

SEStran

Sustainable Urban Distribution

August 2010

Report



TRANSPORT
TRAFFIC
DEVELOPMENT
PLANNING
URBAN DESIGN
ECONOMICS
MARKET RESEARCH

Sustainable Urban Distribution Report

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1 Introduction

1.1 Background

1.1.1 This study is one of several studies into freight transport in the SEStran area that are part of the EU Dryport project in which SEStran is participating. This report provides a high level overview of sustainable urban distribution in the SEStran area, with a focus on Urban Distribution Centres (UDCs) and the use of low carbon vehicles.

1.1.2 The requirements of the study are to:

- review existing study/work experience, including any relevant work being carried out at a national/international level on sustainable distribution
- identify the main centres/destinations for sustainable distribution linked to potential consolidation centres in the SEStran area/South East Scotland potentially linked to Dryports
- look at the operation and economics of possible sustainable distribution operations linked to consolidation centres especially in association with Dryport operations
- consult closely with TRI, FQP Steering Group, relevant local authorities and freight operator, distributors and customers and with partner consultants

1.2 Policy Context

1.2.1 Freight transport addresses issues related to the movement of all kinds of goods from raw materials to finished goods and waste products. It makes use of local, regional, national and international transport systems and is increasingly adopting intermodal and multimodal solutions.

1.2.2 It is recognised that freight is primarily a commercial activity and, therefore, mainly carried out by the private sector. This applies to freight modes; road, rail, sea and air freight as well as freight distribution centres, including most ports.

1.2.3 Government is generally concerned with the outcomes of freight transport e.g. in terms of efficiency, costs, environmental and social impacts, but acknowledges that freight companies will make investments based on commercial expectations.

1.2.4 While the importance of freight transport is clear, it is acknowledged that it creates negative as well as positive impacts, including:

- road congestion
- road accidents
- air pollutants and greenhouse gases
- noise disturbance
- operational problems e.g. from mix of passenger and freight trains

1.2.5 SEStran recognises the importance of freight transport to the region. The *Regional Transport Strategy* (RTS) sets out the need to:

'balance the needs of a growing area and expanding economy and the associated growth in movement of people and goods with the recognition that this increased movement has consequences for the local and global environment'.

1.2.6 Freight is identified as a region-wide initiative with the need for SEStran to act to facilitate efficient movement of goods and ensure quality facilities for the freight sector in key freight corridors.

- 1.2.7 Two key studies have been commissioned by SEStran: the *Freight Study and Action Plan* was completed in 2008. One of the objectives of this study was to promote sustainable distribution, including greater use of environmentally friendly modes and development of inter-modal freight facilities. In 2009, the *Freight Routing Study* studied freight movements in the area and developed a strategy examining signing and lorry parks.
- 1.3 Definition of Sustainable Distribution
- 1.3.1 Sustainable distribution is about achieving a transport system which balances the needs of the economy, the environment and society. Such a system should facilitate the efficient distribution of goods while minimising the impact on society in terms of noise, congestion, safety, air quality etc.
- 1.3.2 According to the DfT's report '*Sustainable Distribution: A Strategy*', sustainable distribution is about more than the transport of goods from A to B. It encompasses supply chain management or "logistics" as well as all modes of transport. The report goes on to state that it is about ensuring that future development of the distribution industry does not compromise the future needs of our society, economy or environment.
- 1.3.3 Sustainable freight distribution should be considered within the context of an integrated transport and land use policy. The close links between SEStran and SESplan facilitate this aim.
- 1.3.4 The DfT provides the following definitions of the supply chain in its document *Delivering a Sustainable Transport System: The Logistics Perspective*:
- *primary distribution* is the transport of goods from the point of production or port to the wholesaler, primary consolidation or import centre
 - *secondary distribution* is the transport of goods from the wholesaler, primary consolidation or import centre to the Regional Distribution Centre (RDC)
 - *tertiary distribution* is the transport of goods from the RDC or local warehouse to local store or customer delivery
- 1.3.5 This study is concerned with tertiary distribution via an Urban Distribution Centre (UDC). This can be described as 'a place of transshipment from long distance traffic to short distance (urban) traffic where the consignments can be sorted and bundled. The centre's main purpose is to achieve a high collection in the goods flow in order to supply efficient transport from the UDC to the city centre and vice versa'. (*Urban Goods Transport, Office for Official Publication of the European Communities, 1999*)

2 Policy Context

2.1 Introduction

2.1.1 A number of policy documents have been reviewed to provide the background context to sustainable distribution and to identify common themes.

2.2 European Policy Context

2.2.1 The development of efficient and integrated transport systems is recognised as a priority of the European Common Transport Policy. The mid-term review of the 2001 White Paper stresses the key role of logistics in ensuring sustainable and competitive mobility in Europe and contributing to meeting other objectives, such as cleaner environment, security of energy supply, transport safety and security.

2.2.2 The *Freight Logistics Plan, 2007* presents a number of short-to-medium term actions aimed at ensuring a competitive and sustainable freight transport system in Europe.

2.2.3 The White Paper on Transport for 2010, *European Transport Policy for 2010: Time to decide* expresses the Commission's desire to promote a European rail network giving priority to freight. The growing containerisation of freight transport and the longer distances covered in the single European market should generate a growing demand for rail transport.

2.2.4 The Commission's *European Ports Policy* sets out the five main challenges facing the European port network:

- increasing the efficiency and productivity of seaports
- balancing the need to increase investment capacity with respect for the environment
- modernising the ports network by, among other things, simplifying administrative procedures and making increased use of information technologies
- guaranteeing fair competition between ports
- addressing the human aspect within a new framework for human dialogue

2.3 UK Policy Context

Sustainable Distribution: A Strategy, DfT, 2004

2.3.2 This report was borne out of the Government's White Paper 'A New Deal for Transport: Better for Everyone', where one of the key aims was to deliver a sustainable approach to goods distribution. Working in partnership with industry, it is intended that government will deliver a strategy *'for the efficient movement of goods, supporting a strong economy with minimum harm to the environment and people's health'*

2.3.3 The aim of the Government's sustainable distribution strategy will include:

- minimising congestion
- making best use of the transport infrastructure
- managing development pressures on the landscape- both natural and man-made
- minimising pollution and greenhouse gas emissions.

2.3.4 The development of a strategy for 'Major Freight Interchanges' comprises part of the DfT report. This national policy framework for major freight interchanges will:

- **Promote their contribution to national and regional competitiveness** by pursuing policies of fair competition in the UK and throughout Europe;
- **Improve their operational and environmental performance** by promoting greater use of less damaging modes for onward distribution;
- **Encourage the full use of existing interchange facilities** by improving access for example or by encouraging regeneration of under-used sites; and
- **Promote best environmental standards for new developments.**

Delivering a Sustainable Transport System: The Logistics Perspective, DfT, 2008

2.3.5 This document provides the first detailed analysis of the movement of major freight commodities on national transport corridors. It sets out the current understanding of the issues across freight modes and considers how government and industry can work together to facilitate effective freight movement and to mitigate its impacts.

Modern Ports: A UK Policy, DfT, 2005

2.3.6 Ports policy is devolved to Scottish Ministers and the current framework is set out in this policy. It states that the Government and the devolved administrations share policy aims for ports which promote:

- UK and regional competitiveness;
- high nationally agreed safety standards;
- the best environmental practice.

2.3.7 The Government and the devolved administrations will work with the industry, its users and other interests, to achieve these four key objectives:

- to make regulation add value rather than unnecessary cost, ensuring that different regulators co-ordinate their overall demands;
- to promote agreed national standards and good practice for port management and port operations alike, without detracting from the legal responsibilities of harbour authorities and other port interests;
- to promote training and the recognition of skills for those who work in the ports industry at all levels not just those engaged by harbour authorities;
- to maintain a balanced policy on development which aims to make the best use of existing and former operational land, secures high environmental standards, but supports sustainable projects for which there is a clear need.

2.4 Scottish Policy Context

2.4.1 There are several policy documents that are relevant to freight.

National Transport Strategy (NTS), Scottish Government, 2006

2.4.2 The NTS sets out its vision for *'an accessible Scotland with safe, integrated and reliable transport that supports economic growth, provides opportunities for all and is easy to use; a transport system that meets everyone's needs, respects our environment and contributes to health...where transport providers and planners respond to the changing needs of businesses, communities and users...'*

2.4.3 There are three key strategic outcomes identified within the NTS, all aimed at achieving this vision:

- Improving journey times and connections;
- Reducing emissions; and
- Improving quality, accessibility and tackling affordability.

- 2.4.4 The NTS looks specifically at sustainable distribution and its importance to the efficiency of the transport network. The NTS seeks to '*actively promote sustainable distribution strategies, aimed at enabling freight to use rail and sea as alternatives to road and reducing the environmental impact of freight traffic on roads*'.
- 2.4.5 The NTS goes on to explain that considerable progress has already been made with regards to encouraging a modal transfer of freight from road to rail and water, and further support is expected to facilitate this shift.

National Planning Framework 2 (NPF2), Scottish Government, 2009

- 2.4.6 The NPF2 takes forward the spatial aspects of the Scottish Government's policy commitments on sustainable economic growth and climate change, which will see Scotland move towards a low carbon economy. It focuses on priorities for the improvement of infrastructure to support long-term development. For transport infrastructure, it promotes the strategic outcomes set out in the National Transport Strategy and incorporates the findings of the Strategic Transport Projects Review. It states that the relationship between transport and land use is central to reducing emissions from transport.
- 2.4.7 NPF2 states that investment will be needed to maintain and enhance essential transport infrastructure, support urban expansion, improve access to facilities and services, facilitate sustainable economic growth, and strengthen international gateways for passengers and freight. Ports and airports providing international freight and passenger links will need to be supported by an effective road and rail infrastructure.

Climate Change (Scotland) Act 2009

- 2.4.8 The Scottish Climate Change Act introduced legislation to reduce emissions by at least 80% by 2050 and will drive new solutions and new technology with the aim of building a sustainable low carbon economy.
- 2.4.9 One of its outcomes is to achieve almost complete decarbonisation of road transport by 2050 with significant progress by 2030 through wholesale adoption of electric cars and vans, and significant decarbonisation of rail by 2050. Improved vehicle technologies, primarily the shift to hybrid and electric vehicles, will provide substantial emissions reductions. An electric charging infrastructure to support the use of plug-in hybrid and electric vehicles across Scotland will need to be planned and developed.
- 2.4.10 Major uptake of new car and van technologies is likely to be required to significantly reduce transport emissions: the power to deliver such change rests with the European Union. Improved road vehicle technologies, some pre, and others post, 2020 include:
- non-engine measures such as improved aerodynamics, weight reduction, gear shift indicators and low rolling resistance tyres
 - improved engine efficiencies in conventional petrol and diesel vehicles
 - increased use of hybrid engine technologies in petrol and diesel vehicles, which capture and use the energy dissipated in deceleration and braking
 - adoption of plug-in hybrids (which switch between using electricity and petrol/diesel depending on the type of driving) and/or fully electric vehicles
 - much further in the future, hydrogen fuel cell technology, using hydrogen produced by renewable sources of energy
- 2.4.11 Developments in train rolling stock technology will continue, with more efficient vehicles and technologies coming forward. There have recently been successful trials of hybrid diesel and battery powered trains which delivered an energy saving of approximately

20% per journey. If proven, these technologies will influence how the Scottish Government specifies future rolling stock.

Strategic Transport Projects Review (STPR)

- 2.4.12 The STPR states that the development of a flexible and sustainable distribution network is needed for Scotland to compete in the global economy. Road freight traffic is concentrated in the Central Belt, and in the corridors linking the Central Belt with North West England. The corridors linking to the Upper Forth area, Dundee and Aberdeen are also relatively busy. Regional Distribution Centres are located generally within the triangle of main roads (M8 - A80 - M9) between Glasgow and Edinburgh and these provide a focus for much of the demand.
- 2.4.13 The review acknowledges that reasonable and reliable journey times are critically important in the context of the effective movement of freight and since most freight in Scotland is carried by road, a key issue for freight traffic is road congestion.

Freight Action Plan (FAP), Scottish Government, 2006

- 2.4.14 The FAP seeks to support the key strategic outcomes identified within the NTS, and examine where there is any additional capacity for freight to move off roads, paying particular attention to the development of multi-modal hubs across the country.
- 2.4.15 The FAP has developed a vision of working in partnership with business and industry to create a Scotland where the movement of freight through the entire supply chain is efficient and sustainable, on a transport infrastructure that is integrated and flexible- thus allowing Scotland's businesses to compete and grow in a global economy.
- 2.4.16 In order to achieve this vision, the FAP has outlined the following aims and objectives:
- **To enhance Scotland's competitiveness** by balancing freight and non-freight requirements in transport investment and continued business developments in the freight and logistics sector;
 - **To support the development of the freight industry in Scotland** by enabling the Scottish freight industry to compete effectively in the European market;
 - **To maintain and improve the accessibility of rural and remote areas** by targeting improvements to road and rail infrastructure;
 - **To minimise the adverse impact of freight movements on the environment in particular through the reduction in emissions and noise** by promoting a modal shift to rail and shipping and improving the efficiency and sustainability of road transport; and
 - **To ensure freight transport policy integration** by co-ordinating freight policy with other UK regions.

Scottish Multi-modal Freight Location Study, Scottish Government, 2009

- 2.4.17 This report examines the possible development of Scotland's key freight locations in terms of their economic competitiveness and contributions to other issues such as promoting modal shift and providing wider benefits.
- 2.4.18 In the SEStran area, the study identified the following multi-modal locations:

Table 2.1: Location and Level of Investment Required

Multi-modal Location	Type	Investment Level
Cameron Bridge- Leven	Regional Gateway	Moderate
Grangemouth	National Gateway	Moderate
Rosyth	National Gateway	Major

2.4.19 The demand analysis noted that none of the above locations have sufficient capacity to meet forecast levels of freight. However, the STAG-based assessment found that Grangemouth and Rosyth were financially viable and, therefore, should be implemented by the private sector with little or no need for direct Government intervention. It was found that Cameron Bridge-Leven could be implemented and while it would not have sufficient demand/revenue to cover its implementation and running costs, it would provide wider economic and other benefits.

2.4.20 It was suggested that indirect Government support could be provided to improve links within the vicinity of the sites and by inclusion in strategic plans.

2.5 Other Freight Policies

2.5.1 There are a number of other freight policies relevant to this review.

The Wales Freight Strategy, May 2008

2.5.2 The Wales Freight Strategy sets out high-level aims and policies for freight transport, and identifies a series of 'steps' towards their delivery. Many of the 49 steps set out in the strategy contain elements that are aimed at reducing the overall environmental impact of freight transport, through modal shift or efficiency measures, in particular the contribution of freight transport to greenhouse gas emissions.

2.5.3 The strategy recognises that a good passenger and freight transport system is central to a vibrant economy and social justice, through equality of access and greater mobility for people and goods. This is reflected through a number of commitments, including a clear aim to transfer freight from road to rail. Moreover, it recognises that transport must play its part to safeguard the environment and improve the quality of life for everyone.

Regional Freight Study: Dublin Transportation Office, 2006

2.5.4 This strategy is for freight distribution in the Greater Dublin Area. Its overarching aims are as follows:

- improve the efficiency of goods distribution through and within the Greater Dublin area given the need to optimise road space for all users
- reduce the impact of HGV traffic on the urban environment and vulnerable road users

London Freight Plan: sustainable freight distribution: a plan for London, Transport for London, 2007

2.5.5 This Plan recognises the need to improve the efficiency of the freight sector whilst also reducing the environmental and social impacts of freight transport on London and in particular the impacts of climate change.

2.5.6 The Plan defines sustainable freight distribution as the balanced management and control of the economic, social and environmental issues affecting freight transport that:

- complies with or exceeds environmental standards, regulations or targets aimed at reducing emissions of climate change gases, improving air quality and minimising impacts from accidents, spillages or wastes
- ensures freight is run efficiently, reduces unnecessary journeys, minimises journey distances and maximises loads with effective planning
- complies with labour, transport and human rights standards and regulations ensuring that employees and communities affected by freight can function in a healthy and safe environment
- minimises the negative impacts of freight activities on local communities

2.5.7 The Plan identifies four key projects and three work streams for delivering freight in London more sustainably:

- **Freight Operator Recognition Scheme** – a tiered set of membership levels to address fleet and freight vehicle operational efficiency, improving all areas of sustainable distribution to reduce CO₂ emissions, congestion, collisions and operator costs. It will recognise legal compliance as the base level and promote the uptake of best practice covering fuel efficiency, alternative fuels and low carbon vehicles, management of road risk, legal record keeping and reducing penalty charge notices through the higher levels. It will also recognise operator achievements with rewards that encourage operators to raise standards to reduce, in particular, CO₂ emissions and collision between heavy goods vehicles (HGVs) and cyclists.
- **Delivery and Servicing Plans (DSPs)** – to increase building operational efficiency by reducing delivery and servicing impacts to premises, specifically CO₂ emissions, congestion and collisions. Contractual relationships between building operators and their supply chain will be used to specify companies committed to sustainable freight distribution. These Plans aim to reduce delivery trips and increase availability and use of safe and legal loading facilities, using a range of approaches including consolidation and out-of-hours deliveries. They will eventually be integrated into the travel plan process and monitored in the same way.
- **Construction Logistics Plans** – have similar objectives to DSPs, but will be applied to the design and construction phases of premises. They will also be integrated into the travel plan process.
- **Freight Information Portal** – a single interface for information on freight between London’s public authorities and freight operators. Aims to reduce operators’ administrative costs and improve access to freight journey planning, to support improved operational efficiency, better driver behaviour and the use of alternative fuels and low-carbon vehicles.

