


HI TRANS

MIDNIGHT TRAIN TO GEORGEMAS

SYSTRA

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1. INTRODUCTION

1.1.1 HITRANS commissioned SYSTRA to undertake a study investigating the feasibility of running an internal Scottish overnight rail service from Caithness to the Central Belt and vice versa. Such a service would provide Sleeper accommodation and day coaches and would provide accommodation for parcels and other small high value items. Consideration has also been given to the operation of a mixed service, conveying both passenger and freight.

1.1.2 The aims of the study were to:

- Investigate current passenger and freight markets and connectivity from Orkney/Caithness to Central Belt;
- Investigate train pathing to permit the sleeper to operate, including access to Central Belt for passenger and freight;
- Review possible rolling stock and traction options;
- Appraise freight opportunities;
- Review of mixed train operations; and
- Provide indicative costings for the service.

1.1.3 The project has been initiated following discussions between HITRANS officials and various other 'stakeholders' about the feasibility of running an internal Scottish Sleeper service from Caithness (for Orkney) to Central Scotland and potentially improving connectivity for some of the remoter parts of the country.

2. BACKGROUND INFORMATION

2.1 Existing coach and rail services

2.1.1 The Caithness area is served by the Far North Line and links Inverness to Thurso and Wick by four trains per day (Monday-Saturday) and one train on a Sunday. The journey times range from 3hrs38mins to 3hr56mins for trips to Thurso. To travel on to Glasgow or Edinburgh the journey time is between 7hr26 and 7hr51, including the transfer time in Inverness.

2.1.2 Recent Monthly Performance Results from ScotRail for 30th April – 27th May 2017 show that less than **40%** of these ScotRail services reach Wick on time and less than 2/3rd of them (**64%**) arrive within 5 minutes of their scheduled arrival time.

2.1.3 A 'Far North Line Review Team' has been set up to tackle this reliability issue and to consider other potential improvements to the passenger experience on this route, including potential infrastructure improvements for the next investment period (CP6 2019-2024).

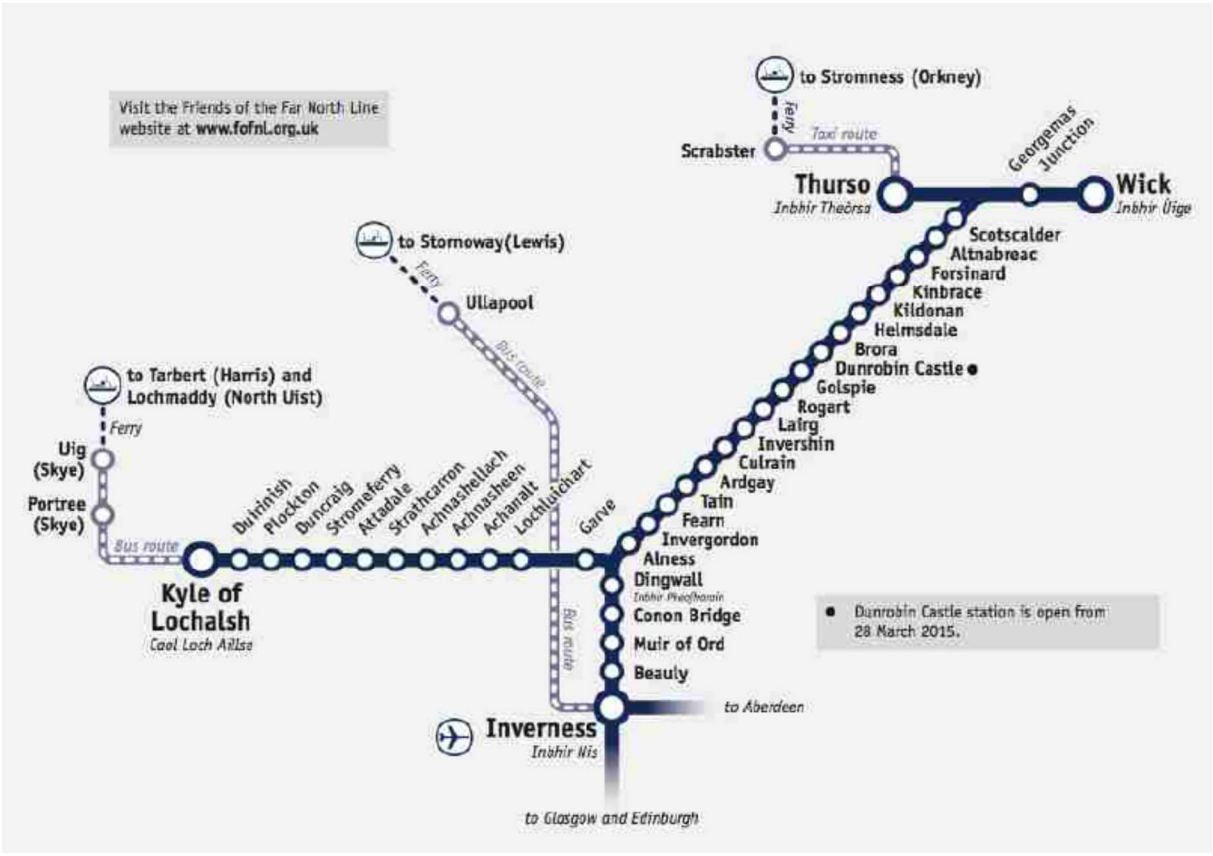

Figure 1. Far North Line (Source: ScotRail.co.uk)

2.1.4 Stagecoach operate the X99 Scrabster and Thurso to Inverness service which takes 3hr17 to 3hr30 and can connect with the Citylink Inverness to Edinburgh and Glasgow service. The current total journey time from Thurso to Glasgow/Edinburgh ranges between 7hr19 and 8hrs45. In contrast to the rail service which tends to operate from Inverness to Thurso then Wick, bus services often operate from Inverness to Wick then Thurso, increasing the journey time for Thurso passengers.

2.2 Caledonian Sleeper

2.2.1 The current Caledonian Sleeper service is formed of two cross-border trains to and from London per night, the Lowlander serving Glasgow and Edinburgh, and the Highlander serving Aberdeen, Fort William and Inverness. The trains include a combination of seating areas and sleeping berths.

2.2.2 The Highland sleeper from London has three portions which split around 04:30 at Edinburgh into a portion for Perth, Aviemore and Inverness, another for Dundee and Aberdeen, and the third for Fort William. The Lowland sleeper has two portions which split at Carstairs, one for Edinburgh and one for Glasgow.

2.2.3 Following the end of the First Group ScotRail franchise in March 2015, the Sleeper has been operated by Serco as a dedicated franchise, '*The Caledonian Sleeper*', let by Transport Scotland.

2.2.4 The National Passenger Rail Survey (NRPS) publishes results on each franchise in the UK and there were a number of outputs from the survey which would be of relevance to the Caithness sleeper, in particular the journey purpose, frequency of travel, views on the rolling stock and ticket types.

- 14% of the sample (609 people) used the Sleeper for travelling for work with 90% of tickets bought at least 2 weeks in advance;
- There are a low number of people who use the service frequently with only 9% using the service 2-3 times a month or more;
- The majority of respondents were using the service for the first time – 51%;
- 56% reported that the upkeep and repair of the service is very/fairly good and 25% reporting it was very poor or fairly poor;
- 67% reported value for money was very/fairly good;
- 64% reported sufficient room in your bed/compartment was very/fairly good;
- 59% reported getting a good night's sleeper was very/fairly good; and
- The ticket breakdown is: First class - 33%; Standard berth (twin) - 44%; Standard berth (solo) - 3% and Standard seat - 20%.

2.2.5 Serco report that the Preston call (0436 southbound, 0100 northbound) is used by some business passengers from the Highlands to fly from Manchester airport, because it enables them to use flights departing too early, or arriving too late, to have connections from any of the Scottish airports[1]. Given the potential arrival times in large population centres such as Inverness, this evidence is particularly relevant.

2.3 Car-based Travel to/from the Caithness /Orkney area

2.3.1 Table 1 shows Google-based estimates of the car journey times from Glasgow and Edinburgh to Inverness and Thurso for a Tuesday, mid-morning northbound journey. The cost for car journeys is calculated using the rate per business mile for 2017-2018 (45p)[2] and an assumed car occupancy of 1.5 which was the average car occupancy from the 2015 Scottish Household Survey Travel Diary[3]. A journey time and cost from Orkney has also been included which assumes an average of occupancy of 1.5 for the cars using the Pentland Firth ferries and a weighted average fare, based on the seasonal and resident/visitor splits implied by the mobile phone data purchased by HITRANS and SYSTRA for this Study (see Appendix B for details). (ie Orkney residents using the ferry are assumed to get a 30% discount).

[1] Research for TRAN Committee – Passenger night trains in Europe: the end of the line? (2017)
[2] https://www.gov.uk/guidance/rates-and-thresholds-for-employers-2017-to-2018
[3] Table TD9 Percentage of car stages by car occupancy

Table 1. Car-based travel

	THURSO			INVERNESS			ORKNEY	
	Miles	Journey time	Cost	Miles	Journey time	Cost	Journey time[4]	cost
Glasgow	276	5hr20-5hr50	£82.80	169	3hr10-3hr40	£50.70	7hr10-7hr40	£133.06
Edinburgh	263	5hr10-6hr	£78.90	155	3hr-3hr50	£46.50	7hr10-8hr	£129.16

2.4 Existing Ferry Services and Potential Changes to These

NorthLink

2.4.1 Serco Ltd began operations of NorthLink Ferries on 5th July 2012. They operate three passenger vessels on the Orkney & Shetland routes: the MV Hjaltland, MV Hrossey and MV Hamnavoe. NorthLink operate the Lerwick-Kirkwall-Aberdeen service which leaves every day from Lerwick and Aberdeen and calls at Kirkwall on a Tuesday, Thursday, Saturday and Sunday (NB) and Monday, Wednesday and Friday (SB). This service is an overnight ferry with berths available for passengers at an additional cost.

2.4.2 NorthLink also operate the Scrabster to Stromness service, which is a 90 minute crossing with two crossings per day throughout the majority of the year and an additional day sailing during the peak months.

2.4.3 National Entitlement Cards (NEC) entitle islanders to two return trips to the mainland per year. These trips can be on the Aberdeen boat and include the cost of a berth, so the service attracts many who are NEC eligible. Travel for hospital appointments also includes travel and berths on the Aberdeen service.

2.4.4 Residents of Orkney or Shetland receive a 30% discount on standard NorthLink Ferries fares and can nominate up to six family and friend households who can also benefit from the 30% discount.

2.4.5 HITRANS and SYSTRA purchased a set of travel pattern data based on mobile phone tracking data for this study (See Appendix B for details). This data has been used to weight the fare and provide a weighted average of the low, mid and peak season fares. A fare which includes the islander discount of 30% has also been calculated and presented in Table 2.

[4] Boat journey time assumed to be two hours (30 min wait time and 90 min on board)

Table 2. Scrabster to Stromness ferry fares

	LOW	MID	PEAK	WEIGHTED (SEASONAL)	WEIGHTED (ISLAND DISCOUNT AND SEASONAL)[5]
Adult single	£16.65	£18.00	£19.40	£17.89	£16.23
Car single	£53.00	£55.00	£59.00	£55.25	£50.14

Pentland Ferries

2.4.6 Pentland Ferries is a privately operated business with three sailings per day between Gills Bay (west of John o' Groats) and St Margaret's Hope (on South Ronaldsay in the Orkney Islands) and an additional sailing during peak months (additional sailing is on a Saturday in May, Friday and Saturday in June and Monday, Thursday, Friday and Saturday in July and August). The crossing takes approximately 1 hour.

2.4.7 The current adult ferry fare is £16 and car ferry fare is £38. No islander discount is available on these services and there is no seasonal variation in these fares.

2.5 Air Services to Orkney and Wick

2.5.1 Flybe (Loganair from 1st September 2017) currently operate air services from Wick and Kirkwall to Glasgow and Edinburgh. An Air Discount Scheme provides up to 50% discount on eligible routes. The Air Discount Scheme is available to anyone whose permanent/main residence is in Orkney, Shetland, Caithness or North West Sutherland. The main aim of the scheme is to make air services more affordable for remote communities in the Highlands & Islands and facilitate accessibility and social inclusion. The scheme is popular and 93% of eligible residents have signed up to the scheme in Orkney and 38% in Caithness, N W Sutherland and Lairg[6]

2.5.2 Table 3 shows the flight times, annual passenger movements and average fares for the Kirkwall to Edinburgh, Kirkwall to Glasgow and Wick to Edinburgh services. The average fare is calculated based on the fares on the Flybe and Loganair website for all flights on 25/07/2017, 16/08/2017, 03/10/2017 and 05/12/2017. The average fare with the Air Discount Fare is also included. This assumes a discount of 50% for 80% of the travellers (assumption that 80% of travellers are residents and signed up to the ADS).

2.5.3 The flight times to Edinburgh allow for almost a full day of work, approximately 0935-1630 in Central Edinburgh (assuming 15 minutes to leave plane/airport and 30 minute journey to Central Edinburgh. Leaving at 1630 to allow for travel to airport and security) but travellers may have to leave meetings early. Air passengers travelling from Wick to

[5] Resident/non-resident split based on mobile phone data movements to Glasgow and Edinburgh from Orkney/Caithness

[6] https://www.transport.gov.scot/news/boost-for-highlands-and-islands-as-air-discount-scheme-renewed/

Edinburgh or from Kirkwall to Glasgow would require an overnight stay to achieve a full working day in the respective cities.

Table 3. Flight times and fares

	SOUTH-BOUND	NORTH-BOUND	ANNUAL PASSENGERS	AVERAGE FARE	AVERAGE FARE WITH ADS DISCOUNT
Kirkwall – Edinburgh	0740-0850	0920-1035	44,500	£102	£60.98
	1105-1215	1250-1405			
	1610-1720	1800-1915			
Kirkwall – Glasgow	1020-1130	1425-1540	17,400	£103	£61.55
Wick - Edinburgh	1315-1415	1140-1245	11,100	£78	£46.56

2.6 Mobile Phone-based Estimates of Current Travel Patterns

2.6.1 HITRANS and SYSTRA purchased some mobile phone tracking data to inform this Study. The data covered movements between Orkney and the Caithness area, excluding trips travelling to/from Orkney and Caithness by air and those using the NorthLink ferry services to Aberdeen.

2.6.2 The data was collected from 3 x 2-week periods in 2016, chosen to represent 'low season', mid-season and 'high season' travel demand conditions and disaggregated to distinguish between residents of the Orkney/Caithness area and visitors to it and by the number of nights between the two legs of the relevant return trips.

2.6.3 Further details of this dataset are provided in Appendix B.

2.6.4 The resulting estimates of average weekly and average numbers of return journeys implied by the mobile phone data are shown in Table 4 and Figure 2.

2.6.5 The exclusion of trips travelling to/from Orkney and Caithness by air and those using the NorthLink ferry services to Aberdeen, represent a potential additional upside, if the proposed sleeper service can also attract trips from these other two existing routes to/from Orkney.

