry	West Mids	150	150	150	172	60%	Exists
Sheffield	S Yorks	-	30	74	114	20%	Secured
Swindon	Wiltshire	-	30	74	114	30%	Secured
Port Warrington	Cheshire	-	22	56	86	0%	Consent being sought
Wentloog	S Glamorgan	-	18	38	57	0%	Secured
Doncaster	S Yorks	-	18	38	57	30%	Secured
Telford	Shropshire	-	18	32	46	20%	Secured
Exeter	Devon	-	9	16	23	0%	Secured
Selby	W Yorks	15	15	15	17	20%	Exists
Total		**1,645**	**5,900**	**9,600**	**13,300**		

3.5 ROAD MOVEMENTS SWAPPING TO LSTs – IA ASSUMPTIONS

The GB Freight model was run to examine the impact of the introduction of LSTs, **but with no change in the rail freight options – i.e. no 50ft containers/LST ISO carriers**. (A subsequent analysis, considered below, looked at the impact if the rail industry adapted its offer to accommodate LST type containers.)

The modelling reviewed the 2009 CSRGT road transport freight flows measured by HGV km travelled, breaking down the flows in terms of size groups based on volume or weight constraint and three distance thresholds as shown in Table 2 (overleaf).

The modelling then made a forecast based on two assumptions

- TAKE UP: The proportion of movements (as a proxy for operations) that 'swapped' to LSTs
- LOADING EFFICIENCY: The assumed % fill of the LSTs (and hence the actual journey saving)

TAKE UP ASSUMPTIONS

Broadly speaking the assumption was that of the inter-depot movements that are not weight constrained (categories 1 & 3 in Table 2, about 68% of all HGV km in 2009), up to 9 out of 10 HGV km might be presumed to transfer to use LSTs.

Conversely, for the generally shorter, final delivery movements that are not weight constrained (categories 2 & 4, about 21% of all HGV km in 2009), only 45% of the HGV km would be switched to LSTs. (Based largely on data supplied by major retailers.)

The remaining 11% of HGV km, whether inter-depot or final leg, was weight constrained and assumed to be much less likely to switch to LSTs.

Table 2: 2011 IA LST 'Take Up' Assumptions (HGV-km switched to LSTs)

Scenario 1,3,5 generally inter-depot trunking moves 2,4,6 generally shorter, final delivery moves			**Convent-ional HGV-km in 2009**	**Low**	**Best Estimate**	**High**
				Distance threshold		
			%	150km	120km	100km
Category	1	Volume-constrained but not weight-constrained travelling distances greater than threshold	34.1%	50%	90%	100%
	2	Volume-constrained but not weight-constrained travelling distances less than threshold	8.4%	0%	45%	75%
	3	Not volume or weight constrained travelling distances greater than threshold	34.3%	50%	90%	100%
	4	Not volume or weight constrained travelling distances less than threshold	12.3%	0%	45%	75%
	5	Weight constrained travelling distances greater than threshold	8.9%	0%	20%	25%
	6	Weight constrained travelling distances less than threshold	2.0%	0%	5%	10%

TRAILER LOADING EFFICIENCY ASSUMPTIONS

The final stage of the modelling was to add a factor to reflect how much of the additional trailer length would be used (IA para 119, page 43) vs a maximum gain of 15.4% additional payload (4 extra pallets)

The assumptions made here were:

- 2009 HGV-km volume constrained but NOT weight constrained (categories 1 & 2) – average 90% of the potential maximum load gain (13.8%)
- 2009 HGV-km neither volume nor weight constrained (categories 3 & 4) – average 50% of the potential maximum load gain (7.7%)

3.6 RAIL MOVEMENTS SWAPPING TO LSTs – IA RESULTS

The process described above provided the IA with results for the transfer of road freight from standard trailers to LSTs. The IA then went on to model prospective transfers of goods to/from rail, based on the same assumptions of their efficiency and take up in road transport as above.

The table below reproduces the results from the IA. Option 5, the only design from these options that has been produced in large numbers, is highlighted.

Table 3: 2011 Pre-trial IA Intermodal Modelling Results

	Domestic Intermodal Rail	**000s tonnes**				**+/- v Base Case**		
		2009	2015	2020	2025	2015	2020	2025
Option								
	Base Case	1,955	6,586	10,444	14,303			
1	14.6m Fixed Axles		4,636	6,871	9,105	-1,949	-3,574	-5,198
2	14.6m Single Self-steer Axle		4,636	6,871	9,105	-1,949	-3,574	-5,198
3	14.6m Active Steering		4,636	6,871	9,105	-1,949	-3,574	-5,198
4	15.65m 2 x Self-steer Axles		3,139	4,126	5,113	-3,447	-6,319	-9,191
5	**15.65m 1 x Command-steer Axle**		**3,139**	**4,126**	**5,113**	**-3,447**	**-6,319**	**-9,191**
6	15.65m 2 x Command-steer Axles		3,139	4,126	5,113	-3,447	-6,319	-9,191
7	15.65m Active Steering		3,139	4,126	5,113	-3,447	-6,319	-9,191
	Road Haulage	**000s tonnes**				**+/- v Base Case**		
		2009	2015	2020	2025	2015	2020	2025
Option								
	Base Case	430,834	438,361	444,633	450,906			
1	14.6m Fixed Axles		440,310	448,207	456,104	1,949	3,574	5,198
2	14.6m Single Self-steer Axle		440,310	448,207	456,104	1,949	3,574	5,198
3	14.6m Active Steering		440,310	448,207	456,104	1,949	3,574	5,198
4	15.65m 2 x Self-steer Axles		441,808	450,952	460,096	3,447	6,319	9,191
5	**15.65m 1 x Command-steer Axle**		**441,808**	**450,952**	**460,096**	**3,447**	**6,319**	**9,191**
6	15.65m 2 x Command-steer Axles		441,808	450,952	460,096	3,447	6,319	9,191
7	15.65m Active Steering		441,808	450,952	460,096	3,447	6,319	9,191
	Total Domestic Unit Load	**000s tonnes**				**+/- v Base Case**		
		2009	2015	2020	2025	2015	2020	2025
	All Options	432,789	444,947	455,078	465,209	0	0	0

This clearly shows how **the IA projected a shift of goods from rail to road of up to 9 million tonnes by 2025, for the scenario where it was assumed that no LST+Rail option became available**.

This represents a 64% reduction in rail freight volume in the targeted markets according to the IA. In terms of the total market for rail freight, 9 million tonnes represents 7% of the total 2023 forecast for rail freight in the 2013 Freight Market Study by Network Rail (FMS). Focussing on the sensitive domestic intermodal sector, 9 million tonnes represents 54% of the FMS 2023 forecast.

A sensitivity test looked at the impact of running longer intermodal trains (17 wagons compared to 14 in the Base Case). This increased the IA forecast of rail volume by around 50%, but this would still represent a reduction of rail freight of 50% in the targeted markets compared to the 'no LSTs' situation.

3.7 ALTERNATIVE IA SCENARIO: RAIL FREIGHT CARRIES LSTS

An alternative scenario assumed that 50' containers and LSTs to carry them could and would be designed and produced. It was assumed these containers would be carried by rail using existing Megafret wagons. Megafret wagons are an advanced wagon designed for intermodal use (see section 7.1). No other wagon options were considered.

In this scenario the cost per container for rail was unchanged from the base case, despite the containers being longer, and so the cost per pallet or per cubic metre for rail freight was reduced. This was a function of the use of Megafret wagons. In normal use, Megafret wagons have "spare" space at the end of each platform. This space would be used by longer containers without adding to train length.

Because this scenario sees rail freight costs per unit of freight fall faster than the fall in costs using LSTs on road, this scenario **results in an increase in rail freight volume of 1 million tonnes per annum by 2025** compared to the reduction of 9 million tonnes assumed in the earlier scenario.

3.8 Sensitivity in the IA intermodal modelling

The very significant 'swing' in the results between the two scenarios is notable.

This extreme sensitivity of rail freight volumes depending on which scenario is selected is, in some ways, an inevitable result as rail freight has a very small share of a very large market. Any change in the relative cost of road or rail results in small changes to the road volume but the same volumes, when carried by rail, represent a large change in rail volume in percentage terms.

