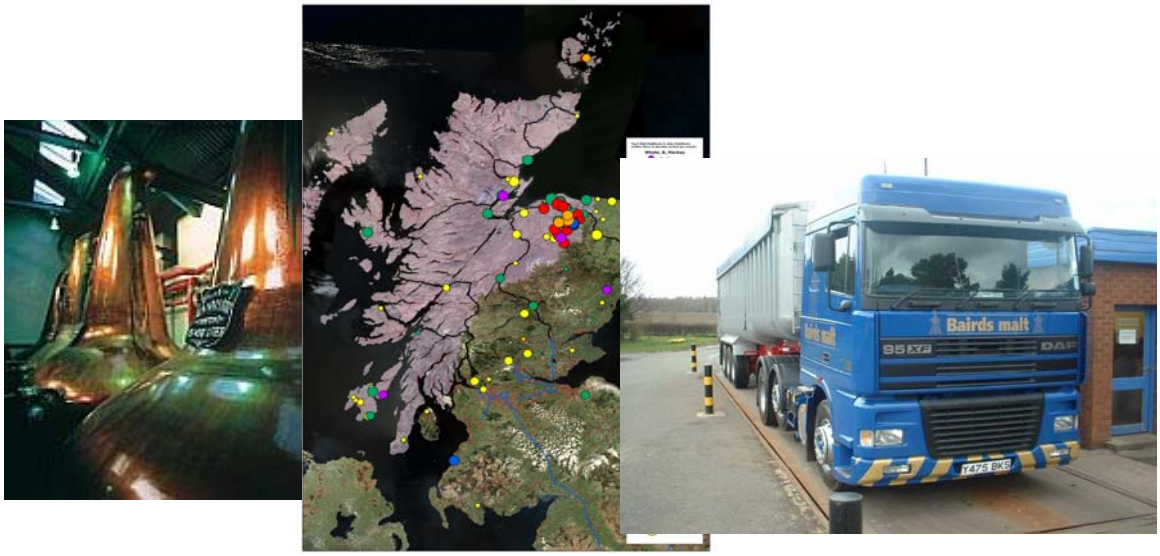
Spirit of the Highlands

Whisky Logistics Study

Report for HITRANS

In Association With Caledonian Solutions

June 2011



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Primary Author:	Chris Paterson
Other Author(s):	Alan Wolstenholme
Reviewer(s):	David Connolly, Alan Wolstenholme
Formatted by:	Chris Paterson

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Summary

MVA Consultancy and Caledonian Solutions were commissioned by HITRANS, the Regional Transport Partnership which covers parts of Argyll and Bute, Highland Council, Moray, Orkney and the Western Isles, to undertake a review of the current logistical requirements of the whisky industry in the HITRANS region, its impact upon the strategic transport network and the implications of and for future growth of the Scotch whisky industry.

Around **85%** of all Scotch malt whisky is produced at the 77 malt distilleries which lie in the HITRANS area. Since the whisky industry currently accounts for the majority of Scottish food and drink exports, producers directly employ around **10,000** workers, with the industry supporting a total of **35,000 jobs**. The industry contributes **£2.7bn** of 'Gross Value Added' (excluding its contribution to the Scottish tourist industry) and is expecting to experience significant growth in the coming years. It is extremely important that the current and future transport needs of the industry are fully understood.

This Study is designed to:

- collate the relevant information on the current logistics of the Scottish whisky industry, focussing on the movement of inputs & outputs to and from facilities located within (or close to) the HITRANS area;
- forecast how the relevant supply and demand may change over time and the impacts these changes will have on the relevant transport infrastructure, again focussing on the infrastructure which supports movements to, from and within the HITRANS area; and
- document the transport related issues and constraints which affect the industry, noting any aspirations and opportunities to improve transport efficiencies.

Consultation

An important element of the study was the detailed consultation with key partners from across the industry, ranging from maltsters, distillers and their trade organisations through to transport providers and hauliers. The purpose of this consultation was twofold:

- to collate the information needed to calibrate the spreadsheet-based prediction tool; and
- to provide an understanding of the main issues and constraints which affect the industry and any opportunities for improvements to the transportation system.

In total more than 20 consultations were carried out either via telephone interviews, face to face discussions or a series of short group presentations. Key themes which arose from consultations include:

The whisky industry is currently almost entirely reliant upon road transport. Given the value of the industry to the UK economy, steps should be taken to actively assist the industry through the removal of pinch points on the road network, potential assistance with transport costs or perhaps importantly assistance to facilitate modal shift towards rail.

Considering the views and experiences of the Scotch Whisky Association (SWA), whisky industry, and rail operators there appears to be considerable scope to further investigate

modal shift towards rail. Negotiations and obstacles will need to be overcome, in particular the requirement for the industry to take a decision on the importance of reducing carbon emissions at the expense of potentially increased freight costs. There does appear to be a willingness from rail operators to become involved, which could potentially smooth negotiations. Considering the requirements for the industry to move to 'bottom fill' tankers in the near future, and the importance of decarbonisation, this would appear the opportune time to further pursue a switch towards rail movements.

Due to the above and the large volumes which can be transported by rail, we believe it important for the **whisky industry as a whole** to unite behind any rail proposals.

Numerous distilleries are located on islands and are reliant upon commercial ferry services. The industry itself has no ownership of such services (Diageo charter grain boats to Islay) and shares access to ferry services along with tourists, other business interests and islanders. It will therefore be necessary to ensure that ferry capacity does not restrict future island-based whisky production, particularly if the expected growth in the demand for whisky materialises over time. Future roll out of the Road Equivalent Tariff (RET) pilot could in itself bring both advantages and disadvantages to hauliers utilising different routes.

Spreadsheet Forecasting Tool

As part of the research, MVA Consultancy and Caledonian Solutions have investigated all elements of the whisky production process to create a spreadsheet tool which can be used to calculate the main transport movements which are made within the HITRANS network as part of the whisky production process. The spreadsheet tool can also be used as a mechanism to forecast future whisky-related demands upon the transport networks to, from and within the HITRANS area.

In order to analyse and summarise the movements of whisky-related goods and their impacts on the HITRANS transport network, the relevant distilleries have been grouped geographically into 14 discreet areas. Each area was attributed a standard routing assumption across the HITRANS region, which the majority of traffic flows would use to access each area. Routes themselves were informed by consultations with the industry. The spreadsheet tool was then used to predict movements on trunk roads which have then been incorporated into a series of maps detailing both volumes of goods transported and vehicle numbers on each stage of each route.

The prediction tool is based upon output capacities gleaned from the Scottish Whisky Review 2009 . **As a default, the tool is set at 80% of current capacity** which is an average representing the previous five years of production. The spreadsheet tool allows changes to be made to this capacity figure which will then recalculate and show the effects of the assumed industry growth on the transport network.

Findings and Recommendations

The majority of transport movements are undertaken by road. The routing maps provided in Chapter 5 illustrate the current impact of the industry on the transport network and the requirements for access to the trunk road network. The main whisky-related movements can be seen to be using the following corridors:

- A9 – Perth to A95;
- A9 – A95 to Inverness;
- A9 – Inverness to Scrabster;
- A95 – Granish - Keith;
- A96 – Inverness - Keith;
- A82 – Glasgow to Crianlarich; and
- A83 – Tarbet to Campbeltown.

The analysis suggests that the A9 and the A95 are the most important corridors in the HITRANS region. We estimate that almost **138,000** goods vehicle trips per year (including return trips) are made in the A95/A941 Speyside corridor. This figure includes a number of relatively-short-distance movements connecting the large number of distilleries, malting facilities and Dried Grains Plants located in this corridor. Around **50,000** longer-distance vehicle trips per year use the A9 (Spey Bridge) for whisky-related movements.

Given the geographical dispersion, volumes of movements and the current lack of alternative modes, the industry's reliance on the road network is understandable. This reliance could lead to constraints for future growth of the industry both in the short and long term futures.

A not-unlikely growth of 10% in whisky production would result in more than **50,000** additional goods vehicle trips per year on the HITRANS road network. To help achieve the desired reduction in greenhouse gas emissions and other traffic-related costs, it would be therefore be advisable to continue to consider targeted, effective and realistic measures to help achieve modal shift where possible, most notably to and from the Speyside area.

1 Introduction

1.1 Background

1.1.1 MVA Consultancy and Caledonian Solutions were commissioned by HITRANS, the Regional Transport Partnership which covers parts of Argyll and Bute, Highland Council, Moray, Orkney and the Western Isles, to undertake a review of the current logistical requirements of the whisky industry in the HITRANS region, its impact upon the strategic transport network and the implications of and for future growth of the Scotch whisky industry.

1.1.2 Around **85%** of all Scotch malt whisky is produced at the 77 malt distilleries which lie in the HITRANS area. Since the whisky industry currently accounts for the majority of Scottish food and drink exports, producers directly employ around **10,000** workers, with the industry supporting a total of **35,000** jobs. The industry contributes **£2.7bn** of 'Gross Value Added'[1] (excluding its contribution to the Scottish tourist industry) and is expecting to experience significant growth in the coming years, it is extremely important that the current and future transport needs of the industry are fully understood.

1.1.3 This implies a need for HITRANS and its constituent Local Authorities and other partners (notably HIE) to carefully consider the current and future logistics requirements of this industry, particularly the aspects of the logistics which lie within their 'sphere of influence'.

1.1.4 Similarly, the scale of the whisky industry and its associated logistics implies a need to consider and fully understand the impact of the industry on the relevant transport networks in the HITRANS area.

1.1.5 This Study is designed to:

- collate the relevant information on the current logistics of the Scottish whisky industry, focussing on the movement of inputs & outputs to and from facilities located within (or close to) the HITRANS area;
- forecast how the relevant supply and demand may change over time and the impacts these changes will have on the relevant transport infrastructure, again focussing on the infrastructure which supports movements to, from and within the HITRANS area; and
- document the transport related issues and constraints which affect the industry, noting any aspirations and opportunities to improve transport efficiencies.

[1] The Economic Impact of Scotch Whisky Production in Scotland

1.2 Focus of the Work

1.2.1 The research commission involved three distinct tasks, summarised as follows:

- investigate the logistical requirements of the whisky industry;
- consult with key stakeholders involved in the industry and the relevant transport operators; and
- present the findings in map-based formats which can be displayed and interrogated via HITRANS web-site.

1.3 Summary of Methodology

1.3.1 The Study has involved:

- investigating the movements of all of the main inputs and outputs of the various stages of whisky manufacture, including:
    - barley and other grain;
    - malt;
    - distilled spirit;
    - casks/barrels;
    - various by-products; and
    - fuel.
- contacting relevant stakeholders to inform the evidence base;
- conducting interviews with transport providers and hauliers to investigate the impacts, constraints and opportunities on the transport network; and
- production of an interactive web-based GIS tool deliverable which summarises the movements of whisky-related goods across the HITRANS transport network.

1.4 The Study Area

1.4.1 The HITRANS region is home to 77 of the 99 currently-active or licensed Scottish malt whisky distilleries and accounts for around 85% of all malt whisky produced in Scotland. It is also home to a set of seven specialist 'malsters' (who turn barley into malt, by initiating, then stopping, the germination process).

1.4.2 Figure 1.1 illustrates the HITRANS region, the relevant transport links and the locations and current ownership of relevant distilleries which lie within or close to the HITRANS boundary.

1.4.3 Figure 1.2 shows the corresponding locations of other whisky-related facilities, including specialist malting facilities.