Table 4. Mobile Phone Data-based Estimates of 'In-scope' Return trips per Week to/from Orkney/Caithness

ORIGIN/DESTINATION	DAY TRIP	OVERNIGHT	2-3 NIGHTS	4+ NIGHTS	TOTAL RETURN TRIPS PER WEEK
Inverness	99	29	27	24	178
Angus and Dundee	1	3	2	3	9
Perth and Kinross	4	5	5	8	22
Stirling, Falkirk and Clackmannanshire	3	3	3	4	13
Edinburgh, East Lothian, Midlothian, West Lothian and Fife	6	10	10	17	43
Strathclyde	9	12	12	16	49
D&G, Borders and RUK	23	26	12	25	87
Total "in-scope"	**145**	**88**	**70**	**98**	**401**
Highlands	1,052	245	72	50	1,418
Aberdeenshire and Moray	14	18	10	15	58
Aberdeen City	5	11	7	10	32

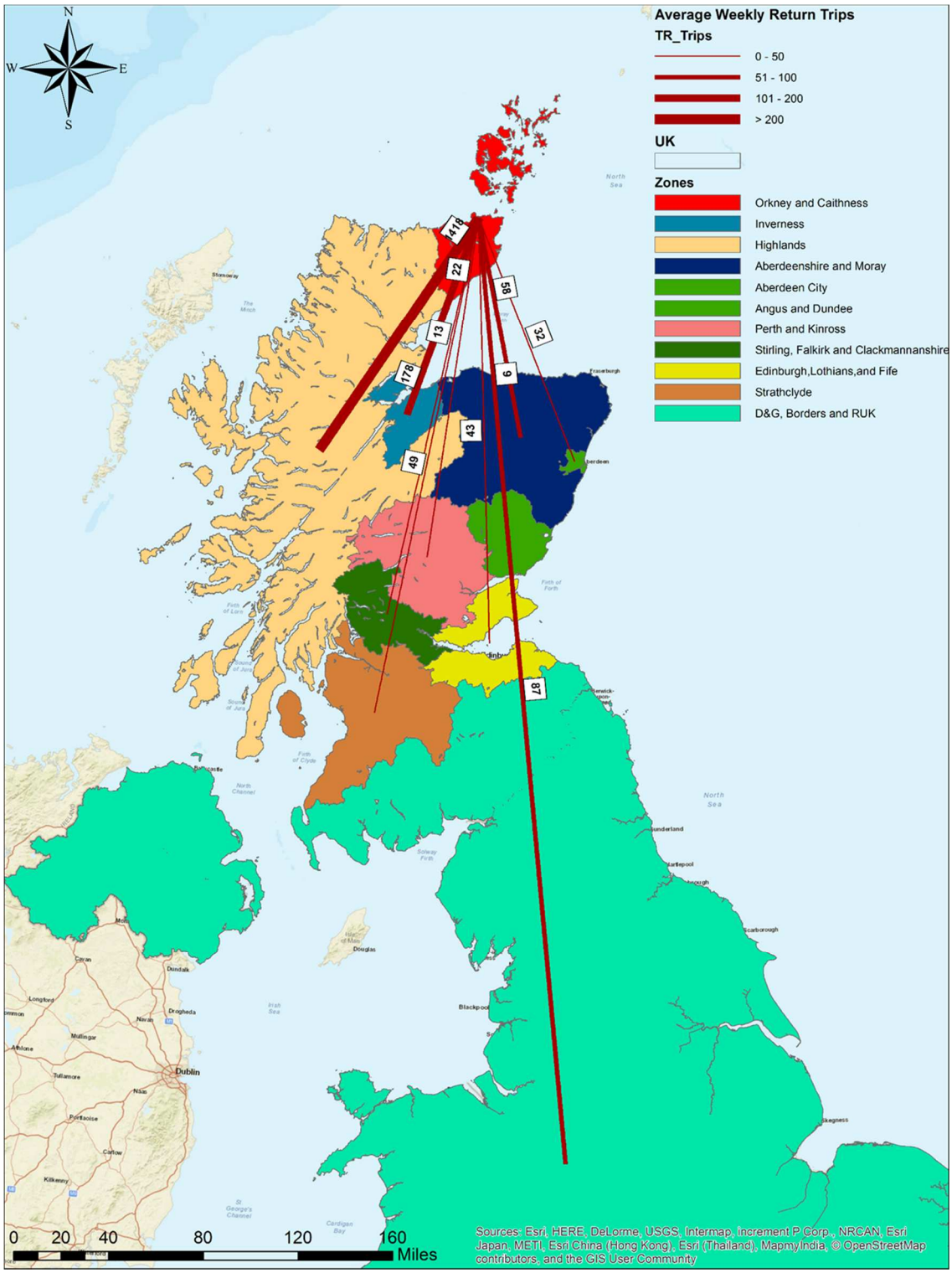

Figure 2. Mobile Phone Data-Based Estimates of 'In-Scope' Return Trips per Week

2.6.6 The mobile phone data (MPD) suggests that there are around 400 return trips per week which could be served by the sleeper (ie excluding any trips to elsewhere in Highland, Aberdeenshire and Moray and Aberdeen City).

2.6.7 The MPD also suggests that the Glasgow and Edinburgh areas have a similar level of demand, suggesting that both population centres should be considered as potential origins/destinations for the proposed sleeper service.

3. STAKEHOLDER CONSULTATION

3.1.1 Stakeholders covering business, residential, transport and tourism views were contacted and phone and face-to-face meetings were arranged.

3.1.2 The following individuals have been interviewed by SYSTRA staff for this Study:

- James Stockan – Orkney Islands Councillor
- Scott Armstrong – Visit Scotland
- Frazer Henderson and Darius Astell – Transport Scotland
- David Simpson – Serco Caledonian Sleeper
- Jenni Banks – Pentland Ferries
- Stewart Nicol – Inverness Chamber of Commerce
- Brian Archibald and Phyllis Towrie – Orkney Islands Council
- Kristopher Bevan – NorthLink Ferries
- Trudy Morris – Caithness Chamber of Commerce
- David Whiteford – North Highlands Initiative
- Robin Clarke – Highlands and Islands Enterprise

3.1.3 The discussions were adjusted to address the issues of most-relevance to the various stakeholders, but all interviews included the stakeholders' views on demand, existing travel patterns and potential destinations for the proposed services.

3.1.4 Appendix A provides a detailed note of all discussions and key points have been highlighted in the Problems/Issues, Constraints, Risks and Opportunities sections of this report.

4. PROBLEMS/ISSUES

Existing rail journey times and reliability

4.1.1 The Far North Line does not currently offer a competitive alternative to car travel. The journey time from Thurso to Inverness ranges from 3hrs38mins to 3hr56mins compared to 2hrs20min by car. There are also reliability issues on the rail service, with recent Monthly Performance Results from ScotRail for 30th April – 27th May 2017 showing that less than 40% of ScotRail services reach Wick on time, while more than 1 in 3 (36%) of them arrive more than 5 minutes later than their scheduled arrival time.

4.1.2 The view among many of the stakeholders was that rail was not an attractive option and rarely used by them or their colleagues, especially when travelling from Orkney.

Connections from Thurso to Scrabster and Gill's Bay

4.1.3 The Scrabster port is located two miles from the Thurso train station. Stagecoach operate a Thurso town circular – Scrabster service (78A) which could be used for a connection (dependent on rail arrival time). 'Rail Sail' tickets are currently available for the train and boat which includes a free transfer from Thurso station (by taxi). Anecdotal evidence suggests the uptake is low although tickets could be purchased online. It is unclear if the Islander discount can be applied to the ferry fare portion of the ticket.

4.1.4 Local taxi operators have recently been awarded a number of school transport contracts, this has resulted in a reduction in Stagecoach services in the area (who previously operated the contracts) and has also impacted on the availability of taxis at school pick up and drop off time.

4.1.5 Stagecoach offer a number of connections from Gill's Bay, where Pentland Ferries serve, including the 80 to Thurso and 77 to Wick, although the timings are not currently suitable for connections to the day rail service (for example, the Thurso bus leaves one hour after the arrival of the Pentland Ferries boat throughout the day). Recent changes to Stagecoach services have led to removal of the Gills Bay to Inverness service and Pentland Ferries highlighted there had been a drop in foot passengers on the service, potentially linked to the removal of this service.

Station facilities

4.1.6 Thurso station is a manned station with limited facilities for Sleeper passengers. Toilets are available (when the station is manned), but there are no self-serve ticket machines, showers, shop or left luggage facilities. Improvements to Thurso station and potentially other stations on the line may be required. Inverness station has shower, toilets and ticket machines available. Facilities for First Class Sleeper passengers are available across from the station at the Guest Services Centre. Facilities include free WiFi, showers (including accessible showers), complimentary snacks and refreshments.

Other modes – competition

4.1.7 As discussed above, the day rail service does not currently offer a competitive journey time compared to car. Day and Sleeper rail services would also be competing with flights, coach services and the boat from Kirkwall to Aberdeen. As described in Section 2.5 of this report, the Orkney to Edinburgh flights allow a day trip to Edinburgh which would be in direct competition with the Sleeper service. The Wick to Edinburgh and Orkney to Glasgow flight times require an overnight stay, which would presumably make the Sleeper a particularly attractive alternative for these journeys.

4.1.8 The proposed Sleeper would also be competing with the day rail service. An early morning service from Inverness to Edinburgh and Glasgow has recently been introduced. This leaves Inverness at 0536, reaches Perth in time to connect with the 0814 Perth-Glasgow service arriving into Glasgow at 0915 and travels on to arrive in Edinburgh at 0923. This service allows for a relatively early start in Glasgow and Edinburgh, but the 0536

departure time is likely to be unattractive to many, especially if compounded by a need to travel into Inverness station from beyond the central Inverness area.

4.2 Constraints

Signalboxes

4.2.1 At the present time the line between Elgin and Aberdeen is closed overnight. If the service were to be routed via Aberdeen there would be a need to open six signal boxes (Dyce, Inverurie, Insch, Kennethmont, Huntly, Keith) for an additional six hours each day to provide continuous operation. This issue may be mitigated somewhat by ongoing investment in the route, but in the short term this would create a significant cost (circa £250k per annum, six extra shifts operating each evening) to open the line overnight.

Engineering possessions

4.2.2 Engineering possessions have been reviewed as part of this study and identified that there are a number of sections on the proposed route which would require further consultation with Network Rail to resolve. The engineering possessions are discussed further in Section 6.5.

Car availability on arrival

4.2.3 Throughout the consultation stage of the study the stakeholders were asked for views on the requirement for a car at the traveller's destination. The responses varied, based on the journey purpose and destination. Orkney and Caithness have limited public transport services and so tourists and those visiting friends and family may find the lack of the car a bit limiting.

4.2.4 However there is 'reasonable' provision of hire cars on Mainland Orkney and the provision around the 'North Coast 500' route is probably also growing. A combination of conventional local taxis, 'Uber-style' services and these hire car services would help reduce the need for the visitors to bring their own cars, provided they are made aware of them and their tariffs and vehicle availability do not create significant barriers to their use. Car hire is available in Thurso and Orkney at a relatively low price (£40 per day in Orkney, £35 per day in Thurso).

4.2.5 The majority of respondents agreed that southbound travellers would benefit from the public transport system and taxi availability in Glasgow and Edinburgh and may not require a car if staying within the city.

4.3 Risks:

- Maintenance costs for sleeper carriages have been significantly higher than anticipated for Caledonian Sleeper.

- The Caithness Sleeper and Caledonian Sleeper would be offering different products (when new rolling stock is phased in for Caledonian Sleeper) which may impact on the branding of the product if they were offered under the same franchise.
- Mark 3 vehicles do not currently meet Persons of Reduced Mobility Technical Specification for Interoperability requirements, which come into force in 2020, although the equivalent vehicles in use on the Great Western sleeper have received a derogation from this process.

5. OPPORTUNITIES

North Coast 500

5.1.1 The North Coast 500 (NC500) is a 516 mile route from Inverness Castle routing round the North West of Scotland and returning to Inverness (http://www.northcoast500.com/). It was marketed and branded by the North Highland Initiative as the Scottish equivalent of the American Route 66. Recent research has found that the initiative has led to job and business growth in the area with stakeholder engagement highlighting that hire car companies are seeing increases in businesses and local super car and campervan hire companies have been started. The research was carried out by University of Glasgow Training and Employment Research Unit and reports that North Coast 500 brought 29,000 more visitors to the Highlands and added £9m to the region's economy[7].

5.1.2 NC500 has a cyclist itinerary and there is evidence of cyclist demand on the route which may benefit from marketing alongside the Sleeper and a more cycle friendly route (excluding the A9 section) could be branded recommending connections using the sleeper.

5.1.3 Inverness is currently seen as the main starting point but there could be opportunities to encourage people to start in Thurso and a local car hire company could build upon that.

Glasgow and Edinburgh

5.1.4 Stakeholder engagement indicated that Edinburgh is likely to be the most important origin/destination for Orkney/Caithness residents and visitors to the area. However, our analysis of the Mobile Phone Data (summarised in Section 2.6 and Appendix B) suggests that the current average travel demand is fairly similar between the Edinburgh and Glasgow areas, with a slightly higher proportion of Orkney and Caithness residents travelling to Edinburgh, but more of the visitors to the area currently starting their trip in the Glasgow area.

5.1.5 This suggests the desirability of serving both cities, if possible, to maximise demand on the services and not to dismiss either of these two destinations too quickly from consideration here.

[7] http://www.bbc.co.uk/news/uk-scotland-highlands-islands-40326188

Integration with Current Ferry Services

5.1.6 To maximise the viability of the service it would have to benefit communities in Orkney and Caithness. Providing a sleeper connection to the evening and morning sailings would make the service more attractive to Orkney residents/visitors.

Inverness

5.1.7 Inverness as an origin or destination represents a large component of the Caithness/Orkney travel according to the Mobile Phone Data. Although challenging, an attractive arrival and departure time at Inverness station may maximise the demand from the area.

Freight – small parcel freight

5.1.8 Shellfish is currently transported on the Inverness to London Highlander Sleeper. A similar service could be offered on the Caithness Sleeper to attract further revenue to the service.

Rolling stock availability

5.1.9 The Mark 3 coaches which are currently used as sleeping cars on the Caledonian Sleeper service between Scotland (Edinburgh, Glasgow, Fort William and Inverness) and London will shortly be replaced by new Mark 5 coaches, which are currently under construction in Spain.

5.1.10 When these Mark 3 coaches become available, they could potentially be used for 'testing the market' on the proposed new sleeper service to Orkney/Caithness. See Section 6.4 for more detail.

Other modes

5.1.11 The Wick to Edinburgh and Orkney to Glasgow flight times require an overnight stay and the Sleeper may be an attractive alternative.

5.1.12 NorthLink offer an overnight Kirkwall to Aberdeen sailing which is popular for day trips to Aberdeen for shopping, visiting families and friends and hospital visits. Travellers may also use the service to connect with the rail network in Aberdeen and those people may consider the Sleeper as an alternative (as journey times would be lower and they have a propensity to travel overnight).

5.1.13 Several stakeholders indicated that the sleeper could work well in partnership with other modes, for example, Orcadians could fly to Edinburgh in the morning and use the sleeper on the return journey, to avoid having to leave events and meetings early in the afternoon.

6. SLEEPER OPERATIONS

6.1 Introduction

6.1.1 This chapter takes into consideration the points outlined above and addresses the rail operations of a proposed Sleeper service. This chapter covers:

- Service Description and Routing Options
- Mixed train operations
- Traction and rolling stock options
- Timetable Planning

6.2 Service Description & Routing Options

6.2.1 The aim of the project is to provide an overnight passenger service linking Thurso with the Central Belt of Scotland. Such a service would help to improve connectivity between the Far North of Scotland and the Central Belt and beyond. Within this the service has a number of more specific objectives that it could fulfil and which impact on the planning of the service:

- Direct service from the Far North to Edinburgh and/or Glasgow
- Connection out of the last Stromness – Scrabster sailing each day to provide links from Orkney
- Connection into (ideally) the first Scrabster – Stromness sailing to provide links to Orkney
- Serve key intermediate stations between Thurso and Inverness
- Provide ample luggage accommodation (especially for tourists) as a selling point of the service
- Provide scope for a direct Parcels and small high value items service between the Far North and Edinburgh/Glasgow city centres

6.2.2 Initially a mixed train operation (conveying both passenger and freight vehicles) was also considered and the issues associated with delivering this are described in a separate chapter.

6.2.3 The following sections describe some of the key issues related to addressing these objectives that impact directly on the operation of the service.

Central Belt Destination Choice

6.2.4 There are two main destinations available in the Central Belt for the proposed service, Glasgow and Edinburgh. Within the work conducted so far an attempt has been made to serve both destinations with the aim of maximising the attractiveness of the service, however it would be possible to serve only one of the two cities.

6.2.5 From an operational perspective there are a number of considerations that influence destination choice:

- The existing Sleeper rolling stock is maintained at Glasgow Polmadie depot and if a similar arrangement were to continue then the rolling stock would have to be in the Glasgow area for servicing, if the service terminated at Edinburgh the service would have to return empty to Polmadie;
- Depending on the operator of the service it may be possible for the train to be serviced at Edinburgh Craigentinny depot;
- The use of Queen Street Low level station if the service were to call at Glasgow first and then Edinburgh. Pathing trains through this station and associated junction in west Glasgow in particular is complex, especially after the full passenger service has begun each morning and
- The availability of platforms for long periods at Edinburgh Waverley.

6.2.6 There are some additional considerations relating to the commercial attractiveness of the service. For example, it is not ideal for a service to pass through a major destination too early in the morning, as passenger would not wish to disembark too early in the day. Equally the service should not leave the central belt cities too early in the evening, but should ideally be available for passengers who wish to board well in advance of departure.

6.2.7 Our consideration here has started by considering the possibility that the proposed services would serve both Glasgow and Edinburgh in some way. More details of the service patterns considered are provided in Section 6.5.