Also, the 2011 IA presented most of its results as tonnes rather than tonne kilometres. Tonne kilometres is a more useful measure of demand and traffic. Indeed, the pre-trial Economic Assessment, using the results discussed above, equated the loss of 9 million tonnes lifted by rail to an increase of 3.7 billion tonne kilometres by road, treating all routes equally. In fact, it would be logical to argue that any 'lost' rail freight traffic would be biased to shorter distance routes, where price competition is tightest, which would affect the estimates of tonne kilometres.

3.9 Criticisms of the IA

There have been a number of published objections either to the trial itself, or the analysis on which the original pre-trial IA was based. Some of these related specifically to the issue of the potential intermodal effects of introducing LSTs. We reviewed these to see whether any of the counter arguments they raised were either borne out by the evidence emerging from the trial or our re-appraisal of the pre-trial intermodal work.

Specifically, before the trial began, objections were published by Metropolitan Transport Research Group for Freight on Rail (MTRU) and Rail Freight Group (RFG). Five years into the trial (2017) Freight on Rail produced a report detailing their concerns about the reduction of emissions by LSTs (Freight on Rail).

The key concerns relating to LST competition with rail freight and an assessment of evidence from the trial to-date regarding these has been discussed in relevant places of this report and summarised in Annex A.

Not all of these issues are directed at the intermodal issues, but they need to be understood to appreciate the nature of the work where operators have chosen to use LSTs, as part of understanding their place in the wider road freight market, with which intermodal offerings need to compete.

4 THE INTERMODAL INDUSTRY: TODAY & CURRENT GROWTH ASSUMPTIONS

Having considered how the pre-trial IA considered intermodal effects, we now look at the situation today, seven years on from that original work and DfT assumptions regarding growth.

4.1 INTRODUCTION

Freight traffic on rail generally falls into three broad categories:

- **Movement of inter-modal containers**, this is normally between dedicated intermodal terminals or port facilities;
- **Movement of bulk commodities**, for example construction aggregates, heavy oil or steel billets – this is generally between client owned terminals; and
- **Moving material necessary for the maintenance of the railway** – such movements are generally determined by Network Rail, are operated by the freight companies and use either privately owned loading facilities or dedicated Network Rail facilities.

Most freight traffic is won after a competitive process, which is often not only between rail freight operators, but also includes other mode options (e.g. road, maritime or air).

GOODS TYPES

The types of commodities on rail are often grouped as:

- Intermodal (ie any products in containers that have been moved by water, rail, road);
- Biomass;
- Iron Ore;
- Petroleum;
- Network Rail Engineering;
- Construction and Metals;
- Coal; and
- Other: Industrial Minerals; Chemicals; Domestic Waste; Automotive; General Merchandise

Overall bulk coal, formerly the largest commodity by volume, is forecast to continue its rapid decline, along with steel and some other bulk products. Growth is forecast for construction traffic and intermodal traffic.

Goods types relevant to LSTs

In considering the impact of LSTs, many of the commodities noted above would be unlikely to be relevant to the discussion since they are high density, heavy products, where having additional trailer length/volume does not permit any significant extra goods to be carried due to the 44T Gross Vehicle Weight (GVW) limit.

The trial to date confirms that, as was expected, the primary use of the longer trailers is lower density general merchandise, some light bulk goods and lighter industrial supplies and parts. There have, for example, been no LST tankers or mineral carriers built. This experience is consistent with the IA assumptions in this area.

4.2 RAIL FREIGHT HUB LOCATIONS

To make economic sense, the road-rail freight operation needs to be meeting a demand for goods to move between parts of the country where there are suitable modal transfer hubs. There are intermodal hubs serving key locations throughout the UK, with the majority of intermodal freight moving from ports to inland intermodal terminals. The map below shows the main hubs and the surrounding 25km area.

Apart from showing the locations, this mapping was also used to locate LST trial participants with regular operations that started and ended within the 25km region around these hubs and who therefore might have had an option to consider rail as part of their operation. These operators were then among those approached to take part in the stakeholder discussions later in the study.

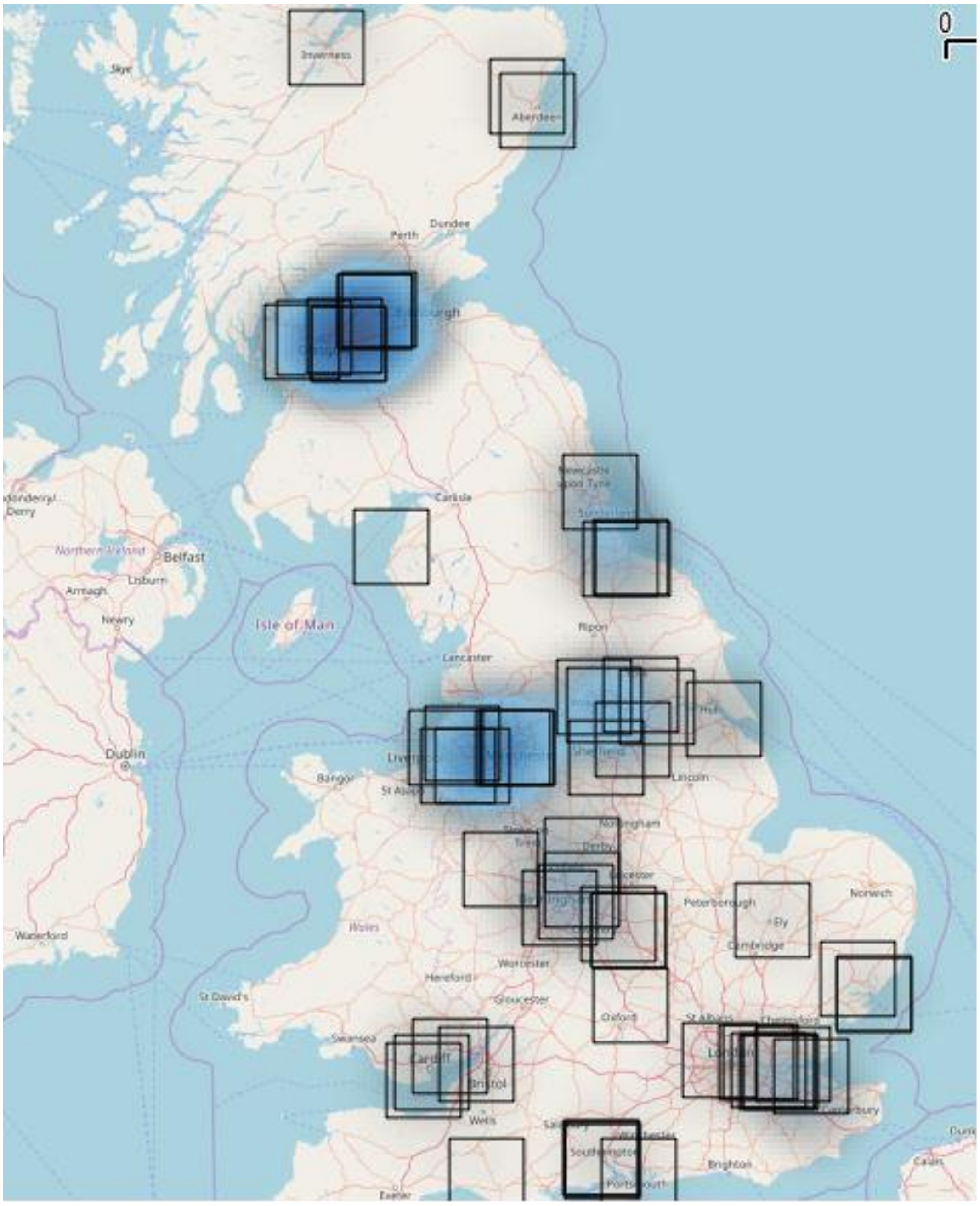

Figure 1: 25 km N/S/E/W around GB Intermodal/Rail Hubs

4.3 CURRENT INTERMODAL MARKET SECTORS AND GROWTH ASSUMPTIONS

It is worth considering the rail freight intermodal market in more detail, to understand which parts of that market could be affected by the introduction of LSTs.

Broadly speaking there are three categories of intermodal rail freight in the UK:

- **Deep sea Intermodal:** the movement of standard ISO shipping containers to and from ports. The containers have typically arrived on ships from the Far East.
- **Channel Tunnel Intermodal:** the movement of trains of containers or swap bodies by rail between intermodal terminals in the UK and intermodal terminals on the continent.
- **Domestic Intermodal**: the movement of containers or swap bodies by rail between intermodal terminals in the UK, but excluding Deep Sea Intermodal containers.

