Assisting Decisions

HITRANS Rail Freight Capability Study

Report for HITRANS

In Association With Brian Ringer

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Summary

This Study was commissioned by the Highlands and Islands Transport Partnership in Scotland and has been managed by a Steering Group, comprising Frank Road (HITRANS), Kenneth Russell (JG Russell) and Anne MacKenzie (Network Rail). MVA have undertaken this Study in conjunction with Brian Ringer (independent consultant), to determine the existing constraints on the HITRANS network for rail freight.

The Study's overarching aim is to fully understand the freight-related capacity of the current rail network in the HITRANS area. This will enable current and potential new rail freight customers plan their future freight operations with confidence and will help HITRANS and others identify and make the case for enhancements which would facilitate increased mode-shift of freight from road to rail.

The following rail freight routes were considered:

- **Far North Line (FNL)**: rural railway line entirely within the Highland area of Scotland, extending from Inverness to Thurso and Wick;
- **West Highland Line (WHL)**: linking the ports of Mallaig and Oban on the west coast of Scotland to Glasgow. The following lines form part of the WHL:
  - Fort William Line (FWL): Glasgow to Corpach;
  - Mallaig Line (ML): Corpach to Mallaig; and
  - Oban Line (OL): Crianlarich to Oban.
- **Highland Main Line (HML)**: runs through the Scottish Highlands, with Perth at one end and Inverness at the other;
- **Aberdeen – Inverness Line (AIL)**: railway line linking Aberdeen to Inverness; and
- **Kyle of Lochalsh Line (KL)**: primarily single track railway line in the Scottish Highlands, running from Dingwall to Kyle of Lochalsh.

Terminals and sidings within the HITRANS area were also considered, including the following:

- Invergordon Distillery 1 and 2;
- Invergordon Alcan;
- Invergordon Sidings;
- Fearn;
- Lairg;
- Forsinard Down;
- Kinbrace Timber Loading;
- Georgemas;
- Georgemas Engineering Siding;
- Altnabreac Station Siding;
- Wick;

- Thurso Yard;
- Thurso Siding;
- Crianlarich Upper;
- Crianlarich Lower;
- Arrochar;
- Connel Ferry;
- Oban (Glenfalloch);
- Oban (Yard);
- Fort William (Tom Na Faire);
- Fort William (Inverlochy);
- Fort William (BP);
- Fort William RTZ (Alcan);
- Dunkeld Goods Yard;
- Corpach;
- Kingussie Upper Sidings;
- Dalwhinnie;
- Inverness Lafarge Cement;
- Inverness Millburn (DBS Terminal);
- Inverness DRS Terminal;
- Inverness Coal Yard (Harbour Branch);
- Keith Yard;
- Elgin;
- Roseisle (Diageo);
- Kyle of Lochalsh (Harbour Siding); and
- Kyle of Lochalsh (East Siding).

A number of data sources were used as inputs to this Study, including 'Room for Growth' strategy documents, Network Rail Sectional Appendices, Network Rail infrastructure data, sectional running times, timetables, terminal information, quail maps etc.

Throughout the course of this Study we met with a number of people to discuss rail freight in the HITRANS area. We consulted with David Prescott (Transport Scotland), Nick Gibbons (DB Schenker), Tom Curry (DRS), Kay Walls (Freightliner Intermodal), Paul Bowyer (Freightliner Heavy Haul) and Simon Ball (Colas Rail). In particular, it was noted from the meeting with David Prescott that the 2011 timetable (with enhanced 'hourly' frequency passenger service between Inverness and Edinburgh/Glasgow) would not be available from TS in time for this Study.

The physical characteristics of each of the routes in this Study was reported on including the commodities they carry, Gross Trailing Loads, Maximum Train Length, Structure Gauge and

Axle load. A summary of the key physical characteristics for each line is shown in the table below.

Key Physical Characteristics

Category	FNL	FWL	ML	OL	HML	AIL	KL
Double/ single lines	Single lines	Single lines	Single lines	Single lines	Approx half double/ single lines	One section of double lines, remaining single lines	Single lines
Commodities	Oil, Timber, Pipes	Aluminium Ingots, Bulk Alumina, MOD, Oil, Timber	Currently no freight running	Currently no freight running	Cement, Containers, Oil, Pipes, Timber	Currently no freight running	Currently no freight running
Loco Class	66 37 (Georgemas to Wick)	66	37	37	66	66	37
Gross Trailing Load (GTL)	Northbound: 1,230-1,460 Southbound: 1,230-1,955 550 (Georgemas to Wick)	Northbound: 1,045-1,795 Southbound: 1,010-1,290	Northbound: 525 Southbound: 520	Northbound 550 Southbound 550	Northbound 1,230 Southbound 1,230	Northbound: 1,535 Southbound: 1,230	Northbound 550 Southbound 550
Maximum Train Length	50 SLU	31 SLU	31 SLU	31 SLU	50 SLU	50 SLU	37 SLU

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Category	FNL	FWL	ML	OL	HML	AIL	KL
Structure Gauge	W8	W8	W7	W7	W7 (enhancement works between Perth & Inverness completed August 2010 to facilitate 9'6" on low-loader wagons)	Aberdeen to Elgin is W7 with permission for particular container/wagon combinations	W6
Axle Load	RA5	RA5	RA5	RA5	RA8	RA10	RA5

Based on these physical characteristics, the key physical constraints were found to be:

Key Route Physical Constraints

Route	Key Physical Constraints
FNL	The physical limits on the FNL ought to allow a commercially viable freight train to operate out of Invergordon, albeit that constraints south of Inverness might cause a reduction in both length and/or GTL. There is also a lack of clearance for Class 66 locos between Georgemas and Wick.
FWL	Whilst the FWL has a number of constraints on the size and weight of freight trains the most restrictive is that on length. The standard length limit of 31 SLU severely restricts the ability to run a viable train load. Whilst slightly less of a problem for bulk traffics, the length constraint has its biggest impact on non bulk and timber traffic that require length to provide the space for a profitable train.
ML	The most severe restriction on the ML is the lack of clearance for any load over RA 5.
OL	The most severe restriction on this line is the lack of clearance for any load over RA 5.
HML	The most pressing restriction on the non bulk market is the present length limit on the HML (50 SLU) and that getting a longer limit, even if based on a timetable solution, is a first aim. Following this restoration of W8 gauge initially and W9 eventually is an aspiration for the FOCs.
AIL	The key constraint on the AIL is that not all of the signal boxes are open continuously, unlike the RETB operation on the WHL and FNL and the HML signal boxes. Broadly the section of line from Elgin to Inverness is open continuously Monday to Saturday but Dyce to Keith is only open on the two day shifts – basically 0600 to 2400 – from Monday to Saturday.
KL	The biggest constraint is that Class 66 locos are not cleared to operate over the line. This means that any freight train operated to Kyle would have to be hauled by a Class 37 loco, and the GTL for the class is 650 tonnes in either direction.

A list of potential additional freight paths by route and a set of key pinch 'sections' which create the main timetabling constraints was determined. This task extended from the physical constraints analysis to include the constraints created by the need to avoid conflicts with other timetabled services. Based on existing timetables, the potential additional freight paths during the day (0600-2400) were identified as set out in the table below.

Additional Freight Paths

Route	Route Section	Additional Freight Paths
FNL	Inverness - Wick/Thurso	5 down services (two finishing at Ardgay) 4 up services (two starting from Ardgay, one starting from Dingwall)
FNL	Dingwall - Wick/Thurso	3 down services 3 up services
FWL	Craigendoran Jn -Fort William	4 down services 4 up services
ML	Fort William -Mallaig	5 down services 4 up services
OL	Crianlarich -Oban	5 down services 5 up services
HML	Perth to Inverness (based on current timetable)	1 down service 1 up service
AIL	Aberdeen - Elgin	4 down services (2 starting from Dyce, 1 starting from Inverurie) 3 up services (1 finishing at Dyce)
AIL	Elgin - Inverness	3 down services 3 up services
KL	Dingwall - Kyle of Lochalsh	2 down services 4 up services (1 finishing at Strathcarron)

When finding additional freight path standard train lengths were assumed: 225m for a standard train and 126m for shorter trains where required. The sections of track (typically likely to be the longer sections of single track) that have the greatest impact in 'blocking' potential paths were identified. This will enable subsequent analysis to identify the scale and location of investment likely to be required to create additional paths where none exist at present. The key timetable-based constraints are summarised in the table below.

Key Timetable-based constraints

Route	Timetable – based constraints
All routes	Single Line with Passing Loops. Speed differential between passenger and freight services.
FNL	Dingwall to Inverness is the primary constraint is the level of current passenger services. Beyond Dingwall the distance between loops at Helmsdale, Forsinard and Georgemas Junction is the next constraining factor. Current service passenger services between Dingwall and Tain also cause constraints.
FWL	The primary constraint is the level of current passenger and freight services on the route.
ML	The primary constraint is the level of current passenger services. Additionally the distance between loops at Fort William, Glenfinnan and Arisaig is the next constraining factor.
OL	The primary constraint is the level of current passenger services. Additionally the distance between loops at Crianlarich, Dalmally and Taynuilt is the next constraining factor.
HML	The primary constraint is the level of current passenger and freight services on the route. Paths would need to alter existing services to be entirely conflict free.
AIL Aberdeen to Elgin	Aberdeen to Inverurie is the primary constraint is the level of current passenger services. Beyond Inverurie the distance between loops at Elgin and Keith is the next constraining factor.
Elgin to Inverness	The primary constraint is the level of current passenger services, and the limited availability of passing loops.
KL	The primary constraint is the level of current passenger services, and the limited availability of passing loops.

Railsys was undertaken for two lines, the West Highland Line (WHL) and Aberdeen to Inverness Line (AIL). One scenario was analysed for each line, namely three up/down services on the AIL and four up/down services on the WHL. The Railsys analysis showed that the impact of the proposed new freight services on existing overall passenger service performance is marginal, though they do have a direct negative impact on the Aberdeen - Inverness and Fort William to Corpach routes. There are also knock-on secondary delays on the Perth – Inverness Route, which might warrant further investigation.

The impact on existing freight service performance is also marginal as the overall performance of the study routes are only marginally affected by the new services tested here.

The reliability of the new freight services themselves is good/marginal and we conclude that the new freight services we have tested here could be accommodated into the Reference Case timetable, possibly with further minor ‘tweaking’ where necessary.

In general, the performance of the new services is no worse, and in several cases, actually better than, that of the existing freight services, resulting in some cases to an improvement in the average freight performance.

The addition of these new freight services increases the capacity utilisation considerably. However, as a result, much of the ‘white space’ where services can currently run out of their path without causing knock on delays has been removed, with a corresponding small negative impact of overall route performance to all services.

We would conclude that the identified freight services could be added, possibly with some further investigation to better understand the minor negative impacts predicted by the modelling. This could include detailed train by train assessment of timetable during perturbed running to address these conflicts.

A list of the terminals/ sidings considered in this Study and their locations were provided. Details regarding these terminals/ sidings were also provided, including their ownership, access and key constraints.

Glossary of Terms

Axle Load

Axle Load is usually defined as a weight per axle at a given speed and grouped into standard rail industry categories referred to as 'Route Availability' e.g. RA3, RA4… RA10. A full definition of these is provided in Appendix A (Section 3). The maximum axle load is the maximum weight of a train per pair of wheels allowable for a given section of track.

Class 4/6 train

Class 4 trains have a maximum speed of 75 mph. Class 6 trains have a maximum speed of 60 mph.

Class 37/66 locomotive

A locomotive of a given power output (e.g. a Class 66). Class 66 is a standard UK diesel freight locomotive of 3,300bhp. Class 37's are also used in the HITRANS area.

Control Period

For financial and other planning purposes, Network Rail works within 5-year 'Control Periods' (CP), each one beginning on 1 April and ending on 31 March to coincide with the financial reporting year. We are currently within CP 4, which runs from 2009 to 2014.

Dwell time

The time a train is stopped at either a station or passing loop.

Freight Operating Companies

Freight Operating Companies (FOC) are those companies which use the rail network to transport goods. They have a track access agreement to operate trains on Network Rail infrastructure. Typically these companies own/ lease locomotives and rolling stock and market their services to freight shippers.

Gross tonnage

Gross tonnage is equal to the trailing tonnage added to the loco weight.

Gross Trailing Load

The gross trailing load is the total weight of the full freight train, typically determined by the haulage capacity of the locomotive on uphill gradients.

High Level Output Specification

The Government's High Level Output Specification (HLOS) specifies the railway that the Government wishes to fund. While this does not as such include freight, as the Government is neither a specifier nor a buyer of freight services, the HLOS consultation includes the reasonable requirements of freight, so as not to disadvantage it, where infrastructure enhancements may be of mutual benefit to both passenger and freight operations.

Line-side loading

This refers to loading which occurs alongside the railway line, rather than say in a terminal.

Maximum Train Length

The Maximum Train Length is often determined by the length of passing loops which the freight services need to be able to use to operate within the overall network timetable.

Network Code

The Network Code is a set of rules which is incorporated by reference into, and therefore forms part of, each bilateral access contract between Network Rail and a holder of access rights. It does not create any contractual relationship between operators of trains.

The purpose of the Network Code is:

- to regulate change, including change to the working timetable, change to railway vehicles specified in an access contract, change to the network, change to computer systems and change to the Network Code itself;
- to establish procedures relating to environmental damage;
- to establish a performance monitoring system; and
- to establish procedures in the event of operational disruption.

Network Rail

Owner of British rail infrastructure. Responsible for track and signalling maintenance and operation but does not operate the trains.

Office of Rail Regulation

The Office of Rail Regulation (ORR) is the independent safety and economic regulator for Britain's railways.

Pathing time

The time added to a Sectional Running Time to either, allow a train pass at a specific location or improve arrival time performance.

Payload

The weight of goods carried on a vehicle.

Radio Electronic Token Block

Radio Electronic Token Block (RETB) is a system of railway signalling used in the United Kingdom (UK). It is a development of the physical token system for controlling traffic on single track lines where tokens are transmitted by radio signal.

Route Utilisation Strategy

A Route Utilisation Strategy (RUS) takes a strategic look at the rail network and its usage and capability in relation to current and future demand. Where shortfalls in capacity are identified, the RUS will identify options for addressing them. These options may involve timetabling changes or investment.

Standard Length Units

The length limit for a line determines how long a train can run over it. In railway operating documents this is normally measured in Standard Length Units (SLU) which is 21 feet, which traditionally was the most common wagon length.

Structure gauge

The structure gauge can be described as the height and width of the structures that a train has to pass through, not the track gauge, which is the width between the rails. Structure gauge is described using standard rail industry categories referred to as e.g. W6, W8... W12. Broadly the higher the 'W' number the larger the gauge and the bigger the wagon/container that can pass along the route. A full definition of each type of structure gauge is provided in Section 4.7.4 of this Report.

Sectional Running Time

The Sectional Running Time (SRT) is the time taken to travel between two points of the network.

Tare weight

Tare weight is the weight of an empty vehicle or container.

Timing loads

A heavier train requires more power to travel fast than a lighter train. Timing loads reflect this by giving shorter Sectional Running Times for trains with a lower Gross Trailing Load.

Track Circuit Block

A Track Circuit Block (TCB) is a signalling system using a simple electrical device used to detect the presence or absence of a train on rail tracks, used to inform signallers and control relevant signals.

Working timetable

A working timetable (WTT) is a set of schedules that show all the planned train movements along a certain line, including lines in Scotland. This includes passenger trains, freight trains, empty stock movements etc. Information includes the timings at every station, junction, what platforms are used, etc.

1 Introduction

1.1 Introduction

1.1.1 This Study was commissioned by the Highlands and Islands Transport Partnership in Scotland (HITRANS). Its overarching aim is to fully understand the freight-related capacity of the current rail network in the HITRANS area. This will enable current and potential new rail freight customers to plan their future freight operations with confidence and will help HITRANS and others identify and make the case for enhancements which would facilitate increased mode-shift of freight from road to rail.

1.1.2 MVA, in conjunction with Brian Ringer, have undertaken this Study to examine the current rail network serving the Highlands and Islands of Scotland, to determine its existing freight capacity and capability and investigate the enhancements required to allow for an increase in freight traffic in this area in the future.

1.1.3 This Study determined existing constraints on the network for rail freight. This understanding will enable HITRANS and others to work within these constraints and to identify a cost-effective program for removing those which are currently creating the most significant restrictions to the potential of the rail network.

1.2 Steering Group

1.2.1 This Study has been managed by a Steering Group, made up of:

- Frank Roach (HITRANS);
- Kenneth Russell (JG Russell); and
- Anne MacKenzie (Network Rail).

1.3 Study Area

Lines

1.3.1 The Study focuses on the rail lines within the HITRANS area plus the relevant extensions to Aberdeen and Perth and the short Ardlui-Crianlarich-Tyndrum section which lies within Tactran. These areas are shown in Figure 1.1.

1.3.2 The following routes are considered within this Report and are shown in Figure 1.1:

- **Far North Line (FNL)**: rural railway line entirely within the Highland area of Scotland, extending from Inverness to Thurso and Wick;
- **West Highland Line (WHL)**: linking the ports of Mallaig and Oban on the west coast of Scotland to Glasgow. The following lines form part of the WHL:
  - Fort William Line (FWL): Helensburgh/ Craigendoran to Corpach;
  - Mallaig Line (ML): Corpach to Mallaig; and
  - Oban Line (OL): Crianlarich to Oban.

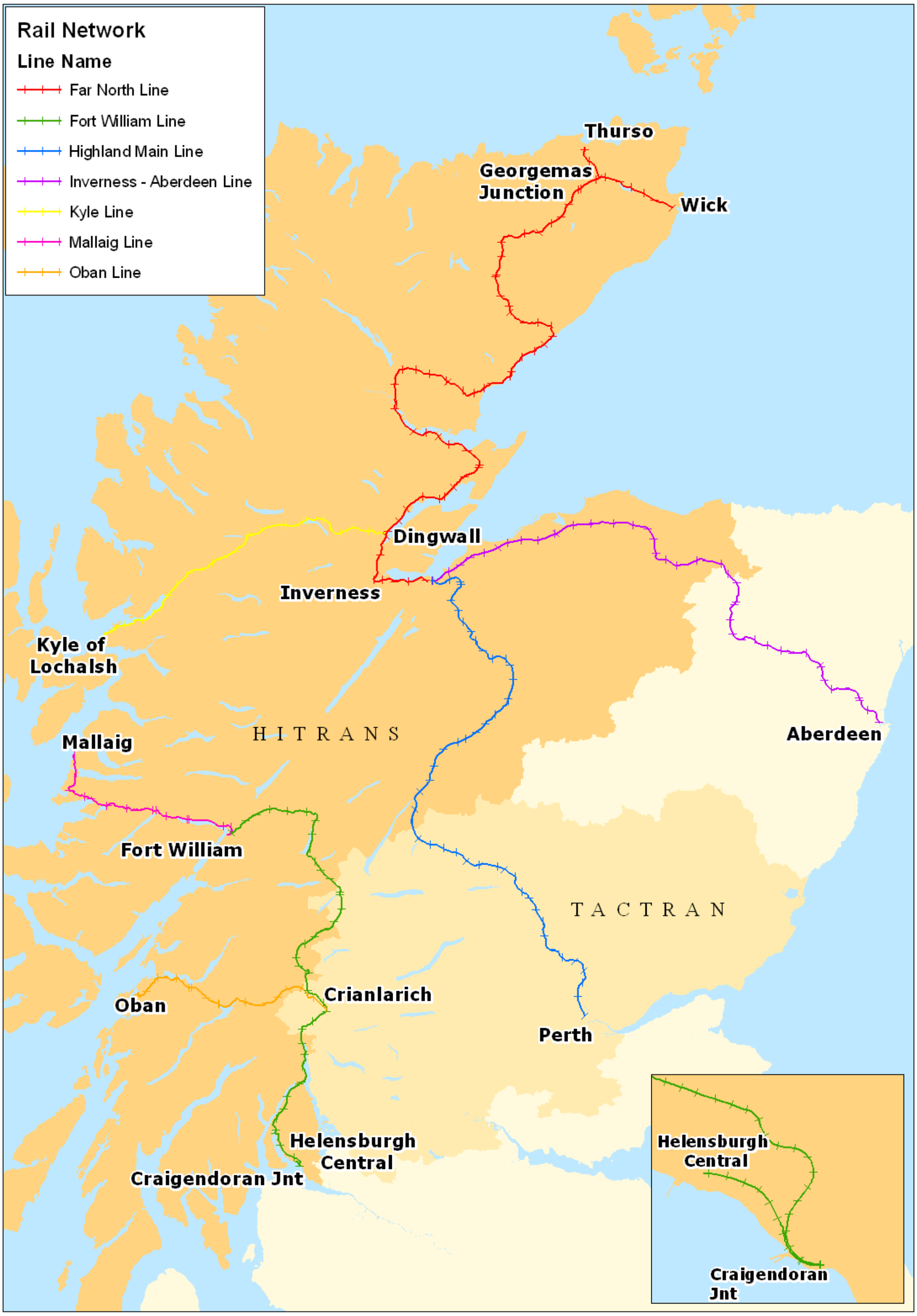

Figure 1.1 Study Area

Terminals & Sidings

1.3.3 There are a number of terminals and sidings in Britain which enable access to the rail network and facilitate freight distribution. These terminals/ sidings can be owned by Network Rail (NR), leased by NR to FOCs or be owned by third parties. Terminals facilitate storage and the gathering of the goods to be transported to/from the rail network. Sidings connect the terminals to the general rail network.

1.3.4 Apart from the general consideration of line-side loading of timber, the terminal analysis has considered only existing (active or disused) terminal locations – i.e. with limited or no consideration of 'blue-skies' planning aspirations which might seek to create new terminal locations.

1.3.5 We have considered terminals/ sidings which are:

- in use;
- still connected but mothballed;
- have been disconnected; or
- site now sold and no longer in railway ownership.

1.3.6 The analysis of terminals/ sidings is restricted to those in the HITRANS area (plus the Ardlui-Tyndrum section which lies in Stirling/ TACTRAN area). This included facilities in the Inverness area as a distribution centre for the greater Inverness area and beyond. We also were interested in facilities in Oban for enabling the amalgamation of goods to/from the different island communities. The Spey Valley is also part of the Study for the handling of the inputs and/or outputs of the whiskey industry. Other key merge points on the strategic road network include Garve, Tyndrum/ Crianlarich, Dalwhinnie, Fort William etc. Other facilities are located in the vicinity of major industrial freight generators/ attractors including distilleries, paper mills, timber-handling facilities (e.g. Corpach), biomass power stations, aluminum smelters etc.

1.3.7 A full list of the terminals/ sidings in this Study is listed below and these are also shown in Figure 8.1.

- Invergordon Distillery 1 & 2;
- Invergordon Alcan;
- Invergordon Sidings;
- Fearn;
- Lairg;
- Forsinard Dn;
- Kinbrace Timber Loading;
- Georgemas;
- Georgemas Engineering Siding;
- Altnabreac Station Siding;
- Wick;

- Thurso Yard;
- Thurso Siding;
- Crianlarich Upper;
- Crianlarich Lower;
- Arrochar;
- Connel Ferry;
- Oban (Glenfalloch);
- Oban (Yard);
- Fort William (Tom Na Faire);
- Fort William (Inverlochy);
- Fort William (BP);
- Fort William RTZ Alcan;
- Corpach;
- Dunkeld Goods Yard;
- Kingussie Upper Sidings;
- Dalwhinnie;
- Inverness Lafarge Cement;
- Inverness Millburn (DBS Terminal);
- Inverness DRS Terminal;
- Inverness Coal Yard (Harbour Branch);
- Keith Yard;
- Elgin;
- Roseisle (Diageo);
- Kyle of Lochalsh (Harbour Siding); and
- Kyle of Lochalsh (East Siding).

1.3.8 The location, ownership, links to road network, etc of each terminal/ siding is of importance to this Study and is discussed in Chapter 8 of this Report.

Relevant / Current Freight Operating Companies

1.3.9 The key Freight Operating Companies (FOC) currently active in the HITRANS area are:

- Freightliner Ltd;
- Direct Rail Services (DRS);
- GB Railfreight; and
- DB Schenker (formerly English, Welsh & Scottish (EWS)).

1.4 Remainder of Report

1.4.1 The remainder of this Report is structured as follows:

- Chapter 2: Background and Data Collation;
- Chapter 3: Stakeholder Consultation;
- Chapter 4: Physical Characteristics;
- Chapter 5: Key Physical Route Constraints;
- Chapter 6: Freight Paths and Timetable Constraints;
- Chapter 7: Railsys;
- Chapter 8: Terminal Analysis; and
- Chapter 9: Summary and Conclusions.

2 Background and Data Collation

2.1 Introduction

2.1.1 In this Chapter we summarise the background to the Study and the various data sources including previous studies used to inform the work. The Steering Group provided much of the background material for this Study, in particular NR documents relevant to the HITRANS area.

2.2 Background

2.2.1 HITRANS is the Highlands and Islands Transport Partnership in Scotland, one of seven Regional Transport Partnerships. HITRANS covers the local authority areas of Argyll & Bute, Highland, Moray, Orkney and Comhairle na Eilean Siar. As a statutory body its remit covers all forms of public transport in the Highlands and Islands of Scotland including ferry, road transport, rail, air travel, cycling and walking.

2.2.2 HITRANS realise that there is scope for enhancing rail services in the HITRANS area. This would involve improving infrastructure to make rail freight more attractive and increasing passenger services on many of the regions lines.

2.2.3 This Study will not consider rail passenger services but it will review rail freight services that cover the HITRANS area. In the HITRANS Regional Transport Strategy, the freight aspirations are to:

- enhance effectiveness and efficiency of freight transport;
- optimise modal shift opportunities for freight transit by rail and coastal shipping;
- enhance co-ordination within and support for the freight industry; and
- co-ordinate freight policies and plans, locally, regionally and nationally.

2.2.4 HITRANS wish to encourage modal shift to rail for freight movements through the area. This would assist in carbon reduction and improve the competitive position of the region. They are aware that this will only occur if businesses have full confidence in the network. Therefore, there is a need to fully understand the current capacity and capability of the rail network in the HITRANS area in relation to freight. This knowledge will assist decision making and justify the case for enhancements. This Study is the first step in undertaking this shift to rail for freight travelling to/ from HITRANS.

2.3 Data Collation

2.3.1 The following documents and data sources were used as inputs to this Study:

- 'Room for Growth' strategy documents;
- NR Sectional Appendices;
- NR infrastructure data;
- working timetables;

- sectional running times;
- Rules of the Plan;
- Rules of the Route;
- NR - Freight RUS;
- NR – Scotland RUS;
- Quail track diagrams and the rail/ track atlases;
- FTA Rail Freight Policy;
- ORR Review of Access Policy; and
- daily recording data.

2.3.2 A brief summary of the information gleaned from these sources is provided below.

2.4 'Room for Growth' Strategy documents

2.4.1 The 'Room for Growth' Study for all of the rail routes in the Highlands of Scotland was commissioned by Highlands and Islands Enterprise to address key rail development issues. These key rail issues are dealt with in the Route Utilisation Strategies (RUS) in other parts of the country, the responsibility of NR. Each route was considered and potential areas of development are highlighted.

2.4.2 The Room for Growth Report considered:

- operational aspects of the network;
- rail traffic – both passenger and freight;
- operational limitations;
- technical assessment;
- overview of existing infrastructure;
- identification of issues with the network; and
- enhancements considered.

2.4.3 The Room for Growth Report recommended the following:

Far North Line

- undertake examination of the potential to increase line speeds through a series of minor works or the relaxation of curving rules and braking assumptions;
- carry out tests on loop points to see if speed increase is practicable; and
- examine each level crossing where train running speeds need to be reduced substantially to ascertain if improvements can be made.

Fort William Line

- deploy additional rolling stock to alter the current pattern of services to provide a better timetable.

Mallaig Line

- undertake minor adjustments to the timetable on this line.

Oban Line

- poor value for money to upgrade the line for Class 66 operation and therefore maintain the specialist equipment necessary to serve the branch on an 'ad hoc' basis.

Highland Main Line

- introduce improved rolling stock with enhanced braking and acceleration characteristics;
- services on the route should be enhanced to an hourly frequency with a four-hourly pattern of station stops; and
- freight trains should be provided with suitable paths, at times during the day which are attractive to operators.

Aberdeen – Inverness Line

- no recommendations were made above planned improvements.

Kyle of Lochalsh Line

- no capacity enhancements undertaken prior to signalling system upgrades; and
- upgrading of the line to cater for heavier rolling stock is possible and should be the subject of more detailed engineering surveys.

2.5 NR Sectional Appendices

2.5.1 NR provided infrastructure data to inform this Study, such as relevant constraints data for the current network, including gross trailing loads/ timing loads, maximum train length, structure gauge (eg W6-W12) and axle load/ Route Availability rating (eg RA3 – RA10) etc.

2.5.2 The NR Sectional Appendices give details of:

- loop length; and
- structure gauge for route sections.

Loads Book

2.5.3 The Freight Train Loads Book tables include:

- maximum axle load (Route Availability) for route sections;
- for a Class 66 loco, the gross trailing loads applicable for:
  - Class 4 (75 mph), where this speed is of use; and
  - Class 6 (60mph).
- routes in the HITRANS area where Class 66 locos are currently not permitted.

2.5.4 The above informed the Study on the physical constraints to freight trains within the HITRANS area and any subsequent timing simulation.

2.5.5 This Study used the following Section Appendices:

- Far North;
- Fort William;
- Mallaig;
- Oban;
- Perth-Inverness;
- Aberdeen-Inverness; and
- Kyle.

2.5.6 Access was also provided to NESA, the online National Electronic Sectional Appendix database.

2.6 NR Infrastructure Data

2.6.1 In addition to the Sectional Appendices, NR also provided the following:

Load Restrictions

2.6.2 This data was provided by NR in Excel format which is an extract from the 'Freight Train Loads Book'. This data can be used to determine the maximum tonnage that can be hauled by different types of locomotive (loco) over specific routes. All tonnages are given as 'trailing', i.e. they exclude the weight of the loco. Gross tonnage is equal to the trailing tonnage added to the loco weight. It also contains information on the maximum lengths permitted. This document recognises that the majority of freight services in the UK are worked by Class 66 locos. This data is included in Appendix A and will be used later in this Report.

Working Manual for Rail Staff – Inter-modal Traffic

2.6.3 The Working Manual for Rail Staff comes in a number of volumes, one of which is specific to Inter-modal Traffic and the working of freight trains. This includes details such as:

- maximum permitted speed for each freight train classification;
- general braking and marshalling requirements on freight trains;
- basic principles for the loading and securing of goods on a freight train;
- requirements for the conveyance of traffic to the continent;
- requirements for conveyance of load units on inter-modal services;
- requirements for conveying vehicles not conforming to the standard axle load or loads for which special conditions apply; and
- conversion between SLUs, metres and feet; etc.

Train Weights

2.6.4 NR provided data on the maximum Gross Trailing Loads for the following lines, in both directions:

- Inverness – Georgemas;
- Georgemas – Wick;
- Craigendoran – Mallaig;
- Crianlarich – Oban;
- Inverness – Perth;
- Inverness – Craiginches (Aberdeen); and
- Dingwall – Kyle.

2.7 Working timetable

2.7.1 A working timetable (WTT) is a set of schedules that show all the planned train movements along a certain line, including the Scottish rail network. This includes passenger trains, freight trains, empty stock movements etc. Information includes the timings at every station, junction, what platforms are used, etc.

2.7.2 The timetables used in this Report are:

- public passenger timetables valid between 13 December 2009 and 22 May 2010 published by ScotRail; and
- freight working timetables valid between 13 December 2009 and 22 May 2010 provided by Network Rail.

2.8 Sectional Running Times

2.8.1 To determine Sectional Running Times (SRT) three separate sources have been used:

- derived from the timetable, this method is simple to apply by calculating the difference in time between two locations and has been used in the initial high level assessment of freight paths where existing freight run. The caution with this measure that dwell time and pathing time where/if known need to be excluded from the SRT;
- referenced from running time tables. These provide the official source of SRT data for all services on all links where each stock type can be planned to run; and
- further running times for new services have been derived from the RailSys model, with a rounding up applied to the technical minimum that is calculated within the software.

2.9 Rules of the Plan

2.9.1 The Rules of the Plan are rules which regulate the standard timings between stations and junctions on the main British rail network. They enable trains to be scheduled into the working timetable. Rules of the Plan for the HITRANS Study area gives details for a range of constraints, such as:

- rolling stock restrictions;
- running times;
- margins and allowances;
- timetable constraints; and
- opening times of signalling centres/ boxes.

2.10 Rules of the Route

2.10.1 The Rules of the Route are rules which regulate the access arrangements for various parts of the rail network. They give details when the railways are affected by inspection, maintenance, renewal and other works. They consist of two parts:

- short National Overview which sets out the planning rules, for the primary benefit of those who require engineering access to the network; and
- route-specific details, including details of restrictions of the use of the network due to maintenance, renewal and enhancement work.

2.11 NR Freight RUS

2.11.1 NR produces the Freight RUS which considers rail freight in Britain, (including Scotland) and its competition with road freight. This document predicts future growth in freight and provides a strategy to cater for this increase in traffic. It recommends a number of enhancements to the rail network to cater for future growth, including capacity and capability enhancements.

2.11.2 The Freight RUS gives the Office of Rail Regulation (ORR) the opportunity to consider the key options to meet freight growth when considering expenditure on the network. It also enables the Department for Transport and Transport Scotland to understand freight needs whilst developing their High Level Output Specification for the future railway. Furthermore, the Freight RUS provides third party investors with an indication of enhancements that would be required to meet their aspirations.

2.11.3 Recommendations are divided into short-term (Control Period 3, CP3, to March 2009), medium-term (CP4, to March 2014), and long-term (CP5, thereafter).

2.11.4 No specific schemes proposed are related to the HITRANS area.

2.12 NR Scotland RUS

2.12.1 NR also publishes a RUS for Scotland (March 2007). The railways in Scotland are divided into three strategic routes:

- Route 24 – East of Scotland;
- Route 25 – Highlands; and
- Route 26 – Strathclyde and South West Scotland together with parts of Route 8 (ECML) and Route 18 (WCML).

2.12.2 As with the Freight RUS, recommendations are divided into short-term, (Control Period 3, CP3, to March 2009), medium-term (CP4, to March 2014) and long-term (CP5, thereafter).

2.12.3 The key recommendations within the Scotland RUS that are relevant to this Study (Route 25) are:

2.12.4 *Medium term (CP4: 2009 – 2014):*

- *to meet the requirement of a faster and more frequent service between Inverness and Perth additional infrastructure is recommended, combined with rolling stock with enhanced performance; and*
- *between Aberdeen and Inverness platform extensions are recommended at Insch and Elgin to provide increased capacity by permitting the operation of six-car services at peak times combined with an enhanced service.*

2.12.5 *Long term (CP5: 2014 - 2019):*

- *on the Highland Main Line it is anticipated that a positive business case can be developed for infrastructure works and rolling stock improvements to allow the further acceleration of the service. As technology develops, signalling alternatives will be progressed to replace RETB to improve capacity and reduce journey time.*

2.13 Quail track diagrams and the rail / track atlases

2.13.1 A series of paperback books are published by Trackmaps, detailing the NR national railway system and showing all tracks, level-crossings, tunnels, signal-boxes, distances and other information. These maps also include certain minor and private railways. For this Study we used Book 1: SCOTLAND & ISLE OF MAN (5th edition, published 2007).

2.13.2 We also used:

- Rail Atlas for Great Britain and Ireland, S.K. Baker, 11th Edition (2007).
- Track Atlas of Mainland Britain, Trackmaps 2009.

2.14 FTA Rail Freight Policy

2.14.1 The Freight Transport Association (FTA) published their policy on rail freight terminals in Britain in December 2009, stating that:

2.14.2 For Scotland, the following sites are the current main inter-modal freight interchanges:

- Mossend Eurocentral (cluster);
- Grangemouth cluster; and
- Coatbridge.

2.14.3 The policy noted that these locations may need investment in facilities and capacity to meet future forecast demand. The policy also considered one possible addition to this list, namely potential new capacity at Elgin stating that it *'is dependent upon whisky traffic to the central belt of Scotland'*.

2.15 ORR Review of Access Policy

2.15.1 The ORR published a document titled Review of Access Policy. The objective of this review is to ensure that their approach to decision making on capacity allocation helps to deliver the commitments in their corporate strategy and business plan relating to optimising the use of capacity.

2.15.2 This review also ensures that ORR's approach remains appropriate for the changing requirements of the railway and its passengers and customers as the network becomes fuller and competition for space increases. The review is concerned with higher priority issues where solutions can be implemented fairly quickly and longer term measures which may take some time to implement.

2.15.3 The consultation document sets out:

- ORR's existing approach to deciding between competing applications, including how they regard competition between open access and franchised passenger operators;
- how ORR consider and decide new applications for competing services, and whether they should change the 'not primarily abstractive test', including a review of their existing moderation of competition policy to see if it is still appropriate and how it fits with our wider policy and approach;
- how ORR choose between passenger and freight services when allocating scarce capacity; and
- how ORR deal with the capacity and performance trade-off.

2.15.4 The consultation process for this is currently running, is started on 26 January and continues until 20 April 2010.

2.16 Daily recording data

2.16.1 A TRUST extract for planned movements downloaded on 4/3/2010 by Network Rail at key locations on the network was used to provide current freight movements. The locations are:

- Aberdeen;
- Aviemore;
- Crianlarich;
- Dyce;
- Elgin;
- Fort William;
- Lairg; and
- Perth.