2.5.8 There are three ongoing workstreams to support delivery of these projects:

- Partnership development
- Major freight projects
- Freight data, modelling and best practice

2.6 Key Themes

2.6.1 The key themes from these strategies are as follows:

- efficient movement of goods – reducing traffic, tackling congestion, improving reliability
- supporting the economy
- minimising environmental and health impacts – CO₂ and other greenhouse gases, safety, noise

- shift from road to rail and sea
- improved quality of life for all
- use of technology to minimise environmental impact
- freight is mainly a private sector activity

3 Review of National/International Experience in Sustainable Urban Distribution

3.1 Introduction

- 3.1.1 Previous research has found that the distribution of urban goods is not organised efficiently and that there is considerable scope for reducing urban goods traffic (vehicle miles) through coordination and consolidation of transport. (*Rationalisation of urban goods transport, COWI Consulting, 1996*).
- 3.1.2 The consolidation of goods flows is aimed at increasing the efficiency of the collection or distribution process, thereby reducing the environmental impact of urban delivery activities. By bundling various trips of one or several carriers to single trips with better capacity usage and using smaller and cleaner vehicles, congestion and noise in the city can be reduced, time gained and delivery made more reliable. (*BESTUFS, Best Practice Handbook, 2002*).
- 3.1.3 An Urban Consolidation/Distribution Centre has been described as 'a logistics facility that is situated in relatively close proximity to the geographic area that it serves, be that a city centre, an entire town or a specific site (e.g. shopping centre) from which consolidated deliveries are carried out within that area'. (*Urban Freight Consolidation Centres Final Report, Browne, Sweet, Woodburn and Allen, University of Westminster, 2005*)
- 3.1.4 A desktop review of existing work/experience on Urban Distribution Centres (UDCs) has been carried out and is presented below. While information on UDCs in Europe (mainly through EU funding) and elsewhere is available, the availability of quantitative information on what they have achieved is variable and often limited.
- 3.1.5 The research has also reviewed the use of electric vehicles for urban distribution and identified several other sustainable distribution opportunities.

3.2 Urban Distribution Centres

- 3.2.1 The BESTUFS project identified three types of UDCs:
- *Special project*: used for non-retail purposes, for example construction material, may serve a single site but could potentially operate over a broad area and operate for a specific period of time.
 - *Single site with one landlord*: for example at an airport or shopping centre
 - *Serving a town/city*
- 3.2.2 The main benefits may include:
- reductions in the number of vehicle trips
 - reductions in the number of vehicle miles
 - better vehicle and driver utilisation
 - fewer vehicles and more suitable vehicles in the urban area
 - reduced vehicle emissions and noise pollution
 - the ability to use low emissions vehicles
 - the opportunity to increase recycling of packaging
 - improved supply chain management
- 3.2.3 The **START** EU project involved the consolidation of deliveries in three cities:

- Bristol, Gothenburg and Ravenna. The final project report (*START Final Report, Future Solutions for Goods Distribution, 2008*) states that the key challenge is financial sustainability of the distribution centres.
- 3.2.4 The report recognises that many of the initiatives are local and quite small, and therefore, the consequences are rather unknown. Within START, the cities have contributed financially in the start-up phase. The key learning points from the project are:
- form a project group of dedicated representatives from the public and private sectors
 - the public sector would have three tasks: regulation, control and provision of incentives. The private sector would have the role of operating the centre and making it profitable
 - collaborate with end-users to explain the underlying reasons for consolidation: environmental and financial
 - find solutions that are aligned with the structure of the transport industry
 - collaborate with developers
 - integrate consolidation schemes with incentives and access restrictions
 - incentives could include use of bus lanes or special loading zones in attractive areas
- 3.2.5 The University of Westminster Report on Urban Freight Consolidation Centres found that they have the greatest prospect for success if they meet one or more of the following criteria:
- availability of funding
 - strong public sector involvement in encouraging their use through the regulatory framework
 - significant existing congestion/pollution problems within the area to be served
 - bottom-up pressure from local interests
 - locations with a single manager/landlord
- 3.2.6 The report also found that Urban Consolidation Centres are most likely to be successful in:
- specific and clearly defined geographical areas where there are delivery-related problems
 - towns that are undergoing a retailing renaissance
 - historic town centres and districts that are suffering from delivery traffic congestion
 - new and large retail or commercial developments (both in and out-of-town)
 - major construction sites
- 3.2.7 Another EU initiative, the BESTUFs project, recommends that the EU should encourage the development of local public-private partnerships to establish local charters on urban deliveries and to promote the development of private or public-private urban consolidation schemes, including schemes targeted at specific locations. BESTUFs recommends that policy makers ensure that trials have sufficient support and funding to run for a suitable period of time over which to measure and analyse results.
- 3.2.8 It also recommends that to be attractive to companies and to be successfully set up, the urban consolidation centre should be led and operated by one or several key commercial players that have identified the potential benefits of being involved.
- 3.2.9 Several case study examples of cities that have in place or have trialled urban distribution centres are included below. As mentioned earlier, the availability of performance measures for these case studies is often limited and inconsistent.

Bristol

- 3.2.10 The city of Bristol has a population of 400,000 and freight vehicle movements contribute to congestion and pollution problems in the city. This project targeted the area of Broadmead, the city centre shopping area which has over 300 stores and was developed under the CIVITAS-VIVALDI project. It is located on the north east side of Bristol near the M32/M4 intersection, serves 72 retailers and is operated by DHL Exel. It has resulted in delivery trips to the Broadmead area being reduced by 23%, saving around 30% of CO₂, NO_x and PM₁₀ emissions. Retailers also have waste and packaging material collected resulting in increased recycling. The scheme has expanded to include a number of stores in neighbouring streets.

Gothenburg

- 3.2.11 Gothenburg has a population of 500,000. A consolidation centre was established in the Lindholmen area which is a former industrial area that has been developed into a business, university and housing area. Electric vehicles are used for deliveries and waste recycling. It is financed by the participating organisations and has seen a reduction in CO₂, NO_x and PM₁₀ emissions of around 50% and a reduction in the number of trips of 50%.

Ravenna

- 3.2.12 The municipality of Ravenna has a population of 136,000. Two firms offered consolidation services (CONSAR and CFC-Copura). CONSAR operated a pilot project for a private shopping centre to deliver products into the city centre. This reduced the number of trips by 4%. Electric van sharing is also offered and it is estimated that one van can substitute up to 8 private vehicles.

Lucca

- 3.2.13 This project was funded through the EC LIFE Environment initiative. It established a City Distribution Terminal to support delivery operations to the historic centre of Lucca. The terminal is located in a service area outside Lucca's historical walls and is less than 1km from the walls and from the motorway tollgate. Deliveries to final destinations are carried out by a fleet of electric vehicles. These vehicles are also used to consolidate loads from other participating logistics operators.

La Rochelle

- 3.2.14 This was a pilot funded through the ELCIDIS programme. A UDC was set up near the city centre and electric vehicles delivered and collected parcels. The vehicles were well suited to the narrow streets of the historic centre. Management of the UDC was outsourced. The initial results estimate the time saved per lorry and day of three hours.

Genoa

- 3.2.15 In Genoa the Municipality founded and organized a UDC serving the historical centre of the town. It has a fleet of electric or methane fuel vehicles that are suited to the narrow streets of the historical centre. A telematic and informatic system supports UDC activities such as monitoring of deliveries and vehicle positions, optimization of delivery times, billing of goods arriving to the UDC. It is reported that carriers and retailers were satisfied with the service, while the UDC operator was not happy with the location of the UDC, which is too far from the area that it is serving.

Stockholm

- 3.2.16 In Stockholm the Hammarby Logistics Centre was used during 2000-2005 to reduce the number of vehicles delivering building material to the construction site for this new development. During this time six vehicles were replaced by one and CO2 emissions were reduced by 90%.
- 3.2.17 In the old town, one third of the restaurants get their deliveries through the distribution centre O-centralen via a biogas truck. It coordinates the supplies and has reduced the number of vehicle movements.

Thun, Switzerland

- 3.2.18 SpediThun is a city logistics scheme operating an UDC in a public-private partnership. At the UDC on the outskirts of Thun, goods are reconsolidated and delivered twice a day to retailers in the inner city using suitable vehicles. The project aims to reduce the number of trucks by 20%, and on average 50 tonnes are delivered into the city per month (2001).

London Construction Consolidation Centre

- 3.2.19 A pilot project was established in 2005 to serve construction sites in London. The centre served four major building projects in central London from a site in Bermondsey south of the River Thames. The site was chosen because it:
- was within 40 minutes travel time of the construction sites
 - was far enough away to reduce construction vehicle movement in the central zone
 - has good links to the road network
- 3.2.20 The key benefits were:
- estimated reduction of 73% (31,422 kgs) in CO2 emissions
 - 70% decrease in the number of freight journeys
 - improved service levels
 - greater delivery flexibility
 - recyclable packaging and unused materials were brought back to the centre improving vehicle utilisation

Heathrow Airport Consolidation Centre

- 3.2.21 This is an off-site consolidation centre to serve the airport retailers that is operated by Exel. It is reported that vehicle trips were reduced by 70% with an estimated saving of 144,000 km and weekly CO2 emissions reductions of 3,100 kg per week.

Tenjin, Japan

- 3.2.22 This centre is a cooperative scheme in the Tenjin district of Fukuoka City involving 36 freight carriers under the supervision of the Regional Transport Office of the Ministry of Transport on a voluntary basis. No subsidy is provided by public agencies. The Joint Distribution Centre is located close to the interchange of urban expressways. It is reported that it has achieved a 65% decrease in numbers of vehicles, a 28% decrease in distance travelled, decrease in traffic on the main trunk road, a decrease in vehicle parking time on service roads in the city centre. Results in 2004 showed vehicle trip reduction of 70% with CO2 savings per week of 3,100 kg.

Regent Street, London

3.2.23 Clipper Logistics operate a consolidation centre located at Brimsdown which consolidates retail goods on behalf of The Crown Estates for retail tenants on Regent Street. The site is on an industrial estate 12 miles from Regent Street. Delivery of parcels, chilled and frozen goods is also being considered.

3.3 Characteristics of Successful Urban Distribution Centres

3.3.1 A review of the above examples and existing research has identified the following success factors for urban distribution centres.

Table 3.1: Characteristics of Urban Distribution Centres

Proximity to the distribution source	Good access to the road network with reliability of journey time
Proximity to the urban centre	Suitable for 24 hour operation
Located away from residential areas	Access to priority vehicle lanes
Use of electric vehicles and availability of charging infrastructure	Incentives such as extended delivery hours to urban centres and entry to pedestrian areas
Outsourcing the management/operation of the centre	Close cooperation between stakeholders- strong partnership – both private and public
Effective marketing and promotion	External funding for start-up operation and to measure and analyse the impact of the UDC
Offer value-added services e.g. recycling, community collection and delivery points	Support of local traders, street association
Demonstrate that costs will be reduced by using the UDC	

3.3.2 The process leading to the establishment of a UDC will require consultation with a number of organisations, including the local authority, potential UDC operator, police, potential customers, local traders, road transport industry etc.

4 Alternative Fuels

- 4.1.1 The increased use of alternative fuels sources, such as biofuels, electricity and hydrogen, will contribute towards reduced CO2 emissions while improving air quality. Some of these alternative fuels involve relatively new and complex technologies, which require further research and development before their uptake can be accelerated.
- 4.1.2 Decarbonising freight and logistics is a key part of the UK Government’s long-term strategy. The aim is to help industry move to lower carbon technologies for HGVs as well as vans and explore other technologies to improve fuel efficiency. The CO2 benefits from any lower carbon HGV technology need to be balanced with other considerations such as infrastructure requirements, costs of the technology, safety implications and any limitations with respect to applicability across the range of HGVs and load types.
- 4.1.3 The use of alternatively fuelled vehicles at an urban distribution centre provides a further opportunity to reduce vehicle emissions to an urban area. There are various types of alternative fuels that could be considered.
- 4.1.4 **Biofuels** are fuels produced from a range of feedstock including animal waste (tallow) and energy crops such as wheat, maize, rapeseed, and sugar cane. The main fuels produced are either bio-ethanol or bio-diesel. Some opportunities also exist with the emergence of viable technologies, to convert commonly available mixed or segregated waste into biofuels.

Table 4.1: Waitrose and Pure Plant Oil

Waitrose has become the first supermarket to run lorries on pure plant oil (PPO). As part of a trial seven vehicles are currently operating on PPO. If judged to be effective and sustainable, Waitrose will consider rolling it out to more fleet vehicles. PPO has a cleaner production process than biodiesel and the associated carbon footprint is around 50 per cent lower than that producing an equivalent biodiesel.

- 4.1.5 The use of **hydrogen** as a fuel for vehicles also has the potential to offer reductions in CO2 emissions, as the only significant emission is water vapour. However, hydrogen powered vehicles are not currently available on the mass market, and significant development is likely to be required before market emergence.
- 4.1.6 **Electric** - urban vehicles can now be powered by electricity, which, although it relies mainly on fossil fuels to recharge the batteries, is completely emission-free at the tailpipe. Battery electric vehicles have a range of up to 150 miles, making them suitable for use in urban distribution where they can be recharged overnight. The fuel cost is around 20% of the diesel equivalent and they are quiet running, reducing noise pollution. They are suitable for use in urban areas because of their fast acceleration and zero emissions which are suited to start-stop situations.
- 4.1.7 There is growing consensus that electric vehicles are the best near-to-market low-emission vehicular technology. They have no emissions at point of use and ‘well-to-wheel’ carbon dioxide emissions 30-40% lower than comparable petrol or diesel-fuelled vehicles.
- 4.1.8 The time taken for an EV battery to charge depends on the initial state of the charge and the power capability of the charging point utilised. The type of charging point therefore is

determined by local needs. (*London's Electric Vehicle Infrastructure Strategy, Draft for Consultation, December 2008*)

- 4.1.9 The ELCIDIS (Electric Vehicle City Distribution: www.elcidis.org) project which ran between 1998 and 2002 and involved Rotterdam, Stockholm, La Rochelle, Erlangen, Regione Lombardia and Stavanger found that a more efficient organisation of urban logistics could be achieved by using electric vehicles, the more efficient routing of the vehicles and the use of urban distribution centres.
- 4.1.10 The main finding was to verify the merits of using such vehicles for urban delivery in conjunction with an urban distribution centre. For battery electric vehicles, an UDC near the city centre with charging equipment is necessary. For hybrid electric vehicles, the UDC may be located further away from the city, but at a reasonable distance.
- 4.1.11 The project report recommended that authorities introduce incentives for the use of clean vehicles, extending delivery hours and enabling them to enter pedestrian areas and use bus lanes.

Table 4.2: Cities Join Forces on Electric Vehicles

<p>The cities of Bogota, Buenos Aires, Chicago, Copenhagen, Delhi, Hong Kong, Houston, London, Los Angeles, Mexico City, Toronto, Sao Paulo, Seoul and Sydney have come together to form the 'C40 Electric Vehicle Network' and collectively will address four areas of municipal action that are critical to the successful introduction of electric vehicles. Through the C40 Electric Vehicle Network, the cities will:</p> <ul style="list-style-type: none">▪ facilitate the planning and deployment of charging infrastructure and related electricity supply systems in collaboration with local utilities.▪ work with relevant stakeholders to streamline permitting processes associated with charging equipment to encourage the safe and expeditious installation on customer premises and elsewhere.▪ coordinate monetary and non-monetary incentives available to the general public and organizations purchasing electric vehicles, and contribute to the package appropriately.▪ develop and publish a plan to mobilize demand for electric vehicles in city fleets for the period 2010 - 2013 and rally private fleets to the safe end. <p>Four private sector companies have committed to work with the C40 Electric Vehicle Network toward the shared goal of growing the market for electric vehicles. This group includes car manufacturers, BYD, Mitsubishi Motors Corporation (MMC), Nissan and Renault. These companies will help inform cities' electric vehicle policies, vehicle procurement and infrastructure investment decisions through advice on vehicle specifications, charging parameters, business models for electricity supply, and incentives.</p> <p>www.c40cities.org</p>
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Types of Electric Vehicles

4.1.12 A variety of types of electric commercial vehicles is now available, including HGVs, vans, minibuses and transit vans. Information on these is available at www.london.gov.uk/electricvehicles/commercial/vehicles.