DEEP SEA INTERMODAL

The deep sea Intermodal rail freight market in the UK is long established and successful. Rail competes strongly for medium to long distance movements inland from ports. This is because all deep sea ports have rail terminals, and the ISO containers are well suited to rail transport.

Deep Sea intermodal is also a fast growing market for several reasons including:

- Deep sea volumes of freight through ports has a strong record of growth, boosting demand for all methods of transport to/from the ports.
- Rail freight market is increasing partly because there are more warehouses located near intermodal terminals, particularly at Strategic Rail Freight Interchanges (SRFI). More SRFI = more rail freight because rail has a point to point offer, without any need for long road deliveries at either end.

The 2013 FMS forecasts Deep Sea Intermodal volume to grow from 15.1 Million tonnes and 5.1 Billion tkm in 2011 to 32.7 million tonnes and 10.8 Billion tkm by 2025.

However, this traffic is exclusively in ISO deep sea containers, which are a maximum of 45' long, this traffic should not have any impact from the introduction of LSTs. Longer containers do exist (50' and 53'), but they are not currently moved on ships and there are no plans to do so in the foreseeable future.

CHANNEL TUNNEL INTERMODAL

This is a very small market with significant potential for growth. Rail has failed to penetrate the cross channel market since the opening of the Channel Tunnel for a variety of reasons, including price, service quality, the impact of strikes, and, more recently and significantly, long periods of service closure due to incursions by migrants.

The 2013 FMS forecasted some growth from 0.6 to 1.3 million tonnes.

Again, it is unlikely that this market will be impacted by the introduction of LSTs. Many international hauliers already use draw bar trailers to achieve higher length platforms. Without further EU legislation, LSTs would not be able to drive on most roads in the EU.

DOMESTIC INTERMODAL

In this market, rail freight has a small, but fast growing, share of a very large freight market (including most retail goods). The Domestic intermodal market has currently limited take-up, but is forecast to grow very strongly in the future. The 2013 FMS forecast growth from 2.3 million tonnes in 2011 to 16.6 million tonnes by 2023 (1.1 to 13.1 billion tkm).

In the context of deep sea, channel tonal, domestic intermodal is effectively, the only market where LSTs would currently compete directly with rail freight.

4.4 DOMESTIC INTERMODAL BY CORRIDOR

The table below is an analysis of region to region domestic intermodal rail freight flows (2011 and forecast for 2023), extracted from data used to prepare the 2013 FMS. (2016 FMS data has been published however, does not contain regional breakdowns to allow this to be updated.)

		Channel Tunnel	East Midlands	East of England	Greater London	North East	North West	Scotland	South East	South West	Wales	West Midlands	Yorks and Humber
2010	Channel Tunnel	0	0	0	0	0	0	0	0	0	0	0	0
	East Midlands	0	20	0	1	0	3	585	1	0	0	0	15
	East of England	0	0	0	0	0	5	0	0	0	0	0	0
	Greater London	0	67	0	1	0	7	11	0	0	0	0	0
	North East	0	0	0	0	0	3	0	2	0	0	0	0
	North West	0	6	4	5	3	31	68	12	5	147	1	7
	Scotland	0	443	0	9	0	89	368	0	0	0	182	2
	South East	0	32	3	177	0	13	0	7	16	0	2	7
	South West	0	0	8	0	0	6	0	1	0	0	4	0
	Wales	0	0	0	0	1	16	0	0	0	0	5	0
	West Midlands	0	0	1	0	0	2	180	6	0	1	19	0
	Yorks and Humber	0	1	0	0	0	99	11	0	0	11	0	4
2023	Channel Tunnel	0	40	0	0	0	0	0	0	0	2	0	0
	East Midlands	2	32	175	110	238	680	1,850	335	291	156	161	459
	East of England	0	173	10	39	139	720	387	100	274	78	434	592
	Greater London	0	78	0	0	0	0	10	0	0	0	0	0
	North East	0	218	180	13	0	63	51	152	86	22	224	16
	North West	0	429	487	35	25	133	552	456	163	108	103	24
	Scotland	0	1,274	163	36	17	482	425	232	89	16	560	322
	South East	0	181	47	140	86	431	322	38	65	19	270	412
	South West	0	204	152	16	48	186	203	80	103	7	105	279
	Wales	0	89	47	5	20	51	42	25	11	2	15	63
	West Midlands	0	96	329	33	168	123	760	343	102	10	23	153
	Yorks and Humber	0	219	394	26	7	43	457	498	268	66	124	9

Table 4: Domestic intermodal rail freight flows 2010 / 2023

Freight origin is on the left and destination across the top. Figures are thousands of tonnes per annum

Data in pink and red represents relatively high volumes of rail freight (greater than about 170 thousand tonnes per annum). A key observation is that there are imbalances between flows north to south and south to north – with more travelling north than south. We note the impacts of this on intermodal decisions in Section 6.3.

Growth in this sector requires a significant growth in the area of warehousing near strategic rail freight interchanges (SRFI). Rail freight can compete for traffic over short distances if both the origin and destination are on an SRFI (and rail paths are available for freight).

Currently services to and from DIRFT, near Rugby, demonstrate the potential, with 5-6 trains per day between DIRFT and Scotland, and daily trains to Wales and London. The number of trains is partly limited by demand, but also by the available 'paths' for freight trains alongside the rest of the rail network traffic. To give some context to this, just one of the companies interviewed said that their throughput every night by road trailers was 300-400 deliveries each night.

While this market has the strongest potential to grow, it is also the market which is most sensitive to changes in rail or road cost, not least because it is reasonable to assume that the traffic already carried by rail is in markets where rail is strongest, and that new markets are increasingly more marginal in terms of costs versus revenue (diminishing returns).

The base case IA forecast of a loss of 9.1 million tonnes (and 3.7 billion tkm) of rail freight compared to industry forecasts. While this is a small percentage of total rail freight, all of the losses would, implicitly, come entirely from the domestic intermodal market, representing a reduction of around half of the forecast market for domestic intermodal rail freight by 2025 (as described earlier). In contrast, the IA model assumed an increase of 1 million tonnes if rail freight takes up the opportunity to use longer units, an increase of 6% over the FMS forecasts, and representing a significant boost to domestic intermodal.

This variability between do nothing and do something is typical of an economic model such as the GBFM. In practice, the impact of LSTs will be more nuanced within sub sectors of the domestic freight market and by corridor.

In the following sections we present revised rail freight demand forecasts, and then look more closely at key factors effecting modal choices and the impact of LSTs on the intermodal market.

5 REVISED RAIL FREIGHT DEMAND FORECASTS

5.1 PURPOSE

Network Rail has recently published an update of its "Rail freight forecasts: Scenarios for 2023/24, 2017". These scenarios were produced because there have been several exogenous developments that were not anticipated in the 2013 FMS projections which have had the effect of adversely affecting the competitive position of rail freight in the UK. These include:

- Government energy policy changes resulting in a faster reduction in the role of coal fired power stations and a lower take-up of biomass than expected because of cuts in the level of financial support available
- Lower fuel price growth and wage growth than expected. Fuel prices have declined in real terms. The projections had been based on the then projections being made by the DfT.
- Lower rate of build-out of rail served warehousing sites than expected, consequent on the 'lost years' of the financial crisis which delayed projects that continue to be 'live'.

Unlike the FMS there is not one central scenario in the new document. There are 4 separate scenarios intended to give a range spanning factors favouring rail to factors disfavouring rail, and low market growth to high market growth:

- 2023/24 scenario A2: Factors which favour rail relative to road, with low market growth Rail freight forecasts: scenarios for 2023/24
- 2023/24 scenario B2: Factors which favour rail relative to road, with high market growth
- 2023/24 scenario C2: Factors which disfavour rail relative to road, with low market growth
  2023/24 scenario D2: Factors which disfavour rail relative to road, with high market growth

As with the FMS, scenarios A2, B2, C2 & D2 are NOT capacity constrained. In reality, unless more capacity is secured for rail freight at capacity-constrained locations on the network, it is unlikely that high quality paths along preferred routes will be available, and the unconstrained growth forecast in some scenarios may not be achievable.

Additional forecast scenarios (A3 & B3) have also been run incorporating a simple approach to capacity constraint - whereby required rail freight capacity through 7 known bottlenecks across the network is limited.