3 Stakeholder Consultation

3.1 Introduction

3.1.1 Throughout the course of this Study we have met with a number of people to discuss rail freight in the HITRANS area. We consulted with the following stakeholders to ascertain their views and aspirations for rail freight in the HITRANS area:

- David Prescott (Transport Scotland);
- Nick Gibbons (DB Schenker);
- Tom Curry (Direct Rail Services);
- Ian Kapur (First GB Railfreight);
- Kay Walls (Freightliner Intermodal);
- Paul Bowyer (Freightliner Heavy Haul); and
- Simon Ball (Colas Rail).

3.1.2 Below is a summary of the key points of view and main conclusions taken from these stakeholder meetings.

3.2 David Prescott - Transport Scotland

3.2.1 MVA and Brian Ringer met with David Prescott, Transport Scotland (TS), on Monday 8 March 2010. In particular, it was noted from this meeting that the 2011 timetable (with enhanced 'hourly' frequency passenger service between Inverness and Edinburgh/Glasgow) would not be available from TS in time for this Study.

3.2.2 The main target for the HML is to increase the frequency for passenger trains along it, and shorten the overall journey time. This includes increasing the speeds by rebuilding certain parts of the track between Perth and Stanley Junction to increase speed to 70/75 by 2013/2014.

3.2.3 It was also discussed that Network Rail are in the process of applying for additional speed restrictions on the Spey and Dalguise Viaducts. These possible variations in speed limits at these two locations have been included within this Report and GIS database.

3.2.4 TS also acknowledged that the HML needs longer loops. The main objectives on the AIL are to seek an hourly service, increase in frequency and journey times. Many of these objectives run in parallel to RUS.

3.3 Nick Gibbons – DB Schenker

3.3.1 Nick Gibbons (NG), DB Schenker Access and Train Planning Manager, thought that if further freight paths or capacity were needed on the WHL then he saw "timetable" solutions being the most likely route. This might well involve re-timing/ increased dwell time for passenger services to allow over length freight trains to pass.

3.3.2 NG thought that the priority on the HML was an increase to the length limit to give more capacity to intermodal services. His aspiration was to get the length limit to 84 SLU (the standard for intermodal trains between ports and inland terminals) and as a long term aim 117 SLU, the European standard. NG did say that at 117 SLU the length limit would be compromised by the haulage capacity of Class 66 locos, so it was very much a long term aim. NG saw this being achieved by small increments when any upgrade work was done on the line, especially if it was for increased capacity for passenger services. On gauge, DB Schenker (DBS) would prefer W9 before W10 in order to facilitate two pallet wide containers.

3.3.3 AIL was seen as a diversionary route by DBS and NG would like to see the route able to take the same gauge through its entire length rather than having the gauge restricted Inverness to Elgin section.

3.4 Tom Curry – Direct Rail Services

3.4.1 On the HML Tom Curry (TC) said the major impediment was length limits and that the southern section had the problem of short loops at both Dunkeld and Pitlochry. TC said that if there was investment available then a long loop could be re-instated at Ballinluig (Mile Post 23) which had a 100 SLU loop until it was removed in the 1960s. Gauge aspiration for Direct Rail Services (DRS) was get the entire route to W8 in the near future.

3.4.2 AIL was seen by TC as short of capacity. He thought that relatively small incremental improvements could ease the situation.

3.4.3 On the FNL TC thought any upgrade for freight should be driven by traffic gains. In this respect he saw the Balcas Biomass Plant at Invergordon and the “clean up” development of Dounreay as the most realistic opportunities.

3.5 Ian Kapur – First GB Railfreight

3.5.1 Ian Kapur (IK) said that First GB Railfreight (First GBRf) had only just taken over the RTZ Alcan contract for alumina to Fort William but had found an acceptable path for the traffic. The major problem that IK found was the number of Permanent Speed Restrictions of 10 mph over bridges and differential speed restrictions for freight traffic. These led to extremely protracted running times.

3.5.2 On the AIL IK stated that if First GBRf gained any freight contracts he could foresee real problems finding a path between Aberdeen and Dundee.

3.6 Kay Walls – Freightliner Intermodal

3.6.1 Kay Walls (KW), General Manger Commercial (Scotland) said that Freightliner Intermodal (F/L Int) had no immediate prospects for running trains beyond their present base at Coatbridge. However, F/L Int were interested in co-operating with other operators on space sharing deals to buy slots on trains. Inverness would be of especial interest and KW saw a market for F/L Int being able to market through transits from major container ports to Inverness, rather than the present option of road haulage from Coatbridge. For this through W8 gauge on the HML would be a priority.

3.6.2 KW saw little traffic opportunity for deep sea container traffic on either the WHL or FNL but did say that Elgin might make an attractive base for intermodal traffic from the Central Belt.

3.7 Paul Bowyer – Freightliner Heavy Haul

3.7.1 Paul Bowyer (PB), Contract Manager Cement confirmed that F/L Heavy Haul's (F/L HH) only involvement in the HITRANS Study area was the Lafarge Cement contract to Inverness. PB said that this worked well on the present path and with the trailing loads for the Class 66/6 locos. The path to Inverness was critical to getting productivity from Lafarge's cement tanks, as they worked in circuit to other cement terminals in Scotland. Hence a major recast on the Inverness run would affect all the other flows. This was critical to F/L HH retaining the Lafarge traffic on rail.

3.8 Simon Ball – Colas Rail

3.8.1 Simon Ball (SB) confirmed that Colas had moved timber from Crianlarich but their customer had stopped buying timber from that area. SB stated that Colas would need to look carefully at hauling timber from there again as the present length limits and trailing loads meant it was difficult to make any money on the traffic (e.g. a Class 57 loco could only lift eight bogie timber carriers from Crianlarich with present trailing loads, not an economic proposition).

4 Physical Characteristics

4.1 Introduction

4.1.1 This section of the Report is concerned with determining the physical characteristics of each route. The physical characteristics inform the constraints analysis in the following Chapter. The following Chapter provides analysis of the key pinch points which are contributing to the current route capabilities.

4.1.2 Given the possibility of running freight services overnight (when the only timetabling constraints are created by an occasional sleeper service, signal box opening hours and the need to ensure access for track maintenance etc), we have analysed and reported on the two sets of relevant constraints separately. Firstly to identify physical constraints imposed by the current rail infrastructure and secondly to identify any additional constraints imposed by timetabling-related issues. This Chapter provides details of the physical characteristics of the network which will be used to analyse the physical constraints in Chapter 6. Timetabling-related issues and constraints are dealt with later in Chapter 7.

4.1.3 This Chapter considers the following for each of routes in the HITRANS area:

- commodities;
- gross trailing loads;
- maximum train length;
- structure gauge; and
- axle load.

4.2 GIS

4.2.1 In addition to listing the relevant route characteristics laid out in this Report, an ArcGIS-based database has also been produced. This GIS-based database records and displays the characteristics and key constraints for each route/ terminal/ siding.

4.3 Definition of Routes

4.3.1 The current general characteristics for each of the routes in the Study Area are shown in the figures below. Figure 1.1 shows the routes being considered in this Study, namely:

- Far North Line (FNL), with two branches from Georgemas to Wick and Thurso;
- West Highland Line (WHL), comprising:
  - Fort William Line (FWL);
  - Mallaig Line (ML); and
  - Oban Line (OL).
- Highland Main Line (HML);
- Aberdeen - Inverness Line (AIL); and

- Kyle of Lochalsh Line (KL).

4.3.2 Figure 4.1 shows which routes consist of double and single lines. It is clear that the majority of Scotland's rail network comprises single lines, with some exceptions on the HML and AIL. The passing loops situated along these lines are shown in the GIS database.

Figure 4.1 Double and Single Lines

We have mapped the commodities which currently run on each line and figures showing this are included in Appendix B. The commodities which currently run are:

- aluminium ingots;
- bulk alumina;
- cement;
- containers;
- MOD;
- oil;
- pipes; and
- timber.

4.3.3 Aluminium Ingots, Bulk Alumina and MOD are run on the FWL only. Cement, Containers are run on the HML only. Pipes are run on the HML and FNL. Oil and Timber are run on the FWL, HML and parts of the FNL.

4.3.4 No freight is currently carried on the following routes:

- Mallaig Line;
- Oban Line;
- Aberdeen – Inverness Line; and
- Kyle of Lochalsh Line.

4.3.5 An exception to this is that on AIL (within HITRANS Study area) occasional specials for MOD/Agricultural run to Elgin. Also, AIL was used regularly over the past winter for diversionary purposes for freight traffic.

4.4 Gross Trailing Load

4.4.1 The Gross Trailing Load (GTL) is the total weight of the full freight train, typically determined by the haulage capacity of the loco on uphill gradients. The heavier the load the slower the train travels and conversely the lighter the load the faster the train travels. A loco of a given power output (eg a Class 66) hauling a certain mass up a given gradient has a limit on its speed.

4.4.2 Figure 4.2 shows what type of loco class which are permitted to run on each of the lines. Class 66 locos run on the HML, FNL (except for the section between Georgemas and Wick), AIL and the FWL. The remaining lines, running westwards, (KL, ML and OL) are restricted to the use Class 37's or similar weight locos.

4.4.3 Other factors that may affect the GTL including coupling strength and timing loads are discussed further below.

Figure 4.2 Loco Class

4.4.4 The following describe factors, other than loco class, that may affect the GTL:

Coupling Strength

4.4.5 British wagons have a variety of couplings which vary in strength (crudely put some couplings are made with thicker metal and have stronger headstocks on the wagon, where the coupling is 'anchored' to the frame). The designation of these is 23.5 tonne, 34.5 tonne and 56 tonne couplings. There are relatively few 23.5 tonne couplings but significant numbers of 34.5 tonne and 56 tonne couplings. A wagon with a 34.5 tonne coupling has a lower GTL than a 56 tonne coupling because of the risk that the forces exerted on it may pull it out of its headstock.

4.4.6 In the HITRANS area of Study there are only a couple of examples where coupling strengths actually affect loads but it is a factor that needs consideration if heavier loads were an option by putting two locos on a train.

Timing Loads

4.4.7 This is a complex area but put at its simplest NR and the FOCs have the ability to trade off train weight for speed. There are two main categories of freight train on the NR system, Class 4 (trains with a maximum speed of 75mph) and Class 6 (trains with a maximum speed of 60mph). Broadly Class 4 timed trains will have lower GTLs given their need to travel at up to 75mph. However whilst there is a disbenefit in lower load this is offset by shorter transit times. Wagon types can also be a determining factor in train speed.

4.4.8 Within the HITRANS Study Area Class 4 timings and the speed they require is only an issue on the HML. Line speed restrictions preclude any benefit from Class 4 timings on most of the remainder of the HITRANS area. Within the Class 6 category there are timing loads where speed is being traded off against weight of train, so again it may not always be practical to exploit the maximum GTL.

Class 66 'Powerplay' Rating

4.4.9 On some routes Class 66 locos are allowed higher GTLs where they exceed their continuous output rating for a relatively short period (up to 30 minutes). This is akin to a car driver using 'overdrive' for a short period to accelerate and push the rev counter into the 'red'. Whilst this can be done for short periods it cannot be done for long periods (not if the engine is to survive for any length of time!). This rating can be exploited where extra power output would get a train up a gradient and then eased off on the succeeding downhill section.

4.4.10 Table 4.1 details the GTLs for each route section. It also defines the loco class and includes notes detailing restrictions on certain sections. These restrictions are also indicated in the GIS database.

Table 4.1 Gross Trailing Loads (excluding loco)

Route	Route Section	Loco Class	Load tonnes	Notes
FNL	Inverness to Lairg	66	1,460	Most restrictive Ardgay to Lairg
FNL	Lairg to Inverness	66	1,955	Most restrictive Ardgay to Inverness
FNL	Lairg to Thurso	66	1,230	Most restrictive Lairg to Georgemas
FNL	Thurso to Lairg	66	1,230	Most restrictive Georgemas to Lairg
FNL	Georgemas to Wick	37	550	Class 66 not cleared to Wick
FNL	Wick to Georgemas	37	550	Class 66 not cleared to Wick
FWL	Fort William to Crianlarich	66	1,045	Most restrictive between Fort William to Crianlarich
FWL	Crianlarich to Fort William	66	1,010	Most restrictive between Crianlarich to Fort William
FWL	Crianlarich to Craigendoran	66	1,080	
FWL	Craigendoran to Crianlarich	66	1,135	
FWL	Fort William to Corpach	66	1,795	Subject to 34.5 tonne coupling strength limit of 1460 tonnes
FWL	Corpach to Fort William	66	1,290	Subject to 34.5 tonne coupling strength limit of 1105 tonnes
ML	Corpach to Mallaig	37	525	Class 66 not cleared to work on ML
ML	Mallaig to Corpach	37	520	Class 66 not cleared to work on ML
OL	Crianlarich to Oban	37	550	Class 66 not cleared to work on OL
OL	Oban to Crianlarich	37	550	Class 66 not cleared to work on OL
HML	Perth to Inverness	66	1,230	
HML	Inverness to Perth	66	1,230	
AI	Aberdeen to Inverness	66	1,535	Most restrictive Craiginches to Kittybrewster
AI	Inverness to Aberdeen	66	1,230	Most restrictive Elgin to Keith
KL	Dingwall to Kyle of Lochalsh	37	550	Class 66 not cleared to work on KL
KL	Kyle of Lochalsh to Dingwall	37	550	Class 66 not cleared to work on KL

4.4.11 This information is shown diagrammatically in Figure 4.3 and Figure 4.4 corresponding to the northbound and southbound directions respectively.

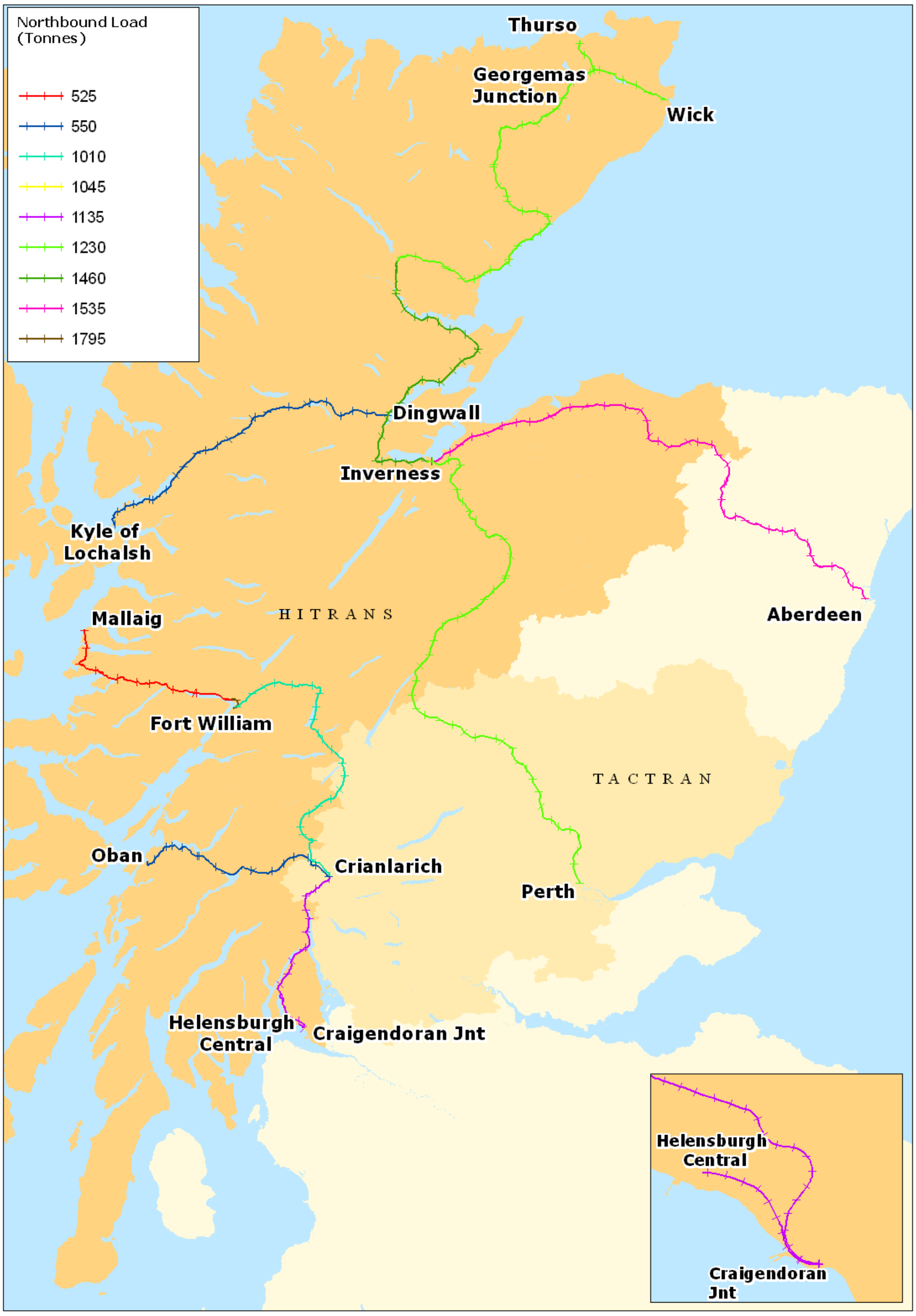

Figure 4.3 Gross Trailing Load Northbound

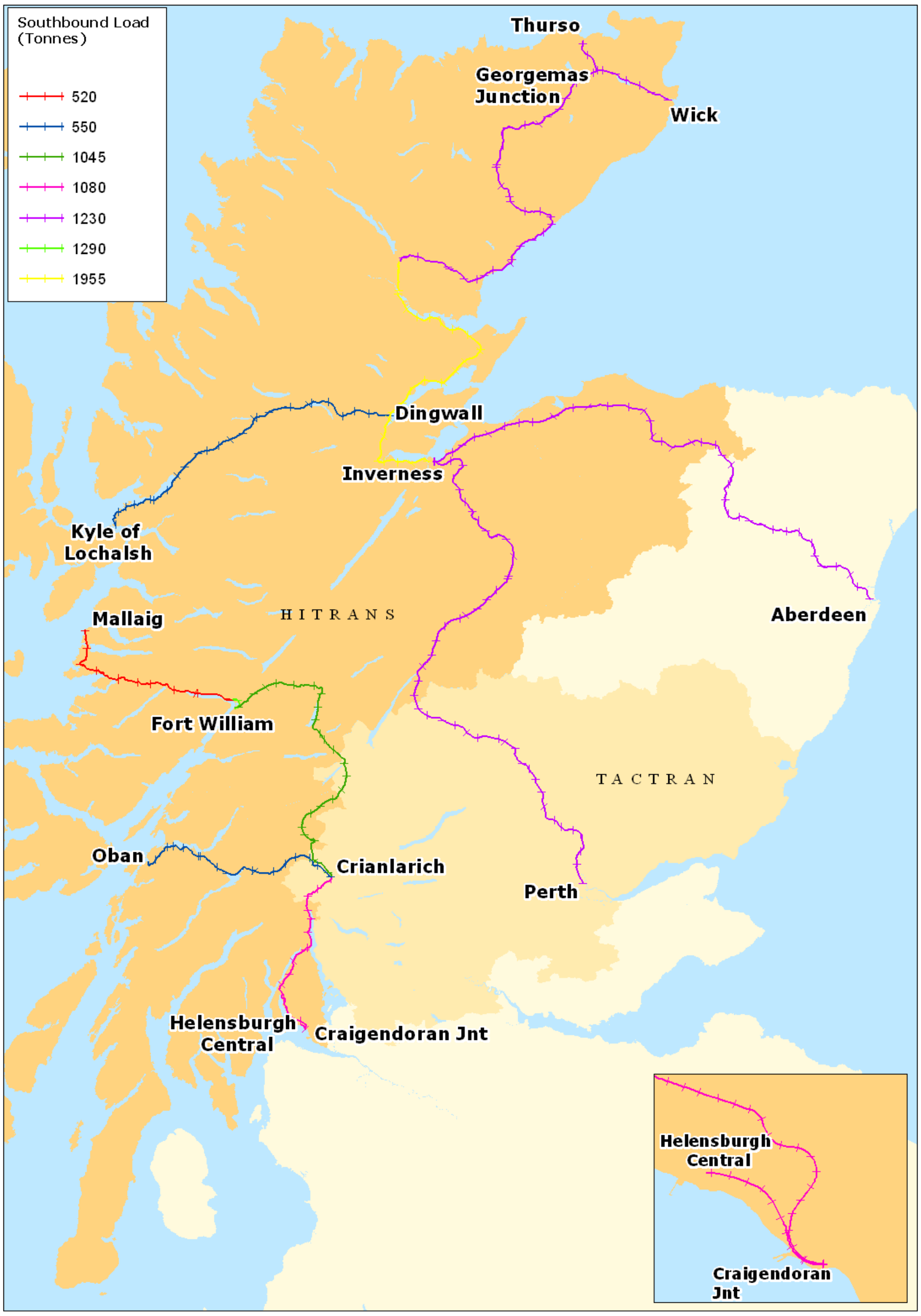

Figure 4.4 Gross Trailing Load Southbound

4.5 Maximum Train Length

4.5.1 The Maximum Train Length (MTL) is often determined by the length of passing loops which the freight services need to be able to use to operate within the overall network timetable. This is a physical characteristic of the railway and is a physical constraint of the network. However, it is also be a constraint to timetabling as it enables/ prevents overtaking trains.

4.5.2 The length limit for a line determines what length of train can run over it. This refers to the total train length and is inclusive of the loco length. In railway operating documents this is normally measured in Standard Length Units (SLU) which is 21 feet, traditionally the most common wagon length.

4.5.3 In most cases the length limit for a given section of line will be the length of the shortest loop or passing place along it. Occasionally it will be determined by a short signal section. Since much of the HITRANS area rail network is single track the ability for two trains to pass is critical and loop lengths tend to be the determining factor.

4.5.4 The length of a train may exceed the stated length limit with NR permission in cases where:

- the train it is timed to pass in a particular loop is shorter than the length limit, meaning that the longer train can 'pass through'; and
- the train is timed to run at a time of day (especially the night hours) when it will not need to pass any other train, in which case the length limit for passing places is no longer of relevance.

4.5.5 Length conversion tables are included in Appendix A (last section) for converting between SLU's and metres/ feet.

Table 4.2 Maximum Train Length

Route	Route Section	Maximum Train Length (SLU)
FNL	Inverness to Wick/ Thurso	50
FWL	Craigendoran to Fort William	31
FWL	Fort William to Corpach	31
ML	Corpach to Mallaig	31
OL	Crianlarich to Oban	31
HML	Perth to Inverness	50
AIL	Aberdeen to Inverness	50
KL	Dingwall to Kyle	37

4.5.6 This data is also shown in Figure 4.4. The FNL, HML and AIL have the least restrictive length limit of 50 SLU's. KL has a length limit of 37 SLU's. The FWL, ML and OL have the most restrictive length limits of 31 SLU's.

Figure 4.5 Maximum Train Length

Structure Gauge

4.5.7 The structure gauge can be described as the height and width of the structures that a train has to pass through. This Report will not try to explain all of the gauging types but will try to outline the major issues that affect gauge.

4.5.8 Structure gauge is described using standard rail industry categories referred to as eg W6, W8… W12. Broadly the higher the 'W' number the larger the gauge and the bigger the wagon/container that can pass along the route. W6 gauge was the most common gauge and was the gauge that the majority of rolling stock on the national rail network conformed to. Over time larger rolling stock (primarily containers on flat wagons) have become available for use on the British railway network and larger structure gauges have been sought to accommodate them.

4.5.9 Since the introduction of the original ISO container in the 1960s a whole plethora of container and swap body height and width combinations have emerged with a much greater variety of 'deck height' on container flat wagons. The present position is that while routes may have a fixed structure gauge measurement the type of container/swap body that may or may not be transported over that route will depend on the type of wagon it is carried on.

4.5.10 Further complicating the matter, one solution that has been found for carrying high containers (especially 9'6'') is the provision of 'well' or 'pocket' wagons where the container is stowed between the bogies of the wagon, much closer to the rail. However this type of wagon comes at a cost in that per metre of train length they are far less efficient (the length of the wagon that accommodates the bogies is effectively unused) and thus reduces the profitability of the train.

- W6a: Available over the majority of the British rail network;
- W8: Allows standard 2.6m (8'6") high shipping containers to be carried on standard wagons;
- W9: Allows 2.9m (9'6") high 'Hi-Cube' shipping containers to be carried on 'Megafret' wagons which have lower deck height with reduced capacity;
- W10: Allows 2.9m (9'6") high 'Hi-Cube' shipping containers to be carried on standard wagons and also allows 2.5m wide 'Euro' shipping containers. Larger than UIC A (continental gauge);
- W11: Little used but larger than UIC B (continental gauge);
- W12: Slightly wider than W10 at 2.6m to accommodate refrigerated containers. Recommended clearance for new structures, such as bridges and tunnels; and
- UIC GB+: Has been implemented for the HS1 and the Channel Tunnel with a proposed extension on the Midland Main Line.

4.5.11 The relative increases between structure gauges are indicated in Figure 4.5 below.

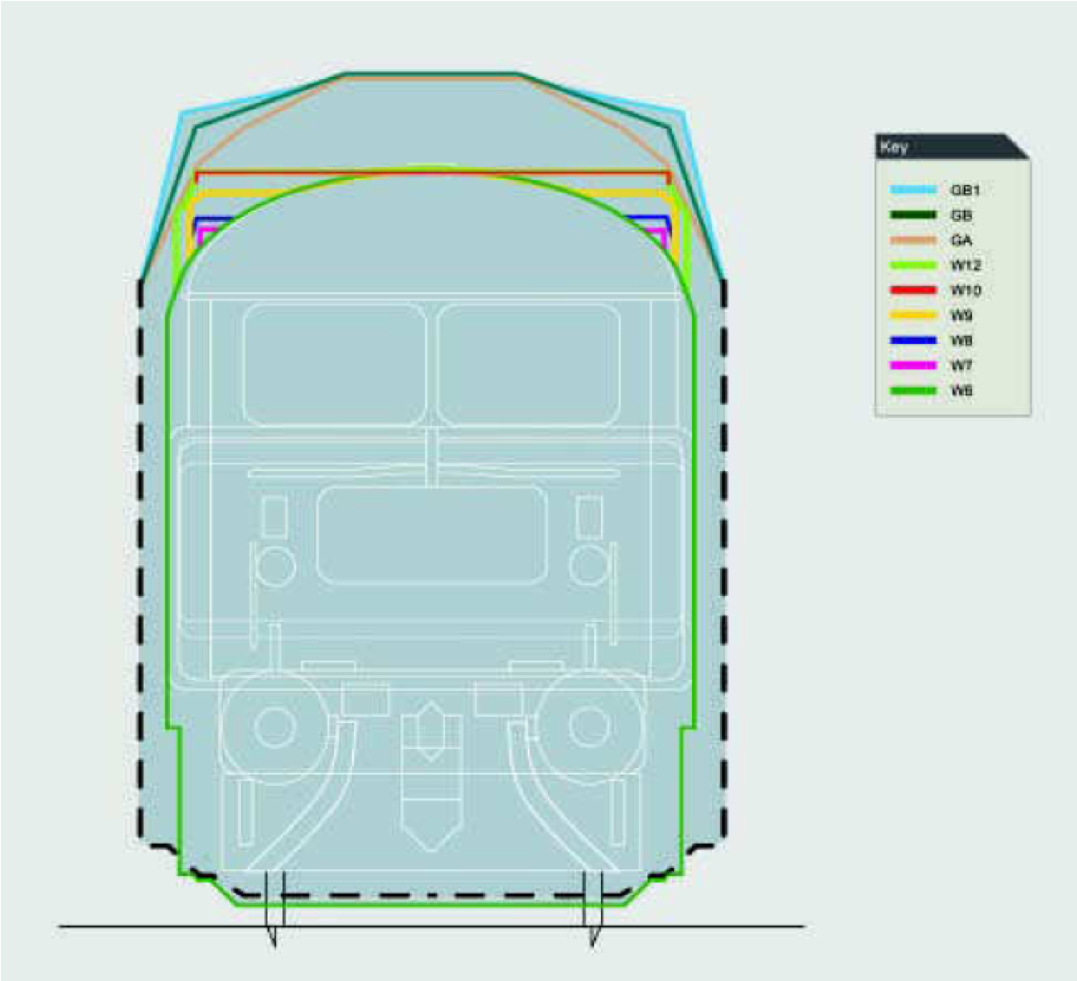

Figure 4.6 Structure Gauge Definition

4.5.12 Table 4.3 details the structure gauge of each of the lines. There are also some notes included in this table which details the structure gauge restrictions of each line. The structure gauge restrictions are also included in the GIS database. This indicates where the minimum structure/ tunnel etc is which limits the structure gauge of each the line.

Table 4.3 Structure Gauge

Route	Route Section	Structure Gauge	Notes
FNL	Inverness to Wick/ Thurso	W8	
FWL	Craigendoran to Fort William	W8	
FWL	Fort William to Corpach	W8	
ML	Corpach to Mallaig	W7	
OL	Crianlarich to Oban	W7	
HML	Perth to Pitlochry	W7	Perth to Pitlochry is W7 with permission for 2590mm x 2550mm (8' 6" x 8' 2'") on FKA and IKA wagons
HML	Pitlochry to Inverness	W8	
AIL	Aberdeen to Elgin	W8S	Aberdeen to Elgin is W8S with permission for the following container/wagon combinations: ■ 2590mm x 2500mm (8' 6" x 8' 2") on KFA ■ 2770mm x 2500mm (9' 1" x 8' 2") on IKA ■ 2896mm x 2500mm (9' 6" x 8' 2") on FLA ■ 2590mm x 2600mm (8' 6" x 8' 6") on IFA ■ 'Safeway' Refrigerated Container on IKA
AIL	Elgin to Inverness	W7	
KL	Dingwall to Kyle	W6	

4.5.13 The Study takes account of ongoing infrastructure 'enhancement'/verification work between Perth and Inverness (scheduled to be completed by August 2010) which aims to ensure that this line is able to handle 9'6" containers on low-platform wagons). Details of this work were provided by NR. By the end of CP4 it is envisaged that the full line will be cleared to W 8.

4.5.14 This data is also shown in Figure 4.6. The FWL, FNL and the majority of the HML are W 8 structure gauge. The ML, OL, AIL and remaining sections of both the FNL and HML are W 7 structure gauge. The KL is W 6 structure gauge.

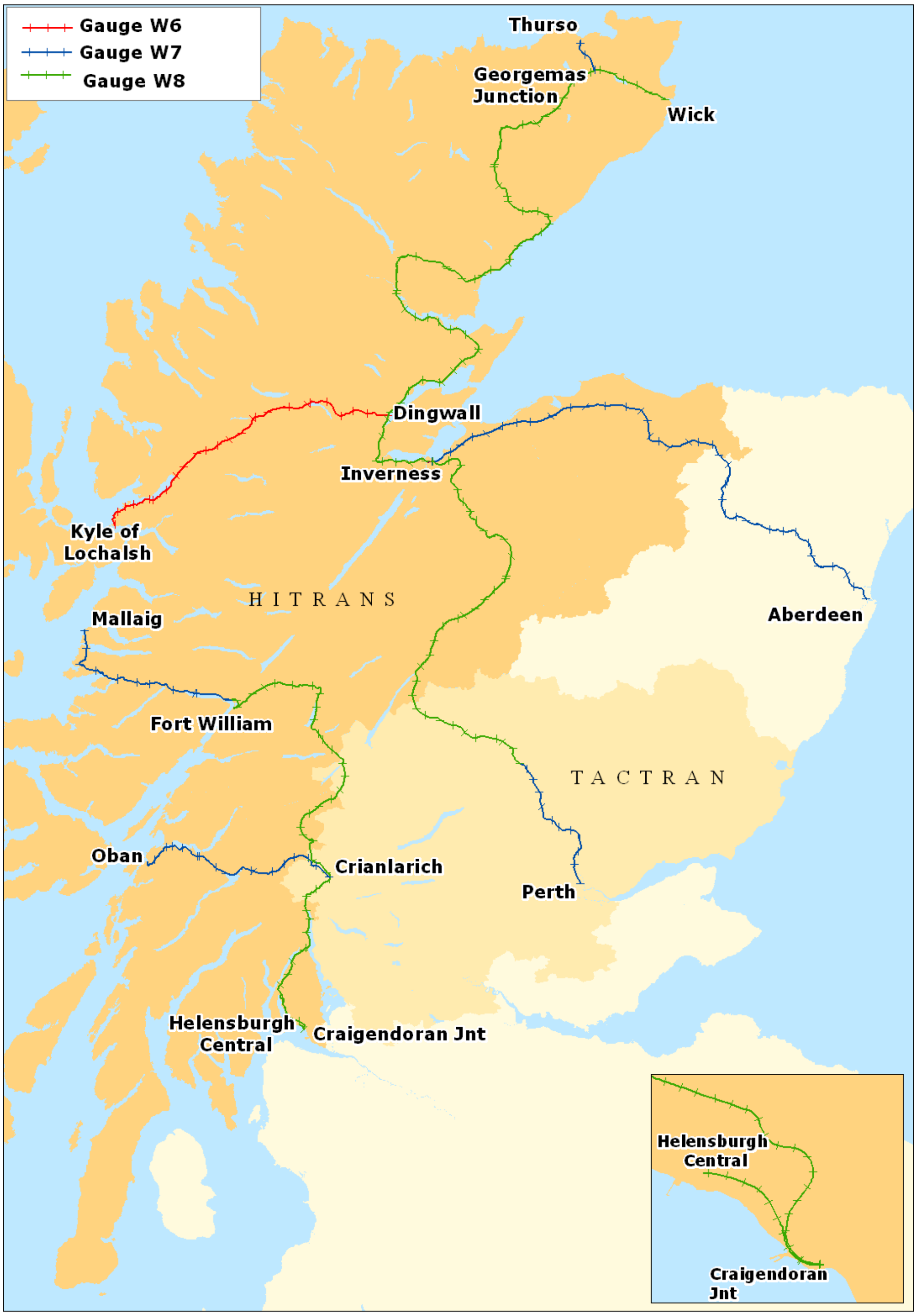

Figure 4.7 Structure Gauge

4.6 Axle Loads

4.6.1 Axle loads is usually defined as a weight per axle at a given speed and grouped into standard rail industry categories referred to as 'Route Availability' (eg RA3, RA4… RA10). The RA table is included in Appendix A (Section 3).

4.6.2 RA1 is the lowest at 13.75 tonnes per axle and RA10 is the highest at up to 25.5 tonnes per axle. In general, the higher the RA for the route the heavier the load the wagon can carry and therefore the greater the carrying capacity and revenue earned by the route. Nearly all bulk products carried on the NR system are in wagons capable of RA10 axle loads. However within the HITRANS area, only AIL is cleared for RA10 axle load wagons.

4.6.3 Route availability for each route section is shown in Table 4.4 below.

Table 4.4 Route Availability

Route	Route Section	Route Availability	Notes
FNL	Inverness to Wick/ Thurso	RA 5	RA8 is permitted Inverness to Invergordon RA3 Georgemas Jn to Wick with RA4 to RA6 traffic allowed subject to Heavy Axle Weight speed restrictions
FWL	Craigendoran to Fort William	RA 5	
FWL	Fort William to Corpach	RA 5	
ML	Corpach to Mallaig	RA 5	
OL	Crianlarich to Oban	RA 5	
HML	Perth to Inverness	RA 8	
AIL	Aberdeen to Inverness	RA 10	
KL	Dingwall to Kyle	RA 5	

4.6.4 This information is shown in Figure 4.7. AIL is rated as RA10. The HML is rated as RA8, with all remaining lines being RA5 or less.

4.6.5 Route Availability also affects loco classes allowed on particular lines, especially Classes 66 and 67. These are prohibited from most routes with a RA5 rating or lower. This means they are not allowed on most of FNL, ML, OL and KL route sections. The Class 66 have dispensation to work on FWL between Craigendoran Junction and Corpach.

4.6.6 In certain cases NR may allow a vehicle with a higher RA than the route is cleared for but only with restrictions on speed over certain structures. These derogations are not a 'right' but are granted at NR's discretion. Additionally on lines with a published RA NR may seek a temporary downgrading for engineering reasons through the Network Change procedure. This will be for a certain length of time until a solution can be found for the engineering problem.