- payload capacities range from 800 to 7,200 kg, with gross vehicle weights of 2,400 to over 12,000kg
- the range runs up to 150 miles depending on battery size
- speed limit ranges from 50-70mph
- the turning circle is from 10.8-14.1m kerb to kerb, making them ideal for the urban environment
- the cost is £30,000 to £82,000, depending on vehicle size. Battery rental or leasing costs may be additional to this cost. Fuel costs will be of around 3-4p/mile

4.1.13 The Low Carbon Vehicle Procurement Programme (LCVPP), funded by the Department for Transport, helps public sector organisations to procure low carbon vehicles: www.lowcvp.org.uk. The LCVPP has identified several Large Panel Vans to be used as vehicle demonstrators:

Allied Electric – electric Peugeot Boxer van:

- Gross vehicle weight 3,500kg
- Payload weight 895kg
- Average range 100-120 miles
- Max speed 70mph

Modec – electric large van:

- Gross vehicle weight 5,490kg
- Payload weight 2,000kg
- Average range 100 miles
- Max speed 50mph

Smith Electric Vehicles – Panel Van:

- Gross vehicle weight 3,500kg
- Payload weight 1,220kg
- Average range 100 miles
- Max speed 50mph

Smith also offers the Smith Newton with the following specifications:

- 7.5t for parcel and home shopping delivery
- 10t for chilled food distribution and logistics operation
- 12t for all distribution and delivery applications
- up to 100 miles on a 6 – 8 hour battery charge

Table 4.3: Electric Vehicles in London

<p>In London, the Mayor wants to work with fleet users and companies to expand the use of electric vehicles in business fleets. Over 200,000 commercial vehicles operate in central London representing a massive market for conversion. The Mayor is leading by example and has committed to converting 1,000 Greater London Authority fleet vehicles to electric by 2015.</p> <p>The Mayor is committed to:</p> <ul style="list-style-type: none">▪ work with key businesses to encourage the uptake of electric vehicles within their fleets.▪ work with commercial fleet users to establish the cost effectiveness of electric vehicle technology to potential users.▪ work with business and commercial fleet operators to establish a plan for larger scale procurement of electric vehicles. <p>Ten companies already use electric commercial vehicles and have agreed to work with the Mayor to drive the uptake of these vehicles in London. They are Amey, Go ahead, DHL, M& S, Royal Mail, Speedy, TNT, Sainsburys, Tesco and UPS.</p>

Table 4.4: TNT's Electric Vehicles in an Urban Environment

<p>TNT as part of its Carbon Emissions reduction programme has ordered 100 7.5 tonne electric vehicles with the aim of reducing the company's CO₂ emissions by 1,300 tonnes annually.</p> <p>TNT's Edinburgh express operations use three electric vehicles alongside diesel equivalents and are utilised on the same delivery patterns to gain a like-for-like comparison. The results have seen a saving of £120 per vehicle per week in fuel plus the additional financial saving of £165 a year for Vehicle Excise Duty.</p> <p>TNT has found that there are potential significant cost savings in the long-term. On average it costs £40 a week to power a zero emission vehicle as opposed to around £200 spent on diesel fuel. The electric vehicles also do not incur road tax in the UK.</p>
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Table 4.5: Smith Newton 10t Electric Truck in London

<p>Truck rental and contract hire specialist, Ryder, has delivered its first leased electric truck.</p> <p>The 10 tonne Smith Newton truck is now in operation with Bunzl, the distribution and outsourcing group. It is deployed in Bunzl's catering and hospitality sector, working in the central London area.</p> <p>The Smith Newton is designed specifically for the rigours of stop-start urban work. Based at Bunzl's Charlton branch, this first truck will have a maximum range of around 80 miles. Earlier trials with a demonstrator Newton proved that this was more than ample - the truck could travel its normal delivery routes around the capital for up to three days before the batteries needed a recharge. Ryder's first electric truck on contract hire.</p> <p>Source: <i>Smith Electric Vehicles</i> http://www.smithelectricvehicles.com/casestudies_ryder.asp</p>

5 Other Sustainable Distribution Opportunities

5.1.1 A number of other sustainable distribution opportunities were identified either by consultees or through desktop research.

Tram freight

5.1.2 With the forthcoming introduction of trams in Edinburgh, there may be an opportunity to pull trailers for freight delivery. Dresden in Germany has a regular CarGoTram service carrying car parts across the city centre to the Volkswagen factory. Vienna and Zurich use trams as mobile recycling depots.

Low Emission Zone

5.1.3 London operates a Low Emission Zone (LEZ). The aim of the scheme is to improve air quality in the city by deterring the most polluting vehicles from driving in the area. The vehicles affected by the LEZ are older diesel-engined lorries, buses, coaches, large vans, minibuses and other heavy vehicles that are derived from lorries and vans, such as motor caravans and motorised horse boxes. Cars and motorcycles are not affected by the scheme

5.1.4 The LEZ commenced in February 2008 and applies to vehicles over 3.5 tonnes and buses and coaches over 5 tonnes with more than eight seats, plus the driver's seat. Different vehicles will be affected over time and tougher emissions standards introduced in January 2012.

5.1.5 Numerous other European cities have LEZs in operation.

Table 5.1: LEZ in Berlin

An LEZ has been in operation in Berlin since January 2008. In April 2009 the LEZ reduced emissions of diesel particulates by 24% and PM10 by 8%. It reduced: PM10 exceedences from 28 to 24 per year, diesel particulate concentrations by 14-22%, & PM10 concentrations by 3% on main roads. It is intended that the second phase of the LEZ will have a greater impact.

Rail and Rail-linked Distribution Centres

5.1.6 More warehousing facilities that are linked to rail will support the growth of rail freight.

Table 5.2: Howbury Park

London Rail has helped to secure approval for the first modern rail-linked distribution park in London (January 2008). The Howbury Park Rail Freight Terminal, near Slade Green in Bexley, will provide between 1600 to 2600 new jobs in one of the most deprived areas of London. The site has good road connections (M25 Junction 1a is 2 miles by dual carriageway) and the rail connection would be made into the North Kent Main Line via an existing disused rail connection at the Slade Green depot.

5.1.7 Tesco has introduced a purpose-built 'green train' which moves non-food products from the Midlands to its main Scottish distribution centre in Livingston. Two state-of the-art

'trains have been imported from Canada to make sure the goods are imported in the most environmentally friendly way. The trains have also been designed to reduce noise and vibration. Tesco has estimated savings of 4.5 million road miles and 6000 tonnes of CO2 a year. The Tesco train link between Daventry and Grangemouth saves 3.18 million road miles per year and reduces CO2 by 2,424 tonnes per year.

Common Use of Transport Fleets

- 5.1.8 Computerised route planning helps to avoid unnecessary mileage, to load lorries more efficiently, and to make use of empty vehicles on return journeys. For example, Waitrose commonly delivers to a shop and then 'back-hauls': picks up stock from a nearby supplier on the way back to the depot, saving fuel and saving the supplier from having to use their own lorry. Waitrose also 'forward-hauls', where a supplier's lorry delivers Waitrose goods to a shop on its way back from a distribution centre.
- 5.1.9 Of the 50% of truck miles which are run empty, Asda reckons 28% are not viable for return loads. However that still leaves 3,000 empty journey legs to fill each week, which has led the company to look at collaboration. It is investigating increasing supplier backloads, and working with others to optimise the efficiency of hauling to stores. It estimates that eliminating this empty running will save nine million miles a year.

Table 5.3: Truck sharing – Mars and Nestle

<p>Two big regional hauliers are benefitting from a unique transport collaboration between confectionary firms Mars and Nestlé on seasonal deliveries to Tesco.</p> <p>Since the project launched in September 2009, some 12,000km of empty running has been eliminated, and more than 60 loads have been consolidated.</p> <p>Through close co-operation with Tesco's logistics department, the two firms have been able to consolidate part-load orders onto one truck for delivery to Tesco Distribution Centres (DCs) in Medway, Southampton and Belfast.</p>

Incentives

- 5.1.10 The City of Stockholm and the Swedish Government have used incentives such as free parking and reduced taxes to promote the use of clean vehicles and now has the highest percentage of clean vehicles in Europe - 30,000 vehicles or 5% of all vehicles are now either hybrid or use biofuels.

Table 5.4: Clean Vehicles in Stockholm

<p>The Clean Vehicles Programme brought business together and worked with car manufacturers to introduce new clean car models and lower the price of existing models. Discussions with the national government together with other cities and NGOs led to tax discounts on vehicles and fuels – first on a trial basis for a few years and ultimately as a long-term national policy. The city offered subsidies for a few, chosen models that still were expensive, making the costs 10- 50% lower.</p> <p>City incentives were also provided:</p> <ul style="list-style-type: none"> ▪ An extensive information campaign directed towards the target group started and a test fleet of AFVs was set up together with the vehicle dealers. ▪ Free parking for electric vehicles was introduced and the plans for free parking for all clean vehicles developed – saving some \$70/month; ▪ No congestion charges for clean vehicles – saving \$8.50/day ▪ Test fleet ▪ Taxi priority ▪ Subsidies for special vehicles ▪ Green procurement <p>National government incentives:</p> <ul style="list-style-type: none"> ▪ long term tax discounts are offered on biofuels and hybrid vehicles. ▪ Clean fuels at fuel stations are now mandatory ▪ Grants are being provided to biogas stations ▪ The federal government is procuring clean vehicles ▪ Strict definitions of what a clean vehicle is, are being introduced, followed by incentives for those meeting the definition – such as cheap/free parking ▪ Consideration is also being given to grants for clean vehicles <p>Essential to sustaining hybrid vehicle use is access to alternate fuels. Stockholm’s first biogas fuelling stations were subsidized, a co-operation then started with a gas company that agreed to set up more stations. Now Stockholm has 150 fuelling stations with renewable fuels, out of a possible 200 in the region.</p> <p>Total reductions are 200,000 tons CO₂/year, including:</p> <ul style="list-style-type: none"> ▪ 35,000 Clean vehicles in the region = 5.3 % of all vehicles in the City. This reduces 100,000 CO₂/ tons/year ▪ E5 biofuel use also reduces some 100,000 tons CO₂/year <p><i>Source: C40 Cities</i></p>

Coastal shipping

- 5.1.11 Short sea and coastal shipping can offer lower costs than road transport, reliability of journey time, flexibility to access numerous coastal ports and reduced emissions. For example, B&Q moved most of its imports from south coast ports to Immingham so that it is nearer their main distribution centres in Scunthorpe and Doncaster. Feederlink BV operates several services linking Rotterdam and UK ports, including Grangemouth. There are also feeder vessels that supply links between UK ports.
- 5.1.12 The EU project, CIPROC recommends developing secondary and inland ports and encouraging the siting of regional distribution centres on sites that are adjacent to water with good connectivity to other modes.

- 5.1.13 An example of the use of coastal shipping in Scotland is the timberLINK project by ABP in Troon. This project received Scottish Government grant funding. Its aim is to ship timber and other forest products by sea. It ships in excess of 100,000 tonnes of timber a year around Scotland. Logs are shipped from the ports of Ardrishaig, Campbeltown, Portavadie and Sandbank and hubbed at Troon where the timber is then forwarded to local wood processing plants.

Freight by Water

- 5.1.14 The port of Lille ships the city's domestic waste by container barge to the incineration plant down/upstream. Over a period of 4 years this regular liner service transported some 300,000 tonnes packed in 55,000 containers. The port of Paris, ideally located with its 70 port sites, collects paper for transport by barge to a waterside recycling factory producing cardboard, which is then loaded on vessels to Le Havre and Antwerp for export to Asia. Also, 175,000 tonnes of burned domestic waste are shipped annually as well as 3 million tonnes of debris and clearing material.
- 5.1.15 In London waste is transported on barges replacing 100,000 lorry movements a year. New waterside state-of-the-art materials recycling facilities will process recyclables such as paper, cardboard, glass bottles, cans and plastics, and lead to a shift of over a million tonnes of refuse off the roads each year.
- 5.1.16 Tesco uses a barge link on the Manchester Ship canal for wine distribution from the port at Liverpool to the bottling plant.

Electric Delivery Tricycle

- 5.1.17 An interesting and sustainable solution to commercial deliveries in urban areas, where light vans and other commercial vehicles are less suited (town centres, pedestrian streets, tourist areas, etc.), is electric tricycles. These are operated by La Petite Reine in two European capitals (Paris and London) and three large French cities.

Table 5.5: Electric Delivery Tricycles

<p>La Petite Reine has 60 Cargocycles which transported 1 million parcels in 2008. Over a twelve month period, this avoided 599,393 t-km hauled by vans in Paris to generate a saving of 89.12 toe (tonnes oil equivalent) in engine consumption; to avoid emissions of 203 tonnes of CO2 and 84 kilos of particles of atmospheric pollution and reduce noise pollution.</p>

Access Restrictions

- 5.1.18 There are opportunities to improve access to city centres for freight vehicles and also improve the pedestrian environment. In Barcelona, for example a control zone has been implemented in the historic city centre. 50 gates have been installed, 5 zones centrally controlled through the use of bollards and smartcards and 8,000 residents cards issued. Delivery vehicles are only allowed to enter during defined periods, however, more flexible time slots will be offered to clean vehicles.

Essential User Lanes

- 5.1.19 This is a means of giving priority to essential vehicles in congested urban areas helping the delivery of goods by improving journey times and reliability. They can also reduce lorry traffic on other routes.
- 5.1.20 For example, in Leeds peak period High Occupancy Lanes are in place on parts of the East Leeds Link. All good vehicles with two or more occupants and all goods vehicles 7.5T or over with one or more occupant are eligible to use the lane.

Van Sharing

- 5.1.21 This project in Bologna is based on cooperation between urban freight operators and local distributors. It combines policy regulations (restricted access to low emission vans during specific time windows) and operational and logistics measures supporting the creation of Urban Freight Distribution Centres, the use of Information and Communication Technologies (ICT), and the renewal of the transport operators fleet into low carbon vehicles. The system makes use of GPS technology for tracking & tracing the vehicles. The IT platform supports route planning, loading optimisation and booking of parking in dedicated areas.

Reduced Curfew Restrictions

- 5.1.22 Delivery of goods outside peak hours would reduce traffic congestion and noise pollution. FTA has developed a tool-kit to assist local authorities to work with industry to improve flexibility of delivery times and enable more night-time deliveries.

Delivery and Service Plans

- 5.1.23 TfL is implementing Delivery and Service Plans (DSP) to help organisations to manage freight vehicle movement to and from individual buildings. The aim is to improve the safety and reliability of deliveries, help reduce congestion and minimise environmental impact.
- 5.1.24 The advantages include:
- reduced delivery costs and improved security
 - more reliable deliveries = less disruption to the business day
 - time saved by identifying unnecessary deliveries
 - less noise and intrusion
 - opportunity to feed into corporate social responsibility (CSR) programmes and ensure operations comply with health and safety legislation
- 5.1.25 A DSP also benefits the freight operator:
- legal loading areas mean less risk of receiving penalty charge notices
 - fuel savings through reduced, re-timed or consolidated deliveries
 - vehicles used more efficiently as delivery reliability will help better planning
- 5.1.26 DSP can be developed as part of a transport assessment or retrospectively for existing buildings. They may consider:
- looking at where safe and legal loading can take place
 - using freight operators who can demonstrate their commitment to best practice
 - reducing numbers of journeys by managing deliveries differently
 - using your procurement processes to encourage more efficient deliveries
 - using more sustainable delivery methods - cycles rather than vans, for example, or requesting that your suppliers use electric vehicles
 - areas and those where refurbishment has taken place, thereby closing the loop

6 Consultation

6.1 Introduction

6.1.1 A number of organisations were consulted in order to establish their views on sustainable distribution in the SEStran area. Telephone interviews were carried out using a standard questionnaire which is attached at Appendix 1.

6.1.2 Views were sought on:

- which freight distribution centres in South East Scotland are currently used and/or important to the area?
- how distribution from these centres could be made more sustainable?
- what benefits the use of sustainable distribution systems could offer?
- any barriers to sustainable distribution?
- examples of good practice, relevant work or studies in relation to sustainable distribution that could be transferable to the area?

6.1.3 The following organisations were contacted:

Table 6.1: Organisations Consulted

Organisation	Comments
FTA	
RHA	
Edinburgh Chamber of Commerce	
Scottish Enterprise	Not able to participate
Network Rail	Not able to participate.
West Lothian Council	
DHL	
John Mitchell	
TRI	
Scottish Retail Consortium	Not able to participate.
Morrisons	
Pantrak Transportation	
John Lewis	
Diageo	
Tesco	Not able to participate
Marks and Spencer	
Richard Turner (ex-FTA)	
The Body Shop	
Next	Not able to participate

6.2 Key findings

6.2.1 Feedback from consultees is summarised below.

Freight Distribution Centres

6.2.2 The distribution centres identified by consultees as important to the area are as follows:

- Grangemouth

- Rosyth
- Coatbridge
- Rail terminal, Mossend
- Dunfermline/Kirkcaldy
- M8 corridor
- Leith (but road congestion is an issue)
- Livingston/Bathgate
- Tesco Distribution Centre
- Junction 4 M8 Distribution Centre
- East Mains Industrial Estate, Broxburn
- Deans Industrial Estate, Livingston
- Whitehill Industrial Estate, Bathgate
- Gyle complex
- Landfill site at Leven (planning application for extended life)
- Super depot at Deans Council Waste HQ (planning application)
- Menzies Distribution Centre
- Asda Distribution Centre
- Lockerbie (could also supply Dumfries & Galloway)
- Galashiels/Hawick

6.2.3 Other comments:

- Edinburgh lacks a proper freight centre and this is a concern
- think about outside the SEStran area –e.g. Spittal Harbour in Northumberland is very important to Scottish freight
- most distribution centres are owned by individual companies and only serve their requirements
- consolidate in South East England and at the rail consolidation centre in Daventry for transportation to branches in Scotland

Sustainable Distribution Opportunities

6.2.4 Suggestions include:

- Road
 - truck sharing for seasonal deliveries
 - change bus lanes to Priority Vehicle Lanes to allow freight to use them as well
 - low emissions zone in Edinburgh
 - make road more sustainable e.g. lower emissions, smaller vehicles etc
 - free up road space for freight
 - electric vehicle hubs at Park & Ride sites
 - Freight trains into Waverley station
- Tram
 - use tram to deliver freight at night – example in Dresden
- Rail
 - completing rail loop at Rosyth for relatively small investment
 - current rail capacity issues - opportunity for Scotland to be involved in the nationwide rail improvements
 - rail could do more but accessibility is a key problem
- Cooperation
 - cooperation among operators is essential e.g. Stobarts/Russell cooperate in delivering to Tesco in Inverness

- could also share information, jointly fill trains, ensure high utilisation rates – co-petition – works in Italy and Brazil
- **Distribution Centre**
 - Ingliston Park & Ride – use as an overnight lorry park and put a distribution centre here. Good location on edge of Edinburgh, close to M8, link to trams and delivery to Princes Street. Consider similar for other cities and larger areas
 - increased focus on distribution centres for more efficient transportation of goods, especially to shopping centres, also for out-of-town shopping centres with limited space for stock
 - M8 is the centre of gravity with lots of jobs created and reduced need for warehousing as goods are constantly on the move and increasingly efficient
 - create sustainable buildings – example 3663 First for Foodservice
 - provide information for customers – telephone listing, website etc
- **Water**
 - Diageo moving whisky by water from Grangemouth
 - potential use of inland waterways for bulky freight but accessibility is a problem
 - coastal shipping along the Forth
- **Integration**
 - improve inter-modal connections between road, rail and water
- **Funding**
 - carbon savings could be made by greater use of rail and canals if government makes the investment
 - examine what throughput levels are necessary to make a distribution centre cost-effective. This may be ok for large conurbations, but more difficult for smaller areas.