5.2 FORECASTS FOR DOMESTIC INTERMODAL

The forecasts for tonnages lifted for 2023/4 are reproduced in the following table:

	All commodities		Port Intermodal		Domestic Intermodal	
	T (thousand)	Tkm(million)	T (thousand)	Tkm(million)	T (thousand)	Tkm(million)
2023 FMS	127,000	32,500	34,100	11,000	16,600	7,100
2023 A2	104,574	23,923	24,252	8,165	8,009	3,466
2023 B2	128,175	28,472	27,133	9,108	8,606	3,726
2023 C2	78,371	17,502	15,320	5,279	3,281	1,526
2023 D2	97,052	21,152	17,077	5,885	3,493	1,631
FMS to B2	0.9%	-12.4%	-20.4%	-17.2%	-48.2%	-47.5%

This clearly shows that, compared to the 2013 forecast, the new forecasts for domestic intermodal traffic are over 48% lower. The report does not explicitly summarise the reasons for this change. However, for intermodal it seems to be a combination of changed assumptions on track access charges and fuel prices and, importantly, reduced assumptions about the pace of development of Strategic Rail Freight Interchanges (SRFI).

SRFIs are a key driver of intermodal growth. More SRFIs provides more opportunities for direct DC to DC rail freight. Rail freight competes most strongly against road when DCs are at or near SRFIs.

This has an important impact on the corridors for which rail freight is most competitive. With SRFIs at both ends of the journey, rail can compete over shorter distances. If one end of the journey needs a long road leg to a location remote from an SRFI, then rail is less likely to be competitive on price.

Currently, domestic rail freight is really only showing its potential on flows between DIRFT and Scotland. This is a long distance route, with major retail DCs located on the DIRFT estate. In Scotland road delivery is required, but the rail price is still competitive.

6 THE MALCOLM GROUP EXPERIENCE OF LSTS

Perhaps the most important development relevant to this topic, since the pre-trial work, has been the development of a viable LST+50’ container design by the Malcolm Group.

We met with the Malcolm Group intermodal team at their base in Daventry to explore their experience as a starting point for our planned conversations with a wider group of stakeholders (January 2018).

Some views expressed in this section reflect the discussion with Malcolm Group at the time, rather than firm conclusions that we endorse at the end of the study.

6.1 MALCOLM GROUP EXISTING RAIL FREIGHT OPERATION

Malcolm Logistics is a Division of the Malcolm Group and is an independent provider of third party logistics services. They offer fully integrated Road, Rail, Warehousing, and Bonded Warehousing services throughout the UK. Malcolm work in many sectors, typically with rail integrated with road to offer the coverage required.

The rail operation currently runs 12 northbound services per week and 12 southbound, 7 days per week to Grangemouth and 5 days a week to Mossend. Trains run with up to 17 twin platforms, 34 intermodal units either 45ft or 50ft. On average they use 14 twin platforms, but is based the demand, 17 is the maximum length of train currently accepted.

Generally, the traffic in the containers is being moved between manufacture and distribution centre, or distribution centre direct to store, or national distribution centre to regional distribution centre.

6.2 MALCOLM USE OF LST+RAIL IN THE TRIAL

Malcom operate a number of conventional LSTs in their day to day road-only operations. They then also developed and built a longer (50’) intermodal unit for use in combined LST/Rail Freight Operations. The container was developed in conjunction with SDC who also built the trailers. A fleet of 19 of these telescopic skeletal LSTs that, when not in use with the 50’ containers, can be collapsed back to a standard length to carry the regular intermodal unit lengths, at which point they operate outside of the LST Trial requirements.

These specialist LSTs operate in and out of the railheads at Daventry in England and Grangemouth in Scotland. Malcolm have transported 17,000 individual road legs via LST in the last four months.

Based on their experience, Malcolm note a number of limitations on the use of LST's for rail. Some of these points also apply more widely to LSTs in general, but are amplified in a road-rail context.

- **Customer acceptance**

Continuous flow load operations such as glass, retail and biomass are most suited to the opportunities LSTs provide. Where there are defined loads, defined orders, defined suppliers, defined locations, defined customer base, changing the supply chain to being able to accept 30 pallets rather than 26 can prove difficult to implement, especially when this may not be a permanent change to the operation. This would be critical for the longer term use of LSTs.

- **Trial status**

Building on the previous point, given that a move to a larger pallet load will require significant changes in supply chains, the fact that this is potentially a temporary change requiring a move back to 26 pallets once the trial finishes has prevented some customers from taking LSTs on board. Also related to trial status, operators are reluctant to replace their ageing LST trailers in case this is only a temporary change.

- **Weight**

While some operations lend themselves to the larger trailers, the product type is also a key factor. Some product types cannot make use of the extra space due to the weight constraints for example soft drinks, manufactured goods and foodstuffs. Several products are more likely to weight out before they cube out. Not only is this true of any LST usage, but is especially the case for intermodal use of LST where an extra weight allowance is needed for the container and skeletal trailer, compared to a standard LST, and therefore the overall weight is compromised. This concern could be addressed by increasing the weight allowance for trucks making deliveries of LST units from rail terminals.

- **Cube**

Double decker road trailers present strong competition for rail, to the extent that, even between the Midlands and Scotland, where goods can be moved by road in double decker trailers (which is usually constrained by the loading dock/systems at either end, and any height restrcitions) then rail cannot compete on price. The availability of LST double decker trailers therefore may not result in any loss for rail freight as the goods they would attract, already move by road.

6.3 COMPETITION FOR LSTS ON RAIL

There are a number of key issues around LSTs on rail, these are explored further below:

- **Long term supply verses short term demand**

The challenge for intermodal is meeting day to day operational demand versus the need for longer term contracts. Rail and intermodal generally require a longer term commitment (12 months) by the operator, given the level of investment in equipment needed. As a result they are less able to respond to the day to day volume pressures in the way road haulage can. Even if rail were an option, many operators cannot commit to such consistent and regular volumes and therefore run the risk of paying for unused space on trains.

- **Intermodal coverage**

Malcolm have explored intermodal routes other than DIRFT-Scotland, but there are difficulties in getting the committed base volume needed to make it viable. For example, Yorkshire to Scotland, Midlands to North East, North West-Midlands – the facilities are there, rail could compete on price, overall demand appears to be there, but services have not started because of the risk of not filling a train.

- **Total journey cost**

Service levels achieved are high, with 97% on time arrival – meaning that reliability is comparable to or better than road for the intermodal routes. However, when comparing costs, while the rail portion of a journey is significantly cheaper it is the length of the required road legs at either end that can make the overall journey more expensive. In addition, costs need to cover a certain degree of empty space. Therefore, rail is naturally limited to specific industries and geographies – i.e. very close to rail hubs.

- **Intermodal LST Wagon design**

To date there is no real alternative to the Megafret. Freightliner have some options that carry 53ft containers on a 60ft platform, however, they are not as efficient meaning that LST's on rail are not always a viable economic option. The defining requirement is that for flexibility, the wagons must be able to take both 45ft and 50ft containers.

- **Environmental impact**

Environmental considerations are becoming less of an issue as modern trucks have reduced emissions. Rail solutions were traditionally 'sold' on environmental benefits but as HGV engines have become cleaner (Euro 6) the emissions benefits of rail have diminished. However, using rail reduces road congestion and road accidents, which are key benefits.

- **HGV driver shortage**

An ageing UK driver force for road haulage, with reduced ability to use EU labour, could favour rail, meaning that some businesses are considering rail as a more viable option and this could influence changes in volumes. There are two effects here. The aging driver force presents the industry with a worsening driver shortage as the current drivers retire, but also, it may be that older drivers are less willing to operate regularly over very long distances, with overnights, if more local work is available. On the other hand, to some extent rail can add wagons to trains to meet rising demand without much impact on resources.

- **LSTs and Double Deckers**

Specifically, the main competition for LSTs with an intermodal unit, is road transport where the potential for using the longer length double decker trailers can compete with intermodal LSTs. Malcolms suggest these are mainly used for high street retailers' DC to DC trunking operations.

- **North south freight flow imbalance**

For the Anglo Scottish haulage operation, the challenge of using LSTs is greater. Imported and exported product flows have different configurations. Imported product destined for Scotland, generally arrives at the terminal in a UK lorry format and has come through another distribution centre in the UK. When Scottish businesses export they do so in shipping line configuration because they are going out of the country. These two very distinct flows makes it very difficult to get back load returns, creating a massive imbalance and adding cost to the intermodal operation. Alongside this, if forestry products travel south by road and a timber trailer is used there is no backload, sometimes a covered wagon is used to try and address the imbalance.