Route Options

6.2.8 There are two main options for routing the service south of Inverness, either via Aberdeen or via Perth. Additionally there are a range of routes available for the service within the Central Belt. These are discussed in more detail below.

Inverness - Aberdeen

6.2.9 The operation of the service via the Inverness – Aberdeen route would allow intermediate stations on the route to benefit from the service, albeit with a relatively late departure and very early arrival in the intermediate stations such as Elgin. In the short term the operation of the service via this route would allow the service to operate consistently whilst the Highland Mainline receives upgrade work.

6.2.10 However the option of routing services via Aberdeen would have two impacts on the cost of the operation. Firstly routing via Aberdeen rather than Perth would add around 60 miles to the journey, with a corresponding impact on the distance related costs. It would also incur a time penalty that would also impact on costs and reduce flexibility in planning the service, and in the case of the northbound service would impact on the ability to meet the connect with the current morning sailing from Scrabster to Stromness.

6.2.11 The second issue relates to the availability of the route. At the present time, the line between Elgin and Aberdeen is closed overnight. If the service were to be routed via Aberdeen there would be a need to open six signalboxes (Dyce, Inverurie, Insch, Kennethmont, Huntly, Keith) for an additional six hours each day to provide continuous operation. This issue may be mitigated somewhat by ongoing investment in the route but

in the short term there would be a significant cost (circa £250k per annum) to open this line overnight.

Perth – Inverness

6.2.12 The route from Inverness to Perth is less commercially attractive, serving fewer centres of population, however it is shorter than the route via Aberdeen and is currently open continuously, apart from on Saturday nights. The route provides a more direct route to the Central Belt and provides the most suitable route for promoting a late departure from central Scotland and an early arrival in the Far North.

Arriving/Departing Edinburgh

6.2.13 Although the planning of services around Edinburgh Waverley can be very complex, there are options available to ease this issue, if required, by routing either the passenger service or associated empty coaching stock (ECS) workings via the Edinburgh Suburban Line which runs to the south of Edinburgh and allows trains from the west to run in a loop round the city and arrive in Edinburgh from the east end of the station.

6.2.14 If the service is loco-hauled, with no arrangements for driving the train from the rear, running the service via the South Suburban line would remove the need for the locomotive to run round at Edinburgh. The option also provides more flexibility in terms of platforming at Edinburgh, as running via the Suburban Line can avoid the need for the service to cross between the "North" and "South" Lines between Haymarket West Junction and Princes Street Gardens.

Arriving/Departing Glasgow

6.2.15 Dealing with the service in Glasgow is more complex. Both Central High Level and Queen Street High Level stations are termini, with no through platforms. Therefore if the service called at these stations there would be a need for the train to have either a locomotive or driving trailer included at the rear of the train or the train would have to be shunt released from the station. If the latter were to occur, this would preclude the use of Queen Street station, however such an operation would be possible at Central High Level station where Caledonian Sleeper currently have a locomotive available for moving the empty Lowland Sleeper train to and from Polmadie depot.

6.2.16 If the service were to ultimately terminate at Edinburgh then then the most effective way of routing the service would be via Glasgow Queen Street Low Level Station. For a service arriving via Highland Mainline and Stirling the routing would be as follows:

Larbert Jn – Carmuirs West Jn – Greenhill Lower Jn – Greenhill Upper Jn – Cowlairs East Junction – Cowlairs North Jn – Maryhill Park Junction – Anniesland - Partick – Finnieston West Jn – Glasgow Queen Street Low Level – Bellgrove - Airdrie

6.2.17 This above routing is the only way of turning the train in a loop through Glasgow. However, there is a limitation to this, as the route from Maryhill Park Junction to Anniesland which has a very restrictive loading gauge (W6) and a low Route Availability (RA) with only locomotives cleared for RA5 permitted to use the route. This route was

only opened in recent years and it is possible that the route is not cleared for higher RA locomotives or gauge cleared above W6 as there has been no need to clear the line for such vehicles.

6.2.18 It would also be possible to route the service from Finnieston West Jn via Glasgow Central Low Level, Rutherglen and either the route to Edinburgh via Shotts or via Carstairs.

Preferred Routing

6.2.19 It is felt that the best approach to route choice is to seek to maintain as much flexibility as possible over the key routes, to ensure that the service can continue to operate when engineering work takes place. With this in mind, no intermediate stops between Inverness and Edinburgh/Glasgow are proposed. Within the Central Belt, multiple options have been tested, but timetables in which trains arrive first at Glasgow before going forward to Edinburgh will use the route via Cowlairs, Anniesland, Glasgow Queen Street Low Level and the Airdrie – Bathgate route, whilst timetables involving trains arriving in Edinburgh first and then going forward to Glasgow will operate via Slateford Jn – Mid Calder Jn and Carstairs.

Intermediate Stations

6.2.20 Given the likely timing and routing of the train, there is only a limited case for intermediate calls on the route.

6.2.21 We believe that there should be no intermediate calls south of Inverness, to allow flexibility over routing during engineering work. However it is proposed to make intermediate stops north of Inverness. It has been assumed that stops will be included at all stations at which the train has to stop at for Radio Token Exchange purposes. This therefore includes calls at, Muir of Ord, Dingwall, Invergordon, Tain, Ardgay, Lairg, Rogart, Brora, Helmsdale, Forsinard and Georgemas Jn.

Serving Inverness

6.2.22 The operation of this service provides the potential to serve Inverness with an overnight service, however to make this service attractive it would be necessary to operate a portion from the main Thurso – Inverness train. This is necessary as the departure and arrival times of the train at Inverness would not be attractive with to passengers, with the service calling after midnight southbound and in the small hours northbound. Instead a portion would allow passengers to join the train earlier in the evening, before the portion joined the main train, with the arrangement working in reverse for northbound passengers.

6.3 Mixed Train Operation

6.3.1 One option to increase the versatility of the service is to operate it as a mixed train operation conveying both freight and passenger vehicles. Such an approach would be unprecedented in UK rail operation, since rail privatisation in the mid-1990s. Similar operations existed previously on the Far North Line up to 1984.

6.3.2 It should be noted that, while the operation of a mixed service whilst potentially add value to the overall impact of the service, doing so would add significantly to the complexity to the initial development of the service.

6.3.3 The following sections summarise the main issues associated with operating a Mixed Train version of the proposed service.

Operational Issues

6.3.4 There are a number of operational issues that a mixed train would create, relative to the operation of a conventional passenger train.

Impact on Train Weight & Traction

6.3.5 Operating a mixed train would be likely to impact on the traction requirements of the train. As described in Section 6.4 (where we consider Traction & Rolling Stock options), the passenger section of the train will load to a minimum of four vehicles or five with driving trailer vehicle, giving a total trailing load of 155 tonnes for a four coach train. The addition of, for example, two container wagons[8] could (when fully loaded) add up to 208 tonnes to the weight of the train, bringing the total up to a total load of 363 tonnes, which is well above the 328 tonnes that the Inverness portion of the Highland Sleeper currently loads to. NB The Inverness portion of the Highland Sleeper currently requires two Class 73/9 locomotives to operate the service, and in the past has relied on a single larger Class 47 or 67.

6.3.6 The preferred traction identified for the Caithness Sleeper uses a single Class 73/9, but the addition of freight traffic would be likely to require either a single larger loco or the use of two Class 73/9s as per the Inverness Sleeper if the service were to maintain time, especially over the steeply graded Highland Mainline. The additional weight would also impact on acceleration from the many stops for token exchange purposes that occur on the Far North Line. This would clearly have a cost impact on the proposed service.

Brake Force

6.3.7 Related to the weight issues described above is the issue of the **brake force** of the train. It is necessary for trains to have sufficient brake force in place to ensure that the train can stop safely from its planned operating speed. The brake force requirement is based around the relationship between the tare (unladen weight) and gross (laden) weight of the train. For passenger trains, this is less of an issue, since the gross weight broadly equals the tare weight, assuming that all vehicles have working brake equipment. However for freight trains there is a significant difference between the tare and gross weight of trains.

6.3.8 The impact of this requirement is that mixing freight and passenger traffic may require a lowering of the maximum speed of the train. Initial calculations suggest that, in the case of a Caithness Sleeper, the inclusion of two twin flat wagons for use by containers and intermodal traffic would limit the maximum speed of the train to 60mph if Class 73/9

[8] Assumed to be an FLA vehicle which allows 9'6" gauge boxes to be used on non gauge cleared routes

locomotives were to be used. This issue would be mitigated if a larger locomotive, such as a Class 67, were to be used.

Choice of Freight Vehicles

6.3.9 The next issue relates to the choice of freight vehicles. Many freight vehicles have different braking systems from passenger vehicles, and this makes the two types incompatible for regular operation. However some vehicles have the ability to switch between the two systems and this applies to most vehicles used on container trains which are permitted to travel at 75mph. It would be necessary to ensure the use of vehicles of this type on the proposed service.

Train Marshalling

6.3.10 The third issue would relate to the marshalling of the train. By their nature, freight vehicles are not equipped with through wiring for electric train supply or with cabling to permit multiple working between locomotives at each end of the train. The impact of this is that to operate a mixed train one of the following conditions would have to apply:

- The passenger stock is always marshalled adjacent to the locomotive if a single loco was in use;
- A second loco (with driver) would need to be marshalled at the rear of the train to provide train heating if it were not possible to marshal passenger stock next to the leading locomotive ;
- The wagons used would have to be modified to provide through wiring for train heating equipment if they were to be marshalled next to the train, this would require a dedicated fleet of vehicles. If such work to be conducted it may be sensible to provide drophead buckeye couplers, to provide consistency with couplers on passenger stock. This approach was used in the 1980's for mixed services between Aberdeen and Wick; and
- If Top & Tail operation were to be deployed, there would also be a need to through wire the wagons to allow multiple working between the locomotives.

Shunting Freight Wagons

6.3.11 A further issue relates to accessing freight terminals. It has been assumed that it will not be possible to operate the train on freight lines with passengers on board, and therefore all shunting of freight stock would have to be completed before passenger boarded and after they left the train. This would add to the time required to operate the service and in the case of the southbound service would complicate the transfer of both freight and passengers from Scrabster to the train, with little time likely to be available to get freight to the train without delaying passengers.

6.3.12 The only alternative would be to split or couple trains on running lines. This may be achievable at Georgemas Junction (with a time penalty) but would be more challenging in the Central Belt, with a need to split the train on running lines close to either Coatbridge or Mossend Yards. This would have a number of issues, specifically:

- The need for a loco to shunt the freight vehicles;

- The need for the signalling in the area to be equipped to treat such an operation as a permitted movement; and
- The impact on the many other local passenger trains that operate in the area.

6.3.13 Given all of these constraints, it is not recommended to proceed with this option.

Summary

6.3.14 As has been highlighted above there are a number of issues associated with operating a mixed train. While none of these are insurmountable, they add a level of complexity to a service which is already likely to be relatively complex to operate in a passenger-only form. It is therefore is recommended that the service be developed as a passenger-only train initially.

6.4 Traction & Rolling Stock Options

6.4.1 Consideration has been given to the most appropriate types of traction and rolling stock available to operate the service. The preferred mixture of traction & rolling stock is driven by the method of operation, which is considered in more detail below.

Method of Operation

6.4.2 There are a number of options which have been identified for the operation of the service as presented below:

- Loco hauled operation;
- Top & Tail working;
- Push – Pull Operation; or
- Use of High Speed Train rolling stock

Loco Hauled Operation

6.4.3 The first method of operation considered involves the use of a single loco to haul the train, the same method of operation currently employed on the Lowland and Highland Sleeper services. Whilst this method is satisfactory on the existing Sleeper services, it presents a constraint in terms of the delivery of a Caithness Sleeper service. The reason for this is the need for at least two reversals on route, firstly at Georgemas Junction where the service would reverse to get to and from the Thurso branch and secondly at Inverness where the service has to either reverse into or out of the station to get from the Far North Line to the south whilst also making a station call. In the long run, this issue may be mitigated by the development of a new platform on the Rose Street Curve at Inverness, but the timescale for the introduction of this 'aspirational' new infrastructure in the Inverness area has not yet been confirmed.

6.4.4 In addition, the service may have to reverse at Edinburgh Waverley, either when the service returned to Glasgow for serving or when running in passenger service to Glasgow, and also for a reversal at Glasgow if Central High Level station were used to start and terminate the service.

6.4.5 Each time the service reversed there would be a need for the loco to uncouple and run round the train, incurring a time penalty of around 15 minutes. In the case of Inverness, this would be complicated further by the dead end arrangement of the platforms meaning that the train would have to be shunt released by another locomotive, incurring both a time and cost penalty. The need for a shunt release would also apply at Glasgow Central High Level. This approach is already used by the Lowland Sleeper service to return trains to Polmadie Depot.

6.4.6 At Edinburgh, obtaining paths for a locomotive to run round, especially in the morning peak would be complex, although in this case there is the opportunity to use the Edinburgh South Suburban line to either arrive or depart from Waverley station without requiring a reversal.

6.4.7 The use of one locomotive on the train would also represent a single point of failure and north of Inverness would represent a significant performance risk, with no other locos likely to be available north of Inverness if the single train loco failed.

6.4.8 The use of a single loco may have some advantages, if it were decided to operate a separate portion for Inverness. The use of one loco would potentially simplify the shunting required to achieve this relative to a Push-Pull arrangement. This assumes that the existing Class 08 shunting locos based at Inverness would be available for this operation.

Top & Tail Operation

6.4.9 Top & Tail operation would involve the use of a locomotive on each end of the train. This would go some way towards addressing the issues of single locomotive operation, including being able to reverse the train more easily and also reducing issues relating to single points of failure, as if one loco failed the other could be used instead.

6.4.10 If this option were pursued, the rolling stock would ideally be equipped to allow multiple working between the locomotives. This would obviate the need for a second driver to be in control of the rear locomotive (helping reduce costs) and in addition it would allow the rear loco to provide power which would offset the negative impact of the weight of the additional locomotive on the power to weight ratio of the train.

Push – Pull Operation

6.4.11 Push-Pull operation would use a single locomotive with a driving trailer vehicle at the rear with all vehicles equipped for remote working of the locomotive from the driving trailer. This option would address issues described above about the train reversing but would not address the issues relating to single points of failure. A further advantage of this option would be the ability to provide a vehicle wholly devoted to luggage and parcels accommodation as the only Driving Trailers likely to be available would be Driving Luggage Vans, which are wholly luggage and parcels vehicles.

High Speed Trains

6.4.12 Over the coming years, a number of High Speed Trains (HSTs) will be released from their current long distance work, and a number of these will be transferred to Scotland. HSTs might provide a viable option for operating services. HSTs have a low route availability

(RA5), allowing them to travel over almost all of the network and having a power car at each end avoids issues associated with about reversing the service.

6.4.13 However the use of two power cars would, like Top & Tail working, increase costs, due to the significant increase in fuel consumption and operating costs.

6.4.14 A more fundamental problem would be the need to carry out significant work on the existing Sleeping Car fleet to make them compatible with HST power cars. The HST fleet uses a different type of train heating system to the Sleeper coaches and the control systems between the HST power cars would require the Sleeper coaches to be modified to allow the power cars work together.

Recommended Method of Operation

6.4.15 We recommend a 'Push-Pull' operation of the proposed new sleeper service. The rationale for this is that this method provides the a balance between cost and flexibility. Services would be able to operate, without the need for a second locomotive and would be able to reverse easily. In addition the use of a driving trailer vehicle would provide ample accommodation for both parcels and luggage and would therefore represent a useful and attractive additional feature for the proposed service, without the associated complications of operating a mixed freight/passenger operation.

6.4.16 The following commentary on traction and rolling stock options is based on the assumption that this method of operation would be employed.

Traction & Rolling Stock Options

6.4.17 Given the relatively specialist nature of the service being considered and the characteristics of the proposed route, there is a need to give careful consideration to the appropriate traction and rolling stock to operate the service.

Locomotives

6.4.18 There are a limited range of locomotives that would be available to operate the train. The locomotives would need to meet the following requirements:

- Be equipped with electric train supply (ETS);
- Be capable of operating on all required routes, with the Far North line being more restricted than other lines; and
- Have sufficient haulage capacity to operate the train.

