4CastOD

Rail Passenger Forecasting Study

Final Report

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Executive Summary

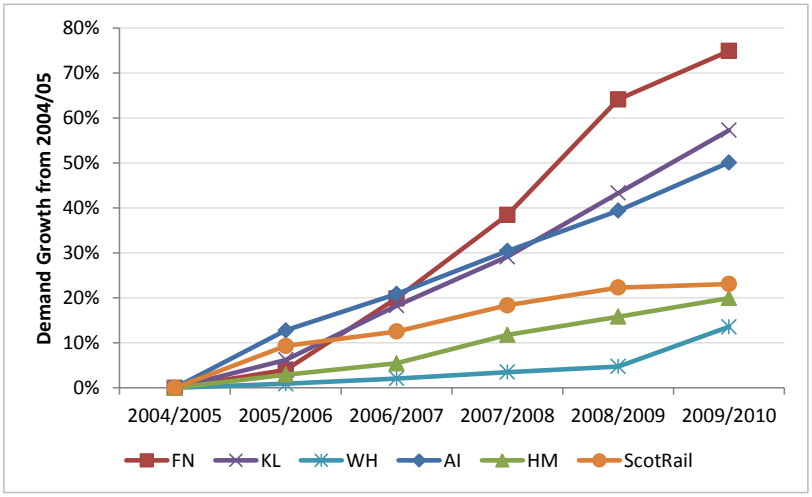
Overview

1. Steer Davies Gleave has been commissioned by the Highlands and Islands Regional Transport Partnership (HITRANS) to undertake a study to analyse actual against forecast rail demand growth in the HITRANS area and to determine when additional capacity will be required between 2010 and 2030.
2. The study has been used to inform HITRANS' response to Transport Scotland's Rail 2014 consultation on the future of ScotRail and is intended to be used to further influence Transport Scotland and potential franchise bidders prior to the commencement of Franchise 3 in 2014.

Updated Forecasting Approach

3. This study considers the demand forecasts for rail services in the HITRANS area undertaken by Halcrow as part of the Room for Growth study in 2006. That study adopted the industry-standard Passenger Demand Forecasting Handbook (PDFH) guidance. This was the best available guidance, but is best suited for forecasting the impact of external factors on mature rail markets and relatively small timetable changes on well served flows. Outturn demand growth between 2004/05 and 2009/10 is illustrated below on all five routes studied (and compared with the ScotRail average):

- Far North Line;
- Kyle Line;
- West Highland Line;
- Aberdeen – Inverness; and
- Highland Mainline.



Source: MOIRA for flows by service code (incl flows outside the HITRANS area), National Rail Trends for ScotRail

Backcasting Exercise

4. The backcasting exercise adjusted for actual changes in the standard PDFH demand drivers over this period, using the standard PDFH forecasting demand drivers and elasticities and populating with outturn data.

5. As anticipated, the backcast demand growth over this period was always lower than the outturn, accounting for only between 17% and 39% of the actual growth by route. Although not usually at this scale this phenomena has been observed recently on 'regional' flows across the UK and on most flows during the current economic downturn.

Revisions to Forecasting Methodology

6. Analysis of the shortfall between forecast and outturn demand growth was undertaken. This was combined with analysis of possible causes of this gap. A number of possible reasons were proposed, these include:

- Move from manufacturing to service sector jobs in urban areas, such as Inverness;
- Consolidation of shopping and other leisure activities in city centres, such as Inverness;
- Below inflation increases in car mileage rates for expense claims;
- The increasing acceptance of train as the environmentally friendly alternative;
- The failure of the current PDFH guidance to capture the impact of employment growth where season tickets are rarely used;
- The weakness of the PDFH 'generalised journey time' (GJT) approach to estimating the impact of timetable improvements on large changes, such as on the Far North Line from December 2005;
- The weakness of this approach in capturing the impact of the retiming of sparse services, such as on the Kyle Line;
- The reaching of a 'tipping point' in the use of car, both in terms of increased fuel costs and, to a lesser extent in this area, congestion around regional urban centres;
- An increase in the use of rail to access local tourism, particularly from overseas and cross-border visitors;
- Improvements in punctuality and reliability of local services;
- Improvements in station facilities;
- Increased provision and quality of car parking;
- Reductions in fraudulent travel; and
- Better marketing and promotions e.g. Club 55.

7. It was not possible to quantify many of these potential factors. However, the standard PDFH methodology has been adapted going forward to include:

- The impact of employment growth on non-season tickets;
- Increased impact of step changes in the timetable;
- Increased sensitivity to car fuel costs; and
- Additional growth due to the impact of tourism on key tourist flows (in the High forecast case).

8. This has closed the gap. However, a gap does remain. This could be closed by including an additional annual growth covering unexplained factors of the following (substantial) rates:

- Far North Line: 2.5% pa;
- Kyle Line: 2.7% pa;
- West Highland Line: 0.9% pa;
- Aberdeen – Inverness: 1.3% pa;
- Highland Mainline: 3.5% pa.

Demand Forecasts

9. Using the revised methodology, three sets of forecasts have been produced using economic and demographic data provided by Highlands and Islands Enterprise (HIE):

Min

- Low population, employment and GVA forecasts from HIE;
- Forecasting adaptations as described above;

Max

- High population, employment and GVA forecasts from HIE;

Max+

- As for Max, but also including additional growth to cover unexplained backcast growth forwards until 2020.

10. Forecasts have been produced for all years up until 2029/30, although it is worth noting that it is usual to assume that beyond 15 years forecasts are purely indicative. The following table summarises growth concentrating on the key years of 2016 (new franchise, but pre-EGIP), 2020 (post-EGIP and into CP6) and the final forecast year of 2029/30.

	2016			2020			2029		
	Min	Max	Max+	Min	Max	Max+	Min	Max	Max+
FN	4%	14%	29%	8%	27%	59%	18%	62%	105%
KL	3%	14%	31%	7%	28%	63%	15%	67%	112%
WH	3%	12%	17%	7%	23%	34%	18%	54%	67%
AI	3%	13%	21%	6%	26%	42%	16%	63%	83%
HM	12%	22%	45%	21%	41%	93%	44%	96%	168%

Peak Service Usage

2011 Counts

11. A key objective of the study was to provide an independent benchmark for current levels of peak service usage in the HITRANS area. To this end counts were

undertaken at a number of locations, as agreed with HITRANS, so as to ensure that the maximum load on all services within the HITRANS area was observed

12. All services were covered in a single week, commencing 5th September 2011. This week was chosen because it was still during the holiday season (and crucially the English school holidays), but at the same time the local commuters (and business travellers) would be back to work after the Scottish summer break.

13. Detailed count data has been provided. The only service that was over 90% loaded, and hence can be deemed to be overcrowded today, was the 1715d Inverness-Ardgay.

Forecast Future Peak Service Usage

14. The forecasts were applied to the above counts by route to give a forecast of future service usage. This gives an identification of the most heavily loaded services for future years. In the short term there are one or two services on the Far North, Kyle and West Highland lines that are a concern, but in the longer term there are services on all lines that need strengthening, but that the high growth forecast for the Highland Mainline is a particular concern.

2016

15. By 2016 there are forecast to be three services which are overcrowded in the Max case:

Far North

- 1715d Inverness-Ardgay
- 0812a Lairg – Inverness

Kyle

- 0900d Inverness-Kyle departing Dingwall

2020

16. By 2020 in the Max case there are two additional overcrowded services:

Far North

- 1035a Wick - Inverness

West Highland Line

- 0907d Glasgow – Mallaig departing FTW 1248

2029

17. By the forecast year of 2029 there are many more services which are forecast to be overcrowded – too many to be sensibly listed here, especially given the potential margin for error over 20 years of forecasting and with the anticipated timetable changes on at least the Highland Mainline and Aberdeen-Inverness lines. Suffice to say that over time more and more services are expected to require strengthening.

Possible Enhancements

18. There are a number of planned initiatives and events which will present opportunities for rolling stock to be made available to strengthen HITRANS services

over the next 20 years. We describe these below, along with possible use of these opportunities to enhance the overcrowded services

Pre-EGIP

19. We do not believe that there is currently any 'spare' rolling stock during the evening (or morning) peak which the current ScotRail franchisee could be required to use to strengthen the Far North Line commuter services. For the Kyle line there is the possibility that units could be transferred from providing strengthening for services in the Central Belt during the summer holiday period, as already happens on the West Highland Line.
20. However the specification for the next franchise could be set in a manner which encouraged the franchisee to use its available rolling stock in a more flexible manner than currently. Currently, some services are strengthened for the benefit of a few passengers travelling only a short distance. Future incentives could be set such that there was greater tolerance of standing in the Central Belt if the rolling stock was redeployed to save standing for longer distances where there was less choice in public transport alternatives.
21. The incoming franchisee in 2014 will have determined in their bid the size of the rolling stock fleet they will procure and how it will be deployed. In the current economic climate, it is unlikely that the fleet size will be greater than present, and indeed bidders may seek to reduce the fleet size. Therefore, the case for strengthening of these services needs to be made both to Transport Scotland to include the requirement in the franchise specification, and directly to the franchise bidders in the event it is left as discretionary. It is also worth noting that these two lines are those with the highest recent growth; if additional peak capacity were made available it may be able to justify additional off- or contra-peak services to improve the case.

Post-EGIP

22. Following introduction of electric services on EGIP routes, a large number of DMUs, primarily Class 170s, will be displaced. The successful bidder for the next franchise will have planned for this and negotiated short term leases with the ROSCOs for the units they wish to displace. The franchisee is likely to reorganise the DMU fleet following EGIP, it is therefore reasonable to assume that a pool of all three types of DMU will be displaced post EGIP.
23. The franchisee's use of this stock will again depend on the franchise specification. Unless instructed or incentivised to cascade the displaced units, they will have planned in their bid to off-lease them. If the next franchise is short, the ROSCOs may set a higher rental tariff for units on a shorter lease than the franchise length, in order to mitigate the risk of a loss of rental revenue. This provides an opportunity to make the case for some of the fleet to be retained and redeployed, on the Far North Line in particular.
24. There is a significant risk that units off-leased post EGIP will be 'lost' to the ScotRail franchise, as once leased by other TOCs the likelihood of them becoming available in the correct timeframes are reduced. Further service improvements are anticipated on the Highland Mainline and Aberdeen – Inverness lines towards the end of the decade, providing both additional capacity and additional demand. Both of these improvements will require additional rolling stock, and the franchisee

may be instructed through the specification to retain units from the EGIP cascade for these services. A case could therefore be made to deploy these units in the interim on the Far North and/or Kyle Lines.

Longer Term

25. By 2020 both the Class 158s and, particularly, the Class 156s will either need substantial upgrading or replacing by a new DMU. UK wide demand for a next generation DMU is currently limited, with DfT and ROSCOs adopting a 'wait and see' approach. Procurement of a limited new build DMU will be very expensive. We believe refurbishment of the Class 156 and/or 158 fleets will almost certainly be the preferred route as this is likely to be more affordable than gauge clearing the Far North and West Highland Lines routes for Class 170 operation.

26. If the next franchise is of a short duration, this refurbishment will take place in the early years of Franchise 4 in order to provide the TOC/ROSCO with sufficient time to recoup their capital investment. By this timeframe, most Central Belt suburban routes, will have sufficient demand to justify a 3 car DMU (Class 170 operation), resulting in the 2-car DMU fleets being primarily used on the Highland, South West and Borders routes. This provides an opportunity to properly specify the refurbishment to meet the (similar) needs of these services, particularly for the tourist market.

27. Whilst fleet deployments are the responsibility of the franchisee, Transport Scotland is responsible for fleet planning beyond the horizon of the next franchise. The current franchise consultation provides a good platform to highlight that DMU deployment post 2020 is something Transport Scotland must take responsibility for.

1 Introduction

Context

1.1 Steer Davies Gleave has been commissioned by the Highlands and Islands Regional Transport Partnership (HITRANS) to undertake a study to analyse actual against forecast rail demand growth in the HITRANS area and to determine when additional capacity will be required between 2010 and 2030.

1.2 The timing of the study is important as Transport Scotland's Rail 2014 consultation[1] on the future of ScotRail will close shortly and DfT's consultation on East Coast services is anticipated this year. The study will therefore form part of the background which HITRANS uses to inform its response to these consultations.

Current Rail Operators and Franchise Renewal

1.3 Whilst changes can theoretically be negotiated at any time, it is when franchises are due for renewal that there is a significant opportunity to redefine the required outputs and thus make major changes to the levels of service provided. Franchises operating over the HITRANS area are expected to be awarded in 2013 (East Coast), and in 2014 (ScotRail).

1.4 In order to meet these timescales, the UK and Scottish Governments have begun to consult on proposed changes to the franchises. Both franchises were expected to be more "hands off" in terms of DfT and Transport Scotland management and to be let for a longer period of time, at least 10 years. However emerging thinking suggests the next ScotRail franchise may be short to help manage the impact of the Edinburgh Glasgow Improvement Programme (EGIP) and to incorporate lessons learned from the first tranche of the new "hands off" franchise specifications, the first of which, Intercity West Coast, was recently issued..

1.5 This makes setting the appropriate specification critical and HITRANS has a key challenge in the forthcoming consultations to ensure services to and from the Highlands are not only protected, but can be enhanced in line with forecast demand growth.

Room for growth study

1.6 There have been considerable changes since the Room for Growth study and supporting analysis (Highlands and Islands Rail Traffic Growth Projections) were undertaken in 2005. These may partly explain why outturn demand appears to have outgrown forecast demand, but we anticipate that these explanations are not sufficient on their own.

- In December 2005, there were substantial improvements to Far North Line services with major frequency improvements.
- There has been a major global recession, which was not forecast in 2005, but does not seem to have had as large an impact on rail demand as would have been anticipated.

[1] RAIL 2014 – PUBLIC CONSULTATION, Transport Scotland, November 2011

[2] Phase 1: Highlands and Islands Rail Demand Projections, Halcrow Group, March 2006

- There have been significant increases in fuel prices over and above inflation.
- There have been recent (December 2011) improvements to the Highland Mainline service although that is outwith the period that has been analysed.

Study Objectives

1.7 Therefore, the following key outputs for this study have been identified:

- Produce a refreshed set of forecasts for the lines in question taking into account:
  - A backcasting exercise comparing outturn demand growth with forecast demand growth using outturn demand drivers, including economic, population and rail service.
  - Identification of reasons for any resulting differences between forecast and outturn
  - Description of the revised forecasting methodology, incorporating lessons learnt from the backcasting exercise
  - Forecasts incorporating high and low forecasts for 2010-2030
- A final report to support Highlands and Islands' case for enhanced services in the next ScotRail franchise including the outputs from above and also:
  - Documentation of counts undertaken of the most heavily laden services at critical points and height of season
  - An identification of when demand will outstrip supply on these services based on the above forecasts
  - Proposed service enhancements to mitigate against overcrowding
  - Proposed service enhancements to improve rolling stock quality

Report Structure

1.8 Beyond this introduction section, this report is structured as follows:

- Chapter 2 describes the PDFH demand forecasting methodology and the 'backcasting' exercise to understand its validity in this context, and then a Revised forecasting methodology;
- Chapter 3 describes the refreshed forecasts;
- Chapter 4 describes the counts undertaken to establish current Peak service usage and the forecasts of future peak service usage; and
- Chapter 5 describes the services that require strengthening, the opportunities for changes and recommendations for enhancements.

1.9 Appendices

- Record of assumptions for backcasting and forecasting exercise
- Detailed forecast loadings by service by forecasting scenario.

2 Backcasting Exercise

Approach

2.1 This study considers the demand forecasts for rail services in the HITRANS area undertaken by Halcrow as part of the Room for Growth study[2] in 2006 and compares with the (higher) outturn demand growth. To give a fully robust comparison we have undertaken a backcasting exercise to update the forecasts for outturn demand drivers, using broadly the same methodology used by Halcrow. By comparison with outturn demand growth we are then able to propose revisions to the forecasting methodology going forward for the next 20 years.

2.2 We have adopted the approach outlined in the Passenger Demand Forecasting Handbook (PDFH), which is consistent with the method adopted by Halcrow in 2006. This approach is an elasticity-based framework which assumes demand changes driven by incremental changes in specific demand drivers can be applied to a base demand level to give a demand forecast and is most appropriate for forecasting the impact of external factors on mature rail markets and relatively small timetable changes on well served flows.

Demand Drivers

2.3 We have adopted the same structure for the backcasting, as proposed for the forecasting exercise. The demand drivers that we have used are as follows:

- GVA per capita, representing the impact of changes to the economy on growth in demand for walk up tickets from originating stations;
- Employment, representing the impact of changes to the economy on growth in rail commuting to destinating stations;
- Population, representing the impact of changes in population on demand for walk up tickets from originating stations;
- Car ownership;
- Car costs;
- Highway journey times;
- Changes in air competition (for one particular flow, Inverness to/from London)
- Changes in bus competition
- Changes in rail fares, disaggregated into walk up and season tickets;
- Changes in rolling stock quality; and
- Changes in rail service, represented by the standard rail industry generalised journey time measure (GJT) for a representative flow for each sub-route.

[2] Phase 1: Highlands and Islands Rail Demand Projections, Halcrow Group, March 2006

Structure

2.4 The base data is taken from MOIRA and represents ticket sales in the 2004/05 financial year, grouped into service codes representing the five HITRANS routes and sub-routes representing groups of origin-destination pairs within each of these service codes, as follows:

- Far North Line
  - FN1: Stations north of Tain to/from Inverness
  - FN2: Stations north of Dingwall to Tain to/from Inverness
  - FN3: Stations Dingwall and south to/from Inverness, which is partly served by Kyle Line services.
  - FN4: Between Far North stations
  - FN5: Far North stations to/from stations south and east of Inverness
- Kyle Line
  - KL1: Stations west of Dingwall to/from Inverness
  - KL2: Stations between Dingwall and Beauly to/from stations west of Dingwall
  - KL3: Stations west of Dingwall to/from stations south and east of Inverness
  - KL4: Between stations west of Dingwall
- West Highland Line
  - WH1: Stations west of Fort William to/from Glasgow
  - WH2: Stations north of Crianlarich to Fort William to/from Glasgow
  - WH3: Stations west of Crianlarich to Fort William to/from Glasgow
  - WH4: Stations south of Crianlarich to/from Glasgow
  - WH5: West Highland stations to/from stations between Edinburgh and London
  - WH6: Stations between Crianlarich and Fort William to/from stations west of Fort William
  - WH7: Other intra-West Highland line flows
- Aberdeen – Inverness
  - AI1: Stations east of Keith to/from Inverness
  - AI2: Stations west of Huntly to/from Inverness
  - AI3: Between stations east of Keith – subsequently discarded as wholly outwith the HITRANS area
  - AI4: Stations between Keith and Forres to/from Inverness
  - AI5: Nairn to/from Inverness
  - AI6: Stations between Nairn and Forres (incl) and stations south of Inverness

- Highland Mainline
  - HM1: Inverness to/from Glasgow
  - HM2: Inverness to/from Edinburgh
  - HM3: Inverness to/from cross-border stations
  - HM4: Stations north of Blair Atholl to/from Inverness
  - HM5: Stations north of Blair Atholl including Inverness and other Central Belt stations.

Assumptions

2.5 For the backcasting exercise outturn figures for each of the demand drivers were available and used as follows:

- GVA per capita:
  - for HITRANS area stations provided by HIE from ONS data;
  - for other areas taken from ATOC OEF[3] forecasts which quote ONS data;
  - normalised to 2009 prices using RPI from ONS data.
- Employment:
  - for HITRANS area stations provided by HIE from ABI and BRES data on a station and/or area basis;
  - for other areas taken from ATOC OEF forecasts which quote ONS data.
- Population:
  - for HITRANS area stations provided by HIE from GROS data on a station and/or area basis;
  - for other areas taken from ATOC OEF forecasts which quote ONS data.
- Car ownership using TEMPRO[4] data
- Car costs using pump prices for Scotland collated by the AA, converted to current year prices using RPI from ONS data. Assumed car fuel efficiency improvement of 1% pa applied;
- A small increase in highway journey times for all flows consistent with the UK National Transport Model;
- Changes in air competition (for one particular flow, Inverness to/from London), we have assumed a small reduction in the number of daily services;

[3] Economic forecasts provided by the Oxford Economic Forum to full members of the Passenger Demand Forecasting Council (PDFC), mostly TOCs, on a monthly basis. April 2011 version has been provided by ScotRail for this purpose. This data set includes outturn levels of demand drivers for recent years.