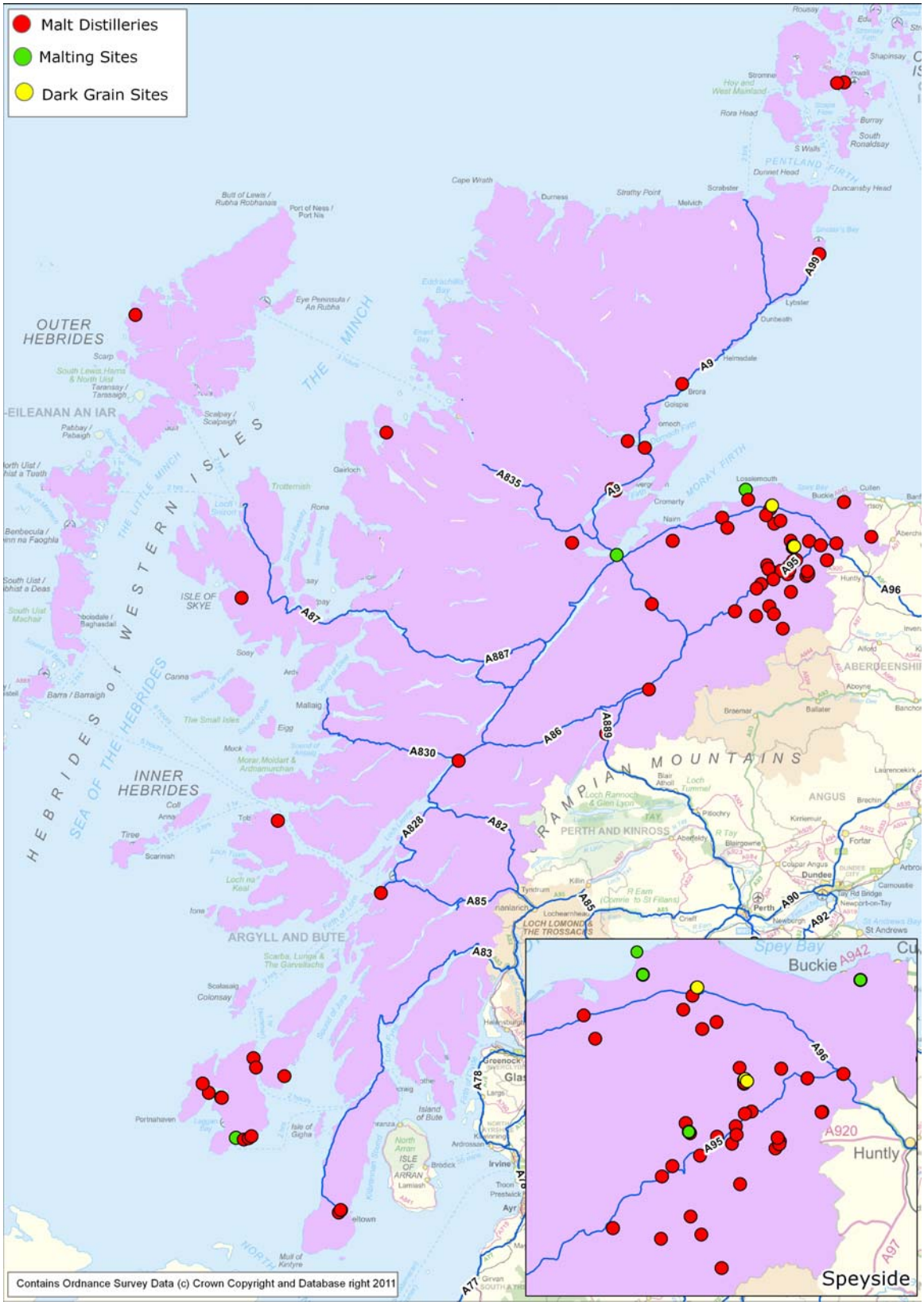

Figure 1.1 Geographic Distribution of Distilleries, malting plants and dark grains facilities within HITRANS region

1.5 Report Content

1.5.1 This report presents the findings from the research, summarises the relevant movements of goods and vehicles and identifies the key constraints and issues affecting the whisky logistics industry. We also present a number of recommendations which will help support and develop the Scotch whisky industry, for consideration by HITRANS and others.

2 Understanding of the Whisky Industry

2.1 The Importance of the Scotch Whisky Industry

2.1.1 Scotch whisky accounts for around **25%** of the UK's food and drink exports and the industry contributes around **£2.7bn** of 'Gross Value Added' to the Scottish economy. The wider industry has a turnover of **£6.4 bn**, adding around **£3.9bn** of GVA. GVA per employee is just over **£262,000**, nearly six times as productive as the average Scottish worker.[2]

2.1.2 The recent trend has suggested that whisky exports are growing at around **1.5%** per annum by volume (and by **4.5%** per annum by value) and there is an expectation that this growth will accelerate as a number of large emerging markets, notably the five so-called BRICM countries (Brazil, Russia, India, China and Mexico) switch from home-produced spirits to Scotch whisky. For example, it has been estimated that if imported spirits can capture 7% of the spirits markets in these five BRICM countries alone the Scottish whisky industry would need to double its current output.

2.1.3 It is therefore vital that appropriate transport policies, infrastructure and supply chains are in place to help support this vital Scottish industry, both now and in the future.

2.1.4 Around **85%** of all malt whisky is produced within the HITRANS area, implying a need for HITRANS and its constituent Local Authorities and other partners (notably HIE) to carefully consider the current and future logistics requirements of this industry, particularly the aspects of logistics which lie within their 'sphere of influence'.

2.2 Logistical Aspects of the Scotch Whisky Industry

2.2.1 Figure 2.1 summarises the main movements of inputs and outputs of the Scotch Malt whisky industry.

[2] Economic Impact of Scotch Whisky Production in Scotland, 2010

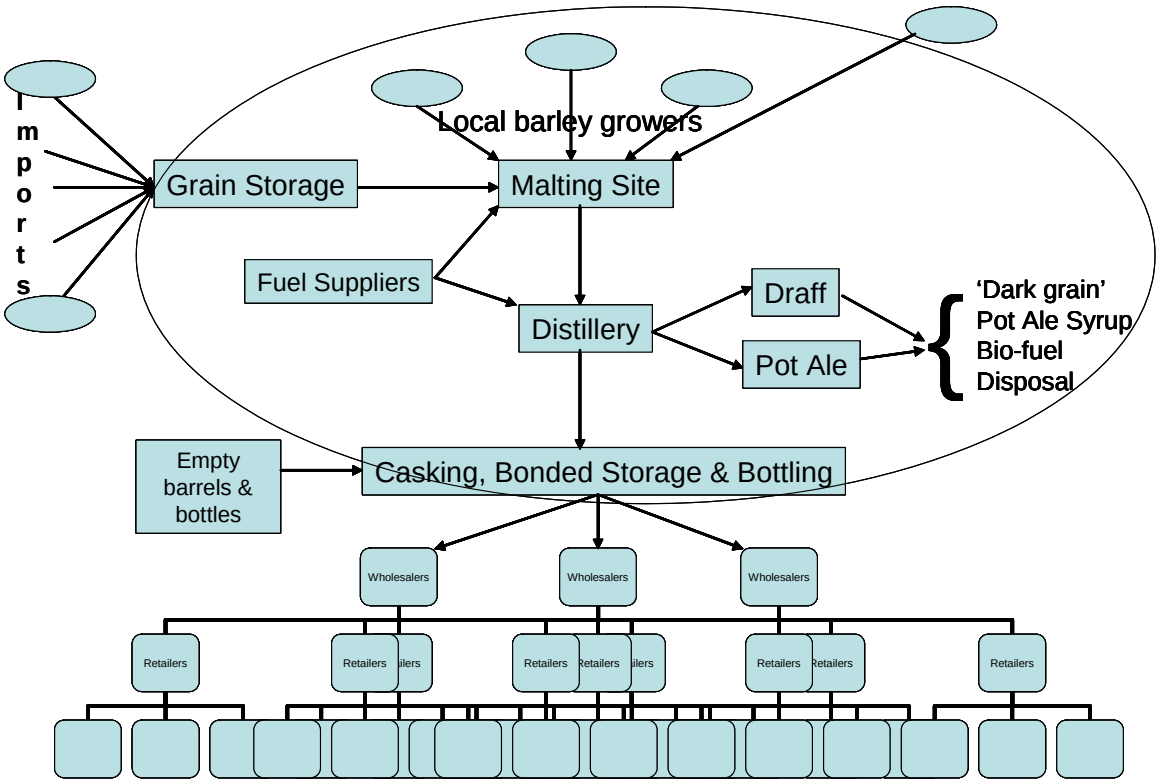

Figure 2.1 Main Movements of Inputs and Outputs to Scotch Whisky Industry

2.2.2 The logistics of the malt whisky manufacturing process can be summarised as follows:

- barley is transported either directly from local farms or via intermediate grain storage facilities to malting facilities where it is wet, warmed, germinated, heated and dried to produce the starting material for the fermentation process – this malting used to normally take place on-site at the individual distilleries but the majority is now undertaken by a handful of specialist 'Maltster' companies who compete with each other on quality and price - those distillers who still malt some or all of their own grain on-site generally doing so for 'marketing' rather than logistical reasons;
- the dried malt is transported to the distillery where it is ground, 'mashed' (ie mixed with water and heated to create a porridge-like mix called a 'wort'), fermented and distilled (twice) to produce four main products – the left-over 'soggy' solids from the barley (known as draff), a significant amount of carbon dioxide (usually vented to the atmosphere), the 'de-alcoholised' liquid, known as pot ale (or Spent Wash in the corresponding grain whisky process) and a 65% strength spirit (the important bit!);
- the spirit is placed in oak casks and stored for at least three years before being bottled – historically these three steps all took place at the individual distilleries, but it is now more common for the majority of the alcoholic spirit to be transferred (in tankers) to large purpose-built cask filling/maturation warehousing and bottling facilities in central Scotland;
- the draff and pot ale are dealt with in a number of different ways – see Section 2.3 for details; and
- fuel deliveries - both malting facilities and distilleries require a non-trivial amount of fuel to power the kilns/stills – while much of the Spey Valley cluster and some of the

Lowland distilleries have access to natural gas, facilities in the other regions rely on supplies of other fuels (usually fuel oil, delivered by road tanker).

Grain Whisky Distilleries

2.2.3 From a logistical perspective, the main differences between the Grain Whisky and the Malt Whisky processes are as follows:

- the scale of production – a grain distillery is typically **10 to 20** times larger than a malt distillery, so that the seven grain distilleries in Scotland together produce around 65% **more** alcohol by volume than the total production of the 100 malt distilleries; and
- different raw materials - most of the raw material of the grain distilling step is a variety of (unmalted) cereal such as wheat or maize, which tends to be imported from further afield than the barley used in the malt whisky process described above.

Ownership and Geographic Locations

2.2.4 The total number of operating malt distilleries fluctuates with the fortunes of the industry but there are currently 99 malt distilleries (and seven grain distilleries) licensed to produce Scotch whisky. Their capacity and output are quoted in 'mla' (million litres of pure alcohol per annum). The smallest are less than 1mla and the largest (excluding the seven grain distilleries) is about 12mla, with the average currently around 3mla.

2.2.5 The two biggest players in the current Scotch Whisky Industry are **Diageo** (created as a result of the combination of DCL, Guinness and Grand Metropolitan) and **Pernod Ricard** (operating under the trading name of '**Chivas**' in Scotland), who together own almost half of the registered distilleries and account for around **40%** of the whisky produced in Scotland.

2.2.6 Edrington (Grouse/Macallan etc.) and Wm Grants (Grants/Glenfiddich/Balvenie) are next in scale, followed by Whyte and Mackay, Inverhouse and Bacardi, who each currently own five distilleries in Scotland.

2.2.7 At the bottom end of the scale there are 15 single distillery companies, although this number changes as the relevant small players enter and exit the industry. Within this group there is a subset of 'boutique' or 'hobby' distillers who operate at a very low level of activity and whose logistic requirements probably do not require individual consideration within this study.

2.2.8 Through our investigations we have been able to produce maps which illustrate the location, ownership and current production of the 78 distilleries located within the HITRANS region which are licensed to produce Scotch whisky and some of the other associated production facilities, notably the main malting facilities and the major cask-filling, warehousing and bottling facilities.

2.2.9 Movements of goods to, from and between the distilleries and other facilities located within (or close to) the HITRANS area are assumed to form the main focus of this study. In particular, we assume that the only grain distillery which requires detailed consideration is the Whyte and Mackay grain distillery in Invergordon. Figure 2.2 below illustrates the ownership of distilleries within the study area.