Benefits of Sustainable Distribution

6.2.5 Benefits relate primarily to the wider economic, social and environmental benefits and to improved operational efficiency. Comments can be summarised as follows:

- economic benefit must be demonstrated to the private sector
- more structured delivery programme
- improved security of vehicles
- environmental benefits will bring about social and economic benefits
- production of a concise and efficient plan will assist with the cooperation of stakeholders
- need to think of the entire logistics system
- reduced congestion
- overall reduction in traffic
- stockless supply chains
- reduced lorry miles
- optimised vehicles for delivery to key centres
- need for commercial organisations to prove their environmental efficiency to win large contracts
- reduced noise
- sustainability of new distribution centres – re-use rain water etc

Barriers to Sustainable Distribution

- 6.2.6 The barriers relate primarily to sources of funding, cooperation between organisations, lack of infrastructure and public perceptions.
- uncertainty over who would pay – need clear message of benefits. Private sector will pay if commercially viable. Need incentives/subsidy from government
 - human behaviour – resistance to change
 - need cooperation between competitors, including smaller firms that play an important role
 - incentives are essential – Government needs to take the lead
 - political unwillingness
 - SEStran area is remote and infrastructure is lacking
 - very difficult to get economic business case for a distribution centre in the area – government investment is needed to ensure road and rail infrastructure is adequate to make the distribution centre efficient
 - vested interests could prevent cooperation
 - relative inaccessibility of rail and water
 - health & safety regulations constrain development
 - public perceptions – attitudes of consumers

Examples of Good Practice

- 6.2.7 Examples which could be transferable to the SEStran area:
- Tram network, Dresden
 - Regent Street, London:
 - Newcastle Consolidation Centre
 - Bristol
 - Daventry
 - Norwich
 - Bluewater
 - East Midlands Airport
 - Meadowhall, Sheffield
 - cycle transport – Copenhagen
 - city couriers – Edinburgh
 - Youngs Brewery, London – horse and cart
 - Rhine shipping
 - Hydraulic trailers which reduce wind resistance thus reducing fuel consumption and carbon emissions
 - Heathrow Airport
 - Leeds
 - Pallet Networks
 - Coastal shipping
 - VW use inland waterways instead of rail (restrictions on rail network)
 - Rail – low emissions diesel

Views on combining Consolidation Centres with Distribution Centres

- 6.2.8 There were differing views on this question. It was suggested that it will be necessary to facilitate this through discussion with organisations and that opportunities exist if barriers are broken and facilities are shared. Consultation and discussion may be a way to overcome barriers.
- 6.2.9 It was suggested that consolidation and distribution centres would need to provide added value and not cost to the supply chain. Additional handling can create additional cost and opportunities for handling damage.

- 6.2.10 It would be necessary to identify a site that would suit both users of consolidation and distribution centres. This could help to facilitate capacity and utilisation of vehicles. Reducing the distance between both centres would have benefits.
- 6.2.11 It was further suggested that it might be more feasible for large companies, possibly for smaller organisations working together.
- 6.2.12 The geographical area that it serves would need to be clarified e.g. Edinburgh, SEStran area, south of Scotland.
- 6.2.13 It may be suitable for some product types e.g. white goods that may benefit from bulk transfer to South East Scotland and onward delivery from there.

Other Comments

- 6.2.14 Numerous other comments are outlined below:
- Funding
 - lots of good ideas that could be implemented, but there is a cost and how would this be funded?
 - Monitoring
 - the Logistics Carbon Reduction Scheme (LCRS) aims to record, report and reduce carbon dioxide emissions from the freight transport sector to benchmark the logistics sector's carbon footprint. It will give policy makers a reliable evidence base for future carbon reduction strategies.
 - need a holistic view on the distribution system and how it fits together
 - concern about the impact of snow on infrastructure. Small couriers ok, but larger vehicles affected
 - increasing use of online shopping where retailers deliver direct to the consumer
 - need leadership from Scottish Government
 - not just about building a distribution centre, also need to improve infrastructure
 - consider Edinburgh Park & Ride and also any cities/larger areas
 - need to bring people together for meaningful discussion
 - important to go with the grain and find out what currently happens and make it more efficient
 - don't build inventory into the system

7 Sustainable Distribution in South East Scotland

7.1 Introduction

7.1.1 This chapter considers sustainable distribution issues and freight flows in the SEStran area, providing a high level overview of the freight and freight movements. Pantrak, a specialist freight consultancy, was commissioned to provide specialist input to this section.

7.2 Existing Freight Data

7.2.1 The primary reference point is the 2009 SEStran report *Freight Routing Study* which details overall freight volumes and broad categories of products moving but provides little transparency on the structures at play or impacts on the road network.

7.2.2 The existence of additional freight information was sought from local authorities in the SEStran area. It was found that little additional freight data exists, and that which does, relates specifically to individual companies seeking planning consent.

7.2.3 Almost no primary data is collected on the detail of freight movements other than the DfT Continuing Survey or Road Goods Movements (CSRGT) and the International Road Haulage Survey (IRHS). Both these surveys only include vehicles over 3.5 tonnes Gross Vehicle Weight. The output of both these surveys forms part of the national statistics on road freight and provide a statistically robust macro picture of freight movements and a good understanding of the structural makeup of freight operations.

7.2.4 Extrapolating this data to regional and sub-regional levels introduces many assumptions and critically, neither survey is able to provide transparency at a regional level of origins and destinations of freight traffic and commodity being moved.

Continuing Survey of Roads Goods Transport

7.2.5 The CSRGT is a weekly survey of Heavy Goods Vehicles selected from the DVLA and DVA NI databases. It relates to the domestic (i.e. within the United Kingdom) activity of UK-registered vehicles. Approximately 400 (individual) vehicles are selected weekly, and the vehicle operators are required to record information about their activity for one week. From the data received, DfT can calculate a wide range of information about UK vehicles, including estimates of total distance travelled, the tonnage lifted and types of goods carried by HGVs.

7.2.6 Businesses employing fewer than 10 people are entitled to an exception from completion of the CSRGT questionnaire, as are many freight movements related to local authority activities. Internationally registered vehicles are also excluded from the survey.

International Road Haulage Survey

7.2.7 The IRHS covers the international activity of GB-registered HGVs. British HGV operators with international licences are asked to record the detail of any trips which begin on a particular day or over a period of days.

7.2.8 Journeys are then scaled up, using counts of vehicles leaving the UK from the DfT's quarterly survey of Road Goods Vehicles Travelling to Mainland Europe, to provide an estimate of total international activity.

Freight Statistics Project

7.2.9 The Scottish Government report, *Freight Statistics Project*, published in June 2009 collates all available freight related statistics relevant to Scotland. This report extracts data from the CSRGV but makes the point that only a relatively small proportion of surveyed companies (itself only a small proportion of the overall number of UK companies) were based in Scotland.

7.2.10 In 2008/9, there were 362,706 HGVs weighing over 3.5 tonnes GVW licenced in the UK, 32,427 specifically in Scotland (Traffic Commissioners' Annual Reports, 2008-9). Table 5.1 shows that the structure of the industry is highly fragmented, reflecting the relatively low barriers of entry to the sector.

Table 7.1: Number of goods vehicle licences by size of fleet in Scotland, 2007

No of Vehicles in Fleet	Restricted Licence	Standard National Licence	Standard International Licence
0 - 2	3,104	2,113	387
3 - 5	448	780	195
6 -10	155	391	88
11-20	51	254	62
21-50	32	129	51
51-100	4	41	22
101-200	2	19	6
201+	0	3	2
Total	3,796	3,730	813
Total UK	(47,303)	(37,431)	(10,702)

7.3 Road Network

7.3.1 In general, the road network in the SEStran area is good and could facilitate the development of UDCs. However, road traffic congestion remains the major constraint to freight/goods movement and in terms of environmental impact, the road network also offers potential for improvement. The accompanying emissions mapping in Appendix 2 provides clear indication that improvements could be made in the reduction of road-based emissions.

7.3.2 The major routes in the SEStran area are:

- M8/ M9/ M90
- A1/ A199/ A68 / A71/ A702/ / A720 /A8/ A8000/ A90/ A902/ A92/ A985

7.3.3 It is likely that the location of any distribution centre will be close to one of these routes although those on the periphery of Edinburgh or on the M8/ M9/ M90 corridors are likely to offer significant advantages over other competing potential sites.

7.3.4 Inter-urban road connections are good and thus in terms of potential for distribution by road, appropriately located distribution centres could capitalise on the road network.

7.3.5 It is well understood that congestion on the road network relates to the morning and evening peak periods and goods movement during these times (typically 07:30 – 09:30

and 15:30 – 16:30) competes with commuting traffic on the road network. While there are significant constraints during the peak traffic hours, congestion is less of a concern for the movement of goods outside of these periods.

7.3.6 Road freight emissions are not directly measured but inferred from traffic count data and generic emission characteristics. Appendix 2 shows the area wide emissions mapping for the SEStran area.

7.3.7 Edinburgh City and a number of surrounding towns have loading restrictions enforced through Traffic Regulation Orders (TROs). These are shown in Appendix 3. For town centre goods delivery, there is a preference to deliver before opening or at least before a notional threshold of 10:00 hrs before pedestrian traffic builds up.

7.4 Rail Network

7.4.1 Rail freight in Scotland has grown by 66% since 1995 and is at its highest level for 30 years. It is forecast to almost double by 2020. Although 70% of rail traffic is coal and 10% cement, many other commodities are moved by this mode.

7.4.2 There is only one intermodal rail freight terminal in the area located at Grangemouth.

7.5 Water

7.5.1 The area has the highest proportion of freight transported by water compared with other RTP areas due to the significance of Grangemouth and Rosyth. Grangemouth is Scotland's largest container port and it has potential for further expansion. Improvements to the strategic road and rail infrastructure will allow the area to function to its full potential as an intermodal freight hub.

7.5.2 The port of Leith currently provides offshore support and handles dry bulks and other general cargo. Domestic water freight can be split into two types: inland waterways and coastal shipping.

7.6 Structure of Freight Distribution Systems

7.6.1 This section of the report is a summary of a more detailed consideration of the structures of freight distribution systems active in the SEStran area to provide a framework from which to assess the opportunities for sustainable distribution and possible consolidation centre solutions. It has looked at:

- network operations – primary, secondary and part load freight
- the role and impact of ports, hubs and terminal
- freight from manufacturing and natural resources
- general freight; the fragmented supply chains serving 'the High Street', business parks, industrial estates and offices
- socially driven freight, including internet shopping
- project freight, including construction

7.7 Commodities

7.7.1 The tables below are extracts from the Freight Routing Study and show the relative level of freight traffic movements modelled from 2007 data.

Table 7.2: Volume of freight moved, originating, destined or moved wholly within SEStran area

Commodity Category Intra-SEStran	2-way tonnes (‘000) 2007	Proportion
Agricultural, fishing and foodstuffs	1,957	2.3%
Forestry and forestry products	460	0.5%
Solid fuel and petroleum products	2,831	3.3%
Minerals, building materials and construction	15,460	17.8%
Metals, machinery and transport equipment	568	0.7%
Leather, textiles and retail/wholesale	13,709	15.8%
Fertilisers and chemicals	437	0.5%
Electronic goods	4	0.0%
Other/Miscellaneous	51,464	59.2%
Total	86,891	100%

Table 7.3: Volume of freight moved through the SEStran area

Commodity Category Through Volumes	2-way tonnes (‘000) 2007	Proportion
Agricultural, fishing and foodstuffs	5,928	2.8%
Forestry and forestry products	15,589	7.5%
Solid fuel and petroleum products	60,719	28.9%
Minerals, building materials and construction	15,643	7.4%
Metals, machinery and transport equipment	877	0.4%
Leather, textiles and retail/wholesale	15,648	7.4%
Fertilisers and chemicals	885	0.4%
Electronic goods	10	0.0%
Other/Miscellaneous	94,653	45.0%
Total	210,223	100%

7.7.2 The Commodity Categories used are economic sector groupings, based on the Standard Index Classifications (SIC) coding system. Although this usefully categorises freight in a general manner, its high-level commodity groupings make it difficult to relate these values to the physical movement of freight on the road network.

7.7.3 The high proportion of freight listed as ‘Other / Miscellaneous’ is also unhelpful in understanding the nature of freight moving around, reconciling officially available statistics with determining targeted actions to achieve sustainable distribution objectives.

7.8 Logistics Decisions

7.8.1 The *Transport, Trade and Strategic Locations Research Report*, 2004, done for Scottish Enterprise Dumfries and Galloway found that of the 55 companies interviewed in detail about their logistics operations, 73% said that they purchase on a delivered cost basis – the supplier was responsible for the supply of goods. Interestingly, 26% also said that

they left the shipment of outbound deliveries to customers – i.e. they largely operated on a customer collection basis.

Whose Supply Chain?

- 7.8.2 Although the larger retail multiples are increasingly turning to factory gate pricing (FGP), having recognized that a 'delivered price' from a supplier can hide a healthy profit margin from the transport element, and that their own large secondary distribution vehicle fleets are often returning empty past a supplier location on the way back to the Distribution Centre, as the research above indicates, the most common point of logistics decision making is at the supplier or contracted supply chain partner.
- 7.8.3 Once the strategic structure of a network is determined, many companies then contract out the physical and day-to-day operational decisions to a contracted specialist. For international movements, this may be one of the larger forwarding groups.
- 7.8.4 Contracted partners are often known as 3PLs (3rd Party Logistics companies), or 4PLs (4th party). 4PLs are less common and more often used in highly complex international flows. They are generally non-asset owning, and strategically manage a customer's whole supply chain. A 3PL is an asset-owning partner directly contracted by a customer to manage the physical operation.
- 7.8.5 The major international forwarders operating in Scotland include:
- DHL providing Road & air services Head Quarters in Germany
 - K+N All modes, Road, Rail, Air & Sea Head Quarters in Switzerland
 - UTI based in Glasgow Road & Air Head Quarters US
 - Geodis Calberson French Group
 - Ceva Logistics based in the UK
 - DB Schenker German Group all modes
 - Panaalpina Swiss Group
- 7.8.6 By managing his outbound operation, the supplier can find efficiencies in vehicle utilization and routing of his own fleet, and where there is lower volume requirements, has the ability to outsource to a subcontractor or pallet-network who may have other traffic going to a similar destination.
- 7.8.7 The shift in procurement patterns from fewer, bulk deliveries to a model that creates a pipeline of supply – smaller and more frequent deliveries to minimize the need for stockholding and risk of stock obsolescence – has led to a large increase in part-load freight. The resulting emergence of pallet-load networks enables business to move single pallets nationwide at costs and efficiencies that compare well with moving full-loads.

Where's the real cost?

- 7.8.8 Decisions about overall logistics solutions from a business perspective go beyond the simple operational choice of mode or operator to use. For businesses primarily engaged in the manufacture or trading of goods, the physical distribution is a derived demand.
- 7.8.9 Of greater concern is managing the level of stock within the entire supply chain, which has a direct impact on the balance sheet and financial requirements of the business. Achieving market competitive response times in terms of customer orders or flexibility to increase or reduce supply in line with demand is also critical. The significant cost elements in this context are investment in physical infrastructure – factories, warehouses, information systems and handling equipment.

- 7.8.10 Complex modelling that looks at the entire system cost of a business, including the profile of customer demand and location, the impact on required stock levels, delivery performance, cost of land, cost and availability of labour and connections to transport infrastructure all factor into the decisions on the optimum number and location of supply chain facilities.

Delivery Performance Metrics

- 7.8.11 Delivery performance is a key metric of transport. The target is succinctly summarized as: On time. In full. At the right cost. Distribution contracts are often monitored and measured against KPIs that relate to these three issues. They are usually the basis for payment or penalty clauses too. Therefore management and control of freight movements is a primary activity, and the source of considerable investment, whether it is telematic systems, electronic data capture, route planning, security or handling equipment.
- 7.8.12 Through a vertically integrated distribution system, control and accountability are easy to understand. With more fragmented systems, involving multiple parties delivering a portion of the overall service, accountability and responsibility for any service failure, damage or stock loss is difficult to resolve with parties taking less ownership of the overall flow.