6.4.19 The Network Rail Scotland Route Sectional Appendix has been used to identify any route availability issues. We have identified the following viable options:

6.4.20 **Class 37/4** – A small number of Class 37/4 locomotives are available, currently operated by Direct Rail Services. These locomotives meet all of the above criteria, though their recent reliability in passenger service on the Cumbrian Coast Line has been mixed, particularly when used for push-pull operations. This has been attributed to the high density of stations on the Cumbrian Coast route, with frequent starts and stops not being

well suited to loco hauled operation. The Class 37/4s are also a legacy fleet, with the design dating back to the early 1960s, which may bring the potential for reliability problems, although very heavily reengineered examples are available. There may also be a need for the coaches to be modified to provide "Blue Star" type multiple working between the loco and Driving Trailer.

6.4.21 **Class 47** – The Class 47 is another legacy class dating from 1963. These locos are more powerful than Class 37s, but are also heavier. Whilst the majority of the fleet are permitted to work on the Far North Line, a small number are restricted for reason of weight. These locos would also be larger than required to operate the train, so may not be the most efficient choice. Finally there are relatively few examples of the fleet left in service and few have been reengineered and therefore might present a performance risk, in terms of their reliability.

Class 66 – The Class 66 fleet is the workhorse of the current UK rail freight sector, with more than 450 locos in service. They are relatively modern, having been built for the UK from 1998 onwards. It is likely that members of the fleet would be available to operate the service. The locos are also cleared to operate over the Far North Line. Members of the fleet have been used in passenger service on Sleeper services in recent times, supporting members of the Class 73 fleet as the latter were introduced into the service. However, they are not equipped with an Electric Train Supply (ETS) and therefore there would be a need to provide a generator in the coaches to provide ETS. This would represent a non-standard approach, and introduce a further cost to introducing the service, although a similar arrangement was used on the London – Aberdeen/Inverness sleepers in the early/mid 1990s. The fleet are also equipped with the AAR (Association of American Railroads) multiple working system which is in daily use on Chiltern Railways loco hauled services, and it is therefore likely could be used in this context as part of a Push-Pull operation.

Class 67 – The Class 67 fleet is technically similar to the Class 66 fleet, though it was designed for use on fast mail trains, and has a top speed of 125mph. The fleet have also seen regular use on passenger trains and, until the change in the Sleeper franchise, operated all three portions of the Highland Sleeper. The locos are equipped with ETS and being fitted with the AAR multiple working system could operate in a push-pull arrangement, with a modified Driving Trailer as already occurs on Chiltern Railways services. However the Sectional Appendix states that the locomotives are currently prohibited from operating north of Lairg on the Far North Line. Like the Class 68 described below, it is unclear if this because there has been no need for the locos to travel north of Lairg or because there is a specific issue preventing them operating on that section of the Far North line. The latter is a possibility, as these locos have a very high route availability (RA8), which limits the routes they can operate on, and there are a number of structures north of Lairg that have speed restrictions imposed for locomotives, suggesting that they may be unable to cope with high axle loadings.

6.4.22 **Class 68** – These are new locomotives currently operated by Direct Rail Services. The locos can operate both passenger and freight trains and are currently used by Chiltern Railways and by ScotRail (for Fife Circle services). They are currently not cleared north of Invergordon, but it is possible that this is because there has thus far been no requirement to operate the locos north of Invergordon. The locos would be likely to be over-powered

for the train, and as new locomotives may be more expensive to lease than other options. Like the Class 66 & 67 these locos are equipped with the AAR multiple working system and could therefore be operated as part of a Push-Pull arrangement.

6.4.23 **Class 73/9** – The Class 73/9 fleet are a small fleet of re-engineered locomotives, originally built in the 1960s. The locos have received a complete rebuild in recent years, with new engines and alternators fitted. The locos were originally built as Electro-Diesels for operation in the south of England, being designed to operate principally on the Third Rail electric network, but being equipped with a small diesel engine for working off the Third Rail. The rebuilding of these locos has retained the Third Rail function, but has significantly increased the size of the engine, to makes its output equivalent to a typical medium sized locomotive such as the Class 37. These converted locomotives are now used by Caledonian Sleepers (on hire from GBRF) for Highland Sleeper services north of Edinburgh. The locos are equipped with the AAR multiple working system , which means they could work with a modified driving Trailer vehicle as part of a Push-Pull operation. The locos also have a high route availability, meaning that they can cover a wide area of operation. The Network Rail Scotland Route Sectional Appendix indicates that they are permitted to operate over the whole of the Far North Line.

Recommended Choice of Locomotive

6.4.24 Based on the information on the types of locomotive available, the Class 73/9 would seem to be the most suitable for the operation of this proposed service. The rationale for this is the locomotives have a good route availability, have been recently rebuild and should therefore be relatively reliable and are able to operate with a suitably modified Driving Trailer vehicle.

6.4.25 In addition, members of the Class are already being used on the Fort William sleeper service which has very similar characteristics to the Caithness Sleeper service. Whilst the existing Class 73/9 fleet are already heavily used, it is known that there are other members of the Class which could be refurbished, increasing the size of the total fleet available.

6.4.26 If Class 73/9s were not available, the next choice would be a Class 67 or Class 68 but only if issues relating to route availability on the Far North Line beyond Lairg can be checked/resolved.

Rolling Stock

6.4.27 Given the relatively specialist nature of the service being planned, there is a relatively limited amount of rolling stock available to form the service. The following sections set out the main options and issues associated with these.

Sleeping Cars

6.4.28 At present the only type of Sleeping Car in operation are British Rail designed Mark 3 Sleeping Cars. These coaches were built in the early 1980s and are currently operated by Caledonian Sleepers (CS) and Great Western Railway (GWR) (i.e. the only two operators of Sleeping Car trains in the UK).

6.4.29 The coaches operated by Caledonian Sleepers are shortly to be replaced by new Mark 5 coaches, meaning that the Mark 3s will be released for other work.

6.4.30 There are currently three types of coach in operation:

- SLE (Sleeper Either Class) – these coaches have 13 compartments with capacity for up to 26 passengers depending on the configuration of First and Standard Class;
- SLEP (Sleeper Either Class Pantry) – These coaches contain 12 compartments with a capacity of 24 passengers depending on the configuration of Standard and First Class. These coaches also contain a small food preparation area and accommodation for attendants; and
- SLED (Sleeper Either Class Disabled) – these coaches have been modified to provide disabled accommodation.

6.4.31 Currently these vehicles do not meet the Persons of Reduced Mobility Technical Specification for Interoperability requirements, which come into force in 2020. Whilst Caledonian Sleepers will have replaced their existing fleet by this point, GWR have instead obtained a derogation to continue with the existing fleet. If Mark 3 Sleepers were chosen for the Caithness service, then a similar derogation would be needed. More work is required to confirm if a derogation would be granted for an entirely new service.

6.4.32 The only alternative to Mark 3 Sleepers would be a follow-on order for Mark 5 Sleepers, to follow the CS order. This would have the advantage of providing a modern fleet across all Sleeper services in Scotland, but would require a Rolling Stock Leasing Company to take the risk on constructing the fleet or alternatively guarantees would have to be provided over ongoing use of the vehicles. In practice, it may be more prudent to test the market for the service using Mark 3 sleepers and order new rolling stock if the service is deemed a success and a long term future is assured.

Day Coaches

6.4.33 There is more flexibility in the range of day coaches available to operate the service. It is envisaged that there will be need for both a lounge car and a conventional day coach (likely to be Fist Class vehicle declassified to Standard Class to provide additional comfort for overnight passengers). The options for this are presented below:

6.4.34 **Mark 2 Coaches** – Currently Caledonian Sleepers use British Rail built Mark 2 coaches as day coaches and lounge cars for their Sleeper services. The lounge cars were converted from conventional coaches in the 1980s. These vehicles were originally built in the early 1970s. However, consultation with Serco Caledonian Sleepers suggest that the vehicles are being overhauled and may have some life left in them after the Mark 5 coaches currently under construction have replaced them.

6.4.35 These vehicles would have the advantage of being relatively cheap to operate, and in the case of lounge cars would come already designed for the purpose.

6.4.36 **Mark 3 Coaches** – An alternative to Mark 2s would be the use of Mark 3 day coaches. A significant number of Mark 3 loco hauled coaches are in operation in East Anglia operating Norwich – London services, however all are due to be replaced between 2019 and 2020. The coaches are more modern than Mark 2s and first class, standard class and catering

vehicles would be available. The catering vehicles may have too much catering accommodation and it may therefore make more sense to convert a First Class vehicle for use as a lounge car, with a smaller catering area.

6.4.37 **Mark 5 Coaches** – Like the Sleeping Car options described above it would be possible to order additional Mark 5 vehicles to operate the service, but this would face similar issues described above in terms of cost and financial risk.

Driving Trailers & Brake Accommodation

6.4.38 Some form of brake vehicle would be required to operate a loco hauled service. Given that it has been identified that a Push-Pull arrangement is likely to be the most suitable option for operating the service, a Driving Trailer vehicle (which would include a brake) would also be required.

6.4.39 The most suitable option to address this would be to use Mark 3 based Driving Luggage Van (DLV). These vehicles were designed as driving vehicles for Push-Pull services on the west Coast Mainline in the 1980s and were designed to replace earlier brake/luggage vans. They are therefore a full vehicle devoted to luggage and parcels space. This would represent a useful facility on the Caithness Sleeper as parcels and large items of luggage could easily be accommodated. It would also facilitate the development of specialist services, similar for example to the movement of shellfish from Inverness to London on the Highland Sleeper.

6.4.40 An alternative option would be the use of Mark 2 vehicles. A small number of Mark 2 Driving Brake Second Open (DBSO) vehicles exist which would provide facilities for Push-Pull operation , and would provide some additional seating accommodation but would have a reduced level of parcels/luggage accommodation relative to a Mark 3 DLV. The availability of these vehicles may be more limited than that of Mark 3s, with a total of 11 vehicles in the fleet of which 5 are used by Network Rail and five are used by Direct Rail Services and one by Vintage Trains. Of these the five currently owned by Direct Rail Services may become available, as the current operation of loco-hauled services on the Cumbrian Coast concludes in 2018. These vehicles would require modification to operate with AAR multiple working systems, as the DRS owned vehicles are currently designed to operate using Blue Star multiple working systems.

6.4.41 If either a non Push-Pull operation were operated or an Inverness portion were planned to operate then a conventional brake vehicle could be used. The existing CS operation uses 11 Mark Open Brake Unclassified vehicles as lounge cars and this type of vehicle would be suitable for use on this type of operation.

Recommended Rolling Stock

6.4.42 Given that the new service would be testing the market, the most appropriate option would be to use existing rather than new rolling stock. This therefore implies the use of existing Mark 3 Sleeper coaches, along with either a Mark 2 lounge car or a converted Mark 3 vehicle, a seated coach and a Mark 3 Driving Luggage Van vehicle.

Train Stabling and Maintenance

6.4.43 It is assumed that the train operating the service would receive maintenance at Glasgow Polmadie depot, as currently take place with the Caledonian Sleeper services. At Thurso, the train would be cleaned and prepared for the journey south, and it proposed that the "Dock" adjacent to the platform would be used for this purpose. This siding is presently out of use but could be reinstated. The operation of the service may provide the opportunity to develop a train crew base at Thurso creating additional jobs in the area.

Train Formation

6.4.44 Based on the above it is possible to derive a train formation. This has been completed for two options, with and without a separate Inverness portion for the train.

6.4.45 The formation without an Inverness portion would be as follows, the first line presents the overall formation the second presents suggested traction and rolling stock options:

Locomotive – Day Coach – Lounge Car – Sleeper – Sleeper – Driving Trailer

Class 73 – Mark 3 TSO – Mark 2 Lounge Car – Mark 3 SLE – Mark 3 SLED – Mark 3 DLV

6.4.46 The formation presented above is very similar to the formation currently used for the Fort William Sleeper. The lines below present an option for a service with an Inverness portion.

Locomotive – Sleeper – Day Coach – Day Coach – Lounge Car – Sleeper – Sleeper – Driving Trailer

Class 73 – Mark 3 SLED – Mark 3 TSO – Mark 3 TSO – Mark 2 Lounge Car – Mark 3 SLED – Mark 3 SLE – Mark 3 DLV

6.4.47 The addition of an Inverness portion increases the length of the train to seven vehicles, which is likely to be at the upper end of the haulage capacity of single Class 73 over the Highland Mainline. The train is marshalled in such a way that the service can be divided at Inverness, with the Inverness portion next to the loco. The sleeper coaches in the Thurso portion are arranged to allocate the coaches at the DLV end to reduce the impact of noise form the locomotive where possible.

6.5 Timetable Planning

6.5.1 Having examined issues relating to routing options, train formations, and traction it is possible to develop more detailed timetable options for the proposed service.

6.5.2 The timetables identified here have used the current Network Rail Scotland Route Operational Rules including both the Timetable Planning Rules and as appropriate the Engineering Access Statement. In addition, the current (May 2017) Working Timetable has been used to identify the availability of train paths. It should be noted that in practise the Working Timetable may well have altered by the time the Caithness Sleeper came into operation for a number of reasons:

- The Edinburgh – Glasgow Improvement Programme will have been delivered resulting in a timetable recast on the Edinburgh – Falkirk High – Glasgow route;
- Other ScotRail timetable improvements will have been delivered altering timetables across Scotland; and
- By May 2020 Virgin Trains East Coast will be operating a revised and improved service from Edinburgh Waverley, which will increase the number of services using Waverley station, with a consequent impact on platforming issues.

6.5.3 Where possible, timetables have been planned to avoid the need to alter other services. However there are a number of services which have either been retimed slightly, or stations where platform docking arrangements have been altered. Any significant changes are highlighted in the text below.

6.5.4 The following sections highlight any issues relating to route opening hours, and other constraints on developing services, before moving on to provide detail of different timetable options.

6.5.5 It should be noted that these train paths have been identified and checked manually. A more-detailed timetabling simulation exercise would be desirable, as part of the detailed design and implementation of the proposed new service.

Route Opening Hours

6.5.6 The table below presents the opening hours of the main sections of route that the service would be likely to operate on.

Table 5. Route Opening Hours (Source: Network Rail Timetable Planning Rules)

ROUTE SECTION	MONDAY - FRIDAY	SATURDAY	SUNDAY
Inverness – Far North	24 Hours	24 Hours	08:15-24:00
Elgin - Inverness	24 Hours	24 Hours	09:35-00:00
Aberdeen - Elgin	~06:00-23:30	~06:00-23:30	~10:00-23:10
Perth – Blair Atholl	24 Hours	24 Hours	24 Hours
Dalwhinnie - Kincraig	24 Hours (Closed 22:40-24:00 FO)	00:00-22:40	09:30-24:00
Kinncraig - Inverness	24 Hours (Closed 23:20-24:00 FO)	00:00-23:20	09:30-24:00
Dundee - Aberdeen	24 Hours	24 Hours	00:01-00:30 & 09:00-23:59
Haymarket West Jn - Dundee	24 Hours	24 Hours	24 Hours
Greenhill Lower Jn – Perth	24 Hours	24 Hours	24 Hours

Perth - Dundee	24 Hours	24 Hours	08:00-23:59
All Other Routes	24 Hours	24 Hours	24 Hours

6.5.7 It can be seen that the majority of routes required are available for operation continuously with shorter opening hours only applying on Saturday nights and Sunday mornings.

6.5.8 The only significant constraint is the Aberdeen – Inverness route, which as identified in the Routing Option work above is currently closed between Elgin and Aberdeen at night. The exact opening hours vary by signal box dependent on the time of the passage of the last train. Ultimately the route from Aberdeen to Inverness will be re-signalled and this will allow the opening of the continuously at no additional cost. However in the short to medium term, six signal boxes (Dyce, Inverurie, Insch, Kennethmont, Huntly, Keith) would need to be opened for an additional six hours each day. This would be likely to generate a cost of around £250k per annum.

6.5.9 It is understood that over the next few years the Highland Mainline upgrade may require overnight services such as the existing Highland Sleeper to be diverted via Aberdeen which would involve Network Rail opening the signalboxes on the Inverness – Aberdeen route overnight. In this case it would be possible (and necessary) to operate the Caithness Sleeper over this route.

Engineering Access Issues

6.5.10 In addition to route opening hours, there is a need to consider engineering access requirements. In principle these should align with the route opening hours, however in practise there is some variation. The table below summarises the situation. To simplify the presentation of this information, not all sections have been considered individually where there is only a slight variation in the engineering access hours.