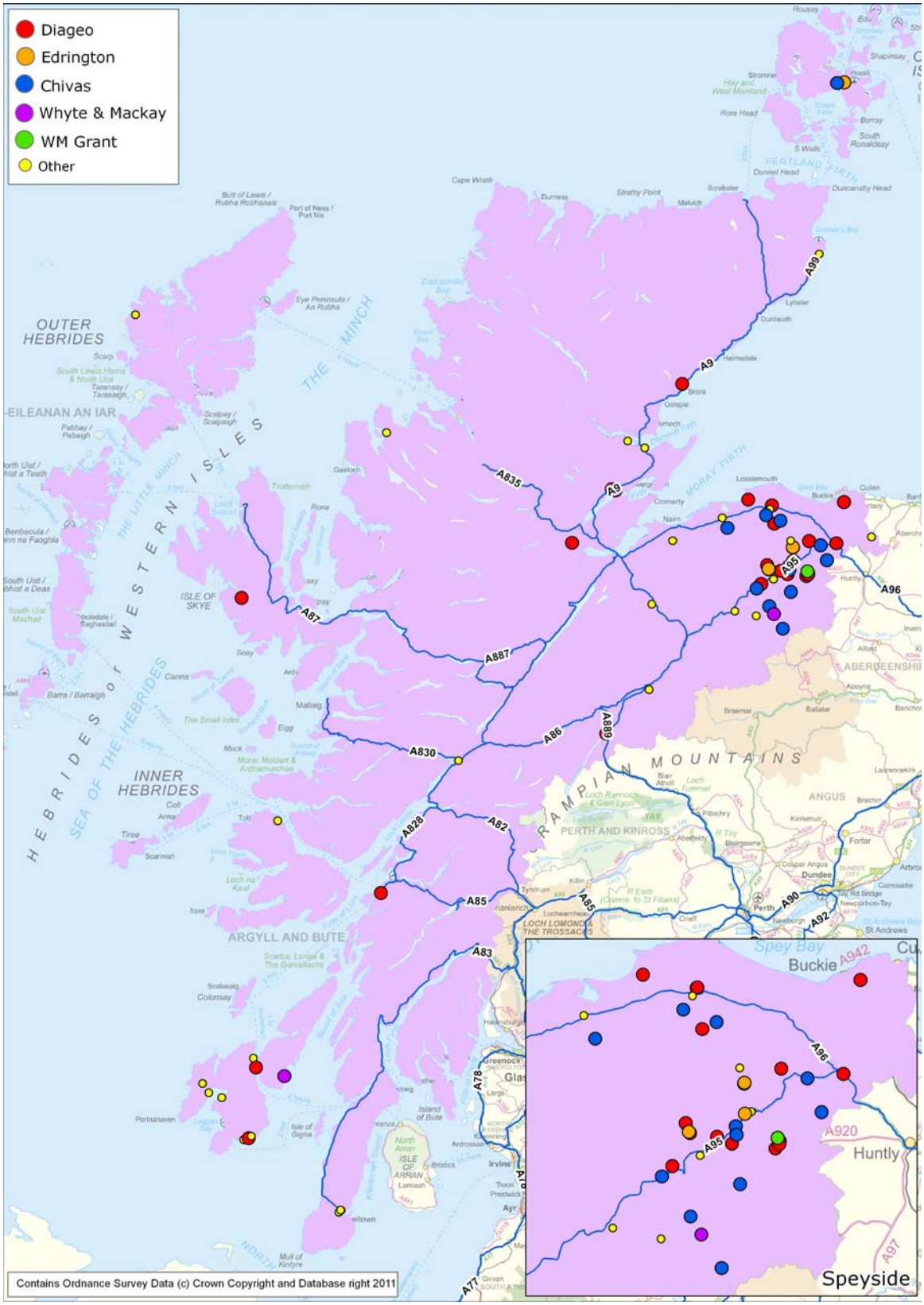

Figure 2.2 Ownership of Distilleries within the study area

2.3 Whisky Producing Regions

Malt Whiskies have traditionally been grouped geographically based upon the location of production. Whilst each distillery produces its own unique flavours, areas often exhibit similar characteristics as the geography and climate of each region can influence the character of the whisky produced.

2.3.1 Scotch malt whisky distilleries are traditionally allocated to one of four whisky-producing 'regions' as follows:

- Campbeltown;
- Highland, made up of three sub-regions - Speyside, the Islands (excluding Islay) and the rest of the Highland mainland;
- Islay; and
- Lowland.

2.3.2 77 of Scotland's 99 malt whisky distilleries are located within the HITRANS study area, those outwith the HITRANS boundary have not been included within our report. There is also a large grain distillery located at Invergordon which forms part of this investigation.

2.4 The Need to Consider the Logistical Impacts of the By-products

2.4.1 This study also considers the various alternatives for disposing of the two main by-products of the distilling process, since these will have a significant impact on the overall logistics requirements of the whisky industry in the HITRANS area.

2.4.2 Traditionally draff (the solid by-product of the distilling process) was fed to cattle, and pot ale (from Malt Whisky) and Spent Wash (from Grain Whisky) was fed to pigs. Often the animals were reared in farming ventures integrated directly with their respective distilleries.

2.4.3 As the scale of distilleries grew, coping with the ever increasing volumes of liquid residues became ever more problematic. For example, at the beginning of the 20th Century the then owners of Macallan lost a legal attempt to claim they had 'legal right' to discharge Pot Ale into the River Spey.

2.4.4 Shortly afterwards the "Combination of Rothes Distillers" (CORD) was set up to evaporate Pot Ale into **Pot Ale Syrup (PAS**) for several local distilleries. The draff was added back to the Pot Ale Syrup prior to final drying into '**Malt Distillers Dark Grains' (MDDG**).

2.4.5 The three large MDDG operations-based at Dailuaine, Glenlossie (both Diageo though they process others' material) and Rothes (CORD) take approximately 5000 tonnes of Draff per week, equating to approximately 250,000 tonnes in a 50 week year.

2.4.6 A current estimate is that approximately 190,000 tonnes of draff per annum is available 'as is'.

2.4.7 Other techniques of Pot Ale disposal have included direct discharge to sea via an outfall, and, where ground conditions permitted, discharge to a pit or lagoon where it would undergo permeation into the soil and a crude form of aerobic/anaerobic digestion. These methods have been increasingly 'outlawed' by recent environmental regulatory controls.

2.4.8 More recently Pot Ale Evaporation using waste process heat has become popular as a solution for single or small groups of distilleries and a market has been developed for Pot Ale Syrup on its own as a feedstuff additive without further drying. The Draff is not used in this process and becomes available for sale 'as is'.

2.4.9 A recent development uses the calorific value of the Draff and Pot Ale (combined with malting chaff and sawdust/wood residues if available/necessary) as a **bio-fuel** for the distillery.

2.4.10 This technique is said to enable distilleries to be carbon neutral and has been adopted at Cameronbridge, Roseisle (Diageo's integrated Maltings and newly commissioned 10 mla Malt distilling complex) and for the next round of capital investment at the Rothes facility of CORD.

2.4.11 The attraction of combustion, if successful, is that the distiller reduces their exposure to energy price fluctuations. They also earn some green credentials (and subsidies) by being able to claim a 'carbon neutral' process.

2.4.12 Early reports indicate difficulty in making the technique self-sufficient from an energy perspective, but, if these difficulties can be overcome, others may follow down this route.

3 Consultation

3.1 Introduction

3.1.1 An important element of the study was the detailed consultation with key partners from across the industry, ranging from maltsters, distillers and their trade organisations through to transport providers and hauliers. The purpose of this consultation was twofold:

- to collate the information needed to calibrate the spreadsheet-based prediction tool; and
- to provide an understanding of the main issues and constraints which affect the industry and any opportunities for improvements to the transportation system.

3.1.2 Consultations were carried out through a combination of face-to-face meetings and telephone interviews.

3.1.3 The following organisations were consulted during the study:

- Scotch Whisky Association (SWA);
- Scotch Whisky Association Transport and Safety Group;
- Maltsters Association of Great Britain (MAGB);
- Simpsons Maltings;
- Crisp Maltings;
- Bairds Malt;
- Greencore Malt;
- Diageo;
- Chivas;
- Edrington;
- McPhersons;
- Carntyne Transport;
- John G Russell Group;
- Mundells;
- Freightliner;
- Freight Transport Association (FTA)
- Road Haulage Association (RHA)
- Network Rail; and
- Transport Scotland.

3.1.4 Information was also collated and cross-checked from the Scotch Whisky Industry Review, the Scotch Whisky Association Transport and Safety Working Group, and Caledonian Solutions' industry experience.

3.1.5 The remainder of this chapter summarises details the issues identified during the stakeholder consultation.

3.2 Malting

3.2.1 As explained in Chapter 2, the production of malt plays a key role in the whisky production process upon which distilling depends. There are 11 malting sites in Scotland which supply the industry, in addition to suppliers in England and a major plant at Berwick. In total around 550,000 tonnes of malt is provided to the Scotch Whisky industry annually. This represents around 20,000 truck deliveries to individual distilleries, including around 480,000 tonnes of malt to distilleries located within the HITRANS region, equivalent to approximately 17,000 'truck-load' deliveries. Given the significance of this movement of malted barley and the less-predictable origin/destination pattern of the corresponding trips (relative to the movement of distilled spirit) it was important to contact a large proportion of maltsters, to enable us to better understand the relevant supply routes.

3.2.2 Discussions with the industry suggest that heavy fuel oil and gas oil account for around 25% to 30% of energy consumed by Scottish (+ Berwick) maltsters. In total, over 10m litres of oil is shipped by road to malting plants. The industry, however, is moving towards gas power, with EU regulations due to be implemented in 2013 which will effectively penalise oil-fired plants. Considering the above, it is reasonable to presume that vehicle flows of heavy fuel oil to malting sites will decrease over time.

3.2.3 Whilst the majority of grain for malting is sourced locally, there are exceptions to this rule. For example the Simpsons Malting plant in Berwick sources barley from across the UK. Similarly, Diageo Maltings at Port Ellen on Islay are regularly supplied by shipments of barley from Hull and Kings Lynn. It should also be noted that Diageo Maltings on Islay supply both of the Diageo distilleries on the island and a further 5400 tonnes of malt to other Islay-based distillers. The remaining malt required by other Islay (and Jura) distilleries is brought in by ferry from the mainland.

3.2.4 During the consultation process, we have been advised that the National Farmers Union (NFU) of Scotland are increasingly attempting to exert pressure on distillers and maltsters to only use Scottish barley. However, there are a number of factors including the length of the Scottish barley season, capacity issues and the risks associated with relying on a limited geographic production area which suggest that this NFU aspiration is unlikely to be achieved.

3.2.5 Within the malting process there is shrinkage between the raw materials and the products, (1.3 tonnes of barley is required to produce 1 tonne of malt). There is therefore a requirement for a greater tonnage of barley to be hauled into a maltings plant than the weight of malt shipped out. The malt itself is then usually shipped to individual distilleries in 28 tonne loads. A number of malting sites make an effort to fill empty trailers with barley or other materials such as woodchips etc. before returning to the malting plant so as to reduce empty running.

3.2.6 Discussions with maltsters did not identify many specific transportation issues, those that were mentioned included:

- a perception that the number of grain transporters has decreased in recent years, resulting in increasing capacity issues/concerns in the peak harvest season;
- transport elements can be affected by winter weather, the greatest problem faced during such times is accessing the individual distilleries themselves;

- HGV speed limits on the A9 create 'issues' in terms of lost time and the potential for accidents due to inappropriate overtaking of slower vehicles; and
- a number of maltsters mentioned the rising cost of fuel as a concern for the transportation aspects of their business.

3.3 Islay, Mull, Skye and Orkney

3.3.1 Islay, located off the west coast of Scotland has long since been a specialised whisky producing region famous across the world for its characteristic whiskies. The island is home to 8 individual distilleries[4]. Whisky is also produced on other Scottish islands of Skye, Mull, Arran, Jura, Lewis and Orkney which are also reliant on a combination of roads and ferries for the movement of raw materials and finished products.

3.3.2 On these island locations (apart from Skye), many of the inputs and outputs of the various processes are transported to and from the Scottish mainland by boat. These movements of goods on and off the islands are usually reliant on road-based trucks/tankers using commercial ferry services, with the notable exception of the supply of grain to Diageo's malting site on Islay, much of which is delivered by sea using commercially-chartered coastal shipping.

3.3.3 As part of the Scottish Government's Scottish Ferries Review, the SWA prepared a consultation response on the access requirements of the whisky industry and its reliance on the ferry network. Relevant extracts have been included below.

"The Scotch Whisky industry has a strong presence in Scotland's islands, with 15 malt whisky distilleries (out of a total of 101 malt whisky distilleries nationwide) located off the mainland:

- *Eight malt whisky distilleries and a maltings located on Islay*
- *Two malt whisky distilleries in the Orkney islands*
- *One malt whisky distillery apiece located on the islands of Arran, Jura, Lewis, Mull and Skye*

Many of these island distilleries have been in existence for centuries, producing well known brands sold worldwide. Others are welcome and more recent additions to the industry. Each distillery plays a key role in the fabric of the island on which they are located, providing jobs and investment, supporting local businesses and community activities. The brands help to attract tourists and further economic benefits to the islands in which they are produced.

Ferries deliver, among other things, plant and machinery, fuel oil, raw materials, casks, and visitors to island distilleries. The resultant spirit and in some cases, finished goods, will then be transported to the Scottish mainland for maturation, blending and bottling purposes, before being shipped on to market. Ferries also bring visitors (both tourists and business travellers) to our facilities.