[4] TEMPRO is software supplied by DfT which gives access to planning data and forecasts from DfT's National Trip End Model, NTEM. Since the outset of this study, Scottish specific STEP data has become available, but we did not consider an update using this data to be likely to make a significant difference.

- Improvements to bus competition to Moray and Nairn, representing a small frequency improvement and improvements to the bus quality and marketing.
- Rail fares are assumed to have increased by the regulated cap of RPI+1% every year;
- A factor representing the beneficial impact of the introduction of the Highlands-specific 158s in 2007/08; and
- Changes in rail service, represented by GJT, calculated in MOIRA[5], using the closest available timetables: June 2005 and May 2010:
  - There have been significant service improvements on the Far North line, with the introduction of the Invernet service enhancement in December 2005. (This does not appear to have been included in the Halcrow forecasts, despite these forecasts having been created in early 2006)
  - In addition there were additional Winter services introduced on the Kyle Line in December 2008, for that line December 2005 and December 2010 timetables have been used.
  - There have been only very minor changes on the other routes.

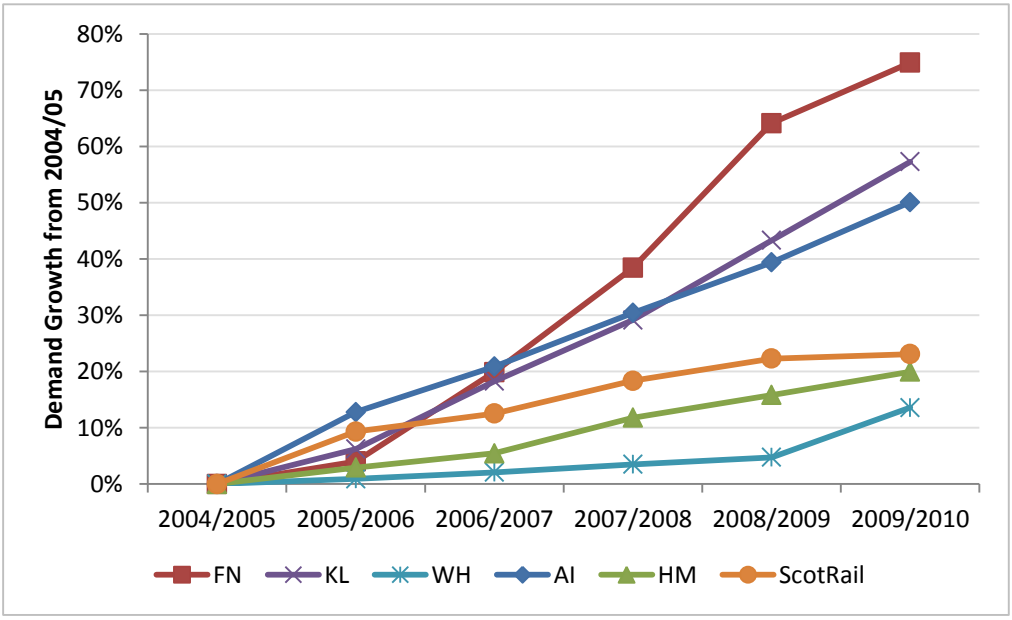
2.6 Elasticities for all of these demand drivers have been taken from the most recent version 5 of PDFH.

Results and Comparison with Outturn Growth

2.7 This section describes the results of the backcasting exercise and a comparison with the outturn changes in demand between 2004/05 and 2009/10. Figure 2.1 shows growth in demand for the five routes on a year by year basis, compared to an overall ScotRail average. It shows significant growth of nearly 80%, on the Far North line, but also demand for the Kyle and Aberdeen – Inverness line services has grown by over 50% in these 5 years. For the Highland Mainline and West Highland line growth is lower than the national average of 23% over this period.

[5] MOIRA is the standard rail industry software which calculates the impact of timetable changes on demand using the PDFH GJT recommendations

FIGURE 2.1 GROWTH IN DEMAND FROM 2004/05 BY HITRANS SERVICE GROUP



Source: MOIRA for flows by service code (incl flows outside the HITRANS area), National Rail Trends for ScotRail

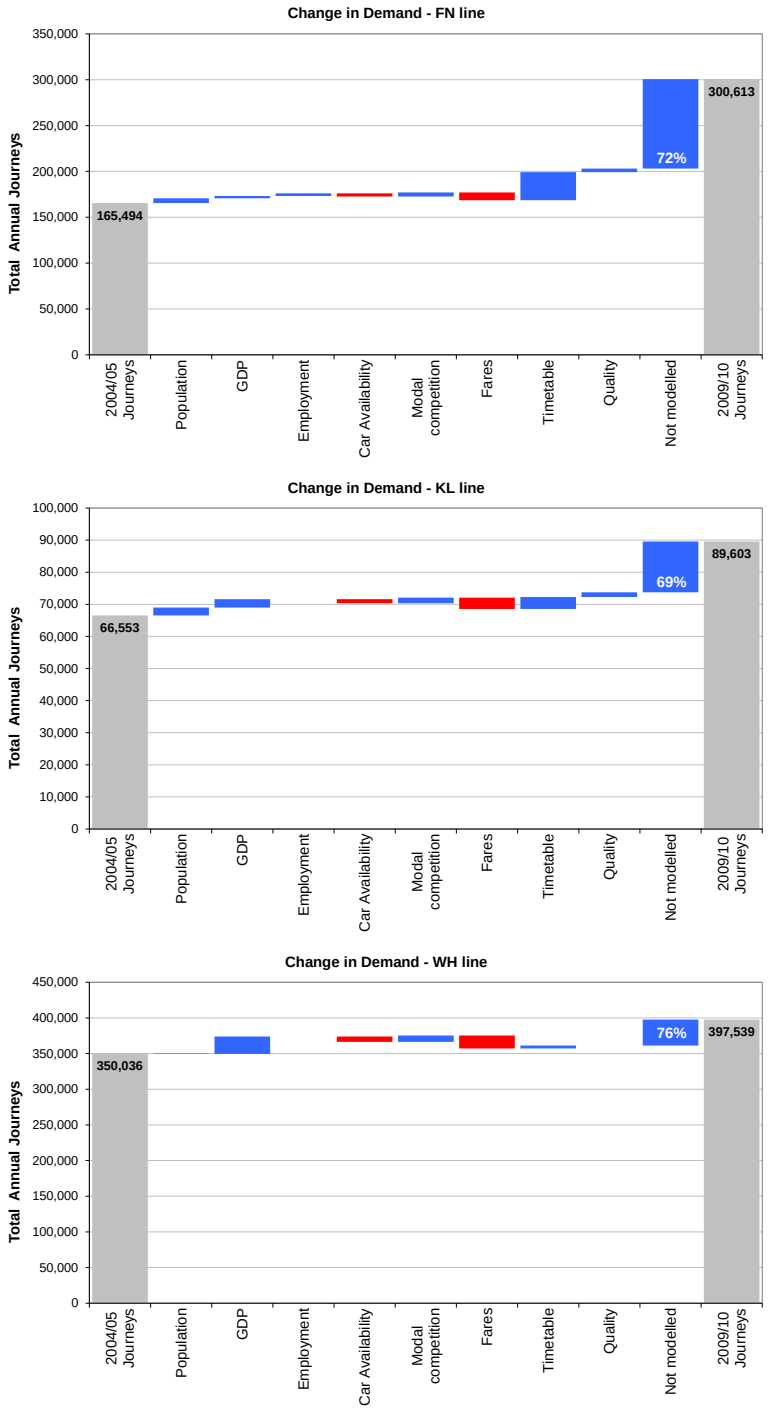
Analysis by Demand Driver

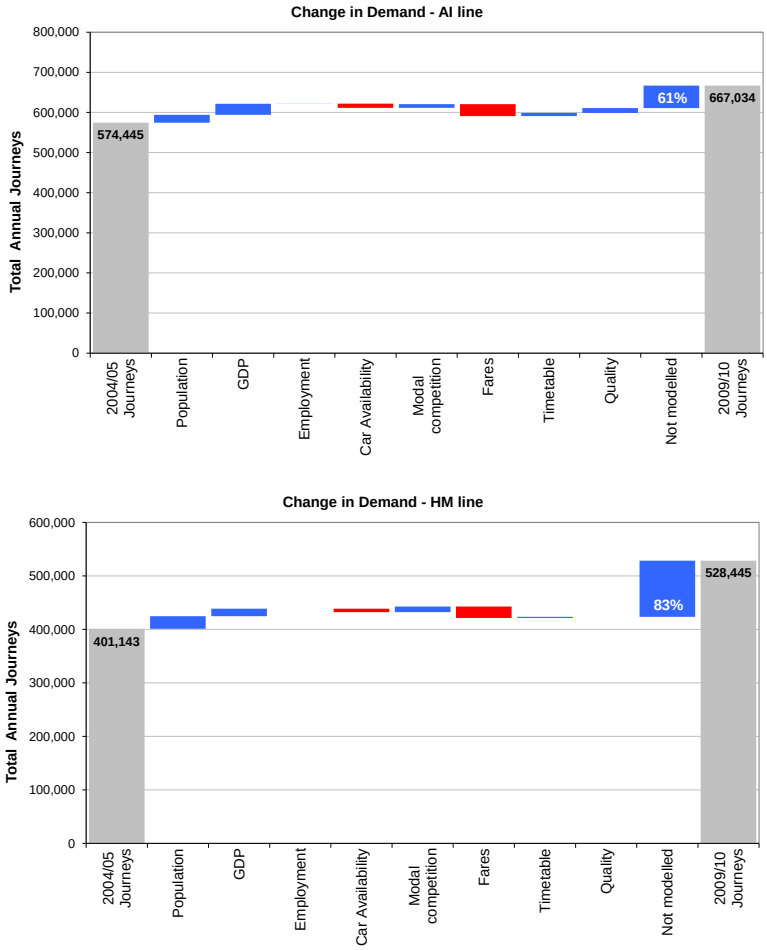
2.8 Figure 2.2 includes 'waterfall' charts showing how the standard demand drivers have built up the demand forecast and a comparison with the outturn demand on an individual route basis. The bars at the beginning and end, represent the 2004/05 and 2009/10 levels of demand for the total service code as reported by MOIRA, the intermediate bars represent the contribution (blue for positive and red for negative) of the different demand drivers to the backcast, with the final intermediate bar representing the remaining difference between the forecast and outturn for 2009/10[6].

2.9 As expected, the final 'not modelled' bar is always positive and makes up between 61% and 83% of the difference between the two years, as shown in the charts. This does not provide confidence that the forecasting techniques will adequately forecast demand for the coming years.

[6] Note that the outturn growth in this and all subsequent charts is restricted to the sub-routes described above and hence to the HITRANS area, unlike Figure 2.1.

FIGURE 2.2 WATERFALL CHARTS SHOWING BACKCAST DEMAND GROWTH BY DEMAND DRIVER AND OUTTURN GROWTH





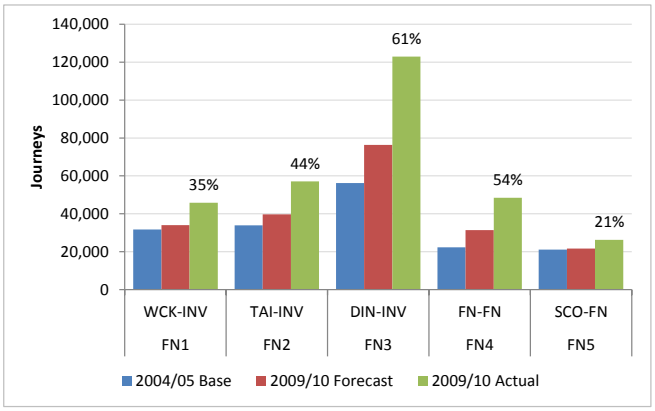
2.10 A number of things are apparent from these charts:

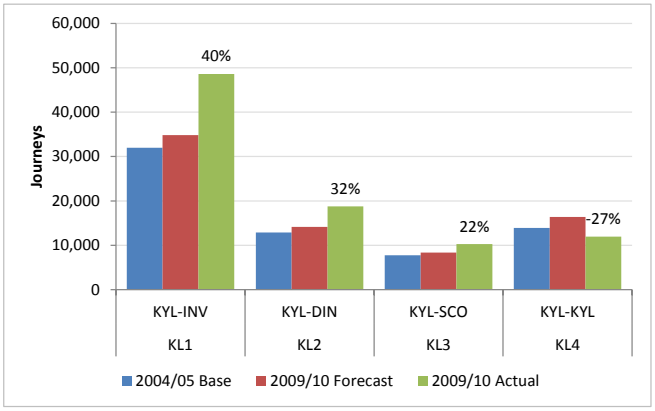
- For all routes the sum of all the external factors and fares amounts to very little growth, except on HML and Aberdeen – Inverness flows where the economic and population growth is more significant. This suggests that either the measure being used is not specific enough or the elasticity is not high enough. It is possible that we should be looking at more specific economic metrics such as by more detailed geography or sector.
- As expected, the only significant timetable effects are on the Far North and Kyle lines. It seems likely that these modelled effects are not large enough.
- The presence of a positive 'not modelled' column for each route suggests that there will be additional demand drivers that are not included in the standard guidance.

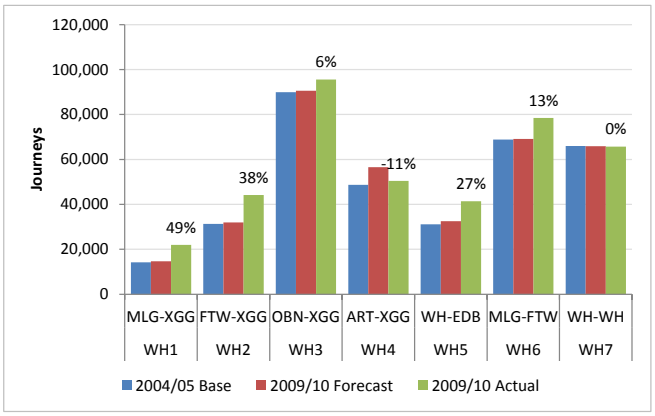
Analysis by Sub-Route

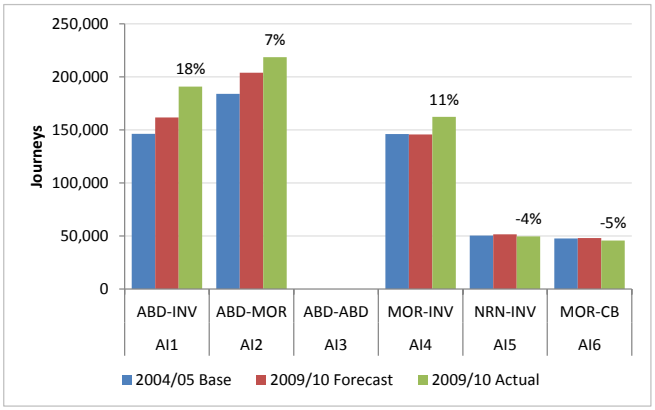
2.11 The analysis of the discrepancy can be informed by closer inspection of the differences by sub-route, as illustrated in Figure 2.3. These charts show forecast and actual growth for each sub-route and the percentage by which the actual growth has outperformed the forecast growth. (Note that Glasgow has been abbreviated to the three letter code XGG).

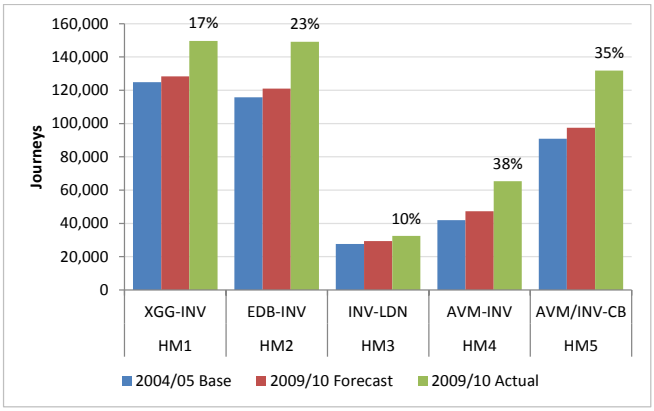
FIGURE 2.3 BACKCAST AND OUTTURN DEMAND BY SUB-ROUTE











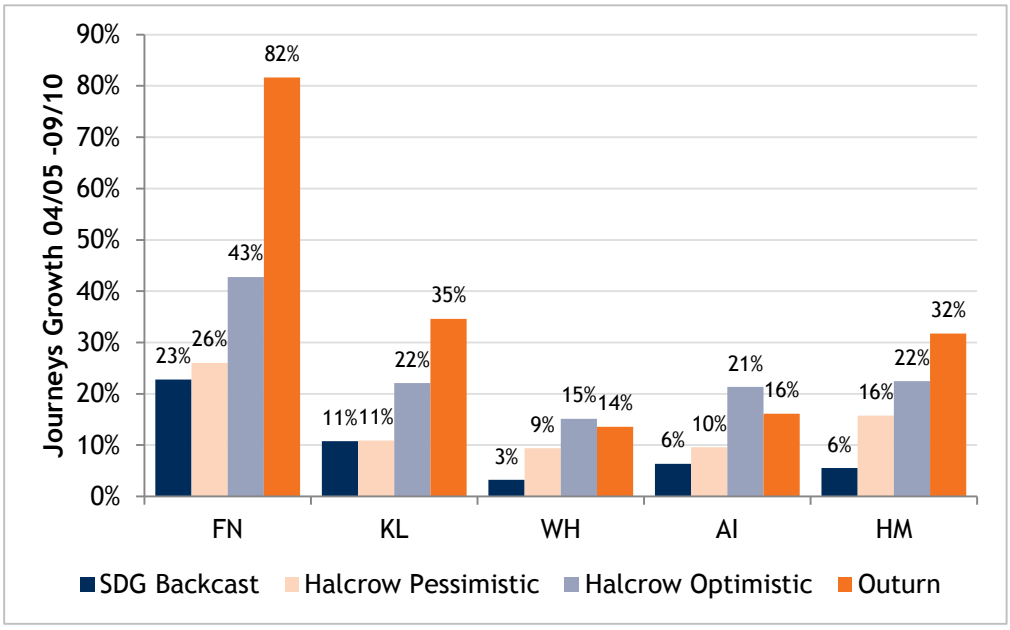
2.12 Figure 2.3 shows that the difference is not uniform across all sub-routes. In particular:

- The biggest discrepancies are on flows which have had a significant service improvement (FN Line), which suggests that the GJT elasticity approach does not sufficiently capture the effect of a step change in the timetable on sparsely served lines.
- There are also the most significant discrepancies on the most important tourist flows, such as the Kyle Line to Inverness, flows involving Mallaig and Fort William and all High Mainline flows, particularly those involving the Aviemore area.
- There is generally a higher discrepancy between flows internal to the HITRANS area than flows to/from the rest of Scotland/UK.
- There are two areas where forecast demand growth is higher than outturn: internal flows along the Kyle line and from Arrochar south to Glasgow.
- The demand forecasts between Glasgow and Oban matched outturn growth much better than flows between Glasgow and the rest of the West Highland line.

Comparison with Room for Growth Forecasts

2.13 It is also instructive to compare the outturn and backcast with the Halcrow 2006 forecasts. Figure 2.4 shows the backcast is in general below the level of the pessimistic Halcrow forecast, the outturn being almost always greater than the optimistic Halcrow forecast.