7.9 Just in Time

- 7.9.1 Just-in-time is a concept that is often talked about in terms being critical to modern logistics and sometimes cited as an excuse for not considering alternative solutions. Just-in-time (at the point of delivery) is perhaps a better description and its implementation requires predictability and reliability to achieve consistent journey times to plan against. These are the characteristics that a mode such as rail, which operates on a highly planned and timetabled basis, has.
- 7.9.2 In reality, orders to suppliers often allow several days before delivery, and further up the supply chain, shipments from manufacturers can work on lead-time of weeks and months. When a shipment is at sea for several weeks and can be sat in the port environment for days waiting to be called off, its could be considered that a lack of forward planning in trying to get a shipment closer to its eventual destination is a greater reason for needing a just-in-time response on a primary distribution leg than actual customer demand.
- 7.9.3 It is found that each of these freight operations place a differing impact on the transport network and are influenced by a different range of factors. 'Flow owners' - those who make the management decisions on how freight moves – tend to be on the supplier side of any origin – destination flow. Transport structures have generally emerged from market driven demands where the seller of goods looks around for the best option that suits their business purpose. Alternatively they go along with proposals presented by an aggressive and competitive transport industry to carry their goods at a set price and agreed transit time.
- 7.9.4 Shippers are driven by cheapest cost and a predictable delivery window and transport companies by the need to fully utilize their equipment with a satisfactory margin. From a transport planning perspective, you have a range of formal and informal structures that have emerged over time. These solutions have been tested by time and continue to operate, therefore, they can be termed sustainable.

- 7.9.5 Where shippers have smaller volumes to move, the transport industry has responded by developing its own consolidation arrangements to find efficiencies, such as pallet and parcel networks.
- 7.9.6 In modern supply chains, the flow of information is critical to managing delivery performance. Outsourced distribution contracts are also increasingly short-term and measured against performance related KPIs. Flow owners can easily switch from one transport provider to another given the availability of a highly competitive supplier base. The ultimate goal is to satisfy the needs of shippers and receivers from an economic and service perspective. Transport firms may deploy different solutions using alternative networks, equipment and modes but the goal is the same – on time & cheapest cost.

8 Freight Distribution Centres

8.1 General

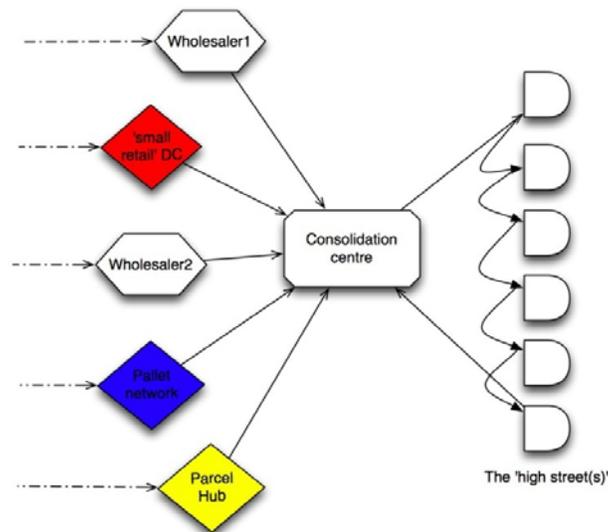
- 8.1.1 Freight distribution centres appear in a variety of forms, some which adopt an intermodal approach, and others which seek to consolidate the various stages of the supply chain. These include road and rail based distribution centres, airports and ports.

Distribution Centre

- 8.1.2 A Distribution Centre is a warehouse or other specialised building which is stocked with products (goods) to be re-distributed to retailers, wholesalers or directly to consumers. Distribution centres are the foundation of a supply network as they allow a single location to stock a vast number of products.

Consolidation Centre

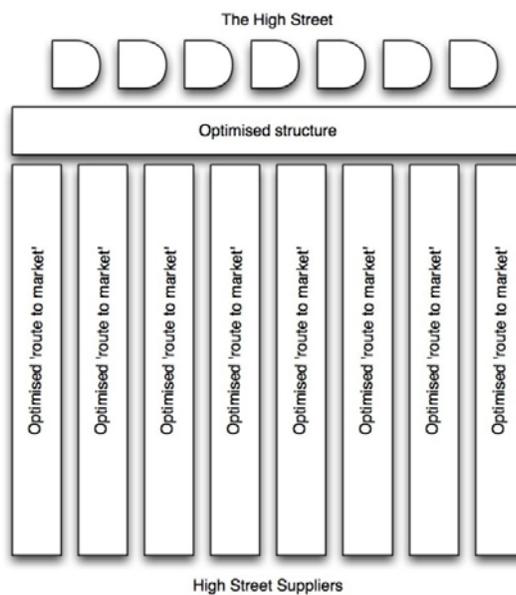
- 8.1.3 A Consolidation Centre is a freight holding area which is operated by a management structure independent from those using its services. Users of the consolidation centre, such as retailers and contractors, place orders for their goods and materials with their suppliers, but instruct that the delivery is made to the Consolidation Centre. Orders are subsequently assembled at the consolidation centre, consolidated into a single load where appropriate, and decanted onto a smaller vehicle, usually belonging to the consolidation centre, which is used to deliver the load to the site.
- 8.1.4 Consolidation Centres are less concerned with the modal shift from road to rail or water, and instead aim to reduce the number of road miles by 'consolidating' the various phases of the supply chain in one location. The main purpose of a consolidation centre is to avoid transfer of goods between various stages of the supply chain process and instead promote the efficient flow of goods from a logistical hub direct to the shop, supermarket or construction site for example.
- 8.1.5 The consolidation centre concept is one that aims to reduce the social and transport network impact of freight movements by aggregating all the final deliveries for a given area onto a common vehicle (or vehicles), that serve all the locations in that area, as shown below.



- 8.1.6 It is worth reinforcing that an entire supply chain is geared to meeting the customers' requirements at the point of delivery i.e. get the goods into the sales location and all the other marketing and promotional efforts can deliver; fail to reliably get the goods into store and market competition and customer reaction will respond accordingly.
- 8.1.7 In terms of the physical movement of goods, this is relatively simple. Gaining the confidence of participants and resolving non-physical issues related to contracts, information flows, payment and service performance guarantees is typically the largest barrier to adoption.
- 8.1.8 Several key issues are raised in considering a Consolidation Centre (CC) solution:
- Who pays for the infrastructure and final delivery?
 - the solution replaces one where the receiver of freight has already paid for a delivery to his premises, and the supplier is working to an acceptable level of cost and has committed resource to provide that delivery (the marginal cost savings from not having to travel the last mile or two is fairly insignificant).
 - if the benefit largely accrues to society, is it logical that the cost should also be borne by society (through public funding)?
 -
 - How do you guarantee delivery performance?
 - for many businesses, the loss of direct control or transparency at the critical point of delivery represents a high risk
 - who is accountable if stock is lost, damaged or contaminated by other goods while in transit through the CC?
 - What information systems are needed to quickly feed back proof of customer delivery?
 - a signed Proof of Delivery (POD) note often triggers the payment between supplier and his logistics partner. The trend towards hand-held units has made this extremely quick and efficient, but each company may have his own system or preferred IT infrastructure. The CC system needs to interface with many, sometimes proprietary, information flows

- How do you manage contract risk?
 - logistics operators may be concerned if a single commercial entity has dominance over all deliveries to an area. Although perhaps a perception, could this preferred operator leverage his position to work back up the supply chain to back-sell and grow his own business more generally, perhaps now armed with privileged information on specific businesses' requirements.

8.1.9 Despite these issues and possible conflicting commercial and social objectives, several Consolidation Centres have emerged. They all share some common characteristics: they are tightly focused on a specific geographic area, or single identifiable project and often have associated operational restrictions:



- The Heathrow Consolidation Centre
 - all businesses have to comply with security requirements for air-side deliveries.
- The London Construction Consolidation Centre
 - construction often occurs in tight urban areas with difficult access for large vehicles and have noise related restrictions on the hours available to work.
- The Broadmead Project in Bristol
 - access restrictions for freight were steadily increased and retail developers encouraged to design the environment to make access challenging, while simultaneously allowing concession for vehicles coming from the CC.

8.1.10 Identification of opportunities for Consolidation Centre solutions within the SEStran area should therefore consider the likely logistics structures in play in a given area, the operational restrictions already existing, or that can be implemented in parallel with providing a commercially attractive alternative and identifying what commercial (cost or service) advantages could be extracted for both receiver and sender of freight from using a CC.

Dryports

- 8.1.11 A dryport is a good example of an intermodal sustainable distribution centre, which reduces the amount of road miles associated with the different phases of the supply chain through creation of an intermodal distribution hub.
- 8.1.12 A dryport can be defined as *'an intermodal terminal situated in the hinterland servicing an industrial / commercial region connected with one or several ports by rail and / or road transport and offering specialised services between the Dry Port and the transmarine destinations. Normally the Dry Port is container and multimodal oriented and has all logistics facilities, which are needed for shipping and forwarding agents in a port'*.
- 8.1.13 The dryport concept underlines a *'modal shift in practice'* where the pressure on conventional sea ports is relieved and a lot of the seaport's associated functions transfer to the hinterland. The Dry Port document *'a modal shift in practice'*, explains that *'a successful dryport is a way of extending the sea perspective into the hinterland and can move traffic off the roads and onto rail or inland waterways thus supporting the reduction of carbon emissions within the logistics chain.'* The key aim of a dryport, therefore, is to act as an extension to an existing sea port, increasing capacity and efficiency, while also moving traffic off-road and onto rail or inland waterways if possible.
- 8.1.14 In line with the increase in world trade, most traditional sea ports are faced with ever increasing capacity issues, there is a need to reduce costs and an obligation towards environmental protection. Dryports are viewed as a solution; as a hinterland intermodal freight transport hub that is fully integrated with the sea port in which they connect.

8.2 Possible Dryport Sites

- 8.2.1 The SEStran Freight Routing Study identified five possible locations for a Dryport facility:
- Leven/Methil Dock
 - Rosyth
 - Grangemouth
 - Coatbridge
 - Lockerbie

8.3 Potential Location of Distribution Centres

- 8.3.1 The RTS outlines the following locations which support sustainable development:
- Grangemouth Docks – Scotland's largest container port
 - Rosyth Docks – Scotland's gateway to Europe with intermodal handling facilities, a deep water port and regular ferry service to mainland Europe
 - Rail intermodal facilities – improved capacity and connection to rail freight intermodal depots situated between Grangemouth and Falkirk
 - Edinburgh Airport – the expansion of the airport with improved links to both road and rail networks which will allow expansion of air freight capability
 - Forth crossing – strategic importance of commercial links from Edinburgh and the Lothians to Fife and North of the Forth Road and Rail bridge, plus from Falkirk to Fife/Clackmannanshire using the Kincardine crossing
- 8.3.2 The M8 corridor is popular for distribution centres as sites near the motorway offer good accessibility to companies as well as the ability for a 24/7 operation. Many of the large supermarkets have regional distribution centres in the area:
- Asda – Grangemouth
 - Somerfield – Pitrievie, Dunfermline
 - Tesco – Livingston

- Booker – Livingston
 - Farmfoods – Livingston
 - Others such as Lidl, Spar, Mace, Coop are located in the M8 corridor
- 8.3.3 The Freight Transport Association (FTA) defines the following as the main rail freight interchanges in the area:
- Mossend Euocentral
 - Grangemouth cluster
 - Coatbridge
- 8.3.4 The *SEStran Freight Consolidation Centre Study, 2010* found that the locations that showed sufficient demand for a consolidation centre were: Livingston, Grangemouth/Falkirk and Coatbridge. While Livingston generated the highest network benefits as a consolidation centre, it was not found to be a suitable site for a dryport.
- ## 8.4 Modelling the Potential Locations
- 8.4.1 Prior to embarking on this Study SEStran had commissioned a Freight Strategy report from Scott Wilson Consulting Ltd. During the course of this work Scott Wilson built and validated a sub-model of the Freight Model for Scotland which was commissioned for Scottish Enterprise. We were advised by SEStran that the use of the Freight Model for the SEStran area would therefore be appropriate for this study. Scott Wilson was duly commissioned by SEStran to provide appropriate output from the model in the form of data sets on which we could analyse the potential locations for Sustainable Distribution Centres.
- 8.4.2 For the purposes of this Study, the SEStran area and the rest of the UK is sub-divided into 71 Zones. The zoning system is provided in Appendix 4. This zoning system has allowed us to look in sufficient detail to provide an indication, appropriate to this stage of analysis, of the areas where Sustainable Distribution Centres could be sited.
- 8.4.3 In terms of the commodity classifications we are of the view that we should concentrate at this stage on three broad categories of freight goods:
- Retail – Food
 - Retail – Non-Food
 - Construction materials
- as it is these that would provide the most fertile areas for the development of distribution centres. We anticipate that subsequent development will look in more detail at the precise composition of the goods transported and the requirements and specifications for any centre that may be developed. While there are many other goods in the freight classification system these, in the main, do not lend themselves to the concept of the advantages that could accrue from the use of a distribution centre.
- 8.4.4 We emphasise here that we have relied entirely on the accuracy and appropriateness of the data supplied by Scott Wilson and our subsequent analysis is entirely based on the outputs provided through the use of the SEStran Freight Model by Scott Wilson Ltd.
- ### Methodology for Goods Distribution Model
- 8.4.5 The data received from Scott Wilson comprised movements of goods by tonnage based on 71 zones. The tonnages were stratified by three types of goods, food retail, non-food retail and construction. More detail on the methodology used is provided at Appendix 5.
- ### Output of Modelled Locations
- 8.4.6 In terms of our methodology of using the Freight Transport Model for the SEStran area this has allowed us to narrow in on potential zones where, by having a distribution centre

located somewhere in that zone, it is more efficient in terms of tonne-kilometres. We have reasoned that through our analysis methodology this benefit can be converted to CO2 reductions because of the use of sustainable modes of transport i.e. electric powered vehicles of the type investigated in this report.

8.4.7 From an overview of the total matrix of freight flows (which provides flows between each zone and all the others) it is readily apparent that some zone pairs have significantly more flows than others. The flows provide a picture of origin and destination zones and thus by analysing these pairings we were able to rationalise the search to a manageable number of zones i.e. it was not necessary to use our analysis on all zone pairs.

8.4.8 In consideration of our overview we have therefore focussed on the zones in Table 8.1;

Table 8.1: Zones used for analysis

Primary Locations		Alternative Locations	
Zone	Description	Zone	Description
6	Granton	5	Leith
9	Newbridge	7	Airport
		8	Ratho
		13	Houstoun Ind Est
16	Whitehill Ind Est	17	Bathgate
		18	Armadale
		19	Whitburn
23	Dalkeith	3	Cameron Toll
		24	Tranent
40	Grangemouth	41	Bankside Ind Est
		43	Alloa
46	Cowdenbeath	45	Dunfermline
		49	Rosyth

8.4.9 The Primary Locations can be taken as a proxy for those in the Alternative Locations column i.e. if located in any one of the alternative there would be marginal changes. The alternative locations should be seen as forming the pool of alternatives within which specific sites could be identified at subsequent stages of the Distribution Centre identification.

8.4.10 The key output from this stage of the study is to identify those zones or combination of zones that offer benefits in terms of a reduction in tonne kilometres of freight moved for each commodity group.

8.4.11 Using the above methodology we derived the following output in Table 8.2 by running the above algorithm for each scenario.

Table 8.2: Net Distribution Benefit

Potential Distribution Centre Locations and Combinations														
	All Figures in Unit '000 Tonne-Kms	Granton	Newbridge	Whitehill Ind Est	Dalkeith	Grangemouth	Cowdenbeath	Newbridge	Whitehill Ind Est Dalkeith	Newbridge Granton Dalkeith	Newbridge Dalkeith Grangemouth Cowdenbeath	Newbridge Cowdenbeath	Newbridge Grangemouth Cowdenbeath	Dalkeith Cowdenbeath
		6	9	16	23	40	46	9	16	9	9	9	16	23
								23	23	6	23	46	40	46
										23	40		46	
											46			
Retail: Food	Without Dist Centres	2,039,455	2,039,455	2,039,455	2,039,455	2,039,455	2,039,455	2,039,455	2,039,455	2,039,455	2,039,455	2,039,455	2,039,455	2,039,455
	With Dist Centres	2,032,460	2,031,063	1,999,658	2,046,302	2,046,302	2,046,302	2,046,302	2,046,302	2,038,190	2,046,302	2,046,302	2,046,302	2,046,302
	Difference	6,995	8,392	39,797	-6,847	-6,847	-6,847	-6,847	-6,847	1,265	-6,847	-6,847	-6,847	-6,847
	& Diff	0.3%	0.4%	2.0%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	0.1%	-0.3%	-0.3%	-0.3%	-0.3%
Retail: Non-Food	Without Dist Centres	3,530,399	3,530,399	3,530,399	3,530,399	3,530,399	3,530,399	3,530,399	3,530,399	3,530,399	3,530,399	3,530,399	3,530,399	3,530,399
	With Dist Centres	3,532,755	3,527,500	3,464,050	3,542,347	3,481,912	3,537,137	3,540,031	3,489,052	3,540,021	3,510,731	3,522,914	3,511,522	3,542,429
	Difference	-2,357	2,899	66,348	-11,948	48,487	-6,738	-9,632	41,346	-9,622	19,667	7,485	18,877	-12,031
	% Diff	-0.1%	0.1%	1.9%	-0.3%	1.4%	-0.2%	-0.3%	1.2%	-0.3%	0.6%	0.2%	0.5%	-0.3%
Construction	Without Dist Centres	562,317	562,317	562,317	562,317	562,317	562,317	562,317	562,317	562,317	562,317	562,317	562,317	562,317
	With Dist Centres	557,444	557,357	536,692	562,356	540,960	556,775	561,432	542,726	562,096	547,244	552,411	551,087	557,594
	Difference	4,873	4,960	25,625	-39	21,357	5,542	885	19,591	221	15,073	9,906	11,230	4,723
	% Diff	0.9%	0.9%	4.6%	0.0%	3.8%	1.0%	0.2%	3.5%	0.0%	2.7%	1.8%	2.0%	0.8%
Total		9,511	16,251	131,770	-18,834	62,997	-8,043	-15,594	54,090	-8,136	27,893	10,545	23,260	-14,154
	% Diff	0.2%	0.3%	2.1%	-0.3%	1.0%	-0.1%	-0.3%	0.9%	-0.1%	0.5%	0.2%	0.4%	-0.2%