[4] Ardbeg, Bowmore, Bruichladdich, Bunnahabhain, Caol Ila, Kilchoman, Lagavuilin, Laphroaig and Port Ellen

Whilst industry growth will benefit the island communities in question, it is clear that growth will have significant implications for local ferry services, in terms of frequency of sailings, capacity and local infrastructure. Currently, the level of ferry service appears to meet local needs but it also appears to be reaching capacity with issues arising on occasion on certain routes at peak times. If the Scotch Whisky industry is to meet demand for growing and emerging overseas markets, it is likely that our own demand on island ferry services will grow. It is important that growth is factored into future service provision.

Operating from an island location adds cost to distillers' supply chains. There is no doubt that the ferry services are critical to maintaining island distilleries and if distilleries are to continue to operate profitably in island locations, there needs to be support for commercial transport links. Tourism is important to many islands but is seasonal. Businesses are likely to use the ferry services all year around and so a reduction in commercial fares would ne appropriate to encourage economic activity.[5]"

3.3.4 Discussions with the SWA, distillers and transport providers have also revealed the following transport related issues with regards accessing the islands:

- weather disruptions can have serious impacts upon the industry, either by affecting production on the islands, or preventing the movement of the finished spirit back to the mainland – these delays can have a direct (and often significant) impact on the hauliers whose income and profit margins are directly affected by their ability to deliver on-time;
- only specific space/volumes are allocated to the whisky industry on ferries, which is presently an issue with the large volumes of spirit and byproducts which require to be transported - a production grows, there will increasingly be the requirement for larger vessels or increased numbers of sailings, since at present many of the relevant ferries are perceived to be running close to capacity, particularly in 'high season'; and
- capacity and accessibility at piers can be an issue, particularly if larger vessels are to be deployed. Port Ellen is currently being upgraded and will be unavailable for use for a period of around 6 months. In this time, all services will be routed through Port Askaig. Whilst Port Askaig will allow access to Islay, it should be noted that the majority of distilleries are located in the south of the island, this will temporarily mean increased numbers of road mileage will be required on Islay.

3.3.5 Due to the specialist nature of the vehicles involved and the inherent one-way nature of the movements of the various inputs and outputs, much of the whisky logistics involve significant amounts of 'empty-running' on the return journeys. B Mundell Transport have developed an innovative solution to this problem by combining a tanker-based vehicle to act as the frame for a curtain-sided truck, so that spirit can be transported in tanks whilst palletised goods can be placed on top. (See picture[6])

[5] Scottish Ferries Review, Consultation Response by Scotch Whisky Association (SWA) 2010.

[6] Photograph courtesy of BigLorryBlog on Roadtransport.com

3.3.6 Note that the benefits from the resulting decrease in empty running will be partially offset by the loss of capacity relative to that of a conventional tanker, so a detailed consideration of the size of the relevant movement of goods in each direction (and associated issues such as ferry sailings/capacity etc) will be required to determine whether this hybrid vehicle can reduce the relevant overall logistics costs.

3.4 Road Haulage

3.4.1 Distillers and production companies do not tend to operate their own freight transport services, instead they use specialist haulage companies which are large enough to accommodate the large variety of movements required by the industry. Due to the specialist equipment required, a large proportion of transport movements are carried out by a critical few haulage companies. Key players in the industry include:

- MacPhersons;
- Carntyne Transport;
- John G Russell;
- Malcolm Group; and
- B Mundell.

3.4.2 These larger players tend to have a large and suitably diverse fleet to allow them to meet the demands of all phases of the whisky production process. The majority of vehicles are specialised and are only used for the whisky industry.

3.4.3 The different types of vehicles required for each stage include:

- temperature-controlled isotanks for transporting bulk materials and by-products;
- double-deck boarded vans used to transport casks;
- specialised spirit tankers used to transport bulk spirit to maturation plants; and
- curtain-sided trailers for general transportation services.

3.4.4 The vehicles tend to be routed via the national trunk road network as much as possible. Typically, the A9 and A95 through Speyside are the most important freight corridors for the industry. Discussions with hauliers reveal that around 10% of movements from Speyside are routed via the A96 and Aberdeen, with the remainder using the A95/A9 route south to Perth and beyond.

3.4.5 Distilleries based on the west coast and Western Isles tend to use the A82 and its feeder routes.

3.4.6 At present, the majority of whisky-related materials, goods and by-products within the HITRANS region are transported by road. The only exceptions to this include ferry journeys to islands where required, grain boats to Diageo's Islay maltings and a small amount of Dark Grains sailing from Buckie harbour.

3.4.7 In terms of bulk spirit, tankers currently in use feature a mix between bottom and top filling tanks. Industry-wide regulations are however being introduced which will require bottom filling and bottom discharging of all tankers by **2024,** this is primarily a safety requirement as it will negate the need to work at height. This will lead to a requirement for currently-non-conforming road tankers to be modified or replaced to fulfil this requirement.

3.4.8 As noted previously, empty running is a concern across the industry, with considerable vehicle mileage occurring without freight. Where possible, hauliers attempt to reduce this empty running but due to the specialist nature of the vehicles, this is often impossible. At least one organisation commented on the Mundell 'Supertanker', remarking that the innovation was very interesting and perhaps should be more widely used across the industry.

Specific Road Issues

3.4.9 Specific road transport issues raised by operators and industry representatives included the following:

- A9 – the industry recognise there are no real alternatives to this route, however in general would like to see measures taken to upgrade the route. The road itself can suffer from incidents of bad weather, accidents and congestion. These occurrences add significant time and costs to hauliers;
- both the RHA and FTA noted the potential for dualling the A9, citing accidents are often caused by inappropriate/dangerous overtaking of slow vehicles, the RHA also suggested increasing the speed limit for HGV's on the A9 to 50 mph as a potential accident reduction strategy;
- whilst hauliers route their vehicles via the relevant trunk roads for as much of the journey as possible, the final link between the trunk road and the distilleries often present problems, since many of these distillery access routes were not designed for the 44-tonne vehicles typically used today – as a result, hauliers can find these local access roads challenging, particularly in periods of adverse weather and often need to invest additional time and funds for driver training in order to negotiate these routes safely;
- the main Speyside artery (A95) between Aviemore and Aberlour causes problems due to being too narrow for the size and volume of vehicles which use the route - in addition, soft verges along this route result in regular vehicle 'rollovers' – the resulting high accident/incident rates create costs, delays and safety impacts for both the industry and other users of this important route;
- hauliers also report key routes not being adequately gritted in winter which leads to accidents and delays;
- the Rest and Be Thankful section of the A83 (used by freight movements servicing distilleries on Islay and Campbeltown), can be a problematic from a reliability perspective, due to the high frequency of landslides and road accidents and the exceptionally long alternative diversionary route; and
- a number of organisations consulted noted the rising price of fuel as having serious consequences on their ability to service the whisky industry.

3.5 Rail Transport

3.5.1 At present, all whisky-related goods within the study area are transported by road or (where necessary) sea. The whisky industry in general is, however, committed to reducing its carbon footprint and working towards industry and Scottish Government targets for decarbonisation. There has been no research undertaken which apportions transport costs of each phase of the process, however the SWA report that at present 11% of all whisky industry-related emissions are accounted for by distribution alone. Given the large volumes of goods transported via road, it is reasonable to assume that transport accounts for a reasonable proportion of all carbon emissions.

3.5.2 At present, no whisky-related goods are transported by rail in the HITRANS region. Indeed we are led to believe that even in the central belt rail is not used until the latter stages of the process when it can transport cased goods south or for export.

3.5.3 Given industry targets for decarbonising along with new requirements to refurbish all tankers to 'bottom fill' by 2024, there would appear to be an obvious role for greater use of rail by the industry, a point which has previously been noted by the industry themselves and by rail freight operators. In 2010, the SWA's Transport Safety Working Group conducted initial research to explore if there was any appetite for a switch to rail, whilst documenting any perceived constraints there may be to modal shift, the goal being to take any constraints to rail freight operators and open constructive negotiations between parties.

3.5.4 In general the industry were interested in pursuing options to use rail as part of the production process, however it became apparent there were numerous obstacles to modal shift, these have been summarised below:

- due to the volumes required, there is a requirement for critical mass before rail becomes feasible, this would potentially require the industry as a whole or at least a number of major players to get behind any proposals in order to secure enough movements to make rail services appropriate and cost effective;
- the research identified that Elgin would be the most appropriate rail head location to service the Speyside distilleries, however this would have to be upgraded and suitable lifting equipment etc installed;
- costs are viewed as a major obstacle to modal shift. Rail is more expensive, in part due to the requirement for road shunts at either end of the journey. Similarly for movements of casks which have to be moved by hand, labour costs will be inflated due to the amount of extra movements required. The only way this cost can be somewhat negated would be to load the entire truck onto the rail wagon;
- control of delivery times and frequency of rail movements – at present manufacturers share whiskies for blends etc, they require some degree of flexibility which rail does not offer, likewise rail movements do not allow for last minute orders;
- the industry has essentially evolved to work continuously - deliveries are scheduled to arrive at appropriate destinations at appropriate times during the day, ensuring everything does not arrive at once. Rail movements do not allow for this degree of working and would require a step change for the industry to consider changing working practices. Essentially reliability of service and efficiency of operations would be key to success;

- the industry believes there to be a lack of specialist equipment used for bulk spirit and cask movements, including the requirement to move to the bottom filling of tankers by 2024;
- if freight arrives at destinations early, it can sit idle in trucks. If freight was to be transported by rail, all must be unloaded at destination;
- issues of utilisation of equipment which would no longer be required due to rail transfer; and
- specific constraints on the rail network. (NB These constraints have been explored and documented within the HITRANS Rail Freight Capability Study[7]). Network Rail have confirmed that constraints identified within the study have not changed, they also note they will be happy to conduct discussions with interested parties should further information be required).

3.5.5 The SWA Transport and Safety Working Group concluded that due to the noted issues there would have to be a desire from the Scotch Whisky industry **collectively** to make modal shift cost effective for the rail operators and consider the environmental benefits for making modal switch rather than making a judgement based on freight costs alone. Drinks companies should also understand the impact their operations have upon the roads and the country's transport infrastructure, in particular, the carbon footprint created by their operations. Whilst there would appear to be the desire from the industry to use rail there needs to be a desire to make the rail elements cost effective, as rail freight operators will require some form of guarantees before committing to services.

Views of Rail Operators

3.5.6 Considering the above, we also consulted with rail freight operators to gather their opinions on issues. In general, it would appear that there is an interest from the rail industry to move into the whisky market however they recognise a number of key constraints observed by the SWA Transport and Safety Group. Above all, is the requirement for the industry as a whole to unite behind the idea and use rail services, without which there will not be the critical mass of movements required to make services commercially feasible.

3.5.7 Rail operators appear to understand the cost implications faced by the industry should they move to rail transport, however operators will also face commercial considerations such as the requirements to build, purchase or lease the specialised equipment required, along with booking rail paths for pre-defined time periods. Rail operators appear to be willing to consider these costs, however they would require commitments from the whisky industry to run a specified number of services for a specified time period.

3.5.8 In contrast to the whisky industry, rail operators believe the equipment is currently available and should further work be required, specialised tanks etc could be built to order where necessary.

[7] HITRANS – Rail Freight Capability Study 2010

McPherson Ltd - Rail Trial

3.5.9 McPhersons of Aberlour recognised the potential for transporting goods by rail some time ago and appointed a business development manager to investigate, source and secure business moving whisky related goods by rail as opposed to road. McPhersons recognised the importance of running services into Elgin, due to its proximity to the concentration of Speyside distilleries.

3.5.10 The company invested in lifting facilities at the Elgin rail head and initiated contracts with numerous customers. The experiment however failed, costing McPhersons significant sums of money. Reasons for this failure included:

- McPhersons believe the service did not match customer expectations; at present customers can request a road movement at any time, unlike rail which is timetabled and scheduled. Rail does not allow for last minute scheduling;
- the current rail facilities at Elgin are not appropriate and require significant improvements;
- rail movements require road shunts at either end which require to be paid for. Effectively three transport movements are required as opposed to one. This can often make the rail option uncompetitive. Despite the industry's wishes to decarbonise, it would appear that cost is still the most important consideration; and
- McPherson's note that there are no green premium grants offered by the government to encourage modal change, such an incentive could displace the effects of increased costs.