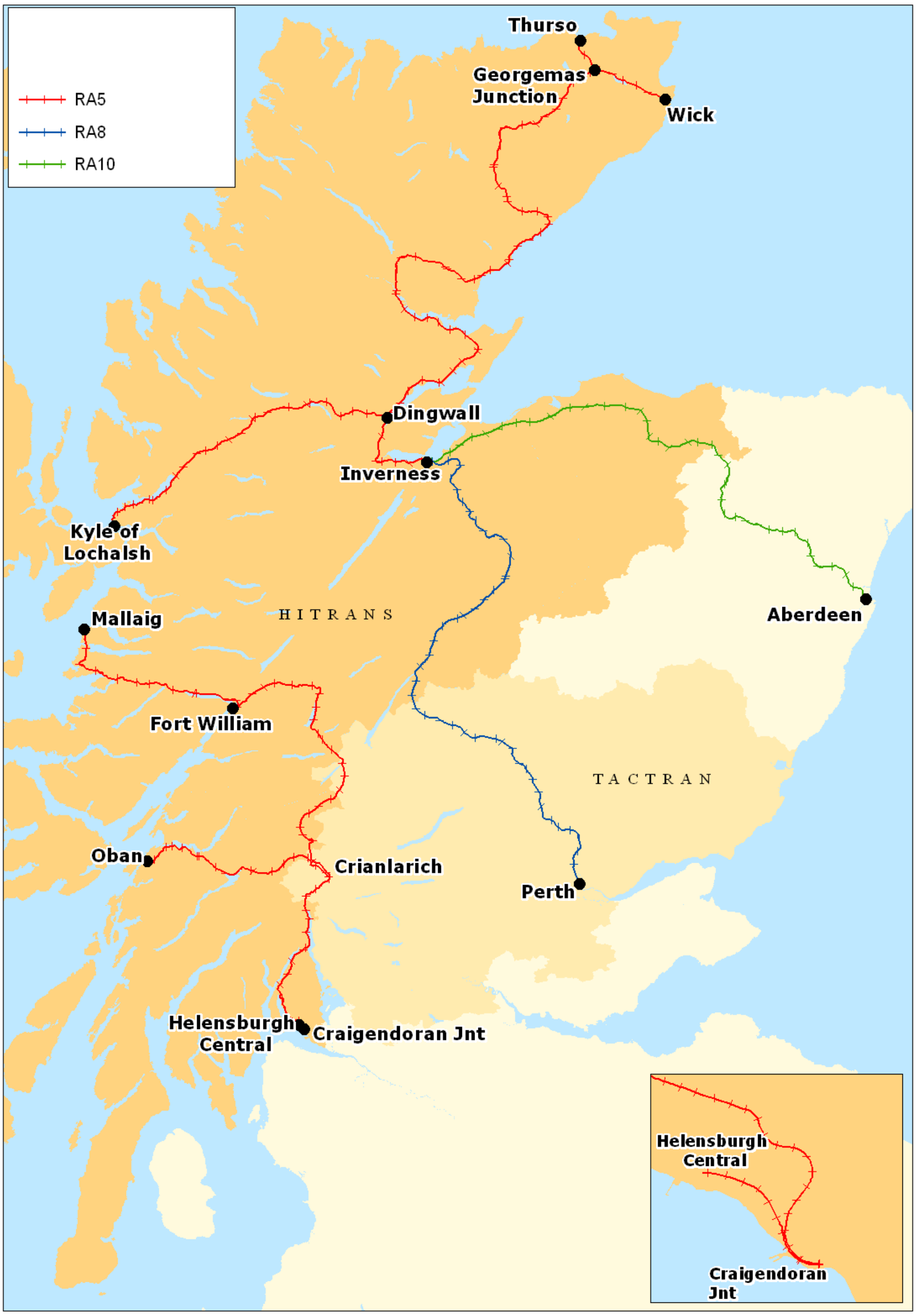

Figure 4.8 Rail Freight Axle Load

5 Key Physical Route Constraints

5.1 Introduction

5.1.1 The previous Chapter details the physical characteristics of the rail network being considered by this Study. This Chapter uses that information to determine the key physical route constraints for transporting freight by rail in the HITRANS region.

5.1.2 There are many factors that affect the length/height/width/weight/axle weight of all freight trains. Some of these interact with each other, for example a more powerful loco might give a heavier GTL over a particular route. However this heavier GTL can only be exploited if there is sufficient length limit over a route to allow extra wagons on the train. This Chapter considers this interaction of the varying limiting factors on the total train size and determines the limiting factor for each line.

5.2 Wagons

5.2.1 There are numerous types of wagons used in the HITRANS area. The wagons that form part of this Study include:

- PCA wagons;
- Bogie timber wagons;
- IKA 'megafret' wagons;
- FKA 'megafret' wagons; and
- HTA wagons.

5.3 Far North Line (Inverness to Wick/ Thurso)

5.3.1 The Far North Line (FNL) refers to that part of the rail network within the HITRANS area north of Inverness Rose Street Junction to Georgemas Junction/Wick/Thurso. Compared to other parts of the HITRANS Study area the FNL serves a number of moderately populated towns, including:

- Thurso: 8,500;
- Wick: 7,500;
- Dingwall: 5,200;
- Invergordon: 4,000; and
- Tain: 3,700.

Route Description

5.3.2 The FNL is overwhelmingly a single track railway, with passing loops at half of the 22 intermediate stations. The FNL is controlled entirely by Inverness Signalling Centre, with the first mile worked by TCB and the remainder by RETB. Additionally at Clachnaharry (1.5 miles north of Inverness) there is a signal box controlling the swing bridge over the

Caledonian Canal. The line is 161 miles long from Inverness to Wick, the branch from Georgemas Junction to Thurso being 6.5 miles in length.

5.3.3 Whilst not as mountainous as the WHL, the FNL does have significant gradients, especially on the northern section of the route, where the topography means it has to cut inland. The first 60 miles from Inverness to Culrain are all on the coastal plain of Ross-shire but beyond there the line climbs to a summit of 488 ft above sea level, near Lairg, with a ruling gradient of 1 in 70/80 in both directions. The most prolonged gradients are from the coastal town of Helmsdale to County March Summit, 708 ft above sea level and back down to Georgemas Junction. In both directions the uphill sections are 15 to 20 miles long, much of it at 1 in 60 to 100. Not unnaturally the Gross Trailing Loads (GTL) on the northern section tend to be low.

Table 5.1 FNL Key Physical Characteristics

Category	Characteristics
Double/ single lines	Single lines
Commodities	Oil Timber Pipes
Loco Class	Class 66 Lairg to Georgemas, Georgemas to Thurso Class 66 not cleared between Georgemas and Wick
Gross Trailing Load*	Inverness to Lairg: 1,460 Lairg to Inverness: 1,955 Lairg to Wick/ Thurso: 1,230 Wick/ Thurso to Lairg: 1,230 *[most restrictive between Ardgay to Lairg and Lairg to Georgemas (northbound), Ardgay to Inverness and Georgemas to Lairg (southbound)]*
Maximum Train Length	50 SLU
Structure gauge	W8
Axle load	RA5 *[RA8 is permitted Inverness to Invergordon, RA3 Georgemas Junction to Wick with RA4 to RA6 traffic allowed subject to Heavy Axle Weight speed restrictions]*

Present Constraints

5.3.4 Despite the terrain that it traverses the FNL has fewer physical constraints than the WHL and, in parts, its profile is better than the HML. The analysis of the route will start with the longest section from Inverness to Georgemas Junction, followed by the branches to Wick and Thurso. A further examination will be made of constraints on the southern section of the line from Inverness to Invergordon and Lairg.

Inverness to Georgemas Junction

5.3.5 The route from Inverness to Georgemas Junction is designated as RA5 for axle loading, has a length limit of 50 SLU and is within W8 for structure gauge. The GTL for a Class 66 loco is 1,230 tonnes in either direction.

5.3.6 Given the size of the potential market for rail freight in this area the restrictions would seem to allow the running of a moderately sized freight train on the FNL. For any bulk traffic the 50 SLU length limit should not be a major constraint and 1,230 tonnes would allow a reasonable sized train. However the axle load limit of RA5 (38 tonnes for a 2 axle wagon and 76 tonnes for a 4 axle wagon – refer to load data, Appendix A) would limit the payload per wagon, with a detrimental effect on profitability. At present the only (infrequent) traffic to Georgemas Junction are trainloads of pipes, for which the axle load restriction is not too onerous. Should a more dense bulk product be identified as rail freight on the FNL then the axle load limit of RA 5 could be the most restrictive constraint.

5.3.7 For non bulk traffic the W8 gauge allows a reasonable selection of containers/swap bodies to be carried but the length limit of 50 SLU could limit the viability of any intermodal train.

5.3.8 It should be noted that NR have a Network Change out for consultation (March 2010) that would reduce the route availability on the Georgemas Junction to Wick line from RA 5 to RA 3, although RA 4 to RA 6 traffic would be allowed to run but at a speed restriction of 10 mph over one structure.

5.3.9 As the entire line is controlled from Inverness Signalling Centre by RETB there may be considerable flexibility to run freight services on ‘night’ shift between 2200 and 0600. However, it must be noted that there is also a requirement to maintain the line and running additional traffic through the night would have an impact on maintenance and engineering access.

Lairg to Wick/ Thurso

5.3.10 The route from Lairg to Thurso is designated as RA5 for axle loading, has a length limit of 50 SLU and is within W8 for structure gauge. The GTL for a Class 66 locos is 1,230 tonnes in either direction. However, the section between Lairg and Wick isn’t cleared for Class 66 loco’s.

Inverness to Lairg

5.3.11 Lairg is the destination of the one regular freight flow on the FNL, comprising oil tanks from BP Oil’s Grangemouth refinery to the oil depot at Lairg. Whilst the structure gauge and route availability are the same as the rest of the line there are significantly better GTL for a Class 66 loco than on the route through to Georgemas Junction. This is explained by the fact that there are steeper gradients between Lairg and Georgemas than there are between Lairg and Inverness. The GTLs are:

- Inverness to Lairg – 1,460 tonnes; and
- Lairg to Inverness – 1,955 tonnes.

5.3.12 However, given the volume of oil that is available to be moved (one train per week on average) it is unlikely that this size of train could be exploited.

Inverness to Invergordon

5.3.13 The reason for examining the FNL to Invergordon is to see if bigger trains could be run to an area that could see substantial industrial development in the timber and biomass production sectors. Invergordon is the site of one biomass production facility and this has the potential to offer large tonnages of traffic to the rail freight industry in the form of biomass feed to electricity generating and combined heat and power plants. To this end it is worth examining whether larger trains in terms length and trailing load are feasible. NR do not publish a GTL for the Inverness to Invergordon section of line, so as a conservative assumption the loads to and from Lairg will be used (although the most restrictive section northbound is between Ardgay and Lairg, north of Invergordon, indicating an improvement on the present GTL ought to be possible).

5.3.14 The present route availability is shown as RA 5, however NR are starting consultation to reduce the previous limit of RA 10 to RA 5, so if substantial volumes of freight traffic were a prospect it ought to be feasible to get the RA back up to RA 10. Even if this is not possible, NR have indicated that they would still allow RA 8 traffic (45.5 tonnes on 2 axles and 90 tonnes on 4 axles) on the Inverness to Invergordon section, with heavy axle weight restrictions over 2 structures.

5.3.15 Finally the length limit for the FNL is 50 SLU. However the length limits for the three loops on this section of line are:

- Muir of Ord: 73 SLU;
- Dingwall: 65 SLU; and
- Invergordon: 63 SLU.

5.3.16 On this basis a length limit of at least 63 SLU ought to be feasible, with the possibility of it being 65 or 70 SLU depending on the path and crossing point with other trains.

5.3.17 To summarise it would appear that Invergordon ought to be able to accommodate freight trains of:

- RA 8;
- 63 to 70 SLU;
- W8; and
- GTL:
  - Inverness to Invergordon – 1460 tonnes (at least);
  - Invergordon to Inverness – 1955 tonnes.

5.3.18 These limits should allow a commercially viable freight train to operate out of Invergordon, albeit that constraints south of Inverness might cause a reduction in both length and/or GTL.

5.4 Fort William Line (Craigendoran Junction – Fort William – Corpach)

5.4.1 With a population of 10,700 Fort William with its surrounding area is the largest settlement on the FWL and indeed the full WHL. Fort William acts as an economic and retail centre for a large area of the Western Highlands and Islands. With the exception of timber loading, which tends to follow the harvesting of timber around the region, Fort William is the most likely generator of volume freight traffic along the FWL.

Route description

5.4.2 Here we are considering the FWL as the line from Craigendoran to Fort William to Corpach. By UK standards the FWL was built relatively late and was opened in 1894. It was almost entirely single track, with passing places at stations, reflecting the desire to minimise construction costs given the modest expectations of traffic levels. A combination of the landscape it was built over – at turns either mountainous or bogs – and the modest traffic levels, meant the line was built to a relatively low specification. These attributes still affect the line today with its low RA and infrequent crossing places that hamper both train length and the pathing of trains.

5.4.3 The physical characteristics of the FWL are shaped by the mountainous terrain that it traverses, causing steep gradients and a route with a high proportion of curved track. The FWL has long climbs leading to summits at Glen Douglas, County March, Gortan and Corrour, all which entail 1 in 50 to 60 gradients. The climb out of Fort William to Corrour is an almost unbroken 28 mile ascent, culminating in 7 miles of 1 in 57 to 60. A rail line built through this type of terrain is always going to suffer with limits on GTLs.

Table 5.2 FWL Key Physical Characteristics

Category	Characteristics
Double/ single lines	Single line
Commodities	Aluminium Ingots Bulk Alumina MOD Oil Timber
Loco Class	66
Gross Trailing Load	Craigendoran – Crianlarich: 1,135 Crianlarich – Craigendoran: 1,080 Crianlarich – Fort William: 1,010 Fort William – Crianlarich: 1,045 Fort William to Corpach: 1,795 *[subject to 34.5 tonne coupling strength limit of 1,460 tonnes]* Corpach to Fort William: 1,290 *[subject to 34.5 tonne coupling strength limit of 1,105 tonnes]*
Maximum Train Length	31 SLU
Structure gauge	W8
Axle load	RA5

Terminals

5.4.4 The present traffic generating locations along the WHL are:

- Glen Douglas – MOD;
- Fort William British Alcan - Lochaber aluminium smelter; and
- Fort William (BP) - oil distribution depot.

5.4.5 The following locations have generated rail freight traffic in the past 10 years but are not used at present:

- Crianlarich Upper – timber loading;
- Arrochar – timber loading;
- Fort William Inverlochy – timber loading; and

- Corpach – former Arjo Wiggins pulp and paper mill site. Now owned by BSW timber processors and a potential intermodal depot.

Load Constraints

5.4.6 This Study looks at how the restrictions of the FWL affect different types of rail freight traffic. These will be divided into Bulk and Non Bulk, with the addition of a section devoted to timber traffic, as this comes half way between the Bulk and Non Bulk sectors.

Bulk

5.4.7 The rail freight bulk sector includes commodities such as coal, minerals, steel, building materials and oil. The products are moved mainly in full trainloads and conveyed in wagons rather than intermodal containers. The main constraints in this market are:

- GTL – how heavy the train is; and
- Route Availability (RA) – how heavy each wagon is (payload).

5.4.8 The operations are characterised by trains that are weight rather than volume limited, ie they tend to 'weigh out' before they 'cube out'.

5.4.9 On the FWL the sole flow of bulk traffic is the alumina conveyed from Blyth (Northumberland) to the RTZ Alcan smelter at Fort William. Therefore the sample train used for Bulk traffic is one composed of RTZ's PCA alumina tanks. Looking at Table 5.2 we see that the route availability for the WHL is RA 5. Comparing this to the load data in Appendix A the maximum gross weight for a two axle wagon (such as the PCA tanks) is 38 tonnes.

5.4.10 It should be noted that the maximum gross weight for a PCA is 51 tonnes, so the reduction to 38 tonnes caused by the RA of the FWL has a dramatic commercial effect of reducing payload per wagon by 13 tonnes = 33%.

5.4.11 Referring to Table 5.2 we know that the loco class on this line is Class 66 and the lowest GTL is 1,010 northbound and 1,045 southbound. The GTL for a standard Class 66 in the northbound direction (lowest GTL) is 1,010 tonnes which allows for 26 PCA wagons assuming a load limit of 38 tonnes. Table 5.2 shows that the length limit is 31SLU on the FWL. With each PCA wagon being 7.4m long, it means that the length restriction is 27 PCA wagons.

5.4.12 However, NR allows a longer length limit of 43SLU (equivalent to 37 PCA wagons) for the alumina train on this line. Hence for Bulk traffics the GTL for the FWL can only be maximised by NR allowing a specially authorised length limit. However, it must be remembered that the terrain along this route may limit the practicality of increasing loads.

5.4.13 Given the desire to convey aluminium slab produced at Lochaber on the southbound alumina train (where the PCA wagons are empty) then it would appear that one or two slab carrying wagons could be added to the existing train. Problems would exist in accommodating the empty slab carrying wagons on the northbound train which is already at its maximum GTL and hence has no weight capacity to convey even empty slab carrying wagons. The most likely option for conveying any slab carrying wagons on the alumina trains is to run the train more often so that the number of PCA alumina tanks on each train is reduced and capacity is freed up to convey tonnages of slab. Obviously only the FOC can determine whether this is economic.

5.4.14 Not unexpectedly the FWL GTL limit is the limiting factor for bulk traffics.

Timber

5.4.15 Timber is a commodity that is probably more akin to a bulk product than non bulk but is more sensitive to length constraints, as it has a lower density than most bulk products. At RA 5 a four axle timber carrier (load data Appendix A) has a limit of 76 tonnes gross weight, which with a tare weight of 26 tonnes ought to give a payload of 50 tonnes.

5.4.16 The constraints on the FWL between Crianlarich and Craigendoran are of particular interest, as Crianlarich has the potential to be a significant timber loading terminal. This section of route has slightly better GTL than the section north of Crianlarich to Fort William, as seen in Table 5.2.

5.4.17 Southbound from Crianlarich the GTL to Mossend is 1,080 tonnes. Assuming 76 tonnes gross weight per wagon, a standard Class 66 will be made up of 14 bogie timber wagons, which is equivalent to 45 SLU.

5.4.18 The length of these trains is well in excess of the 31 SLU limit for the FWL, however a ‘timetable solution’ might be more easily found for a train emanating from Crianlarich, given that it is only 36 miles to Craigendoran Junction. This would require that an over length train might be pathed at times when it would not be required to cross another train before getting to Craigendoran Junction or vice versa.

Non Bulk

5.4.19 Here we consider the constraints on Non Bulk traffic, e.g. wagonload or intermodal, on the Craigendoran to Fort William/Corpach section of the FWL. Given that non bulk traffics tend to be cube rather than weight sensitive it is the restrictive length limit that has most effect on it. This assertion can be tested on a train formed of IKA ‘Megafret’ wagons (these are permanently coupled twin container carriers). An IKA wagon is 37.4m long, with 8 axles (2 permanently coupled 4 axle wagons) and weigh 48 tonnes tare. If it is assumed that each of the twin sections conveys one intermodal container weighing 30 tonnes, then the total weight of an IKA is 108 tonnes.

5.4.20 The largest train that may be conveyed is a Standard Class 66 GTL of 1,045 tonnes. This equates to 9 IKA wagons totalling 972 tonnes. However 9 IKA wagons are 53 SLU in length, above the NR limit of 31 SLU for the WHL. It would be very difficult to find a ‘timetable solution’ for an over length Alcan train, along with a potential long timber train from Crianlarich and a further intermodal train running over the standard length limit for the FWL. It also must be remembered that for every over length train that runs in one direction there has to be an over length train running in the opposite direction. Plainly it is hard to see how all of these trains could be fitted into the night shift even when there are no other trains running. Also, an additional traffic running through the night would have an effect on maintenance and engineering access.

Accommodating over length trains

5.4.21 Whilst the FWL has a number of constraints on the size and weight of freight trains the most restrictive is that on length. The standard length limit of 31 SLU severely restricts the ability to run a viable train load. Whilst slightly less of a problem for bulk traffics, the length constraint has its biggest impact on non bulk and timber traffic that require length to provide the space for a profitable train. 'Timetable' solutions might be provided for one or two trains to run 'over length' with NR dispensation, especially on night shift. Again, this must consider the effect on maintenance and engineering access. However these trains would need to return during daylight hours, in order to get reasonable productivity from the rolling stock, when 'timetable' solutions are much harder to come by.

5.4.22 Should the 'timetable' solution prove insufficient then there are very few alternatives. The next option would be enhancements to the infrastructure, which could prove expensive. Amongst these might be reviving the scheme to extend the passing loop at Bridge of Orchy to around 50 or 60 SLU. Bridge of Orchy is approximately half way between Criagendoran and Fort William. The benefit would be that two 'over length' freight trains from opposite directions could pass each other. However it still leaves the problem that Bridge of Orchy would be the only passing place for 'over length' freights and would become the timing point that the whole timetable would have to be built around, irrespective of customer requirements. It has to be stressed that this Study doesn't consider the cost of providing a longer loop at Bridge of Orchy nor of whether it would be remotely viable in terms of cost benefit analysis – this would require much further work.

5.5 Mallaig Line (Corpach to Mallaig)

5.5.1 The ML was built as an extension to the West Highland Railway from Banavie Junction to Mallaig and was one of this country's few railway lines to open in the 20th Century – on 1st April 1901. It is interesting to note that it was constructed with the backing of a Government guarantee for its debts. In the first 13 years of operation, from 1901 to 1914, the Mallaig extension made a cumulative loss of £72,600 and the Treasury was obliged to put in £36,600 under the terms of the guarantee. (Perhaps the earliest case of a Public Service Obligation payment).

5.5.2 The Mallaig Extension Line was built through even more difficult terrain than the WHL. Whilst the first 13 miles skirt Loch Eil and are relatively level, the remaining 28 miles are a veritable 'switch back', with curves and gradients as steep as 1 in 48 to 50 to several 'summits'. This topography means that GTL on the ML will always be low and the nature of its construction precludes heavy axle weight traffic.

5.5.3 Mallaig has a population of 797 (2001 Census) and is the largest settlement on the line once it leaves the greater Fort William area at Corpach. The main industries in the town are tourism and fishing.

Table 5.3 ML Key Physical Characteristics

Category	Characteristics
Double/ single lines	Single
Commodities	Currently no freight running
Loco Class	37
Gross Trailing Load	Corpach to Mallaig: 525 Mallaig to Corpach: 520
Maximum Trailing Length	31 SLU
Structure gauge	W7
Axle load	RA5

5.5.4 In common with the FWL the Corpach to Mallaig section has an axle load limit of RA 5 and a length limit of 31 SLU. Like the OL the structure gauge is more restrictive at W7. Loads above RA 5 are not permitted to Mallaig, meaning that the most likely motive power for any freight train is a Class 37.

5.5.5 With the GTLs in the table above it is hard to see a freight train of viable size being able to be operated. Hence the most severe restriction on the ML is the lack of clearance for a Class 66.

5.6 Oban Line (Crianlarich to Oban)

5.6.1 Oban has a population of 9,500, compared to Fort William's population of 10,700. This route covers the section of line from Lower Crianlarich Junction Ground Frame (44 chains west of Crianlarich Junction) to Oban. The 44 chains to Lower Crianlarich Junction are discussed below in relation to establishing a new timber terminal at Crianlarich Lower, on the track bed of the former Callander and Oban Railway.

Table 5.4 OL Key Physical Characteristics

Category	Characteristics
Double/ single lines	Single lines
Commodities	Currently no freight running
Loco Class	37
Gross Trailing Load	550
Maximum Trailing Length	31 SLU
Structure gauge	W7
Axle load	RA5

5.6.2 The limits on the OL are the same as the FWL, ie 31 SLU is the length limit and the axle load is RA 5, however there is a further restriction on the structure gauge, which is W7 (compared to W8 on the FWL). Loads above RA 5 are not cleared to use the OL, so the freight train loads are most likely to be based on Class 37 locos. The GTLs for a Class 37 are shown in the table above.

5.6.3 With GTLs such as these make it is hard to see how a viable freight service could be run on the OL, hence the most severe restriction on this line is the lack of clearance for Class 66 locos.

5.7 Highland Main Line (Perth to Inverness)

5.7.1 The Perth to Inverness route, the HML, is crucial to the HITRANS Study because of its importance to the Region's economy. Between 1971 and 2001 the population of Inverness and its surrounding area grew by 34% from 41,000 to 65,000 (source Scotland Census 2001), making it the largest population centre in the HITRANS Region by some distance. Adding to Inverness' economic importance is the role the town has as the retail and distribution centre for much of the HITRANS Region, with a much greater population looking to it as their centre for shopping and commercial activity. If any location in the HITRANS Region has the capacity to support rail freight services, then it is Inverness.

Table 5.5 HML Key Physical Characteristics

Category	Characteristics
Double/ single lines	Approx half double/ single lines
Commodities	Cement Containers Oil Pipes Timber
Loco Class	66
Gross Trailing Load	1,230
Maximum Trailing Length	50 SLU
Structure gauge	W7
Axle load	RA8

5.7.2 There is currently ongoing infrastructure 'enhancement'/verification work between Perth and Inverness (scheduled to be completed by August 2010) which aims to ensure that this line is able to handle 9'6'' containers on low-loader wagons).

Load Constraints

5.7.3 The analysis of constraints on freight operations are divided into Bulk and Non-Bulk, to explain the different limiting factors these two markets face.

Bulk

5.7.4 Looking at the present constraints on the HML, the limit for bulk commodities is the GTL of a loco Class 66 is 1,230 in either southbound or northbound direction.. This can be tested against the sole bulk commodity traffic to Inverness, the trainloads of Lafarge cement from Oxwellmains (Dunbar) that runs at present. This traffic is moved in PCA two axle cement tanks rated for a maximum load of 51 tonnes at RA10 but limited to RA 9 on the HML at a gross wagon weight of 48 tonnes (load data, Appendix A).

5.7.5 At their present weight of 48 tonnes the GTL of a Class 66/6 (1,595 tonnes) equates to 33 PCA wagons. The present length limit for the HML is 50 SLU, which equates to the length of 43 PCA wagons. Thus it can be seen that there is no infrastructure constraint on the cement traffic, as it 'weighs out' even with the GTL of the most powerful loco allowed on the HML.

5.7.6 As a sensitivity test a comparison has been made for a hypothetical train composed of DB Schenker 102 tonne HTA coal hoppers. The reason for choosing these wagons is not that there is any prospect of coal moving on the HML but because HTA's could be used for moving biomass traffic from the Highlands. The comparison is made using a Class 66/6 GTL of 1,595 tonnes (although DB Schenker do not operate any of these locos) and with the gross weight of the wagons limited to RA 8. Loaded to RA 8 the GTL of the Class 66/6 would haul 17 HTA wagons, again below the length limit for the route (50 SLU = 18 HTA wagons). Once again it is the GTL of the loco that is the limiting factor, not the infrastructure.

5.7.7 However the loadability of biomass traffic has not yet been established and it may be that only 55 or 60 tonnes of the product can be loaded in an HTA. If this is the case then the length limit of 50 SLU may yet become the limiting factor.

Non Bulk

5.7.8 In the non bulk market (including intermodal traffic), gauge and length limit are more important constraints. Non bulk traffics are rarely constrained by route availability or GTL. (For example a 60ft container carrying wagon loaded with a 40ft and a 20ft container would normally weigh less than 75 tonnes, which equates to RA5).

5.7.9 Using the FKA/IKA Megafret wagon as the sample container carrier most often used on the HML, with a length of 37.7m, the length limit for the route of 50 SLU would only allow 8 Megafrets to be conveyed on a train. This is well below the 1,230 tonne GTL for a 'standard' Class 66. If the 1,230 tonne GTL were to be the limiting factor then 11 Megafrets equal to a length limit of 65 SLU would be hauled. Thus it is apparent that for non-bulk traffic the length limit is the limiting factor for a train at present.

5.7.10 It should be noted that FOCs have an aspiration for longer trains on the HML and would like to see 84 SLU as the length limit (this is the length of many intermodal trains operating between ports and inland terminals on much of the network). To achieve this it would be necessary to use the Class 66H 'Powerplay' GTL of 1,535 tonnes (see comments on Class 66H 'Powerplay' loads in Section 4.4.8). This would allow 14 Megafret wagons (based on each of the twin wagons being loaded with a container weighing 30 tonnes and a tare weight of 48 tonnes making a total of 108 tonnes) totalling 1,512 tonnes and equal to 83 SLU in length.

Gauge Constraints

5.7.11 Turning to gauge, the HML is split into two sections:

- Perth to Pitlochry is W7 gauge, with a dispensation to convey 2590mm x 2550mm (8ft 6in x 8ft 2.5in) containers on Megafret wagons; and
- Pitlochry to Inverness is W8 gauge.

5.7.12 The first step to improve the situation would be to get the entire HML from Perth to Inverness cleared for W8 gauge. This would require track slue/track lowering/structural alterations on the Perth to Pitlochry section. It is believed that four bridges and one tunnel (Inver Tunnel) would require remedial work. It is outside the scope of this Study to judge what the cost of the work or the payback would be from undertaking this work. However, NR is committed to removing the most restrictive structure to allow WH Davis Super Low

Loader by August 2010 with a plan to remove the remaining constraints on W8 running by the end of CP4.

5.7.13 Finally FOCs have expressed an aspiration to see the HML cleared to W9 gauge to allow better access for intermodal units capable of two pallet width loads on standard height container flats. Again this Study is not mandated to assess what level of work or whether a wagon solution would be an alternative nor what the business case would be for such an upgrade.

5.7.14 From the above it can be seen that the most pressing restriction on the non bulk market is the present length limit on the HML (50 SLU) and that getting a longer limit, even if based on a timetable solution, is a first aim. Following this restoration of W8 gauge initially and W9 eventually is an aspiration for the FOCs.

Signalling Constraints

5.7.15 Signal boxes are also a constraint; however the current maintenance and engineering access requirements will also be a constraint for any proposed overnight operations.

5.8 Aberdeen – Inverness Line (Aberdeen to Inverness)

5.8.1 This Study examines the operating constraints over the entire length of the AIL, from Craiginches Yard (one mile south of Aberdeen station) to Millburn Junction, Inverness but is only required to investigate rail freight terminals within the HITRANS and Moray Council areas. The four main towns within Moray are all situated on the AIL and their 2001 Census populations are as follows:

- Nairn – 8,418;
- Forres – 9,174;
- Elgin – 25,678; and
- Keith – 4,491.

5.8.2 It can be seen that, compared to much of the HITRANS area Moray has a number of relatively populous towns and, in Elgin, has a small sub regional centre. However none of these towns has the importance of Inverness as a regional economic centre. The major economic activities within the Moray area are tourism, agriculture and food and drink manufacture. Whisky production is centred on the Spey valley and the Diageo plant at Roseisle.

Table 5.6 AIL Key Physical Characteristics

Category	Characteristics
Double/ single lines	One section of double lines, remaining single lines
Commodities	Currently no freight running
Loco Class	66
Gross Trailing Load	1,535 northbound (most restrictive Craiginches to Kittybrewster) 1,230 southbound (most restrictive Elgin to Keith)
Maximum Trailing Length	50 SLU
Structure gauge	W7 - Aberdeen to Elgin is W8S with permission for the following container/wagon combinations: ■ 2590mm x 2500mm (8' 6"' x 8' 2") on KFA ■ 2770mm x 2500mm (9' 1" x 8' 2") on IKA ■ 2896mm x 2500mm (9' 6" x 8' 2") on FLA ■ 2590mm x 2600mm (8' 6" x 8' 6") on IFA ■ 'Safeway' Refrigerated Container on IKA
Axle load	RA10

5.8.3 The route has a number of mothballed or sparsely used freight facilities in the HITRANS Study Area:

- Keith – Goods yard and former Chivas private siding;
- Elgin – Goods yard occasionally used by DB Schenker; and
- Roseisle – Mothballed branch line from Alves Junction to the Diageo maltings and distillery at Roseisle.

Signalling constraints

5.8.4 Unlike most of the lines in the HITRANS Study Area, much of the 107 mile Aberdeen to Inverness Line (AIL) was built as a double track railway, between Aberdeen and Keith and Keith and Inverness. It has subsequently been reduced to single track except for the 5.5 mile section between Insch and Kennethmont. Today approximately 95% of the route is single track. All the other passing places are loops at intermediate stations.

5.8.5 The AIL, unlike the WHL and FNL, is signalled using traditional signal boxes, which have a variety of signalling systems. These include TCB, Absolute Block and Tokenless Block. A total of 11 signalling installations control the line, typically with a signal box at each passing point.

5.8.6 A major problem for the AIL is that not all of the signal boxes are open continuously, unlike the RETB operation on the WHL and FNL and the HML signal boxes. Broadly the section of line from Elgin to Inverness is open continuously Monday to Saturday but Dyce to Keith is only open on the two day shifts – basically 0600 to 2400 – from Monday to Saturday. This situation could get worse if aspirations for a more intensive passenger service on the AIL come to fruition. This is discussed further in the timetable constraints section.

Axle Load Constraints

5.8.7 The axle load for the route is RA 10, the heaviest available on NR, allowing a gross weight of 51 tonnes on a two axle wagon and 102 tonnes on a four axle wagon. This makes it the only route in the HITRANS Study Area that allows RA 10 axle loads.

Length Limit Constraints

5.8.8 The length limit for the AIL is 50 SLU, a length limit it shares with the HML and FNL. The length limit is determined by the shortest loop length and the need to pass a passenger service. It is almost certain that a freight service between Aberdeen and Inverness would need to cross a passenger train at some point in its journey.

5.8.9 However examination of the Sectional Appendix gives the following length limits for loops along the AIL:

- Inverurie – 68 SLU;
- Insch to Kennethmont – 5 miles of double track;
- Huntly – 72 SLU;
- Keith – 69 SLU;
- Elgin – 59 SLU (Down Passenger Loop only);
- Forres – 32 SLU; and
- Nairn – 66 SLU.

5.8.10 Looking at the above there would seem to be a case for examining the length limit for an individual freight train path given that five of the intermediate passing places have loop lengths recorded as over 65 SLU. The North and South Arrival/Departure Line with a length of over half a mile (100+ SLU) could be used in either direction.

Structure Gauge Constraints

5.8.11 The AIL has an interesting structure gauge position. Following an initiative from the North East Scotland Rail Freight Development Group, an association of local authorities, Network Rail and rail freight companies, the Scottish Government helped fund a gauge enhancement scheme for the Mossend – Aberdeen - Elgin route. This enabled a set number of container/swap body and wagon combinations to be used on this route. The gauge does not exactly correspond to any other NR gauge specification but has been referred to as 'W 8S' and the set of container /wagon combinations given in the Sectional Appendix is shown in Table 5.6, above. This gauge means that with the right rolling stock the majority of the most commonly used container/swap body sizes can be used between Aberdeen and Elgin.

5.8.12 Between Elgin and Inverness the line has a structure gauge of W 7, restricting the route's usefulness as an intermodal corridor between Elgin and Inverness. It is believed that only two structures prevent the 'W 8S' gauge from being extended to Inverness. This would not only open up the intermodal market along the Aberdeen to Inverness corridor but provide a full diversionary route for intermodal services between Inverness and the Central Belt on occasions when the HML is shut due to engineering work, severe weather or other emergencies. This project would need further work to judge both its technical feasibility and a business case.

GTL Constraints

5.8.13 The GTL for a standard Class 66 loco, as shown in Table 5.6, is:

- Aberdeen to Inverness: 1,535 tonnes (most restrictive section Craiginches to Kittybrewster); and
- Inverness to Aberdeen: 1,230 tonnes (most restrictive section Elgin to Keith).

5.8.14 Examining these GTLs in terms of bulk commodities and non bulk commodities, as with other lines in this Study we found that for bulk commodities using a PCA 51 tonne cement tank fully loaded to RA 10, as the sample wagon for the bulk sector, the GTL for a Class 66 would allow 30 PCAs from Aberdeen to Inverness and 24 PCAs in the opposite direction. The more likely scenario is for bulk traffic to go to the Inverness area rather than from it, so at 1,535 tonnes the GTL does not represent a major constraint on running a viable train. In neither direction does the present length limit impinge on the haulage capacity of a Class 66 hauling a bulk commodity train.

5.8.15 For non-bulk commodities, using an IKA 'Megafret' wagon as the standard for an intermodal train conveying non bulk commodities, the assumption will be made that the wagon is loaded with two 30 tonne containers, grossing 108 tonnes and 37.4 metres in length. From Inverness to Aberdeen the GTL is 1,230 tonnes, which equates to 11 Megafret wagons with a length of 65 SLU. From Aberdeen to Inverness the GTL is 1,535 tonnes, which equates to 14 Megafrets and a length of 82 SLU. In both cases the length of the train capable of being hauled within the GTL is well in excess of the 50 SLU NR length limit. Were NR able to offer a dispensation on the length limit nearer to the 65 SLU outlined above, then an intermodal train of 11 Megafrets would almost maximise both the GTL at 1,188 tonnes and the length limit. However between Aberdeen and Inverness it is highly unlikely that the full GTL of 1,535 tonnes could be fully exploited given that a length limit of 82 SLU would be required. So, as in previous cases, for non bulk commodities it is the length limit on the AIL that is the constraint on maximising train size.

Minor Operational Improvements

5.8.16 During consultations with third parties a couple of small improvements were suggested to improve pathing of freight trains on the AIL.

- First ScotRail run most of the Edinburgh to Aberdeen services through to Inverurie, where they turn round and form the next service back to Edinburgh. It is believed that the ScotRail Class 170 unit stands in one of the platform lines at Inverurie (i.e. a running line) during the turn round. Now the majority of these trains only dwell at Inverurie for five minutes between arrival and departure, but four services have turn rounds of between 16 and 24 minutes. It was stated during consultation that there is an up side engineer's siding at Inverurie. This siding could allow a ScotRail Class 170 unit to be shunted in clear of the main line, onto the engineer's siding, to keep both of the through lines clear. This might allow extra paths through Inverurie; and

- The layout at Elgin has the connection from the goods yard joining the Up Main Line approximately a third of the way along the loop. To exploit any length of train above 40 SLU that is destined for Aberdeen it would have to propel beyond the end of the loop towards Elgin signal box. In order to perform this manoeuvre the train requires the single line token for the Elgin to Forres section – some 11 miles long –to be clear.