6.4 MALCOLM'S VIEW OF THE FUTURE OF LSTS AND RAIL FREIGHT

Payload will continue to be an issue for the wider use of LST and rail. Rail can take higher weight but then the truck and trailer weight alongside the product weight prevents payload being compatible with road transport. More often than not road is required for the first and last legs.

Increasing the weight limit for certain routes and destinations would allow for greater use of rail and LSTs, indeed for LSTs in general, but this option would be resisted by most of the rail freight industry.

Malcolm believe that LSTs do have a place in the industry, including in combination with rail, to increase capacity, but it will take time to change customer access, supply chains procedures and operators need confidence that the longer trailers will be a permanent feature for the haulage industry.

Greater influencers on the use of rail is the potential for driverless trucks and/or driver shortages, LSTs have the potential to increase rail use although the issue of weight will continue to constrain the opportunity.

KEY POINTS FROM THE MALCOLM OPERATION

- A viable container has been developed which is 50' long and able to accommodate 30 pallets, 4 more than a 45' unit
- These are handled using standard reach stackers
- They are carried on standard Megafret wagons
- They are particularly competitive for general goods

- One constraint is that many customers order loads in multiples of 26 pallets, a standard road load
- For high cube traffic, double deck LST road vehicles compete strongly
- For heavy weight products rail should have a strong advantage, but intermodal LSTs cannot carry the full weight payload due to road weight restrictions at the start and end of the journey

GROSS LADEN WEIGHT DEROGATION

Malcolm's highlighted that rail has the potential to carry high payloads when measured by weight. But once containers are unloaded they are limited by HGV weight restrictions like all road goods traffic. This prevents rail from using its payload advantage, and actually puts rail at a disadvantage for heavy loads because the combination of a trailer and a container is heavier than a standard road trailer.

Where distribution centres are located on SRFIs, delivery within the SRFI is not subject to road legislation, and heavier loads could be carried without any change in the law where both ends are SRFIs (although this is likely to be for a minority of the total potential market)

Some representatives of the rail industry have argued for a GVW derogation to 48 tonnes from the standard 44 tonnes, but only for vehicles delivering to or from rail heads. The suggestion is that this would be capped to within 48 miles or kms of a rail head, and so the concept is known as "48 for 48".

Others in the rail industry have concerns about derogation, stemming from past experience of derogation. The move from 38T GLW to 44T GLW was initially a derogation for rail, but quickly moved to cover all vehicles, eliminating rail's "level playing field" benefit.

Russell Group plans for LST+Rail

In 2018 Russell Group, a similar logistics business to Malcolm both being major intermodal operators in the UK market, announced that they too would be investing in new LST containers and trailers.

7 WAGON AND UNIT TYPES COMPARED

In this section we assess the extent to which the LST+Rail solution demonstrated by the Malcolm Group operation could be expanded, given the availability of compatible rail wagons.

This is important as, if the emerging demand for combined LST and rail operations (within the other constraints such as rail path availability) exceeded the available wagons, then this would limit the benefits that could be claimed from the technical availability of such operations.

We also look at other rail freight options using standard containers.

7.1 THE MEGAFRET WAGON

Figure 2: Megafret Wagon (from VTG Brochure)

The Megafret wagon is the only wagon available in the UK that can efficiently carry a 50' LST intermodal unit. The wagons are low platform wagons permanently coupled into pairs. The Megafret is one of the most advanced railcar designs for use in combined traffic. With a loading deck height of only 825 mm it is possible to transport 9'6" containers (Highcube) through the Channel Tunnel into European terminals. This was its original main function.

Each platform of the wagon is 16.1 metres (52.84 feet), designed to carry two standard swap bodies per platform. Each platform can therefore carry one 50' LST container, a total of 2 containers per wagon. The tare weight of a Megafret is 39t and the axle load is 16t (at 120kmh). Therefore the payload (including the weight of containers) is 89t. At 44.5t per container this is well above the current limit for containers carried by road.

The Megafret carries its containers in a slight dip, or well, in the wagon floor meaning that some of the length of the wagon is "empty" above each bogie. When carrying 50' LST containers, effectively 16% of the train length is the space between the containers.

When carrying other types of container the Megafret has even more empty space. It can carry the same number of 40' or 45' containers as 50'. Using this wagon as the base case in the IA exaggerates the efficiency of the Megafret because, while it is very efficient for LSTs, it is not so efficient for other size containers.

7.2 OTHER WAGONS

A variety of other wagons can carry 40’ or 45’ containers. Many of these are optimised for use to and from deep sea ports where the ability to mix 40’, 45’ and 20’ units has led to a standard wagon able to carry 1-3 20’ units. These wagons cannot carry 50’ LST containers.

A relatively new design is the Ecofret wagon. This has been optimised to carry 40’ long high cube containers with minimum space between each container, with only 8% of ‘empty’ space when carry 40’ containers.

Comparing these wagon types in typical 600’ or 750’ intermodal trains, while the Megafret with 50’ containers is an extremely efficient wagon, a train of Ecofret wagons carrying 40’ containers can accommodate slightly more pallets.

Figure 3: Ecofret Wagon showing short gap between containers

Table 5 provides a comparison of wagon types

Table 5: Comparison of wagon types

Wagon Type	Ecofreight Double	Ecofreight Triple	Twin Flat Wagon FEAB	Megafret
Tare Weight	42	21	20	39
Payload	61		82.5	89
GLW	103		102.5	128
Length	28.018	40.82	40.65	36.44
Length (single)	14.009	13.60666667	20.325	18.22
Deck Height	0.98			0.825
Units				
50'	0	0	2	2
45'	0	0	2	2
40's	2	3	2	2
20's	4	6	6	4
Roundown Wagons				
200	7.00	4.00	4.00	5.00
330	11.00	8.00	8.00	9.00
400	14.00	9.00	9.00	10.00
600	21.00	14.00	14.00	16.00
750	26.00	18.00	18.00	20.00
50'				
UNITs				
200	-	-	8.00	10.00
330	-	-	16.00	18.00
400	-	-	18.00	20.00
600	-	-	28.00	32.00
750	-	-	36.00	40.00
Pallets				
200	-	-	240	300
330	-	-	480	540
400	-	-	540	600
600	-	-	840	960
750	-	-	1,080	**1,200**
45'				
UNITs				
200	-	-	8.00	10.00
330	-	-	16.00	18.00
400	-	-	18.00	20.00
600	-	-	28.00	32.00
750	-	-	36.00	40.00
Pallets				
200	-	-	208	260
330	-	-	416	468
400	-	-	468	520
600	-	-	728	832
750	-	-	936	**1,040**
40'				
UNITs				
200	14.00	12.00	8.00	10.00
330	22.00	24.00	16.00	18.00
400	28.00	27.00	18.00	20.00
600	42.00	42.00	28.00	32.00
750	52.00	54.00	36.00	40.00
Pallets				
200	336	288	192	240
330	528	576	384	432
400	672	648	432	480
600	1,008	1,008	672	768
750	1,248	1,296	864	960

7.3 WAGON AVAILABILITY

Among the objections to the widespread introduction of LSTs is a view that rail's response would be limited by the lack of suitable wagons.

Presently, the only wagon which can carry LST containers is the Megafret. The majority of Megafrets operated in the UK are owned and leased by a subsidiary of VTG, the largest wagon operator in Europe.. On the continent hundreds more Megafret wagons are operated by other wagon operators and freight operators.

VTG currently operate circa 750 Megafret wagons split between operations in the UK and operations on the continent. In the UK these are used on domestic intermodal services and on deep sea services. Over time, the use of Megafrets on deep sea services is being supplanted by the Ecofret wagon, also VTG operated. This will release a number of Megafrets for domestic use. VTG is looking for ways to make use of surplus Megafret wagons, including possibly shortening them to make them more efficient when carrying 40' or 45' containers, but of course some could, instead, be retained for use in conjunction with LSTs, carrying 50' containers.

Megafrets are internationally capable, i.e. can operate in the UK and in mainland Europe. Consequently, there is movement of wagons between both areas depending on where the demand exists.

VTG were consulted during the study, and they confirmed that Megafrets could be made available for use carrying LST type containers.