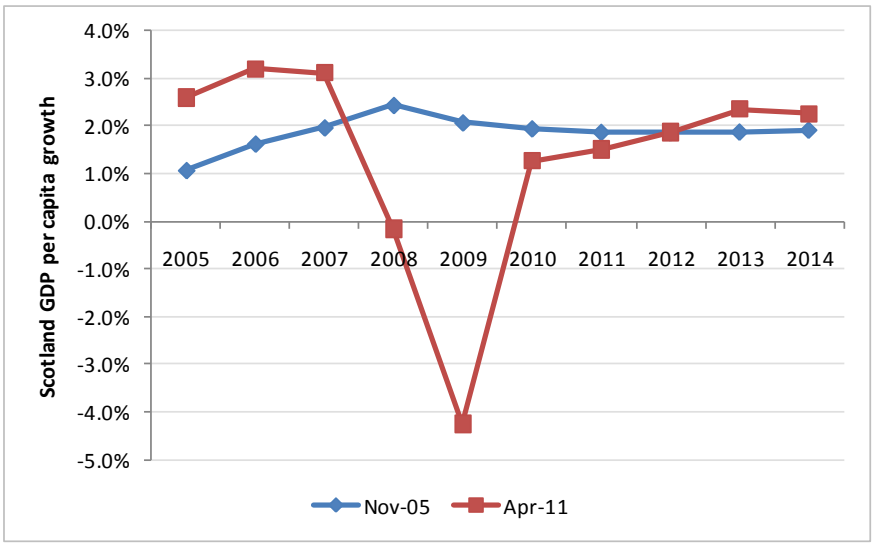
FIGURE 2.4 FORECAST AND ACTUAL JOURNEYS GROWTH 2004/05 - 2009/10



2.14 The position of the backcast in the Room for Growth range is not surprising given that in 2006 there was no sign of a recession and that economic factors are the single biggest driver of background growth in the PDFH approach. This is illustrated by Figure 2.5 which shows the forecast of GVA per capita for Scotland in early 2006 against outturn GVA per capita. The cumulative impact between 2004 and 2009 is that economic growth was 60% down on forecast over this period.

2.15 The outturn bars in Figure 2.4 are an extreme example of the trend that has been illustrated through the UK, that rail demand has held up to the recession, particularly in terms of GVA per capita, better than the forecasting approach would suggest.

FIGURE 2.5 COMPARISON OF FORECAST AND ACTUAL GDP PER CAPITA GROWTH FOR SCOTLAND



Source: ATOC OEF Forecasts

Revisions to Forecasting Methodology

2.16 This analysis backs up the premise for the project brief, which was that demand growth has been higher than predicted and therefore that a revised forecasting methodology might be required going forward. This phenomena is not unique to the HITRANS area in two respects.

2.17 Recent studies[7] which have compared backcasts with outturn demand changes in the UK have concluded that demand is outperforming forecast on 'regional' flows. These studies have concentrated on flows into major urban centres, but some of the conclusions about the re-structuring of the economy, the growth of importance of cities and road congestion will still hold. Unfortunately no changes to the guidance have yet emerged from this line of research.

2.18 Also it is apparent that demand has not reacted to the downturn in GDP/GVA to the extent that the forecasting approach would suggest. Again no definitive guidance has emerged on this subject.

2.19 In this section we discuss the possible reasons for the discrepancy and ideas for proposals for how the methodology can be adapted to provide more robust forecasts going forward. Some of the most easily quantified proposals have been road tested in the backcasting. But not all have been able to be quantified, so a view has been taken on the degree to which the discrepancy will continue into the future.

UK-wide Structural Changes

2.20 As described earlier with reference to other UK-wide studies, there are structural changes in the economy which may have meant that the PDFH approach, which is largely based on evidence from the last few decades of the last century, is less relevant. Two specific examples are the move from manufacturing jobs to service sector jobs, which tend to be located in areas more suitable for access by rail and the consolidation of shopping and other leisure activities in major city centres, increasing their attractiveness. Both apply to the Inverness area. This is potentially linked with the lack of downturn in demand due to the recent recession discussed above.

2.21 This has proved difficult to incorporate quantitatively across the UK and we have no specific proposals to revise the methodology. However, it will be part of the justification for additional growth.

2.22 Other possible reasons for additional growth which apply similarly in the HITRANS context include:

- The lack of increase in car mileage rates for expense claims over the recent years, making car less attractive for business journeys. This is true for both local trips and particularly for long interurban trips such as on the HML and between Aberdeen and Inverness.
- Increasingly high barriers, particularly the cost of insurance, to young people beginning driving.

[7] Regional Flows, MVA for PDFC, September 2009 and Recent Rapid Growth, SDG for ATOC, February 2007

- The increasing number of large events which generate large flows of (particularly) young people, such as Rock Ness and T in the Park.
- The increasing acceptance of train travel as the environmentally friendly alternative which has made train use more socially acceptable in a rural context.

Capturing Employment Growth

2.23 The PDFH captures the impact on demand of changes in employment through growth in the demand for season tickets. However, there is very little demand for season tickets on these routes. Part of the reason for this is the wide use of the Highland Railcard, which gives a 50% discount on walk up tickets for residents of the Highlands and Islands. Having said that, even with this discount, season tickets on the Far North line appear to be cheaper when being used for 4 or more trips per week, so you would expect them to be used for regular commuting.

2.24 The recent NPS Boost survey recorded 20% commuting on the Far North line and 15% on the Kyle Line and this is not being captured in the ticket sales data.

2.25 Given the low rate of season ticket use, it is appropriate to use a combination of employment and GVA per capita as the economic demand driver of growth of Full fares. We have tested the use of such a relationship based on the aggregate ticket type to journey purpose mapping from the NPS Boost survey. This slightly closed the gap between backcast and outturn.

Step Changes in Timetable Provision

2.26 The standard PDFH approach for estimating the impact of timetable changes on demand is not appropriate for either routes where there is a step change in service or sparsely served routes, or both. This is the certainly the case on the Far North line and, to a lesser extent, on the Kyle Line. The elasticity-based approach is only appropriate for relatively small changes in GJT. For larger improvements there can be a tipping point where the service becomes viable for a significant proportion of demand and the GJT elasticity should effectively be higher[8].

2.27 It is worth noting that the effect of the December 2005 timetable change should have worked through by now and there are no proposed significant timetable changes which need to be included in the future forecasts. It is also worth noting that any subsequent improvements to the Far North Line, will be from the improved base. We would expect the GJT approach to be more valid at these sorts of frequencies.

2.28 However, we have tested an increase in GJT elasticities in the backcasting. We have increased the recommended -0.7 elasticity for non-Season tickets to the more standard -0.9 and doubled this elasticity for flows with a more than 25% GJT improvement. This improved the backcast for the Far North Line so that the gap between backcast and outturn is at a similar level to the other flows.

[8] The Passenger Demand Forecasting Council (PDFC) has recently tendered for consultants to examine the possibility of estimating higher GJT elasticities for larger changes in GJT.

Retiming of Sparse Services

2.29 This is amplified on sparsely served lines with large gaps between trains, where measuring an appropriate GJT can be difficult. This is a particular issue when changes in demand are due to retiming of trains to meet particular local demand, which cannot be captured by a more generic forecasting technique. For example MOIRA calculates GJT using a combination of the 'rooftop model' which applies a penalty for train frequency and time profiles of demand which are used for all similar flows across the UK.

2.30 Such an analysis would be very difficult to undertake, as locally specific departure time profiles would be required and these are difficult to derive even with specific surveys, as they need to be of preferred rather than observed time.

Car Costs and Congestion

2.31 An often-cited reason for the discrepancy between forecast and outturn demand on regional flows is that in major regional centres a tipping point in car congestion has been reached, which is both difficult to measure and not adequately captured by the fairly low recommended elasticities. To a lesser extent, this may also be the case in the HITRANS area. Without available data we have not been able to include this effect in the backcasting.

2.32 Anecdotally, we would have expected the recent large increases in fuel costs to have had an impact on a modal shift away from car to rail, amongst other modes. However, the data that was used in the backcasting suggested only a small increase in real car costs, amounting to 1.5% per annum. This is partly because fuel price and inflation are correlated as the former is a significant driver of the latter, both directly and through the distribution costs of goods. Rail fares are also pegged to inflation so you would not expect there to be a sudden switch in cost between car and rail modes, although this is sometimes the perception.

2.33 To reflect the car fuel cost effect we have tested the doubling of the car fuel cost elasticities, which does improve the fit.

Tourism

2.34 The high shortfall in the demand forecasts for certain key tourist flows such as Mallaig/Fort William to Glasgow, Mallaig-Fort William, Kyle-Inverness, Aviemore to Central Belt suggests that having some measure of rail tourism as a demand driver may help to close the gap between forecast and outturn. At present the impact of increased numbers of tourists from beyond the limits of the routes we are looking at is only felt as a second order effect with increased income and employment (and population) of the resident population leading to more travel by them. Tourism, of course, takes many forms and includes people on day trips which we might expect to be captured in the PDFH approach.

2.35 This is supported, to some degree, by the NPS Boost survey where the highest levels of tourism (taking travel to/from holiday and a day out) are on the WHL to Mallaig (57%) and Kyle to Inverness (35%), although also the WHL to Oban (46%) were the same high shortfall has not been observed. Of course, this analysis is only available for a single point in time and we would need to know whether this develops as a trend.

2.36 There is some data on tourism available, but not at an adequate level of detail (Highlands, rail use) or a snapshot rather than a trend. The only trend data we have found covering the period, across all of Scotland, shows a decrease in total demand over the period. Whereas anecdotally there has been an increase in rail use for tourism in the area, particularly from overseas and cross-border visitors.

2.37 Therefore, in consultation with HIE, our approach has been to identify the main tourist flows on the network and for those sub-routes apply a tourism growth figure to the proportion of demand which has been identified as tourism in the NPS Boost survey. This growth factor has been assumed to be 20% over a decade for the backcasting period, and the same assumption has been made for the high growth forecasting scenario. This reflects a scenario where the current level of growth in tourism and the related promotional activity continues. Arguable there is a case for an even higher growth scenario where the promotional activity is targeted more specifically at rail-based tourism.

Other Endogenous Factors

2.38 PDFH does give guidance on the impact of other 'endogenous' factors on demand - that is factors that are within rail's control. . It can be argued that small improvements are required in order to maintain the status quo in competition with developments in other modes. The only such factor that we have included in the backcasting model represents the refurbishment of the Highland Class 158s. Other potential factors include:

- Punctuality and Reliability;
- Other rolling stock quality improvements;
- At station facilities;
- Increased provision and quality of car parking;
- Reductions in fraudulent travel; and
- Better marketing and promotions e.g. Club 55.

2.39 We have no evidence to include these factors within the backcasting model, but some of these factors may be part of the cause of the remaining discrepancy described in the following section.

Remaining Discrepancy

2.40 Of the above we have included the following in the backcasting:

- GVA and employment drive Full fare growth
- -0.9 GJT elasticities
- Double GJT elasticity for 25%+ changes
- Double car cost elasticities
- Additional tourist growth

2.41 This has closed the gap. However, a gap does remain. This could be closed by including an annual growth covering unexplained factors of the following rates,:

- Far North Line: 2.5% pa;

- Kyle Line: 2.7% pa;
- West Highland Line: 0.9% pa;
- Aberdeen – Inverness: 1.3% pa;
- Highland Mainline: 3.5% pa.

2.42 These annual growth rates average 2.0%. This is similar to a rate used by Network Rail in the preparation of the Scotland RUS[9] for the "Continuing Rail Competitiveness Scenario". This scenario introduced additional growth rates which also sought to close the gap between forecast and outturn demand as a higher sensitivity test. For Rural and Interurban flows, this rate was around 1.5% pa.

[9] Scotland Route Utilisation Strategy (Generation Two), Network Rail, June 2011

3 Demand Forecasts

Methodology

3.1 Demand forecasts have been prepared for the next twenty years using the standard PDFH approach, as described in Chapter 2, with some adaptations as described in the revisions to forecasting methodology section. In particular the following adaptations resulting from the backcasting exercise, have been adopted for all scenarios:

- Capturing employment growth by using GVA and employment to drive all ticket types;
- Using -0.9 GJT elasticities throughout;
- Double car cost elasticities;
- Double GJT elasticity for 25%+ changes.

3.2 In addition we have included the following in the high sensitivity tests:

- Additional tourist growth; and
- Include additional growth rates.

Assumptions

3.3 This section describes in some detail the assumptions that have been used. More detail is provided in Appendix A.

3.4 Highland and Islands Enterprise (HIE) economists have provided high and low forecasts for population, employment and GVA based on analysis of recent trends and local experience. Economic forecasts for further afield have been taken from the November 2011 OEF forecasts prepared for ATOC.

3.5 As for the backcasting, car ownership has been forecast using forecasts from the UK Government's National Transport Model.

3.6 In the current context, it is very difficult to forecast fuel costs, although it seems clear that they will increase. In the two years since the figure quoted for 2009/10, the pump prices have risen by 28%, and inflation has risen by 10%. However, in the short term, pump prices are set to reduce and fuel efficiency continues to improve. We have chosen to use an average increase in fuel cost over the back-casting period and extended that forward. This equates to an increase of 1.5% per annum.

3.7 A small annual increase in highway journey times (of around 0.2% pa) for all flows consistent with the UK National Transport Model, as used in the back-casting model.

3.8 No further committed changes in air or car competition, or in rail rolling stock quality.

3.9 Rail fares are assumed to continue to increase by the regulated cap of RPI+1% every year.

3.10 Beyond the December 2011 HML timetable change, which is now in place, we have not included any further timetable changes, although changes are anticipated on both the Highland Mainline and Aberdeen-Inverness line. We believe that this is acceptable because any increase in frequency on these routes is likely to increase capacity by more than demand. Since these forecasts are to be used to forecast when capacity is reached this is the conservative approach.

Forecast Range

3.11 We have produced three sets of forecasts, using combinations of the above assumptions. These have been labelled Min, Max and Max+ and are defined as follows:

Min

- Low population, employment and GVA forecasts from HIE;
- Double car cost elasticities
- Double GJT elasticity for 25%+ changes

Max

- High population, employment and GVA forecasts from HIE;
- Additional tourist growth equating to 20% growth over 10 years, for non-Season tickets

Max+

- As for Max, but also including additional growth described in the Remaining Discrepancy section of the above chapter until 2020.

Results

3.12 Forecasts have been produced for all years up until 2029/30, although it is worth noting that it is usual to assume that beyond 15 years these are purely indicative. In planning future enhancements we have noted the key years of 2016 and 2020, as described in the Chapter 5. As a summary Table 3.1 shows the three scenarios' growth forecasts for these years and 2029/30.

3.13 With the exception of the Highland Mainline the Min case shows very little growth, with rates of only 3% up until 2020 and 10% up until 2029. The additional HML growth is due to the Dec 2011 timetable change. In a higher scenario more consistent with the backcasting work, but also assuming higher economic and demographic growth, forecast growth is around 25% by 2020 and 60% by 2029. With the inclusion of the additional growth required to fully close the gap in the backcasting, there is significant additional growth particularly on the Far North and Kyle lines and the Highland Mainline, resulting in at least a doubling of growth by 2029.

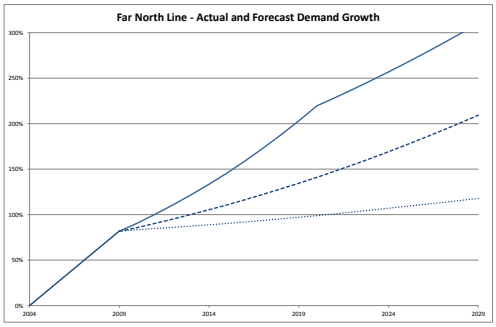
TABLE 3.1 FORECAST DEMAND GROWTH FROM 2011 FOR 3 FORECAST SCENARIOS

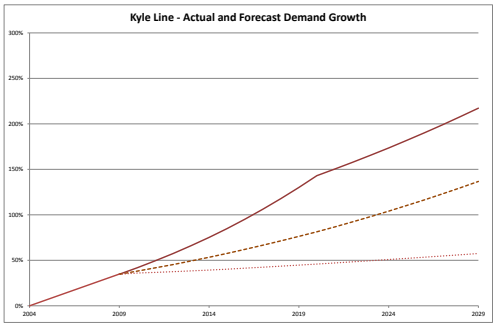
	2016			2020			2029		
	Min	Max	Max+	Min	Max	Max+	Min	Max	Max+
FN	4%	14%	29%	8%	27%	59%	18%	62%	105%
KL	3%	14%	31%	7%	28%	63%	15%	67%	112%
WH	3%	12%	17%	7%	23%	34%	18%	54%	67%
AI	3%	13%	21%	6%	26%	42%	16%	63%	83%
HM	12%	22%	45%	21%	41%	93%	44%	96%	168%

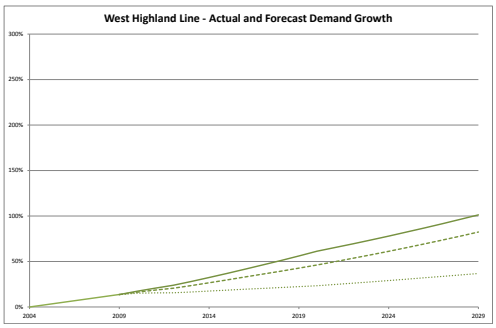
3.14 As a further illustration of these scenarios, Figure 3.1 shows forecast demand growth by route, using 2004 as a base. This helps to demonstrate which of the three growth curves is 'on trend' with recent growth. In most cases, with perhaps the exception of the HML, the Max+ case, is, as expected, the line which appears to be most on trend with recent growth.

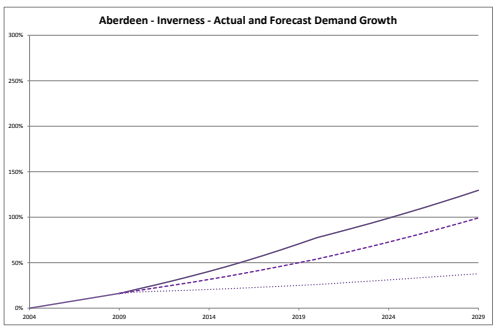
3.15 More detail of the growth forecasts is provided in Appendix B.

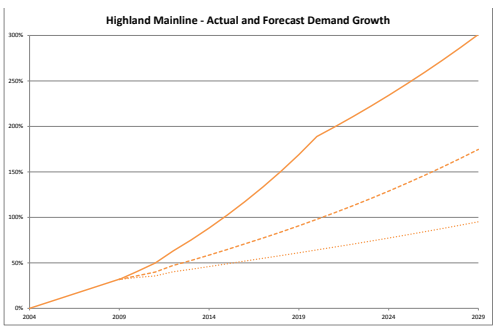
FIGURE 3.1 RANGE OF FORECAST DEMAND GROWTH BY ROUTE (2004-2029)











4 Peak Service Usage

Summary of 2011 Counts

4.1 A key objective of the study was to provide an independent benchmark for current levels of peak service usage in the HITRANS area. To this end we undertook counts covering all services in the HITRANS area. These are summarised in this chapter.

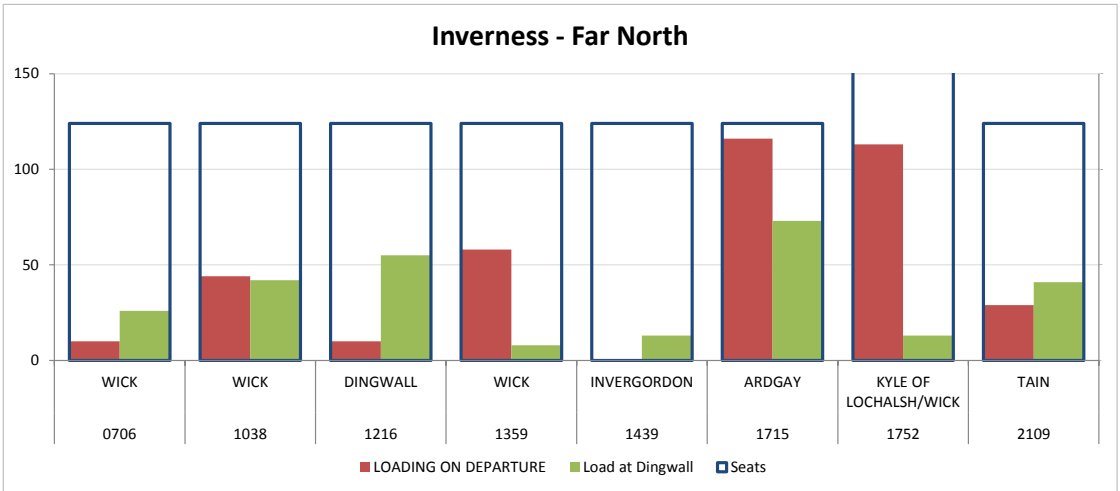
4.2 All services were covered in a single week, commencing 5th September 2011. This week was chosen because it was still during the holiday season (and crucially the English school holidays), but at the same time the local commuters (and business travellers) would be back to work after the Scottish summer break.