5.9 Kyle of Lochalsh Line (Dingwall to Kyle of Lochalsh)

5.9.1 The 63 mile branch from Dingwall to Kyle features some extremely steep gradients and is single track with passing loops at intermediate stations. It was constructed to access Kyle of Lochalsh, then the main ferry port to the Isle of Skye. Kyle of Lochalsh's population is 739 (2001 Census) the largest settlement on the line after leaving Dingwall.

Table 5.7 KL Key Physical Characteristics

Category	Characteristics
Double/ single lines	Single lines
Commodities	Currently no freight running
Loco Class	37
Gross Trailing Load	550
Maximum Trailing Length	37 SLU
Structure gauge	W6
Axle load	RA5

5.9.2 The constraints on the line for freight are:

- RA 5;
- 37 SLU; and
- W7.

5.9.3 However the biggest constraint is the fact that Class 66 locos are not cleared to operate over the line. This means that any freight train operated to Kyle would have to be hauled by a Class 37 loco, and the GTL is shown in the table above.

5.9.4 With this limited tonnage of freight train and an inability to convey the majority of intermodal units, by virtue of the W7 structure gauge, the Kyle of Lochalsh branch has relatively little potential for freight traffic.

5.10 Radio Electronic Token Block

5.10.1 Another issue for all lines (except for between Aberdeen to Inverness and Perth to Inverness) is the challenge faced by new operators on RETB controlled lines. The lack of availability of RETB CDUs and associated equipment could prove to be a barrier to new entrants.

5.10.2 Whilst Network Rail owns the infrastructure based equipment including the radio base stations the on-train equipment is 'owned' by TOCs and FOCs. New CDUs are no longer being manufactured and the CDU components are becoming obsolete therefore spares are extremely hard to get hold of (and costly).

5.10.3 Currently, there is no one organisation that formally owns RETB CDUs therefore any new entrant who wants to operate on an RETB line must approach the various TOCs and FOCs to ask whether they have any units available for use which could either be transferred to them or leased.

5.10.4 Whilst the development of ERTMS on both the Cambrian Coast and East Suffolk lines might mean that units become available as they are 'owned' by the current users of the lines there is no guarantee of an efficient cascade of equipment.

5.11 Summary

5.11.1 Below is a summary of the key physical constraints for the routes in the Study. These constraints are also shown in the GIS database.

Table 5.8 Key Physical Constraints

Route	Key Physical Constraints
FNL	The physical limits on the FNL ought to allow a commercially viable freight train to operate out of Invergordon, albeit that constraints south of Inverness might cause a reduction in both length and/or GTL. There is also a lack for clearance for Class 66 locos between Georgemas and Wick.
FWL	Whilst the FWL has a number of constraints on the size and weight of freight trains the most restrictive is that on length. The standard length limit of 31 SLU severely restricts the ability to run a viable train load. Whilst slightly less of a problem for bulk traffics, the length constraint has its biggest impact on non bulk and timber traffic that require length to provide the space for a profitable train.
ML	The most severe restriction on the ML is the lack of clearance for any load over RA 5.
OL	The most severe restriction on this line is the lack of clearance for any load over RA 5.
HML	The most pressing restriction on the non bulk market is the present length limit on the HML (50 SLU) and that getting a longer limit, even if based on a timetable solution, is a first aim. Following this restoration of W8 gauge initially and W9 eventually is an aspiration for the FOCs.
AIL	The key constraint on the AIL is that not all of the signal boxes are open continuously, unlike the RETB operation on the WHL and FNL and the HML signal boxes. Broadly the section of line from Elgin to Inverness is open continuously Monday to Saturday but Dyce to Keith is only open on the two day shifts – basically 0600 to 2400 – from Monday to Saturday.
KL	The biggest constraint is that Class 66 locos are not cleared to operate over the line. This means that any freight train operated to Kyle would have to be hauled by a Class 37 loco, and the GTL for the class is 650 tonnes in either direction.
All	Current maintenance and engineering access restricts overnight operations on all routes. The lack of availability of RETB CDUs and associated equipment could prove to be a barrier to new entrants.

6 Freight Paths & Timetable Constraints

6.1 Introduction

6.1.1 This Section of the Report is concerned with the availability of additional paths and the key constraints restricting this availability. Below is a list of potential additional freight paths by route and a set of key pinch 'sections' which create the main timetabling constraints.

6.1.2 This task extends from the previous constraints analysis to include the constraints created by the need to avoid conflicts with other timetabled services (and which primarily apply to freight services operating between say 0600 and 2400 hrs).

6.1.3 In addition to identifying available paths, this analysis included an identification of which section (or sections) of track (typically likely to be the longer sections of single track) are having the greatest impact in 'blocking' potential paths. This will enable subsequent analysis to identify the scale and location of investment likely to be required to create additional paths where none exist at present.

6.2 Timetable

6.2.1 The existing (2010) passenger timetables forms the Reference Case assumptions for all lines apart from the HML. TS stated the intention to deliver an hourly passenger service on the HML (i.e. 13 passenger trains in each direction in a 13-hour period) by 2011 and the lack of a definitive timetable for this service within the timescales of this Study will make it difficult/impossible to identify any additional day-time freight services on this route (over and above existing freight paths).

6.3 Methodology

6.3.1 The timetable data for December 2009 was compiled on a route by route basis to show:

- current passenger paths; and
- current freight paths.

6.3.2 A standard freight timing is assumed from a representative service. The standard freight timings were repeated and added incrementally to the timetable. These paths were checked to be free from timetable conflicts. In some cases partial services are included when a path can only be found for part of the route. The number of services that could be added determines the capacity available. Train graphs were used for checking the timetabled paths, showing the key timetabling locations such as stations with more than one platform and loops.

6.4 Assumptions

6.4.1 The following assumptions were made:

- trains arriving and departing from the HITRANS area are able to be accommodated by the surrounding network;

- trains arriving and departing at depots are able to be accommodated;
- existing passenger services are assumed to be fixed;
- a 60mph Class 66 service (60-TR40) timing load is assumed, where freight services currently run (2010);
- pathing at intermediate stops in the standard freight path is reduced to five minutes;
- where freight timings have not been available passenger times have been increased by 50% to give an estimation of freight timings;
- detailed speed restrictions for Class 66 have not been included in this high level analysis but SRT values assumed do allow a margin for slower running;
- headways are defined by the time taken for the previous train to exit the block and the time required for the RETB signalling to release the next block. Time to exit the block is unique to location. The time for the RETB signalling to release the block has been assumed to be between 2 and 5 minutes, this gives a suitable margin for operations timings such as awaiting instruction;
- study period between 06:00 and 23:59. Further capacity is available outside of these times;
- study has looked at a typical week day and included freight running on a typical day. Specific services on specific days are expected to utilise one of the existing paths and does not consider Rules of the Route;
- study assumes standard train length (225m for a standard train and 126m for shorter trains), each timetabled path would need to be checked against minimum length restrictions; and
- conflicts have been reduced to a level suitable for this Study given the uncertainty of running times.

6.5 Findings

6.5.1 This section gives details of the paths that can be found on each of the individual HITRANS routes. There is an inter dependency of paths across different lines, for example a path from Inverness to Wick and from Dingwall to Kyle of Lochalsh will share a common section of route between Inverness and Dingwall. While some effort has been made to match paths the final numbers presented will demand which paths are required and the opportunities for trains to wait off the main network between sections for continuation of their path on each different line.

Far North Line

6.5.2 There is capacity between Inverness & Wick/Thurso for:

- Five down services (two finishing at Ardgay); and
- Four up services (one starting at Dingwall, two starting at Ardgay).

6.5.3 The train length assumed is 225m, which is less than the maximum train length allowed of 50 SLU's.

Table 6.1 FNL Additional Freight – Down Services

Origin	Departure	Arrival	Destination	Duration	Notes
Inverness	11:25	13:36	Ardgay	02:11	FNL
Inverness	12:35	18:14	Thurso	05:39	FNL
	or	18:26	Wick	05:51	FNL
Inverness	15:05	21:04	Thurso	05:59	FNL
	or	21:16	Wick	06:11	FNL
Inverness	18:20	23:59	Thurso	05:39	FNL
	or	00:11	Wick	05:50	FNL
Inverness	21:30	23:33	Ardgay	02:03	FNL

Table 6.2 FNL Additional Freight – Up Services

Origin	Departure	Arrival	Destination	Duration	Notes
Dingwall	05:52	10:00	Inverness	04:08	FNL
Thurso	09:27	16:12	Inverness	06:44	FNL
Wick	09:20		or	06:51	FNL
Ardgay	17:12	19:27	Inverness	02:15	FNL
Ardgay	20:25	22:40	Inverness	02:15	FNL

Fort William Line

6.5.4 There is capacity between Craigendoran Jn and Fort William for:

- Four down services; and
- Four up services.

6.5.5 The maximum train length allowed is 31SLU's and therefore the shorter standard train length of 126m is assumed.

Table 6.3 FWL Additional Freight - Down Services

Origin	Departure	Arrival	Destination	Duration	Notes
Craigendoran Jn	07:01	11:17	Fort William	04:16	FWL
Craigendoran Jn	15:18	19:34	Fort William	04:16	FWL
Craigendoran Jn	16:43	21:19	Fort William	04:36	FWL
Craigendoran Jn	19:54	00:10	Fort William	04:16	FWL

Table 6.4 FWL Additional Freight – Up Services

Origin	Departure	Arrival	Destination	Duration	Notes
Fort William	04:57	09:12	Craigendoran Jn	04:15	FWL
Fort William	08:34	13:15	Craigendoran Jn	04:39	FWL
Fort William	12:45	16:58	Craigendoran Jn	04:13	FWL
Fort William	15:30	19:35	Craigendoran Jn	04:05	FWL

Mallaig Line

6.5.6 There is capacity between Fort William and Mallaig for:

- Five down services; and
- Four up services.

6.5.7 The maximum train length allowed is 31SLU's and therefore the shorter standard train length of 126m is assumed.

Table 6.5 ML Additional Freight - Down Services

Origin	Departure	Arrival	Destination	Duration	Notes
Fort William	04:39	06:44	Mallaig	02:05	ML
Fort William	10:09	12:14	Mallaig	02:05	ML
Fort William	13:18	15:23	Mallaig	02:05	ML
Fort William	18:15	20:49	Mallaig	02:34	ML
Fort William	20:11	22:36	Mallaig	02:25	ML

Table 6.6 ML Additional Freight – Up Services

Origin	Departure	Arrival	Destination	Duration	Notes
Mallaig	07:50	09:54	Fort William	02:04	ML
Mallaig	12:55	14:59	Fort William	02:04	ML
Mallaig	19:47	20:52	Fort William	02:05	ML
Mallaig	21:35	23:40	Fort William	02:05	ML

Oban Line

6.5.8 There is capacity between Crianlarich and Oban for:

- Five down services; and
- Five up services.

6.5.9 The maximum train length allowed is 31SLU's and therefore the shorter standard train length of 126m is assumed.

Table 6.7 OL Additional Freight - Down Services

Origin	Departure	Arrival	Destination	Duration	Notes
Crianlarich	08:15	10:03	Oban	01:48	OL
Crianlarich	12:55	14:43	Oban	01:48	OL
Crianlarich	15:42	17:30	Oban	01:48	OL
Crianlarich	18:14	20:02	Oban	01:48	OL
Crianlarich	21:00	22:48	Oban	01:48	OL

Table 6.8 OL Additional Freight – Up Services

Origin	Departure	Arrival	Destination	Duration	Notes
Oban	09:25	11:32	Crianlarich	02:07	OL
Oban	10:56	13:03	Crianlarich	02:07	OL
Oban	13:20	15:27	Crianlarich	02:07	OL
Oban	16:05	18:12	Crianlarich	02:07	OL
Oban	19:20	21:27	Crianlarich	02:07	OL

Highland Main Line

6.5.10 Using the current timetable (2010), there is capacity between Perth to Inverness for:

- One down services; and
- One up services.

6.5.11 The train length assumed is 225m, which is less than the maximum train length allowed of 50 SLU's.

6.5.12 These paths are quite tight and require some further refinement of pathing and existing freight to be fully conflict free. We also understand that the 2011 timetable will provide less capacity for freight services running during the day.

Table 6.9 HML Additional Freight – Down Services

Origin	Departure	Arrival	Destination	Duration	Notes
Stanley Jn	15:50	18:33	Inverness	02:43	HML

Table 6.10 HML Additional Freight – Up Services

Origin	Departure	Arrival	Destination	Duration	Notes
Inverness	09:40	12:33	Stanley Jn	02:53	HML

Aberdeen – Inverness Line

6.5.13 There is capacity between Aberdeen and Elgin for:

- Four down services (two starting from Dyce, one starting from Inverurie); and
- Three up services (one finishing at Dyce).

6.5.14 There is capacity between Elgin and Inverness for:

- Four down services; and
- Three up services.

Table 6.11 AIL Additional Freight - Down Services

Origin	Departure	Arrival	Destination	Duration	Notes
Dyce	08:45	10:48	Elgin	02:03	AIL
Dyce	12:20	14:23	Elgin	02:03	AIL
Aberdeen	14:15	17:43	Elgin	03:28	AIL (loop Huntly)
Inverurie	19:12	21:13	Elgin	02:01	AIL
Elgin	12:18	13:29	Inverness	01:11	AIL
Elgin	13:58	15:09	Inverness	01:11	AIL
Elgin	20:53	22:04	Inverness	01:11	AIL
Elgin	22:23	23:34	Inverness	01:11	AIL

Table 6.12 AIL Additional Freight – Up Services

Origin	Departure	Arrival	Destination	Duration	Notes
Inverness	09:55	11:01	Elgin	01:06	AIL
Inverness	11:40	13:03	Elgin	01:23	AIL
Inverness	16:25	17:31	Elgin	01:06	AIL
Elgin	09:01	12:29	Aberdeen	03:28	AIL (loop Huntly)
Elgin	12:31	14:32	Dyce	02:01	AIL
Elgin	20:06	22:24	Aberdeen	02:18	AIL

Kyle of Lochalsh Line

6.5.15 There is capacity between Dingwall and Kyle of Lochalsh for:

- Two down services; and
- Four up services (one finishing at Strathcarron).

Table 6.13 KL Additional Freight – Down Services

Origin	Departure	Arrival	Destination	Duration	Notes
Inverness	18:20	22:17	Kyle of Lochalsh	03:57	KL
Inverness	21:30	01:12	Kyle of Lochalsh	03:42	KL

Table 6.14 KL Additional Freight – Up Services

Origin	Departure	Arrival	Destination	Duration	Notes
Kyle of Lochalsh	05:52	10:00	Inverness	04:08	KL
Kyle of Lochalsh	09:34	16:12	Inverness	06:38	KL
Strathcarron	16:40	19:27	Inverness	02:46	KL
Kyle of Lochalsh	18:42	22:40	Inverness	03:58	KL

6.5.16 The Figures 6.1 to 6.5 below gives approximate timings for these services. Black denotes passenger services, red existing freight services and blue possible future freight services.

6.6 Lineside Loading

6.6.1 Additional train paths may be suitable for lineside loading on quieter parts of the network.

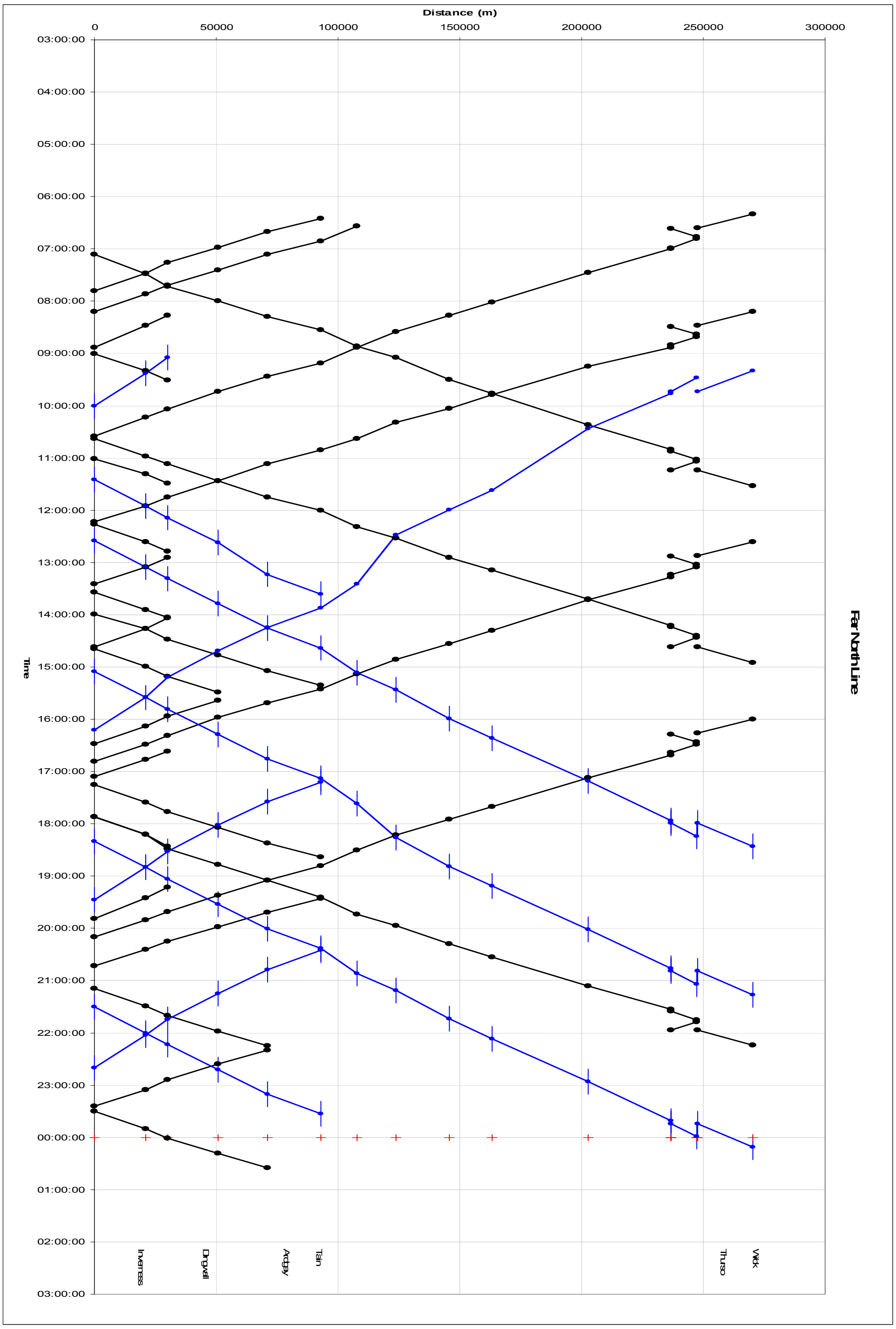

Figure 6.1 FNL timetable analysis

mvaconsultancy

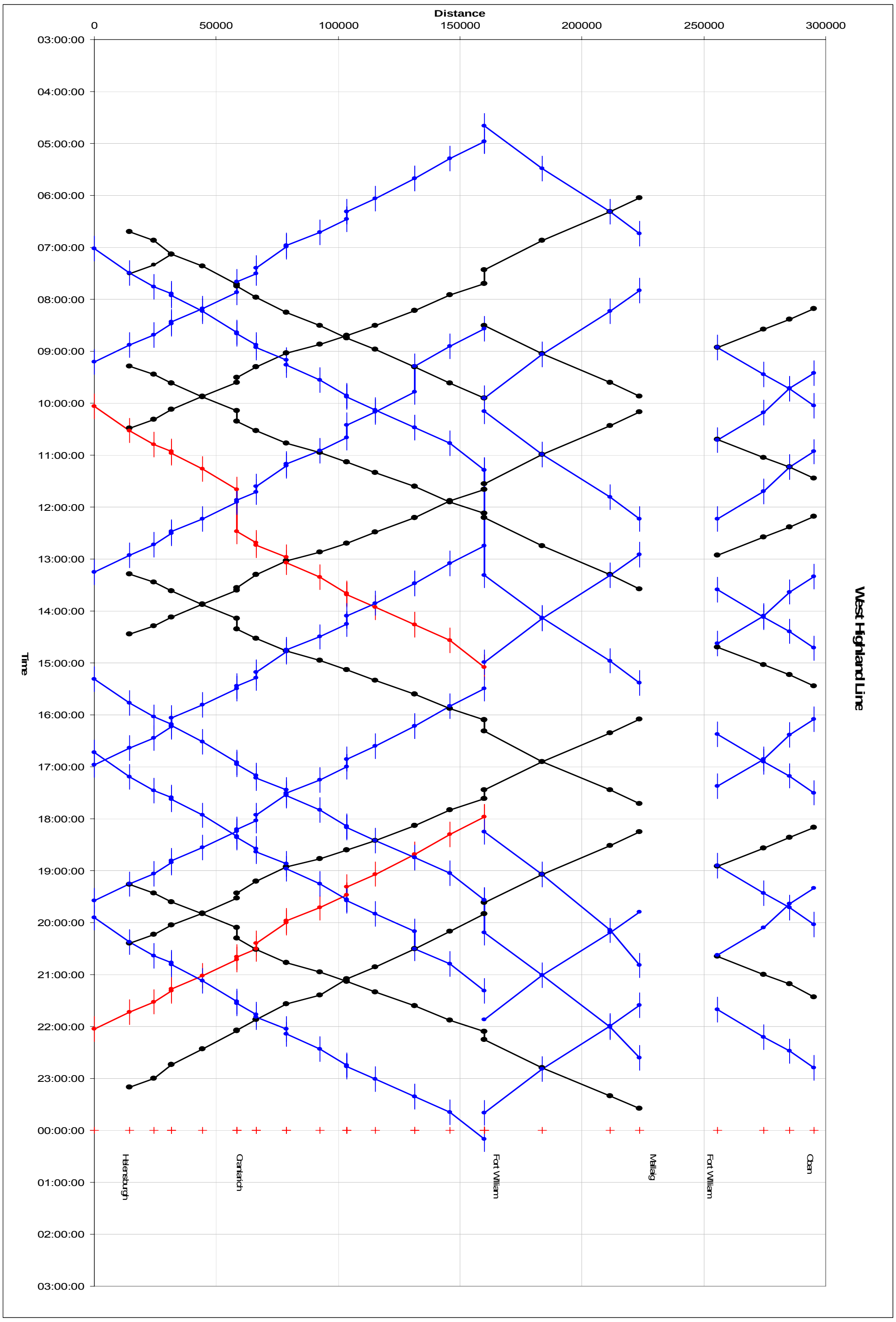

Figure 6.2 WHL (FWL, ML, OL) timetable analysis

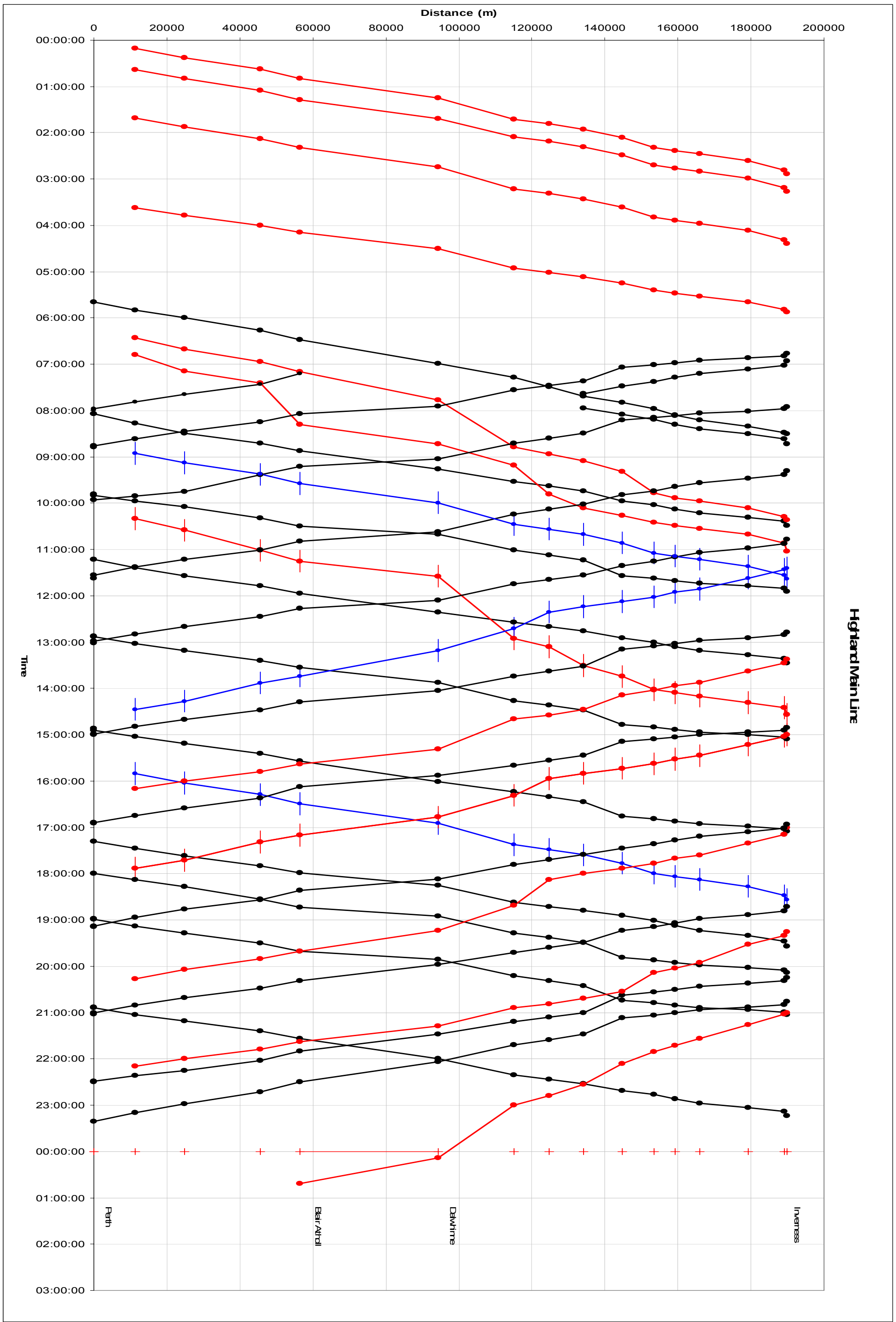

Figure 6.3 HML timetable analysis

mvaconsultancy

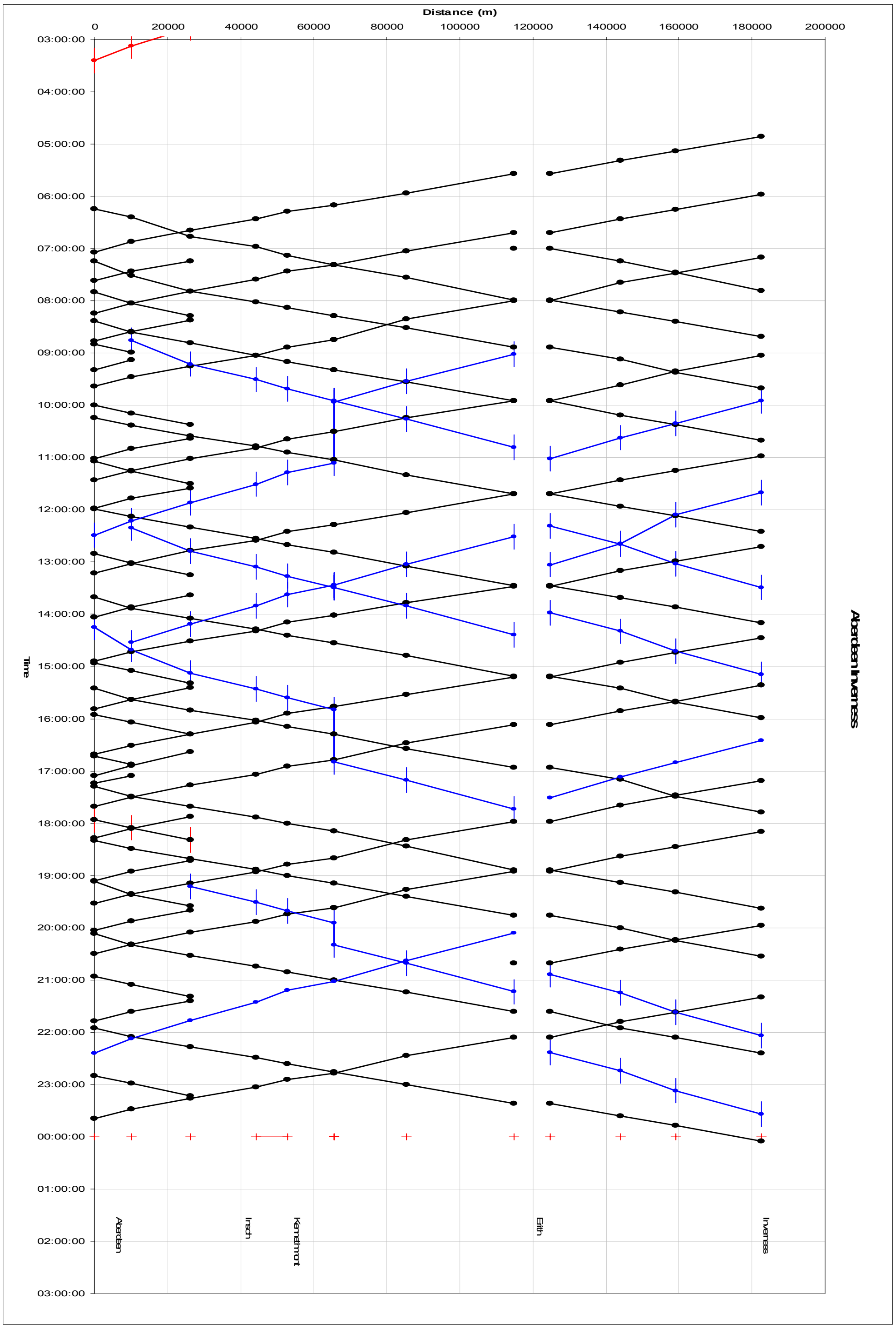

Figure 6.4 AIL timetable analysis

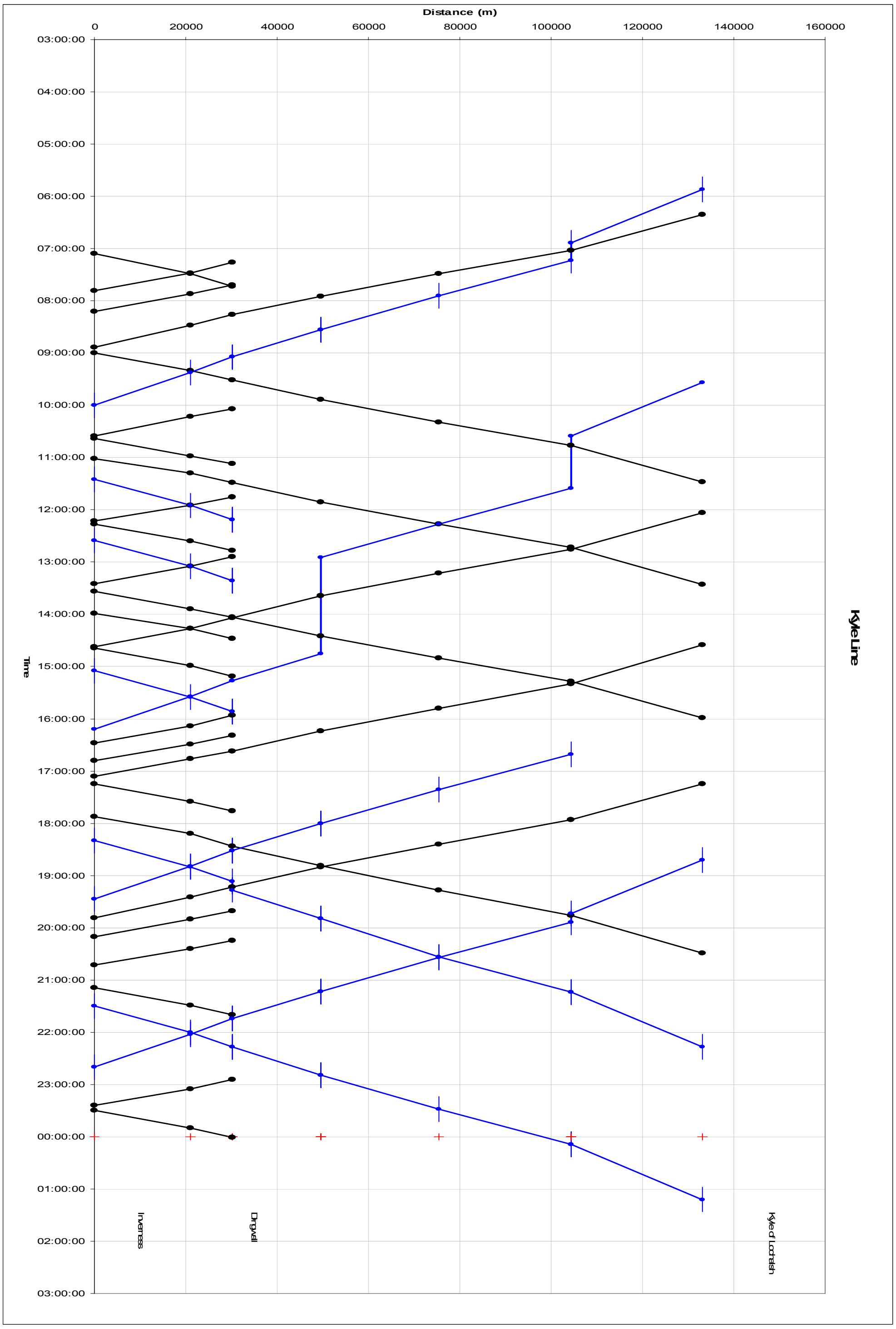

Figure 6.5 KL timetable analysis

6.7 Timetabled-based constraints

Far North Line

6.7.1 The pathing of freight trains during 'day' shifts (0600 to 2200) has to work around the four through passenger services that run in each direction over the Inverness to Wick/Thurso line, along with the two morning and evening 'commuter' services that run between Tain/ Ardgay and Inverness. Additionally there are four return services on the Inverness to Kyle route that take up paths between Inverness and Dingwall.

Aberdeen – Inverness Line

6.7.2 Unlike most of the lines in the HITRANS Study Area, much of the 107 mile Aberdeen to Inverness Line (AIL) was built as a double track railway and has been reduced to single track as a subsequent economy measure. A small proportion of the double track remains on the 5.5 mile section between Insch and Kennethmont, but 95% of the route is single track. All the other passing places are loops at intermediate stations.

6.7.3 The AIL, unlike the WHL and FNL, is signalled using traditional signal boxes, which have a variety of signalling systems. These include TCB, Absolute Block and Tokenless Block. A total of 11 signalling installations control the line, typically with a signal box at each passing point.

6.7.4 A major problem for the AIL is that not all of the signal boxes are open continuously, unlike the RETB operation on the WHL and FNL and the HML signal boxes. Broadly the section of line from Elgin to Inverness is open continuously Monday to Saturday but Dyce to Keith is only open on the two day shifts – basically 0600 to 2400 – from Monday to Saturday.

6.7.5 The signal box opening hours means that the AIL cannot utilise the night shift for running freight trains at times when no passenger services are being run to overcome the length limit constraints at passing loops. However the continuous operation of the Elgin to Inverness section of line means that freight terminals on this section could be served on night shift provided the train runs to/from Inverness.

6.7.6 The opening hours of the signal boxes on the AIL is critical to the operation of freight traffic as the present passenger service leaves little room for additional freight paths during the two day shifts (06:00 to 22:00). The December 2009 to May 2010 passenger timetable has a Monday to Friday service level of:

- Eleven Inverness to Aberdeen and v.v. stopping all stations;
- Ten Inverurie to Aberdeen and v.v;
- Two Dyce to Aberdeen and v.v; and
- One Elgin to Inverness and v.v.

6.7.7 These services operate from as early as 04:51 departure from Inverness to a 23:39 arrival at Aberdeen and a 0005 arrival at Inverness.

6.7.8 This situation could get worse if aspirations for a more intensive passenger service on the AIL come to fruition.

Table 6.15 Timetable-based constraints

Route	Timetable – based constraints
All routes	Single Line with Passing Loops. Speed differential between passenger and freight services.
FNL	Dingwall to Inverness is the primary constraint is the level of current (2010) passenger services. Beyond Dingwall the distance between loops at Helmsdale, Forsinard and Georgermas Junction is the next constraining factor. Current service passenger services between Dingwall and Tain also cause constraints.
FWL	The primary constraint is the level of current (2010) passenger and freight services on the route.
ML	The primary constraint is the level of current (2010) passenger services. Additionally the distance between loops at Fort William, Glenfinnan and Arisaig is the next constraining factor.
OL	The primary constraint is the level of current (2010) passenger services. Additionally the distance between loops at Crianlarich, Dalmally and Taynuilt is the next constraining factor.
HML	The primary constraint is the level of current (2010) passenger and freight services on the route. Paths would need to alter existing services to be entirely conflict free.
AIL Aberdeen to Elgin	Aberdeen to Inverurie is the primary constraint is the level of current (2010) passenger services. Beyond Inverurie the distance between loops at Elgin and Keith is the next constraining factor.
Elgin to Inverness	The primary constraint is the level of current (2010) passenger services, and the limited availability of passing loops.
KL	The primary constraint is the level of current (2010) passenger services, and the limited availability of passing loops.