Table 6. Engineering Access (Source: Network Rail Engineering Access Statement)

ROUTE SECTION	MID WEEK NIGHTS	SATURDAY NIGHTS	SUNDAY NIGHTS
Inverness – Far North[9]	~22:40-~06:00	~22:40-~06:00	~22:40-~12:00
Elgin - Inverness	~23:45 -~05:15	~23:45 -~05:15	~23:45 -~05:15
Aberdeen - Elgin	~23:30 -~06:00	~23:30 -~06:00	~23:30 -~10:00
Inverness Station[10]	00:20-05:40	00:15-0925	00:05-05:40
Perth – Blair Atholl[11]	Overnight	Overnight	Overnight
Dalwhinnie – Kincraig[11]	Overnight	Overnight	Overnight
Kincraig – Inverness[11]	Overnight	Overnight	Overnight
Dundee - Aberdeen	~23:20 - ~0500	~23:20 - ~0500	~23:20 - ~0500
Haymarket West Jn – Dundee	~01:00-04:40	~01:00-04:40	00:05-08:30
Greenhill Lower Jn – Perth	00:01-05:55	00:01-05:55	23:40-09:30
Perth - Dundee	00:30-05:30	00:30-05:30	23:30-08:55
All Other Routes	Open at time Sleeper would pass		

6.5.11 The Engineering Access Statement suggests that access to parts of the network are relatively limited. This in many ways contradicts the relatively limited restraints imposed by the Train Planning Rules. It is possible that the Engineering Access Statement is actually a reflection of a lack of overnight trains running through much of the study area, especially in the Far North of Scotland and is therefore designed to provide the maximum possible time to engineering staff.

6.5.12 It is interesting to note that for a number of routes there is a requirement for possessions to be given up for the passage of specific services. Some of these services may only run infrequently, but other examples operate every night. For example there is a requirement for possessions to be given up each night around Edinburgh Waverley for the passage of light engines to and from Millerhill Yard or Craigentinny Depot which are being used for the Highland Sleeper train. This approach would suggest that there may be scope for

[9] Possessions to be given up for certain trains
[10] Access to depot to be provided, also potential to split possession between Highland and Far North platforms and access to certain platforms required depending on day of week.
[11] Possession to be give up for passage of certain trains

operating the Caithness Sleeper service in a similar way. More detailed consultation with Network Rail would be required to fully understand these constraints and opportunities.

6.5.13 For much of the Far North Line, it would still be possible to have quite long engineering possessions overnight by bringing the start time of the possession forward to after the passage of the last trains. This could be over an hour earlier than the current start times on some parts of the route, particularly around Helmsdale, where the last two train cross over.

Commercial Considerations

6.5.14 In planning the proposed service, a balance has to be struck between operational convenience and the commercial attractiveness of the service. With this in mind some specific objectives have been set around the development of the timetable:

- The northbound service should depart as late as is feasible, to be as attractive as possible to as many groups of passengers as possible;
- The rolling stock for the northbound service should be available to board as early as possible at either Edinburgh or Glasgow;
- The service should provide relatively attractive arrival and departure times from Inverness, within the constraints of also serving Thurso;
- If possible the northbound service should connect with a current ferry sailing to Orkney;
- The southbound service should provide a connection from the last Stromness – Scrabster sailing; and
- The southbound service should arrive in the Central Belt in time for passengers to connect into early morning departures to London and Northern England, either from Glasgow or Edinburgh.

6.5.15 Given the constraints on operating the service, it is possible that not all service options can simultaneously achieve all of these objectives.

Timetable Options

6.5.16 A number of options have been worked up in detail. Initially the timetables were developed around the idea of having common arrival and departure times across all options for the section between the Far North and Inverness and with a common set of timing between Perth and Edinburgh/Glasgow with options going either via Glasgow or Edinburgh first. For the middle section between Inverness and Perth options for operating either via the Highland Mainline or Aberdeen and Dundee were developed. However the additional journey time of operating the service via Aberdeen means that it is not possible to operate the service via Aberdeen and connect with the morning sailing to Orkney. Therefore this options has only been developed for options where the service does not connect with the morning sailing. This is less of an issue for the southbound service as it departs much earlier from Thurso than the northbound services depart from Edinburgh/Glasgow.

6.5.17 A further issue, particularly for the northbound service is the balance between arrival times in Thurso and Inverness especially if the service is to meet the morning sailing. For the train to meet the boat, the service passes through Inverness at a very early hour. With this in mind an option has been developed that has a separate Inverness portion.

6.5.18 The options presented in detail here are listed below.

- Thurso – Glasgow Central via Edinburgh (Inverness portion);
- Thurso – Edinburgh via Glasgow Queen Street Low Level (runs via Highland Mainline or Aberdeen); and
- Thurso – Glasgow Central via Aberdeen, Tay Bridge, Forth Bridge and Edinburgh

6.5.19 Full details of the relevant timetables are attached in Appendix C of this report.

Sectional Running Times

6.5.20 Where possible Sectional Running Times have been taken other appropriate services with a similar timing load to the proposed Caithness Sleeper. These timetables would require further detailed validation if the service were to be introduced.

6.5.21 The following current running times have been used:

- Inverness – Perth – Edinburgh: Inverness portion of Highland Sleeper;
- Aberdeen – Dundee – Edinburgh: Aberdeen portion of Highland Sleeper;
- Aberdeen – Inverness: Royal Scotsman charter train;
- Perth – Dundee: Royal Scotsman charter train;
- Glasgow Queen Street Low Level – Airdrie – Edinburgh: Fort William portion of Highland Sleeper; and
- Glasgow Central – Edinburgh via Carstairs or Shotts: Empty Stock Working times of Lowland Sleeper for Edinburgh - Polmadie and Polmadie – Glasgow.

6.5.22 Either low weight freight trains or slow passenger train were used for other sections not covered in the list above. The exception to this was the Far North line, where an analysis was made of existing freight train paths, passenger charter train and historic loco hauled passenger train times.

Thurso – Glasgow via Edinburgh (Inverness portion)

6.5.23 This option attempts to address all of the timetable-related objectives set out above. To do this, a separate Inverness portion has been included in the service. This would attach and detach from the main Thurso train at Inverness. This option would allow the northbound train to provide a reasonable arrival time in Inverness while also connecting with the first Scrabster – Stromness sailing at 08:45. To make this connection, the train has to arrive in Thurso around an hour before the ferry departs.

6.5.24 The tables below sets out the broad timing of the service at key locations along with the identified routes.

Table 7. Thurso – Glasgow Southbound with Inverness portion

LOCATION	ARRIVE	DEPART	REMARK
Thurso	-	19:30	
Georgemas Jn	19:46	19:54	Train reverses
Inverness	00:10	00:45	Attaches portion
ROUTE	Highland Mainline		
Perth	03:21	04:00	Operational Stop
Stirling	04:37	04:39	
ROUTE	LINLITHGOW		
Edinburgh	05:23	07:03	Provides early connection to London
ROUTE	CARSTAIRS		
Glasgow Central	08:11		High Level Station

Table 8. Glasgow – Thurso Northbound with Inverness portion

LOCATION	ARRIVE	DEPART	REMARK
Glasgow Central	-	21:25	High Level Station
ROUTE	CARSTAIRS		
Edinburgh	22:23	22:28	
ROUTE	LINLITHGOW		
Stirling	23:08	23:10	Connection out of 22:18 Glasgow Q St – Alloa
Perth	23:48	23:50	
ROUTE	Highland Mainline		
Inverness	02:14	02:54	Detaches Inverness portion
Georgemas Jn	06:55	07:42	Uses Passenger loop and shunts via Bower end of station to cross 0618 Wick – Inverness
Thurso	07:42	-	Connection into sailing

6.5.25 This option addresses the objectives well, but is operationally complex. The requirement to meet the morning sailing requires a complex shunting operation to take place in Inverness station in both directions. This represents a performance risk to the service and may also present some issues about the opening hours of Inverness station and the requirement for staff to be on duty. There is also an issue relating to the provision of a train supply for heating and lighting purposes. Given that passengers might stay in their berths until around 08:00, some sort of shore supply would be required to provide heating to the train.

6.5.26 To conduct the shunting operation at Inverness it has been assumed that the Far North platform would be used for the train as these are accessible at all times unlike the Highland Mainline side of the station which is not accessible to the public at night. The proposed plan would be as follows assuming Push-Pull operation:

- From the south the train would arrive with the loco leading, which would then shunt into platform 6 of the Far North platforms.
- The loco and Inverness portion would uncouple and shunt the Inverness portion to Platform 7
- The loco would return to the main train and depart north.
- The reverse operation would occur for the southbound service
- An alternative option would be to divide/attach the train on the Rose Street Curve which would simplify the operation, but may require changes to the Sectional Appendix to permit this movement.

6.5.27 It should also be noted that the northbound service has to engage in a shunt movement at Georgemas Junction, where it crosses the 06:18 Wick – Inverness service. Due to the layout at Georgemas Junction, the train would have to arrive in the passenger loop to allow the Inverness service to arrive from Thurso. After the Inverness train departed the Sleeper would have to shunt via the Wick end of the station to cross back to the main platform and access the Inverness branch.

6.5.28 In the medium term the issue with the 0618 Wick – Inverness may be resolved through the retiming of the train as a result of Far North Line Review team work currently being undertaken. At this stage it is not clear what the impact of this might be, as it may instead require the Sleeper to cross the train further south, at Forsinard for example.

6.5.29 It can be seen that the southbound train arrives in Edinburgh early and provide a range of connections to the south. However all Edinburgh passenger have to leave the train by 07:00 to allow the service to depart. Platforming constraints prevent the service from remaining in the station beyond this point, unless the service were to depart via the Edinburgh South Suburban route, which would add to the journey time to Glasgow.

6.5.30 The southbound train arrives and terminates in Glasgow Central at 08:11 and a path exists for an empty stock movement at 08:34 to Polmadie Depot.

6.5.31 The northbound service leaves Glasgow Central relatively early at 21:25, however it is possible to leave Glasgow later by using a 22:18 Glasgow Queen Street – Alloa service and changing at Stirling. The nature of the operation also precludes early boarding at Edinburgh, with the train making a brief call around 22:25. It is not possible to resolve these issues, whilst also connecting with the early sailing to Orkney. The only alternative

would be to start the service at around 21:25 and run via Glasgow Queen Street Low Level. However, this would only swap the issues around between Glasgow and Edinburgh.

Thurso – Edinburgh via Glasgow Queen Street Low Level

6.5.32 This option avoids the need for the service to have a separate Inverness portion, but in so doing the northbound service fails to connect with the current morning sailing to Orkney. Instead, the service would run north from Inverness in the path of 07:00 Inverness – Wick. This option would also have the advantage of not disturbing engineering possessions on the Far North Line.

6.5.33 The tables below set out draft timings for the service.

Table 9. Thurso – Edinburgh via Glasgow Southbound

LOCATION	ARRIVE	DEPART	REMARK
Thurso	-	19:30	
Georgemas Jn	19:46	19:54	Train reverses
Inverness	00:10	00:32	Train Reverses in Platforms
ROUTE	Highland Mainline or Aberdeen		
Perth (via Highland)	02:47	02:52	
Perth (via Aberdeen)	04:51	05:54	
Stirling (via Highland)	03:29	05:48	
Stirling (via Aberdeen)	05:30	05:48	
ROUTE	CROY, ANNIESLAND		
Glasgow Queen St	06:41	06:43	Low Level Station Provides connection to South
ROUTE	AIRDRIE		
Edinburgh	07:48	-	

6.5.34 The southbound leg of Option 2 follows the same path to Inverness as Option 1. On departure from Inverness, the service can operate either via Aberdeen or the Highland Mainline. If operated via the Highland Mainline the train waits for over two hours, so that going forward the train can share the same train path with a service routed via Aberdeen, providing flexibility in the operation of the service. It has been assumed that the service would wait at Stirling, but in practice it could be held at any point between Inverness and Stirling.

6.5.35 The service routes via Glasgow Queen Street Low Level, giving an arrival time suitable to cross to Glasgow Central for connections to the south. The train goes forward to Edinburgh arriving at 07:48. Due to platforming issues at Edinburgh, it is not possible for the service to wait long, with the empty train departing at 07:50 to Glasgow Polmadie depot.

Table 10. Edinburgh – Thurso via Glasgow Northbound

LOCATION	ARRIVE	DEPART	REMARK
Edinburgh	-	23:23	
ROUTE	AIRDRIE		
Glasgow Queen St	00:28	00:31	Low Level Station
ROUTE	ANNIESLAND, CROY		
Stirling	01:23	01:25	
Perth	02:03	02:05	
ROUTE	Highland Mainline		
Inverness	05:35	06:42	Reverses in platforms
Georgemas Jn	11:06	11:16	Train reverses
Thurso	11:33	-	Connection into sailing (summer only)

6.5.36 Dropping the need to connect with the current morning Orkney sailing provides much more flexibility in the planning of the northbound service. The version presented above delivers a departure from Edinburgh as late in the evening as possible. However it would be possible to board the service in Edinburgh from 21:29 when the train arrived, empty from Glasgow.

6.5.37 An alternative version of the service would see it departing Edinburgh at 22:18 and running north around one hour ahead of the times presented here. There would be sufficient time in the schedule for such a service to operate either via the Highland Mainline or via Aberdeen.

6.5.38 The service is planned to wait in Inverness until 06:42, to allow more time for Inverness passengers to leave their berths. On departure from Inverness, the service would run forward in a path similar to the present 07:00 Inverness – Wick. To avoid the Sleeper train having to replicate all the calls of the 07:00 service, and also to ensure that a train is available in Wick for the 12:34 Wick – Inverness service, the following approach is suggested:

- The train currently used for the 07:00 departure instead runs empty to Lairg ahead of the Sleeper train, coming into service at Ardgay to provide an all stations service to Thurso and Wick; and

- The Sleeper service follows the empty train calling at all stations to Ardgay, before going forward calling only at station where a stop is require for Token Exchange purposes.

6.5.39 The approach above would avoid issues relating to stock imbalances for services on the Far North Line, and would also provide a connection with the current middle sailing to Orkney.

Thurso – Glasgow via Aberdeen, Tay Bridge and Forth Bridge and Edinburgh

6.5.40 The final option examined in detail here is for a service that travels via Aberdeen but then, rather than routing to Perth to re-join the same train path as options that travel via the Highland Mainline, the train continues to Edinburgh via Kirkcaldy and Inverkeithing. This reduces the time penalty of travelling via Aberdeen, although the service would still take longer than the Highland Mainline route.

6.5.41 The tables below present an outline of the timetable for this option.

Table 11. Thurso – Glasgow via Aberdeen and Edinburgh

LOCATION	ARRIVE	DEPART	REMARK
Thurso	-	19:30	
Georgemas Jn	19:46	19:56	Train reverses
Inverness	00:10	00:32	Reverses in Station
ROUTE	ELGIN		
Aberdeen	03:10	03:11	Operational Stop
Dundee	04:23	04:23	Pass time
ROUTE	KIKCALDY		
Edinburgh	05:43	07:03	Provides early connection to London
ROUTE	CARSTAIRS		
Glasgow Central	08:11		High Level Station

Table 12. Glasgow – Thurso via Edinburgh and Aberdeen

LOCATION	ARRIVE	DEPART	REMARK
Glasgow Central	-	21:25	High Level Station
ROUTE	CARSTAIRS		
Edinburgh	22:23	22:28	
ROUTE	KIRKCALDY		
Dundee	00:01	00:01	Pass time
Aberdeen	01:16	01:17	Operational Stop
ROUTE	ELGIN		
Inverness	04:16	06:42	Train reverses in station
Georgemas Jn	11:06	11:16	Train reverses
Thurso	11:33	-	Connection into sailing

6.5.42 The operation of the service would clearly be dependent on the ability to open the Aberdeen – Inverness line continuously. The arrival and departure times in the Central Belt are the same as the first option that operates via the Highland Mainline with a separate Inverness portion. The departure time for the southbound service from Thurso is also the same as the other services. However the later arrival of the northbound service in Inverness means that it is impractical for the service to connect with the morning sailing to Orkney. With this in mind the service waits to allow Inverness passengers to have a reasonable time to leave their berths, before the service departs northwards following the pattern described above using the path of the existing 07:00 Inverness – Wick.

Summary

6.5.43 There are a range of options available to operate the service. The only option that satisfactorily addresses all of the main objectives of the service is to operate a separate Inverness portion. This adds to the operational complexity of the service, but would provide a more attractive commercial proposition.

6.5.44 The southbound service is relatively easy to operate, with a choice of routes to use and few timetabling constraints. The main constraints relate to timetabling service in the morning peak, with platforming at Edinburgh being a limitation along with pathing between Edinburgh and Glasgow.