- 8.4.12 From our analysis we can see that there are relatively few locations that provide a net benefit in terms of the unit cost of freight goods (food and construction) movement (in unit thousand tonne kilometres) by sustainable methods. The analysis uses unit costs and thus we can convert such unit costs into any conventional measurements e.g. CO₂. What is important here is that our analysis establishes those zones that offer a net benefit in terms of net sustainable transport.
- 8.4.13 Our model assumes that if the cost of transporting freight goods by sustainable means is half that of conventional means and although the introduction of a distribution centre(s) would increase the total movement of freight the cost, in terms of sustainable transport e.g. the use of electric vehicles, a net benefit may accrue if the distribution centre is appropriately located.
- 8.4.14 We can summarise our findings thus:
- Beneficial zone locations
- Food , Retail
 - a) Whitehill Industrial Estate
 - Reduction of 39,797 unit thousand tonne kilometres
 - 2% reduction
 - Food, Non-retail
 - a) Whitehill Industrial Estate
 - Reduction of 66,648 unit thousand tonne kilometres
 - 1.9% reduction
 - b) Whitehill Industrial Estate & Dalkeith
 - Reduction of 41,346 unit thousand tonne kilometres
 - 1.2% reduction
 - c) Grangemouth
 - Reduction of 48,487 thousand tonne kilometres
 - 1.4% reduction
 - Construction
 - a) Whitehill Industrial Estate
 - Reduction of 25,625 unit thousand tonne kilometres
 - 4.6% reduction
 - b) Whitehill Industrial Estate & Dalkeith
 - Reduction of 19,591 unit thousand tonne kilometres
 - 3.5% reduction
 - Total Freight (Food and Construction)
 - a) Whitehill Industrial Estate
 - Reduction of 131,770 unit thousand tonne kilometres
 - 2.1% reduction
 - b) Whitehill Industrial Estate & Dalkeith
 - Reduction of 62,997 unit thousand tonne kilometres
 - 1.0% reduction
 - c) Grangemouth
 - Reduction of 54,090 unit thousand tonne kilometres
 - 0.9% reduction
- 8.4.15 The conclusion we draw from this analysis is that a distribution centre located around the Whitehill/ Bathgate/ Armadale/ Whitburn area i.e. west of Livingston would appear to be the best location to offer net benefits from a sustainable approach. It is interesting to note that from our analysis locating distribution centres closer to Edinburgh along the M8

corridor does not appear to offer added benefits. On their own or in combination they perform less well than the west of Livingston location.

- 8.4.16 The Whitehill Industrial Estate location performs well across all three of our freight classifications i.e. Retail Food and Non-Food as well as Construction goods, and it is the only site to perform strongly in the Retail Food sector.
- 8.4.17 The next best option would appear to be a centre located at Grangemouth for the non-Food and Construction sectors. However we note that in overall terms this performs less well than the Whitehill Industrial Estate location on its own.
- 8.4.18 We tested a number of different combinations i.e. multi centre distribution centres and most did not perform well. However a combination of Whitehill and Dalkeith would appear to perform positively although we note that it does not perform as well as either of the single site options.
- 8.4.19 An interesting combination that we felt would be intuitively successful was an Edinburgh City triangle – Newbridge, Granton, Dalkeith – but rather surprisingly this combination did not perform well and on the whole was broadly neutral offering no great advantage over a ‘do nothing’ approach.
- 8.4.20 We also anticipated that there may be a single site or combination that could serve the Fife area but our analysis failed to come up with a site that performed strongly.
- 8.4.21 In conclusion we recommend that there appears to be sufficient evidence to take forward an investigation of distribution centres at the west side of Livingstone, around the Bathgate area. Further testing and modelling would be justified to confirm the viability of centres at Grangemouth and in the Dalkeith area on their own or in combination.

9 Conclusions

9.1 Overview of Sustainable Distribution

- 9.1.1 Distribution, for all its complexity, is ultimately just a series of processes to get a product from its source to a destination where a business can add value to that product and sell it at a profit, or to distribute and market a product locally with a positive profit margin.
- 9.1.2 For most companies, having a competitive transport supply base at a lower cost than a competitor is as important as having a competitive product to sell. In sectors where product differentiation is small, many compete on the basis of their supply chain performance.
- 9.1.3 Sustainable distribution solutions are often initiated by trying to mitigate the impacts of freight at the end delivery point. This is where industry and retail is at its most fragmented and competitive. Overcoming concerns about impact to delivery performance and competition is a far greater hurdle than the actual handling and movement of goods. Sustainable transport solutions, including distribution/consolidation centres, need to identify and solve a commercial problem (for example terms of sale and contract conditions) as well as providing a solution for the environment and society.
- 9.1.4 Of the existing consolidation centre solutions, most either have a tight focus on an issue i.e. serving a specific geographic location or project, or have been developed in parallel to restrictions being placed on everyday operations in terms of delivery times or approved parking zones for offloading.
- 9.1.5 For sustainable distribution solutions to work a detailed understanding of all the products that a business will purchase have an impact on transport flows irrespective of what that firm manufactures. For example janitorial volumes, furnishings, equipment, food & provisions, mail are also necessary to sustain a production operation. Needless to say these products are inevitably delivered by road.
- 9.1.6 A solution can only really be found by segmenting the sector by the type of networks at play. Logistics efficiencies have been achieved by removing the influence of product. A pallet can be packed with different products, however, from a transport perspective it is still a pallet.
- 9.1.7 Identifying sustainable distribution solutions therefore requires the detailed knowledge of individual businesses across a wide range of sectors with the end goal of putting in place solutions that are not only practical from an operational perspective but economically viable.

9.2 Urban Distribution Centres

- 9.2.1 An Urban Distribution Centre (UDC) consolidates goods flows and thereby improves efficiency and reduces the environmental impact of urban delivery activities. The use of low emissions vehicles for delivery of these consolidated goods offers the opportunity for reduced congestion, noise, emissions and improved timing and reliability of delivery.
- 9.2.2 The SEStran Freight Model (sub-model of the Freight Model for Scotland) was used to model potential locations for the consolidation of three broad categories of freight goods: Retail (Food); Retail (Non-Food) and Construction Materials. The improved efficiencies in tonne-kilometres achieved by consolidation of goods could then be converted to CO2 reductions through the use of electric vehicles.

9.2.3 Modelling has shown that a distribution centre located west of Livingston around the Whitehill/Bathgate/Armadale/Whitburn area would appear to be the best location to offer net benefits from a sustainable approach. This is consistent with feedback from consultation.

9.3 Dryport Synergies

9.3.1 As discussed in the *SEStran Freight Consolidation Centre Study*, April 2010, dryports are intermodal facilities that are located inland and connect the rail and road networks with sea ports in the region. The following criteria are necessary to meet the criteria for a dryport:

- the terminal should have a direct connection to a seaport by road or rail
- the terminal should have a high capacity traffic mode
- the terminal should offer the same services and facilities as a sea port

9.3.2 This study concludes that Dryports and Consolidation Centres are two separate operations. A Dryport processes container traffic in the same way as a port, while a consolidation/distribution centre usually serves the retail or construction industries, consolidating goods into its own vehicles to create financial and environmental efficiencies.

9.3.3 It further concluded that the best location for a consolidation centre serving the SEStran area would be Livingston and this is consistent with the conclusions of this study which identifies the area west of Livingstone as the best location. Livingston, however, has not been identified as a site that is suitable for a Dryport.

10 Recommendations

- 10.1.1 This report has created a framework from which to assess the issue of sustainable distribution. Going forward, detailed primary research is necessary to apply this framework to a specific problem area by gathering more detailed information on specific business flows and working towards solutions that draw on their operational commonality.
- 10.1.2 It is recommended that an investigation of distribution centres to the west of Livingston around the Bathgate area should be carried out, while further testing and modelling would be justified to confirm the viability of centres at Grangemouth and in the Dalkeith area on their own or in combination.
- 10.1.3 The possibility of funding the following should be investigated:
- carry out this subsequent research into a UDC west of Livingston and begin discussion with potential private sector operators and users
 - carry out further modelling on UDCs at Grangemouth and in the Dalkeith area
 - implement a trial UDC using electric vehicles
 - consider if the UDC could be linked to other incentives in the area such as extending delivery hours, allowing the use of bus lanes and offering more convenient parking areas in the city

11 References

11.1 References

11.1.1 The following references have been used in this document:

- *SEStran – An Anatomy of Freight*, Pantrak, 2010
- *SEStran Freight Study and Action Plan*, 2008
- *SEStran Freight Routing Study*, 2009
- *SEStran Freight Consolidation Centre Study*, April 2010
- *Tesco sets the Pace on Low Carbon and Efficiency*, Freight Best Practice
- *Choosing and Developing a Multi-modal Transport Solution*, Freight Best Practice
- *Scottish Multi-Modal Freight Locations Study*, Scottish Government, Scottish Enterprise and HIE, 2009
- *Sustainable Distribution: A Strategy*, DfT, 2004
- *Delivering a Sustainable Transport System: The Logistics Perspective*, DfT, 2008
- *Scotland's National Transport Strategy*, Scottish Executive, 2006
- *London Freight Plan, Sustainable freight distribution: a plan for London*, TfL, 2007
- *Good Deliveries in City Centres: Have we got the Policy Balance Right?*, Whiteing and Edwards, University of Huddersfield
- *The Case for Water, Sea and Water*, 2006
- *Future Solutions for Goods Distribution*, START Final Report, 2008
- *Urban Goods Transport*, Office for Official Publication of the European Communities, 1999
- *Regent Street, Delivery and Servicing*, TfL, 2009
- *London Construction Consolidation Centre Final Report*, TfL, 2008
- *ELCIDIS Final Report*, 2002
- *London's Electric Vehicle Infrastructure Strategy*, Greater London Authority, 2009
- *Ultra-low Carbon Vehicles in the UK*, H M Government, 2009
- *Low Carbon Transport: A Greener Future*, July 2009
- *BESTUFS Best Practice Handbook*, 2003
- *The Benefits of Operating Electric Vehicles in an Urban Environment*, Freight Best Practice, 2009
- *Urban Freight Agenda*, Freight Transport Association
- *Urban Consolidation Centres, Last Mile Solutions*, BESTUFS, 2005
- *Urban Freight Consolidation Centres Final Report*, University of Westminster, 2005

11.2 Websites

11.2.1 The following are useful websites:

- www.freightbywater.org
- www.freightbestpractice.co.uk
- www.freightonrail.org.uk
- www.fta.co.uk
- www.lowemissionzones.eu
- www.bestufs.net
- www.inlandnavigation.org
- www.elcidis.org.uk
- www.sugarlogistics.eu
- www.civitas-initiative.org
- www.london.gov.uk/electricvehicles
- www.c40cities.org

Appendix 1- Consultation Questionnaire

Sustainable Distribution in the South East of Scotland

Introduction

The South East of Scotland Transport Partnership (SEStran) has commissioned Colin Buchanan to carry out a study into the potential to develop sustainable distribution systems linked to freight distribution centres in South East Scotland.

Freight distribution has impacts in terms of congestion, noise, emissions, energy use and road safety. Sustainable distribution aims to move goods efficiently, supporting the economy while reducing the environmental and social impacts of freight transport.

This questionnaire relates specifically to sustainable distribution from freight centres to customers. We wish to consider the operation, economics and environmental impact of sustainable distribution systems which provide links to distribution centres and potentially to new consolidation centres.

Definitions

*A **Distribution Centre** is a warehouse or other specialised building which is stocked with products (goods) to be re-distributed to retailers, wholesalers or directly to consumers. Distribution centres are the foundation of a supply network as they allow a single location to stock a vast number of products.*

*A **Consolidation Centre** is a freight holding area which is operated by a management structure independent from those using its services. Users of the consolidation centre, such as retailers and contractors, place orders for their goods and materials with their suppliers, but instruct that the delivery is made to the consolidation centre. Orders are subsequently assembled at the consolidation centre, consolidated into a single load where appropriate, and decanted onto a smaller vehicle, usually belonging to the consolidation centre, which is used to deliver the load to the site.*

We would like to seek your input to the study and would be grateful if you would consider the questions below which relate specifically to the SEStran area.

For further information, contact Keri Stewart, Associate Transport Planner: 0141 229 6520, keri.stewart@cbuchanan.co.uk

Organisation

Name

1. Which freight distribution centres in South East Scotland do you currently use and/or which do you think are important to the area?

2. How can distribution from these centres be made more sustainable? Please provide any examples that relate to specific freight distribution centres in the area, existing and planned, and consider:

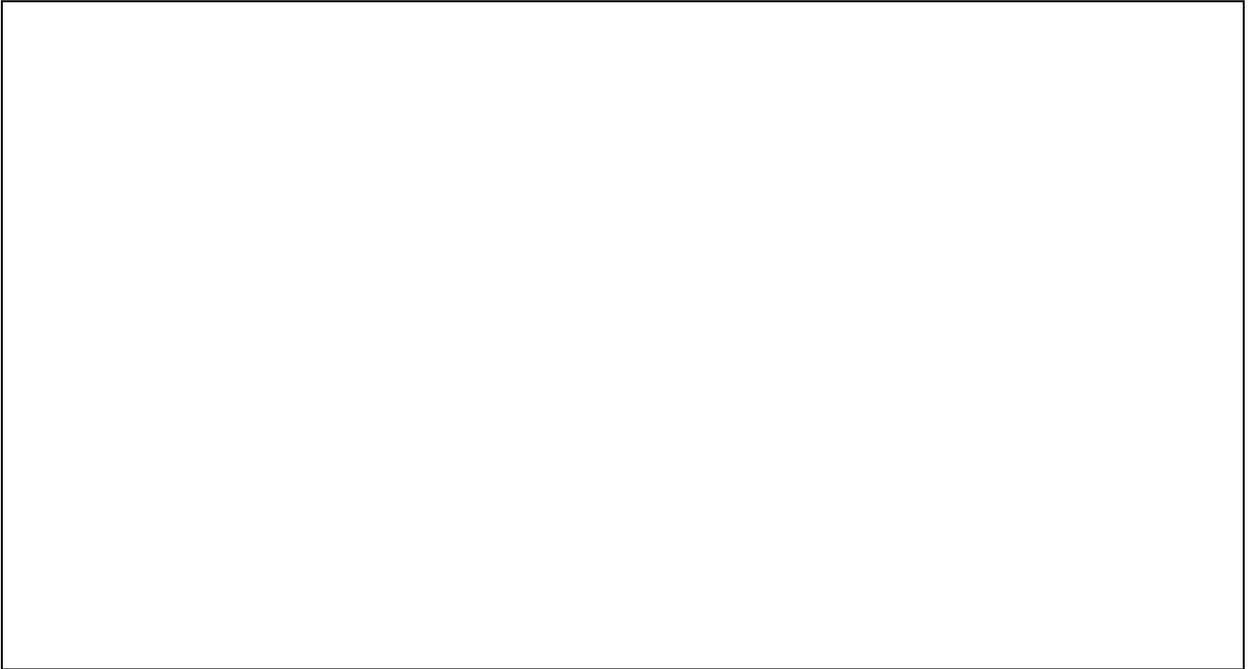
- a. road
- b. rail
- c. water

3. Would the use of sustainable distribution systems to deliver goods from these centres offer you and/or the area any benefits?

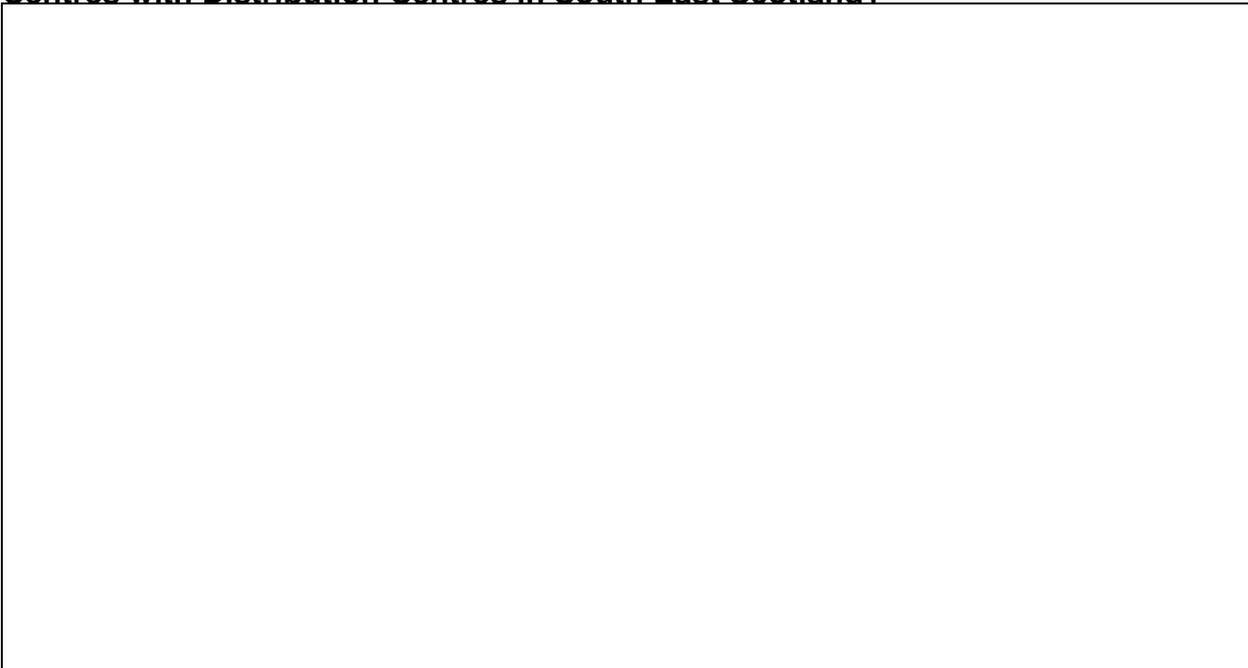
- a. economic**
- b. environmental**
- c. social**
- d. other**

4. Are there any barriers to using sustainable distribution from distribution centres? Please specify any barriers that relate to specific centres in the SEStran area.