6.7.9 These constraints are also shown in the GIS database.

7 RailSys

7.1 Introduction

7.1.1 In addition to the timetable analysis in the previous chapter, we have also undertaken RailSys analysis for two routes, namely:

- Aberdeen – Inverness Line; and
- West Highland Line (including FWL, ML and OL).

7.1.2 As explained in the previous chapter, the current (May 2009) passenger timetables forms the basis of the Reference Case scenario for all lines apart from the HML (Perth-Inverness).

7.1.3 RailSys was used to consider the WHL between Dalmuir and Corpach. The analysis of this route does not identify or test a freight path as far as Mallaig, but does consider the possibility of freight services joining or leaving the route via the lower terminal at Crianlarich.

7.1.4 The RailSys analysis of the WHL does not continue into or through Glasgow, but endeavours to take into consideration existing freight paths that run south of Dalmuir and the location of sidings which could be used to help ensure the feasibility of onward passage of the additional day-time freight services through the Glasgow area network.

7.1.5 To be attractive to operators, any additional freight paths should aim to provide a Central Belt to Inverness and back round trip within a 12-hour period (i.e. avoiding a prolonged lay-up in Inverness waiting for a return southbound slot).

7.1.6 Overnight freight services are currently not possible on the AIL, due to the current hours of operation of the relevant signal boxes etc.

7.1.7 Our analysis of the available paths on the AIL includes consideration of the possibility of asymmetry to/from Elgin (e.g. in to Elgin from Aberdeen and out via Inverness, or vice versa).

7.2 Methodology

Creating the Base RailSys Model

7.2.1 Network Rail provided relevant information on 18 March 2010 as a starting point for the creation of the RailSys Base model.

7.2.2 Several checks were made to ensure the base model was complete and internally consistent. This involved checking speeds and signalling and ensuring that the model boundaries were defined correctly. The May 2009 timetable in CIF format was converted into an *rsx* file and imported into the model. Trains were checked to ensure that they were correctly routed through the model.

7.2.3 We also obtained a report detailing which freight services are actually using their allocated paths, since some freights documented in the timetable are ‘Q’ paths which might not be operated regularly/at all. The trains used were taken from 22 October 2009 representing the day with the highest number of freight trains that ran during a weekday over a period of 12 weeks between 24 August 2009 and 13 November 2009. This information was provided by Network Rail on 31 March 2010.

7.2.4 Associations were then created and the minimum turnround times taken from the Rules of the Plan 2009. Alternative platforms were generated and the scheduled static timetable was de-conflicted down to under three minutes. The scheduled timetable was simulated to establish whether the dynamic conflicts were acceptable.

Calibrating the Base

7.2.5 Once the perturbation parameters were created, 150 perturbed timetables were generated, and a process of resolving deadlocks was undertaken to ensure that these were reduced to an acceptable level so that over 100 simulations were available for analysis. The simulation results were exported into the evaluation manger where a calibration evaluation was created to capture the 'Time To' figures for a number of service codes at various locations. This determines whether the base model is producing realistic results through the replication of secondary delays from the primary delays input into the model.

Creating the option model

7.2.6 The recommendations from the previous Chapter have been used as the starting point for this analysis. The base timetable was analysed with additional freight paths added so that they were able to be accommodated into the timetable without causing an increase in the number of static conflicts in the timetable. Static conflicts are a measure of compliance with Rules of the Plan.

Generating perturbations for new trains to ensure results were comparable

7.2.7 To ensure that all trains received the correct amount of perturbation, a new timetable variant was created which included all trains in the base model and each of the option models. The perturbed timetables were then generated. They were used in each of the option models and base model to ensure that the level of perturbations were comparable between base and option models.

Reporting the findings

7.2.8 After completing the option model a report of the key performance differences of the option against the base was produced.

7.3 Assumptions

7.3.1 The relevant RailSys modelling assumptions were as follows:

- as performance data for the 2010 timetable (Dec 2009) is not yet available the standard weekday timetable for May 2009 (chosen filter date 22 October 2009) has been used as the base timetable;
- model boundaries are at Dalmuir, Perth and Aberdeen;
- a standard freight stopping pattern was assumed for all services unless additional stops are required at passing loops;

- nominally Class 66 715 timing load speed 60mph length 225m (37SLU) is assumed for new services where possible;
- nominally Class 66 315 timing load speed 60mph length 126m (21SLU) is assumed where holding in shorter passing loops is required;
- entry delay distributions for new freight locations are assumed as the closest current location:
  - Elgin as Dyce;
  - Elgin Yard as Dyce;
  - Corpach as Ft William Jn;
  - Inverness TMD / CE as Inverness Lafarge; and
  - Kyle of Lochalsh starting lateness as Strathcarron.
- the proposed new services were allocated the following service codes are:
  - 52406840 WHL services; and
  - 52406842 AIL services.
- passenger services for service code 23541003 were given entry delays at Inverness as 23543003 service code;
- route availability and gauge clearance are considered elsewhere in this report and therefore we have therefore not catered for this aspect in this chapter;
- junction margins and headways for the new services are assumed to be the same or greater than existing freight services;
- any consideration of additional ‘shoulder’ (late evening or early morning) or overnight freight services will consider the impact on the signalling and maintenance operations;
- it is assumed that there will be no loss of existing freight access rights on any of the rail lines;
- it is also assumed that the speed for additional rail freight services will be determined by the relevant characteristics of each line using the Sectional Appendices;
- the section from Aberdeen to Elgin has already been cleared to ‘W8S’ gauge, a bespoke gauge to allow a fixed set of wagon and container combinations to work through from Mossend to Aberdeen and Elgin, most notably 9ft 6 in containers on ‘Lowliner’ wagons. It is believed that only a couple of structures stop the Elgin to Inverness route being cleared to ‘W8S’ and allowing the Elgin route to act as a diversionary route for traffic from Inverness to the Central Belt via Aberdeen;
- the hours of operation through Fort William are taken into account;
- no infrastructure modifications or recommendations have been made for this project;
- we have reduced all conflicts to less than 180 seconds, but there are 30 ‘unresolved’ instances where the conflicts are between 60 and 120 seconds - these unresolved conflicts are not considered significant in the overall scheme of the RailSys modelling work reported here, but could be further improved if more time/budget was available;
- no changes are made to the existing services in the timetable;

- for trains to pass in a loop a minimum seven minute dwell is allocated for the freight service. This gives at least three minutes for clearance of the single line RETB section for the return moves;
- gradients and signalling were not checked in detail against signalling plans;
- full investigations of all changes in delays have been analysed at high level and not by individual service;
- passenger and freight services are required to run to time so that they meet at the loops on the single line at the correct time - once the timetable is significantly perturbed it is possible for services to become delayed and cause knock on delays directly to other services on the route; and
- RailSys is unable to cancel services once they become significantly delayed - as a result there are some occasions where services continue to run with very high lateness although in reality they would be cancelled.

7.4 Calibration

Measuring the performance of the base model

7.4.1 To ensure that the base model is performing as close to the real time operation as possible a process of calibration is required. This involved comparing known TRUST data (effectively observed operational performance) for a given period with similar data extracted from the model. The 'Time To' arrival figures for three minutes, five minutes and ten minutes were measured for a number of service codes at a variety of locations.

Origin of the TRUST data

7.4.2 TRUST data was derived by taking historic average lateness figures over a period of 12 weeks between 24 August 2009 and 13 November 2009. This was provided by Network Rail on 31 March 2010.

Successful calibration of the base model

7.4.3 To enable the base model to calibrate as closely to the real operation as possible we generated 150 perturbed timetables. This allowed us to offset any deadlocks in the simulations which we were unable to resolve, and also meet the requirements of the RailSys standards (which state that there must be at least 100 deadlock free simulations).

7.4.4 Data is presented for all routes where there is sufficient TRUST data and matching timetable data from RailSys to give a meaningful comparison. Network Rail standards recommend that results should be within a +/- 10% tolerance.

7.4.5 The charts below show for each service group 'time to 5' performance with the TRUST data (orange) and the Base RailSys results (blue).

13560015 Service Code Dalmuir – Helensburgh Central

7.4.6 As shown in Figure 7.1, this service group with a large number of trains presents an excellent match between the TRUST and Base model data.

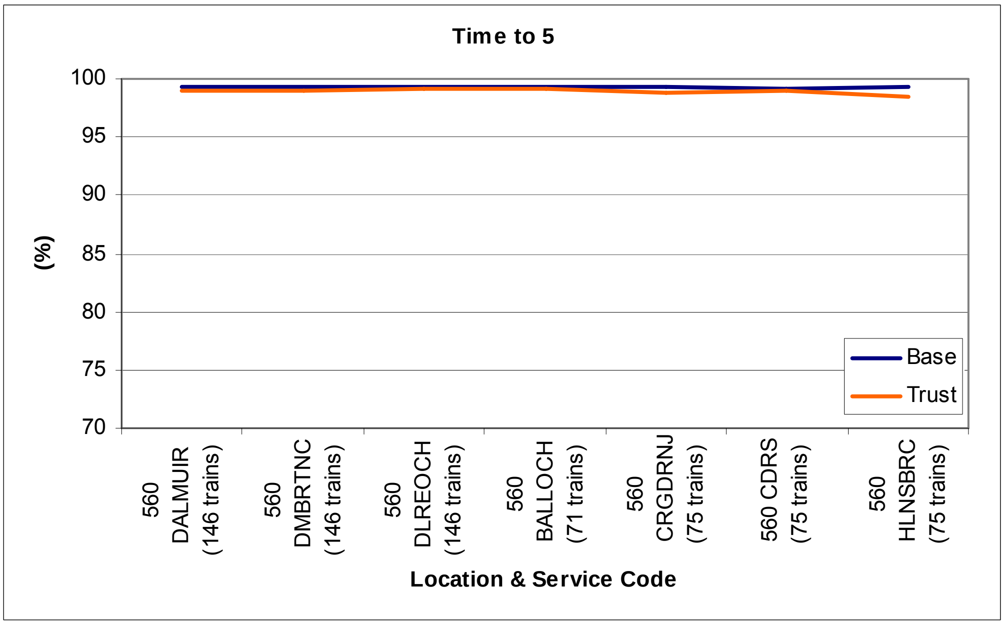

Figure 7.1 Service Code Dalmuir – Helensburgh Central

23541003 Service Code Aberdeen – Inverurie

7.4.7 This service group shows a good match with the Base model results which are a few percent higher than the TRUST data but within acceptable levels.

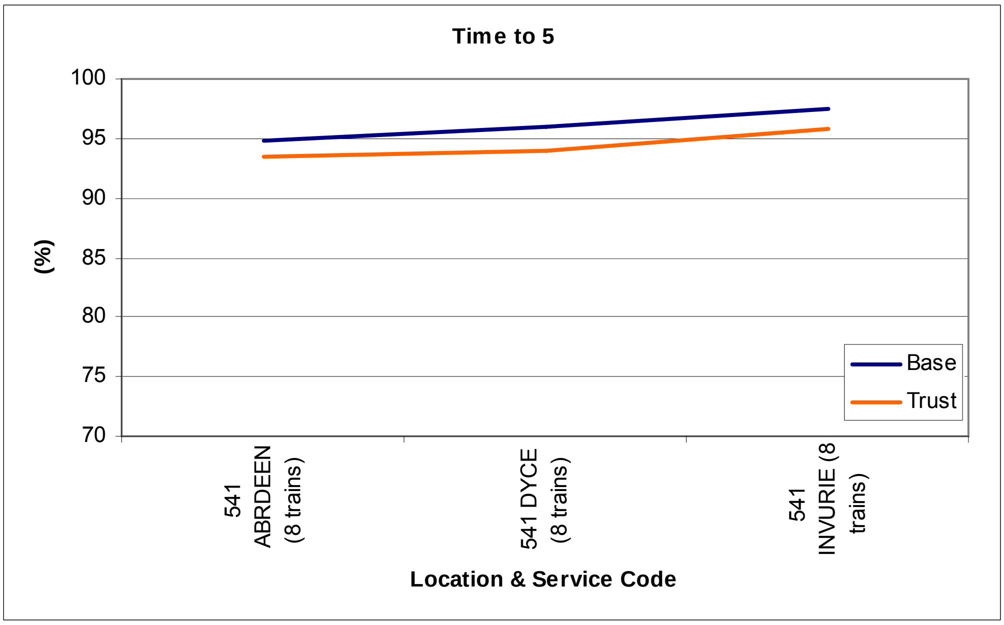

Figure 7.2 Service Code Aberdeen – Inverurie

23543003 Service Code Inverness – Stromeferry

7.4.8 This service group shows a marginal match with the Base model result which is generally a few percent higher than the TRUST data but again within acceptable levels.

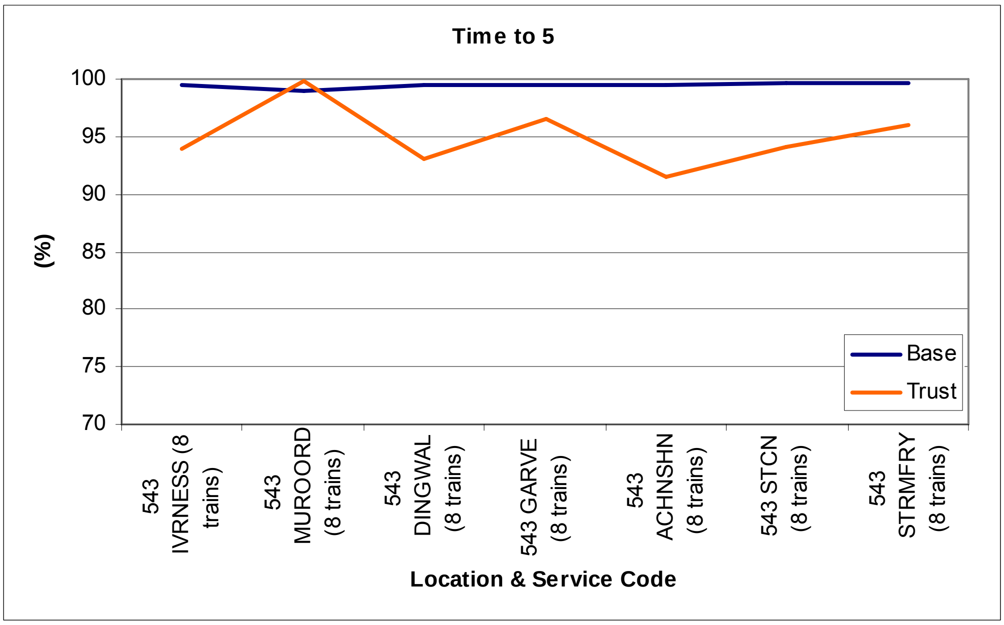

Figure 7.3 Service Code Inverness – Stromeferry

23547003 Service Code Aberdeen – Inverness

7.4.9 This service group shows a marginal match with the Base model result a few percent higher than the TRUST data but within acceptable levels.

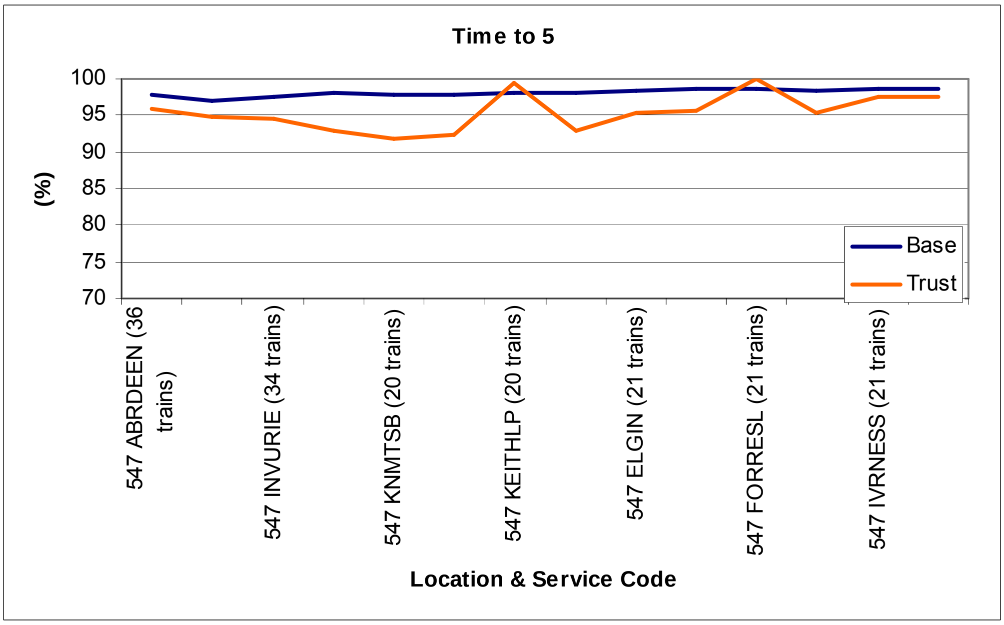

Figure 7.4 Service Code Aberdeen – Inverness

23549003 Service Code Perth – Inverness

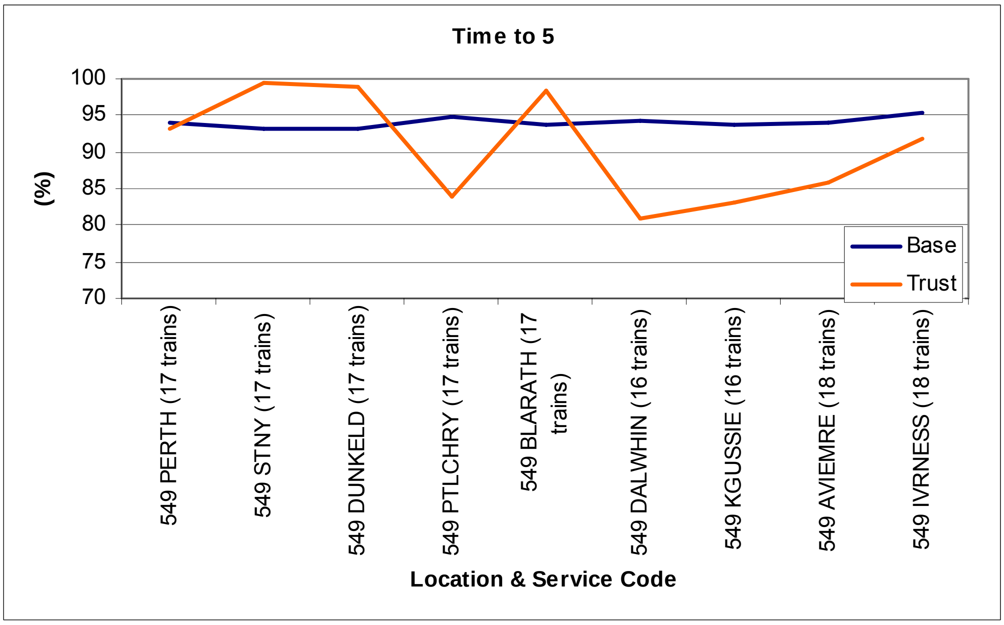

Figure 7.5 Service Code Perth – Inverness

7.4.10 This service group (with nine trains) shows a poor match, with the Base Model sometimes higher and sometimes lower than the TRUST data and some of the points lying outside of the 10% target limit. While it is hard to be definitive, due to the small sample size, it would also appear that the Base Model is generally over-estimating the reliability on this line. This feature should be borne in mind when considering the Do Something results for this line.

7.4.11 However, given the small number of trains and acceptable match of other services we feel that the RailSys Base Model is suitably calibrated for further analysis.

7.5 Timetable

7.5.1 Using the May 2009 timetable and available SRTs, the journey times between origins and destinations were determined and suitable paths identified. Freights trains were then created in RailSys to establish whether they fitted in the identified paths and ascertain that they were Rules of the Plan compliant.

7.5.2 Manipulation of paths were undertaken, where relevant, to ensure that the best possible fit was achieved. The following tables show the trains that were added into the current timetable.

Fort William Line

7.5.3 There is capacity between Craigendoran Jn and Fort William for:

- Three down services; and
- Four up services.

Table 7.1 FWL Additional Freight - Down Services

Origin	Departure	Arrival	Destination	Duration	Notes
Dalmuir	06:40	12:12	Corpach Pulp Mill	05:32	Waits 28 mins in Tyndrum and 20 mins in Fort William
Dalmuir	14:45	21:19	Corpach Pulp Mill	06:34	Waits 18 mins in Craigendoran Jn, 44 mins in Corrours and 20 mins in Fort William *
Dalmuir	19:43	01:20	Corpach Pulp Mill	05:37	Waits 20 min in Ardlui and 20 min in Fort William

Table 7.2 FWL Additional Freight – Up Services

Origin	Departure	Arrival	Destination	Duration	Notes
Corpach Pulp Mill	04:35	10:01	Dalmuir	05:26	Waits 20 mins in Fort William, 23 mins in Ardlui and mins in Garelochhead
Corpach Pulp Mill	08:44	14:19	Dalmuir	05:35	Waits 20 mins in Fort William and 15 mins in Garelochhead *
Corpach Pulp Mill	12:43	17:19	Dalmuir	05:06	Waits 18 mins in Fort William *
Corpach Pulp Mill	14:48	20:00	Dalmuir	05:12	Waits 31 mins in Fort William

* Train Class 6 D31560 (126 m)

Aberdeen – Inverness Line

7.5.4 There is capacity between Aberdeen and Elgin for:

- Four down services (two starting from Dyce, one starting from Inverurie); and
- Three up services (one finishing at Dyce).

7.5.5 There is capacity between Elgin and Inverness for:

- Four down services; and
- Three up services.

Table 7.3 AIL Additional Freight - Down Services

Origin	Departure	Arrival	Destination	Duration	Notes
Dyce	08:57	10:46	Elgin Yard	01:49	*
Dyce	12:34	14:39	Elgin Yard	02:05	Waits 30 mins in Keith Loop
Aberdeen	14:34	17:40	Elgin Yard	03:06	Waits 1 hour and 25 mins in Huntly loop
Inverurie	19:26	21:13	Elgin Yard	01:47	Waits 30 mins in Keith Loop
Elgin Yard	12:15	13:23	Inverness TMD	01:08	
Elgin Yard	14:09	15:12	Inverness TMD	01:03	
Elgin Yard	20:03	21:06	Inverness TMD	01:03	
Elgin Yard	22:28	23:25	Inverness TMD	00:57	

Table 7.4 AIL Additional Freight – Up Services

Origin	Departure	Arrival	Destination	Duration	Notes
Inverness TMD	09:54	10:57	Elgin Yard	01:03	
Inverness TMD	11:40	12:52	Elgin Yard	01:12	
Inverness TMD	16:27	17:28	Elgin Yard	01:01	
Elgin Yard	08:55	12:02	Dyce	03:07	Waits 1 hour, 25 mins in Huntly loop
Elgin yard	11:56	13:36	Dyce	01:40	
Elgin Yard	19:50	22:18	Aberdeen	02:28	Waits 38 mins in Inverurie

* Train Class 6 D31560 (126 mt)

7.6 Results

Input data

7.6.1 This section summarises the basic statistics of each model run. These values show that the levels of delay in the models are sufficiently close to offer sensible comparisons between them. The table below gives a summary of these statistics.

Table 7.5 – Summary of model statistics

	Base	Option
Number of trains	348	371
Number of Static Conflicts	91	105
Number of Trains Obstructed	98	110
Static conflicts above 60 sec	30	30
Max Static Conflict (mm:ss)	02:44	02:44
Total Static Conflicts (hh:mm:ss)	02:38:37	03:06:29
Max Dynamic Conflict (min)	81	107
Total Dynamic Conflicts (s)	184414	241513
Number of Entry Delays	2005	2614
Number of Departure Delays	6486	6529
Number of Dwell Time Delays	9721	9721
Total Number of Delays	18212	18864
Simulation Deadlocks (of 150)	15	28

Measurement of acceptable performance

7.6.2 To assess whether the performance of a timetable is acceptable we have developed a broad guide to compare the performance of the scheme against some known benchmarks. Table 7.6 gives a broad range of possible scheme performances and how to assess these in terms of taking the scheme forward.

Table 7.6 – Performance acceptance criteria

Public Performance Measure (PPM)	Performance	Recommendation
Above 97%	Excellent	Scheme proves beneficial to performance and should be strongly supported.
97% to 95.3% (current)	Very Good	Scheme proves beneficial to performance and should be supported.
95.3% to 92% (target)	Good	Scheme will improve current performance but still falls short of target. May need modifying before support can be given.
92% to 90%	Marginal	Scheme performance needs to me improved or other performance plans put in place before support can be given.
Below 90%	Poor	Scheme performance is detrimental to meeting targets and should be re considered or no supported.

7.6.3 It should be noted that RailSys results cannot be directly compared with the industry Public Performance Measure (PPM) because RailSys models 'normal events' where contingency plans such as cancellations or turning back short cannot be made. Therefore RailSys should be used as a guide, concentrating on the change from current base performance, rather than focussing on the absolute values.

7.6.4 The following charts show the average minute's lateness and the 'time to 5' at all locations along the route. Graphs have been plotted for services where there has been a change in performance and for the new services. The figures should be used as a measure of change from the current timetable performance.

21701001 Intercity East Coast: Kings Cross - Inverness

7.6.5 There is one service per day on this route. The down services operate with marginal performance. There is a drop in time to five of these existing services from Dalwhinnie. These are secondary knock on delays caused by late running 23549003 ScotRail: Glasgow / Edinburgh – Perth / Inverness services.

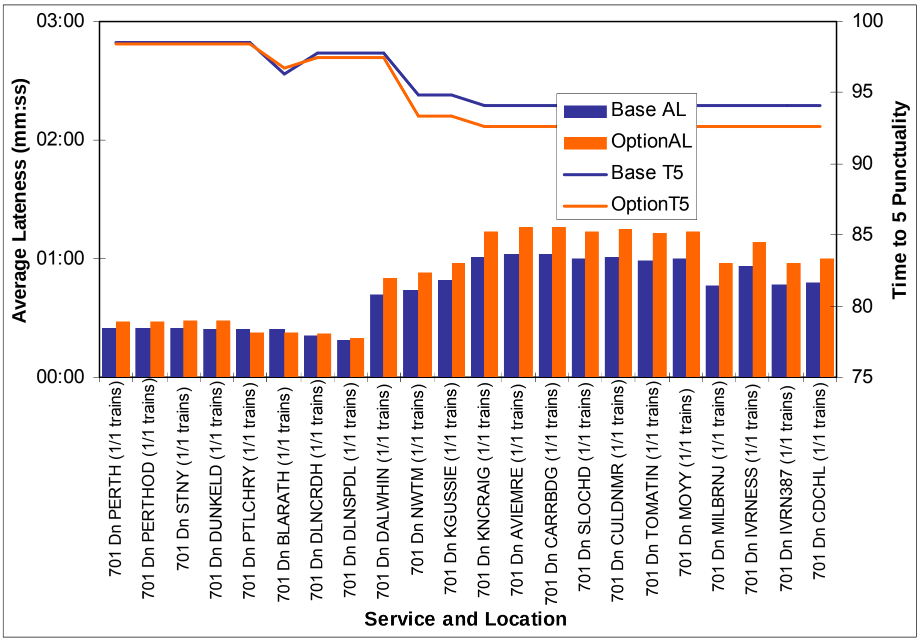

Figure 7.6 Kings Cross - Inverness Down Service

7.6.6 Up services operate with good performance.

Figure 7.7 Kings Cross - Inverness Up Service

mvaconsultancy

23541003 ScotRail: Edinburgh - Aberdeen

7.6.7 Down services operate with marginal performance. Services pick up delays after Dyce and carry these through to Inverness.

Figure 7.8 Edinburgh – Aberdeen Down Services

mvaconsultancy

23545003 ScotRail: Glasgow Queen Street – Oban / Fort William / Mallaig

7.6.8 Down services operate with marginal performance. On the early sections of the route between Dalmuir, Tyndrum and on to Oban performance is good. Between Tyndrum and Corpach performance is marginal. Between Corpach and Mallaig performance is poor, due primarily to the conflicting move with freight services into the pulp mill.

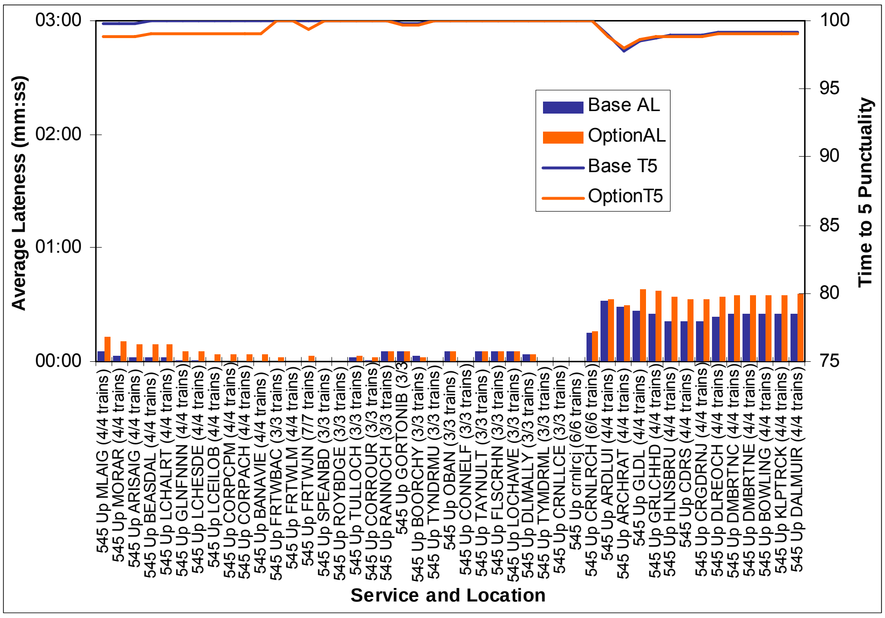

Figure 7.9 Glasgow Queen Street – Oban / Fort William / Mallaig Down Services

7.6.9 Up services operate with marginal performance. Some delays are caused by the poor performance of services arriving at Mallaig in the Down direction. Other delays are caused after Garelochhead.

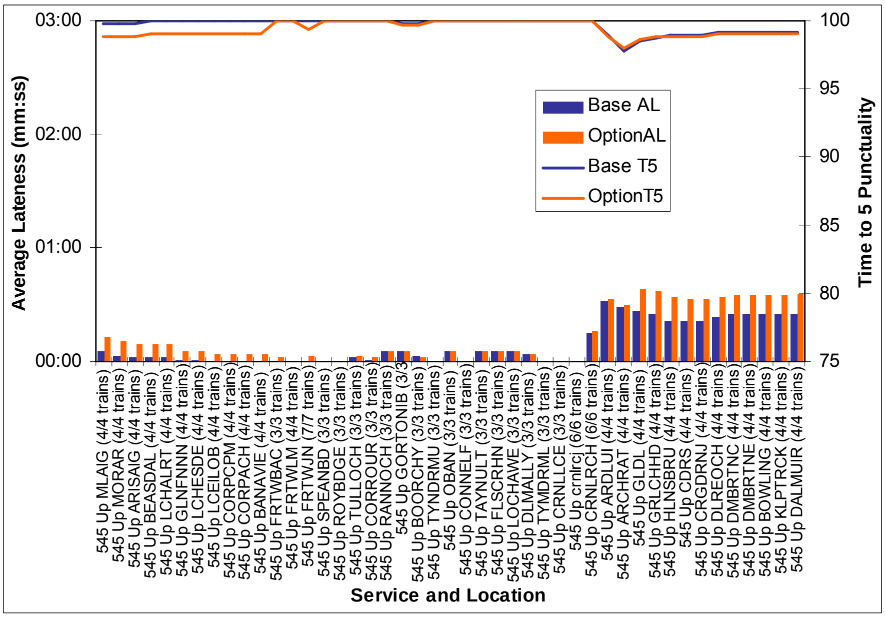

Figure 7.10 Glasgow Queen Street – Oban / Fort William / Mallaig Up Services

7.6.10 Down services operate with poor performance. As a direct result of the increase in freight services on this route performance becomes progressively worse in comparison to the base timetable.

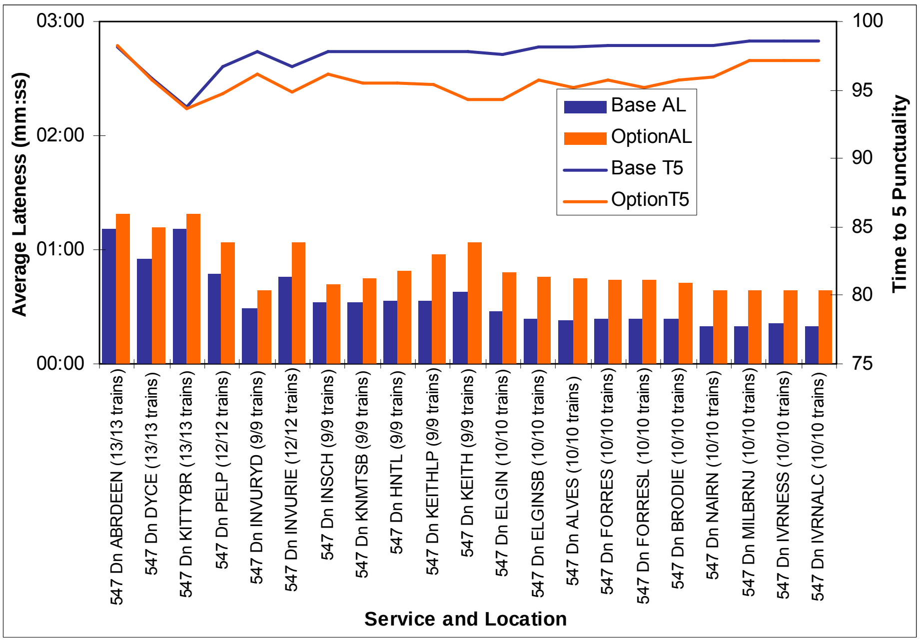

Figure 7.11 Aberdeen – Inverness Down Services

7.6.11 Up services operate with marginal performance. Although services depart from Inverness with similar performance gets progressively worse as its journey continues.

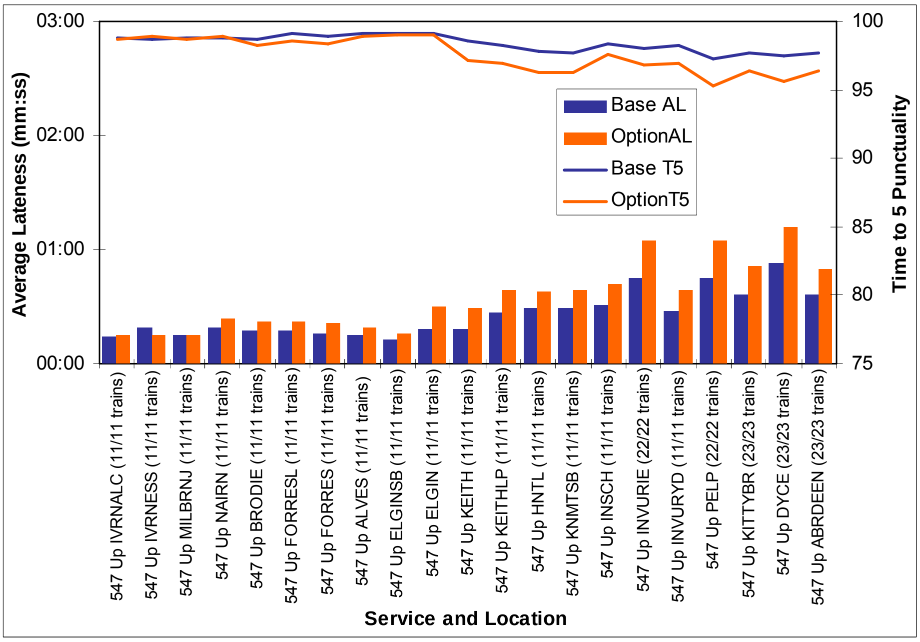

Figure 7.12 Aberdeen – Inverness Up Services

7.6.12 Down services operate with good performance.

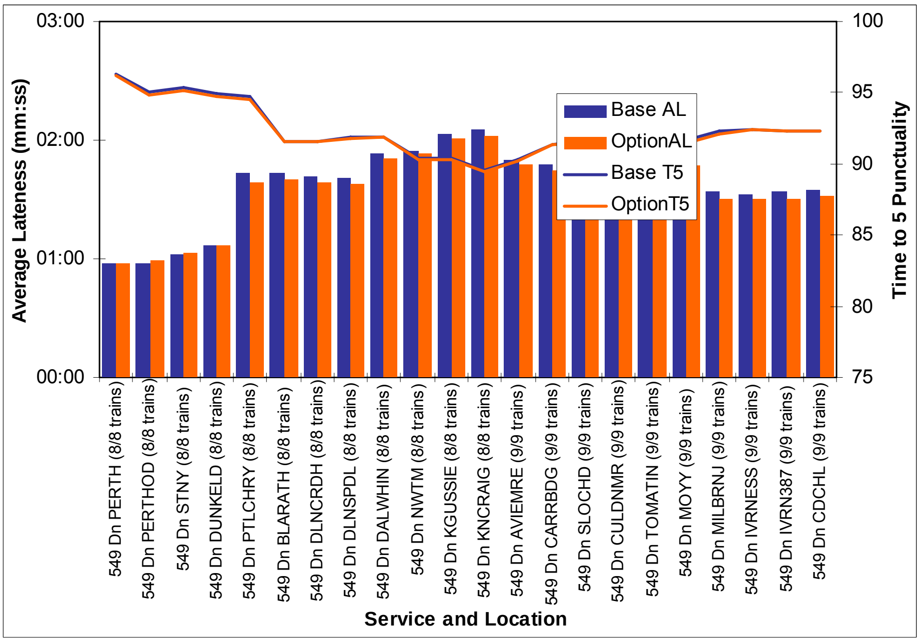

Figure 7.13 Glasgow / Edinburgh – Perth / Inverness Down Services

7.6.13 Up services operate with marginal performance. Delays are carried from Inverness onto this Perth route. This is thought to be the cause of delays to 21701001 Intercity East Coast: Kings Cross - Aberdeen / Inverness services.