6.5.45 The northbound service also has a range of options available if the constraint on meeting the current morning Orkney sailing is removed. Whilst relatively late departures from the Central Belt are possible, this generates a relatively late arrival at the Far North stations.

7. SCHEME COSTS

7.1.1 Based on the assessment of different service options presented above, it is possible to derive some high level costs for the operation of the different service options. These costs have been derived from SYSTRA's understanding of the cost of operating services of this nature.

7.1.2 There are two main types of cost:

- Train movement costs including vehicle hire or leasing, maintenance, fuel and train crew costs, including driver, conductor and on train hosts; and
- Infrastructure Charges including, Variable Track Access Charges and proportions of Station Long Term Charges, and tin the case of services routed via the Inverness – Aberdeen route signal box staffing charges.

7.1.3 It should be noted no allowance has been made for changes to the Fixed Track Access Charge paid by the operator of the service.

7.1.4 As described in Section 6.4 above, it has been assumed that the service will operate using refurbished Class 73/9 locomotives and Mark 2 and Mark 3 coaches. Options have been assessed with and without Inverness portions and with either Top & Tail operation or DVT operation. In addition the various routing options via either Perth or Aberdeen have been considered.

7.1.5 In deriving the costs, it has also been assumed that to provide a six night per week service the equivalent of three full rakes of coaches would be required, with two sets in service each night plus one set being used for spares and/or maintenance.

7.1.6 The tables below summarises the costs by category.

Table 13. Estimated Costs

ROUTE	OPTION	MOVEMENT COSTS	INFRASTRUCUTRE COSTS	TOTAL
Glasgow – Edinburgh – Perth – Inverness	DVT – Inverness Portion	£5.42m	£0.257m	£5.67m
	T&T – Inverness Portion	£8.38m	£0.355m	£8.74m
	DVT – Direct	£5.07m	£0.253m	£5.32m
	T&T – Direct	£8.04m	£0.36m	£8.40m
Edinburgh – Glasgow – Perth – Aberdeen - Inverness	DVT – Direct	£5.54m	£0.47m	£5.54m
	T&T – Direct	£8.05m	£0.58m	£8.63m
Glasgow – Edinburgh – Aberdeen - Inverness	DVT	£5.03m	£0.45m	£5.48m
	T&T	£8.01m	£0.56m	£8.57m

7.1.7 It can be seen that in all cases the cost of operation is significant. Train movement costs represent the largest proportion of costs, although this is partly because only marginal infrastructure costs have been included, with no allowance for Fixed Track Access Charges.

7.1.8 The use of a DVT rather than a second locomotive Top & Tailing reduces costs by around £3.07m per annum for the first pair of options. It is interesting to note that the marginal cost of operating an Inverness portion of the service is relatively limited, for example in the first pair of options the additional cost is only around £350k per annum.

7.1.9 A further alternative mode of operation would be to use a single locomotive with no DVT and doing a 'run around' where required. This would produce a saving of around £250k per annum, depending on the option.

7.1.10 A further test has examined the cost of operating the service only on alternate nights. Although this would reduce some operating costs by 50%, the overall reduction in costs would not be so high as there would still be need to maintain a number of additional vehicles to cover for maintenance requirements. The table below summarises the impact on total operating costs of an alternate night service.

Table 14. Estimated Costs for an Alternate Night Service

ROUTE	OPTION	TOTAL
Glasgow – Edinburgh – Perth – Inverness	DVT – Inverness Portion	£2.98m
	T&T – Inverness Portion	£4.79m
	DVT – Direct	£2.54m
	T&T – Direct	£4.42m
Edinburgh – Glasgow – Perth – Aberdeen - Inverness	DVT – Direct	£3.18m
	T&T – Direct	£4.64m
Glasgow – Edinburgh – Aberdeen - Inverness	DVT	£3.06m
	T&T	£5.00m

7.1.11 Section 8 below looks at the implied cost per passenger of the service options.

8. POTENTIAL PATRONAGE AND PRICING

8.1.1 Mobile phone data and existing data from sources such as the Scottish Transport Statistics, NorthLink and the Transport Model for Scotland have been analysed to produce a high level review of potential patronage.

8.1.2 A number of assumptions underlie this review including:

- Parity of fare with competitive modes (see Section 0);
- 10% of Sleeper users to use the Sleeper in both directions;
- 10% abstraction of trips from road/rail (mobile phone data);
- 5% abstraction of trips from flights;
- Highlands, Aberdeenshire & Moray and Aberdeen City trips excluded from sleeper patronage;
- It is assumed that 10% of Inverness to Glasgow and Edinburgh rail trips transfer to the Sleeper if an Inverness portion is operated[12]. As this represents a large proportion of trips a sensitivity test has been conducted using a 5% market share; and
- No net trip generation included – NB this is a very conservative assumption, as the stakeholder engagement work suggests that the service could help develop tourism markets in the Far North area.

8.1.3 The table below summarises our analysis of the potential demand.

[12] This is based on evidence from ORR data that suggests that the Caledonian Sleeper has a 14% share of all Scotland – London rail trips, and that a service that offered pre 0900 access to the Central Belt would abstract an 1/14 (7%) of Inverness – Central Belt passengers (based on 14 departures a day from Inverness to Central Belt. The average of these two figures is 10%.

Table 15. Potential Sleeper Patronage (10% and 5% Inverness – Central Belt Market Share Options)

ORIGIN/DESTINATION	TOTAL RETURN TRIPS PER WEEK	ANNUAL RETURN TRIPS	FLIGHTS - RETURN	POTENTIAL 1-WAY SLEEPER TRIPS PA	WEEKLY (ANNUAL AVERAGE)
Inverness – Far North/Orkney	178	9,279		1,021	20
Angus and Dundee	9	465		51	1
Perth and Kinross	22	1,137		125	2
Stirling, Falkirk and Clackmannanshire	13	651		72	1
Edinburgh, East Lothian, Midlothian, West Lothian and Fife	43	2,232	27,800	1,774	34
Strathclyde	49	2,554	8,700	759	15
D&G, Borders and RUK	87	4,513		496	10
Total (Caithness & Orkney)	**401**	**20,831**		**8,598**	**165**
Inverness – Central Belt (10% Rail Market Share)	2,058	107,033		23,547	453
Inverness – Central Belt (5% Rail Market Share)	1,029	53,516		11,773	226
Total (inc Inverness – Central Belt 10% Market Share)	**2,459**	**127,864**		**32,145**	**618**
Total (inc Inverness – Central Belt 10% Market Share)	**1,430**	**74,348**		**20,372**	**392**

8.1.4 Our analysis suggests that there are potentially around 165 one-way trips per week which could use the sleeper service from north of Inverness, with Edinburgh being the main destination of these (20%). The addition of a dedicated Inverness portion would increase this to over 600 one-way trips per week, or around 50 passengers per train per night. Were the Inverness to Central Belt market share reduced to 5% this would reduce the

annual patronage to just over 20,000 trips per annum, representing a weekly patronage of around 400 one-way trips per week.

8.2 Pricing

8.2.1 The abstraction from existing modes will be highly dependent on the pricing structure of the tickets. A review of road, day rail and flight prices has been undertaken to create a comparable fare to use in this analysis.

8.2.2 The main assumptions are summarised below:

- Orkney/Caithness to Inverness do not include overnight accommodation. All other origin-destinations include accommodation[13];
- 1.5 occupancy in vehicles[14];
- Flight fares from selected days (average fare for midweek flights from four dates over 6 months). Air Discount Scheme 50% discount applied to 80% of fare;
- The low, mid and peak boat fares have been weighted by the mid, low, and high proportions of trips from the mobile phone data. The islander discount has been applied to 31% of the fare (resident/non-resident split from Mobile Phone Data);
- Sleeper fare to Glasgow and Edinburgh would be identical;
- Kirkwall to Aberdeen boat trips have not been taken into consideration;
- A parity fare (designed to understand the maximum potential fare) assumes the fare for two way travel by road including accommodation minus one way travel by day rail or flying (assuming one way travel by sleeper and a non-car based return journey); and
- A proposed fare for each route has been suggested based around treating the parity fare as a maximum cap (with the exception of the Thurso – Inverness fare).

8.2.3 The concept of a "parity fare" has been used to identify a fare where the Sleeper service would become as attractive as the cheapest available alternative option. For example if a trip by car cost £75 and a trip by plane cost £150 then the parity fare would be £75. This approach does not identify the full fare that the market would bear for the service, for example if the Sleeper was perceived to be a less onerous journey than the same journey by car then the market would be prepared to pay a fare higher than the cost of travelling by car.

8.2.4 However the reverse could also apply for flows where passengers might perceive a disadvantage of using the Sleeper, relative to car in which case the actual fare paid may have to be lower than car in practice. Within the constraints of the work described here it is not feasible to go beyond identifying the point of indifference between the Sleeper and other options.

[13] Average room rate for Edinburgh and Glasgow - http://www.ljresearch.co.uk/hotel-room-rates-grow-edinburgh-glasgow-whilst-challenges-persist-aberdeen/

[14] Average car occupancy - Transport and Travel in Scotland 2015 - Scottish Household Survey Travel Diary results Table TD9 Percentage of car stages by car occupancy.

Table 16. Existing road, rail, ferry and bus costs

MODE	ORIGIN - DESTINATION	1-WAY/ 1 NIGHT	RETURN TRIP INC ACCOMMODATION & RETURN FERRY	SINGLE BY FERRY/RAIL/AIR	POTENTIAL SINGLE PARITY FARE FOR SLEEPER
Road	Orkney to Central Belt	£81.45	£344.72	£46.23	£298.48
	Orkney to Inverness	£33.30	£165.92	£28.83	£137.08
	Thurso to Inverness	£33.30	£66.60[15]	£65.89	£0.71
	Inverness to Central Belt	£48.60	£179.70	£22.30	£157.40
	Thurso to Central Belt	£80.85	£244.20	£30.00	£214.20
Flights	Orkney to Central Belt	£61.27	£205.03	£61.27	£143.77
	Wick to Central Belt	£46.56	£175.63	£46.56	£129.06
Rail	Inverness to Central Belt	£22.30	£127.10	£22.30	£104.80
	Thurso to Central Belt	£30.00	£142.50	£30.00	£112.50
	Thurso to Inverness	£20.40			
Ferry passenger	Orkney-Scrabster	£16.23			
Ferry car fare	Orkney-Scrabster	£49.66			
Accommodation	Central belt	£82.50			

[15] Excludes accommodation cost

8.2.5 The earlier analysis of comparative costs for different modes gives an indication of a suitable competitive fare and the following fare assumptions have been made for the Sleeper Service.

- Thurso to Central Belt @£100 per passenger;
  - Orkney to Central Belt flights are considerably cheaper than driving and that has been taken into consideration in this analysis. £100 is a balance between the parity fare for road and flight (excluding the ferry cost);
- Thurso to Inverness £20.40 (as per day rail, assumes a day trip and accommodation is not required); and
- Inverness to Central Belt @ £75 per passenger.

8.2.6 These fares are anticipated to be standard flexible fares with a berth (unless stated otherwise). However, in reality there would likely be a matrix of fares, similar to that currently used on the Caledonian Sleeper. The Caledonian Sleeper offers Fixed Advance and Flexible fares for 1st class, standard class and seats. Table 17 shows the fares for Glasgow Central to London Euston for travel next day, 4, 8 and 12 weeks in advance.

Table 17. Caledonian Sleeper fares (Glasgow to London)

GLASGOW TO LONDON	FIXED ADVANCE (1ST/STANDARD/SEAT)	FLEXIBLE (1ST/STANDARD/SEAT)
Next day	£195/ £140/ £55	£225/ £165/ £75
4 weeks	£150/ £95/ £40	£180/ £120/ £60
8 weeks	£150/ £95/ £40	£180/ £120/ £60
12 weeks	£150/ £75/ £40	£180/ £100/ £60

8.3 Revenue & Cost per Passenger

8.3.1 Based on the costs estimated in Section 7 and estimates of demand and fares presented in this section, it is possible to provide an estimate of the revenues, costs, and subsidies required to operate the service.

8.3.2 The tables below presents an estimate of the different levels of revenue and support required, the first based on a 10% market share for the Inverness – Central Belt market and the second on a 5% market share.

Table 18. Costs, Revenues and Subsidy

ROUTE	OPTION	SINGLE TRIPS PA	OPERATING COST (£M)	COST PER PASSENGER	TOTAL REVENUE (£M)	REVENUE AS % OF COST	SUBSIDY (£M)	SUBSIDY PER PASSENGER
Glasgow – Edinburgh – Perth – Inverness	DVT – Inverness Portion	32,145	£5.67m	£177	£2.54	45%	£3.14	£98
	T&T – Inverness Portion	32,145	£8.74m	£272	£2.54	29%	£6.21	£193
	DVT – Direct	8,598	£5.32m	£619	£0.77	14%	£4.55	£530
	T&T – Direct	8,598	£8.40m	£978	£0.77	9%	£7.64	£888
Edinburgh – Glasgow – Perth – Aberdeen - Inverness	DVT – Direct	8,598	£5.54m	£645	£0.77	14%	£4.78	£556
	T&T – Direct	8,598	£8.63m	£1,005	£0.77	9%	£7.87	£915
Glasgow – Edinburgh – Aberdeen - Inverness	DVT	8,598	£5.48m	£638	£0.77	14%	£4.72	£548
	T&T	8,598	£8.57m	£997	£0.77	9%	£7.81	£908

Table 19. Costs, Revenues and Subsidy

ROUTE	OPTION	SINGLE TRIPS PA	OPERATING COST (£M)	COST PER PASSENGER	TOTAL REVENUE (£M)	REVENUE AS % OF COST	SUBSIDY (£M)	SUBSIDY PER PASSENGER
Glasgow – Edinburgh – Perth – Inverness	DVT – Inverness Portion	20,371	£5.67m	£278	£1.65	29%	£4.02	£197
	T&T – Inverness Portion	20,371	£8.74m	£429	£1.65	19%	£7.09	£348
	DVT – Direct	8,598	£5.32m	£619	£0.77	14%	£4.55	£530
	T&T – Direct	8,598	£8.40m	£978	£0.77	9%	£7.63	£888
Edinburgh – Glasgow – Perth – Aberdeen - Inverness	DVT – Direct	8,598	£5.54m	£645	£0.77	14%	£4.78	£556
	T&T – Direct	8,598	£8.63m	£1,005	£0.77	9%	£7.87	£915
Glasgow – Edinburgh – Aberdeen - Inverness	DVT	8,598	£5.48m	£638	£0.77	14%	£4.72	£548
	T&T	8,598	£8.57m	£997	£0.77	9%	£7.81	£908

8.3.3 It can be seen that the costs of the service outstrip the revenue generated, a not unexpected result given that both the ScotRail franchise and the Caledonian Sleeper service already receive considerable subsidy. In the best case with an Inverness portion achieving 10% rail market share, using a DVT with the service routed via the Highland Mainline the service will cover around 45% of total costs. In the worst case, this ratio reduces to 9%, where there is no Inverness portion and the service is wholly reliant on trips from the Caithness and Orkney areas. A sensitivity test involving the Inverness portion with only a 5% rail market share will only cover 29% of its operating costs.

8.3.4 The inclusion of an Inverness portion appears to be essential, as no option without an Inverness portion is predicted to cover more than 14% of its costs.

8.3.5 The figures presented almost certainly represent a worst case scenario, as it is possible that the service could pick up additional passengers at stations in the Central Belt such as Perth, although the yield from these passengers would not be significant. The level of subsidy required lies in the range of £3.14m to £7.8m, a considerable annual cost. The level of subsidy per passenger varies between £98 per passenger to an unacceptably high £915 per passenger. If market share from Inverness to the central belt were only 5% the minimum level of subsidy rises to £4.02m per annum.

8.3.6 To provide some context to these figures, the implied subsidies were compared with the subsidies for the Caledonian Sleeper service. The publicly available accounts for the Caledonian Sleeper franchise indicate that franchise payments from Transport Scotland represented 37% of total costs, in comparison to the best case scenario of subsidy representing 55% of the costs of operation of this service. This aggregate figure will in practice mask significant variation. For example the it is likely that the "trunk" portions of the Highland and Lowland sleepers will require a lower subsidy per passenger than the "branches" to Inverness, Aberdeen and Fort William where, for example, the high fixed costs of locomotive hauled operation for shorter trains will increase the cost per passenger.

8.3.7 It is therefore possible that the likely subsidy requirements for the Caithness Sleeper would be broadly comparable with those required for other rail services in Scotland.