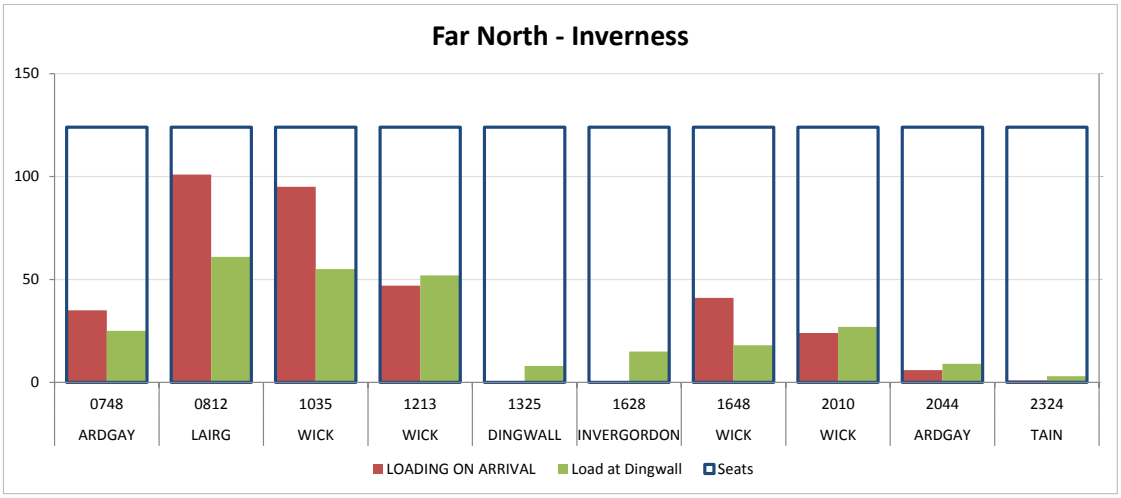
4.3 Counts were undertaken at a number of locations, as agreed with HITRANS, so as to ensure that the maximum load within the HITRANS area was observed, as follows:

- At Inverness for all arriving and departing services on the Far North, Kyle and Aberdeen-Inverness lines and Highland Mainline;
- At Dingwall for all arriving and departing services to/from Inverness on the Far North and Kyle lines. This was planned to monitor whether heavily loaded trains were still heavily loaded to the North and West of the core commuter area.
- At Glasgow Queen Street for all arriving and departing services on the West Highland Line.
- At Fort William for all arriving and departing services to Glasgow and Mallaig. This was chosen because anecdotally it was known that the departure in the middle of the day to Mallaig was a problem train.

4.4 The counts are summarised by route in the following charts. These charts show loadings at Inverness and other key locations, together with the number of seats. Charts for services leaving Inverness show loadings on departure from Inverness and arrival at Dingwall. For services terminating at Inverness the charts show loadings departing Dingwall and arriving Inverness.

FIGURE 4.1 SUMMARISED COUNTS FOR FAR NORTH LINE

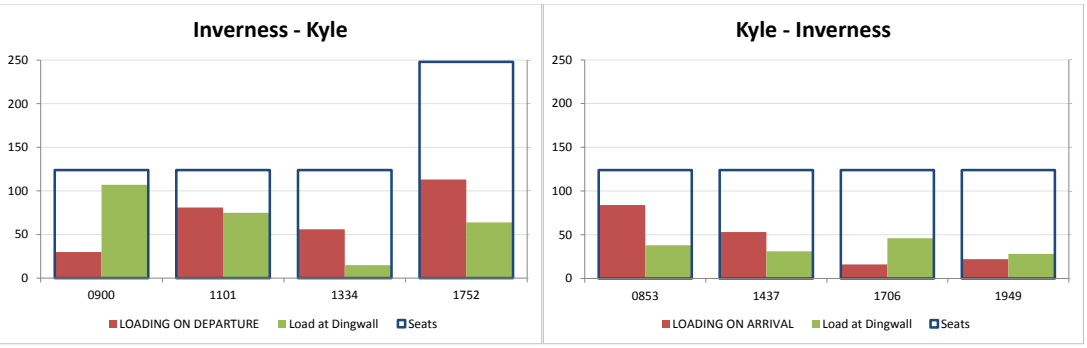




4.5 On the Far North Line loadings were generally comfortably accommodated in the largely single Class 158 with 124 seats. The key exception was the 1715 departure to Ardgay, which was expected to be heavily loaded, and was with 116 passengers leaving Inverness and still 73 on arrival at Dingwall 30 minutes later. The following service was similarly loaded, but consists of joined Class 158s, as it splits to Kyle and Wick. There were also two slightly less loaded in the morning, with the 0812 from Lairg the heaviest.

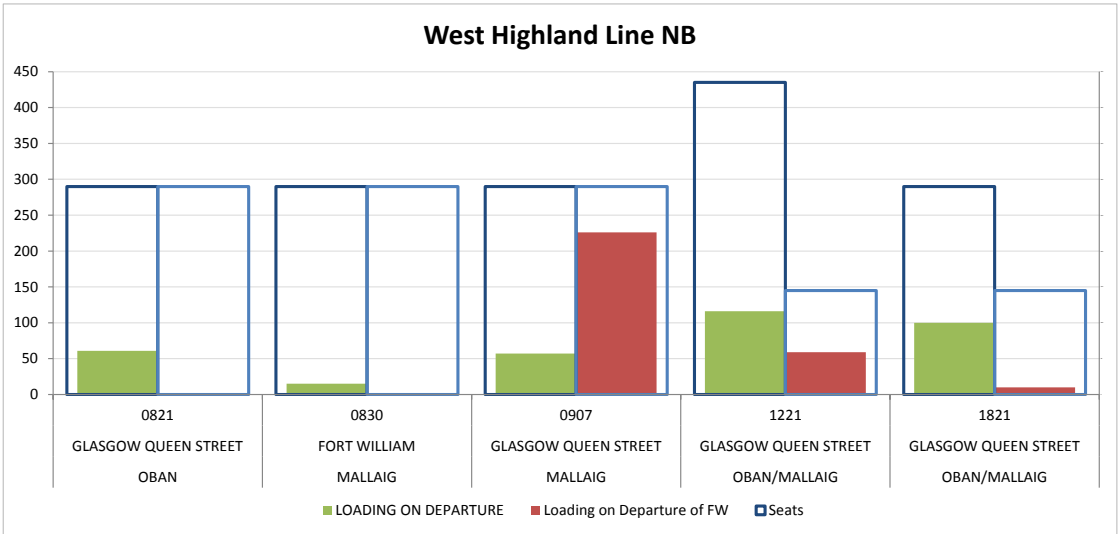
4.6 On one of the counts days three services in the middle of the day were cancelled and there are only Dingwall counts (taken on another day). These counts showed that these were not heavily loaded services.

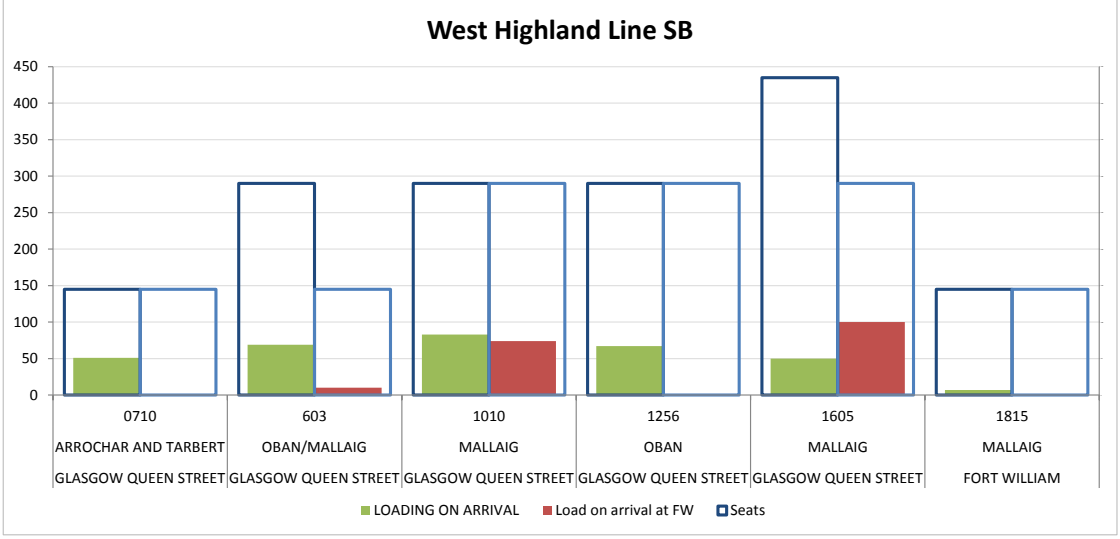
FIGURE 4.2 SUMMARISED COUNTS FOR KYLE LINE



4.7 On the Kyle Line loadings were generally comfortably accommodated in the largely single Class 158 with 124 seats. The most heavily loaded service was the 0900 Inverness to Kyle service which had a load of 107 at Dingwall. This looks as though it might be a large tourist party joining somewhere West of Inverness. As this is typical it has not been treated as an anomaly.

FIGURE 4.3 SUMMARISED COUNTS FOR WEST HIGHLAND LINE

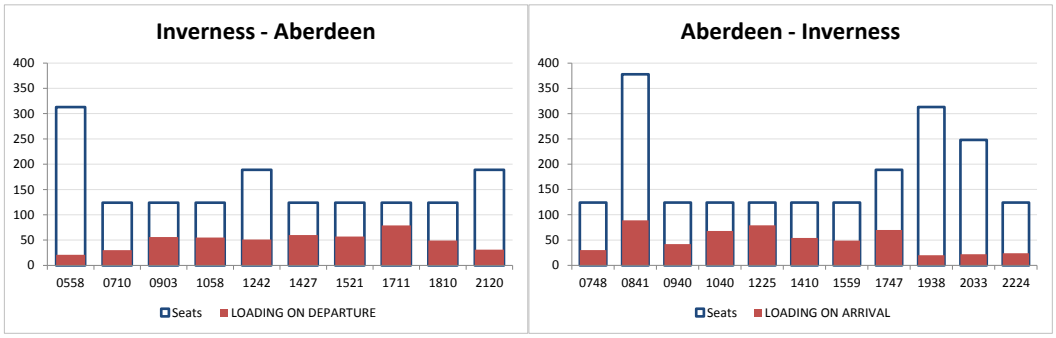




4.8 On the West Highland Line, counts were undertaken for all services at Glasgow Queen Street, so for most services there were two or three Class 156s providing more than enough capacity for the load departing Glasgow. The charts also show loadings leaving Fort William northbound and arriving Fort William southbound, as this had been identified as a potential area for high loadings.

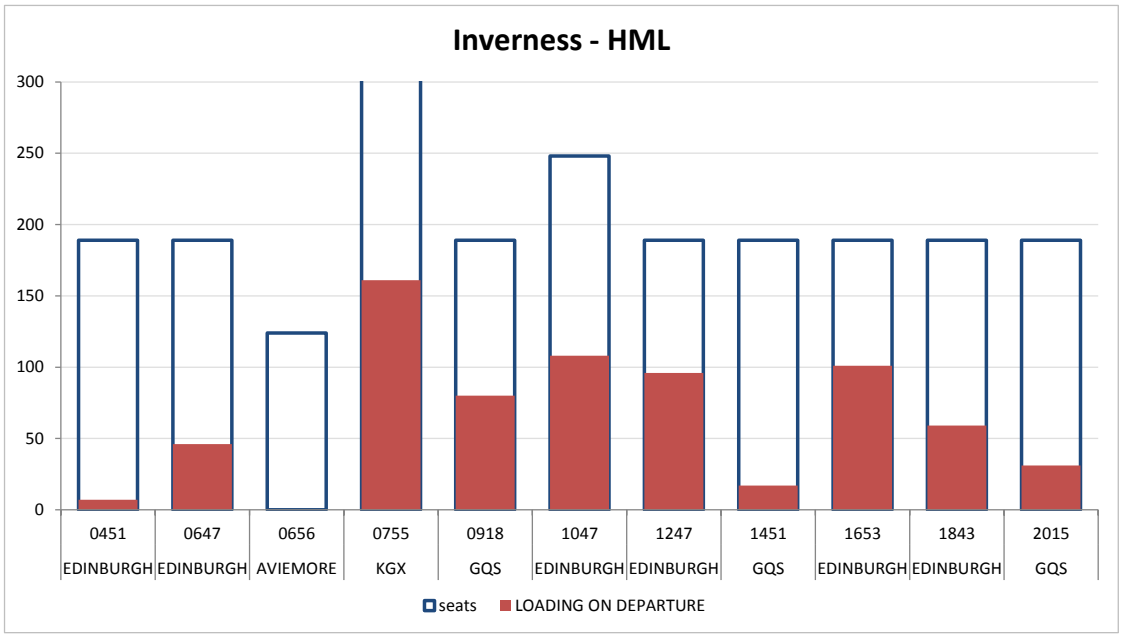
4.9 The only critical issue identified was the 1248 departure from Fort William to Mallaig (0907 from Glasgow), which was 78% loaded with 226 on board two Class 156s. This will be close to being uncomfortable for what must have been mainly tourists.

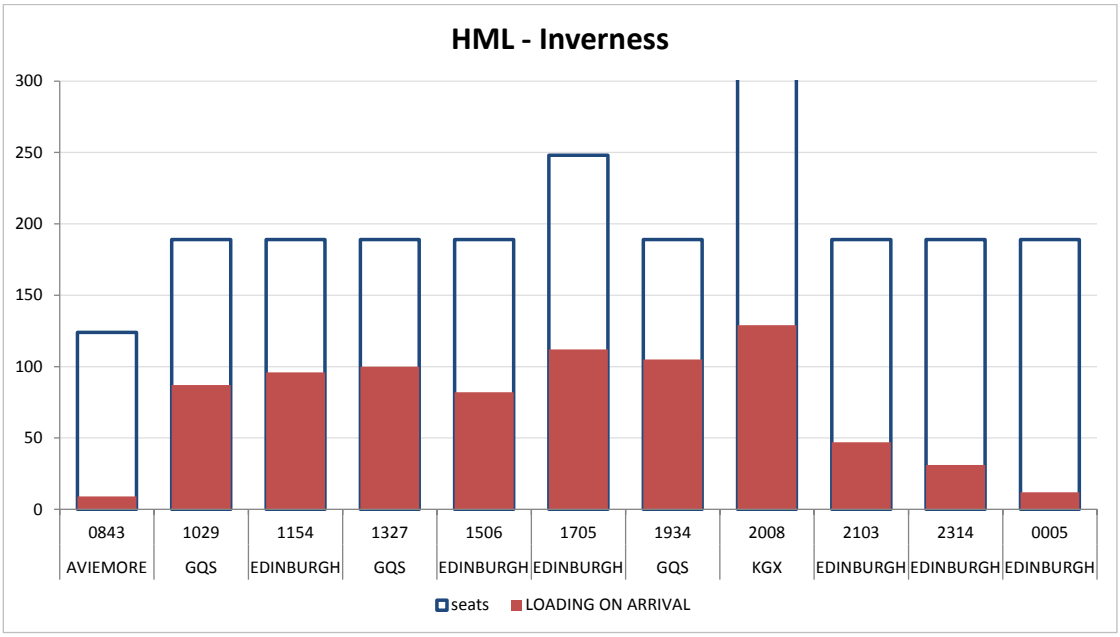
FIGURE 4.4 SUMMARISED COUNTS FOR ABERDEEN – INVERNESS LINE



4.10 On the Aberdeen-Inverness Line, at the Inverness end of the service the loadings were comfortably accommodated in various combinations of Class 158s and Class 170s. This included the 1711 departure, which anecdotally is a heavily loaded service, but on this day was the busiest service, but only at a 64% load factor. Some of these services will have been more heavily loaded at the Aberdeen end, with loads increasing from Elgin eastwards, but this was not counted.

FIGURE 4.5 SUMMARISED COUNTS FOR HIGHLAND MAINLINE





4.11 At the Inverness end Of the Highland Mainline services demand was comfortably accommodated in what was mostly Class 170s, with occasional combinations of Class 158s and one East Coast HST in each direction. The East Coast was, as expected, the most heavily loaded in each direction, but still comfortably loaded in the over 500 HST seats. The services with the highest load factors (both c 60%) were the 1934 arrival from Glasgow Queen Street (1611 departure) and the 1653 departure to Edinburgh. For all of these services, loadings will increase outside the HITRANS area into Perth and beyond to or from the Central Belt termini at Edinburgh and Glasgow Queen Street. However, for this study, counts were not undertaken at these points.

Forecast Future Peak Service Usage

4.12 The forecasts developed in Chapter 3 were applied to the above counts by route to give a forecast of future service usage. This yields an identification of the most heavily loaded services for future years. To summarise this information we have concentrated on the key years of 2016 (pre-EGIP), 2020 (post-EGIP and into CP6) and the final forecast year of 2029/30. Table 4.1 summarises how many of the above counted services had maximum HITRANS loads of over 60% and over 90% in the three forecast scenarios.

4.13 The table shows that in the short term there are one or two services on the Far North, Kyle and West Highland lines that are a concern, but in the longer term there are services on all lines that need strengthening, but that the high growth forecast for the Highland Mainline is a particular concern.

4.14 Of course, these forecasts have assumed that the same rolling stock serves the same services into the future, as a simplistic assumption. As we describe in the following chapter, this is unlikely to be the case, even in a Business As Usual scenario, but serves to identify where capacity is, or becomes, an issue. The detailed forecast load factors for all services is included in Appendix C.

TABLE 4.1 SERVICE LOAD FACTOR DISTRIBUTION

		2016			2020			2029		
		Min	Max	Max+	Min	Max	Max+	Min	Max	Max+
FN	<60%	15	15	14	15	15	12	15	12	10
	60-90%	2	1	1	2	0	3	0	3	3
	90%+	1	2	3	1	3	3	3	3	5
KL	<60%	5	5	5	5	5	1	5	1	1
	60-90%	3	3	2	2	2	4	2	4	1
	90%+	0	0	1	1	1	3	1	3	6
WH	<60%	11	11	11	11	11	11	11	10	10
	60-90%	1	1	0	1	0	0	0	1	1
	90%+	0	0	1	0	1	1	1	1	1
AI	<60%	19	18	18	19	17	13	18	10	9
	60-90%	2	3	3	2	4	6	3	9	9
	90%+	0	0	0	0	0	2	0	2	3
HM	<60%	21	17	12	17	13	11	12	11	7
	60-90%	1	5	10	5	9	6	10	5	5
	90%+	0	0	0	0	0	5	0	6	10

5 Solutions

Key Capacity Issues Identified

5.1 The objective of this study is to identify when capacity will be exceeded on services across the HITRANS area. This chapter identifies these services in the three key years of 2016, 2020 and 2029 and notes that because of the local geography these services will have standing for more than 10 minutes, which is the current Transport Scotland measure of overcrowding.

5.2 Because of the margin for error on the counts and the forecasts we have assumed that services with a forecast load factor of over 90% are where the loading exceeds capacity. We have then used the Max forecast as the central forecast to identify the services that require strengthening.

2016

5.3 By 2016 there are forecast to be two or three services which are overcrowded. It is worth noting that the 1715d Inverness-Ardgay has a load factor of more than 90% in the 2011 count.

Kyle

- 0900d Inverness-Kyle departing Dingwall

Far North

- 1715d Inverness-Ardgay
- 0812a Lairg – Inverness (but only in the Max, Max+ cases)
- 1035a Wick - Inverness (but only in the Max+ case)

West Highland Line

- 0907d Glasgow – Mallaig departing FTW 1248 (but only in the Max+ case)

2020

5.4 By 2020 in the Max case there are two additional overcrowded services, one on the Far North line and one between Fort William and Mallaig on the WHL. A number of Highland Mainline services are shown to be overcrowded in the Max+ case with the highest growth, although we have noted that since these counts were done there have been additional services introduced on the HML, which should have gone some way to relieve this crowding – but also generated more growth.