3.6 Whisky Tourism

3.6.1 Whilst not an essential element of the production process, whisky tourism is becoming increasingly popular. At present there are 51 distilleries in Scotland with a formal visiting facility of some kind, the majority of which are located within the HITRANS region. The SWA note that 1.2 million people visited distilleries in 2008, this accounts for a significant proportion of vehicle trips on the transport network. We would assume that a reasonable proportion of these visitors will arrive on tourist buses, however there will also be significant car trips made on the trunk road network.

3.6.2 The SWA are currently in the process of preparing an economic report on the value of tourism to the whisky industry which will provide a deeper insight into visitor numbers and trends for 2010, unfortunately this report will not be available until after completion of our research. The SWA have advised, however, that initial figures indicate a 3% increase on visitor numbers from 2008. This figure is an initial estimate and based across the industry as a whole, Diageo have a 19% increase to their facilities over the same period.

3.6.3 Projection of tourism-related traffic is outwith the scope of this study. However readers should be aware that whilst tourism brings in positive economic benefits to the industry and local area, it also has impacts on the transport network.

3.7 Summary of Conclusions

3.7.1 The whisky industry is currently almost entirely reliant upon road transport. Given the value of the industry to the UK economy, steps should be taken to actively assist the industry through the removal of pinch points on the road network, potential assistance with transport costs or perhaps importantly assistance to facilitate modal shift towards rail.

3.7.2 Considering the views and experiences of the SWA, whisky industry, and rail operators there appears to be considerable scope to further investigate modal shift towards rail. Negotiations and obstacles will need to be overcome, in particular the requirement for the industry to take a decision on the importance of reducing carbon emissions at the expense of potentially increased freight costs. There does appear to be a willingness from rail operators to become involved, which could potentially smooth negotiations. Considering the requirements for the industry to move to 'bottom fill' tankers in the near future, and the importance of decarbonisation, this would appear the opportune time to further pursue a switch towards rail movements.

3.7.3 Due to the above and the large volumes which can be transported by rail, we believe it important for the whisky industry as a whole to unite behind any rail proposals.

3.7.4 As noted previously, numerous distilleries are located on islands and are reliant upon commercial ferry services. The industry itself has no ownership of such services (apart from Diageo's grain boats to Islay) and shares access to ferry services along with tourists, other business interests and islanders. It will therefore be necessary to ensure that ferry capacity does not restrict future island-based whisky production, particularly if the expected growth in the demand for whisky materialises over time.

4 Spreadsheet-based Forecasting Tool

4.1 Introduction

4.1.1 As part of the research, MVA Consultancy and Caledonian Solutions have investigated all elements of the whisky production process to create a spreadsheet tool which can be used to calculate all of the main transport movements which are made within the HITRANS network as part of the whisky production process. The spreadsheet tool can also be used as a mechanism to forecast future whisky-related demands upon the transport networks to, from and within the HITRANS area.

4.2 Routes and Locations

4.2.1 77 of Scotland's 101 Malt Distilleries, including many of its largest and most famous, are located within the HITRANS region, with a further 12 situated just beyond its boundaries. Additionally one of the industry's large grain distilleries (Invergordon) is also situated in the HITRANS region. This means the HITRANS area and its transport network is vital to one of Scotland's most important industries.

4.2.2 In order to analyse and summarise the movements of whisky-related goods and their impacts on the HITRANS transport network, the relevant distilleries have been grouped geographically as follows:

- Ord;
- Sutherland;
- Nairn;
- Kingussie;
- Skye;
- Oban & Mull;
- Fort William;
- Far North West;
- Campbeltown;
- Orkney;
- Tomatin;
- Islay;
- Speyside, and
- Invergordon Grain Distillery.

4.2.3 We have also sub-divided the main transport corridors into discrete sections, to enable us to analyse and report the flows of the relevant goods (and goods vehicles) on the strategic transport network. These route sections are illustrated in Figure 4.1 and Table 4.1.

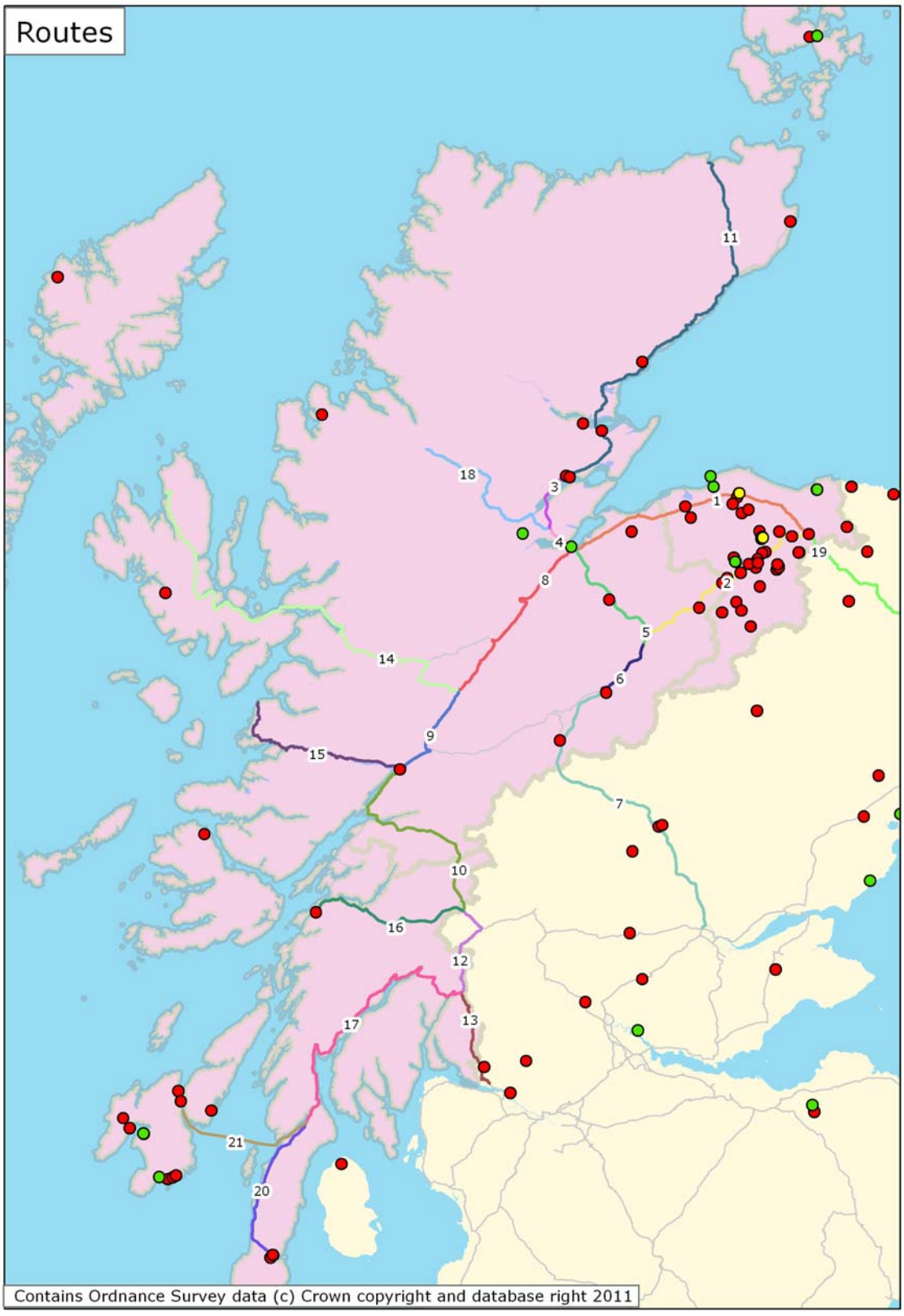

Figure 4.1 Discrete Route Sections

Table 4.1 Route Identification

ID	Route	Description
1	A96	**A96** – Keith - Inverness
2	A95	**A95** – Keith - Speybridge
3	A9	**A9** – Invergordon – A835
4	A9	**A9** – A835 - Inverness
5	A9	**A9** – Inverness – Speybridge
6	A9	**A9** – Speybridge – Kingussie
7	A9	**A9** – Kingussie - Perth
8	A82	**A82** – Inverness – A87
9	A82	**A82** – A87 – A830
10	A82	**A82** – A830 – A85
11	A9	**A9** – Scrabster - Invergordon
12	A82	**A82** – A85 – A83
13	A82	**A82** – A83 - Balloch
14	A87	**A87** – A82 – Skye
15	A830	**A830** – A82 - Mallaig
16	A85	**A85** – A82 - Oban
17	A83	**A83** – A82 - Kennacraig
18	A835	**A835** – A9 - Ullapool
19	A86	**A96** - East, Keith - Aberdeen
20	A83	**A83** – Kennacraig to Campbeltown
21	-	Ferry crossing between Kennacraig and Islay

4.2.4 Routes assumed within our analysis are based upon discussions with key stakeholders including drinks companies, distillers, maltsters and transport operators. For each specified area, routing choices have been assumed and documented, but can be altered by the user of the spreadsheet tool.

4.2.5 The tool combines figures from each area to produce routing volumes and truck/tanker loads on the trunk road network for the following materials and goods:

- bulk spirit movements from distilleries to the central belt;
- malt movements from maltsters to distilleries;
- culm and chaff movements from maltsters;
- draff and pot ale movements to dark grain plants;
- Dark Matter – Dark Grains Pellets - from Dark Grains Plants; and
- heavy fuel oil to distilleries.

4.2.6 The spreadsheet tool predicts movements on trunk roads which have then been incorporated into a series of maps detailing both volumes of goods transported and vehicle numbers on each stage of each route.

4.2.7 The prediction tool is based upon output capacities gleaned from the Scottish Whisky Review 2009[8]. As a default, the tool is set at 80% of current capacity which is an average representing the previous five years of production. The spreadsheet tool allows changes to be made to this capacity figure which will then recalculate and show the effects of the assumed industry growth on the transport network.

4.2.8 The SWA are informed of each producer's outputs but do not collate estimates of future production and therefore cannot provide forecasts of future demand or production. We believe that a 2% growth per annum in production is a reasonable assumption, but the user of the spreadsheet tool can adjust this assumption manually (by geographic area, if necessary), to explore the differential impacts on the HITRANS transport network.

4.2.9 Due to the complexity of the topic, a series of assumptions have been made. Where possible each assumption has been generalised across each whisky producing region to afford consistency however in certain instances this has proved impossible due to region-specific idiosyncrasies. All assumptions have been documented below and contained within an 'assumptions' worksheet held within the spreadsheet tool to allow each to be easily changed if necessary.

4.2.10 The remainder of this chapter documents specific assumptions used in the spreadsheet tool.

[8] Scotch Whisky Industry Review 2009

4.3 Assumptions

General Assumptions

- industry assumed to be operating at 80% level of its rated Malt Whisky Capacity (based on 5 year figures) Growth can be predicted by altering capacity proportion;
- yield from malted barley is 405 litres of pure alcohol per metric tonne;
- truck is assumed to carry 28 tonne loads unless otherwise indicated;
- 1.3 tonne of 'uncleaned' barley required to produce 1 tonne of malt;
- 1 tonne of malt generates 0.05 tonnes of chaff, which are cleanings such as husks and stalks;
- malt also generates 0.03 culms (rootlets) for every tonne of malt;
- assumed that tankers carry 30,000 litres of spirit;
- unless wherever indicated, fuel is heavy fuel oil (HFO), 1 litre of HFO is required to make 1 litre of Pure Alcohol;
- bulk movements of alcohol take place at 64% (i.e all movements of spirit include approximately 1/3rd H2O). This is why movements of spirit are described as bulk spirit rather than MLA;
- casks are available in many shapes and sizes, for the purpose of this research a cask is assumed to be 225 litres bulk capacity;
- for the purposes of the research, it has been assumed that 15% of HITRANS output is warehoused in casks within the region, whilst 85% is tankered south;
- 150 empty casks fit into a high-sided container;
- 90 full casks fit into truck trailer (TLV) Trader Locked Vehicle;
- casks have two fill rotations before being returned south;
- after maturation, 50% of spirit is sent south in casks, remainder travels in bulk tankers; and
- maltings plants are fired predominately by gas.

Spreadsheet Assumptions

- chaff cleanings such as husks and stalks (equivalent to 0.05 per tonne of malt);
- culms – rootlets etc generated during malting process. For every tonne of malt, 3%;
- pure Alcohol, (0.64 the strength (**64%**) that comes off the stills);
- casked to warehouse – Approx split. 15% of total spirit produced remains within HITRANS region;
- tankered new – 85% tankered to central belt;
- casks needed - (volume divided by no of bulk litres in an average cask)
- casks new – the factor for percentage of casks on first whisky fill;
- post maturation volume – maturation/evaporation allowance;

- pot Ale – Bulk litres per LPA;
- tonnes – Cubic metre conversion– represents the process of converting liquid pot ale to Dry Matter;
- draff proportion solids – factor percentage dry matter;
- pot ale proportions – factor percentage dry matter;
- MDDG Moisture factor – 11% moisture factor;
- 150 Empty casks in 40ft container; and
- 90 mature casks in trailer.