Over the medium to longer term, domestic intermodal, deep sea intermodal, and aggregates traffic are all forecast to grow strongly. There is no significant pool of unused wagons to meet this strategic growth: invariably wagon operators and freight operators invest in new wagons to meet demand. Shortage of wagons may deter ad hoc rail freight opportunities, but wagon supply has never been a constraint to rail freight growth and is not seen as a constraint in DfT or Network Rail forecasts. The type of wagon built for domestic intermodal traffic will depend on market demand – and if demand is to carry containers longer than 45' then there is no reason to believe that the wagon leasing industry will not meet that demand.

8 STAKEHOLDER ENGAGEMENT – DRIVERS OF MODAL CHOICE

Following the desktop studies and Malcolm Group discussions, we consulted with a range of stakeholders. Some of these were individual interviews, others were discussions as part of wider meetings.

8.1 SCOPE OF DISCUSSIONS

The aim of the discussions was to understand the implications, from an operator perspective, of the introduction of LSTs to the market on decisions to use or not to use multimodal freight solutions.

Based on our experience of LSTs we know that there are certain product types, routes and geographies that have the greatest potential for modal shift we therefore based our discussions with stakeholders where LSTs may present the greatest opportunity. We looked for organisations that currently operate LST routes between locations that already have intermodal connections.

8.2 WHO WE SPOKE TO

Three of the operators already use rail to some degree – these are highlighted in bold.

Operators:

- Bibby Distribution Ltd
- **Culina Logistics Ltd**
- **John G Russell Transport Ltd**
- Royal Mail Group
- Hayton Coulthard
- Lloyd Fraser Group
- Maxi Group Ltd
- **Malcom Group**
- The Alternative Parcels Company Limited
- White Logistics and Storage LTD
- Tandem Transport Limited

Other Stakeholders:

A meeting was held on 25th January with RHA, Freight on Rail (Part of Campaign for Better Transport), TfL as well as DfT the discussion of which have been incorporated into this paper.

The issue was discussed at the CILT Rail Freight Forum and comments from there have been incorporated into this report.

VTG were consulted and their thoughts have been incorporated in the wagon availability section.

A brief conversation with FTA was undertaken but were unavailable for inclusion in the stakeholder session

8.3 THEMES

There are many reasons behind freight decisions many of which are unrelated to the introduction of LST's, the ones quoted as part of the interview process are highlighted below. Some of these points were also validated through a number of research papers including Freight Modal Choice Study (2010) and DfT Rail Freight Growth & Modal Shift Study 2016.

- **Service (lead times, time slots)**

  The operators interviewed highlighted that the nature of their supply chains mean than lead-times are short which does not always allow for significant forward planning. This combined with often very specific time slots from their customers, means that often timeslots for trains cannot meet these needs. The service offer is not 24/7.

- **Concerns of reliability**

  While anecdotal, there was a fear expressed by those interviewed who were currently not using rail that rail failures would result in significant customer service issues.

- **Location and accesses:**

  Interviewees confirmed that limited network coverage and terminal issues mean that options for road operators are not available.

- **Flexibility**

  Many of the operations highlighted the need for flexibility within their businesses, noting that volumes and types of product change regularity (as do destinations). This, they felt didn't support rail as a solution.

- **Product sensitivities**

  Product qualities such as product life, fragility and size were quoted as reasons for rail not being an option for the operators interviewed.

- **Large, regular consignments of suitable goods**

  The average number of vehicles specified to each operator licence is 4.3 - demonstrating the large proportion of smaller operators in the industry. Further to this, most freight operators (87%) employ fewer than 10 people and only 55 road haulage companies employ more than 250 workers. This indicates that many HGV operators do not operate with regular, large volumes of committees that lends itself to rail movements. This was supported by the interviews.

- **Longer distance**

  Rail is known to be proven where the distance is long – of those interviewed, the journey distances used by LST's weren't conducive to rail – or certainly not in the volume to make it viable.

- **Other factors** – that may in future affect take-up of LST intermodal compared with road based solutions and standard intermodal, include:
  - Driver shortages may encourage businesses to revisit intermodal solutions
  - Further technological developments – which may lead to LST Intermodal becoming more or less attractive compared with other solutions.
  - Further development of UK rail and intermodal hub.

While price is clearly a key driver, what appears to be the overriding factor that influences decision makers is service. It doesn't matter how cost effective the solution may be if the customer wants the delivery by 9am and the solution can't provide for that, then it's not a viable solution.

We have summarised the issues into a set of key themes identified as part of the interview process, including the engagement with Malcom, in the table overleaf.

Table 6: Limits on the relationship between LST availability and rail freight take-up

Themes	Summary
Theme 0: The introduction of trial LSTs on the trial has not been a factor in decisions to use/not use rail	**The availability of LSTs with a slightly larger load capacity, is a second order influence on their decisions. The primary influences are in Themes 1-4.** All operator stakeholders involved said that LSTs have not changed their decision making in relation to rail. None of those interviewed had considered water as part of their multimodal options.
Theme 1: Limited number of rail-connected distribution centres (depots)	Rail's major offer is as a replacement for depot to depot road deliveries, but few road depots are currently rail connected. Road use will therefore often be required at one or both ends of the rail leg adding cost, complexity and risk. The logistics of getting to and from rail hubs affects LSTs and standard trailers equally.
Theme 2: Highly variable demand for freight requires flexibility	Even if rail meets all the requirements of an operator from a cost, location and access perspective, even in optimistic forecasts rail is still a minority share of long distance freight due to an overriding need for flexibility. This affects LSTs and standard trailers equally.
Theme 3: Collection and delivery time criticality	Pallet trunking, a major sector that has adopted LSTs, would not, as it is currently set up, find rail an attractive alternative. For these operations, there are about 300-400 drops per night into the central depots and the role of redistributing the product across the network of operations is highly time critical and so it is felt that rail wouldn't be appropriate. In addition, volumes vary massively which would be difficult to plan for in the rail market. This makes road (with or without LSTs) a more attractive option than rail.
Theme 4: LSTs offer insufficient economic gain to overcome other variables affecting modal choice / shift decisions	For price to become a sufficiently dominant factor to move freight from rail to road, the additional load per vehicle needs to be much more than the 15% or less offered by LSTs, especially when a joint LST+Rail solution exists, offering the best of both worlds. The industry stakeholders identified double-deck trailers, where they can be used, as the more direct competitor to rail, since they offer double the number of pallets per wagon.

9 SUMMARY POINTS AND NEXT STEPS

9.1 SUMMARY POINTS

This study has assessed whether the availability of LSTs would have a material effect on the amount of intermodal freight movement, given the increased capacity of the LSTs compared to other standard trailers.

Forecasts in the 2011 IA were very sensitive to assumptions about the take-up of LSTs for road haulage, types of goods carried and on what routes, and the availability of a Rail+LST intermodal option. However, the IA was necessarily high level. The market is more complex and is affected by many more factors that drive modal decisions than the modelling could account for – the market has also been developing in a number of ways since that work was carried out.

- **Rail+LST intermodal option:** The pre-trial Impact Assessment (IA) suggested that introduction of LSTs could significantly reduce forecast volumes of rail freight in the key domestic intermodal sector. However, IF the rail industry responded by carrying 50' containers on Megafret wagons then the IA suggested that rail volumes could actually increase above forecast levels. Two recent developments are relevant to this:
  - Malcolm Group have now introduced a 50' unit, carried on Megafret wagons, and delivered using adaptable LSTs and
  - New Ecofret wagons, allow for more efficient transport of standard containers by rail.

  Industry concerns that only one leasing company owns Megafrets and that this would hinder the exploitation and widespread use of larger intermodal units should now be allayed as more than one company now owns megafrets, and additional megafrets are becoming available as they are being displaced from other services.
- **Operator decision making**: A number of factors, unrelated to the availability of LSTs, or to the availability of a Rail+LST intermodal option, dominate modal decision making. We have identified five themes in operators' responses these are shown in Table 7:

Table 7: Five themes from operators about road vs rail decisions

Theme 0	The introduction of the trial LSTs on the trial has not been a factor in decisions to use/not use of rail. The availability of LSTs with a slightly larger load capacity, is a second order influence on their decisions. The primary influences are in Themes 1-4
Theme 1	The limited number of rail-connected distribution centres (depots) remains a major constraint on any decision to use rail
Theme 2	Highly variable demand for freight requires flexibility (which road can currently meet better than rail)
Theme 3	Collection and delivery time criticality for many commodities (which road can currently meet better than rail).
Theme 4	For price to become a dominant factor, such that freight will move from rail to road, the additional load per vehicle would need to be much more than the saving of 15% or less offered by LSTs. Double-Deckers are the competitor to both LST and rail (rather than LSTs competing with rail).