ABD-INV (where an improved timetable is expected)

- 1711d Inverness-Aberdeen (but only in the Max+ case)
- 1225a Aberdeen – Inverness (but only in the Max+ case)

Kyle

- 0900d Inverness-Kyle departing Dingwall
- 1101d Inverness-Kyle (but only in the Max+ case)
- 0853a Kyle-Inverness (but only in the Max+ case)

Far North

- 1715d Inverness-Ardgay
- 0812a Lairg – Inverness (but only in the Max, Max+ cases)
- 1035a Wick - Inverness (but only in the Max, Max+ cases)

West Highland Line

- 0907d Glasgow – Mallaig departing FTW 1248 (but only in the Max, Max+ cases)

HML (where timings have already changed and more services are expected)

- 1247d Inverness-Edinburgh (but only in the Max+ case)
- 1653d Inverness-Edinburgh (but only in the Max+ case)
- 1154a Edinburgh –Inverness (but only in the Max+ case)
- 1327a Glasgow-Inverness (but only in the Max+ case)
- 1934a Glasgow-Inverness (but only in the Max+ case)

2029

5.5 As Table 4.1 demonstrates, by the forecast year of 2029 there are many more services which are forecast to be overcrowded – too many to be sensibly listed here, especially given the potential margin for error over 20 years of forecasting and with the anticipated timetable changes on at least the Highland Mainline and Aberdeen-Inverness lines. Suffice to say that over time more and more services are expected to require strengthening over time.

Future Changes – Opportunities

5.6 There are a number of planned initiatives and events which will present opportunities for rolling stock to be made available to strengthen HITRANS services over the next 20 years. We describe these below, along with possible use of these opportunities to enhance the overcrowded services.

December 2011 timetable change

5.7 Since the counts were taken last September there has been a significant increase in services on the Highland Mainline with two additional services in each direction. This is potentially part of the solution to any HML capacity issues, providing additional capacity, but also stimulating further growth. This timetable change has been included in the forecasts.

Rail 2014 – Refranchising

5.8 Transport Scotland has effectively begun the process of specifying and procuring the next ScotRail franchisee with the Rail 2014 Consultation to understand stakeholders' priorities for the next franchise. The industry as a whole is calling for longer franchises, probably around 15 years, but Transport Scotland needs to decide whether this franchise (Franchise 3) should be relatively short to cover the risks of the period of disruption around the construction of the Edinburgh – Glasgow Improvements Programme (EGIP), with the following Franchise 4 reverting to 15 years.

5.9 There are a number of opportunities in the franchise process. Firstly, to identify in the franchise specification where and when strengthening is required – bidders will

then be expected to provide rolling stock solutions. Failing that, and depending on the freedom given in the franchise ITT, bidders can be encouraged to propose options over and above the specification. Beyond franchise award, as in the current franchise with HML and Dundee changes, variations can be negotiated once the franchise is in place.

Edinburgh – Glasgow Improvements Programme (EGIP)

5.10 The Edinburgh-Glasgow Improvement Programme (EGIP) is a series of improvements designed to provide more services and shorter journey times across the Central Belt. The key upgrades include the electrification of over 350km of railway including the main Edinburgh-Falkirk High-Glasgow line and north to Stirling, Dunblane and Alloa. This will allow the journey time for the fastest services between Edinburgh and Glasgow to be reduced to 37 minutes (a 25% reduction over today) with an increase in frequency to 6 trains per hour. Journey times between Edinburgh / Glasgow and Dunblane will also be reduced by 5-10 minutes. The full EGIP improvement programme is scheduled to be delivered by 2016.

5.11 The electrification of these lines will also require new electric rolling stock to be introduced to the Central Belt and this will release the Class 170 rolling stock currently used on the Edinburgh-Falkirk High-Glasgow line for other use, creating a potential rolling stock cascade which will provide a resource for additional services in the HITRANS area.

Future Committed Improvements

5.12 Beyond EGIP, both the Scottish Government and Network Rail have committed to improvements on both the Highland Mainline and Aberdeen-Inverness lines before the end of CP5, 2019. This will have the double impact of providing extra capacity and stimulating additional demand. Therefore, using current counts to estimate required strengthening beyond 2020 is not that helpful. Given the current anticipated franchise timings, there will be an opportunity to understand whether these enhancements are properly resourced when Franchise 4 is procured.

5.13 In the longer term the Scottish Government has also committed to electrification of these lines which will mean both that these lines will require electric rolling stock and the availability of further DMUs for the other routes. However, this is not currently anticipated to happen until the end of the period analysed in this report.

Rolling Stock

5.14 As described in the Rail 2014 consultation document: "Ninety-six two-car DMUs will reach their expected withdrawal dates between 2018 and 2020 and will need to be re-engineered, refurbished or replaced at that time. They will also have to be adapted to comply with accessibility legislation by 1 January 2020 or receive a derogation from the European Commission to operate beyond that date.

5.15 The rural routes are unlikely to be electrified in the near future, so either existing diesel rolling stock will need to be refurbished or new diesel trains will be required."

5.16 Combined with EGIP and the other committed improvements described above, the plan for DMUs at the end of the decade presents a challenge for to Transport

Scotland and the franchisee. There will be other potential sources of existing DMUs by then (e.g. GWML, Northern, TPE electrification), but their suitability and conformity will be an issue. On the West Highland Line in particular the Class 156 has grandfather rights concerned gauging and stepping etc, but any new stock will not. There are similar issues with Class 170s on the Far North and Kyle lines. In addition, these issues will need to be balanced with the aspirations of HITRANS and others to improve the quality of the rolling stock, particularly for the tourism market.

Possible Enhancements

Rail operations

5.17 There are a number of significant constraints which make anything other than incremental change in service levels difficult and expensive.

5.18 There are actually few trains "captive" to the HITRANS area and much of the timetable is driven by the need to have DMUs in the Central Belt for the morning and evening peaks. The introduction of electric train services between Edinburgh and Glasgow from December 2016 provides the first realistic opportunity to cascade additional stock onto Highland routes.

5.19 All of the routes in the area have long stretches of single line with irregularly spaced passing loops. This makes it operationally more difficult to run frequent shuttle type services (eg between Inverness and Dingwall) in between the longer distance trains to Wick and Thurso. All the routes are controlled by Radio Electronic Token Block (RETB) signalling and all rolling stock therefore has to be fitted with RETB in-cab equipment which currently restricts the number of vehicles which can be used on FNL, WHL and Kyle lines to a specific sub-set of the ScotRail fleet. Class 170 trains have not been gauge cleared for operation on these routes and services are therefore currently fulfilled by Class 156 on the WHL and Class 158 on FNL and Kyle routes.

Pre-EGIP

5.20 The key service that appears to require strengthening in this time frame is the 1715 Inverness-Ardgay, which is a key commuting service. In addition the 0812 arrival from Lairg, which effectively works the commuting service in the morning peak will be close to needing strengthening. Lastly the 0900 Inverness-Kyle service shows as being heavily loaded from Dingwall, possibly the result of a large tourist group.

5.21 We do not believe there is currently any 'spare' rolling stock during the evening (or morning) peak which the current ScotRail franchisee could be required to use to strengthen the Far North Line commuter services. For the Kyle line there is the possibility that units could be transferred from providing strengthening for services in the Central Belt during the summer holiday period, as already happens on the West Highland Line. This is already established practice in other parts of the UK, for example, in West Yorkshire where some strengthening is removed during the school/university holidays to accommodate increased tourist numbers on the Settle – Carlisle Line.

5.22 However, the specification for the next franchise could be set in a manner which encouraged the franchisee to use its available rolling stock in a more flexible manner than currently. Currently, some services are strengthened for the benefit of a few passengers travelling only a short distance. Future incentives could be set such that there was greater tolerance of standing in the Central Belt (where distances are shorter and services more frequent), if the rolling stock was redeployed to save standing for longer distances where there was less choice in public transport alternatives.

5.23 It is also worth noting that these two lines are those with the highest recent growth; if additional peak capacity were made available it may be able to justify additional off- or contra-peak services to improve the case.

5.24 The incoming franchisee in 2014 will have determined in their bid the size of the rolling stock fleet they will procure and how it will be deployed. In the current economic climate, it is unlikely that the fleet size will be greater than present, and indeed bidders may seek to reduce the fleet size. Therefore, the case for strengthening of these services needs to be made both to Transport Scotland to include the requirement in the franchise specification, and directly to the franchise bidders in the event it is left as discretionary.

Post-EGIP

5.25 Following introduction of electric services on EGIP routes, a large number of DMUs, primarily Class 170s, will be displaced. The bidders for the next franchise will have planned for this and negotiated short term leases with the ROSCOs for the units they wish to displace. The franchisee is likely to reorganise the DMU fleet following EGIP, potentially moving Class 170s to the remaining Strathclyde diesel routes to better match capacity to demand – a number of routes only require a 3 car unit in the peak, but are currently served by 2 x Class 156 or 158s – and also to standardise allocation of fleets to maintenance depots. It is therefore reasonable to assume that a pool of all three types of DMU will be displaced post EGIP.

5.26 The franchisee's use of this stock will again depend on the franchise specification. Unless instructed or incentivised to cascade the displaced units, they will have planned in their bid to off lease them. If the next franchise is short, the ROSCOs may set a higher rental tariff for units on a shorter lease than the franchise length, in order to mitigate the risk of a loss of rental revenue. This provides an opportunity to make the case for some of the fleet to be retained and redeployed, on the Far North Line in particular.

5.27 There is a significant risk that units off leased post EGIP will be 'lost' to the ScotRail franchise, as once leased by other TOCs the likelihood of them becoming available in the correct timeframes are reduced. Further service improvements are anticipated on the Highland Mainline and Aberdeen – Inverness lines towards the end of the decade, providing both additional capacity and additional demand. Both of these improvements will require additional rolling stock, and the franchisee may be instructed through the specification to retain units from the EGIP cascade for these services. A case could therefore be made to deploy these units in the interim on the Far North and/or Kyle Lines.

5.28 Outside of HML and Aberdeen-Inverness, our analysis forecasts that by the end of the decade, in addition to the services described above, the following services will require strengthening (taking the Max forecast as the most likely):

- 1035 arrival in Inverness from Wick;
- 0907 Glasgow – Mallaig departing Fort William 1248

5.29 If the case for one additional Class 158 and one additional Class 156 working could be made, these too could be included in the franchise specification.

Longer Term

5.30 By 2020 both the Class 158s and, particularly, the Class 156s will either need substantial upgrading or replacing by a new DMU. Whilst the Class 170s will be available, there are questions about their suitability. In addition work will be required to allow Class 170s or other replacement DMU stock to be cleared on the three rural lines.

5.31 UK wide demand for a next generation DMU is currently limited, with DfT and ROSCOs adopting a 'wait and see' approach. Procurement of a limited new build DMU will be very expensive. We believe refurbishment of the Class 156 and/or 158 fleets will almost certainly be the preferred route as this is likely to be more affordable than gauge clearing the Far North and West Highland Lines routes for Class 170 operation.

5.32 If the next franchise is of a short duration, this refurbishment will take place in the early years of Franchise 4 in order to provide the TOC/ROSCO with sufficient time to recoup their capital investment. By this timeframe, most Central Belt suburban routes, will have sufficient demand to justify a 3 car DMU (Class 170 operation), resulting in the 2-car DMU fleets being primarily used on the Highland, South West and Borders routes. This provides an opportunity to properly specify the refurbishment to meet the needs of these services, particularly for the tourist market.

5.33 Whilst fleet deployments are the responsibility of the franchisee, Transport Scotland is responsible for fleet planning beyond the horizon of the next franchise. The current franchise consultation provides a good platform to highlight that DMU deployment post 2020 is something Transport Scotland must take responsibility for, in order to avoid the risk of DMUs being off leased in the medium term to save cost, but being 'lost' to the franchise in the longer term resulting in substantially increased cost or constraining use of the rail network in rural areas.

APPENDIX

A

RECORD OF ASSUMPTIONS FOR BACKCASTING AND FORECASTING EXERCISES

steer davies gleave

memo

To	Frank Roach		
Cc			
From	Duncan Edmondson		
Date	28 February 2012		
Project	4CastOD	**Project No.**	22362901

Subject Record of Assumptions for Backcasting and Forecasting Exercises

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1 Introduction

1.1 This note is a simple record of the assumptions used in the backcasting and forecasting undertaken on the five HITRANS routes as part of the 4CastOD project. The assumptions used were consistent between the back- and forecasting with the exception of a small number of assumptions adopted in the forecasting, as a result of the outcome of the backcasting exercise.

1.2 We have adopted the approach outlined in the Passenger Demand Forecasting Handbook (PDFH). This approach is an elasticity-based framework which assumes demand changes driven by incremental changes in specific demand drivers can be applied to a base demand level to give a demand forecast and is most appropriate for forecasting the impact of external factors on mature rail markets and relatively small timetable changes on well served flows.

Structure

1.3 The base data is taken from MOIRA and represents ticket sales in the 2004/05 financial year, grouped into service codes representing the five HITRANS routes and sub-routes representing groups of origin-destination pairs within each of these service codes, as shown below. In addition to the geographical segmentation, demand is split into Full, Reduced and Season ticket types. The sub-routes where the most relevant flows are of less than 20 miles are marked with an * – these have different elasticities applied:

- Far North Line
  - FN1: Stations north of Tain to/from Inverness
  - FN2: Stations north of Dingwall to Tain to/from Inverness
  - FN3*: Stations Dingwall and south to/from Inverness, which is partly served by Kyle Line services.
  - FN4*: Between Far North stations
  - FN5: Far North stations to/from stations south and east of Inverness
- Kyle Line
  - KL1: Stations west of Dingwall to/from Inverness
  - KL2: Stations between Dingwall and Beauly to/from stations west of Dingwall
  - KL3: Stations west of Dingwall to/from stations south and east of Inverness
  - KL4*: Between stations west of Dingwall
- West Highland Line
  - WH1: Stations west of Fort William to/from Glasgow
  - WH2: Stations north of Crianlarich to Fort William to/from Glasgow
  - WH3: Stations west of Crianlarich to Fort William to/from Glasgow

- WH4: Stations south of Crianlarich to/from Glasgow
- WH5: West Highland stations to/from stations between Edinburgh and London
- WH6: Stations between Crianlarich and Fort William to/from stations west of Fort William
- WH7*: Other intra-West Highland line flows

- Aberdeen – Inverness
  - AI1: Stations east of Keith to/from Inverness
  - AI2: Stations west of Huntly to/from Inverness
  - AI3*: Between stations east of Keith – subsequently discarded as wholly outwith the HITRANS area
  - AI4: Stations between Keith and Forres to/from Inverness
  - AI5*: Nairn to/from Inverness
  - AI6: Stations between Nairn and Forres (incl) and stations south of Inverness
- Highland Mainline
  - HM1: Inverness to/from Glasgow
  - HM2: Inverness to/from Edinburgh
  - HM3: Inverness to/from cross-border stations
  - HM4: Stations north of Blair Atholl to/from Inverness
  - HM5: Stations north of Blair Atholl including Inverness and other Central Belt stations.

Demand Drivers

1.4 The demand drivers that we have used are as follows:

- GVA per capita, representing the impact of changes to the economy on growth in demand for walk up tickets from originating stations;
- Employment, representing the impact of changes to the economy on growth in rail commuting to destinating stations;
- Population, representing the impact of changes in population on demand for walk up tickets from originating stations;
- Car ownership;
- Car costs;
- Highway journey times;
- Changes in air competition (for one particular flow, Inverness to/from London)
- Changes in bus competition

- Changes in rail fares, disaggregated into walk up and season tickets;
- Changes in rolling stock quality; and
- Changes in rail service, represented by the standard rail industry generalised journey time measure (GJT) for a representative flow for each sub-route.

1.5 The structure for the forecasting is an extension of that set out in PDFH Chapter B1, where D represents demand and most of the other factors are elasticities applied to factor changes in the relevant demand driver

$$\left(\frac{D_{new}}{D_{base}}\right) = \left(\frac{GVApercapita_{new}}{GVApercapita_{base}}\right)^{g} \times \left(\frac{Employment_{new}}{Employment_{base}}\right)^{e} \times \left(\frac{Population_{new}}{Population_{base}}\right)^{p} \times \exp\left(n(NC_{new} - NC_{base})\right) \times \left(\frac{FUELCOST_{new}}{FUELCOST_{base}}\right)^{f} \times \left(\frac{CARTIME_{new}}{CARTIME_{base}}\right)^{c} \times \left(\frac{BUSHEAD_{new}}{BUSHEAD_{base}}\right)^{b} \times \left(\frac{AIRHEAD_{new}}{AIRHEAD_{base}}\right)^{a} \times \left(\frac{RailFare_{new}}{RailFare_{base}}\right)^{r} \times RollingStockFactor \times \left(\frac{GJT_{new}}{GJT_{base}}\right)^{gjt}$$

2 Backcasting Assumptions

2.1 For the backcasting exercise, outturn figures for each of the demand drivers were available and used as described below. Elasticity tables referred to below are from PDFH version 5

GVA per capita

Elasticity

2.2 Table B1.4 Non-London Inter-Urban (Over 20 miles):

- Seasons 1.5
- Other 1.1

2.3 Table B1.5 Non London Short Distance Flows (20 miles and less):

- Other 0.85

2.4 Table B1.3 Rest of Country to and from London (for Inverness – London only)

- Other 1.9

Demand driver data

2.5 For HITRANS area stations provided by Highlands and Islands Enterprise (HIE) from Office for National Statistics (ONS) NUTS3 level data:

TABLE 1 REAL GVA PER CAPITA (£2009 PRICES)

NUTS3 area	2004	2009	%ge change
Caithness, Sutherland, Ross and Cromaty	13,741	14,136	3%
Inverness & Nairn and West Moray, Badenoch & Strathspey	16,354	16,237	-1%
Ross, Skye, Lochaber and Argyll	12,990	13,741	6%
Aberdeen City and Aberdeenshire	24,852	28,731	16%

Source: ONS NUTS3 level data

2.6 For other areas taken from ATOC OEF[1] forecasts which quote ONS data

[1] Economic forecasts provided by the Oxford Economic Forum to full members of the Passenger Demand Forecasting Council (PDFC), mostly TOCs, on a monthly basis. April 2011 version has been provided by ScotRail for this purpose. This data set includes outturn levels of demand drivers for recent years.

TABLE 2 REAL GVA PER CAPITA (£2006 PRICES)

NUTS3 area	2004	2009	%ge change
Scotland	17,281	18,036	4%
Glasgow	24,311	26,186	8%
Edinburgh	29,225	31,760	9%

Source: OEF forecasts, April 2011

Employment

Elasticity

2.7 Table B1.4 Non-London Inter-Urban (Over 20 miles):

- Seasons 0.0

2.8 Table B1.5 Non London Short Distance Flows (20 miles and less):

- Seasons 1.0

2.9 Table B1.3 Rest of Country to and from London (for Inverness – London only)

- Other 1.0

Demand Driver Data

2.10 For HITRANS area stations, provided by HIE from ABI (Annual Business Inquiry) and BRES (Business Register Employment Survey) data on a station and/or area basis. ABI data was used for 2004, but ABI data was only available up until 2008, so overlapping BRES data was used to create the 2009 value.

TABLE 3 HIE ESTIMATES OF EMPLOYEES

Area/localities	2004	2009	%ge change
Areas			
Argyll and the Islands	26,800	29,000	8%
Lochaber	8,500	9,500	12%
Skye & Lochalsh	4,800	5,200	8%
Wester Ross	2,200	2,200	0%
Badenoch & Strathspey	5,500	5,800	5%
Easter Ross	13,300	16,000	20%
Sutherland	4,300	4,300	0%
Caithness	11,400	11,000	-4%
Moray	33,700	34,000	1%
Localities			
Oban	5,500	6,300	15%
Fort William	5,400	5,800	7%
Mallaig	600	660	10%
Kyle of Lochalsh	500	400	-20%
Aviemore	2,300	2,200	-4%
Inverness (wider definition)	36,800	41,000	11%
Nairn	3,300	3,500	6%
Beauly	400	620	55%
Conon Bridge	300	310	3%
Muir of Ord	700	990	41%
Alness	2,100	3,100	48%
Dingwall	3,900	4,300	10%
Elgin	14,700	16,000	9%
Forres	3,800	3,400	-11%
Invergordon	1,500	2,100	40%
Inverness City	28,800	27,000	-6%
Keith	1,900	1,770	-7%
Tain	1,100	1,320	20%
Thurso	4,000	3,600	-10%
Wick	3,500	3,900	11%
Aberdeen	167,700	175,800	5%

Source: ABI, BRES data

2.11 For other areas, taken from ATOC OEF forecasts which quote ONS data.

TABLE 4 OEF EMPLOYMENT (000S)

	2004	2009	%ge change
Scotland	2,612	2,706	4%
Glasgow	413	430	4%
Edinburgh	338	331	-2%

Source: OEF forecasts, April 2011

Population

Elasticity

2.12 Table B1.4 Non-London Inter-Urban (Over 20 miles):

- Seasons 1.0
- Other 1.0

2.13 Table B1.5 Non London Short Distance Flows (20 miles and less):

- Seasons 1.0 – note this relates to relative population growth, but is so insignificant in this case, has been left to apply to all change.
- Other 1.0

2.14 Table B1.3 Rest of Country to and from London (for Inverness – London only)

- Other 1.0

Demand driver data

2.15 For HITRANS area stations, provided by HIE from General Register Office for Scotland (GROS) mid-year estimates on a station and/or area basis.