5. Do you know of any examples of good practice, relevant work or studies in relation to sustainable distribution that could be transferable to the area?



6. Do you think there are any opportunities to combine Consolidation Centres with Distribution Centres in South East Scotland?

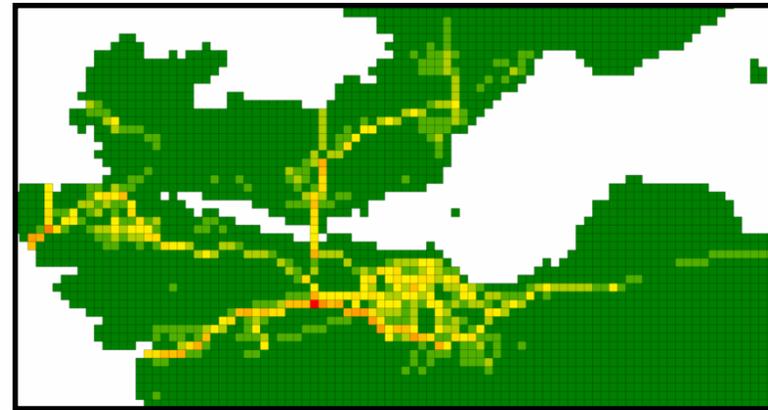
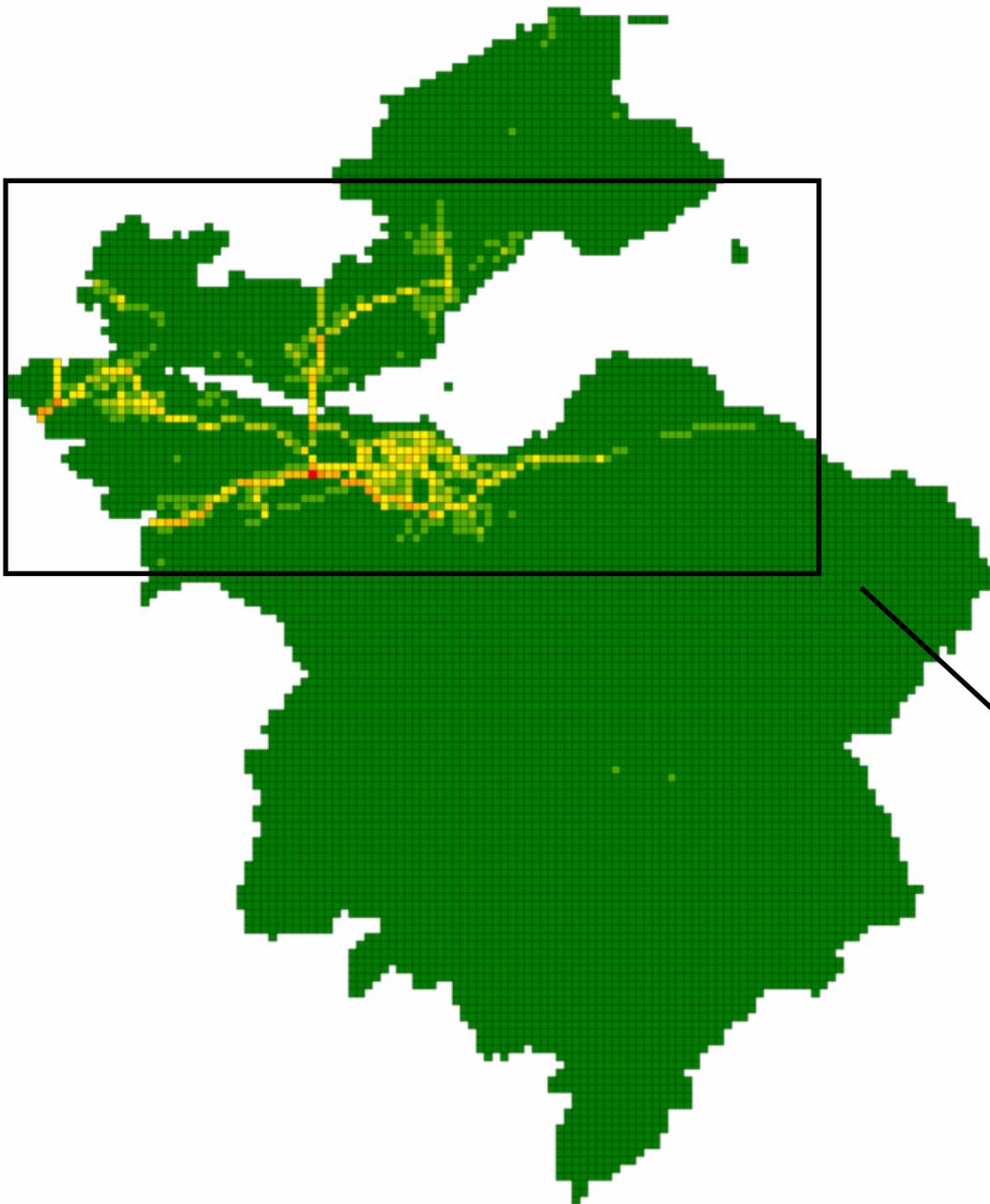
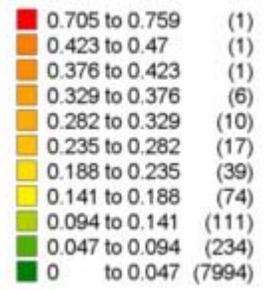


7. Do you have any other comments on sustainable distribution in South East Scotland?

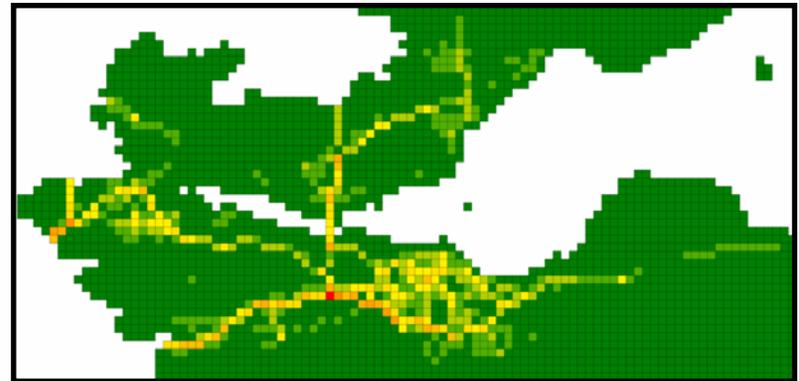
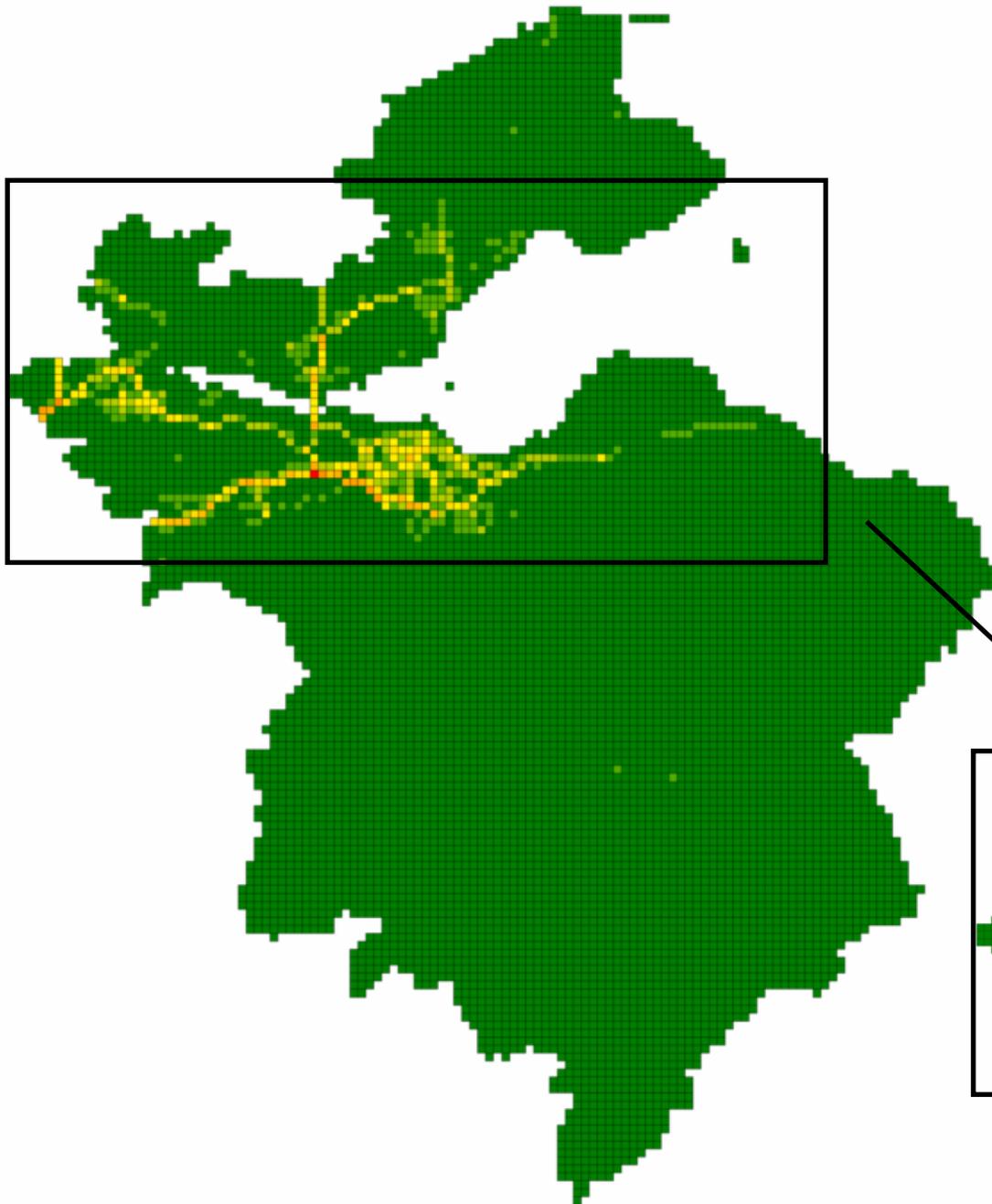
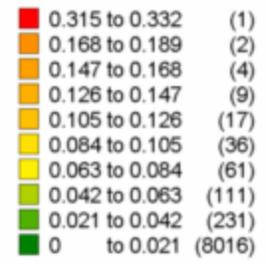
Date