8.4 Parcels

8.4.1 The Citizen's Advice Service in Scotland undertook research in 2012-15 to assess the issue of delivery to areas of Scotland[16]. The study found that

- Consumers in Scotland's highland and island communities face a postcode penalty to deliver goods they buy online;
- Consumers in the Highlands are charged an average £14.23 per delivery compared to the national average of £5.01 (2015 prices); and
- 13.9% of businesses responding to the survey stated that they are unable to deliver to certain parts of the country due to delivery costs.

[16] https://www.cas.org.uk/system/files/publications/the_postcode_penalty_-_the_distance_travelled.pdf

8.4.2 Based on the following assumptions an annual parcel income could generate £141,988 (2015 prices):

- 50 packages are carried per night;
- 50% of the Highlands mark up rate (£4.61 per parcel) to reflect handling charges and delivery at either end of journey; and
- 624 services (6 nights per week, both directions).

8.5 Summary

8.5.1 It has been shown in this section that the operation of a Sleeper service could serve over 30,000 trips per annum, as well as having the potential to start to develop a parcels-by-rail service.

8.5.2 It has also been shown that the operation of an Inverness portion is fundamental to the operation of the service, with a subsidy requirement becoming unacceptably high without one.

8.5.3 In the best case scenario, it is estimated that the service would generate revenues of up to £2.54m but would require a subsidy of around £3.14m per annum, around 55% of costs. Whilst this is higher than the overall subsidy rate for the Caledonian Sleeper, it is likely to be similar to the subsidy requirements for the Highland portions of the current Sleeper services.

9. CONCLUSIONS

9.1.1 This report has examined the feasibility of developing a Rail Sleeper Service linking the Far North of Scotland with the Central Belt, helping to improve connectivity from remote part of the country and with the potential to support the local economy and develop new tourism markets.

9.1.2 There is considerable interest in the development of a Caithness Sleeper service helping to link the Far North with Edinburgh and Glasgow. Stakeholders in Caithness and Orkney have identified that the service would help to broaden the opportunities for travel for residents, both on the mainland and from Orkney.

9.1.3 Work in this study has examined the operational feasibility of delivering such a service. It has been identified that it would be possible to operate such a service with the option that would generate the greatest number of trips being a service operating from Thurso to Edinburgh, calling at Glasgow Queen St en route. Such a service would involve the operation of a portion to serve Inverness. By operating a portion for Inverness passengers it would be possible for the northbound service to connect with the morning sailing from Scrabster to Stromness.

9.1.4 The preferred method of operation of the service would involve the use of a Class 73/9 operating with a Driving Trailer vehicle which would also act as a parcels vehicle. This would provide flexibility in operation and allow the opportunity to use the service to move parcels and small high value items providing an additional source of revenue for the service.

9.1.5 The preferred service options would be for a Thurso – Edinburgh service with a separate Inverness portion. The Inverness portion is essential to provide a reasonable level of revenue for the service.

9.1.6 Using a range of data sources, we have estimated that the service would attract up to 32,000 one-way passenger trips per annum. The methodology deployed is relatively conservative. In particular, further work might identify the potential for the service to generate additional tourism trips to/from the Far North area.

9.1.7 Based on these estimates, we believe that the proposed service would require a subsidy of around £3.14m per annum, representing approximately 55% of the associated operating costs. If market share from Inverness were only 5% the minimum annual subsidy requirement would rise to £4.02m While significant, this factor is likely to be comparable with the corresponding subsidy required to operate the Highland portions of the current Caledonian Sleeper services.

9.1.8 The operation of this service would represent an exciting opportunity to develop rail links to the Far North and improve connectivity to help support tourism and the local economy. This study has shown that there may be scope to develop such a service, although more detailed work may be required to understand certain detailed aspects of the proposed service.

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SYSTRA

Stakeholder Consultation Appendix A

INFO NOTE

MIDNIGHT TRAIN TO GEORGEMAS

STAKEHOLDER CONSULTATION

IDENTIFICATION TABLE	
Client/Project owner	HITRANS
Project	Midnight Train to Georgemas
Title of Document	Stakeholder Consultation
Type of Document	Info Note
Date	15/06/2017
Reference number	105983
Number of pages	16

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1. JAMES STOCKAN – ORKNEY COUNCILLOR

1.1 Phone call - 25/04/2017

1.1.1 Background:

- James Stockan has promoted the idea of a sleeper service from Caithness to the Central Belt for a number of years.
- 85% of Orkney – Mainland crossings are over the Pentland Firth which has crossings twice a day and three times a day during the peak weeks.
- There are a further three sailings per week from Lerwick and Kirkwall to Aberdeen.
- This is an overnight crossing with berths available although demand often exceeds supply for berths which can cause conflict between Orkney and Shetland passengers.
- There are 20,000 residents on Orkney but 250,000 journeys from the islands a year. There are 30,000 residents in Caithness but there are limited flights available from Caithness.
- From a carbon perspective the introduction of a sleeper service to Thurso seems like the logical point of view as it would reduce car movements and is a lower carbon option than flying.

1.1.2 Service:

- An overnight sleeper from Thurso to the Central Belt would also provide a connection to London as well and arrive in London earlier than flying.
- James proposed a later boat and sleeper service however this would not allow for routing via Aberdeen. Discussions are underway regarding the potential retiming of the Pentland Firth Northlink services.
- James proposed operating six nights a week with no service on a Saturday night to allow for track maintenance (and low demand) and no service in January to allow for line and vehicle maintenance at a time when the boats would also be maintained.

1.1.3 Demand:

- If the sleeper can arrive in Edinburgh before the first flight from Orkney then the service could potentially complete with flights.
- Boarding a sleeper in Edinburgh on a Friday night and the return service on a Sunday night would allow for weekend trips to Orkney with no time off work and potentially allow residents to commute to the Central Belt for work each week. Students could also use the service to travel home for the weekend.
- Residents travelling south would often not require a car in the destination which would make the sleeper attractive. Car hire is readily available and possibly cheaper than the ferry crossing (depending on length of hire/trip).

1.1.4 Freight:

- The ferry freight fare from Kirkwall to Aberdeen is considerably lower than the Pentland Firth fare. Historically this was to remove traffic from the A9.
- Supermarket freight could be transported to Orkney and fish could be exported although James acknowledge this could be a difficult market to break into.
- Streamline have previously investigated the impact of the freight ferry fares.

- Currently the supplier pays the transport to the nearest port, which is Aberdeen and the haulage company pays the remainder of the journey, this skews the movement to Aberdeen instead of Scrabster.
- The Transport Scotland Freight Review will highlight the potential link for Stromness and Scrabster.

1.1.5 Facilities:

- If the service was a late service than a restaurant car wouldn't be required and local venues could be advertised for breakfast or dinner.

1.1.6 Fares:

- Review Aberdeen crossing fares to understand an appropriate competitive fare

2. SCOTT ARMSTRONG – VISITSCOTLAND

2.1 Phone call on 27th April

2.1.1 VisitScotland are keen to see as much connectivity as possible to Caithness and Orkney and are interested in the sleeper service but believe it would be challenging to have sufficient demand. Would be supportive of a pilot service.

2.1.2 Data:

- Advised contacting the research department and checking the VisitScotland website for data on tourist movements in the area.

2.1.3 Demand:

- See movements to/from Orkney as generating the majority of the demand.
- Many tourists travelling north would require their car at destination so would be inclined to travel by car.
- Inverness is a tourism draw and many companies are offering day trips to Caithness and even to Orkney which are popular and would be an alternative to a sleeper service.
- Does not expect there to be significant demand in Inverness given the city is already well served by rail.
- Edinburgh would be the largest draw because of the tourist attractions.

2.1.4 Cost:

- Cost would play a big part and would have to be competitive compared to alternative travel and overnight accommodation. In particular the sleeper would be competing with the airfares.

3. FRAZER HENDERSON AND DARIUS ASTELL – TRANSPORT SCOTLAND

3.1 Meeting on 3rd May

3.1.1 Expressed support for the study and would be interested to see the outcomes of the report. Frazer and Darius offered Transport Scotland's assistance if required.

3.1.2 Planned infrastructure improvements:

- The Aberdeen to Inverness route improvements are in a state of flux and Audrey Laidlaw of Network Rail may be able to provide further information

3.1.3 Routing:

- TS would like to understand any policy reasons behind routing the service via Aberdeen
- Acknowledge that a route via Aberdeen may be more secure than via Perth however the routeway becomes busy as it nears Edinburgh
- Glasgow v Edinburgh – recognise that Edinburgh has the tourism draw. Both cities have the London connection and although Glasgow will benefit from faster journey times in the future the arrival time in Glasgow would be later.
- Is freight the main reason for routing to Glasgow and Edinburgh? Serving both cities appears confused.
- How could Pentland Ferries passengers connect with the sleeper.
- The Caledonian Sleeper offers a commuter service from Kingussie to inverness and Edinburgh to Fort William and this is something which could be considered for Caithness also.
- Inverness is potentially a large market and the time it hits Inverness (before or after midnight could be crucial)
- Five signal boxes on the Inverness to Elgin line would need an additional shift to operate for the sleeper which would be an additional cost.

3.1.4 Open Access:

- The service could potentially be operated through open access with a sponsoring body. This could be Serco but they may not wish to be associated with older rolling stock given the premium product planned for the Caledonian Sleeper.
- A large sum of public money is spent on the Caledonian Sleeper and TS may not be content to use the old rolling stock (although they agree it would be a good use for the rolling stock).
- The branding and product for Caledonian Sleeper v Caithness Sleeper would be very different given the old v new rolling stock and this may prove challenging

3.1.5 Funding:

- Contact the Decommissioning Authority for a potential source of funding.
- HITRANS and HIE are other potential funding sources.
- 1/3 of Transport Scotland's budget goes towards rail related initiatives. ScotRail is heavily subsidised (between 70-80%) and

3.1.6 Risks:

- Need to understand the risks and costs associated with the services. Both the perceptual and actual risks.
- Consider the implications for the Caledonian Sleeper brand.

3.1.7 Freight:

- Freight at Invergordon could potentially expand
- Dundee is aiming to become the decommissioning site for North Sea and move the industry from Aberdeen.

3.1.8 Maintenance:

- Heavier and more frequent trains may have track maintenance implications, especially north of Inverness.
- Does Thurso have appropriate maintenance facilities for the sleepers? Improved maintenance facilities could potentially generate jobs in the area.
- Light maintenance could be carried out in Inverness however heavy maintenance would be in Polmadie or Craigentinny
- Maintenance costs for Sleeper stock have been considerably higher than Serco originally anticipated.
- Serco own the seating and club cars which are from the 1970s and the berths are owned by Porterbrook and will revert back to them when the lease ends in 2018.
- There are heating issues on the current seated stock.

3.1.9 Market/Demand

- Need to understand the stratification of the market to propose the most appropriate berths and seats.
- The new Caledonian Sleeper rolling stock will be targeting the whole market from backpackers to millionaires and need to establish the target market for the Caithness sleeper and adjust the facilities and prices accordingly.

3.1.10 Facilities:

- Off train facilities (showers and toilets) would have to be improved
- 1st class in the new Caledonian Sleeper fleet will have en-suites or access to showers
- No wifi currently available on Caledonian Sleeper
- Serco are committed to providing an ever increasing proportion of local produce on the Caledonian Sleeper with an emphasis on small and medium enterprises.
- The Caledonian Sleeper currently has a microwave only so only microwave meals are provided.
- Seated passengers do not have access to the Club Car

4. DAVID SIMPSON – SERCO CALEDONIAN SLEEPER

4.1 Meeting on 8th May (with James Jackson (SYSTRA) and Frank Roach (Hitrans))

4.1.1 JJ provided a note to the meeting attendees which proposed a number of routing, traction and rolling stock and method of operation options for discussion. These were discussed in turn and the following points summarise the meeting.

4.1.2 Maintenance:

- Currently the Mark 3 sleepers are maintained at Polmadie and Mark 5 sleepers will also be maintained at Polmadie once in operation.

4.1.3 Method of Operation, traction and rolling stock:

- There was a discussion about the feasibility of a number of options proposed and the single locomotive option was discounted because of the requirement to reverse at Thurso and Inverness;

- A class 73 and DVT formation was discussed which could include a freight wagon to the rear of the DVT. This would require unhooking prior to entering Inverness and freight would have to be removed before arrival in Glasgow or Edinburgh;
- Reliability issues associated with 73s are potentially due to driver error;
- High availability of DVTs across the UK;
- DVTs have sliding doors which would allow for two pallets loaded in;
- In terms of performance a refurbished 73 is similar to the performance of a 37;
- Mark 2s are currently undergoing an overhaul with Serco anticipating selling them when the Mark 5s become available. They potentially have 5-10 years of operation remaining.
- The Mark 3s do not currently meet PRM-TSI standards. There are precedents for derogations but this may not be the case for a new service

4.1.4 Freight:

- Agreed that freight requires a further detailed analysis of both the market demand for movement by freight and the method of operation.
- Shellfish has been transported from Inverness to Euston from circa 2002 and a third party arranges the drop off and pick up of the goods.

4.1.5 Timetable:

- First central belt arrival (either Glasgow or Edinburgh) no earlier than 0600, with use of station lounge available as necessary; 0730 at destination. Departures can be when operationally convenient as long as customers able to board at origin station by 2130/2200, and departure from the 'other' central belt station no later than c2330 (with station lounge access to that point)
- Ferry passengers need to be at the pier 30 mins before departure. Could passengers possibly register for the crossing on the sleeper service or at Waverley/Glasgow (to be discussed with Northlink)

4.1.6 Other

- North of Inverness the rail service could be operated as a micro-franchise

4.1.7 Staffing

- Propose host for the two sleeper coaches and a Train manager/team leader role who would be in charge operationally and run the lounge car between stops. Train Managers (Guards) and Team Leaders are separate roles currently. DS proposed out/lodge/back turns to keep one crew for the journey, which helps with resilience and provides consistent customer service.
- Maximum 12 hour turn length for the safety critical roles.
- Personal needs breaks would have to be accommodated

4.1.8 Costs

- David to provide a guide price for locomotive hire and contact GBRF for pricing. Information to be provided in confidence.

4.1.9 Proposed option discussed:

- Thurso to both Glasgow and Edinburgh routed via Perth but with timed options via both the Highland Mainline and via Aberdeen but with no intermediate stops via either route. This would allow for flexibility in the event of engineering possessions.

It was discussed that the Highland Mainline will have possessions in the near future so an Aberdeen options may be needed fairly regularly.

- Northbound service to focus on connecting with the ferry rather than operating the 07:02 INV-THR
- Basic formation - 73 (or equivalent loco) – Mk 2 seated coach – Mk2 lounge car – SLED sleeper – SLEP sleeper – DVT
- The routing issue was about being able to go either way in the event of engineering possessions. Highland Mainline likely to have a number of possessions in the near future so an Aberdeen options may be needed fairly regularly. However in those circumstances NR would pick up the cost of opening the boxes.

5. JENNI BANKS – PENTLAND FERRIES

5.1 Phone call – 09/05/2017

5.1.1 Pentland Ferries are keen to see an increase in options to travel to Orkney and are supportive of the proposals.

5.1.2 Connections:

- Stagecoach have recently cut the Gill's Bay to Inverness bus service which used to provide a link for foot passengers
- JB acknowledges that connection times from Thurso are not suitable for linking with the current ferry times.
- Caithness bus service is unpredictable and travellers may feel uncomfortable relying on a bus to connect with the train and/or boat.
- No current rail sale tickets offered

5.1.3 Market share:

- Mainly vehicles with a large number of commercial vehicles. The number of foot passengers has reduced since the removal of the Inverness bus service.
- A mixture of tourists and residents use the service.
- Would expect tourists to travel north with a car, especially to Orkney where the lack of public transport would be problematic.

6. STEWART NICOL – INVERNESS CHAMBER OF COMMERCE

6.1 Phone call 17/05/2017

6.1.1 Stewart is supportive of the investigations into the service and would welcome any increase in travel choice but has concerns over the level of demand for such a service

6.1.2 Background:

- Inverness is one of 26 Chambers of Commerce in Scotland and although it has a geographical boundary there are no restrictions on the chamber a business can join. The Chamber has members in Caithness who are members of both Inverness and Caithness or Inverness only.
- The Inverness Chamber of Commerce lobby on a number of issues including transport infrastructure and work closely with Caithness, Lochaber and Moray Chambers.