TABLE 5 HIE ESTIMATES OF POPULATION CHANGE

Area/localities	2004	2009	%ge change
Areas			
Argyll and the Islands	70,901	70,543	-1%
Lochaber	19,004	19,193	1%
Skye & Lochalsh	11,725	12,002	2%
Wester Ross	7,370	7,496	2%
Badenoch & Strathspey	12,128	12,649	4%
Easter Ross	42,690	43,771	3%
Sutherland	9,496	9,574	1%
Caithness	25,236	25,199	0%
Moray	86,764	87,660	1%
Localities			
Oban	8,158	7,985	-2%
Fort William	9,890	9,857	0%
Mallaig	772	752	-3%
Kyle of Lochalsh	724	650	-10%
Aviemore	2,726	2,989	10%
Inverness	55,953	59,278	6%
Nairn	9,340	9,670	4%
Forres	10,256	10,427	2%
Elgin	21,965	22,475	2%
Keith	4,598	4,503	-2%
Beauly	1,878	1,987	6%
Muir of Ord	2,779	3,056	10%
Conon Bridge	2,763	2,824	2%
Dingwall	5,899	5,813	-1%
Alness	5,292	5,469	3%
Invergordon	3,262	3,331	2%
Tain	3,525	3,486	-1%
Thurso	8,541	8,497	-1%
Wick	6,916	6,676	-3%
Aberdeen City	205,700	213,800	4%

Source: GROS mid-year estimates

2.16 For other areas, taken from ATOC OEF forecasts which quote ONS data.

TABLE 6 OEF POPULATION (000S)

	2004	2009	%ge change
Scotland	5,078	5,194	2%
Glasgow	578	589	2%
Edinburgh	454	478	5%

Source: OEF forecasts, April 2011

Car ownership

Elasticity

2.17 The car ownership elasticity is not actually an elasticity, but is the factor n in the equation shown above.

2.18 Table B2.4 Non-London Inter-Urban (Over 20 miles):

- Other 0.80

2.19 Table B2.5 Non London Short Distance Flows (20 miles and less):

- Seasons 0.94
- Other 0.84

2.20 Table B2.3 Rest of Country to and from London (for Inverness – London only)

- Other 0.54

Demand driver data

2.21 Data representing the proportion of households not owning a car was extracted from TEMPRO[2] version 6.4 by 'area', but is too detailed to include here.

Fuel costs

Elasticity

2.22 Table B2.4 Non-London Inter-Urban (Over 20 miles):

- Seasons 0.25
- Other 0.27

2.23 Table B2.5 Non London Short Distance Flows (20 miles and less):

- Seasons 0.30
- Other 0.34

2.24 Table B2.3 Rest of Country to and from London (for Inverness – London only)

- Seasons 0.25

[2] TEMPRO is software supplied by DfT which gives access to planning data and forecasts from DfT's National Trip End Model, NTEM. Since the outset of this study, Scottish specific STEP data has become available, but we did not consider an update using this data to be likely to make a significant difference.

- Other 0.22

Demand driver data

2.25 Pump prices for Scotland were taken from those collated by the AA[3]. This was then converted to 2009 prices using RPI from ONS data. The increase in fuel cost per litre was offset by an assumed car fuel efficiency improvement of 1% pa.

- Pump prices in current year prices: 81.8p (2004), 106.0 (2009).
- Converting to 2009 prices: 93.6p (2004), 106.0 (2009). A 13% increase.
- Offset by 1% pa efficiency improvement: an 8% increase.

Car Time

Elasticity

2.26 Table B2.4 Non-London Inter-Urban (Over 20 miles):

- All 0.30

2.27 Table B2.5 Non London Short Distance Flows (20 miles and less):

- All 0.25

2.28 Table B2.3 Rest of Country to and from London (for Inverness – London only)

- All 0.30

Demand driver data

2.29 We have included a small increase (0.2% pa) in highway journey times for all flows, which is consistent with the assumption made in DfT Rail's RIFF-Lite model for Rural Scotland, which, in turn is based on the UK National Transport Model outputs.

Air Headway

Elasticity

2.30 Table B2.3 Rest of Country to and from London (for Inverness – London only)

- Other 0.05

Demand driver data

2.31 We noted that there has been a reduction in the number of flights serving the Inverness-London route from approximately 7 a day to 5 a day, leading to an increase in air headway of 40%.

Bus Headway

Elasticity

2.32 Table B2.4 Non-London Inter-Urban (Over 20 miles):

- Seasons 0.05
- Other 0.04

[3] http://www.theaa.com/motoring_advice/fuel/index.html

2.33 Table B2.5 Non London Short Distance Flows (20 miles and less):

- Seasons 0.025
- Other 0.025

Demand driver data

2.34 It has been noted that there have been considerable Improvements to bus competition to Moray and Nairn. Although the frequencies have only improved slightly which has retained a 20 minute headway throughout daytime between Inverness and Elgin, and 60 minute headway between Inverness and Aberdeen. However, Inverness-Nairn buses have increased slightly from 3 to 4 per hour. The more significant changes have been in terms of investment in new buses - the latest currently being introduced also have wi-fi installed; some very visible marketing by Stagecoach Bluebird, and more attractive fare offerings - particularly through introduction of Megarider multi-day tickets.

2.35 We have included a proxy headway change on the relevant sub-routes (AI4 and AI5) of a 50% reduction to reflect these factors.

Rail Fares

Elasticity

2.36 Table B3.4 Non London

- <20 miles
  - Seasons -0.7
  - Other -1.0
- >=20 miles
  - Seasons -0.9
  - Other -1.0

Demand driver data

2.37 Rail fares are assumed to have increased by the regulated cap of RPI+1% every year.

Rolling Stock Quality

2.38 A factor of 2% has been included to represent the beneficial impact of the introduction of the Highlands-specific 158s in 2007/08. No additional elasticity needs to be applied. This factor is based on experience of previous versions of PDFH, as much as the current version Chapter B7.

2.39 This factor has been applied to FN, KL and AI routes on which the majority of services are operated by Class 158s.

Rail service improvements

2.40 We believe that there have been two main areas of significant service improvement in the HITRANS area:

- There have been significant service improvements on the Far North line, with the introduction of the Invernet service enhancement in December 2005.
- In addition there were additional Winter services introduced on the Kyle Line in December 2008.

2.41 To reflect the timetable changes on all sub-routes we have used the concept of generalised journey time (GJT) introduced in the PDFH Chapter B4. Calculated GJTs by ticket type for representative flows are readily available from the Scottish version of MOIRA[4]. Ideally timetables used would be June / December 2004 and June / December 2009. However we have only had access to the equivalents for 2005 and 2010, but note that there were not significant changes between 2004 and 2005 and 2009 and 2010. We have therefore examined the GJT improvement between June 2005 and May 2010 – except for the Kyle line, with additional Winter services, where December 2005 and December 2010 timetables have been used.

Elasticity

2.42 Table B4.5 Non London

- Seasons -0.9
- Other -0.7, where changes in frequency form the basis of the GJT variation

[4] MOIRA is the standard rail industry software which calculates the impact of timetable changes on demand using the PDFH GJT recommendations

3 Forecasting Assumptions

3.1 For the forecasting exercise most of the elasticities were kept the same as for the backcasting with some adaptations as described below. In particular the following adaptations resulting from the backcasting exercise, have been adopted for all cases:

- Capturing employment growth by using GVA and employment to drive all ticket types;
- Using -0.9 GJT elasticities throughout.
- Double car cost elasticities;
- Double GJT elasticity for 25%+ changes;

3.2 In addition we have included the following in the Max and Max+ sensitivity tests:

- Additional tourist growth.

3.3 In the Max+ case an additional growth factor representing the difference between outturn and backcast in the backcast period has been applied between the 2009 base year and 2020, as follows:

- Far North Line: 2.5% pa;
- Kyle Line: 2.7% pa;
- West Highland Line: 0.9% pa;
- Aberdeen – Inverness: 1.3% pa;
- Highland Mainline: 3.5% pa.

3.4 The following section details forecasting demand driver data and only describes methodologies and/or elasticities where they have changed from the backcasting.

GVA per capita

3.5 To better reflect the use of Walk up (Full and Reduced) tickets for commuting, for flows of less than 20 miles, we have applied the GVA per capita assumptions to non-commuters and the employment assumptions to commuters. We have derived the number of commuters using the results of the NPS Boost survey, as shown in Table 7.

TABLE 7 JOURNEY PURPOSE X TICKET TYPE SPLIT FROM NPS BOOST SURVEY, 2011

	Full	Reduced	Season
Commuting: Employment	18.5%	6.5%	74.1%
Business/Leisure: GVA	57.7%	56.3%	18.5%
Tourism: GVA	23.8%	37.2%	7.4%
Total	100.0%	100.0%	100.0%

3.6 For HITRANS area stations, provided by HIE based on projections forward of actual growth from last 10 years, as detailed in Table 1.

TABLE 8 REAL GVA PER CAPITA GROWTH PROJECTIONS

	2009-2020		2020-2030	
NUTS3 area	**Min**	**Max**	**Min**	**Max**
Caithness, Sutherland, Ross and Cromaty	10%	25%	10%	25%
Inverness & Nairn and West Moray, Badenoch & Strathspey	10%	25%	10%	25%
Ross, Skye, Lochaber and Argyll	5%	15%	5%	15%
Aberdeen City and Aberdeenshire	10%	25%	10%	25%

Source: Based on historical ONS data

3.7 For other areas taken from ATOC OEF November 2011 forecasts, which are only available until 2018, and extrapolated thereafter.

TABLE 9 REAL GDP PER CAP PROJECTIONS (£2006 PRICES)

NUTS3 area	2009	2011	2018
Scotland	18,036	18,303	20,380
Glasgow	26,186	26,846	31,466
Edinburgh	31,760	31,638	36,059

Source: OEF forecasts, April 2011

Employment

3.8 The methodology for employment has also been adapted as described above under GVA per capita.

3.9 For HITRANS area stations, provided by HIE extrapolated forward based on a combination of HIE's views on growth and observed growth from recent years from ABI and BRES data on a station and/or area basis, as shown in Table 3.

TABLE 10 HIE PROJECTIONS OF EMPLOYEES

Area/localities	2009	2020		2030	
		Min	Max	Min	Max
Areas					
Argyll and the Islands	29,000	29,000	31,000	30,000	34,000
Lochaber	9,500	8,700	10,000	8,700	10,500
Skye & Lochalsh	5,200	4,900	5,400	4,900	5,700
Wester Ross	2,200	2,200	2,500	2,200	2,600
Badenoch & Strathspey	5,800	5,700	5,900	5,700	6,500
Easter Ross	16,000	16,800	19,200	16,800	21,100
Sutherland	4,300	3,800	4,200	3,800	4,400
Caithness	11,000	10,100	11,700	10,100	12,300
Moray	34,000	30,000	34,000	30,000	36,000
Localities					
Oban	6,300	6,700	7,000	6,700	7,700
Fort William	5,800	5,400	6,200	5,400	6,500
Mallaig	660	660	660	660	660
Kyle of Lochalsh	400	400	400	400	400
Aviemore	2,200	2,300	2,400	2,300	2,600
Inverness (wider definition)	41,000	44,000	48,000	46,000	53,000
Nairn	3,500	3,100	3,300	3,100	3,500
Beauly	620	620	620	620	620
Conon Bridge	310	310	310	310	310
Muir of Ord	990	990	990	990	990
Alness	3,100	3,000	3,300	3,000	3,600
Dingwall	4,300	4,200	4,800	4,200	5,000
Elgin	16,000	14,300	15,800	14,300	16,600
Forres	3,400	3,100	3,500	3,100	3,700
Invergordon	2,100	2,200	2,400	2,200	2,600
Inverness City	27,000	28,000	31,000	28,000	33,000
Keith	1,770	1,770	1,770	1,770	1,770
Tain	1,320	1,320	1,320	1,320	1,320
Thurso	3,600	3,100	3,800	3,100	4,000
Wick	3,900	3,500	4,100	3,500	4,300
Aberdeen	175,800	185,000	193,000	185,000	212,000

Source: Based on historical ABI and BRES data

3.10 For other areas taken from ATOC OEF November 2011 forecasts, which are only available until 2018, and extrapolated thereafter. These have been used for both Min and Max cases.

TABLE 11 OEF EMPLOYMENT PROJECTIONS (000S)

	2009	2011	2018
Scotland	2,706	2,675	2,763
Glasgow	430	426	453
Edinburgh	331	333	352

Source: OEF forecasts, April 2011

Population

3.11 For HITRANS area stations, provided by HIE, extrapolated forward from GROS mid-year estimates, as in Table 5, on a station and/or area basis.

TABLE 12 HIE POPULATION PROJECTIONS

Area/localities	2009	2020		2030	
		Min	Max	Min	Max
Areas					
Argyll and the Islands	70,543	70,300	73,900	70,300	77,600
Lochaber	19,193	19,300	20,300	19,300	21,300
Skye & Lochalsh	12,002	12,100	12,700	12,100	13,300
Wester Ross	7,496	7,500	7,800	7,500	8,200
Badenoch & Strathspey	12,649	13,500	14,200	14,200	15,600
Easter Ross	43,771	43,700	45,900	43,700	48,200
Sutherland	9,574	9,700	10,200	9,700	10,700
Caithness	25,199	23,900	26,400	23,900	27,700
Moray	87,660	83,300	92,100	83,300	96,700
Localities					
Oban	7,985	7,700	8,500	7,700	8,900
Fort William	9,857	9,400	10,400	9,400	10,900
Mallaig	752	700	800	670	840
Kyle of Lochalsh	650	580	650	550	680
Aviemore	2,989	3,400	3,700	3,600	4,100
Inverness	59,278	62,800	65,800	65,900	72,400
Nairn	9,670	10,200	10,700	10,700	11,800
Forres	10,427	9,800	10,800	9,800	11,300
Elgin	22,475	21,600	23,900	21,600	25,100
Keith	4,503	4,200	4,700	4,000	4,900
Beauly	1,987	2,200	2,400	2,300	2,600
Muir of Ord	3,056	3,300	3,600	3,500	4,000
Conon Bridge	2,824	2,900	3,000	3,000	3,300
Dingwall	5,813	5,800	6,100	5,800	6,400
Alness	5,469	5,400	5,700	5,400	6,000
Invergordon	3,331	3,300	3,500	3,300	3,700
Tain	3,486	3,500	3,700	3,500	3,900
Thurso	8,497	8,000	8,800	8,000	9,200
Wick	6,676	6,300	6,900	6,300	7,200
Aberdeen City	213,800	217,100	228,000	217,100	239,400

Source: Based on historical GROS mid-year estimates

3.12 For other areas taken from ATOC OEF November 2011 forecasts, which are only available until 2018, and extrapolated thereafter. These have been used for both Min and Max cases.

TABLE 13 OEF POPULATION PROJECTIONS (000S)

	2009	2011	2018
Scotland	5,194	5,244	5,347
Glasgow	589	595	606
Edinburgh	478	490	515

Source: OEF forecasts, April 2011

Car ownership

3.13 Forecasts representing the proportion of households not owning a car was extracted from TEMPRO version 6.4 by 'area', but is too detailed to include here.

Fuel costs

Elasticity

3.14 Elasticities were assumed to be double that recommended in PDFH.

3.15 Over 20 miles:

- Seasons 0.50
- Other 0.54

3.16 20 miles and less:

- Seasons 0.60
- Other 0.68

3.17 For Inverness – London only:

- Seasons 0.50
- Other 0.44

Demand driver data

3.18 Fuel prices are notoriously difficult to forecast. We have assumed that the increase observed in period of the backcasting exercise will continue over the next 20 years, that is 1.5% real increase per annum.

Car Time

3.19 We have extrapolated the small increase (0.2% pa) in highway journey times for all flows, for all years in the forecasting horizon.

Air Headway

3.20 We have not assumed any changes over the forecasting period.

Bus Headway

3.21 We have not assumed any changes over the forecasting period.

Rail Fares

3.22 Rail fares are assumed to have continue to increase by the regulated cap of RPI+1% every year.

Rolling Stock Quality

3.23 We have not assumed any changes over the forecasting period.

Rail service improvements

3.24 We have only assumed one change over the forecasting period to reflect the timetable changes that have been in place since December 2011. A detailed MOIRA run has been undertaken and the GJTs incorporated into the relevant HM flows.

Elasticity

3.25 To reflect the perceived additional sensitivity to timetable changes we have increased the recommended -0.7 elasticity for non-Season tickets to the more standard -0.9 and doubled this elasticity for flows with a more than 25% GJT improvement. However, given there is only one change modelled, this has very little effect.

Tourism

3.26 There is some data on tourism available, but not at an adequate level of detail (Highlands, rail use) or a snapshot rather than a trend. The only trend data we have found covering the period, across all of Scotland, shows a decrease in total demand over the period. Whereas anecdotally there has been an increase in rail use for tourism in the area, particularly from overseas and cross-border visitors.