Other factors - Other factors that may affect take-up of LST Intermodal compared with road based solutions and standard intermodal, include:

- Driver shortages may encourage businesses to look more closely at intermodal solutions
- Further technological developments – which may lead to LST Intermodal becoming more or less attractive compared with other solutions.
- Further development of UK rail and intermodal hubs.

OVERALL CONCLUSIONS

1. **Overall where routes operating LSTs (during the trial) might have competed with rail at a limited level, rail has been able to respond effectively and integrate LST operations into its business model.**
2. **This LST+Rail option will not allow rail to increase its forecast volume, but is effective enough to avoid rail losing potential traffic to LSTs.**
3. **The effect of introducing LSTs can currently be regarded as neutral or at least a second order influence on operator's modal choice.**

9.2 POSSIBLE FINAL STAGE OF WORK

We may need to revisit the conclusions on the impact of LSTs on intermodal freight in the light of revised take up forecasts from the trial data and take further factors into account in the scaling up of trial results to national projections, if DfT plans to assess the impact of LSTs over a long timescale (10-20 years).

The key question to consider would be whether the expansion in strategic rail hubs and associated rail paths might open up the range of routes over which LST+Rail operations might be considered such that growth might be limited by factors such as wagon availability, within the timeframe of any modelling.

We will discuss the possible need for such work with DfT later in 2018 as part of planned work to 'scale up' the trial results to a hypothetical wider roll out of LSTs in GB.

ANNEX A: REVIEW OF PUBLISHED OBJECTIONS

There have been a number of published objections either to the trial itself, or the analysis on which the original pre-trial IA was based. Some of these related specifically to the issue of the potential intermodal effects of introducing LSTs. We wanted to review these to see whether any of the counter arguments they raised were either borne out by the evidence emerging from the trial or our re-appraisal of the pre-trial intermodal work.

Specifically, before the trial began, objections were published by Metropolitan Transport Research Group for Freight on Rail (MTRU) and Rail Freight Group (RFG). Five years into the trial (2017) Freight on Rail produced a report detailing their concerns about the reduction of emissions by LSTs (Freight on Rail)[2].

The key concerns relating to LST competition with rail freight are summarised below. Not all of these issues are directed at the intermodal issues, but they need to be understood to appreciate the nature of the work where operators have chosen to use LSTs, as part of understanding their place in the wider road freight market, with which intermodal offerings need to compete.

LOAD FACTOR

One of the expected benefits of LSTs is a reduction in vehicle kilometres as a result of increased load factor. Industry groups were concerned that this would not materialise due to weight restrictions and that the road industry would lobby for higher weight limits to go with the increased trailer length (MTRU).

Linked to weight restrictions, industry groups questioned the utilisation of LSTs and argued that the introduction of LSTs could add to the 50% of trucks which already run only partially full as a result of weight or other constraints. It was also argued that previous purchasing figures when truck sizes/weights were increased, indicate hauliers tend to purchase the largest vehicle available and use it for both large and small jobs leading to an increase in part loading. The argument was that they would do the same with LSTs (Freight on Rail).

The evaluation of the longer semi-trailer annual report (2016), details utilisation by deck space covered and the figures present a different picture. Figure 4 indicates that LSTs have been 100% full for 34% of their distances travelled and 54% of journeys have used the extra length. A trailer is categorised as 100% full when an operator cannot load another unit of goods (cage or pallet) onto the trailer. The trial data also notes that only 2% of operations was constrained by weight.

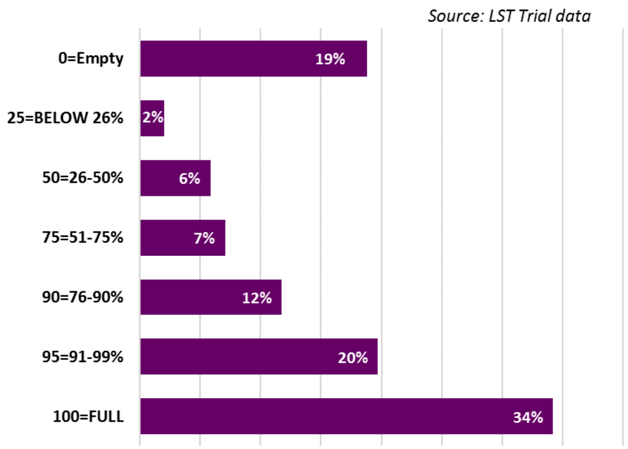

Figure 4: LST km by Deck% covered

Trial data also indicates that LSTs ran empty for around only 18% of the total distance covered. In comparison to the average figure for GB articulated HGVs in 2013-2015 of 29%, this is considerably lower, suggesting that most operators on the trial are choosing LSTs to service their high load factor routes with the capacity to fill the trailer. In addition, the report notes that a substantial portion of the empty running is in the retail sector, where the empty return leg will form part of a

---

[2] Rail Freight's role in the Government's emissions reduction plan- Freight on Rail- Philippa Edmunds 07.2017

Review of Government proposals for Longer Semi Trailers (LSTs)- Metropolitan Transport Research Unit- June 2011

Consultation on Possibility of Allowing an Increase in the length of Articulated Lorries- Response from Rail Freight Group- June 2011 loop journey in which the outbound leg would have been full and the return empty, regardless of the trailer length.

The argument that all operators will, over time, naturally migrate to have all their fleet at the maximum available size is based largely on past experience of increases in maximum Gross Vehicle Weight (GVW), up to the present 44t limit. This trend is key in the competition with rail, where the superior load limit on rail over road transport is important. However, Risk Solutions' current view – based on the ongoing operator survey – is that there are many other factors involved in moving to LSTs and the trial participants see very clear scenarios where the longer trailer is a benefit and others where it has no value. The situation is more akin to the introduction of taller, dual deck trailers than the past GVW increase, since the external size and dynamic envelope of the vehicle limits their use to roads and depots where they can be accommodated efficiently and safely.

The current conclusion is that the trial evidence to date is of most operators only electing to use LSTs where they are most efficiently deployed.

PRE-TRIAL IA ASSUMPTIONS LST BENEFIT CALCULATION

Industry groups raised several concerns regarding the pre-trial IA assumptions, questioning whether less rail traffic would translate into fewer train kilometres or whether this could lead to an increase in empty running with the same train kilometres travelled. In other words, the IA assumed that rail costs savings would be proportionate to the volume of rail freight lost. Opponents argued that rail costs are fairly fixed, and so a reduction in forecast rail volume would result in a lower percentage reduction in rail costs. Opponents pointed out that omitting 50% of rail cost savings would mean an overall social disbenefit. (MTRU).

It would be wrong to assume that a 9% fall in forecast rail demand would lead to a reduction of 9% in volume on each train operated. In practice, for domestic intermodal routes, the main impact would be to limit the corridors on which rail could compete successfully. There would be little impact on longer distance corridors, whereas there could be significant impact on shorter distance corridors leading to a reduction in the number of trains. This would suggest that rail costs would actually be reduced at a similar rate to the reduction in demand.

LONGER INTERMODAL UNITS

The IA proposed longer intermodal units as a measure to mitigate the introduction of LST.

It was commented that although Megafrets can utilise longer intermodal units, only one leasing company owns Megafrets. There was concern that these issues would hinder the exploitation and widespread use of larger intermodal units. Instead it was proposed that DfT should explore the development of longer intermodal units from the design stage into production.

In line with this, industry reports did not view the mitigating measures as sufficient for rail freight, proposing gauge enhancement to allow Megafrets and longer unit operation on additional routes. (RFG)

A wider discussion of the available rail freight wagon options is given in the main body of this report. The key facts are that there is more than one company that now owns megafrets, and additional megafrets are available as they are being displaced from other services.

TRANSFER OF DOMESTIC FREIGHT FROM RAIL TO ROAD

The 2011 IA assumed a reduction in train kilometres, primarily on the basis that longer intermodal units were not presumed to be available. Rail groups were concerned about this on two levels; firstly that road would capture the light weight palletised consumer goods market that could be transported by rail and secondly by the impact of this on future rail freight forecasts, as analysis in the IA suggested the introduction of LSTs would reduce rail freight growth by two thirds (RFG).