Ord Area Assumptions

- malt inputs are provided from suppliers in the Ord and Inverness areas;
- by-products treated at dark grains plants in Speyside;
- no production of pot ale syrup; and
- bulk spirit transported south on A9.

Sutherland Area Assumptions

- malt inputs are provided from suppliers in the Ord and Inverness areas;
- by-products treated at dark grains plants in Speyside;
- no production of pot ale syrup; and
- bulk spirit transported south on A9.

Kingussie Area Assumptions

- malt inputs are provided from suppliers in the Ord and Inverness areas;
- by-products treated at dark grains plants in Speyside;
- no production of pot ale syrup;
- bulk spirit transported south on A9;

Nairn Area Assumptions

- malt inputs are provided from suppliers in the Ord and Inverness areas;
- by-products treated at dark grains plants in Speyside;
- no production of pot ale syrup; and
- bulk spirit moved south on A96 and A9.

Skye Area Assumptions

- malt inputs are provided from suppliers in the Ord and Inverness areas;
- by-products disposed of locally, draff to local area and pot ale through disposal consents;
- no production of pot ale syrup; and
- bulk spirit moved south on via A87 and A82.

Oban / Mull Area Assumptions

- malt is imported from outside the HITRANS region, routes north via A82 and A85;
- by-products disposed of locally, draff to local area and pot ale through disposal consents;
- no production of pot ale syrup; and
- bulk spirit moved south via A85 and A82.

Fort William Area Assumptions

- malt is imported from outside the HITRANS region, routes north via A82;
- by-products disposed of locally, draff to local area and pot ale through disposal consents;
- no production of pot ale syrup; and
- bulk spirit moved south via A82.

Far North West Area Assumptions

- malt is imported from outside the HITRANS region, routes north via A9 and A835;
- by-products disposed of locally, draff to local area and pot ale through disposal consents;
- no production of pot ale syrup; and
- bulk spirit moved south via A835 and A9.

Campbeltown Area Assumptions

- malt is imported from outside the HITRANS region, routes via A82 and A83;
- by-products disposed of locally, draff to local area and pot ale through disposal consents;
- no production of pot ale syrup; and
- bulk spirit moved via A83 and A82.

Orkney Area Assumptions

- malt is imported from outside the HITRANS region, routes via A9 and ferried from Scrabster;
- by-products disposed of locally, draff to local area and pot ale through disposal consents;
- no production of pot ale syrup; and
- bulk spirit moved via ferry to Scrabster and A9.

Tomatin Area Assumptions

- malt is imported from outside the HITRANS region, routes via A9;
- by-products treated at dark grains plants in Speyside;
- production of pot ale syrup; and
- bulk spirit moved via south ferry via A9.

Islay Area Assumptions

- cleaned Barley shipped to Port Ellen;
- medium fuel oil arrives by boat;
- draff – 50% utilised on island, 50% backloaded to mainland;
- balance of malt requirements by ferry in 25 tonne loads;
- 15% spirit remains on island in casks;
- 85% shipped to mainland in tankers; and
- bulk Spirit routed via A83 and A82.

Speyside Area Assumptions

- 67% of malt sourced from within HITRANS area, 33% from outside area, mainly east coast maltings plants
- 80% of by-products sent to Dark Grains Plants, other 20% used for local draff and production of pot ale syrup;
- 70% fuelled by gas, 30% by heavy fuel oil;
- all spirit tankered south, 90% via A95 and A9, 10% via A96 and east coast; and
- materials shipped in follow 90%/10% split.

Invergordon Grain Distillery Assumptions

- grain yield is 390 litres of pure alcohol per metric tonne;
- malt includes mash recipe for grain malt (Mash recipe; 12% malted barley:88% wheat);
- all malt is imported into HITRANS region, sourced from East Coast Malting plants and routed via A96 and A9;
- Invergordon grain distillery powered by natural gas;
- all by-products treated on site (making dark grains);
- no pot ale syrup production; and
- bulk spirit transported south via A9.

5 Vehicle Routing

5.1 Routing Assumptions

5.1.1 As noted in the previous chapter, the spreadsheet tool was used to calculate the required volumes of materials and products for each stage of the whisky production process, this was accompanied by predicting the number of vehicles (tankers and trucks) required to transport all associated elements. As a final task, predicted vehicle flows were placed on to the transport network to estimate the likely annual impact of whisky related traffic.

5.1.2 Whilst every effort was taken to ensure routings remain as accurate as possible, a number of assumptions were required. Assumptions have been based where possible on factual data provided by stakeholder consultations. We have also utilised Caledonian Solutions industry experience and MVA Consultancy's knowledge of the strategic transport network.

5.1.3 Considering the scope of the project, coupled with the large number of potential origins and destinations, complete O-D routing was deemed to be infeasible without first participating in an industry-wide consultation exercise. Instead origins and destinations were attributed sections of road-based upon location. Combining these origins and destinations allowed the methodology to remain consistent with that described in the previous chapter, of the assumption of the 14 areas.

5.1.4 Each area may not specifically see a transport movement mapped (for example barley movements are not shown in the 'Far North West' as barley is transported directly to Maltsters. Each area, such as 'Far North West' was however used to identify the volumes of barley which would be required at Malting Plants to serve each specific area.

5.1.5 Likewise, the majority of Malting Plants within the HITRANS region are to be found in the Speyside area. For consistency we have not shown flows emanating from each Malting Plant, but rather placed all flows on the Speyside routes, replicating the flow from Malting Plants to the large number of Speyside Distilleries.

5.1.6 The following section describes routing assumptions taken as part of the mapping, whilst the final section discusses findings and implications.

5.2 General Assumptions

5.2.1 Considering both the scale of the study, and the size of vehicles used, it was deemed reasonable to assume that all vehicles proceed to the trunk road network at earliest opportunity. This assumption was cross checked as part of the consultation exercise, in general most hauliers route vehicles over the most suitable roads. For the purposes of this study, only trunk network flows are predicted and mapped.

5.2.2 Origins and Destinations are attributed to sections of route which are most relevant to the area. This allows the area clustering methodology to be carried over for consistency.

5.3 Movement of Bulk Spirit

5.3.1 Bulk spirit is tankered in 30,000 litre capacity loads, all bulk spirit is tankered to maturation warehouses and bottling plants in central Scotland. We are aware that certain hauliers use larger capacity tankers however 30,000 litre loads has been assumed as an industry average.

5.3.2 Bulk spirit is transported south via the A9 from the following 'area clusters'

- Ord;
- Sutherland;
- Nairn;
- Kingussie;
- Far North West;
- Orkney;
- Tomatin; and
- Invergordon.

5.3.3 In addition to the above, 90% of all bulk spirit produced in the Speyside region is routed via the A9, with the remaining 10% routed via the A96 and the east coast of Scotland. This proportional breakdown was suggested during the consultation phase.

5.3.4 Bulk spirit is transported south via the A82 from the following area clusters:

- Skye;
- Oban/Mull;
- Ben Nevis;
- Campbeltown; and
- Islay.

Movement of Malted Barley

5.3.5 Malt is one of the essential materials used in the production process across each of the 77 malt distilleries within the study area;

5.3.6 Quantities of malt was calculated using the spreadsheet prediction tool, assumptions were made as to which area clusters would source malt from each Malting Plant. The difference in available capacity of Maltings Plants allowed assumptions to be drawn as to which distilleries would source malt directly from outwith the HITRANS area, thus allowing a routing distinction to be made between malt travelling direct to distilleries from outwith the study area, and malt travelling from malting plants within the HITRANS region. Table 5.1 below documents the area clusters have been assumed to procure malt from within and outwith the study area.

Table 5.1 Sources of Malt

Malt Produced within HITRANS Region	Malt sourced from elsewhere
Ord	Oban/Mull
Sutherland	Ben Nevis
Nairn	Far North West
Kingussie	Campbeltown
Skye	Orkney
67% of Speyside Requirements	33% of Speyside Requirements
	Tomatin
	Islay
	Invergordon

5.3.7 Where malt is produced inside the HITRANS region, we have assumed that Malting Plants located in Speyside will supply Speyside distilleries. Malting Plants in Inverness and Muir of Ord supply the following distilleries:

- Ord;
- Sutherland;
- Nairn;
- Kingussie; and
- Skye.

5.3.8 On occasions where malt is utilised from outwith the study area, the main transport arteries of the A9 and A82 have been made the default transport routes.

5.4 Movement of Barley

5.4.1 Barley is utilised in the malting process, unlike other key materials however barley is delivered to Malting plants rather than the distilleries themselves.

5.4.2 Quantities of barley were calculated using the spreadsheet prediction tool, assumptions were made as to which area clusters would source malt from each Malting Plant. The difference in available capacity of Maltings Plants allowed assumptions to be drawn as to which distilleries would source malt directly from outwith the HITRANS area, thus negating the requirement for shipments of barley to be mapped.

5.4.3 Consistent with Malting assumptions, only the following area clusters require barley to be transported to Malting Plants within the study area:

- Ord;
- Sutherland;
- Nairn;
- Kingussie; and
- Skye.

5.4.4 A small floor maltings in Orkney was ignored as being trivial in context of the scale of the study.

5.4.5 Consistent with the above, the grain distillery at Invergordon requires all wheat to be transported in. We have assumed that this is supplied from outside the HITRANS area.

5.4.6 All barley used to supply the Muir of Ord and Inverness Malting plants has been assumed to originate from the east of Scotland areas Aberdeenshire. Malting Plants in Speyside have been assumed to be supplied by barley from central Scotland. We are aware that an element of barley will be procured locally however due to aggregation it was felt most appropriate to supply all from outwith the area.

5.4.7 Consistent with assumptions made previously, 67% of malt utilised in the Speyside region will be produced within the HITRANS area, this proportion will require the transfer of barley. The remaining malt will be transported into the area without the requirement for barley movements within the study area.

5.4.8 60% of malt utilised on Islay is produced at the Port Ellen Malting Plant on the island, this plant is supplied with barley by commercial boat from other areas of the UK. The remaining malt requirements are transported by road to Islay and produced outwith the study area. For the purposes of this study, it is assumed that no barley is routed to Islay on the road network.

Movement of Culms and Chaff

5.4.9 Culms and chaff are by-products of the cleaning and malting process. As with the example of barley above, both culms and chaff are not utilised at distilleries. Instead both by-products are produced at Malting locations. Considering the above, only malt sourced from within the HITRANS area will produce culms and chaff to be mapped as part of this study.

5.4.10 We are aware that culms and chaff could potentially be routed from Malting Plants to destinations across the UK, both local and national. In the absence of accurate routing information, all culms and chaff have been routed in the direction barley was sourced from.

5.5 Movement of Draff and Pot Ale to Dark Grains Plants

5.5.1 Draff is the moist co-product from the mashing stage of the whisky process, whilst pot ale is the liquid co-product produced at the Wash distillation stage of Malt Whisky. Traditionally all whisky by-products were used as local animal feeds however, due to increasing volumes of by-products Dark Grains Plants are utilised to process both draff and pot ale into dried grain

pellets. Whilst Dark Grain Plants can process large volumes of by-products per year, there currently lacks capacity and proximity in Scotland to deal with every distillery's output.

5.5.2 Due to this lack of capacity, draff continues to be available and evaporated Pot Ale Syrup is also produced and sold in certain locations.

5.5.3 In terms of this study, capacities of dark grains plants have been calculated, along with by-product output from each area cluster to attribute likely movements to each dark grain plant. On occasions where there is insufficient capacity to transfer by-products to dark grains plants, we have assumed local disposal consents. Where possible these consents have been cross checked as part of the consultation process. Table 5.2 below explains which area clusters supply Dark Grains Plants and which either treat on site or dispose locally.

Table 5.2 Areas which feed Dark Grains Plants or dispose of by-products

Supply Dark Grains Plant	Local Disposal (Land Spreading or Deep Sea Outflow)
Ord	Skye
Sutherland	Oban/Mull
Nairn	Ben Nevis
Kingussie	Far North West
Speyside	Campbeltown
	Orkney
	Islay

** Tomatin distillery produces quantities of Pot Ale Syrup which is then sold on.*

*** Invergordon grain distillery has its own Dark Grains Treatment Plant on site.*

5.5.4 Considering routing requirements, all draff and pot ale flows represent vehicle flows from area clusters of distilleries to the area which represents dark grains plants. In the case of the dark grains plants themselves, all are located within the Speyside area.