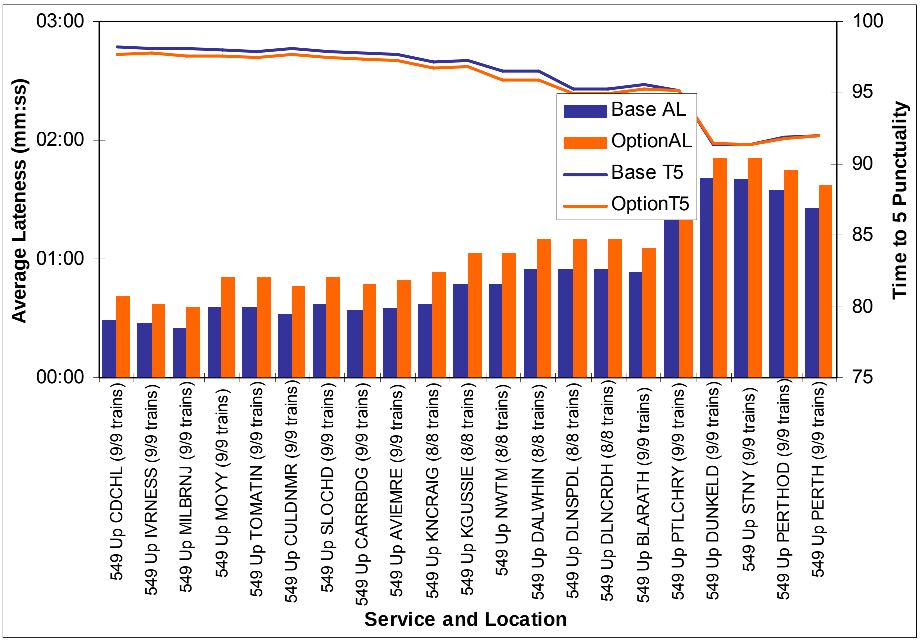

Figure 7.14 Glasgow / Edinburgh – Perth / Inverness Up Services

23555003 Caledonian Sleeper: Fort William – Edinburgh Sleeper Portion

7.6.14 Down services operate with good performance.

Figure 7.15 Fort William – Edinburgh Sleeper Down Services

7.6.15 Up services operate with good performance.

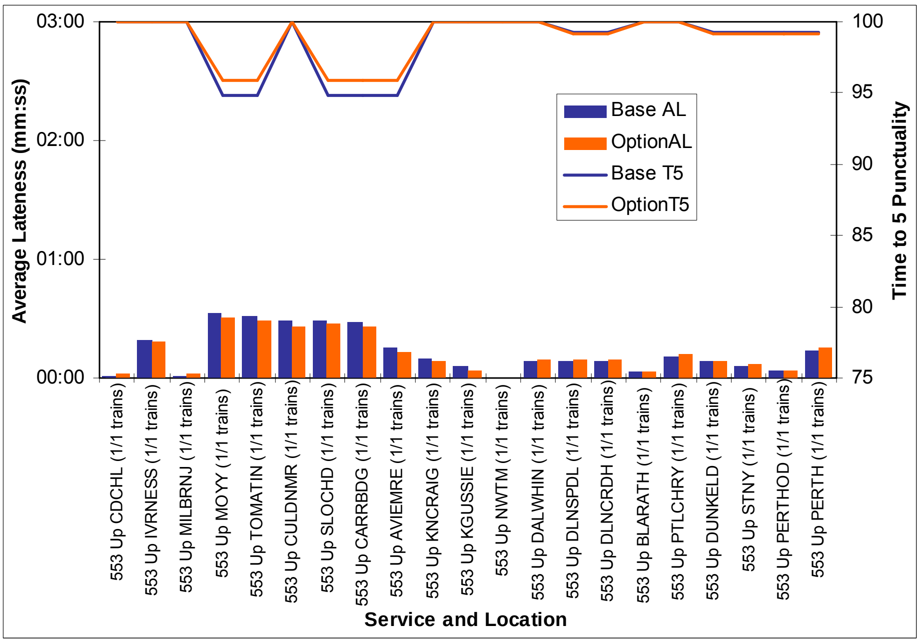

Figure 7.16 Fort William – Edinburgh Sleeper Up Services

52406840 Freight: Dalmuir – Corpach

7.6.16 Down services operate with good performance. The three new freight services on the main section of the route actually has a positive impact on the average freight performance figures, with the new trains predicted to operate with better performance than the existing service, resulting in an improved 'average' freight performance.

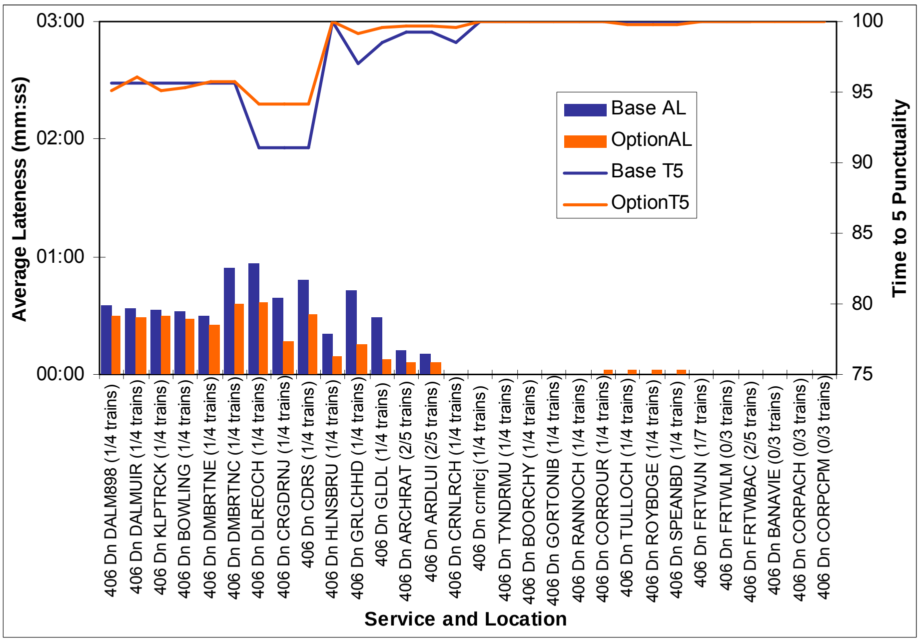

Figure 7.17 Freight Dalmuir – Corpach Down Services

7.6.17 Up services operate with marginal performance. The four new services are only marginally worse than the existing service.

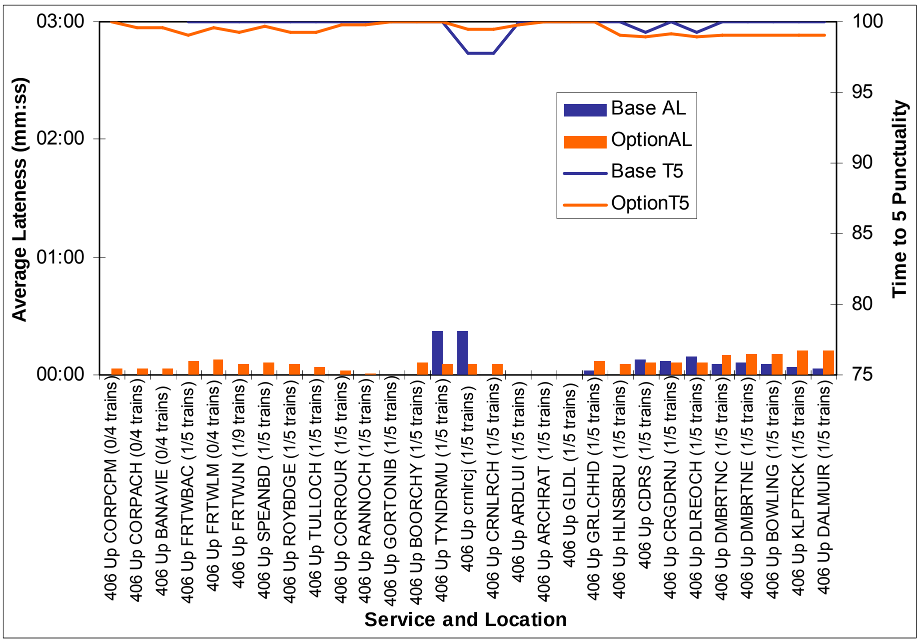

Figure 7.18 Freight Dalmuir – Corpach Up Services

52406842 Freight: Aberdeen - Inverness

7.6.18 Down services operate with poor performance. There are four new freight services on this route so little data from the base timetable to compare against. Although the 'time to 5' figure is low in comparison to all other services the average is an improvement over existing services.

Figure 7.19 Freight Aberdeen – Inverness Down Services

7.6.19 Up services operate with poor performance. There are three new freight services on this route so little data from the base timetable to compare against. Although the 'time to 5' figures is low in comparison to all other services the average is an improvement over existing services.

Figure 7.20 Freight Aberdeen – Inverness Up Services

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52800000 Freight: Perth - Inverness

7.6.20 Down services operate with marginal performance.

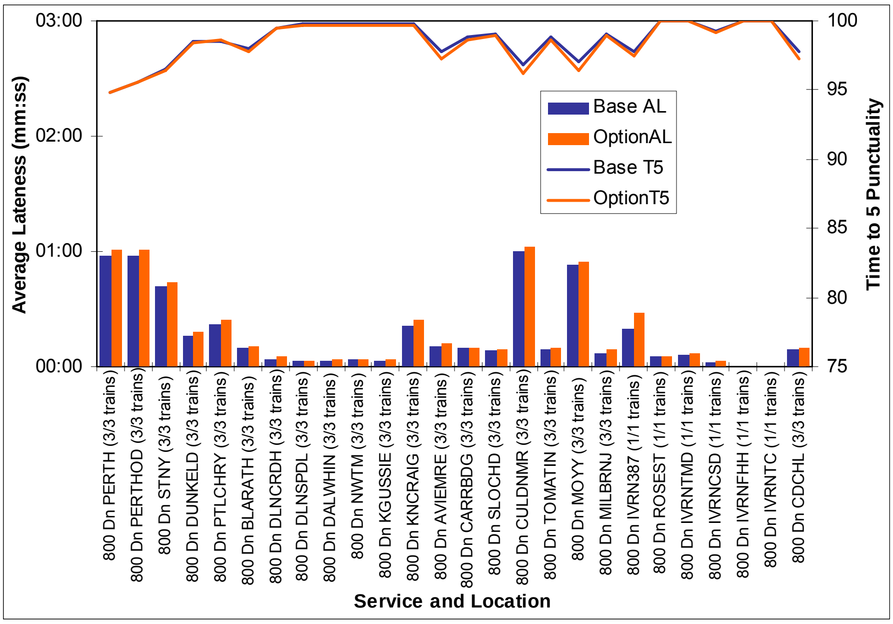
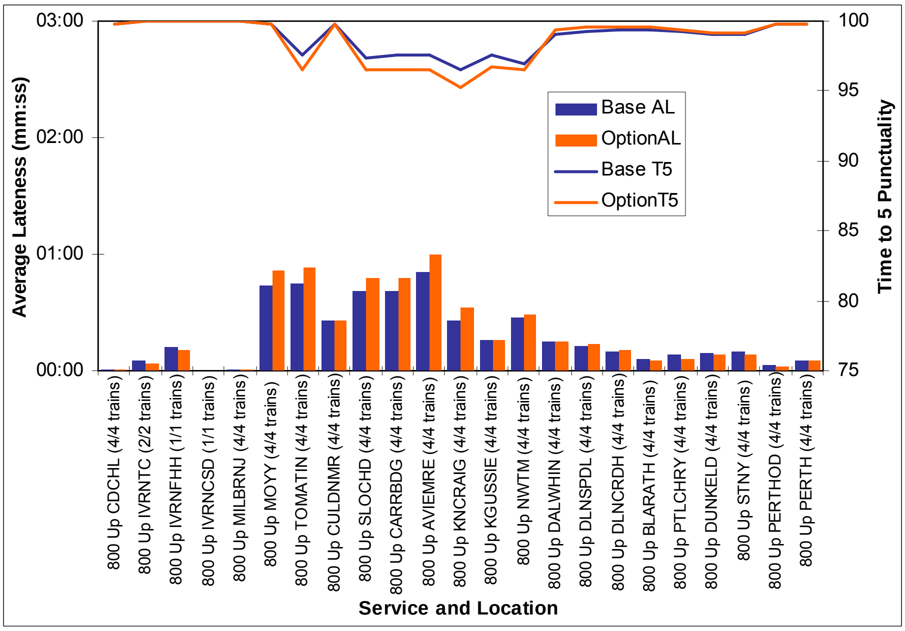


Figure 7.21 Freight Perth – Inverness Down Services

7.6.21 Up services operate with marginal performance.



mvaconsultancy

Figure 7.22 Freight Perth – Inverness Up Services

7.7 Summary and Conclusions

7.7.1 The impact of the proposed new freight services on existing overall passenger service performance is marginal, though they do have a direct negative impact on the Aberdeen - Inverness and Fort William to Corpach routes. There are also knock-on secondary delays on the Perth – Inverness Route, which might warrant further investigation.

7.7.2 The impact on existing freight service performance is also marginal as the overall performance of the study routes are only marginally affected by the new services tested here.

7.7.3 The reliability of the new freight services themselves is good/marginal and we conclude that the new freight services we have tested here could be accommodated into the Reference Case timetable, possibly with further minor 'tweaking' where necessary.

7.7.4 In general, the performance of the new services is no worse, and in several cases, actually better than, that of the existing freight services, resulting in some cases to an improvement in the average freight performance.

7.7.5 The addition of these new freight services increases the capacity utilisation considerably. However, as a result, much of the 'white space' where services can currently run out of their path without causing knock on delays has been removed, with a corresponding small negative impact of overall route performance to all services.

7.7.6 We would conclude that the identified freight services could be added, possibly with some further investigation to better understand the minor negative impacts predicted by the modelling. This could include detailed train by train assessment of timetable during perturbed running to address these conflicts.

8 Terminal/ Sidings Analysis

8.1 Introduction

8.1.1 The location of freight-handling terminals and the access arrangements and facilities at these terminals, is an important part of this Study. This Chapter identifies and categorises current terminal/ sidings, using:

- current 'Quail' track diagrams, Rail Atlas of Great Britain and Ireland and Trade Gazetteers;
- relevant knowledge of the Study team (client and consultant) and relevant local authority planners; and
- details of current road and rail proposals (notably Inverness, A96 Corridor and Crianlarich).

8.1.2 A list of the main terminal/ siding locations along with their ownership, access capabilities and constraints are listed below.

8.2 Terminal/ Sidings Locations

8.2.1 A list of the terminals considered in this Study and their locations are in Table 8.1. Each terminal's map reference is also provided in this table.

Table 8.1 Terminal / Sidings Locations

Route	Reference	Terminals	Location
FNL	FNL 1	Invergordon Distillery 1 & 2, Alcan	NH 722 701
	FNL 2	Fearn	NH 814 782
	FNL 3	Lairg	NC 583 039
	FNL 4	Forsinard Dn	NC 891 425
	FNL 5	Kinbrace Timber Loading	NO 862 316
	FNL 6	Georgemas	NO 155 593
	FNL 7	Georgemas Engineering Siding	NO 155 593
	FNL 8	Altnabreac Station Siding	ND 004 457
	FNL 9	Wick	NO 359 509
	FNL 10	Thurso Yard	NO 113 678
	FNL 11	Thurso Siding	NO 113 678
WHL	WHL 1	Crianlarich Upper	NN 384 251
	WHL 2	Crianlarich Lower	NN 383 255
	WHL 3	Arrochar	NN 312 044
	WHL 4	Connel Ferry	NM 914 340
	WHL 5	Oban (Glenfalloch)	NM 858 292
	WHL 6	Oban (Yard)	NM 857 298
	WHL 7	Fort William (Tom Na Faire)	NM 120 752
	WHL 8	Fort William (Inverlochy)	NN 118 754
	WHL 9	Fort William (BP)	NN 115 747
	WHL 10	Fort William RTZ Alcan	NN 123 750
ML	ML 1	Corpach	NN 080 765
HML	HML 1	Dunkeld Goods Yard	NO 031 416
	HML 2	Kingussie Upper Sidings	NN 756 004

Route	Reference	Terminals	Location
	HML 3	Dalwhinnie	NN 635 850
	HML 4	Inverness Lafarge Cement	NH 675 458
	HML 5	Inverness Millburn (DBS Terminal)	NH 675 458
	HML 6	Inverness DRS Terminal	NH 675 458
	HML 7	Inverness Coal Yard (Harbour Branch)	NH 667 458
AIL	AIL 1	Keith Yard	NJ 431 516
	AIL 2	Elgin	NJ 222 623
	AIL 3	Roseisle (Diageo)	NJ 122 652
KL	KL 1	Kyle of Lochalsh (Harbour Siding)	NG 763 271
	KL 2	Kyle of Lochalsh (East Siding)	NG 763 271

8.2.2 All of the terminals above are existing terminals but may not be currently in use. It was noted in the FTA policy for rail freight terminals that there is potentially new capacity at Elgin to become an inter-modal interchange, which is dependent upon whisky traffic to the central belt of Scotland.

8.2.3 The location of each of these terminals is shown in Figure 8.1. Each terminal is displayed as per their reference code in Table 8.1.

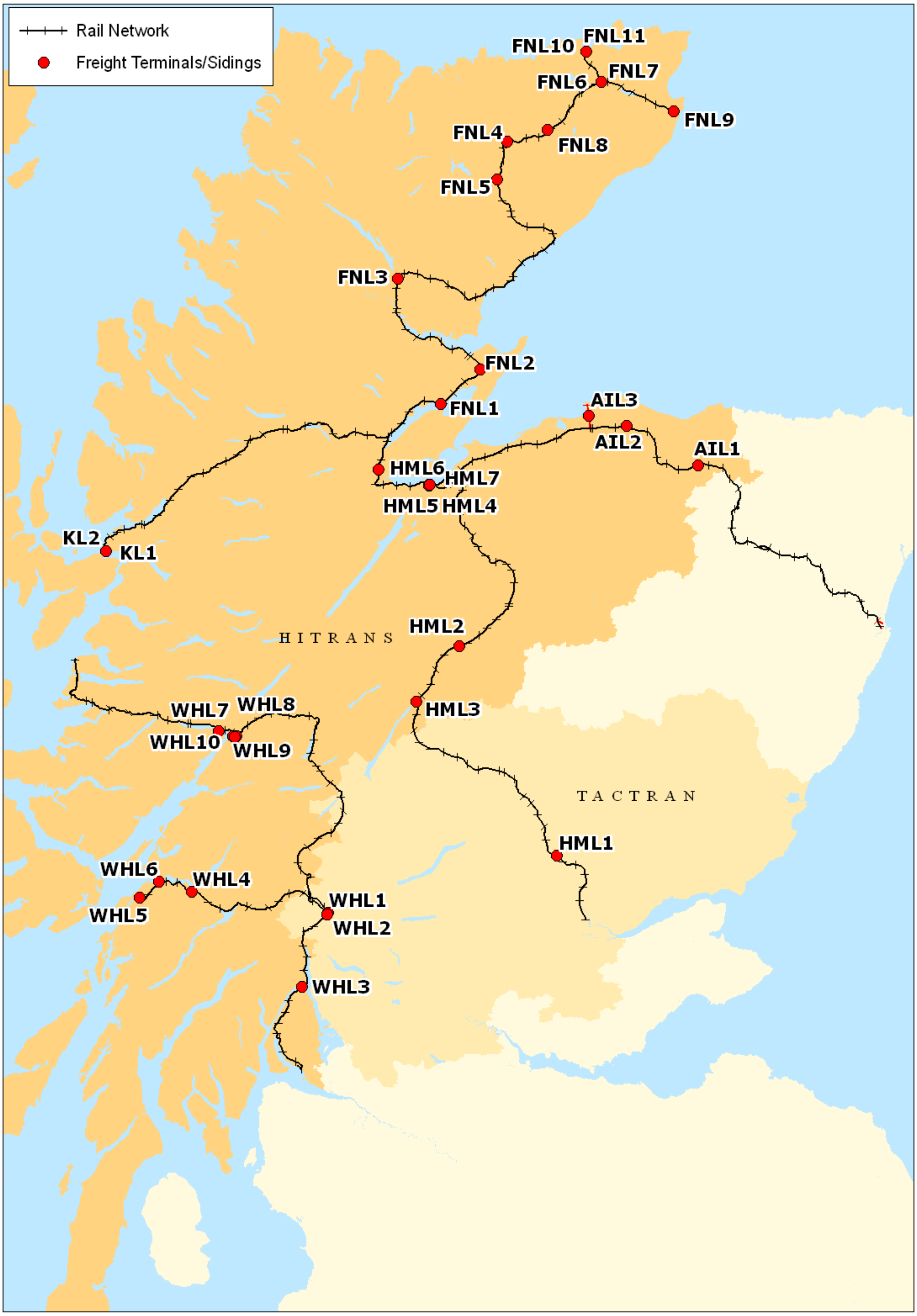


Figure 8.1 Terminal / Sidings Locations

8.3 Terminal / Sidings Ownerships

8.3.1 The following table lists each terminal being considered in this Study and the corresponding owner/ leaser, type of lease, freight usage and commodities it serves.

Table 8.2 Terminal / Sidings Ownership

Route	Terminals	Ownership	Type of Lease	Freight Use (Feb 2010)	Commodities
FNL	Invergordon Distillery 1 & 2	Invergordon Distillers	N/A	None	
	Invergordon Alcan	Balcas Ltd	N/A	None	
	Fearn	Network Rail	N/A	None	
	Lairg	DCC Fuels	N/A	Light	Petroleum products
	Forsinard Dn	Network Rail - Engineers Siding	N/A	None	Timber
	Kinbrace Timber Loading				
	Georgemas	Network Rail	None	None	Timber
	Georgemas Engineering Siding	Network Rail - Engineers Siding	None	None	
	Altnabreac Station Siding	Network Rail - Engineers Siding	None	None	Timber
	Wick	Network Rail	N/A	None	
	Thurso Yard	Strategic Freight Site	N/A	None	
	Thurso Siding	Network Rail - Engineers Siding	N/A	None	
WHL	Crianlarich Upper	Network Rail	None	Current	Timber
	Crianlarich Lower	Network Rail (part owned)	None	None	Timber
	Arrochar	Network Rail	None	None	Timber
	Connel Ferry	Gleaner Fuels	N/A	None	
	Oban (Glenfalloch)	Esso	N/A	None	

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Route	Terminals	Ownership	Type of Lease	Freight Use (Feb 2010)	Commodities
	Oban (Yard)	Network Rail		None	
	Fort William (Tom Na Faire)	DB Schenker	N/A	Light	Petroleum
	Fort William (Inverlochy)	DB Schenker	Yard & Sidings (125 year lease)	Light	Charter
	Fort William (BP)	DCC Oils	Freight Terminal (125 year)	Medium	Various
	Fort William RTZ Alcan	British Alcan	N/A	Medium	Metals
ML	Corpach	BSW	N/A	None	Timber
HML	Dunkeld Goods Yard	Network Rail - Engineers Siding	N/A	None	
	Kingussie Upper Sidings	Network Rail - Engineers Siding	N/A	None	
	Dalwhinnie	Network Rail - Engineers Siding	N/A	None	
	Inverness Lafarge Cement	DB Schenker	'Let Sidings	Medium	Cement
	Inverness Millburn (DBS Terminal)	DB Schenker	(125 year)'	Light	
	Inverness DRS Terminal	DRS	Let Sidings	Medium	Containerised
	Inverness Coal Yard (Harbour Branch)	Strategic Freight Site		Light	Various
AIL	Keith Yard	Strategic Freight Site	Yard & Sidings (125 year lease)	None	

Route	Terminals	Ownership	Type of Lease	Freight Use (Feb 2010)	Commodities
	Elgin	DB Schenker	DBS Freight Terminal Lease	None	Various containerised
	Roseisle (Diageo)		N/A		
KL	Kyle of Lochalsh (Harbour Siding)	Highland Reg. Council		None	Timber
	Kyle of Lochalsh (East Siding)	Network Rail	N/A	None	Timber

8.4 Terminal / Sidings Access Arrangements

8.4.1 The following table lists each terminal being considered in this Study and the corresponding road and rail access. This terminal information is included in the GIS database.

Table 8.3 Terminal / Sidings Access Arrangements

Route	Terminals	Current Status of Infrastructure	Traffic Potential	Connection Status	Road Access
FNL	Invergordon Distillery 1 & 2	Short Term NC Established [5 years] Not operational in 1994	No	Connection removed (RETB 'slot' remains)	No public road access
	Invergordon Alcan	Out of Use	Potential	Removed but reinstatable connection	
	Fearn	No material effect Established	Some potential for Nigg Yard	Has been used in past 10 years	B9165, approx 2km to A9 Surrounded by Greenfield sites
	Lairg	In Use – has both oil terminal and yard – latter accessible to 3rd parties	Yes	Live	Located off A836, approx 26km to A9, approx 75km to A835
	Forsinard Dn	Out of Use	Potential	Engineers siding	Tight turn off Helmsdale-Melvich Road
	Kinbrace Timber Loading		Potential for timber, also recent ballast storage		Good access
	Georgemas		Yes	Live	Located just off A9

Route	Terminals	Current Status of Infrastructure	Traffic Potential	Connection Status	Road Access
	Georgemas Engineering Siding		No	Live	
	Altnabreac Station Siding	Short Term Network Change established 19/02/10 – now plainlined	Potential	Engineers siding	
	Wick	Not operational in 1994	Potential	Not operational on 31/3/94	Town centre location Located approx 0.2km from A99 Some Greenfield sites adjacent
	Thurso Yard		Potential	Out of Use	Town centre location Located off B874, approx 0.8km to A9/A836
	Thurso Siding		Not suitable for rail freight	Engineers siding	
WHL	Crianlarich Upper	Poor road access		Live	Village centre location – planned bypass will alleviate access problems.

Route	Terminals	Current Status of Infrastructure	Traffic Potential	Connection Status	Road Access
	Crianlarich Lower	Out of Use for the past year/ 18 months (wasn't operational in 1994) - NR only own part of the land BRBR own the remainder which is currently under offer	Future Potential as a replacement for current yard	April 2004 - not operational	Out of town – good road access to village centre
	Arrochar		Potential	Live – in use until 2008	
	Connel Ferry	Site closed - not been operational since pre 1994	No	Not operational in April 1994	
	Oban (Glenfalloch)	Not operational in 1994	Not suitable for rail freight	Not operational in April 1994	
	Oban (Yard)	Not operational in 1994		Not operational in April 1994	
	Fort William (Tom Na Faire)	In Use	Yes	Live	
	Fort William (Inverlochy)	In Use	Yes	Live	Located off A82
	Fort William (DCC Fuels)	In Use	Yes	Live	Located off A82
	Fort William RTZ Alcan	In Use	Yes	Live	

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Route	Terminals	Current Status of Infrastructure	Traffic Potential	Connection Status	Road Access
ML	Corpach	Active project	Yes	Currently out of use	
HML	Dunkeld Goods Yard		Not suitable for rail freight	Engineers siding	Difficulty of HGV access across A9
	Kingussie Upper Sidings	Network Change established 12/11/2009 (NC/G1/2009/SCOT/0388-v)	Not suitable for rail freight	Engineers siding	
	Dalwhinnie		Not suitable for rail freight – has been used in emergency recently	Engineers siding	
	Inverness Lafarge Cement	In Use	Yes	Live	
	Inverness Millburn (DBS Terminal)	In Use		Live	
	Inverness DRS Terminal	In Use	Yes	Live	
	Inverness Coal Yard (Harbour Branch)	In Use	Strategic Freight Site	Live	
AIL	Keith Yard		Strategic Freight sites require to be 'protected' by NR	Out of Use	B9116, approx 1km to A96

Route	Terminals	Current Status of Infrastructure	Traffic Potential	Connection Status	Road Access
	Elgin	In Use (occasionally)	Yes – has daily service potential	Live	A941 Station Rd, approx 0.8km to A96 Town centre location
	Roseisle (Diageo)	Out of use	Potential		Line mothballed
KL	Kyle of Lochalsh (Harbour Siding)		Potential – East siding used since '96 for timber	Out of Use	Village centre location – timber moved from barge to truck there Location off Station Road, A87
	Kyle of Lochalsh (East Siding)	Not operational in 1994	Not suitable for rail freight	Not operational in April 1994	

8.5 Key Terminal / Sidings Constraints & Opportunities

8.5.1 Following on from the preceding information in this Chapter, the key terminal constraints are discussed below.

8.6 Far North Line Terminals & Sidings

Invergordon Distillery & Alcan

8.6.1 These are the two remaining connections at Invergordon, the former private siding connections to British Alcan Ltd – Down Side and MK Shand Ltd (Pipecoaters) – Up Side have both been removed. Whilst the RETB 'slots' remain for the facility the connections to the network were removed more than 10 years ago.

8.6.2 It should be noted that the Alcan connection could be reinstated, which would provide rail access to the Balcas Biomass facility (on the site of the former British Alcan smelter). The potential exists to use these connections to provide sidings to any industrial development at Invergordon port.

Invergordon Goods Yard

8.6.3 All that remains of Invergordon Goods Yard is a single siding for engineers' use that is accessed via a ground frame. There is no run round facility in the yard so any freight traffic would have to be shunted using the loop in the station, whilst not perfect, this is not an insurmountable problem.

Fearn Goods Yard

8.6.4 Two short sidings are accessed by a ground frame, south of Fearn station. There is no run round facility either in the sidings or at the station, making operation difficult. Whilst Fearn might be seen as a railhead for Nigg Bay it would seem that Invergordon may also be suitable, especially if Alcan is reconnected.

Lairg DCC Energy

8.6.5 The DCC Energy sidings at Lairg receive a booked weekly train of oil from BP Oil at Grangemouth. Sidings are adequate and work well for the traffic.

Forsinard

8.6.6 Forsinard has a short siding for engineers use adjacent to Forsinard station passing loop. From track plans the length of the current siding looks too short for a viable freight train, however it is thought to be extendable. The location is extremely isolated and the only possible traffic could be timber.

Kinbrace

8.6.7 A location for lineside loading of timber and has worked well in the past. This is dependent on timber harvesting in the area.

Georgemas Junction

8.6.8 The goods yard at Georgemas Junction has been used by DB Schenker for unloading pipes for a local pipe fabricator. Georgemas would seem to be the best strategic location for freight traffic in Caithness, given that it can handle a viable freight train load.

Altnabreac

8.6.9 This location has been plainlined, as part of a NR short term network change. The only possible use would be for lineside timber loading.

Wick Goods Yard

8.6.10 Wick retains sidings of sufficient length to accept a viable size train load. The sidings have received trainloads of pipes for North Sea related work in the past but Georgemas is the preferred location to handle them now. Again, like Thurso, the decision would seem to be whether to concentrate traffic for the Wick area on Georgemas to give it critical mass. Wick Goods Yard also should be protected for any large energy related contracts.

Thurso Goods Yard

8.6.11 This location was used for freight traffic approximately a decade ago when Thurso Building Supplies obtained a Freight Facilities Grant from the Scottish Executive to develop the facility. However, despite the Grant a lack of traffic meant that there was insufficient volume to develop a viable train load and hence the facility soon fell into disuse. The principal question over developing Thurso for general freight traffic is whether it would not be better to concentrate on Georgemas, rather than split trains between two locations. However, the facility at Thurso should be protected as it would be useful for any large contracts connected with re-development of the Dounreay nuclear facility.

8.7 West Highland Line (including FWL, ML and OL) Terminals & Sidings

Crianlarich Upper

8.7.1 The goods yard comprises two sidings on the Down side of the WHL, adjacent to the station. It has had an intermittent history for loading timber but this ceased again in 2008/9. The length of the sidings at Crianlarich Upper is insufficient to make up a viable freight train and this is the cause of the latest cessation of traffic. The footprint of the yard also precludes the sidings from being lengthened. However, it should be noted that a sufficient trainload can be achieved when worked in tandem with Arrochar. Road access into the site is straight off the A82 in the middle of the village. Unless the sidings can be lengthened it is hard to see how a viable train size can be achieved.

Crianlarich Lower

8.7.2 This is a former timber loading location used by Scottish Pulp and Paper over 25 years ago. It uses the stub end of the former Callander and Oban Railway alignment at Crianlarich Lower. It has the potential to handle long trains. The disadvantage is that it requires upgraded road access, which may be possible by using some of the solum of the disused railway adjacent to the A85, just east of Crianlarich. As Crianlarich Lower Junction is only 44 chains from Crianlarich Junction, the ban on Class 66 locos on the Oban Line, hopefully, would not affect this operation.

Arrochar

8.7.3 Arrochar Goods yard has been used for timber loading. The site consists of two relatively short sidings accessed via a headshunt off the Up side loop at Arrochar. Reasons for the lack of use of the site have been poor access from the public highway and poor ground conditions and drainage within the loading area. The short siding length hinder viable train sizes being operated from this location. As stated above, it should be noted that a sufficient trainload can be achieved when worked in tandem with Crianlarich Upper.

Connel Ferry

8.7.4 The freight siding at Connel Ferry is the site of a long defunct BP Oil terminal, last used over 20 years ago. It consists of two short sidings accessed via a ground frame connection. The loop can accommodate a train of approximately 30 SLU in length.

8.7.5 Like all locations on the Oban Line the major problem is that Class 66 locos are not permitted and hence train sizes with less powerful locos are barely viable.

Oban Glenfalloch

8.7.6 This is the former Shell Oil Company sidings on the outskirts of Oban. Land ownership of the site is unknown but it might have some potential for freight handling. It is accessed via a ground frame connection and trains would utilise the run round at Oban station. Network change is being consulted upon.

8.7.7 Like all locations on the Oban Line the major problem is that Class 66 locos are not permitted and hence train sizes with less powerful locos are barely viable.

Oban Yard

8.7.8 Oban Yard consists of the three remaining sidings adjacent to the Caledonian Macbrayne ferry terminal. It is an extremely awkward location as any HGV would have to negotiate the ferry terminal car park to gain access as well as being in Oban town centre. Rail access is by a ground frame connection adjacent to the station.

8.7.9 Like all locations on the Oban Line the major problem is that Class 66 locos are not permitted and hence train sizes with less powerful locos are barely viable.

Fort William Tom-na-Faire Sidings

8.7.10 Tom-na Faire sidings are part of the loco depot at Fort William but can also be used for loading freight to rail.

Fort William Inverlochy Sidings

8.7.11 This is the main freight sidings in Fort William for loading freight. The sidings are accessed via a connection at Fort William Junction.

Fort William BP Oil

8.7.12 The terminal receives oil from BP Oil at Grangemouth, hauled by DB Schenker to Fort William on their general freight service. It is large enough for the volumes of oil that are transported. Access is via a connection controlled by Fort William Junction signal box.

Fort William RTZ Aluminium

8.7.13 The connection to RTZ Aluminium's Lochaber smelter is accessed by a ground frame half a mile east of Fort William Junction on the Crianlarich line. Rail lines access:

- alumina discharge shed;
- metal loading shed;
- power house; and
- fuel oil siding.

8.7.14 As the major freight generating location on the WHL this well established operation is crucial to the future of freight on the line.

8.8 Mallaig Line Terminals & Sidings

Corpach

8.8.1 The Corpach site is the former Arjo Wiggins pulp and paper mill which has been acquired by BSW Ltd (British Sawn Wood) for redevelopment as a timber processing plant. The sidings are accessed via a ground frame off the Mallaig line at Annat, two miles west of Fort William. The only slight operational disadvantage Corpach has is that to access it both Fort William Junction Signal Box and Annat gate box have to be open. They are presently only open for two shifts, 0600 to 2400 Monday to Saturday.

8.9 Highland Main Line Terminals & Sidings

Dunkeld Goods Yard

8.9.1 This goods yard is adjacent to Dunkeld station. It was used for timber loading nearly 15 years ago. The yard consists of two extremely short sidings (100m and 85m) meaning that it is almost impossible to load a viable sized freight train from this location. Also, the road access from the A9 is poor.

Kingussie Upper Sidings

8.9.2 Kingussie has an engineers siding adjacent to the station which is accessed via a ground frame. The length of the engineers siding is unknown, so what length of train it could accommodate is also unknown, however the loop at Kingussie is 44 SLU, which is short considering a viable train length.

Dalwhinnie

8.9.3 Dalwhinnie has an Up Relief Siding (URS) and an engineers siding. The Network Rail Sectional Appendix gives the length of the URS as 68 SLU, which should be long enough to handle a viable train of constructional steelwork for the Denny to Inverness Electricity Grid Line project. The layout at Dalwhinnie appears to allow a train to be run round within the station before propelling into the URS. Dalwhinnie also has HGV access.