6.1.3 Demand:

- Although supportive of the study has concerns of the level of demand for the service.
- Improvements need to be made to the journey times on the Highland Mainline and Far North Line.
- This study has merit partly because of the poor journey times on the Highland Mainline and Far North Line.
- Hitrans' improvements to connections from the Inverness commuter belt have been a success however this is a different market.
- From Inverness there may be a market for a late night departure to arrive in the central belt for a morning meeting without the need for overnight accommodation. Not used it yet personally but the new 0536 from Inverness arrives in Glasgow or Edinburgh at 0914 or 0931 respectively.
- Personally, Stewart would maximise an overnight stay in Glasgow or Edinburgh an arrange meetings in the afternoon or evening which would not be possible with an overnight service.
- If air links were improved from Wick and Inverness to Glasgow and Edinburgh then it would impact on the viability of the sleeper.
- Considers that the service could generate new demand, not solely a mode shift.

6.1.4 Destination

- No particular view on Glasgow or Edinburgh. Personally Stewart travels to Glasgow more regularly for work but recognises the Parliament and tourism draw of Edinburgh which could be tied together with such a service.

6.1.5 Pricing

- Although the business sector is relatively robust relating to price it would be a consideration for other users.

6.1.6 Frequency

- Services on alternate days could work as business travellers may be open to moving meetings to fit the train availability. The weekends would have to be operated with a view to tourism.

6.1.7 Freight

- High value, small parcel freight transport is likely to be popular amongst members

7. BRIAN ARCHIBALD AND PHYLLIS TOWRIE – ORKNEY ISLANDS COUNCIL

7.1 Meeting 23/05/2017

7.1.1 Pricing:

- The price of the service would impact on the success and in particular the price compared to flights which can be expensive if not booked in advance.
- Although flights to Edinburgh allow for a day trip the return flight at 6pm often means leaving events/meetings early to travel to the airport.

7.1.2 Boat times:

- The current boat times are a balance and although a later boat may work with the sleeper better it would impact on those travelling to Inverness or onwards. Drivers need to be able to arrive at a reasonable time for accommodation providers.
- If one boat provider moved their service to a later time then there would have to be negotiations to have an earlier service with the other provider.

7.1.3 Service and Demand

- Potentially offer a lounge facility at Thurso station for passengers using the sleeper service.
- Feel that travelling north on the sleeper would be more attractive than travelling south and the sleeper could be combined with other modes of transport (eg. early flight to Edinburgh, day of meetings and then sleeper train north. Or boat to Aberdeen, train to Edinburgh and then sleeper north).
- Will attract those interested in trains/sleepers and tourists wanting to see the scenery.
- Could potentially generate new trips, not just mode shift, especially for those without access to a car.
- People travelling to Orkney often tie it in with other trips around Scotland including North Coast 500. Would need to improve connections to encourage people to travel without a car.
- Service would need to be a pleasant experience. Comfortable and clean.

7.1.4 Current travel habits:

- Colleagues currently travel to the central belt by plane. There and back in a day. Members may stay overnight, often because meetings may run on later than the last flight.
- Don't know of anyone who has used the train.
- Current train timetable is poor and it's difficult to get people to use it.

7.1.5 Freight

- Fish on the sleeper would be competing with moving fish on the London sleeper.

7.1.6 Kirkwall – Aberdeen boat service:

- Journey times for connections from Aberdeen are much lower.
- Orkney residents travel to Aberdeen for the day on the overnight boat for shopping trips and hospital appointments.

7.1.7 Timetable

- Residents may move meetings/events to fit with alternate day service, if possible.
- If an alternate day service is offered it should be on the opposite day to the Aberdeen boat.

7.1.8 Destination

- Edinburgh is well served by flights. Discussed whether the train should serve Glasgow to balance between Glasgow and Edinburgh.
- Holidaymakers may choose Edinburgh for tourism. Scottish Government located in Edinburgh would also be a big draw for Edinburgh.

7.1.9 Current choice of crossing:

- Why do people choose to travel on Northlink or Pentland Ferries. Northlink service is more of an experience.
- Location and convenience play a big part in the choice
- The summer pedestrian only service from John O'Groats is very popular with day trippers using the bus package.
- Limited connections to Pentland Ferries so the service so minimal foot passengers.

8. KRISTOPHER BEVAN, FREIGHT MANAGER - NORTHLINK FERRIES

8.1 Meeting 24/05/2017

8.1.1 Destination

- From a government point of view Edinburgh may attract the greater demand.

8.1.2 Demand

8.1.3 Currently the journey time for rail between Thurso and Inverness can't compete with bus and car.

8.1.4 Connections:

- Rail sail ticket sales are low. Tickets have to be bought at a manned train station which would not be possible for Orcadians. Unsure whether Orcadians could get the resident discount on the NorthLink component of the rail sail ticket.
- Connections between Thurso and Scrabster can be difficult. Taxis provide school transport which reduces their availability at school start and finish times (particularly problematic for the 0830 sailing)

8.1.5 Current choice of crossing:

- The Aberdeen service has a greater number of foot passengers but a fairly high proportion travel by foot on the Scrabster service and use public transport.
- Aberdeen foot passengers would often be travelling for hospital appointments or shopping trips and not require a car at destination.
- Pentland Ferries – the main driver for those using Pentland Ferries is the price difference. Especially for those who do not receive the residents. They have more frequent sailings.
- There's a product premium on the NorthLink service and different visitor demographic.
- National Entitlement Card entitles islanders to 2 return trips per year. These trips can be on the Aberdeen boat and include the cost of a berth so the service attracts many who are NEC eligible. Travel for hospital appointments also includes travel and berths on the Aberdeen service. The service is popular with school and sports groups leaving on a Friday and back on a Saturday or Sunday.
- There are peaks and troughs for cabin bookings throughout the year. If booking a couple of weeks in advance it should be possible to book a cabin.
- The Kirkwall calls southbound on a Friday night are the busiest of the week.
- The peak season is P5 to P9 in July and August.
- The Hamnavoe has approximately 17 overnight berths. Passengers can board between 2130-2230 and the crew will drive cars onto the vessel in the morning in time for the 0630 departure. The service has proved popular.

- There are approximately 120 berths on the Aberdeen boat.
- There is a resident discount of 30% and the fares vary throughout the year on NorthLink services reflecting the change in demand.

8.1.6 Boat times:

- The removal of the 11am sailing on the Pentland Firth crossing was not popular with passengers and there are plans to reintroduce the service on some peak weekends.
- Boat times overall have remained static for a number of years. Freight users would prefer an earlier first service and later last service but there is a balance between the needs for freight and residents. Due to difficulties berthing overnight in Scrabster the boat berths in Stromness overnight which affects the time of the first crossing onto the island in the morning.
- Changing the boat times to fit with the rail timetable would be challenging and a big change.
- Delays to the ferry service of over 10 minutes are penalised by the Scottish Government (unless they are outwith the control of NorthLink)
- It is possible to delay departures but it is dependent on a case-by-case basis, for example, a delay on the A9. To hold the boat for any rail delays NorthLink would have to be aware of the number of people travelling and balance that with the needs of others using the crossing. Ticket integration would be required to ensure a joined up approach.

8.1.7 Freight

- The Aberdeen service is more popular and driver hours can be an important component.
- Not convinced there would be sufficient volume for small parcels
- Aquaculture, whisky, building and construction and retail (wholesale and supermarket) are the main freight movements currently. The whisky and aquaculture flow of freight is mirrored in Caithness.

8.1.8 Future changes

- Keen to look at small changes to the ferry service, possibly new services, the ferry fare freight review, introducing RET on the Pentland Firth would result in a reduction in fares.

9. TRUDY MORRIS – CAITHNESS CHAMBER OF COMMERCE

9.1 Meeting 24/05/2017

9.1.1 Freight:

- If there was a delay caused because of freight impacting on passengers or vice versa, who would be responsible for the consequences?
- DRS undertook some consultation with local businesses regarding freight. They had conversations with local distilleries and engineering companies in Caithness and Orkney. They couldn't make the case work for volumes and pricing. There isn't enough regular freight moving down the line and it would require a company like Tesco to get involved.
- If there's an option to remove freight at Inverness then there

9.1.2 Train times:

- Will the service arriving in Wick at 2252 impact on the sleeper?

9.1.3 Demand:

- May not be sufficient demand for running 6 days per week but potentially on alternate days.
- If possible people would plan around the transport available but that is dependent on who is arranging a meeting/event.
- Local businesses could build upon the service – high quality hire car for NC500, motorhome hires, wildlife tours.
- Facilities would have to be improved at Thurso station
- Offered to survey members once details for the service have been finalised.
- Pricing would have to be competitive with the flights.
- People travelling north may be more likely to use the service. A change in attitude would be required for Caithness residents to use the train as they are used to not being able to get to Inverness by 1030 and car is the first choice.
- Inverness is a big draw, especially for shopping. Ideally would want to draw visitors to Inverness further north.
- For those without a car and who don't like flying it is difficult to get away for the weekend, but unsure of how many of those people exist.

Destination

- Difficult to determine the most appropriate destination between Glasgow and Edinburgh

Current mode choice:

- Train isn't seen as a viable option due to journey times and people drive to Inverness if they have a car.
- People accept that the train isn't a great service
- Scenic train is popular during the summer but unsure of eth frequency
- Stagecoach lost a number of schools contracts and can no longer operate the services they had been operating between school times leading to the removal of a number of services. Many of the contracts have gone to taxi drivers which impacts on taxi availability at school drop off/pick up time.
- The Edinburgh flight is more utilised than the Aberdeen flight.

10. DAVID WHITEFORD – NORTH HIGHLAND INITIATIVE

10.1 Phone call – 08/06/2017

10.1.1 North Highland Initiative:

- The North Highland Initiative gives advocacy to the people in the North Highlands and is committed to growing the economy.
- NHI developed the North Coast 500 concept and is currently investigating a number of other concepts in the area including a possible rebranding of the Far North Line. John Lennon of Caledonian University has been commissioned to consider branding the Far North Line as one of the world's best rail routes – the Great North Highland Line.

- The rebranding would primarily be for tourists with awareness that it is also a commuter line in parts and used by residents.
- There are synergies between the work on the Far North Line and the Sleeper
- Also investigating possible synergies with marine transport. Potentially develop small marinas or pontoons along the route. Tie in with the new businesses which have been developed as part of NC500 – accommodation, restaurants etc.

10.1.2 Demand:

- The Edinburgh to Wick flight is unreliable and this could be an alternative
- Forsinard RSPB is on the route and is currently applying to be recognised as a UNESCO World Heritage Site.
- Old stations could be transformed into business opportunities (eg Platform 1864 in Tain)
- People could get off at Dunrobin for breakfast and then get the day train later in the morning
- Possibly have a rover ticket for the sleeper so it could be used with day trains.
- Combined food and drink offer with locally sourced goods would be attractive.
- No hassle with airport security.
- Travel and accommodation in one package
- Offer basic packages up to high-end packages.

10.1.3 North Coast 500:

- People are flying into Inverness to do the North Coast 500. NHI currently in discussions with Heathrow about increasing the flights from Heathrow. Anecdotal evidence of people using the Amsterdam service for NC500.
- There is scope to build up the numbers in the shoulder peaks.
- A number of businesses in Inverness are building on NC500. Hire car companies are seeing increases in businesses and local super car and campervan hire companies have been started.
- NC500 may also drive a demand for a motor-rail service, potentially from London. Classic car enthusiasts would not want to drive cars on motorways but would be attracted to NC500.
- NC500 has a cyclist itinerary and there is evidence of cyclist demand on the route. There are opportunities for kit-forwarding companies drawing on the cyclist demand.
- Potentially an event to highlight the cycling on the NC500 route.
- The east coast of the route is not attractive for cyclists and the sleeper could possibly maximise that – start in Thurso and finish in Inverness (going anti-clockwise).
- Inverness is seen as the main starting point but there could be opportunities to encourage people to start in Thurso – the local car hire company could build upon that.

11. ROBIN CLARKE – HIGHLANDS AND ISLANDS ENTERPRISE

11.1 Phone call – 12th June

11.1.1 Determining what is physically possible, the cost of delivering the service and demand are key to the study.

11.1.2 An Inverness sleeper operated in the 1980s but improvements have possibly made that service obsolete:

- Improved flight times
- Road improvements
- Rail improvements

11.1.3 Previously there had been frustrations about travelling to the central belt for an early meeting as the first train arrived after 10am. A new service leaves at 0536 to arrive in Glasgow and Edinburgh shortly after 9am. Those living close to Inverness station may consider that service but people needing to travel from out of the city may find a sleeper more attractive.

11.1.4 Flights do not allow a day trip for meetings

11.1.5 Unlikely to generate much demand in Inverness and possibly as far north as Invergordon but beyond that point a sleeper may be more attractive.

11.1.6 Cost and fare structure will be a delicate balance to attract passengers. The sleeper to London isn't cheap but do need to factor in the accommodation savings.

11.1.7 Alternating days – may be possible to alter plans to suit travel arrangements but often it is out of people's hands.

11.1.8 Public sector and private sector business travellers may view it differently depending on costs – especially when arriving in Glasgow or Edinburgh. May be more cost effective to drive and avoid taxi/public transport costs at the destination

11.1.9 Travelling north the car is important due to the limited range of public transport options. Particularly important for leisure travel.

11.1.10 Any transport development which brings the area closer to the central belt, closer to customers and collaborating businesses is likely to be beneficial to the area.

11.1.11 Important that the service meets the customers' needs and expectations and is priced suitably.

APPROVAL					
Version	**Name**		**Position**	**Date**	**Modifications**
1	Author	Claire Mackay	Principal Consultant	15/06/2017	
	Checked by			DD/MM/YY	
	Approved by			DD/MM/YY	
2	Author			DD/MM/YY	
	Checked by			DD/MM/YY	
	Approved by			DD/MM/YY	

Mobile phone data Appendix B

1. MOBILE PHONE DATA

1.1.1 The Scottish Transport Statistics, National Passenger Rail Survey and NorthLink statistics show a picture of the movement of people to and from the Orkney area but there are gaps in the information – the final destinations of travellers and the movement from Caithness. To identify the pattern and scale of movement from Caithness and Orkney mobile phone data was purchased from Telefónica.

1.1.2 A number of mobile phone operators (including O_2/Telefónica) are able to provide anonymised and aggregated data derived from the observed movements of their subset of mobile phones.

1.1.3 The phone network operator records the approximate location of the phone, based on which transmitter 'cell' the phone is currently in, with more accuracy when the phone is being used on a call or to send a text or when it is in the 'higher G' networks. Provided the phone is turned on, it leaves a series of 'bread-crumbs' as it passes from the reception area of one phone mast to the next.

1.1.4 This data is often missing a proportion of short-distance trips which do not generate one of these 'hand-over' events, particularly in areas with poor mobile phone signal. However, long distance trips are the main focus of this work and this approach provides a robust approach for long distance trips.

1.1.5 By combining the phone movement data with information about the phone's home location (typically where it goes to at night), the mobile phone operators can classify trips as 'from-home, to-home or non-home based trips by local residents and trips into (or through) a region by non-residents.

1.1.6 The observed set of movements of the relevant subset of mobile phones then needs to be scaled up to match the assumed travel patterns of the full populations of residents and visitors.

1.1.7 This mobile phone data (MPD) was purchased to provide the following information:

- an approximation of the frequency with which residents of the Orkney and Caithness area travel to Central Scotland and beyond;
- an estimate of the split between residents and visitors making trips between the Orkney/Caithness area and central Scotland and beyond;
- the seasonality of the residents and visitor travel to/from the Orkney/Caithness area
- disaggregation of local residents' travel by the number of bed nights spent away from home (which may be an important factor in determining the attractiveness of the proposed sleeper service); and
- the number of bed-nights which visitors spend in the Orkney/Caithness area (which will help to estimate the value of these trips to the local economy and may inform the consideration of the attractiveness of the proposed sleeper service.

1.1.8 Data was requested for 42 days over the year to represent a low, mid and peak season (25th Jan-7th Feb 2016, 23rd May-5th June 2016 and 25th July-7th August 2016) for movements from Orkney and Caithness to ten destinations:

- Inverness

- Highlands
- Aberdeenshire and Moray
- Aberdeen City
- Angus and Dundee
- Perth and Kinross
- Stirling, Falkirk and Clackmannanshire
- Edinburgh, East Lothian, Midlothian, West Lothian and Fife
- Strathclyde
- Dumfries & Galloway, Borders and Rest of UK

1.1.9 Flights and travel via the Kirkwall to Aberdeen boat have been excluded from this MPD data set.

Working Timetable Appendix C

Attached Spreadsheet