5.6 Movement of Dark Grain from Dark Grain Plants

5.6.1 As explained above, all dark grains are produced in the Speyside area, with the exception of Invergordon which produces its own by-products.

5.6.2 As with culms and chaff, dark grains could conceivably be routed to local destinations or much further afield. Consultation suggests dried grains are sent further afield, with local farms content to purchase cheaper 'moist products' In the absence of reliable data however all dark grains have been assumed to travel outside of the HITRANS study area. All traffic is transported on the trunk routes, with the standard assumption of 90% of Speyside produce

routing via the A9 with the Speyside remainder travelling on the A96 via the east coast of Scotland.

5.7 Movement of Fuel

5.7.1 Through a combination of the consultation process and the industry experience provided by Caledonian Solutions, assumptions have been made as to which areas are primarily supplied by gas and which by heavy fuel oil (or similar). Distilleries dependant on heavy fuel oil require fuel to be tankered by road; on these occasions, there is an obvious effect on the transport network. With the exception of Speyside Distilleries and the Invergordon Grain Plant, we have assumed that all other area clusters run on heavy fuel oil.

5.7.2 In addition to the above, it has been assumed that 30% of distilleries in the Speyside region run on heavy fuel oil.

5.7.3 In terms of fuel routings, it has been assumed that all fuel loadings travel on the conventional trunk routes. Consistent with other transport elements, the default position is 90% of Speyside requirements use the A9 whilst the remainder traverse the A96.

5.7.4 We recognise Islay requires fuel oil, however this is conventionally delivered by boat and hence has no effect on our transport maps.

5.8 Movement of Total Vehicles

5.8.1 A final map has been produced which reflects total annual vehicle movements across the HITRANS network. Unlike each of the above flows which have been noted as one way traffic, total vehicles have been assumed to be two way where appropriate, representing the requirement of 'empty running' of vehicles such as tankers on their return leg. For each of the following we have assumed two way trips:

- Fuel oil;
- Bulk Spirit; and
- Pot Ale and Pot Ale Syrup.

5.8.2 Other transport elements have the potential to reload on return journeys. As we are not in possession of figures which represent these return journeys we have assumed that for each of the other transport elements, a return load will be collected on every 2nd occasion, hence the following elements have assumed 1.5 way trips:

- Barley;
- Malt;
- Culms/Chaff
- Dark Grains.

5.9 Minor movements

5.9.1 The whisky distilleries support a wide range of support activities including the supply of yeast, cleaning materials, workwear, engineering supplies etc.

5.9.2 Yeast is supplied from either Hull, Yorks or Menstrie, Clacks as either 28% Dry Matter paste in trucks (20%) or 18% Dry Matter slurry in tankers (80%). Due to shelf life considerations the delivery schedule will be determined by both volume demand and time. This would require a detailed study of its own and so has not been included in the study's calculations. It is estimated that, in optimal circumstances about **125** trucks of paste and **750** tankers of slurry would be required for the HITRANS area per annum at the **80%** activity level. This equates to a truckload of paste every other weekday and about 3 tankers of slurry per weekday.

5.9.3 Very little bottling is carried out in the HITRANS area and virtually all of that is carried out in Speyside by Grants (Glenfiddich) and Gordon and Macphail of Elgin. Bottles and dry goods will be trucked via the A9 and cased goods despatched back. On the basis that around 200,000 cases are bottled, approximately one truck of bottles/dry goods will head North every other weekday (125 pa) and one curtain trailer or shipping container will head south every other weekday (125 pa)

5.9.4 Unique to the Invergordon Grain Distillery is the requirement to utilise large quantities of wheat. We have calculated Invergordon requires to be supplied with almost **2500** truck loads of wheat per year. These wheat shipments have not been mapped, as they are unique to one distillery only.

5.9.5 All other inputs have been ignored as trivial in terms of the scale of this study.

5.10 Outputs

5.10.1 The spreadsheet tool described in the previous chapter has allowed detailed predictions of each element described in Section 4.2.5. Using the assumptions described within this chapter we have been able to route predicted vehicle flows and display geographically on a map-based background volumes of trucks trips, tanker trips and total vehicle trips which are required annually to serve the whisky industry in the HITRANS region. Figures 5.1 – 5.9 show annual vehicle flows for each element in the whisky production process.

5.10.2 In addition to these figures, flows are also available to view and interrogate on HITRANS freight website, www.highlandrailfreight.com

6 Findings and Implications for the Industry

6.1 Findings

6.1.1 The main findings of this study can be found both within the spreadsheet tool and the graphical interface available on www.highlandrailfreight.com. These findings are summarised below and based upon the default industry position of **80%** utilisation and calculate **Single trip** transport movements generated by the whisky industry in the Hitrans region. This equates to **109,078** single trip vehicle journeys per annum. As discussed previously, vehicles require return journeys, often the bespoke kit utilised by the industry leads to instances of 'empty running'.

Table 6.1 Summary of Single Journey Transport Movements

	Volumes	Trucks	Tankers
Barley	425848	13855	0
Chaff	15339	531	0
Malt	480314	16445	0
Culms			
Spirit (64%)	346350000		
Casked to WH	51952500	0	0
Tankered new	294397500	0	9813
Casks needed	230900	2207	0
Casks new	99304	770	0
Tankered mature	25976250	0	0
Tankered mature less maturation	23378625	0	779
Casks from WH	115450	1462	0
HFO	82712000		2757
Draff	484485	13893	0
Pot Ale	1394214540	0	38404
Pot Ale as syrup	52394000	0	1746
MDDG from DGP (11%moisture)	194264	6070	0
Total		55578	53500

6.2 Summary

6.2.1 The preceding chapters have documented the processes involved as part of the study investigating the implications of the Whisky industry on the strategic transport network in the HITRANS region of Scotland, as follows:

- **Scene setting** – summarising the main inputs and outputs of each stage of the whisky making process;

- **Stakeholder Consultation** – discussions with key partners from across the industry, ranging from maltsters, distillers and their trade organisations through to transport providers and hauliers - this consultation has highlighted some of the key logistics issues affecting the industry and informed the calibration of the spreadsheet tool and the routing assumptions;
- **Spreadsheet forecasting tool** - used to estimate/predict all of the current/future movements of whisky-related materials and products using the HITRANS transport network; and
- **Predicted Routing Maps** – combining the consultation and the spreadsheet forecasting tool, we have put created routing maps for each of the main whisky-related products – these provide a visual interpretation of current and future whisky-related transport flows across the HITRANS network.

6.2.2 Here we draw together and summarise the key themes arising from the study, highlighting the implications for both the whisky industry and the strategic transport network.

6.3 Current Situation

6.3.1 As noted previously, the whisky industry is currently operating at around **80%** of its capacity-based on production evidence from the previous 5 years.

6.3.2 The majority of transport movements are undertaken by road. The routing maps provided in Chapter 5 illustrate the current impact of the industry on the transport network and the requirements for access to the trunk road network. The main whisky-related movements can be seen to be using the following corridors:

- **A9** – Perth to A95;
- **A9** – A95 to Inverness;
- **A9** – Inverness to Scrabster;
- **A95** – Granish - Keith;
- **A96** – Inverness - Keith;
- **A82** – Glasgow to Crianlarich; and
- **A83** – Tarbet to Campbeltown.

6.3.3 The analysis suggests that the **A9** and the **A95** are the most important corridors in the HITRANS region. We estimate that almost 138,000 goods vehicle trips per year (including return trips) are made in the A95/A941 Speyside corridor. This figure includes a number of relatively-short-distance movements connecting the large number of distilleries, malting facilities and Dried Grains Plants located in this corridor. Around 50,000 longer-distance vehicle trips per year use the A9 (Spey Bridge) for whisky-related movements.

6.3.4 The spreadsheet-based forecasting tool developed for this Study also enable the user to apply different future growth assumptions by geographic area and predict the impacts of these assumptions on the transport network.

6.3.5 We have used the tool to predict transport impacts both in terms of the current situation (80%) and that of each distillery operating at 100% capacity. Table 6.1 below illustrates the current flow and predicted increase in 'total vehicle trips' across key strategic corridors on the transport network. The total vehicle trip calculation is consistent with that described in section 5.8 assuming two way trips where appropriate.

Table 6.2 Current and Future flows based on growth scenarios

Route Section	80%	100%
A9 – Perth – A95	47,132	58,915
A9 – A95 – Inverness	34,617	43,271
A9 – Inverness - Invergordon	32,847	41,059
A9 – Inverness – Scrabster	17,401	21,751
A95	137,500	171,875
A96	14,536	18,163
A82 – Glasgow – Tarbet	3,126	3,908
A82 – Tarbet - Tyndrum	1186	1,483
A83 (Including Islay link)	1940	2,425
Islay Ferry Link	1423	1,778
Total	**326,182**	**391,418**

Considering the figures above, predicted growth of the whisky industry will have considerable implications on the transport network such as increased road mileage and associated congestion.

6.3.6 In addition to the figures presented above, Table 6.2 (check) below illustrates the proportion of whisky-related vehicles travelling on key links, based on comparison with the Department for Transport's estimates of Annual Average Daily flows of goods vehicles.

6.3.7 These values suggests that currently around 50% of all HGV traffic on the A95 is related in some way to the whisky industry.

Table 6.3 Whisky-related traffic flow as a proportion of all goods vehicles

Route	Whisky-related goods vehicle per day	DfT Goods Vehicles Estimates	Whisky % of HGV's
A9 Invergordon	96	832	12%
A9 Aviemore	136	1025	13%
A95 East of Grantown on Spey	377	754	50%
A83 Tarbet	8	200	4%

Exports

6.3.8 Figure 6.1 below illustrates the profile of Scotch whisky exports over the last 10 years. The graph shows that exports have fluctuated over this time period, with a net increase of around 13% increase in exports over this time period.

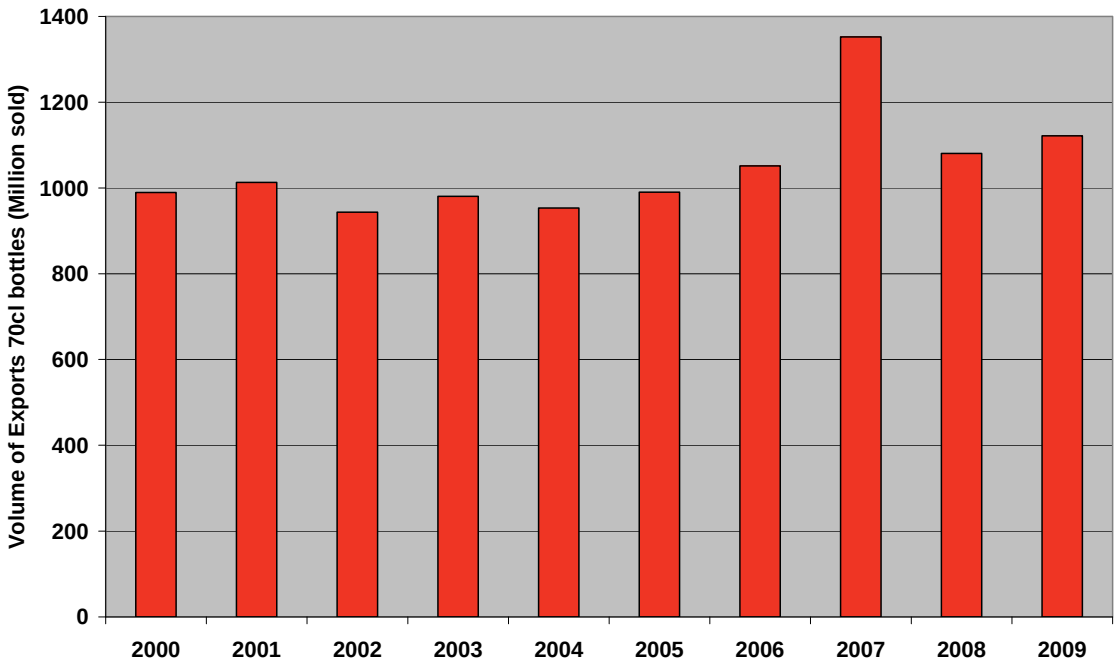

Figure 6.1 Scotch Whisky Exports

6.3.9 Consultation and our team's knowledge of the whisky industry suggests that this recent upward trend is likely to continue, particularly if the expected growth in demand for Scotch whisky in the significant 'BRICM' markets (Brazil, Russia, India, China and Mexico) materialises. This Study has not endeavoured to predict how the Scotch whisky industry will change in response to any increase in demand, but has provided HITRANS with a tool which they can use to predict the impact of different growth scenarios, including any assumed regional variation in this growth profile.