Inverness Terminals

8.9.4 Inverness has a cluster of freight terminals and sidings in the Millburn Yard area, on the up side of the HML leaving Inverness station. These are:

- Lafarge Cement Siding;
- Millburn Yard;
- Needlefield Yard; and
- Harbour Branch Sidings.

Inverness Lafarge Cement

8.9.5 Lafarge Cement Siding is the private siding accessing Lafarge Cement's storage and distribution depot in Inverness. It has specialised off loading facilities to "pressure discharge" the cement from the rail tanks into the storage silos. The facility meets the requirements of Lafarge and their freight operating company, Freightliner Heavy Haul for the train service presently operated.

Inverness Millburn (DBS Terminal)

8.9.6 DBS have a long lease on a number of sidings which previously formed Millburn Down Yard. In addition there is road accessible space for loading/unloading products to/from rail, such as timber, ballast and palletised goods. DBS also have a covered platform for handling parcels and palletised goods for "express freight" carriers and, until three years ago, ran such a service for DHL.

8.9.7 Taken together DBS has sufficient space for a large increase in freight handling within the Millburn Yard site.

Inverness DRS Terminal

8.9.8 DRS have a long lease on Needlefield Yard (just to the west of Millburn Yard) and sub let it to J.G. Russell Ltd for handling intermodal traffic. Needlefield is part former goods yard and part former carriage shed but has been turned into an area of hard standing where containers are loaded/unloaded to/from rail. It has the capacity to handle more than the present two intermodal trains per day. The connection to Needlefield is shared with the Harbour Branch and FSR carriage maintenance.

Inverness Coal Yard (Harbour Branch)

8.9.9 The Harbour Branch consists of a half mile single track branch from Millburn Yard leading to a small goods yard with two dead end sidings. It is a relatively small site, which has the operational disadvantage of no run round facility, so any wagons have to be propelled along the branch. The Harbour Branch Sidings do have hard standing and have handled intermodal containers in the past. This is a useful facility, although unused for several years now.

8.10 Aberdeen – Inverness Line Terminals & Sidings

Keith Yard

8.10.1 The goods yard is adjacent to Keith station and at the junction of the former branch to Dufftown (now the preserved Keith and Dufftown Railway Association). The yard is comprised of at least six sidings and an area of hard standing for the transhipment of products to/from rail wagons. The length of these sidings means that a viable freight train could be run from Keith Yard. In addition, there was a private siding to serve the adjacent Chivas Ltd whisky distillery. All these facilities are presently out of use but represent an asset that could be of value if whisky traffic returned to rail transport.

Elgin

8.10.2 Apart from Inverness, Elgin Goods Yard is the next largest freight facility in the HITRANS Study area. The connection to the Goods Yard is at the east end of Elgin station (formerly a junction for the branch to Lossiemouth) and leads to a fan of at least eleven sidings. Contained within the yard are hardstanding areas for loading traffic to/from rail, a disused gantry crane spanning two tracks for intermodal containers and a connection to a former oil terminal. Road access leads onto the station approach road and the A941.

8.10.3 The amount of siding space means that handling a viable size of freight train is not a constraint for Elgin.

8.10.4 The goods yard is presently leased to DBS but sees only spasmodic traffic. Elgin Goods Yard has the potential to form a sub regional freight hub and is well placed for both the Spey Valley whisky distilleries and food processing industries in the Moray area. This is a valuable site that should be protected.

Roseisle (Diageo)

8.10.5 Roseisle is situated on the former Hopeman branch which diverges from the AIL at Alves Junction, between Elgin and Forres. Originally it served two Scottish Malt Distillers facilities, at Roseisle and Burghead, but the line to Burghead has now been abandoned. The remaining facility at Roseisle is now owned by Diageo and has a large grain malting plant and a new whisky distillery. It represents a large industrial complex and could have considerable potential for rail freight, both for grain inbound and whisky spirit outbound. Given the sidings available a viable sized freight train could be operated.

8.10.6 The two mile branch from Alves Junction is presently classed as “mothballed” by NR but is capable of being brought back into use if traffic were to return. Given its potential this is another valuable asset for rail freight.

9 Summary and Conclusions

9.1 Summary

9.1.1 This Study was commissioned by the Highlands and Islands Transport Partnership in Scotland and has been managed by a Steering Group, comprising Frank Road (HITRANS), Kenneth Russell (JG Russell) and Anne MacKenzie (Network Rail). MVA undertook this Study in conjunction with Brian Ringer (independent consultant) to determine the existing constraints on the HITRANS network for rail freight.

9.1.2 The Study's overarching aim was to fully understand the freight-related capacity of the current rail network in the HITRANS area. This will enable current and potential new rail freight customers plan their future freight operations with confidence and will help HITRANS and others identify and make the case for enhancements which would facilitate increased mode-shift of freight from road to rail.

9.1.3 The following rail freight routes were considered:

- Far North Line (FNL);
- West Highland Line (WHL): The following lines form part of the WHL:
  - Fort William Line (FWL);
  - Mallaig Line (ML); and
  - Oban Line (OL).
- Highland Main Line (HML);
- Aberdeen – Inverness Line (AIL); and
- Kyle of Lochalsh Line (KL).

9.1.4 Terminals and sidings within the HITRANS area were also considered.

9.1.5 Following a background study and stakeholder consultation, analysis of the current rail freight network within the HITRANS area was carried out. This analysis considered both physical characteristics and current timetables to determine the existing constraints of the network.

9.1.6 Railsys was also undertaken for two lines, the West Highland Line (WHL) and Aberdeen to Inverness Line (AIL). One scenario was analysed for each line, namely three up/down services on the AIL and four up/down services on the WHL.

9.1.7 Details regarding the terminals/ sidings relevant to the HITRANS area were provided, including their ownership, access and key constraints.

9.2 Conclusions

9.2.1 A summary of the main conclusions deemed from this Study is set out below. The key physical constraints were determined for each line in the study and are summarised as follows.

Far North Line

- The physical limits on the FNL ought to allow a commercially viable freight train to operate out of Invergordon, albeit that constraints south of Inverness might cause a reduction in both length and/or GTL. There is also a lack for clearance for Class 66 locos between Georgemas and Wick.

Fork William Line

- Whilst the FWL has a number of constraints on the size and weight of freight trains the most restrictive is that on length. The standard length limit of 31 SLU severely restricts the ability to run a viable train load. Whilst slightly less of a problem for bulk traffics, the length constraint has its biggest impact on non bulk and timber traffic that require length to provide the space for a profitable train.

Mallaig Line

- The most severe restriction on the ML is the lack of clearance for any load over RA 5.

Oban Line

- The most severe restriction on the ML is the lack of clearance for any load over RA 5.

Highland Main Line

- The most pressing restriction on the non bulk market is the present length limit on the HML (50 SLU) and that getting a longer limit, even if based on a timetable solution, is a first aim. Following this restoration of W8 gauge initially and W9 eventually is an aspiration for the FOCs.

Aberdeen – Inverness Line

- The key constraint on the AIL is that not all of the signal boxes are open continuously, unlike the RETB operation on the WHL and FNL and the HML signal boxes. Broadly the section of line from Elgin to Inverness is open continuously Monday to Saturday but Dyce to Keith is only open on two day shifts – basically 0600 to 2400 – from Monday to Saturday.

Kyle of Lochalsh Line

- The biggest constraint is that Class 66 locos are not cleared to operate over the line. This means that any freight train operated to Kyle would have to be hauled by a Class 37 loco, and the GTL for the class is 650 tonnes in either direction.

9.2.2 A list of potential additional freight paths by route and a set of key pinch 'sections' which create the main timetabling constraints was determined. Based on existing timetables, the potential additional freight paths were identified as set out below.

FNL: Inverness to Dingwall

- Five down services; and
- Four up services.

FNL: Dingwall to Wick/Thurso

- Three down services; and
- Three up services.

ML: Fort William to Mallaig

- five down services; and
- Four up services.

OL: Crianlarich to Oban

- Five down services; and
- five up services.

HML: Perth to Inverness

- One down service; and
- One up service.

AIL: Aberdeen to Elgin

- Four down services (two starting from Dyce, one starting from Inverurie); and
- Three up services (one finishing at Dyce).

AIL: Elgin to Inverness

- Three down services; and
- Three up services.

KL: Dingwall to Kyle

- Two down services; and
- Four up services (one finishing at Strathcarron).

9.2.3 The key timetable constraints were found to be as follows:

All routes

- Single Line with Passing Loops. Speed differential between passenger and freight services.

Far North Line

- Dingwall to Inverness is the primary constraint is the level of current passenger services. Beyond Dingwall the distance between loops at Helmsdale, Forsinard and Georgemas Junction is the next constraining factor. Current service passenger services between Dingwall and Tain also cause constraints.

Fort William Line

- The primary constraint is the level of current passenger and freight services on the route.

Mallaig Line

- The primary constraint is the level of current passenger services. Additionally the distance between loops at Fort William, Glenfinnan and Arisaig is the next constraining factor.

Oban Line

- The primary constraint is the level of current passenger services. Additionally the distance between loops at Crianlarich, Dalmally and Taynuilt is the next constraining factor.

Highland Main Line

- The primary constraint is the level of current passenger and freight services on the route. Paths would need to alter existing services to be entirely conflict free.

Aberdeen to Inverness Line

- Aberdeen to Inverurie is the primary constraint is the level of current passenger services. Beyond Inverurie the distance between loops at Elgin and Keith is the next constraining factor.
- The primary constraint is the level of current passenger services, and the limited availability of passing loops.

Kyle of Lochalsh Line

- The primary constraint is the level of current passenger services, and the limited availability of passing loops.

9.2.4 The Railsys analysis showed that the impact of the proposed new freight services on existing overall passenger service performance is marginal, though they do have a direct negative impact on the Aberdeen - Inverness and Fort William to Corpach routes. There are also knock-on secondary delays on the Perth – Inverness Route, which might warrant further investigation.

9.2.5 The impact on existing freight service performance is also marginal as the overall performance of the study routes are only marginally affected by the new services tested here.

9.2.6 The reliability of the new freight services themselves is good/marginal and we conclude that the new freight services we have tested here could be accommodated into the Reference Case timetable, possibly with further minor ‘tweaking’ where necessary.

9.2.7 In general, the performance of the new services is no worse, and in several cases, actually better than, that of the existing freight services, resulting in some cases to an improvement in the average freight performance.

9.2.8 The addition of these new freight services increases the capacity utilisation considerably. However, as a result, much of the ‘white space’ where services can currently run out of their path without causing knock on delays has been removed, with a corresponding small negative impact of overall route performance to all services.

9.2.9 We would conclude that the identified freight services could be added, possibly with some further investigation to better understand the minor negative impacts predicted by the modelling. This could include detailed train by train assessment of timetable during perturbed running to address these conflicts.

9.2.10 Of the terminals analysed in this Study, the following were found to have the greatest development potential:

- Invergordon Distillery 1 & 2;
- Invergordon Alcan;
- Invergordon Goods Yard;
- Kinbrace;
- Georgemas;
- Wick;
- Crianlarich Lower;
- Corpach;
- Dalwhinnie;
- Inverness Millburn;
- Inverness DRS;
- Keith;
- Elgin; and
- Roseisle.

9.2.11 It is not suggested that all of these terminals/ sidings should be developed. Instead, it is advised that a small number of these could be developed to cater for their respective hinterland. A further study may be required to determine the need for a terminal north of Inverness.

Appendix A – Freight Train Loads Book Extract

Introduction

This document replaces the former 'Freight Train Loads Book'. It should be used to determine the maximum tonnage that can be hauled by different types (classes) of locomotive over specific routes. **All tonnages quoted are trailing**, i.e. excluding the weight of the locomotive. Loco weights are shown at the head of each column, and when added to the trailing tonnage give a gross tonnage. Note that loco weights shown differ slightly from loco weights shown in TOPS data.

Locomotive classes known to be extant in Europe (but not preserved or heritage types) are included. Although many of these loco classes do not work regular freight services, it is possible that a) they may be used at short notice to cover failures or b) may find further use with new or existing freight operators. They are included in this document to cover for these possibilities and to obviate as far as possible the need for further amendments to this spreadsheet. Classes of loco not listed here must not operate freight services without special authority.

It is recognised that the majority of freight services are worked by class 66 locomotives and the relevant columns have been underlined and highlighted in colour for ease of use. Loads for class 73/1 electro-diesel locomotives refer to diesel mode only. No distinction is made between 47/0 and 47/4 loco classes as the difference in tonnage is minimal. Space has been included for the new locos currently on order for Freightliner.

The loads quoted are taken from Manual of Maximum Loads produced by AEA technology. The loads are calculated taking into account the characteristics of the loco class concerned and the topographical and operating parameters applicable to the route in question. The loads are calculated so as not to damage locos, rolling stock or couplings over the routes concerned. In certain circumstances, AEA data for some stretches of line is not available and appropriate loads have been estimated – these loads are shown *in italics* pending proper verification.

1) **Timing Loads**

Loads quoted are the maximum possible trailing tonnage, NOT the 'Timing Load', which is the load used by train planners to work out a suitable path, based on the 'bid' information supplied by the Freight Operating Company. If the Timing Load for a particular train is exceeded, the train may lose time. To ascertain the Timing load for a specific train, use the TSIA feature in TRUST to ascertain details for a specific headcode – the 'Timing Load' is shown at the top of the column headed 'Tlod'.

2) **Coupling Strength**

The Coupling strength columns must always be referred to, and if less than the load quoted for the loco type/class of train, then coupling strength must be the limit of the trailing weight. Coupling strength limits MUST NOT be exceeded. Failure to observe this provision may result in a train division. To ascertain the coupling strengths for specific freight vehicles, do a 'J6 1 1' TOPS enquiry on the wagon. The output will give current location, status and various physical characteristics including coupling strength. If various wagons on a train have different coupling strength, the wagon with the lowest strength will determine the permitted trailing weight.

3) **Route Availability (RA)**

This figure determines whether a loco/vehicle is too heavy for a specific route. Each route is classified 1-10 inclusive. Routes with lower RAs can accept only lighter axleweight vehicles, usually due to the build quality of bridges, embankments, culverts etc. Locos and wagons are also classified with an RA figure. A vehicle classified RA1 can go anywhere, a vehicle classified with a higher RA is not normally permitted to pass over routes with a lower RA, e.g. a loco/vehicle classified RA7 is not normally permitted to pass over routes classified RA6 or less, and so on. However there may be circumstances where local engineers are happy for RA to be exceeded subject to certain conditions, and these arrangements are published elsewhere. RA MUST NOT be exceeded without the appropriate authority. The presence of a tonnage for a specific loco type over a specific route in this spreadsheet DOES NOT constitute authority for RA to be exceeded.

Note specially that TOPS train consists show an RA of '10' as '0'. The RA figures quoted are those published in the relevant Sectional Appendix (SA) and may be amended at any future date. Where vehicles and locomotives regularly operate at higher RA's than those quoted here, reference MUST be made to the specific RT3973 form for the type of vehicle (or locomotive) to be conveyed. Where a route specific RT3973 form is applicable this is shown in the relevant notes.

Route Availability on WCML shown thus:- 8/10 indicates RA10 applies in NR Scotland Route/LNW Route Boundary; RA 8 applies in LNW Route south of Route Boundary.

ROUTE AVAILABILITY

Vehicles	RA	Vehicles	RA
Two-axle vehicles		**Four-axle vehicles**	
Gross Laden Weight (tonnes)		(2 x two axle bogies)	
Up to 27.5t	1	*Gross Laden Weight (tonnes)*	
Over 27.5t and up to 30t	2	Up to 61t	3
Over 30t and up to 33t	3	Over 61t and up to 70t	4
Over 33t and up to 35.5t	4	Over 70t and up to 76t	5
Over 35.5t and up to 38t	5	Over 76t and up to 79t	6
Over 38t and up to 40.5t	6	Over 79t and up to 86t	7
Over 40.5t and up to 43t	7	Over 86t and up to 90t	8
Over 43t and up to 45.5t	8	Over 90t and up to 97t	9
Over 45.5t and up to 48t	9	Over 97t and up to 102t	10
Over 48t and up to 51t	10		
Multi-axle vehicles			
Car-carrying vehicles	2		

4) **Length Limit (LL)**

All routes have a nominal length limit (shown in SLUs = Standard Length Units = 1 SLU = 21 feet). This is to ensure that trains will fit in loops, sidings etc without causing perturbation to other services. **In Scotland, if no length limit is shown, a length limit of 71SLU inluding the locomotive applies**. If length limits for specific routes or locations varies then this will be shown in the LL column.

TOPS train consists include train lengths in feet/metres both with and without the locomotive(s). A feet/metres/SLU conversion chart is included within this document. Length Limits MUST NOT be exceeded (unless already agreed and published) without the authority of Network Rail Scotland Route Control. **All length limits quoted in these loads tables include the locomotive. The lengths shown assume that only 1 locomotive would be attached. Users are requested to ensure that terminals can accept trains of the length required, and that a schedule path is obtainable for any non TSDB schedule.**

5) **Routes**

Not every through route is shown - in some circumstances with through special or diverted trains it may be necessary to look up more than one route and adopt the most restrictive.

Loads for both diesel and electric locos on Anglo-Scottish routes to Carlisle are also valid beyond Carlisle to Warrington, Bescot and Wembley, via Shap or Settle. Similarly loads from Mossend and Millerhill to Tyne via the ECML are also valid through to Doncaster and Immingham. This is because the most restrictive sections of the routes concerned are north of the border.

6) **More than 2 Locomotives Coupled Together**

In Scotland, not more than two locos may run coupled together, either as light engines or working a train, without special authority. If it is necessary to run 3 or more locos coupled, authority must first be sought from Network Rail Scotland Route Control for each occasion. It should be noted that special speed/route restrictions may apply and that more than 2 locos coupled may be prohibited on some stretches of line. These restrictions are summarised in the Network Rail Sectional Appendix (Scotland Route – General Instructions).

7) **Double-Headed Trains (Please refer to Sectional Appendix for specific route permissions)**

Diesel traction –
Trains worked by two locomotives do not necessarily haul twice the published trailing tonnage, nor do they haul the sum of individual load of different classes. Loads should be calculated by reference to the table '% Load Factor for Assisted Trains' reproduced in this document.
Electric Traction - For double headed electrically hauled trains refer to the instructions concerning Electric Traction (see Note 11). Don't forget to check coupling strength!

8) **Diesel Locomotive Loads**

This aims to show a comprehensive list of loads in Scotland, listed alphabetically by starting point. Every route in Scotland is shown, to aid planning of, say, possession trains or any possible new freight flows. Against certain loading lines there are abbreviations shown. These are
FB – See special instructions relating to the Forth Bridge (below)
TB – Subject to Tay Bridge clearance. There are few freight trains permitted over the Tay Bridge. Loads shown between Ladybank and Dundee are valid via Perth.
WCL – If via the Wishaw Connecting Line (Shieldmuir-Wishaw) – use appropriate entry and apply loading accordingly.
ET – Electric traction – see also loads for Electric Locomotives
MGR – See also loads for MGR trains

9) **66H Loads**

66H loads take cognisance of the fact that class 66 locomotives can exert higher horsepower output for limited periods, rather than the continuous output used in the calculation of other loadings. 66H loads are typically used when conveying trains of bulk products, e g 'block' or 'unit' trains of coal, stone, petroleum or other products. A 'Block' or 'Unit' train means all the wagons are of the same basic type and carrying the same commodity. Load Tables in respect of Trailing Tonnages, previously noted as 66H have been recorded in a separate line of entry. Instances where the 66H load exceeds the Standard Class 66. Tonnage may only be used when if the tonnage is officially recognised as a specially authorised load. Such tonnages have been recorded as specified in Note 5.. Tonnages listed under Heading 66H are based upon a standard class 66 Locomotive working beyond it's normal capacity for a limited length of time - recommended by Fleet Engineers as a maximum of 30 minutes at any one time.

This entails the loco being driven with the Amp meter needle in the red section of the dial in order to maintain the higher output. The practice however accentuates the likelihood of the loco shutting down due to overheating and therefore 66H tonnages must only be used as a guide to securing a specially Authorised Tonnage which will need to be trialled by agreement between Network Rail and the Freight Operating Company and ratified through the Vehicle Change procedure.

10) **West Highland and Far North Lines**

Loads for these lines are included in the main alphabetical list ("Diesel"), but for ease of reference are also grouped together separately (see Notes). Note that locomotives working onto these lines MUST have RETB equipment fitted. Care must be taken to ensure that other special freight or charter trains are not booked to pass any WTT freight trains authorised overlength before authorising the excess length. Note that double heading of class 66 and 67 locos on West Highland lines is PROHIBITED unless necessary to clear the line in the event of failure.

15) **Special instructions for Class 59, 60 and 66 locomotives**

Where train loads require a Class 59, 60 or 66 locomotive to be assisted, other than in the case of failure, the assisting locomotive must be coupled at the rear of the train. An assisting locomotive may be coupled at the front in order to improve running times but not to increase the trailing load. Where this occurs the assisting locomotive must not have power applied at speeds below 15mph.
(Note: there are no such loads currently applicable to Scotland)

16) **Longitudinal Shocks** : In very long trains there is a risk of longitudinal shocks. Special instructions to minimise the risk are:-

In very long trains there is a risk of longitudinal shocks. The severity of these shocks is determined by the trailing load, the number and characteristics of the couplings and the nature of the route. It is recommended that further guidance is sought for loads in excess of those shown here.

Coupling Type	Trailing Load
Instanter	3000
Screw	3500
Buckeye/Tightlock	no constraint

% Load factor for Assisted Trains

Percentage of the sum of Individual maximum Trailing Loads

Loco Class	20	31	33	37/0	37/4	37/7	47/0	56	57	58	59	60	66	73/1
20	100	80	85	90	95	95	85	90	90	90	95	100	90	95
31	80	100	85	80	70	70	95	80	80	80	75	65	80	60
33	85	85	100	90	80	80	90	100	100	100	90	80	95	75
37/0	90	80	90	100	85	85	80	95	95	95	100	90	95	85
37/4	95	70	80	85	100	100	75	85	85	85	90	95	85	95
37/7	95	70	80	85	100	100	75	85	85	85	90	95	85	95
47/0	85	95	90	80	75	75	100	80	80	80	75	70	80	65
56	90	80	100	95	85	85	80	100	100	100	90	85	95	85
57	90	80	100	95	85	85	80	100	100	100	90	85	95	85
58	90	80	100	95	85	85	80	100	100	100	90	85	95	85
59	95	75	90	100	90	90	75	90	90	90	100	90	90	90
60	100	65	80	90	95	95	70	85	85	85	90	100	85	95
66	90	80	95	95	85	85	80	95	95	95	90	85	100	85
73/1	95	60	75	85	95	95	65	85	85	85	90	95	85	95

Instructions:

Example - a train from Stranraer to Falkland double headed by a class 20 and a class 56.
Class 20 load - 500 weight. Class 56 load - 1020 weight.
Total 500+1020=1520 weight. Check table - shows load factor of 90%.
90% of 1520 = 1368 weight which is the max trailing load for 20 + 56.
Finally - check the coupling strength! If you have 23T couplings your max weight is 950T so you don't need the extra loco - just a 56 will do!

Use this table to calculate loads for trains double-headed by the same or different loco types.

DIESEL LOCOMOTIVE MAXIMUM TRAILING LOADS - SCOTLAND ROUTE

IMPORTANT - **Read Notes Section at the front of the Manual**

Abbreviations: ET - See also Electric Traction ; **MGR** - See also MGR pages; **FB** - see instructions relating to the Forth Bridge; **TB** - Subject to Tay Bridge Clearance; **WCL** - If via Wishaw onnecting Line see entry 'Shieldmuir - Wishaw'

Look for departure point (listed alphabetically) And Don't forget to check coupling strength!

				Diesel Loco Class & Weight. (For Electric locos see sheet 3)																					
	Length Limit		RA	Most restrictive section	20	31/1	33	37/0	37/4	37/7	47	56	57	58	59	60	66	66/6	67	FL PH	73/1	66H	Coupling Strength		
	loco weight	*	*	(weight)	73	111	77	104	104	115	117	123	113	127	124	125	124	124	89		78	124	23t	34.5t	56t
	AEA ref	LL	RA	Most restrictive section (weight)	**ABERDEEN TO INVERNESS** MAXIMUM LOAD (EXCLUDING LOCO WEIGHT)																		Coupling Strength		
Aberdeen to Inverness also Aberdeen to Dyce Raiths Farm/Elgin	2220	50	10	Craiginches - Kittybrewster	685	435	695	880	1140	1130	760	1340	800	1270	1770	2065	1535	1980	465		330	1910	1225	1835	2985
Aberdeen to Kittybrewster	2220	50	10	Craiginches - Kittybrewster	685	435	695	880	1140	1130	760	1340	800	1270	1770	2065	1535	1980	465		330	1910	1225	1835	2985
Aberdeen Waterloo Goods - Kittybrewster			8	*estimated*	*685*	*435*	*695*	*880*	*1140*	*1130*	*760*	*1340*	*800*	*1270*	*1770*	*2065*	*1535*	*1980*	*465*		*330*	*1910*	*1225*	*1835*	*2985*
Coatbridge FLT to Inverness via Stirling/Perth.	2200	50	8	Perth - Inverness	540	335	550	695	905	895	600	1150	630	1085	1420	1665	1230	1595	365		255	1535	1065	1600	2600
	AEA ref	LL	RA	Most restrictive section (weight)	**CORPACH TO VARIOUS** MAXIMUM LOAD (EXCLUDING LOCO WEIGHT)																		Coupling Strength		
Corpach to Fort William	1881	31	5	Corpach - Fort William	445	415	475	620	650	715	650	765	805	740	1285	1210	1290	1290	415		420	1290	735	1105	1800
Corpach to Mallaig	1873	31	5	Corpach - Mallaig	410	245	420	525	600	660	455	705	480	680	1060	1110	920	1185	280		190	1145	690	1035	1680

IMPORTANT - **Read Notes Section at the front of the Manual**

Abbreviations: ET - See also Electric Traction ; **MGR** - See also MGR pages; **FB** - see instructions relating to the Forth Bridge; **TB** - Subject to Tay Bridge Clearance; **WCL** - If via Wishaw onnecting Line see entry 'Shieldmuir - Wishaw'

Look for departure point (listed alphabetically) And Don't forget to check coupling strength!

				Diesel Loco Class & Weight. (For Electric locos see sheet 3)																					
	Length Limit		RA	Most restrictive section	20	31/1	33	37/0	37/4	37/7	47	56	57	58	59	60	66	66/6	67	FL PH	73/1	66H	Coupling Strength		
	loco weight	*	*	(weight)	73	111	77	104	104	115	117	123	113	127	124	125	124	124	89		78	124	23t	34.5t	56t
	AEA ref	LL	RA	Most restrictive section (weight)	**CRIANLARICH TO VARIOUS** MAXIMUM LOAD (EXCLUDING LOCO WEIGHT)																		Coupling Strength		
Crianlarich to Glen Douglas	1883	31	5	Crianlarich - Glen Douglas	490	305	500	630	715	790	545	845	570	815	1240	1335	1080	1380	335		235	1335	800	1200	1955
Crianlarich to Oban	1950	31	5	Crianlarich - Oban	405	260	430	550	590	650	475	695	500	670	1100	1090			295		200		680	1020	1655
	AEA ref	LL	RA	Most restrictive section (weight)	**ORIGINATING LOCATIONS VARIOUS D TO E** MAXIMUM LOAD (EXCLUDING LOCO WEIGHT)																		Coupling Strength		
Dingwall to Kyle of Localsh	2260/5	37	5	Dingwall - Kyle of Localsh	430	260	440	550	650	705	475	765	500	740	1100	1210	960	1230	295		200	1185	735	1105	1800
	AEA ref	LL	RA	Most restrictive section (weight)	**ELGIN TO VARIOUS** MAXIMUM LOAD (EXCLUDING LOCO WEIGHT)																		Coupling Strength		
Elgin to Mossend via Dundee, Perth, Stirling	2227	50	10	Elgin - Keith	540	335	550	695	905	895	600	1150	630	1085	1420	1665	1230	1595	365		255	1535	1065	1600	2600

IMPORTANT - **Read Notes Section at the front of the Manual**

Abbreviations: ET - See also Electric Traction ; **MGR** - See also MGR pages; **FB** - see instructions relating to the Forth Bridge; **TB** - Subject to Tay Bridge Clearance; **WCL** - If via Wishaw onnecting Line see entry 'Shieldmuir - Wishaw'

Look for departure point (listed alphabetically) And Don't forget to check coupling strength!

				Diesel Loco Class & Weight. (For Electric locos see sheet 3)																					
	Length Limit		RA	Most restrictive section	20	31/1	33	37/0	37/4	37/7	47	56	57	58	59	60	66	66/6	67	FL PH	73/1	66H	Coupling Strength		
	loco weight	*	*	(weight)	73	111	77	104	104	115	117	123	113	127	124	125	124	124	89		78	124	23t	34.5t	56t
	AEA ref	LL	RA	Most restrictive section (weight)	**FORT WILLIAM TO VARIOUS** MAXIMUM LOAD (EXCLUDING LOCO WEIGHT)																		Coupling Strength		
Fort William to Corpach	1872	31	5	Fort William - Corpach	610	585	650	855	890	980	895	1050	1095	1015	1790	1685	1795	1795	595		575	1795	970	1460	2370
Fort William to Mossend (see also Specially Authorised Loads)	1882	31	5	Fort William - Crianlarich	475	290	485	605	695	770	525	820	550	795	1200	1300	1045	1340	325		225	1290	785	1175	1910
	AEA ref	LL	RA	Most restrictive section (weight)	**GEORGEMAS TO THURSO** MAXIMUM LOAD (EXCLUDING LOCO WEIGHT)																		Coupling Strength		
Georgemas Jn to Thurso	2270/5		5	Georgemas Jn - Thurso	675	430	685	870	1125	1115	750	1385	790	1315	1750	2045	1515	1960	455		325	1890	1260	1895	3075

IMPORTANT - **Read Notes Section at the front of the Manual**

Abbreviations: ET - See also Electric Traction ; **MGR** - See also MGR pages; **FB** - see instructions relating to the Forth Bridge; **TB** - Subject to Tay Bridge Clearance; **WCL** - If via Wishaw onnecting Line see entry 'Shieldmuir - Wishaw'

	AEA ref	LL	RA	Most restrictive section (weight)	**GLEN DOUGLAS TO VARIOUS** MAXIMUM LOAD (EXCLUDING LOCO WEIGHT)																		Coupling Strength		
Glen Douglas to Crianlarich	1870	31	5	Glen Douglas - Crianlarich	510	325	530	660	740	815	575	875	600	845	1300	1385	1135	1445	355		250	1395	825	1240	2015
Glen Douglas to Mossend (all routes)	1884	31	5	Glen Douglas - Craigendoran Jn	600	380	610	765	900	980	665	1060	695	1025	1515	1690	1320	1695	410		290	1635	1010	1515	2460

IMPORTANT - **Read Notes Section at the front of the Manual**

Abbreviations: ET - See also Electric Traction ; **MGR** - See also MGR pages; **FB** - see instructions relating to the Forth Bridge; **TB** - Subject to Tay Bridge Clearance; **WCL** - If via Wishaw onnecting Line see entry 'Shieldmuir - Wishaw'

Look for departure point (listed alphabetically) And Don't forget to check coupling strength!

Diesel Loco Class & Weight. (For Electric locos see sheet 3)

INVERNESS TO VARIOUS
MAXIMUM LOAD (EXCLUDING LOCO WEIGHT)

	Length Limit		RA	Most restrictive section	20	31/1	33	37/0	37/4	37/7	47	56	57	58	59	60	66	66/6	67	FL PH	73/1	66H	Coupling Strength		
	loco weight	*	*	(weight)	73	111	77	104	104	115	117	123	113	127	124	125	124	124	89		78	124	23t	34.5t	56t
	AEA ref	LL	RA	Most restrictive section (weight)																			Coupling Strength		
Inverness to Aberdeen Craiginches	2227	50	10	Elgin - Keith	540	335	550	695	905	895	600	1150	630	1085	1420	1665	1230	1595	365		255	1535	1065	1600	2600
Inverness to Aberdeen Waterloo Goods	2220	50	8	Craiginches - Kittybrewster	540	335	550	695	905	895	600	1150	630	1085	1420	1665	1230	1595	365		255	1535	1065	1600	2600
Inverness to Coatbridge FLT via Perth & Stirling	2215	50	8	Inverness - Perth	540	335	550	695	905	895	600	1150	630	1085	1420	1665	1230	1595	365		255	1535	1065	1600	2600
Inverness to Georgemas Jn and Wick	2204/5	50	5	Lairg - Wick	540	335	550	695	905	895	600	1150	630	1085	1420	1665	1230	1595	365		255	1535	1065	1600	2600
Inverness to Grangemouth via Perth and Stirling (also via Ladybank/Alloa)	2215	50	8	Inverness - Perth *(estimated via Alloa)*	540	335	550	695	905	895	600	1150	630	1085	1420	1665	1230	1595	365		255	1535	1065	1600	2600
Inverness to Lairg	2203	50	5	Ardgay - Lairg	645	410	660	835	1080	1070	725	1340	755	1270	1685	1970	1460	1890	440		315	1820	1225	1835	2985
Inverness to Millerhill via Perth, Ladybank, Kircaldy/Cowdenbeath, Forth Bridge	2215	50	8	Inverness - Perth*	540	335	550	695	905	895	600	1150	630	1085	1420	1665	1230	1595	365		255	1535	1065	1600	2600
Inverness to Mossend via Perth and Stirling	2215	50	8	Inverness - Perth	540	335	550	695	905	895	600	1150	630	1085	1420	1665	1230	1595	365		255	1535	1065	1600	2600
Inverness to Mossend via Perth, Ladybank, Kirkcaldy/Cowdenbeath and Forth Bridge **FB**	2215	50	8	Inverness - Perth*	540	335	550	695	905	895	600	1150	630	1085	*1294	*1294	1230	*1294	365		255	*1294	1065	1600	2600
Inverness to Millerhill/Oxwellmains via Ladybank, Kirkcaldy/Cowdenbeath and Forth Bridge, Sub/Waverley **FB**	2215	50	8	Inverness - Perth*	540	335	550	695	905	895	600	1150	630	1085	*1294	*1294	1230	*1294	365		255	*1294	1065	1600	2600
Inverness to Oxwellmains via Stirling, Sub/Waverley	2215	50	8	Inverness - Perth	540	335	550	695	905	895	600	1150	630	1085	1420	1665	1230	1595	365		255	1535	1065	1600	2600

IMPORTANT - Read Notes Section at the front of the Manual

Abbreviations: ET - See also Electric Traction ; **MGR** - See also MGR pages; **FB** - see instructions relating to the Forth Bridge; **TB** - Subject to Tay Bridge Clearance; **WCL** - If via Wishaw onnecting Line see entry 'Shieldmuir - Wishaw'

Look for departure point (listed alphabetically) And Don't forget to check coupling strength!

Diesel Loco Class & Weight. (For Electric locos see sheet 3)

	Length Limit		RA	Most restrictive section	20	31/1	33	37/0	37/4	37/7	47	56	57	58	59	60	66	66/6	67	FL PH	73/1	66H	Coupling Strength		
	loco weight	*	*	(weight)	73	111	77	104	104	115	117	123	113	127	124	125	124	124	89		78	124	23t	34.5t	56t
KITTYBREWSTER / RAITHS FARM TO ABERDEEN — MAXIMUM LOAD (EXCLUDING LOCO WEIGHT)	AEA ref	LL	RA	Most restrictive section (weight)																			Coupling Strength		
Kittybrewster/Raiths Farm to Aberdeen Craiginches	2229		10	Kittybrewster - Craiginches	1045	755	1105	1425	1515	1675	1265	1660	1325	1575	2855	2975	2485	3060	755		590	2905	1490	2235	3635
Kittybrewster-Aberdeen Waterloo Goods	2220		8	Craiginches - Kittybrewster	685	435	695	880	1140	1130	760	1340	800	1270	1770	2065	1535	1980	465		330	1910	1225	1835	2985
KYLE OF LOCALSH TO DINGWALL — MAXIMUM LOAD (EXCLUDING LOCO WEIGHT)	AEA ref	LL	RA	Most restrictive section (weight)																			Coupling Strength		
Kyle of Localsh to Dingwall (Class 66 not cleared to Kyle)	2260/6	37	5	Dingwall - Kyle of Localsh	430	260	440	550	650	705	475	765	500	740	1100	1210	960	1230	295		200	1185	735	1105	1800
LAIRG TO INVERNESS — MAXIMUM LOAD (EXCLUDING LOCO WEIGHT)	AEA ref	LL	RA	Most restrictive section (weight)																			Coupling Strength		
Lairg to Inverness	2213/4	50	5	Ardgay - Inverness	885	575	895	1140	1470	1460	985	1720	1030	1635	2250	2620	1955	2510	595		445	2425	1545	2315	3760
ORIGINATING LOCATIONS VARIOUS M TO N — MAXIMUM LOAD (EXCLUDING LOCO WEIGHT)	AEA ref	LL	RA	Most restrictive section (weight)																			Coupling Strength		
Mallaig to Corpach (Class 66 not cleared to Mallaig)	1880	31	5	Mallaig - Corpach	375	260	395	520	545	600	475	645	500	620	1075	1010	960	1075	295		200	1075	635	955	1550
MOSSEND TO VARIOUS — MAXIMUM LOAD (EXCLUDING LOCO WEIGHT)	AEA ref	LL	RA	Most restrictive section (weight)																			Coupling Strength		

Look for departure point (listed alphabetically) And Don't forget to check coupling strength!