Data from the annual report shown in Figure 5 indicates that FMCG mixed products (29%) are the commodity with the highest number of **loaded** kilometres transported by LST, with a proportion of the empty running being return trips associated with those loaded FMCG legs. Trial data indicates that goods transported by LST are most likely to be on pallets or in cages.

In order to properly assess the potential exchange between road only and road-rail, further research would be required into this with the potential to compare LST routes and proximity to rail heads, but this is beyond the scope of this current study.   This could be done using the LST route modelling tools descibed in the Annual Report, where we believe we would be able to extract the particular sub-set of the trial data where a true competition between road and road-rail exists. We would then want to look at the 'Scaling up' work planned for the trial to decide how the trial data might related to the whole country view of traffic flows.

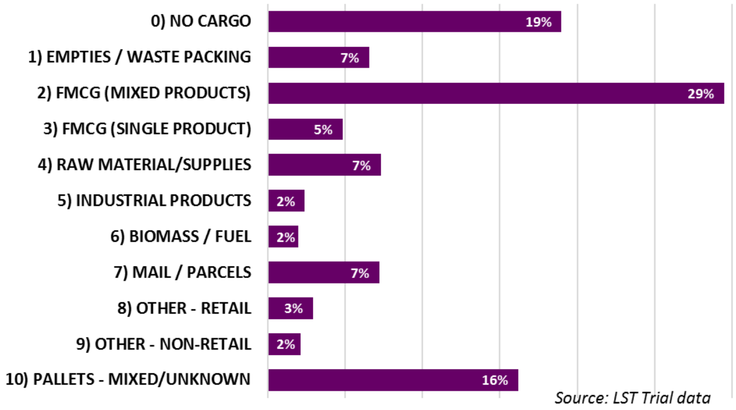

Figure 5: LST Trial LST distance by goods type

CARBON EMISSIONS & CONGESTION

Concerns were raised regarding the dependence of environmental benefits on the large reduction of vehicle kilometres forecast - industry groups did not believe the forecast reduction in road journeys from using LSTs would be borne out in real-life operations.

It was proposed that rail could reduce carbon emissions as it produces 76% less CO_2 emissions than the equivalent HGV journey (Freight on Rail), the acceleration of freight electrification was proposed to increase the use of electric locomotives for freight and therefore reduce CO_2 emissions further.

A lack of sensitivity testing on the impact of additional congestion caused by LSTs (because they are longer) was raised by several publications as a gap in the IA.

Although it is hard to explore the specific concern about LSTs being longer on the road and any effect this might have on the length of traffic congestion queues, , Risk Solutions and WSP have developed an LST Emissions model based on the core trial analysis of actual journey reductions, which contains results for both a 'real world' and 'uncongested' flow set of journey times on the LST routes. The results of this modelling have been reported separately.

SAFETY

Rail Freight Group raised concerns over the IA safety assessment arguing that the potential safety impacts of LSTs are highly dependent on the reduction in the number of LST journeys. It was suggested that the DfT should carry out further sensitivity tests for road km.

The main work on LST safety is being conducted in the core trial evaluation being conducted by Risk Solutions. The intermodal results may have a second-order input to that work in that in scenarios where more LST HGV-km transfer to rail, there would be an associated reduction in safety risk posed on the roads.

GLOSSARY

Bogie:	Is the structure underneath a railway vehicle to which axles are attached
Bulk goods:	In the logistics environment this term is used to describe goods such as coal, grains, oil, or chemicals that are not packaged in any type of container and are stored, transported, and sold in large quantities:
Steering (vs Fixed) Axles	An axle on which the angle between the wheels and the trailer frame can be adjusted. Steering the rear axle (or sometimes more than one) not only increased the manoeuvrability of the trailer, allowing it to track the movement of the tractor unit better, but is also reduces the wear on tyres from the 'scrubbing' on the road that occurs when you turn a trailer with 2 or 3 fixed axles. **Three main design types are shown below, in comparison to a 'fixed' axle**
Fixed axle:	An axle is a central shaft for a rotating wheel or gear. The axle may be fixed to the wheels, rotating with them, or fixed to the vehicle, with the wheels rotating around the axle. As a general rule the exclusive use of fixed axles makes manoeuvres more difficult and makes steering more rigid, but it is the most common form of axle on current articulated HGVs.
Self-steer axle	In self-steering axles, the individual wheel hubs are mounted on a spindle that can rotate within fixed limits. The steering occurs as the trailer turns, imposing lateral forces on the wheel causing it to turn to remove the force. The mechanisms include damping to control turning motion.
Command-steer	In command steering, front trailer axles are steered proportionately to the articulation angles between the tractor and corresponding trailers using a physical (metal bar or wires) or hydraulic connection. In the most common designs, a solid axle is fixed to a turntable under the trailer and it is the turntable that moves.
Active steer	Active steer refers to a range of more advanced steering systems in which some form of additional control over the turn angle of axle is imposed using a computer (which may take into account not only the 5th wheel angle, but speed and other issues) to produce a closer 'track' to that of the power unit, and reducing cut in or tail swing. It also refers to manually controlled axles (used in heavy haulage)
CSRGT:	Continuing Survey Road Goods Transport, a survey of the UK activity of GB registered HGV's based on sampled returns from operators showing specific trailer's operations, loading etc over a show period. (The core data fields collected on the trial were created to be a simplified sub-set of the CSRGT fields and options.)
Cube:	Dimensional metric for the measurement of a load – i.e. the amount of space an item takes up on a vehicle. Frequently a load will "volume out" or "cube out" before it "weights out"
DfT:	Department for Transport
Draw bar trailer:	A drawbar is a solid coupling between a hauling vehicle and its hauled load. Drawbars are in common use with rail transport, road trailers, both large and small
FMCG:	Fast Moving Consumer Goods
FMS:	Freight Market Study. A "regular" study undertaken by Network Rail to establish the market forecasts for rail freight.
GBFM:	Great Britain Freight Model a model, designed by MDS that attempts to forecast freight movements, and is widely used throughout the industry as the best available data source
GVW:	Gross vehicle weight, means the weight of a vehicle or trailer including the maximum load that can be carried safely when it's being used on the road
HGV:	Heavy goods vehicle, a vehicle over 3.5 tonnes up to a maximum of 44 tonnes

IA:	Impact Assessment (IA) of Longer Semi-Trailers (updated post-consultation) undertaken as part of the pre-trial project
Intermodal per vehicle km:	Intermodal container traffic is commonly measured in twenty-foot equivalent units (TEUs), rather than cargo weight, e.g. a TEU-km would be the equivalent of one twenty-foot container transported one kilometre
ISO units:	A standardise shipping container, designed and built for intermodal freight, meaning they can be used across different modes of transport – from ship to rail to road
MDS Rail Freight Forecasts:	MDS produce, on behalf of Network Rail, rail freight forecasts. These have been done recently in 2013 and 2018
Megafrets:	Type of intermodal wagon
National Distribution Centres (NDCs):	A distribution centre that serves the entire country, potentially through smaller regional or local distribution centres
Payload:	The part of a vehicle's load, from which revenue is derived, usually measured by weight in the case of road and rail but sometimes by volume
Regional Distribution Centres (RDCs):	A distribution centre that serves a particular area or region, potentially through smaller regional or local distribution centres
Semi-trailer:	A semi-trailer is a trailer without a front axle. A large proportion of a semi-trailer's weight is supported by a tractor unit, or a detachable front-axle assembly known as a dolly, or the tail of another trailer. A semi-trailer is normally equipped with landing gear to support it when it is uncoupled
Skeletal trailer:	A skeletal trailer the base of a trailer for articulated lorries that then has containers secured on them or may have additional fixings to carry most abnormal or oddly shaped loads.
SRFI:	Strategic rail freight interchanges is purposely designed an area where distribution centres are linked into both the rail and trunk road system to enable the movement of goods by road and rail
SRN:	The 'Strategic Route Network' - the Motorways and Major A-roads controlled by Highways England. Used generically here to also include the roads controlled by equivalent state bodies in Wales and Scotland
Tare weight:	Tare weight, sometimes called unladen weight, is the weight of an empty vehicle or container
Tonne kilometres:	A tonne-kilometre, abbreviated as tkm, is a unit of measure of freight transport which represents the transport of one tonne of goods by a given transport mode (road, rail, air, sea, inland waterways, pipeline etc.) over a distance of one kilometre.

WSP House
70 Chancery Lane
London
WC2A 1AF

wsp.com