6.4 Possibilities for Modal Shift

6.4.1 Given governmental and industry aspirations to reduce road freight vehicle mileage, we believe it appropriate to consider and actively pursue alternative or supplemental modes of transport for some of these whisky-related goods movements.

6.4.2 In addition, the whisky industry itself is committed to reducing its carbon footprint and is working towards industry and Scottish Government targets for carbon reduction across the whole of the industry. We also believe that key players within the rail freight industry are also keen to explore opportunities to work with the whisky industry.

6.4.3 The whisky industry has already taken some initial steps to investigate opportunities for modal shift towards rail.

6.4.4 In particular, the SWA has asked its Transport and Safety Working Group to investigate the opportunities and constraints for a transfer of goods from road to rail. The detailed conclusions from the Group's considerations, including a summary of the main difficulties and barriers, are reported elsewhere in this report.

6.4.5 The Group concluded that the costs and other difficulties made it unlikely that individual distillers operating in isolation would achieve significant mode-shift to rail, particularly if their decisions were based solely on their own logistics costs.

6.4.6 Instead, there would need to be a collective desire from the Scotch Whisky industry to make modal shift to rail cost-effective and that the wider environmental benefits (including reductions in greenhouse gas emissions) of any modal switch should be included within the overall consideration.

6.4.7 There is also scope for further consideration of increased use of coastal shipping (ie in addition to the current imports of barley to Islay, barley, malt, dark grain and spirit movements through Buckie harbour and the imports of grain to Invergordon). The most likely opportunities here include the movement of barley and/or malt to the distilleries located on islands or in remote coastal locations (notably the Campbeltown area).

6.4.8 Such an option would reduce road freight mileage and (probably) the overall greenhouse gas emissions. However, the extra costs associated with the need for an extra transfer from ship to lorry for the final leg of the delivery to the distillery are likely to be significant.

6.4.9 We see merit in further pursuit of the potential benefits associated with achieving an increased shift of whisky-related goods from road to (potentially) more-sustainable modes and therefore recommend further study and support for any realistic initiatives in this area.

6.5 Ferry-related Issues

6.5.1 An element of sea transport is necessary to access, supply and service the island-based distilleries and malting facilities. Much of this (with the exception of some of the barley and malt imports to Islay) is currently reliant on the relevant goods vehicles finding space on the relevant commercial ferry services. This creates a number of additional potential difficulties for the relevant distilleries and/or the hauliers transporting their products on and off these islands.

6.5.2 At present, adverse weather is the primary issue faced, as sailings can become delayed or cancelled for uncertain periods of time. Weather disruptions can have serious impacts upon the industry, this may be in the form of delaying production on the islands, or getting spirit to the mainland for blending purposes. In general the industry works on the basis of 'just in time' delivery, with all hauliers contracted to deliver goods within set time periods. Disruption to ferry services can therefore have significant consequences for hauliers struggling to meet their obligations.

6.5.3 In addition to weather constraints, capacity issues on some ferries may become an increasing problem, particularly during the peak summer season, especially if initiatives by Scottish Government and Visit Scotland to boost visitor numbers coincide with the expected growth in whisky production and/or any changes to ferry services (frequency or vessels). The (current and future) needs of the whisky industry should therefore be considered carefully as part of any consideration of measures which affect these ferry services.

Considering the above, we believe ferry capacity has the potential to be is a major issue which will affect and potentially constrain the future growth of the island-based whisky industry.

6.5.4 The movements of whisky-related goods to/from the distilleries in the Campbeltown area (and potentially also Islay/Jura) should also be considered when considering the potential for any (vehicle-carrying) ferry connecting the Kintyre peninsula to the Ayrshire coast.

6.5.5 The potential to import barley from Ireland to Campbeltown distilleries may also be a relevant consideration for any future consideration of a reintroduction of (vehicle-carrying) ferry between Campbeltown and the Antrim coast.

6.5.6 Finally, we also note the ongoing Road Equivalent Tariff (RET) pilot, which has significantly reduced fares to Coll, Tiree and the Outer Hebrides. Studies have shown that RET does not reduce prices on routes to the Northern Isles in particular, while cost recovery on short routes would be problematic if a wider roll-out was adopted. Further implementation of RET would introduce both positive and negative impacts across the industry. Indeed, one issue consistently raised by hauliers is concerns over capacity as lower prices attract more cars onto fixed capacity ferries with rigid timetables.

6.6 Strategic Improvements to Scotland's Transport Networks

6.6.1 In 2008, the Scottish Government published the Strategic Transport Projects Review (STPR). The purpose of this review was to deliver a strategic transport network which will benefit the whole of Scotland and deliver on the priorities set out in the Government Economic Strategy, National Transport Strategy, National Planning Framework and the Scottish Climate Change

Bill. It consequently identifies improvements on the national rail and road networks to address identified challenges from 2012 onwards.

There are 29 distinct interventions identified in the STPR across three themes which are:

- maintain and safely operate existing assets;
- make better use of existing capacity; and
- targeted infrastructure improvements.

6.6.3 Of the 29 interventions identified, **nine** have direct relevance for both current and potential whisky-related transport movements in the HITRANS region, as follows

- **Intervention 3** - Targeted programme of measures to improve road standards between Glasgow and Oban/Fort William (A82);
- **Intervention 4** - Targeted programme of measures to reduce (road) accident severity in north and west Scotland;
- **Intervention 6** – Further electrification of the strategic rail network;
- **Intervention 7** - Reconfiguration of the national rail timetable;
- **Intervention 12** – Enhancing rail system capacity through targeted improvements;
- **Intervention 16** – A9 upgrading from Dunblane to Inverness;
- **Intervention 17** – Rail enhancements on the Highland Main Line between Perth and Inverness;
- **Intervention 18** – Upgrade the A96 to dual carriageway between Inverness and Nairn; and
- **Intervention 23** – Rail service enhancements between Aberdeen and the central belt.

6.6.4 Full information of the above strategies can be found within the STPR summary document.

6.6.5 We believe that each of the four road-based measures listed above has the potential to provide some positive benefit to the whisky logistics industry.

6.6.6 In addition to the road-based measures, the rail measures highlighted above could help deliver assist some modal shift, if they help create timetable space for new rail freight paths on the relevant route(s).

6.6.7 **Intervention 17** in particular may help increase the freight capacity of the main Perth-Inverness route, for example by permitting longer/heavier/more frequent/more efficient freight trains to use this route.

6.6.8 Whilst the STPR suggests a number of interventions which will benefit the whisky industry, the key A95/A941 corridor was not included explicitly within the STPR Study. As noted throughout this report, this corridor is a key route for the whisky industry due to the density of distilleries, dark grains plants and malting sites along this Speyside route. While a significant proportion of these movements are relatively 'local', their importance to the overall Scotch whisky industry (and the importance of this industry to Scotland's economy), suggest that the needs of this route identified by this Study should be given serious consideration by all levels of Scottish Government (Local, Regional and National).

Considering the above, and noting the value of the whisky industry to the Scottish economy, we believe there to be merit in considering a range of interventions to maintain and improve the A95/A941 corridor. This includes continued consideration of rail freight opportunities in this corridor.

In addition, the whisky industry should be included (explicitly) in any consideration of future transport-related investment in the Speyside area.

6.7 Weather and Infrastructure Failure

6.7.1 Considering the contents of this report it is clear that links and transport corridors could be susceptible to periods of adverse weather or infrastructure failure. Whilst all links could conceivably be affected, there are numerous key links which lack alternative routes, which could serve to significantly derail the industry in the event of a significant period of adverse weather or infrastructure failure. Routes which could have a significant effect upon the industry include:

- **A9** - entire length, however sections between Perth and Inverness and Inverness to the Invergordon Grain Distillery are particularly critical. It should also be noted that Orkney distilleries are reliant on the ferry service from Scrabster and the entire length of the A9;
- **A95** - key corridor with heaviest concentration of malt whisky distilleries;
- **A83** – supplies both Islay and Campbeltown distilleries; and
- **Islay** ferry link.

6.7.2 We are aware that lessons have been learned from the recent winter, and the Scottish Government has developed action plans to 'keep the country moving' in periods of adverse weather. Whilst the above routes highlighted are key to the whisky industry, local authorities will have to maintain local routes and the industry themselves should ensure that the final access links to individual distilleries and processing plants are kept open during (and/or re-opened as soon as possible after) adverse winter weather.

Considering the number of important whisky production locations which are served by a single connecting route (ie where the diversionary route is either much-longer or non-existent), we note the importance of the reliability of these key routes and encourage any measures which improve the safety (i.e. reducing closure due to accidents) and reliability (snow/land-slips etc) of these key links.

6.8 Conclusions

6.8.1 Given the geographical dispersion, volumes of movements and the current lack of alternative modes, the industry's reliance on the road network is understandable. This reliance could lead to constraints for future growth of the industry both in the short and long term futures.

6.8.2 A not-unlikely growth of 10% in whisky production would result in around 50,000 additional goods vehicle trips per year on the HITRANS road network. To help achieve the **desired reduction** in greenhouse gas emissions and other traffic-related costs, it would be therefore

be advisable to continue to consider targeted, effective and realistic measures to help achieve modal shift where possible, most notably to and from the Speyside area.

6.8.3 As evidenced during the last two winters, weather-related issues can seriously affect Scotland's transport infrastructure. Transport Scotland, HITRANS and its constituent Local Authorities should continue their efforts and investment to ensure that the roads relevant to the whisky industry's logistics remain open during (or get re-opened as soon as possible after) severe winter weather and that the damage caused by frost and snow are fully repaired, to avoid any long-term deterioration in the quality and safety of these routes.

6.8.4 Rising fuel costs have been cited as a key issue by a large number of our consultees, including individual distillers, malsters, hauliers, the Road Haulage Association and Freight Transport Association. In particular, fluctuation in fuel prices can significantly affect the financial viability of hauliers (who may not have time to pass on the increased costs in time to protect their profit margins), potentially resulting in loss of logistics capacity at a time when the whisky industry is expecting growth. This loss of peak logistics capacity, plus any of the longer-term growth in fuel prices which do get passed on to the whisky production industry (including their own fuel needs for drying/malting/distilling etc) may also constrain the future growth of the Scotch whisky industry.

6.8.5 These knock-on effects need to be considered by those in a position to influence or mitigate the impact of fuel prices on the whisky logistics industry to, from and within the HITRANS area.

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For more information visit www.mvaconsultancy.com

Abu Dhabi
AS Business Centre, Suite 201, Al Ain Road, Umm al Nar, P.O. Box 129865, Abu Dhabi, UAE
T: +971 2 510 2402 F: +971 2 510 2403

Birmingham
Second Floor, 37a Waterloo Street
Birmingham B2 5TJ United Kingdom
T: +44 (0)121 233 7680 F: +44 (0)121 233 7681

Dublin
First Floor, 12/13 Exchange Place
Custom House Docks, IFSC, Dublin 1, Ireland
T: +353 (0)1 542 6000 F: +353 (0)1 542 6001

Edinburgh
Second Floor, Prospect House, 5 Thistle Street,
Edinburgh EH2 1DF United Kingdom
T: +44 (0)131 220 6966 F: +44 (0)131 220 6087

Glasgow
Seventh Floor, 78 St Vincent Street
Glasgow G2 5UB United Kingdom
T: +44 (0)141 225 4400 F: +44 (0)141 225 4401

London
Second Floor, 17 Hanover Square
London W1S 1HU United Kingdom
T: +44 (0)20 7529 6500 F: +44 (0)20 7529 6556

Lyon
11, rue de la République, 69001 Lyon, France
T: +33 (0)4 72 10 29 29 F: +33 (0)4 72 10 29 28

Manchester
25th Floor, City Tower, Piccadilly Plaza
Manchester M1 4BT United Kingdom
T: +44 (0)161 236 0282 F: +44 (0)161 236 0095

Marseille
76, rue de la République, 13002 Marseille, France
T: +33 (0)4 91 37 35 15 F: +33 (0)4 91 91 90 14

Paris
12-14, rue Jules César, 75012 Paris, France
T: +33 (0)1 53 17 36 00 F: +33 (0)1 53 17 36 01

Woking
Dukes Court, Duke Street, Woking
Surrey GU21 5BH United Kingdom
T: +44 (0)1483 728051 F: +44 (0)1483 755207

Email: info@mvaconsultancy.com

Offices also in
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