3.27 Therefore, in consultation with HIE, our approach has been to identify the main tourist flows on the network and for those sub-routes apply a tourism growth figure to the proportion of demand which has been identified as tourism in the NPS Boost survey, as detailed in Table 7. This growth factor has been assumed to be 20% over a decade for the high growth forecasting scenario. The effected flows are assumed to be as follows:

Far North

- North of Tain - Inverness
- Intra FNL
- Far North to rest of Scotland

Kyle

- Inverness - West of Dingwall
- Beauly-Dingwall - Kyle
- Kyle Line to rest of Scotland

WHL

- West of Fort William - Glasgow
- Fort William-Tyndrum - Glasgow
- Oban-Tyndrum - Glasgow
- Oban-Tyndrum - Edinburgh+Cross-Border
- West of Fort William - Fort William-Tyndrum

HML

- Glasgow-Inverness
- Edinburgh - Inverness
- Cross-Border - Inverness
- Aviemore - Central Belt

APPENDIX

B

DETAILED GROWTH FORECASTS BY SUB-ROUTE

Aggregate by segment

		2009/10 A	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
FN1	FN	45,836	46,269	46,482	46,697	46,915	47,136	47,359	47,651	47,945	48,241	48,539	48,839	49,306	49,778	50,255	50,736	51,223	51,715	52,211	52,713	53,221	53,733
FN2	FN	57,112	57,651	58,159	58,674	59,195	59,723	60,258	60,878	61,504	62,137	62,777	63,424	64,145	64,874	65,612	66,359	67,115	67,880	68,655	69,439	70,233	71,036
FN3	FN	122,924	124,564	125,621	126,693	127,778	128,876	129,989	131,301	132,627	133,968	135,323	136,692	138,142	139,608	141,090	142,590	144,106	145,639	147,190	148,758	150,344	151,948
FN4	FN	48,459	48,630	48,830	49,033	49,238	49,446	49,657	49,944	50,233	50,524	50,817	51,112	51,446	51,782	52,121	52,462	52,807	53,153	53,503	53,855	54,211	54,568
FN5	FN	26,283	26,498	26,622	26,663	26,921	27,205	27,493	27,799	28,089	28,381	28,666	28,954	29,313	29,678	30,047	30,421	30,800	31,183	31,572	31,966	32,365	32,770
KL1	KL	48,612	49,185	49,515	49,849	50,188	50,530	50,876	51,297	51,722	52,151	52,583	53,020	53,498	53,981	54,468	54,960	55,457	55,959	56,466	56,978	57,495	58,017
KL2	KL	18,765	18,954	19,048	19,142	19,238	19,334	19,432	19,557	19,683	19,810	19,938	20,066	20,207	20,348	20,490	20,634	20,778	20,924	21,071	21,219	21,368	21,518
KL3	KL	10,253	10,294	10,351	10,384	10,535	10,696	10,861	11,026	11,180	11,335	11,491	11,650	11,812	11,977	12,145	12,315	12,487	12,663	12,840	13,021	13,204	13,390
KL4	KL	11,973	12,056	12,074	12,092	12,110	12,128	12,147	12,177	12,207	12,237	12,267	12,297	12,341	12,384	12,427	12,471	12,515	12,559	12,604	12,648	12,693	12,738
WH1	WH	21,967	22,332	22,541	22,628	23,013	23,427	23,849	24,255	24,629	25,001	25,387	25,778	26,218	26,665	27,120	27,583	28,053	28,532	29,019	29,514	30,018	30,531
WH2	WH	44,139	44,515	44,659	44,665	45,005	45,374	45,747	46,145	46,503	46,857	47,223	47,591	48,131	48,678	49,231	49,791	50,357	50,931	51,511	52,099	52,693	53,294
WH3	WH	95,571	97,252	97,891	98,154	99,321	100,572	101,837	102,980	104,016	105,043	106,104	107,177	108,592	110,027	111,481	112,956	114,452	115,968	117,505	119,063	120,643	122,245
WH4	WH	50,435	51,099	51,852	52,181	53,561	55,064	56,609	58,126	59,538	60,960	62,447	63,973	65,538	67,143	68,789	70,478	72,210	73,988	75,811	77,681	79,600	81,569
WH5	WH	41,339	41,733	41,838	41,849	42,307	42,799	43,307	43,810	44,270	44,728	45,191	45,659	46,265	46,880	47,504	48,137	48,780	49,431	50,092	50,763	51,443	52,134
WH6	WH	78,406	78,945	78,543	78,145	77,753	77,366	76,984	76,718	76,455	76,192	75,931	75,672	75,831	75,992	76,154	76,316	76,479	76,644	76,809	76,975	77,142	77,310
WH7	WH	65,683	67,001	66,872	66,743	66,616	66,489	66,363	66,232	66,101	65,972	65,843	65,715	65,888	66,063	66,238	66,415	66,593	66,772	66,951	67,132	67,314	67,497
AI1	AI	190,792	194,206	195,740	197,292	198,864	200,456	202,068	203,996	205,945	207,913	209,902	211,911	214,147	216,408	218,694	221,006	223,344	225,709	228,099	230,517	232,962	235,435
AI2	AI	218,485	221,858	222,827	223,809	224,803	225,810	226,829	228,165	229,511	230,867	232,232	233,608	235,667	237,745	239,845	241,964	244,105	246,266	248,449	250,653	252,879	255,127
AI3	AI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AI4	AI	162,225	164,076	164,941	165,817	166,704	167,603	168,513	169,668	170,833	172,006	173,189	174,381	176,260	178,161	180,083	182,027	183,994	185,983	187,996	190,031	192,090	194,172
AI5	AI	49,700	50,173	50,346	50,523	50,702	50,883	51,068	51,329	51,593	51,858	52,125	52,394	52,848	53,307	53,771	54,239	54,711	55,188	55,670	56,156	56,647	57,143
AI6	AI	45,833	46,264	46,502	46,589	47,071	47,600	48,138	48,719	49,273	49,829	50,373	50,924	51,601	52,288	52,984	53,690	54,405	55,130	55,865	56,610	57,366	58,131
HM1	HM	149,667	151,889	153,819	161,944	164,803	167,826	170,905	174,085	177,139	180,215	183,383	186,609	189,996	193,446	196,960	200,540	204,186	207,900	211,683	215,537	219,463	223,461
HM2	HM	149,112	150,422	151,912	153,497	156,240	159,133	162,117	165,130	168,024	170,947	173,919	176,945	180,119	183,352	186,646	190,002	193,422	196,906	200,456	204,073	207,759	211,514
HM3	HM	32,452	33,091	33,358	33,844	35,040	36,421	37,852	39,186	40,449	41,716	43,122	44,575	46,111	47,700	49,344	51,044	52,804	54,623	56,506	58,454	60,469	62,553
HM4	HM	65,362	67,333	68,380	73,966	75,119	76,292	77,486	78,774	80,084	81,416	82,771	84,148	85,373	86,616	87,877	89,157	90,456	91,774	93,111	94,469	95,846	97,244
HM5	HM	131,852	134,454	136,385	139,042	142,216	145,559	149,012	152,487	155,869	159,301	162,805	166,386	169,758	173,200	176,711	180,294	183,950	187,681	191,487	195,371	199,335	203,379

Aggregate by line

	2009/10 A	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
FN	300,613	303,612	305,714	307,759	310,047	312,387	314,758	317,573	320,398	323,250	326,121	329,022	332,352	335,719	339,124	342,568	346,050	349,571	353,131	356,732	360,373	364,055
KL	89,603	90,490	90,988	91,467	92,070	92,688	93,317	94,057	94,792	95,532	96,279	97,034	97,857	98,689	99,530	100,379	101,238	102,105	102,980	103,865	104,760	105,663
WH	397,539	402,876	404,195	404,367	407,576	411,092	414,696	418,266	421,512	424,753	428,125	431,564	436,463	441,447	446,518	451,676	456,924	462,264	467,698	473,227	478,854	484,579
AI	667,034	676,577	680,356	684,029	688,144	692,352	696,616	701,878	707,153	712,473	717,821	723,218	730,523	737,909	745,377	752,926	760,560	768,277	776,079	783,968	791,944	800,008
HM	528,445	537,189	543,855	562,292	573,419	585,231	597,372	609,662	621,566	633,596	646,000	658,662	671,356	684,313	697,538	711,037	724,817	738,884	753,244	767,904	782,871	798,151
Total	1,983,234	2,010,744	2,025,108	2,049,915	2,071,257	2,093,751	2,116,758	2,141,436	2,165,421	2,189,604	2,214,346	2,239,499	2,268,552	2,298,078	2,328,087	2,358,587	2,389,588	2,421,101	2,453,133	2,485,697	2,518,801	2,552,456
Total (m)	1.98	2.01	2.03	2.05	2.07	2.09	2.12	2.14	2.17	2.19	2.21	2.24	2.27	2.30	2.33	2.36	2.39	2.42	2.45	2.49	2.52	2.55

Growth from 2011/12

		2016/17	2020/21	2029/30
FN1	FN	3%	3%	4%
FN2	FN	5%	6%	7%
FN3	FN	5%	6%	7%
FN4	FN	2%	3%	3%
FN5	FN	4%	6%	7%
KL1	KL	4%	4%	5%
KL2	KL	3%	3%	4%
KL3	KL	7%	8%	9%
KL4	KL	1%	1%	1%
WH1	WH	8%	9%	11%
WH2	WH	3%	4%	5%
WH3	WH	5%	6%	7%
WH4	WH	12%	15%	18%
WH5	WH	5%	6%	7%
WH6	WH	-2%	-3%	-3%
WH7	WH	-1%	-1%	-1%
AI1	AI	4%	5%	6%
AI2	AI	2%	3%	4%
AI3	AI			
AI4	AI	3%	4%	4%
AI5	AI	2%	2%	3%
AI6	AI	5%	6%	7%
HM1	HM	13%	15%	17%
HM2	HM	9%	11%	13%
HM3	HM	17%	21%	25%
HM4	HM	15%	17%	19%
HM5	HM	12%	14%	17%

Aggregate by segment

		2009/10 A	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
FN1	FN	45,836	47,132	48,583	50,081	51,626	53,222	54,868	56,645	58,481	60,376	62,333	64,355	66,584	68,891	71,279	73,750	76,307	78,954	81,693	84,527	87,461	90,498
FN2	FN	57,112	58,413	60,007	61,648	63,336	65,073	66,861	68,787	70,770	72,811	74,912	77,075	79,482	81,965	84,527	87,171	89,898	92,713	95,617	98,614	101,706	104,897
FN3	FN	122,924	125,767	128,758	131,826	134,971	138,196	141,504	145,099	148,787	152,570	156,451	160,431	164,515	168,704	173,002	177,411	181,933	186,573	191,333	196,215	201,224	206,362
FN4	FN	48,459	49,200	50,276	51,379	52,508	53,666	54,851	56,149	57,478	58,840	60,235	61,665	63,098	64,567	66,072	67,614	69,194	70,814	72,473	74,174	75,918	77,705
FN5	FN	26,283	26,859	27,475	28,017	28,801	29,632	30,488	31,386	32,289	33,216	34,157	35,126	36,161	37,227	38,324	39,454	40,618	41,816	43,050	44,321	45,630	46,978
KL1	KL	48,612	50,058	51,530	53,049	54,614	56,227	57,890	59,686	61,538	63,449	65,419	67,452	69,672	71,967	74,337	76,787	79,317	81,932	84,634	87,426	90,310	93,291
KL2	KL	18,765	19,291	19,839	20,404	20,985	21,584	22,200	22,865	23,551	24,257	24,984	25,733	26,528	27,348	28,193	29,064	29,962	30,889	31,844	32,829	33,845	34,892
KL3	KL	10,253	10,410	10,609	10,786	11,090	11,410	11,743	12,082	12,415	12,756	13,106	13,466	13,843	14,230	14,628	15,037	15,458	15,891	16,336	16,795	17,266	17,751
KL4	KL	11,973	12,145	12,312	12,482	12,654	12,829	13,006	13,198	13,393	13,591	13,792	13,995	14,213	14,435	14,659	14,888	15,120	15,355	15,595	15,838	16,085	16,336
WH1	WH	21,967	22,542	23,068	23,478	24,206	24,983	25,783	26,586	27,368	28,166	28,996	29,850	30,747	31,671	32,622	33,602	34,612	35,653	36,725	37,829	38,966	40,138
WH2	WH	44,139	45,041	46,008	46,851	48,064	49,337	50,645	52,013	53,368	54,751	56,180	57,647	59,194	60,784	62,417	64,094	65,817	67,587	69,405	71,273	73,191	75,162
WH3	WH	95,571	98,318	100,573	102,484	105,387	108,447	111,594	114,679	117,715	120,809	124,012	127,301	130,775	134,345	138,014	141,784	145,659	149,641	153,733	157,938	162,260	166,702
WH4	WH	50,435	51,099	51,852	52,181	53,561	55,064	56,609	58,126	59,538	60,960	62,447	63,973	65,538	67,143	68,789	70,478	72,210	73,988	75,811	77,681	79,600	81,569
WH5	WH	41,339	42,215	43,021	43,744	44,952	46,224	47,544	48,889	50,217	51,574	52,967	54,398	55,908	57,461	59,058	60,701	62,390	64,126	65,913	67,750	69,639	71,583
WH6	WH	78,406	80,219	81,967	83,756	85,588	87,463	89,383	91,482	93,631	95,832	98,085	100,392	102,881	105,434	108,050	110,732	113,482	116,301	119,191	122,154	125,191	128,305
WH7	WH	65,683	67,437	68,418	69,414	70,425	71,451	72,493	73,544	74,611	75,693	76,793	77,908	79,110	80,332	81,573	82,833	84,114	85,416	86,738	88,082	89,447	90,834
AI1	AI	190,792	196,705	201,771	206,975	212,320	217,812	223,454	229,583	235,882	242,356	249,009	255,847	263,472	271,326	279,416	287,749	296,333	305,175	314,282	323,664	333,328	343,283
AI2	AI	218,485	224,797	230,363	236,078	241,944	247,967	254,151	260,846	267,722	274,782	282,033	289,479	297,800	306,365	315,180	324,255	333,596	343,211	353,109	363,298	373,787	384,585
AI3	AI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AI4	AI	162,225	166,299	170,792	175,415	180,172	185,068	190,107	195,560	201,172	206,949	212,895	219,015	225,841	232,883	240,149	247,647	255,383	263,366	271,603	280,103	288,875	297,926
AI5	AI	49,700	50,655	51,717	52,803	53,914	55,051	56,214	57,487	58,790	60,123	61,487	62,882	64,385	65,923	67,500	69,115	70,769	72,463	74,199	75,977	77,799	79,665
AI6	AI	45,833	46,562	47,314	47,923	48,948	50,038	51,157	52,339	53,513	54,709	55,911	57,139	58,459	59,809	61,191	62,605	64,052	65,533	67,048	68,599	70,185	71,809
HM1	HM	149,667	154,026	158,597	169,777	175,664	181,877	188,312	195,025	201,769	208,710	215,934	223,411	231,453	239,787	248,423	257,372	266,646	276,257	286,215	296,536	307,231	318,314
HM2	HM	149,112	152,471	156,459	160,635	166,128	171,917	177,948	184,162	190,397	196,818	203,453	210,316	217,681	225,308	233,205	241,384	249,853	258,623	267,706	277,112	286,852	296,940
HM3	HM	32,452	33,652	34,573	35,746	37,712	39,942	42,299	44,622	46,936	49,327	51,959	54,731	57,753	60,942	64,307	67,858	71,606	75,560	79,733	84,136	88,783	93,687
HM4	HM	65,362	68,218	70,706	78,057	80,908	83,866	86,934	90,201	93,593	97,112	100,764	104,555	108,113	111,794	115,601	119,538	123,610	127,823	132,179	136,686	141,347	146,169
HM5	HM	131,852	136,245	140,632	145,893	151,840	158,133	164,722	171,519	178,398	185,526	192,933	200,636	208,019	215,674	223,611	231,841	240,375	249,223	258,398	267,912	277,776	288,004

Aggregate by line

	2009/10 A	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
FN	300,613	307,371	315,100	322,950	331,243	339,788	348,572	358,066	367,805	377,813	388,089	398,652	409,840	421,354	433,204	445,399	457,951	470,869	484,166	497,852	511,939	526,440
KL	89,603	91,904	94,291	96,720	99,343	102,050	104,839	107,831	110,897	114,053	117,301	120,647	124,256	127,978	131,817	135,775	139,858	144,068	148,409	152,887	157,506	162,269
WH	397,539	406,872	414,906	421,908	432,183	442,970	454,051	465,318	476,449	487,784	499,479	511,469	524,154	537,169	550,523	564,226	578,285	592,712	607,516	622,707	638,295	654,291
AI	667,034	685,018	701,957	719,193	737,299	755,937	775,082	795,816	817,079	838,919	861,335	884,363	909,956	936,306	963,437	991,371	1,020,133	1,049,748	1,080,242	1,111,642	1,143,975	1,177,269
HM	528,445	544,612	560,967	590,108	612,253	635,734	660,214	685,529	711,093	737,493	765,043	793,648	823,019	853,504	885,147	917,993	952,090	987,486	1,024,232	1,062,381	1,101,989	1,143,114
Total	1,983,234	2,035,777	2,087,221	2,150,881	2,212,320	2,276,480	2,342,759	2,412,561	2,483,324	2,556,062	2,631,247	2,708,778	2,791,225	2,876,312	2,964,127	3,054,764	3,148,316	3,244,883	3,344,566	3,447,470	3,553,704	3,663,383
Total (m)	1.98	2.04	2.09	2.15	2.21	2.28	2.34	2.41	2.48	2.56	2.63	2.71	2.79	2.88	2.96	3.05	3.15	3.24	3.34	3.45	3.55	3.66

Growth from 2011/12

		2016/17	2020/21	2029/30
FN1	FN	17%	20%	24%
FN2	FN	15%	18%	21%
FN3	FN	13%	16%	18%
FN4	FN	12%	14%	17%
FN5	FN	14%	18%	21%
KL1	KL	16%	19%	23%
KL2	KL	15%	19%	22%
KL3	KL	14%	17%	20%
KL4	KL	7%	9%	10%
WH1	WH	15%	19%	22%
WH2	WH	13%	16%	19%
WH3	WH	14%	17%	20%
WH4	WH	12%	15%	18%
WH5	WH	14%	17%	20%
WH6	WH	12%	14%	17%
WH7	WH	7%	9%	11%
AI1	AI	14%	17%	20%
AI2	AI	13%	16%	19%
AI3	AI			
AI4	AI	15%	18%	21%
AI5	AI	11%	14%	16%
AI6	AI	11%	13%	16%
HM1	HM	23%	27%	32%
HM2	HM	18%	22%	26%
HM3	HM	29%	36%	43%
HM4	HM	28%	32%	37%
HM5	HM	22%	27%	32%

Aggregate by segment

		2009/10 A	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
FN1	FN	45,836	48,357	51,142	54,089	57,208	60,510	64,004	67,795	71,811	76,066	80,574	85,349	88,306	91,366	94,532	97,809	101,201	104,711	108,344	112,103	115,994	120,021
FN2	FN	57,112	59,932	63,168	66,583	70,184	73,984	77,993	82,326	86,902	91,732	96,833	102,219	105,411	108,705	112,103	115,609	119,227	122,959	126,811	130,785	134,886	139,118
FN3	FN	122,924	129,037	135,541	142,378	149,565	157,120	165,064	173,659	182,703	192,219	202,233	212,769	218,186	223,742	229,442	235,289	241,287	247,440	253,752	260,228	266,871	273,685
FN4	FN	48,459	50,480	52,925	55,491	58,186	61,015	63,984	67,200	70,579	74,130	77,862	81,783	83,683	85,631	87,627	89,672	91,768	93,916	96,117	98,373	100,685	103,055
FN5	FN	26,283	27,557	28,922	30,260	31,915	33,690	35,565	37,564	39,649	41,848	44,153	46,585	47,958	49,371	50,827	52,325	53,869	55,458	57,095	58,781	60,516	62,304
KL1	KL	48,612	51,409	54,351	57,463	60,755	64,239	67,924	71,923	76,157	80,641	85,391	90,420	93,397	96,473	99,651	102,934	106,327	109,832	113,454	117,196	121,063	125,058
KL2	KL	18,765	19,812	20,925	22,102	23,345	24,659	26,048	27,553	29,145	30,829	32,611	34,496	35,562	36,660	37,793	38,961	40,165	41,407	42,688	44,008	45,370	46,774
KL3	KL	10,253	10,691	11,189	11,684	12,337	13,036	13,779	14,558	15,365	16,213	17,108	18,052	18,556	19,075	19,609	20,157	20,722	21,302	21,899	22,514	23,146	23,795
KL4	KL	11,973	12,473	12,986	13,520	14,077	14,657	15,261	15,904	16,575	17,274	18,002	18,761	19,053	19,350	19,651	19,958	20,268	20,584	20,905	21,231	21,562	21,898
WH1	WH	21,967	22,745	23,485	24,117	25,090	26,127	27,208	28,306	29,402	30,531	31,713	32,942	33,931	34,951	36,001	37,083	38,197	39,346	40,528	41,747	43,002	44,295
WH2	WH	44,139	45,447	46,840	48,127	49,817	51,598	53,442	55,379	57,334	59,349	61,446	63,618	65,326	67,080	68,882	70,733	72,635	74,588	76,594	78,655	80,772	82,947
WH3	WH	95,571	99,203	102,391	105,276	109,232	113,416	117,757	122,102	126,462	130,954	135,636	140,486	144,320	148,260	152,309	156,470	160,746	165,140	169,656	174,297	179,067	183,968
WH4	WH	50,435	51,559	52,789	53,603	55,516	57,587	59,735	61,888	63,962	66,079	68,301	70,599	72,326	74,097	75,914	77,778	79,690	81,651	83,663	85,727	87,845	90,017
WH5	WH	41,339	42,595	43,799	44,936	46,592	48,342	50,170	52,053	53,949	55,905	57,932	60,033	61,699	63,413	65,175	66,988	68,852	70,769	72,740	74,767	76,852	78,997
WH6	WH	78,406	80,941	83,449	86,038	88,711	91,471	94,320	97,404	100,589	103,880	107,279	110,790	113,538	116,354	119,242	122,202	125,236	128,347	131,537	134,806	138,158	141,594
WH7	WH	65,683	68,044	69,655	71,305	72,995	74,725	76,497	78,304	80,155	82,050	83,991	85,978	87,304	88,652	90,022	91,413	92,827	94,263	95,722	97,205	98,711	100,242
AI1	AI	190,792	199,262	207,051	215,152	223,578	232,343	241,459	251,308	261,560	272,232	283,341	294,906	303,695	312,748	322,073	331,679	341,573	351,765	362,263	373,077	384,217	395,691
AI2	AI	218,485	227,719	236,392	245,405	254,773	264,510	274,630	285,530	296,865	308,655	320,918	333,673	343,264	353,136	363,298	373,758	384,525	395,608	407,017	418,762	430,852	443,298
AI3	AI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AI4	AI	162,225	168,461	175,261	182,345	189,726	197,415	205,425	214,065	223,071	232,460	242,248	252,451	260,319	268,437	276,812	285,455	294,372	303,574	313,068	322,866	332,976	343,410
AI5	AI	49,700	51,314	53,070	54,889	56,773	58,724	60,744	62,927	65,190	67,535	69,965	72,482	74,214	75,988	77,805	79,666	81,573	83,526	85,527	87,577	89,676	91,828
AI6	AI	45,833	47,167	48,552	49,816	51,543	53,377	55,279	57,292	59,338	61,453	63,619	65,863	67,384	68,940	70,533	72,163	73,831	75,537	77,284	79,071	80,901	82,772
HM1	HM	149,667	159,417	169,893	188,234	201,579	216,013	231,483	248,126	265,691	284,450	304,597	326,173	337,915	350,082	362,690	375,756	389,295	403,326	417,866	432,933	448,548	464,729
HM2	HM	149,112	157,808	167,602	178,099	190,636	204,183	218,743	234,305	250,717	268,243	286,991	307,055	317,808	328,942	340,473	352,413	364,777	377,582	390,842	404,574	418,796	433,523
HM3	HM	32,452	34,829	37,036	39,632	43,275	47,438	51,996	56,771	61,806	67,228	73,293	79,905	84,317	88,973	93,886	99,071	104,542	110,315	116,408	122,837	129,621	136,780
HM4	HM	65,362	70,606	75,742	86,544	92,844	99,606	106,864	114,761	123,244	132,354	142,138	152,647	157,842	163,216	168,773	174,522	180,467	186,617	192,978	199,557	206,363	213,402
HM5	HM	131,852	141,014	150,649	161,754	174,240	187,812	202,485	218,220	234,917	252,852	272,150	292,922	303,701	314,877	326,465	338,481	350,940	363,859	377,254	391,143	405,544	420,477