Diesel Loco Class & Weight. (For Electric locos see sheet 3)

	Length Limit		RA	Most restrictive section	20	31/1	33	37/0	37/4	37/7	47	56	57	58	59	60	66	66/6	67	FL PH	73/1	66H	Coupling Strength		
	loco weight	*	*	(weight)	73	111	77	104	104	115	117	123	113	127	124	125	124	124	89		78	124	23t	34.5t	56t
Mossend to Fort William (see also Specially Authorised Loads)	1871	31	5	Crianlarich - Fort William	445	280	465	585	650	715	505	765	530	740	1160	1210	1010	1290	310		215	1250	735	1105	1800
Mossend to Glen Douglas	1869	31	5	Craigendoran Jn - Glen Douglas	470	445	500	660	685	760	690	810	850	785	1360	1280	1365	1365	440		445	1365	775	1160	1890
Mossend to Inverness via Forth Bridge, Kirkcaldy/Cowdenbeath and Ladybank **FB**	2200	50	8	Perth - Inverness	540	335	550	695	905	895	600	1150	630	1085	*1294	*1294	1230	*1294	365		255	*1294	1065	1600	2600
Mossend to Inverness via Stirling and Perth	2200	50	8	Perth - Inverness	540	335	550	695	905	895	600	1150	630	1085	1420	1665	1230	1595	365		255	1535	1065	1600	2600
Mossend to Perth	1607		10	Stirling - Hilton Jn	785	505	795	1015	1250	1300	875	1370	915	1300	2015	2350	1750	2255	530		390	2175	1250	1875	3045

	AEA ref	LL	RA	Most restrictive section (weight)	OBAN TO CRIANLARICH MAXIMUM LOAD (EXCLUDING LOCO WEIGHT)																		Coupling Strength		
Oban to Crianlarich	1955	31	5	Oban - Crianlarich	425	260	440	550	620	685	475	730	500	705	1100	1150	960				200		710	1065	1730

IMPORTANT - **Read Notes Section at the front of the Manual**

Abbreviations: ET - See also Electric Traction ; **MGR** - See also MGR pages; **FB** - see instructions relating to the Forth Bridge; **TB** - Subject to Tay Bridge Clearance; **WCL** - If via Wishaw onnecting Line see entry 'Shieldmuir - Wishaw'

Look for departure point (listed alphabetically) And Don't forget to check coupling strength!

Diesel Loco Class & Weight. (For Electric locos see sheet 3)

	Length Limit		RA	Most restrictive section	20	31/1	33	37/0	37/4	37/7	47	56	57	58	59	60	66	66/6	67	FL PH	73/1	66H	Coupling Strength		
	loco weight	*	*	(weight)	73	111	77	104	104	115	117	123	113	127	124	125	124	124	89		78	124	23t	34.5t	56t
	AEA ref	**LL**	**RA**	**Most restrictive section (weight)**	**THURSO TO GEORGEMAS MAXIMUM LOAD (EXCLUDING LOCO WEIGHT)**																		**Coupling Strength**		
Thurso to Georgemas Jn	2270/5		5	Thurso - Georgemas Jn	675	430	685	870	1125	1115	750	1385	790	1315	1750	2045	1515	1960	455		325	1890	1260	1895	3075
	AEA ref	**LL**	**RA**	**Most restrictive section (weight)**	**ORIGINATING LOCATIONS VARIOUS W TO Y MAXIMUM LOAD (EXCLUDING LOCO WEIGHT)**																		**Coupling Strength**		
Waterloo - See Aberdeen Waterloo			8																						
Wick and Georgemas Jn to Inverness (see also Lairg-Inverness)	2211	50	5	Georgemas Jn - Lairg	540	335	550	695	905	895	600	1150	630	1085	1420	1665	1230	1595	365		255	1535	1065	1600	2600

Length Conversion Table

	SLU	Metres	Feet	SLU	Metres	Feet	SLU	Metres	Feet
0.142857143	1	7	21	41	263	861	81	519	1701
0.153846154	2	13	42	42	269	882	82	525	1722
0.15	3	20	63	43	276	903	83	532	1743
0.153846154	4	26	84	44	282	924	84	538	1764
0.15625	5	32	105	45	288	945	85	544	1785
0.153846154	6	39	126	46	295	966	86	551	1806
	7	45	147	47	301	987	87	557	1827
	8	52	168	48	308	1008	88	564	1848
	9	58	189	49	314	1029	89	570	1869
0.15	10	64	210	50	320	1050	90	576	1890
SLU/m	11	71	231	51	327	1071	91	583	1911
1.251	12	77	252	52	333	1092	92	590	1932
	13	84	273	53	340	1113	93	596	1953
	14	90	294	54	346	1134	94	602	1974
	15	96	315	55	352	1155	95	608	1995
	16	103	336	56	359	1176	96	615	2016
	17	109	357	57	365	1197	97	621	2037
	18	116	378	58	372	1218	98	628	2058
	19	122	399	59	378	1239	99	634	2079
	20	128	420	60	384	1260	100	640	2100
	21	135	441	61	391	1281	101	646	2121
	22	141	462	62	397	1302	102	653	2142
	23	148	483	63	404	1323	103	659	2163
	24	154	504	64	410	1344	104	666	2184
	25	160	525	65	416	1365	105	672	2205
	26	167	546	66	423	1386	106	678	2226
	27	173	567	67	429	1407	107	685	2247
	28	180	588	68	436	1428	108	691	2268
	29	186	609	69	442	1449	109	698	2289
	30	192	630	70	448	1470	110	704	2310
	31	199	651	71	455	1491	111	710	2331
	32	205	672	72	461	1512	112	717	2352
	33	212	693	73	468	1533	113	723	2373
	34	218	714	74	474	1554	114	730	2394
	35	224	735	75	480	1575	115	736	2415
	36	231	756	76	487	1596	116	742	2436
	37	237	777	77	493	1617	117	749	2457
	38	244	798	78	500	1638	118	755	2478
	39	250	819	79	506	1659	119	762	2499
	40	256	840	80	512	1680	120	768	2520
							121	774	2541
							122	781	2562
							123	787	2583
							124	794	2604
							125	800	2625

West Highland and Far North Line loads are duplicated here from the main loads tables (Sheet 2) but grouped together for ease of reference.

WEST HIGHLAND LINES LOADS	LL	RA	Most restrictive section (tonnes)	AEA ref	20 73	31/1 111	33 77	37/0 104	37/4 104	37/7 115	47 117	56 123	57 113	58 127	59 124	60 125	66 124	66/6 124	66H 124	67 89	73/1 78	Coupling Strength		
Mossend to Fort William	28	5	Crianlarich - Fort William	1871	445	280	465	585	650	715	505	765	530	740	1160	1210	1010	1290	1250	310	215	735	1105	1800
Fort William to Mossend	28	5	Fort William - Crianlarich	1882	475	290	485	605	695	770	525	820	550	795	1200	1300	1045	1340	1290	325	225	785	1175	1910
Mossend to Glen Douglas	28	5	Craigendoran Jn - Glen Douglas	1869	470	445	500	660	685	760	690	810	850	785	1360	1280	1365	1365	1365	440	445	775	1160	1890
Glen Douglas to Mossend	28	5	Glen Douglas - Craigendoran Jn	1884	600	380	610	765	900	980	665	1060	695	1025	1515	1690	1320	1695	1635	410	290	1010	1515	2460
Glen Douglas to Crianlarich	28	5	Glen Douglas - Crianlarich	1870	510	325	530	660	740	815	575	875	600	845	1300	1385	1135	1445	1395	355	250	825	1240	2015
Crianlarich to Glen Douglas	28	5	Crianlarich - Glen Douglas	1883	490	305	500	630	715	790	545	845	570	815	1240	1335	1080	1380	1335	335	235	800	1200	1955
Crianlarich to Oban	28	5	Crianlarich - Oban	1950	405	260	430	550	590	650	475	695	500	670	1100	1090	960	1165	1165	295	200	680	1020	1655
Oban to Crianlarich	28	5	Oban - Crianlarich	1955	425	260	440	550	620	685	475	730	500	705	1100	1150	960	1225	1185	295	200	710	1065	1730
Fort William to Corpach	28	5	Fort William - Corpach	1872	610	585	650	855	890	980	895	1050	1095	1015	1790	1685	1795	1795	1795	595	575	970	1460	2370
Corpach to Mallaig	28	5	Corpach - Mallaig	1873	410	245	420	525	600	660	455	705	480	680	1060	1110	920	1185	1145	280	190	690	1035	1680
Mallaig to Corpach	28	5	Mallaig - Corpach	1880	375	260	395	520	545	600	475	645	500	620	1075	1010	960	1075	1075	295	200	635	955	1550
Corpach to Fort William	28	5	Corpach - Fort William	1881	445	415	475	620	650	715	650	765	805	740	1285	1210	1290	1290	1290	415	420	735	1105	1800

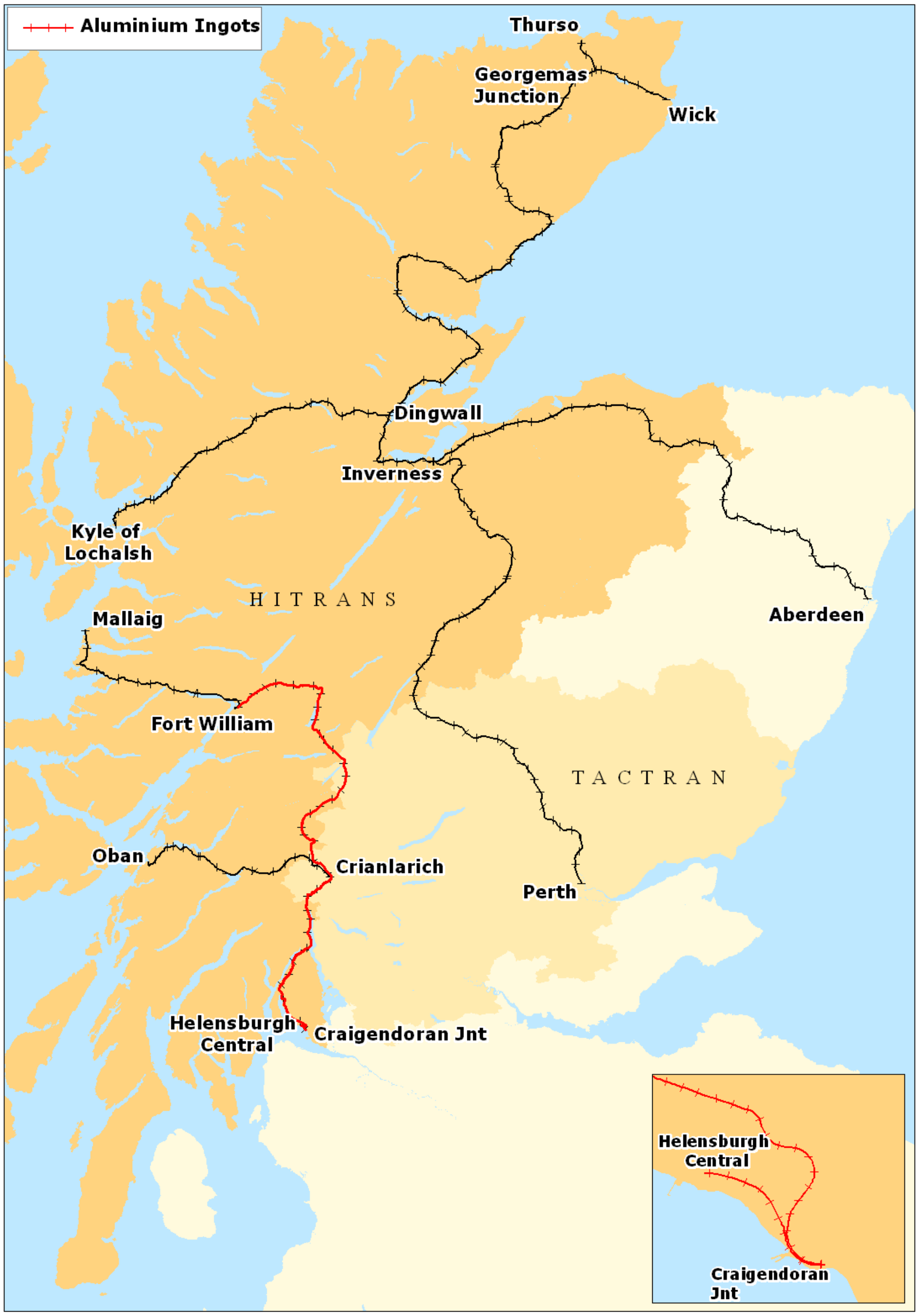
Note: 1)West Highland loadings from Mossend are valid either via Cowlairs or via the Argyle Line (Singer or Yoker), or via Shettleston. 2)All locomotives working over West Highland Lines MUST have RETB equipment 3) All locomotives over RA5 working over West Highland Lines must have appropriate published authority. 4) Double heading of class 67 and 67 locos over West Highland Lines is PROHIBITED unless to clear the line in the event of failure. 5) Class 66 Not Cleared on Oban Line

FAR NORTH LINES LOADS	LL	RA	Most restrictive section (tonnes)	AEA ref	20 73	31/1 111	33 77	37/0 104	37/4 104	37/7 115	47 117	56 123	57 113	58 127	59 124	60 125	66 124	66/6 124	66H 124	67 89	73/1 78	Coupling Strength		
Inverness to Georgemas Jn and Wick	28	5	Lairg - Wick	2204/5	540	335	550	695	905	895	600	1150	630	1085	1420	1665	1230	1595	1535	365	255	1065	1600	2600
Inverness to Lairg	28	5	Ardgay - Lairg	2203	645	410	660	835	1080	1070	725	1340	755	1270	1685	1970	1460	1890	1820	440	315	1225	1835	2985
Dingwall to Kyle of Localsh	28	5	Dingwall - Kyle of Localsh	2260/5	430	260	440	550	650	705	475	765	500	740	1100	1210	960	1230	1185	295	200	735	1105	1800
Wick and Georgemas Jn to Inverness	28	5	Georgemas Jn - Lairg	2211	540	335	550	695	905	895	600	1150	630	1085	1420	1665	1230	1595	1535	365	255	1065	1600	2600
Lairg to Inverness	28	5	Ardgay - Inverness	2213/4	885	575	895	1140	1470	1460	985	1720	1030	1635	2250	2620	1955	2510	2425	595	445	1545	2315	3760
Kyle of Localsh to Dingwall	28	5	Dingwall - Kyle of Localsh	2260/6	430	260	440	550	650	705	475	765	500	740	1100	1210	960	1230	1185	295	200	735	1105	1800

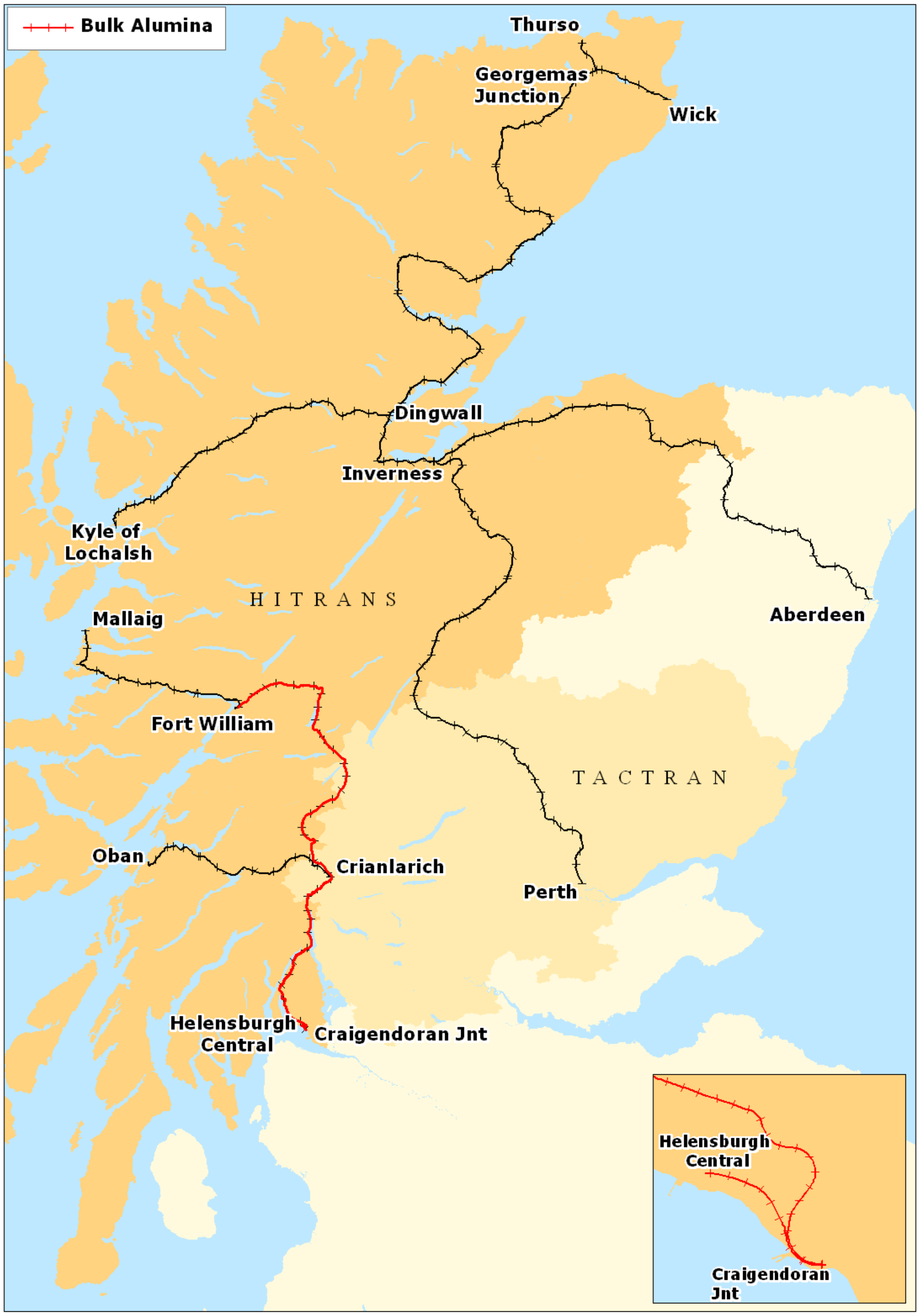
Note: 1)All locomotives working over Far North and Kyle Lines MUST have RETB equipment 2) All locomotives working over Far North and Kyle Lines must have appropriate published authority to exceed published RA where necessary.

Appendix B – Commodities Maps

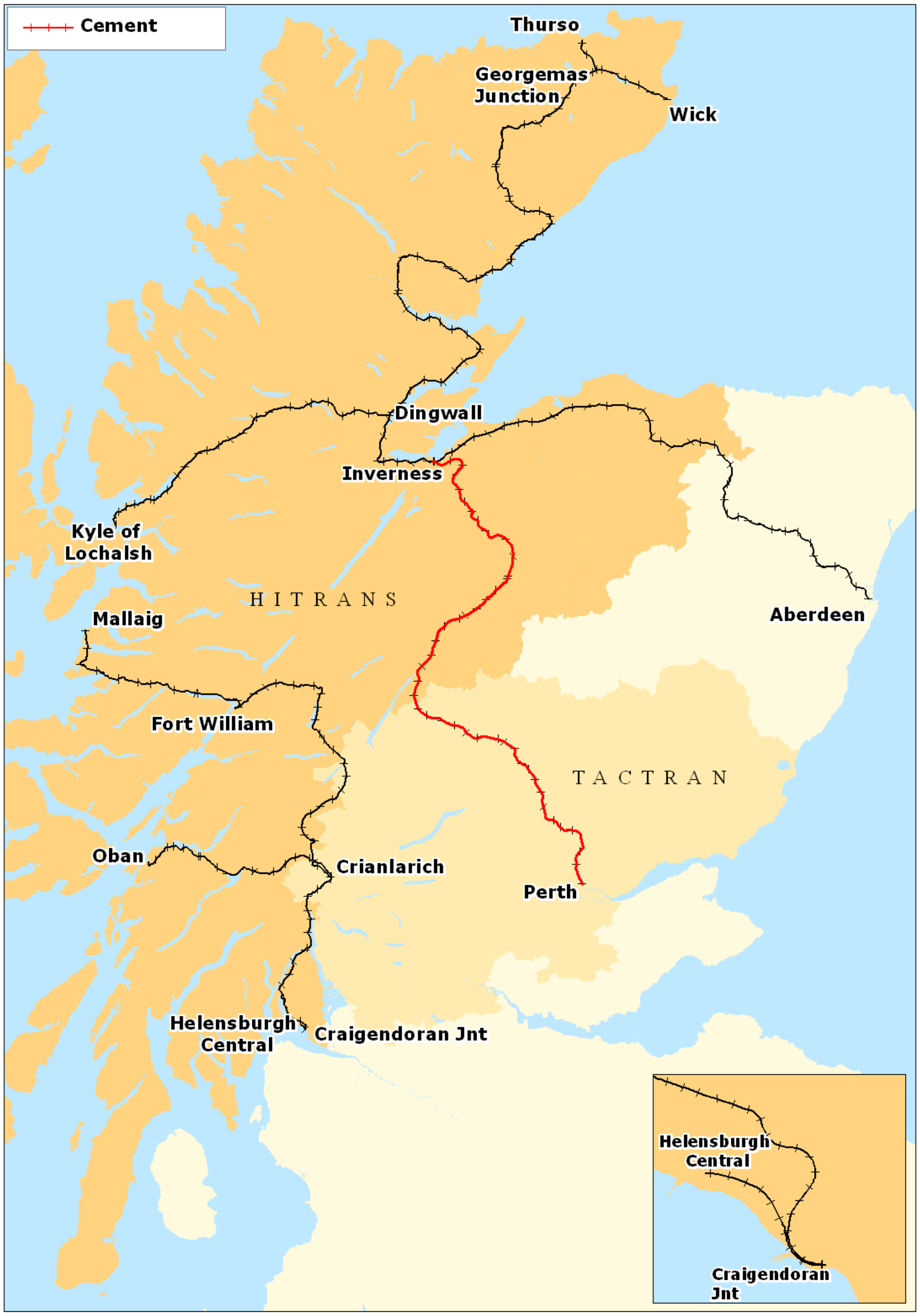
Commodities – Aluminium Ingots



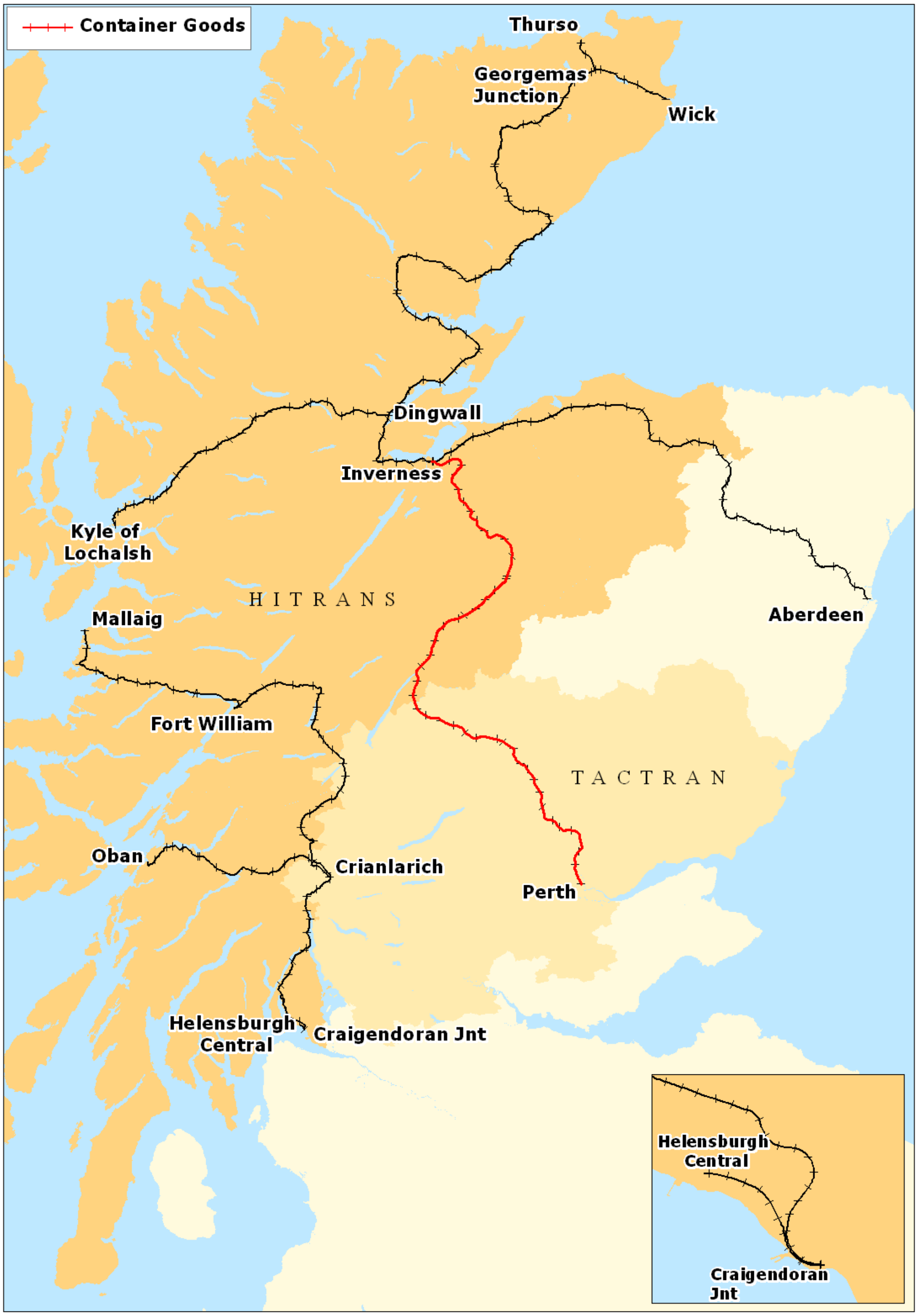
Commodities - Bulk Alumina



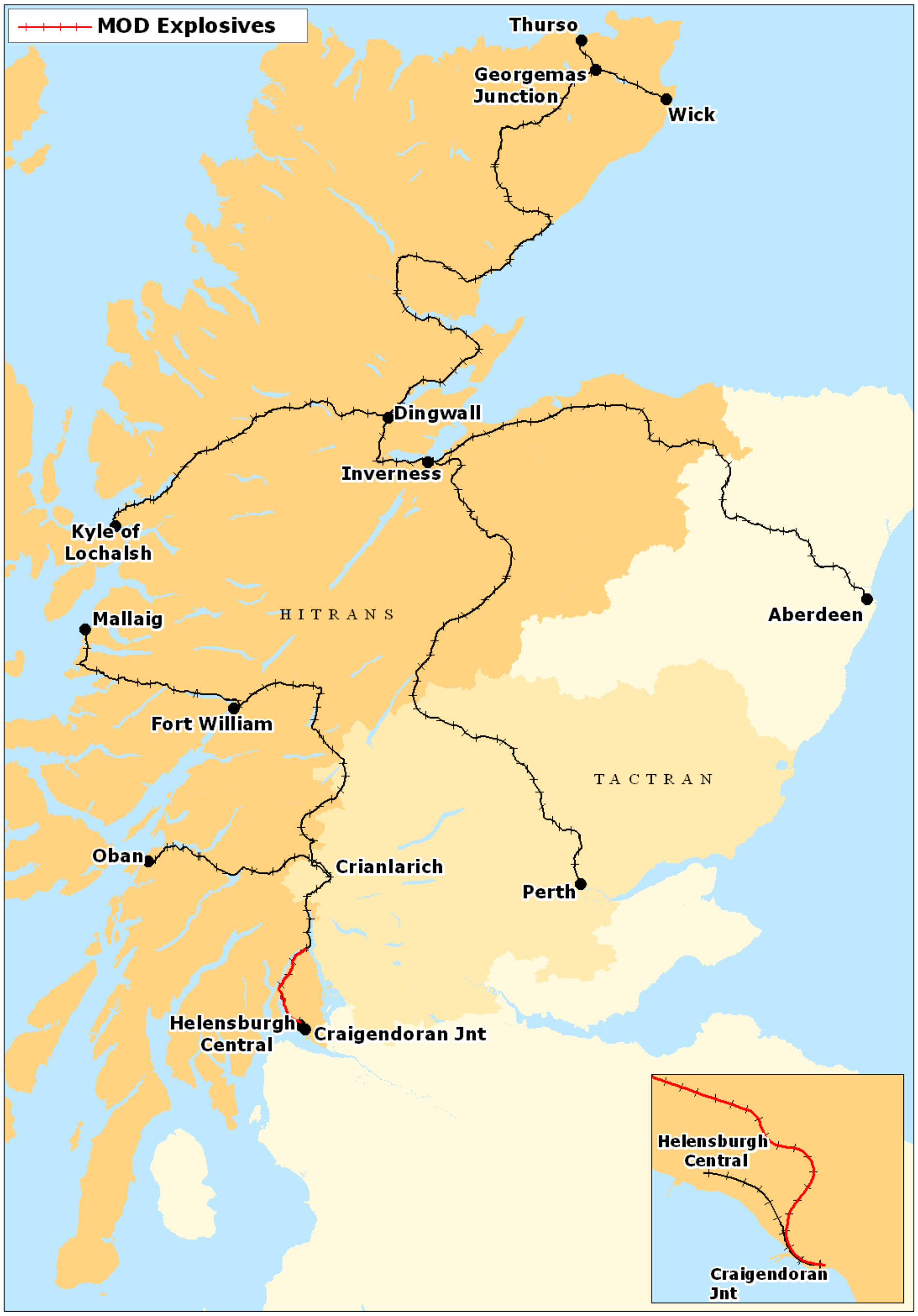
Commodities - Cement



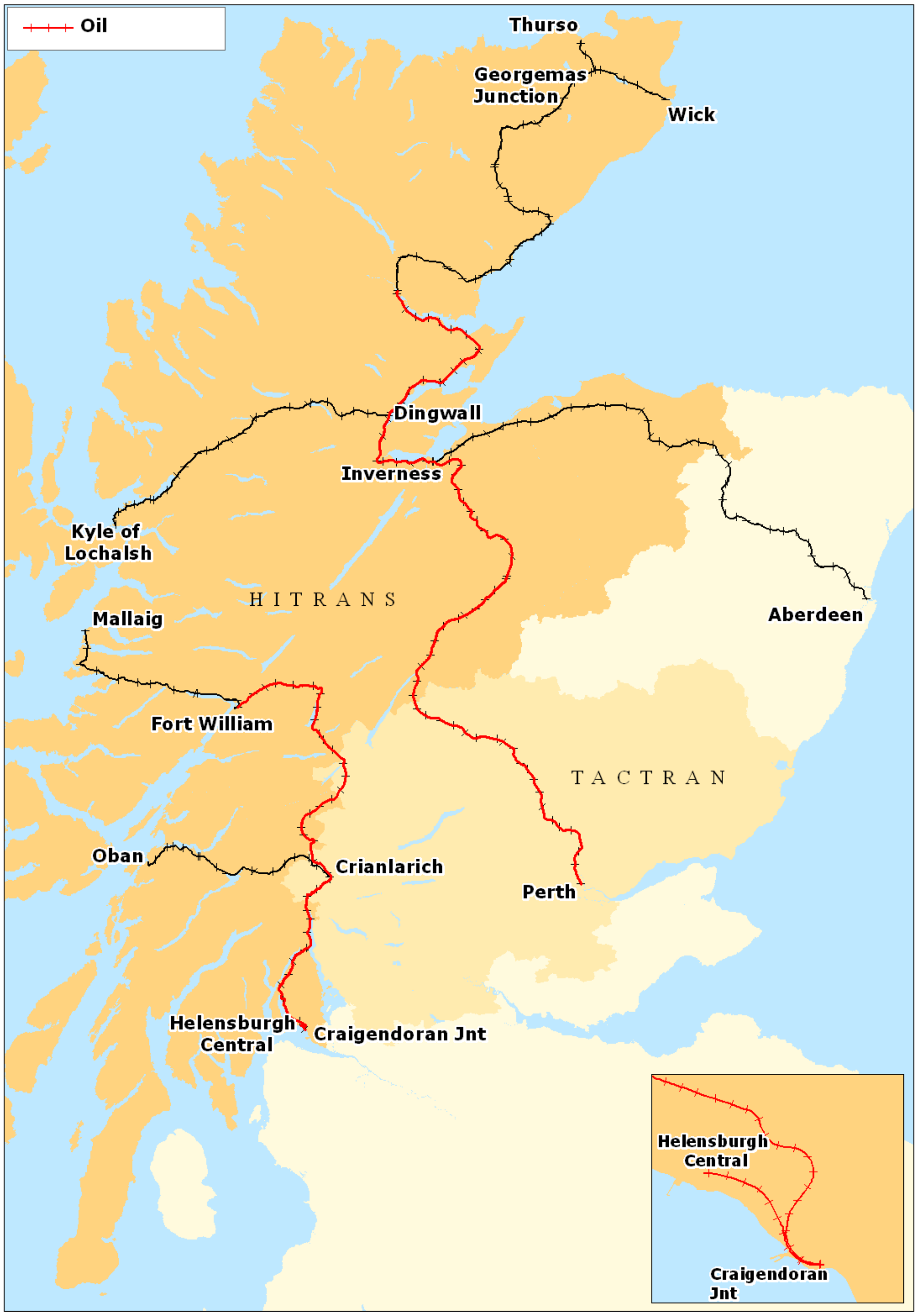
Commodities - Containers



Commodities - MOD

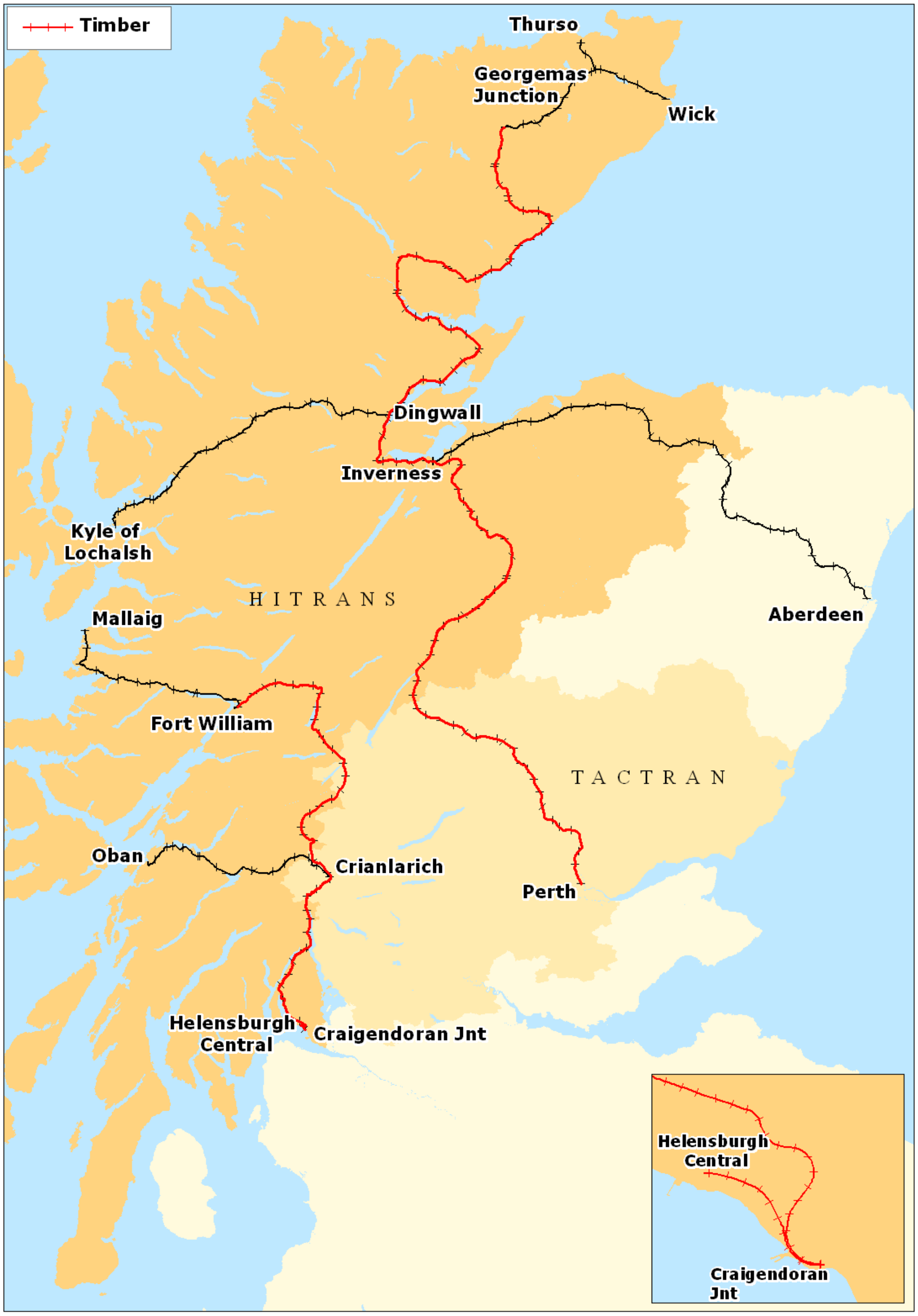


Commodities - Oil



Commodities - Pipes

Commodities - Timber



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