Aggregate by line

	2009/10 A	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
FN	300,613	315,363	331,698	348,801	367,059	386,318	406,609	428,543	451,644	475,996	501,654	528,706	543,544	558,815	574,530	590,704	607,351	624,484	642,119	660,270	678,953	698,184
KL	89,603	94,385	99,451	104,768	110,514	116,591	123,012	129,938	137,241	144,957	153,111	161,730	166,569	171,558	176,704	182,010	187,483	193,126	198,947	204,949	211,141	217,526
WH	397,539	410,533	422,408	433,403	447,953	463,266	479,129	495,437	511,853	528,748	546,297	564,445	578,445	592,808	607,545	622,667	638,183	654,104	670,441	687,205	704,408	722,061
AI	667,034	693,923	720,326	747,608	776,393	806,368	837,538	871,121	906,024	942,334	980,091	1,019,376	1,048,876	1,079,249	1,110,522	1,142,720	1,175,874	1,210,010	1,245,160	1,281,353	1,318,622	1,356,999
HM	528,445	563,674	600,922	654,264	702,574	755,053	811,572	872,185	936,374	1,005,127	1,079,169	1,158,702	1,201,582	1,246,090	1,292,288	1,340,242	1,390,022	1,441,699	1,495,347	1,551,045	1,608,871	1,668,911
Total	1,983,234	2,077,878	2,174,806	2,288,844	2,404,493	2,527,595	2,657,859	2,797,225	2,943,137	3,097,162	3,260,323	3,432,960	3,539,016	3,648,520	3,761,589	3,878,344	3,998,912	4,123,424	4,252,013	4,384,822	4,521,995	4,663,682
Total (m)	1.98	2.08	2.17	2.29	2.40	2.53	2.66	2.80	2.94	3.10	3.26	3.43	3.54	3.65	3.76	3.88	4.00	4.12	4.25	4.38	4.52	4.66

Growth from 2011/12

		2016/17	2020/21	2029/30
FN1	FN	33%	40%	49%
FN2	FN	30%	38%	45%
FN3	FN	28%	35%	42%
FN4	FN	27%	33%	40%
FN5	FN	30%	37%	45%
KL1	KL	32%	40%	48%
KL2	KL	32%	39%	47%
KL3	KL	30%	37%	45%
KL4	KL	22%	28%	33%
WH1	WH	21%	25%	30%
WH2	WH	18%	22%	27%
WH3	WH	19%	24%	28%
WH4	WH	17%	21%	25%
WH5	WH	19%	23%	28%
WH6	WH	17%	21%	24%
WH7	WH	12%	15%	18%
AI1	AI	21%	26%	31%
AI2	AI	21%	26%	31%
AI3	AI			
AI4	AI	22%	27%	33%
AI5	AI	19%	23%	27%
AI6	AI	18%	22%	27%
HM1	HM	46%	56%	67%
HM2	HM	40%	50%	60%
HM3	HM	53%	67%	82%
HM4	HM	52%	63%	75%
HM5	HM	45%	56%	68%

APPENDIX

C

DETAILED FORECAST LOADINGS BY SERVICE BY FORECASTING SCENARIO

C1.1 Output shows 2011 counts and load factor forecasts, assuming constant timetable and rolling stock for 2016, 2020 and 2029, for Min, Max and Max+ cases. Counts are shown at the following locations:

- Far North Line: At Inverness
- Kyle Line: At Inverness, South of Dingwall.
- West Highland Line: Glasgow Queen Street, West of Fort William
- Aberdeen-Inverness: At Inverness
- Highland Mainline: At Inverness

C1.2 Blue shading represents forecast load factor between 60% and 90%, pink shading represents forecast load factor greater than 90%. Yellow shading is where no count was taken.

SB	INVERNESS							2011	2011	2016	2016	2016	2020	2020	2020	2029	2029	2029
DEPART	ARRIVE	ORIGIN	DESTINATION		Stock	Seats	Critical Load	Count	Min	Max	Max+	Min	Max	Max+	Min	Max	Max+	
ARDGAY	0748	0625	INVERNESS	c158		124	35	28%	29%	32%	36%	30%	36%	45%	33%	46%	58%	
LAIRG	0812	0634	INVERNESS	c158		124	101	81%	85%	93%	105%	88%	103%	130%	96%	132%	167%	
WICK	1035	0620	INVERNESS	c158		124	95	77%	80%	87%	99%	82%	97%	122%	90%	124%	157%	
WICK	1213	0812	INVERNESS	c158		124	47	38%	39%	43%	49%	41%	48%	60%	45%	62%	78%	
DINGWALL	1325	1254	INVERNESS	c158		124		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
INVERGORDON	1628	1538	INVERNESS	c158		124		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
WICK	1648	1236	INVERNESS	c158		124	41	33%	34%	38%	43%	36%	42%	53%	39%	54%	68%	
WICK	2010	1600	INVERNESS	c158		124	24	19%	20%	22%	25%	21%	24%	31%	23%	31%	40%	
ARDGAY	2044	1926	INVERNESS	c158		124	6	5%	5%	5%	6%	5%	6%	8%	6%	8%	10%	
TAIN	2324	2220	INVERNESS	c158		124	1	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	

NB			INVERNESS														
DEPART	ORIGIN	DESTINATION	ARRIVE	Stock	Seats	Critical Load											
INVERNESS	0706	WICK	0706	c158	124	10	8%	8%	9%	10%	9%	10%	13%	10%	13%	17%	
INVERNESS	1038	WICK	1038	c158	124	44	35%	37%	40%	46%	38%	45%	57%	42%	58%	73%	
INVERNESS	1216	DINGWALL	1216	c158	124	10	8%	8%	9%	10%	9%	10%	13%	10%	13%	17%	
INVERNESS	1359	WICK	1359	c158	124	58	47%	49%	53%	60%	50%	59%	75%	55%	76%	96%	
INVERNESS	1439	INVERGORDON	1439	c158	124		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
INVERNESS	1715	ARDGAY	1715	c158	124	116	94%	97%	106%	121%	101%	118%	149%	110%	152%	191%	
INVERNESS	1752	E OF LOCHALSH/N	1752	2xc158	248	113	46%	47%	52%	59%	49%	58%	73%	54%	74%	93%	
INVERNESS	2109	TAIN	2109	c158	124	29	23%	24%	27%	30%	25%	30%	37%	28%	38%	48%	

ORIGIN	DEPART	DESTINATION	INVERNESS DEPART	Stock	Seats	2011 Load at INV	2011 Count	2016 Min	2016 Max	2016 Max+	2020 Min	2020 Max	2020 Max+	2029 Min	2029 Max	2029 Max+	2011 Load at DIN	2011 Count	2016 Min	2016 Max	2016 Max+	2020 Min	2020 Max	2020 Max+	2029 Min	2029 Max	2029 Max+
Inverness	0900	KYLE OF LOCHALSH	0900	c158	124	30	24%	25%	28%	32%	26%	31%	39%	28%	40%	51%	107	86%	89%	99%	113%	92%	110%	140%	99%	144%	183%
Inverness	1101	KYLE OF LOCHALSH	1101	c158	124	81	65%	68%	75%	85%	70%	84%	106%	75%	109%	139%	75	60%	63%	69%	79%	65%	77%	98%	70%	101%	128%
Inverness	1334	KYLE OF LOCHALSH	1334	c158	124	56	45%	47%	52%	59%	48%	58%	73%	52%	75%	96%	15	12%	13%	14%	16%	13%	15%	20%	14%	20%	26%
Inverness	1752	KYLE OF LOCHALSH/WICK	1752	2xc158	248	113	46%	47%	52%	60%	49%	58%	74%	52%	76%	97%	64	26%	27%	30%	34%	28%	33%	42%	30%	43%	55%

ORIGIN	INVERNESS ARRIVE	DEPART	DESTINATION	Stock	Seats	Load at INV																					
KYLE OF LOCHALSH	0853	0621	INVERNESS	c158	124	84	68%	70%	77%	89%	72%	87%	110%	78%	113%	144%	38	31%	32%	35%	40%	33%	39%	50%	35%	51%	65%
KYLE OF LOCHALSH	1437	1203	INVERNESS	c158	124	53	43%	44%	49%	56%	46%	55%	70%	49%	71%	91%	31	25%	26%	29%	33%	27%	32%	41%	29%	42%	53%
KYLE OF LOCHALSH	1706	1435	INVERNESS	c158	124	16	13%	13%	15%	17%	14%	17%	21%	15%	22%	27%	46	37%	38%	42%	48%	40%	47%	60%	43%	62%	79%
KYLE OF LOCHALSH	1949	1715	ELGIN	c158	124	22	18%	18%	20%	23%	19%	23%	29%	20%	30%	38%	28	23%	23%	26%	30%	24%	29%	37%	26%	38%	48%

ORIGIN	DEPART	DESTINATION	GLASGOW QUEEN STREET DEPART	Stock	Seats Glas	Seats At Terminus	Glas Load	2011 Count	2016 Min	2016 Max	2016 Max+	2020 Min	2020 Max	2020 Max+	2029 Min	2029 Max	2029 Max+	Load at FTW	2011 Count	2016 Min	2016 Max	2016 Max+	2020 Min	2020 Max	2020 Max+	2029 Min	2029 Max	2029 Max+
GLASGOW QUEEN STREET	0821	OBAN	0821	c156	290	290	61	21%	22%	24%	25%	22%	26%	28%	25%	32%	35%											
FORT WILLIAM	0830	MALLAIG	0830	c156	290	290												15	5%	5%	6%	6%	6%	6%	7%	6%	8%	9%
GLASGOW QUEEN STREET	0907	MALLAIG	0907	2xc156	290	290	57	20%	20%	22%	23%	21%	24%	26%	23%	30%	33%	226	78%	81%	87%	91%	83%	96%	104%	92%	120%	130%
GLASGOW QUEEN STREET	1221	OBAN/MALLAIG	1221	2xc156	435	145	116	27%	28%	30%	31%	28%	33%	36%	32%	41%	44%	59	41%	42%	46%	48%	43%	50%	54%	48%	63%	68%
GLASGOW QUEEN STREET	1821	OBAN/MALLAIG	1821	2xc156	290	145	100	34%	36%	39%	40%	37%	43%	46%	41%	53%	58%	10	7%	7%	8%	8%	7%	9%	9%	8%	11%	12%

ORIGIN	DEPART	DESTINATION	GLASGOW QUEEN STREET ARRIVE	Stock	Seats Glas	At Origin																					
ARROCHAR AND TARBERT	0710	GLASGOW QUEEN STREET	0821	c156	145	145	51	35%	36%	39%	41%	38%	43%	47%	42%	54%	59%											
OBAN/MALLAIG	603	GLASGOW QUEEN STREET	1130	c156	290	145	69	24%	25%	27%	28%	25%	29%	32%	28%	37%	40%	10	7%	7%	8%	8%	7%	9%	9%	8%	11%	12%
MALLAIG	1010	GLASGOW QUEEN STREET	1530	c156	290	290	83	29%	30%	32%	34%	31%	35%	38%	34%	44%	48%	74	26%	26%	29%	30%	27%	31%	34%	30%	39%	43%
OBAN	1256	GLASGOW QUEEN STREET	1600	c156	290	290	67	23%	24%	26%	27%	25%	28%	31%	27%	36%	39%											
MALLAIG	1605	GLASGOW QUEEN STREET	2131	c156	435	290	50	11%	12%	13%	13%	12%	14%	15%	14%	18%	19%	100	34%	36%	39%	40%	37%	43%	46%	41%	53%	58%
MALLAIG	1815	FORT WILLIAM	N/A	c156	145	145												7	5%	5%	5%	6%	5%	6%	6%	6%	7%	8%

ORIGIN	DEPART	DESTINATION	INVERNESS DEPART	Stock	Seats	2011 Critical Load	2011 Count	2016 Min	2016 Max	2016 Max+	2020 Min	2020 Max	2020 Max+	2029 Min	2029 Max	2029 Max+
INVERNESS	0558	ABERDEEN	0558	c158+c170	313	21	7%	7%	8%	8%	7%	8%	9%	8%	11%	12%
INVERNESS	0710	ABERDEEN	0710	c158	124	30	24%	25%	27%	29%	26%	30%	34%	28%	39%	44%
INVERNESS	0903	ABERDEEN	0903	c158	124	56	45%	47%	51%	55%	48%	57%	64%	53%	74%	83%
INVERNESS	1058	ABERDEEN	1058	c158	124	55	44%	46%	50%	54%	47%	56%	63%	52%	72%	81%
INVERNESS	1242	ABERDEEN	1242	c170	189	51	27%	28%	31%	33%	29%	34%	38%	31%	44%	49%
INVERNESS	1427	ABERDEEN	1427	c158	124	60	48%	50%	55%	59%	51%	61%	68%	56%	79%	89%
INVERNESS	1521	ABERDEEN	1521	c158	124	57	46%	47%	52%	56%	49%	58%	65%	54%	75%	84%
INVERNESS	1711	ABERDEEN	1711	c158	124	79	64%	66%	72%	77%	68%	80%	90%	74%	104%	117%
INVERNESS	1810	ABERDEEN	1810	c158	124	49	40%	41%	45%	48%	42%	50%	56%	46%	64%	72%
INVERNESS	2120	ABERDEEN	2120	c170	189	31	16%	17%	19%	20%	17%	21%	23%	19%	27%	30%

DEPART	INVERNESS ARRIVE	ORIGIN	DESTINATION	Stock	Seats	Critical Load									
0700	0748	ELGIN	INVERNESS	c158	124	30	24%	25%	27%	29%	26%	30%	34%	28%	39%	44%
0614	0841	ABERDEEN	INVERNESS	2xc170	378	89	24%	24%	27%	28%	25%	30%	33%	27%	38%	43%
0625	0940	MONTROSE	INVERNESS	c158	124	42	34%	35%	38%	41%	36%	43%	48%	39%	55%	62%
0823	1040	ABERDEEN	INVERNESS	c158	124	68	55%	57%	62%	66%	58%	69%	78%	64%	89%	100%
1014	1225	ABERDEEN	INVERNESS	c158	124	79	64%	66%	72%	77%	68%	80%	90%	74%	104%	117%
1159	1410	ABERDEEN	INVERNESS	c158	124	54	44%	45%	49%	53%	46%	55%	62%	51%	71%	80%
1340	1559	ABERDEEN	INVERNESS	c158	124	49	40%	41%	45%	48%	42%	50%	56%	46%	64%	72%
1525	1747	ABERDEEN	INVERNESS	c170	189	70	37%	38%	42%	45%	39%	47%	52%	43%	60%	68%
1718	1938	ABERDEEN	INVERNESS	c158+c170	313	20	6%	7%	7%	8%	7%	8%	9%	7%	10%	12%
1820	2033	ABERDEEN	INVERNESS	2xc158	248	22	9%	9%	10%	11%	9%	11%	13%	10%	14%	16%
2007	2224	ABERDEEN	INVERNESS	c158	124	24	19%	20%	22%	23%	21%	24%	27%	23%	32%	35%

ORIGIN	DEPART	DESTINATION	INVERNESS DEPART	stock	seats	Critical load	2011 Count	2016 Min	2016 Max	2016 Max+	2020 Min	2020 Max	2020 Max+	2029 Min	2029 Max	2029 Max+
INVERNESS	0451	EDINBURGH	0451	c170	189	7	4%	4%	5%	5%	4%	5%	7%	5%	7%	10%
INVERNESS	0647	EDINBURGH	0647	c170	189	46	24%	27%	30%	35%	29%	34%	47%	35%	48%	65%
INVERNESS	0656	AVIEMORE	0656	c158	124		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
INVERNESS	0755	KGX	0755	HST	539	161	30%	33%	37%	43%	36%	42%	58%	43%	59%	80%
INVERNESS	0918	GQS	0918	c170	189	80	42%	47%	52%	61%	51%	60%	82%	61%	83%	113%
INVERNESS	1047	EDINBURGH	1047	2xc158	248	108	44%	49%	53%	63%	53%	62%	84%	63%	86%	117%
INVERNESS	1247	EDINBURGH	1247	c170	189	96	51%	57%	62%	74%	62%	72%	98%	73%	100%	136%
INVERNESS	1451	GQS	1451	c170	189	17	9%	10%	11%	13%	11%	13%	17%	13%	18%	24%
INVERNESS	1653	EDINBURGH	1653	c170	189	101	53%	60%	65%	78%	65%	76%	103%	77%	105%	143%
INVERNESS	1843	EDINBURGH	1843	c170	189	59	31%	35%	38%	45%	38%	44%	60%	45%	61%	84%
INVERNESS	2015	GQS	2015	c170	189	31	16%	18%	20%	24%	20%	23%	32%	24%	32%	44%

ORIGIN	INVERNESS ARRIVE	DEPART	DESTINATION	stock	seats	Critical load									
AVIEMORE	0843	0757	INVERNESS	c158	124	9	7%	8%	9%	11%	9%	10%	14%	10%	14%	19%
GQS	1029	0706	INVERNESS	c170	189	87	46%	52%	56%	67%	56%	65%	89%	66%	90%	123%
EDINBURGH	1154	0833	INVERNESS	c170	189	96	51%	57%	62%	74%	62%	72%	98%	73%	100%	136%
GQS	1327	1011	INVERNESS	c170	189	100	53%	59%	65%	77%	64%	75%	102%	76%	104%	142%
EDINBURGH	1506	1135	INVERNESS	c170	189	82	43%	49%	53%	63%	53%	61%	84%	62%	85%	116%
EDINBURGH	1705	1335	INVERNESS	2xc158	248	112	45%	51%	55%	66%	55%	64%	87%	65%	89%	121%
GQS	1934	1611	INVERNESS	c170	189	105	56%	62%	68%	81%	67%	79%	107%	80%	109%	149%
KGX	2008	1200	INVERNESS	HST	539	129	24%	27%	29%	35%	29%	34%	46%	34%	47%	64%
EDINBURGH	2103	1741	INVERNESS	c170	189	47	25%	28%	30%	36%	30%	35%	48%	36%	49%	67%
EDINBURGH	2314	1935	INVERNESS	c170	189	31	16%	18%	20%	24%	20%	23%	32%	24%	32%	44%
EDINBURGH	0005	1930	INVERNESS	c170	189	12	6%	7%	8%	9%	8%	9%	12%	9%	12%	17%

CONTROL SHEET

Project/Proposal Name	4CastOD
Document Title	Rail Passenger Forecasting Study
Client Contract/Project No.	Click here to enter text.
SDG Project/Proposal No.	22362901

ISSUE HISTORY

Issue No.	Date	Details
1.0	12 February 2012	First full draft to client
2.0	29 February 2012	Final Draft
3.1	24 April 2012	Final Report to Client

REVIEW

Originator	Duncan Edmondson	
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DISTRIBUTION

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