Appendix 2- Emissions Mapping

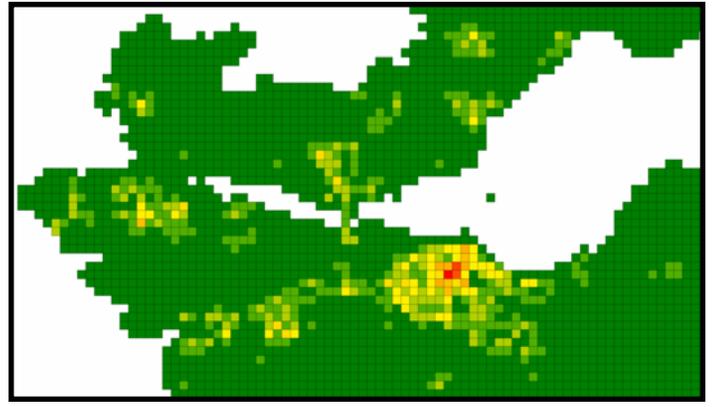
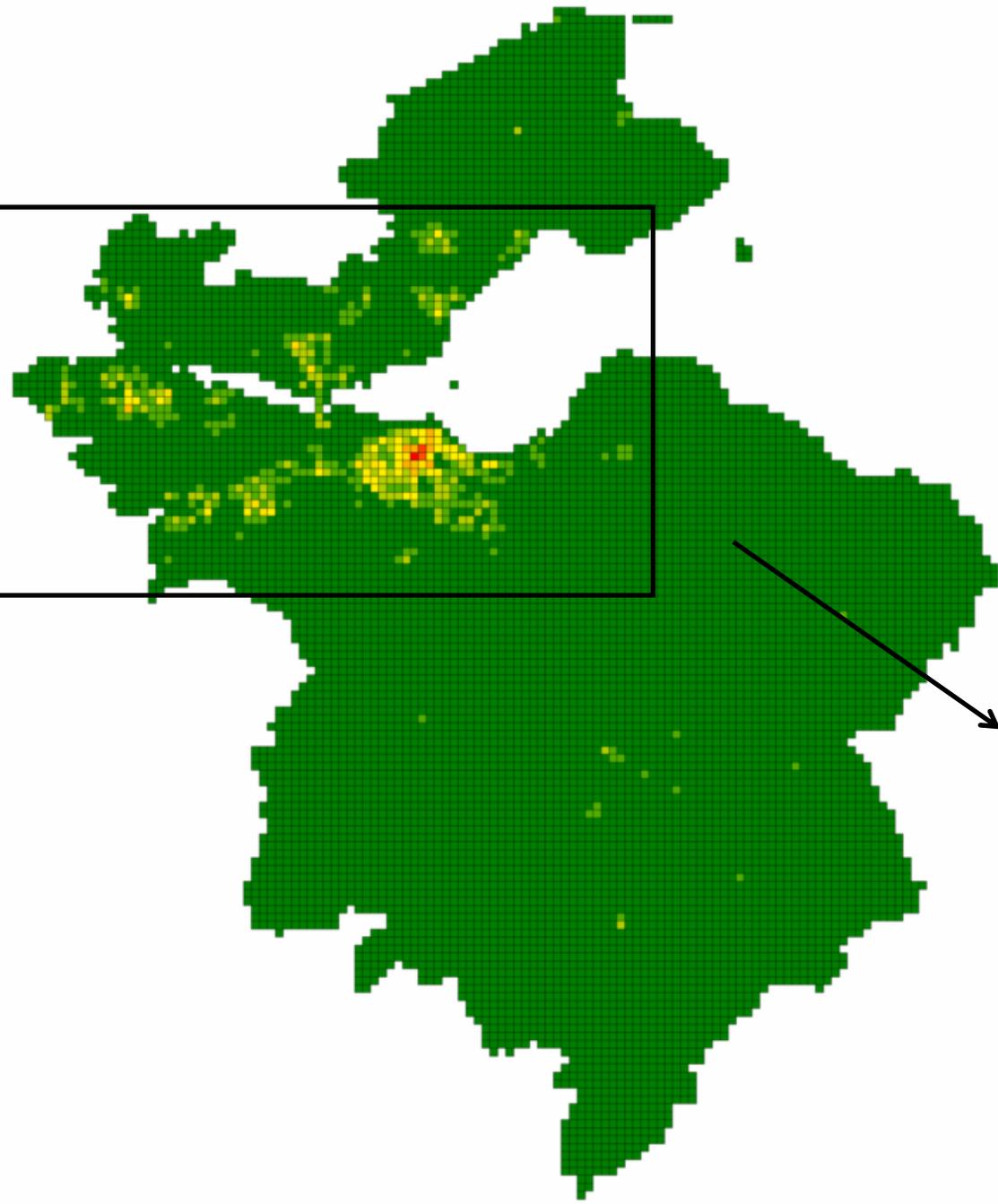
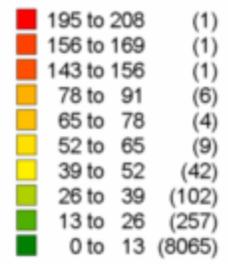
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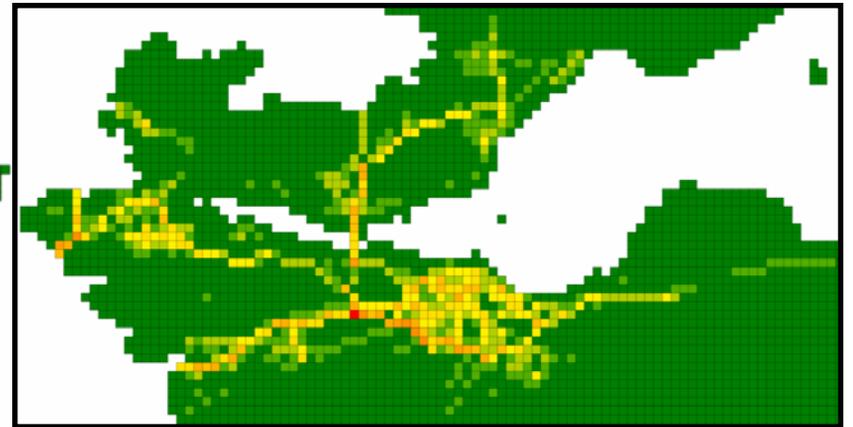
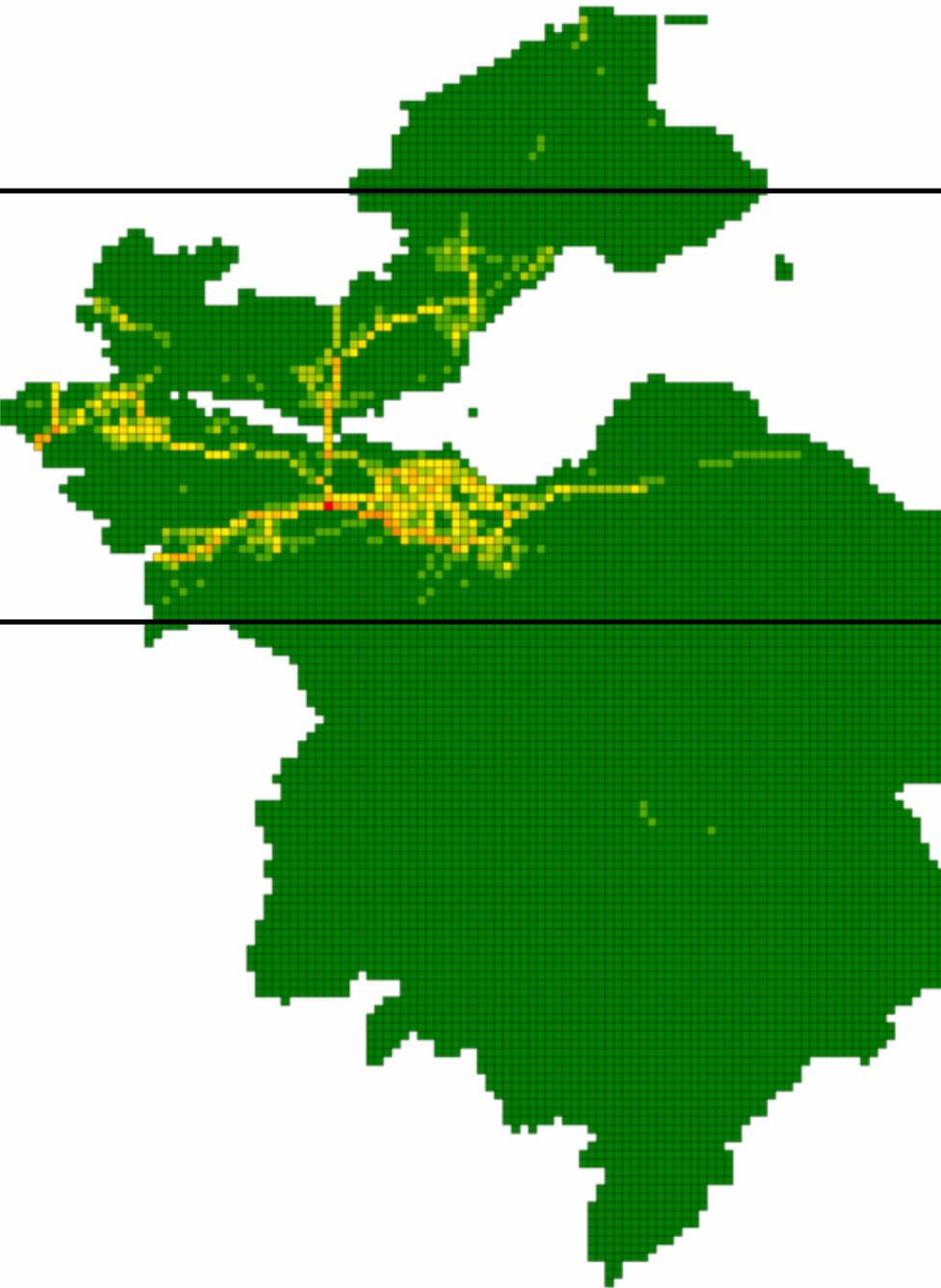
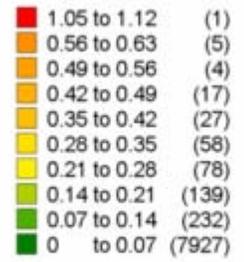
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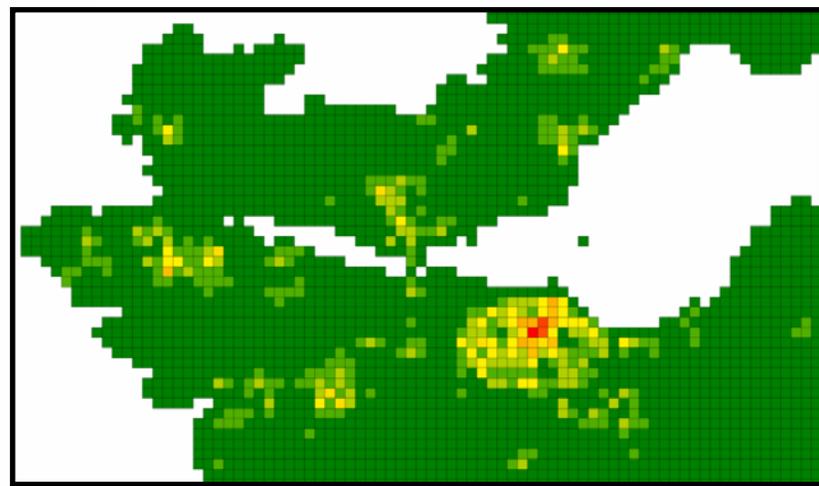
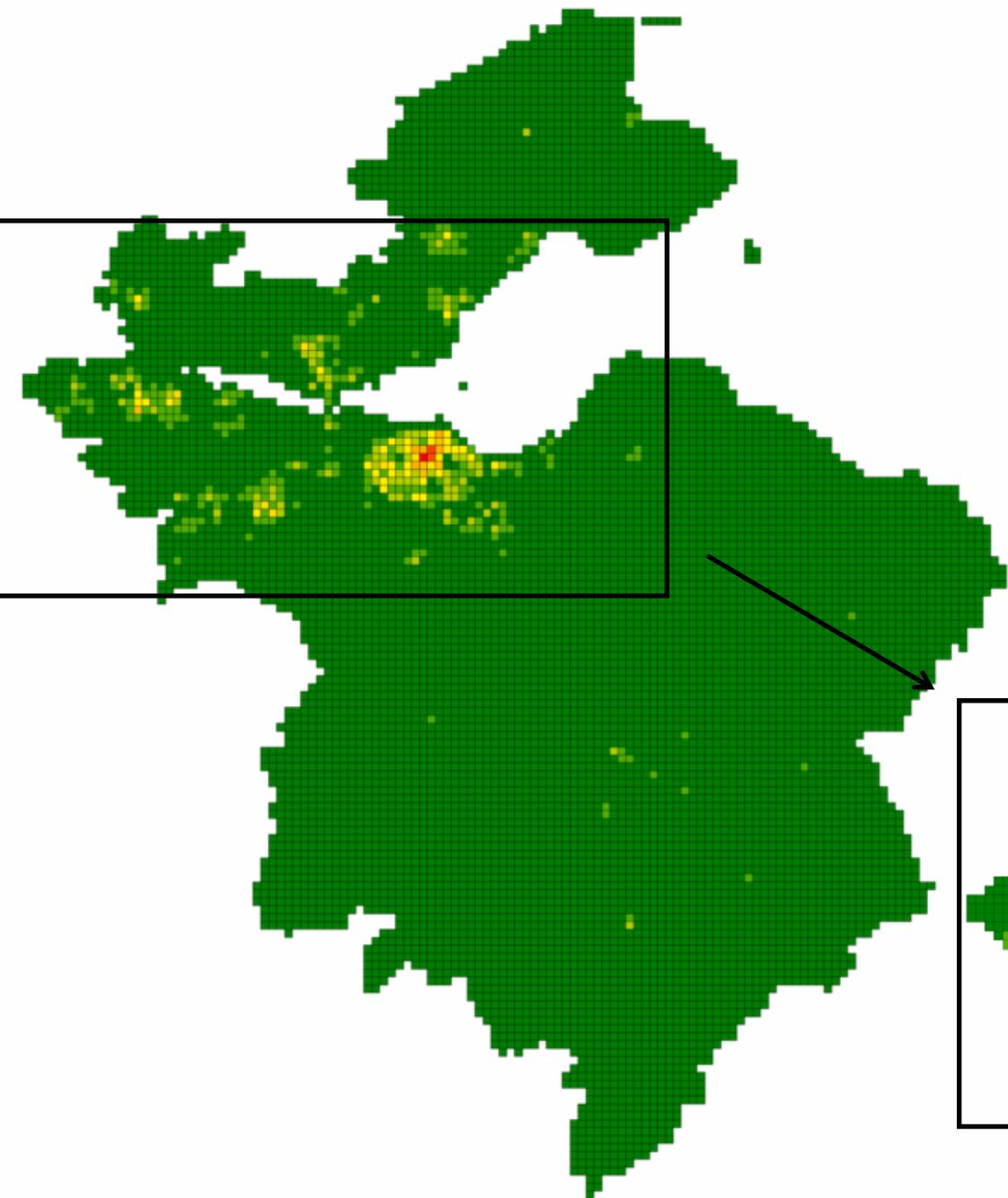
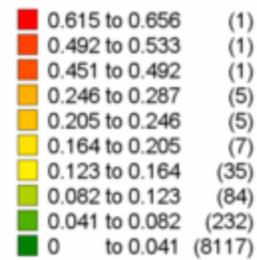
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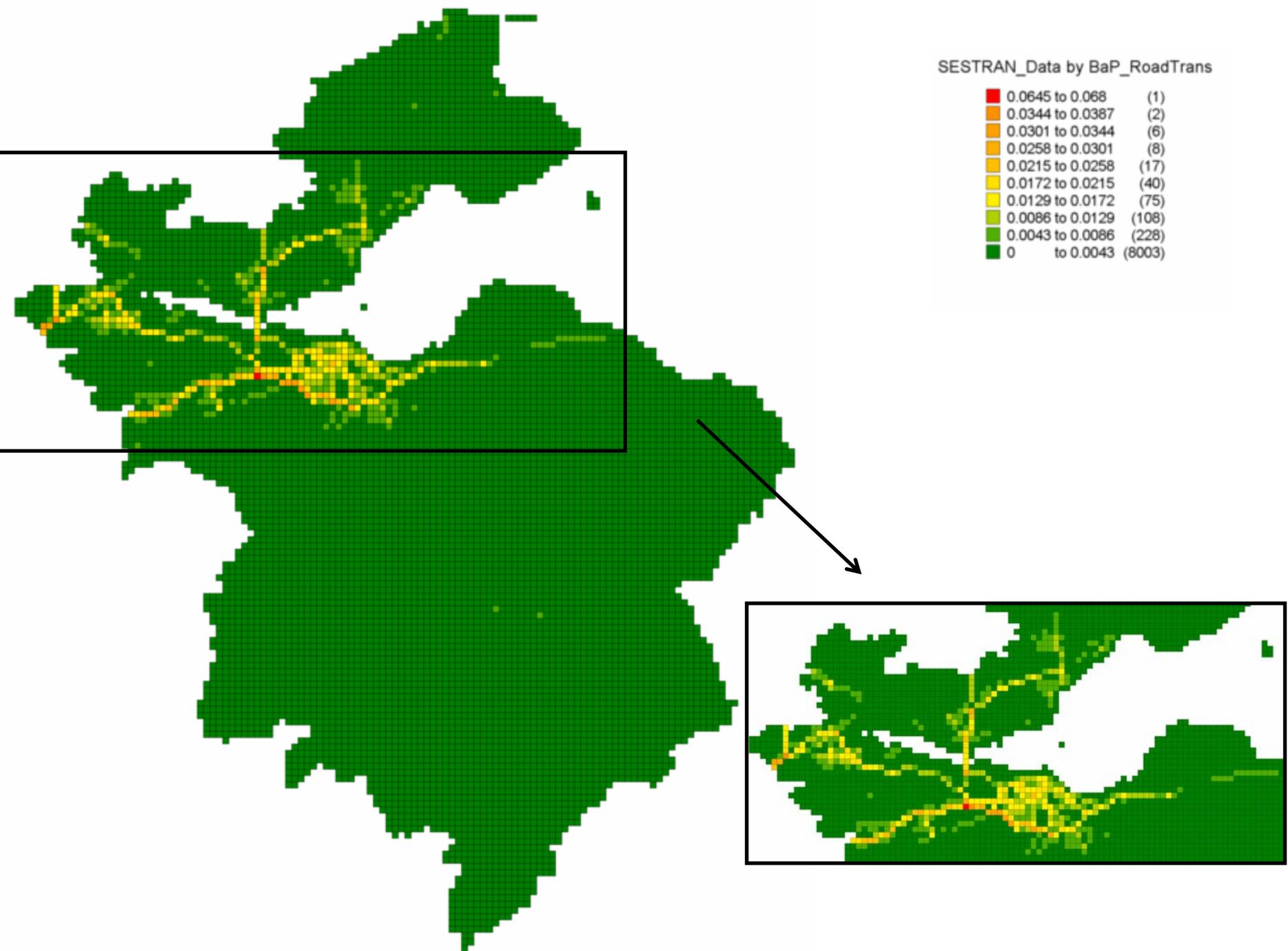
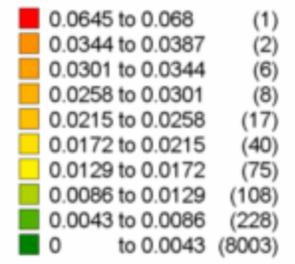
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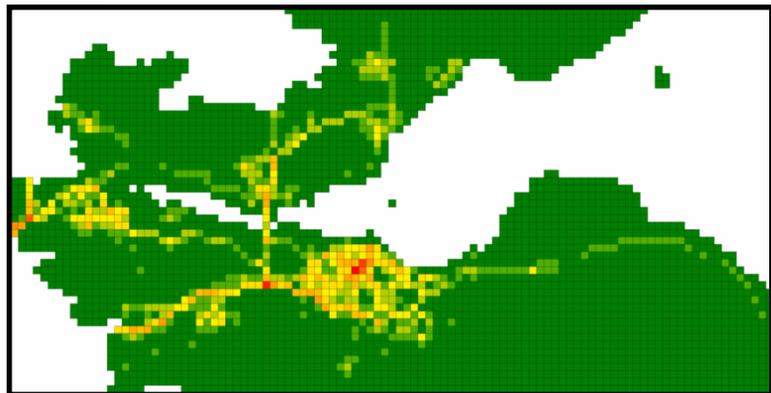
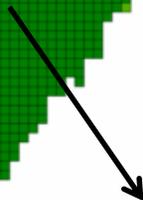
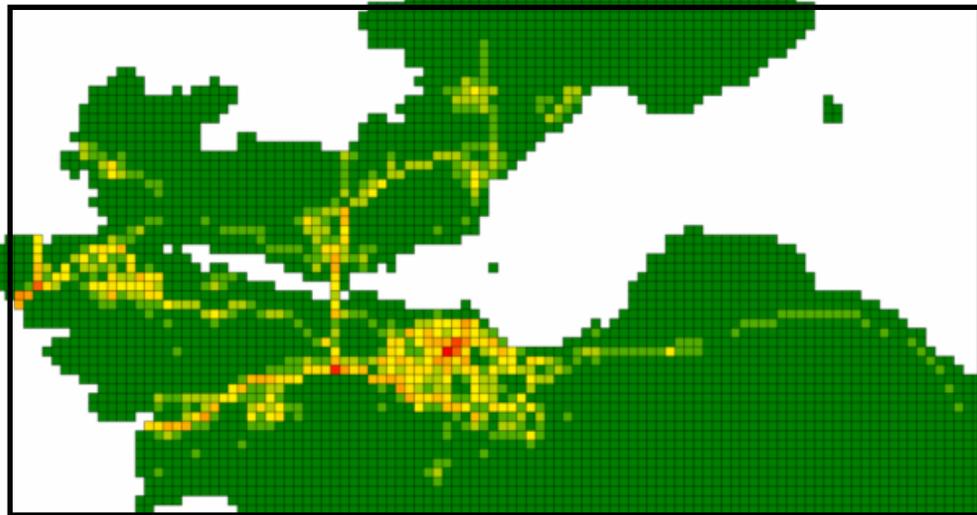
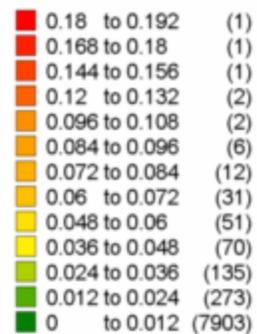
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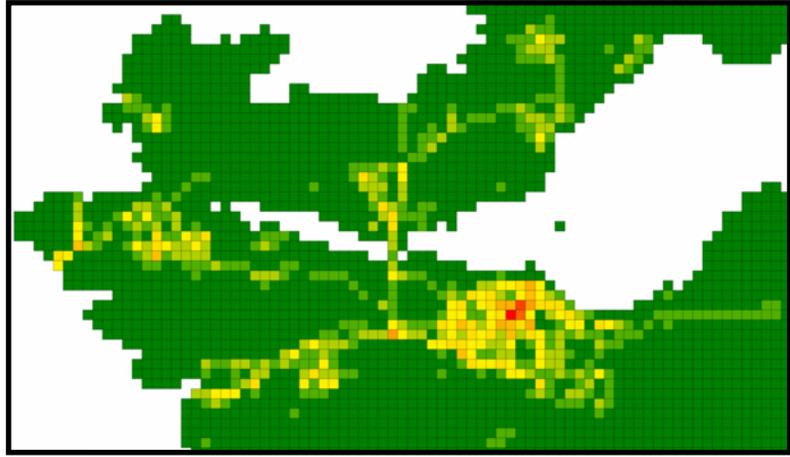
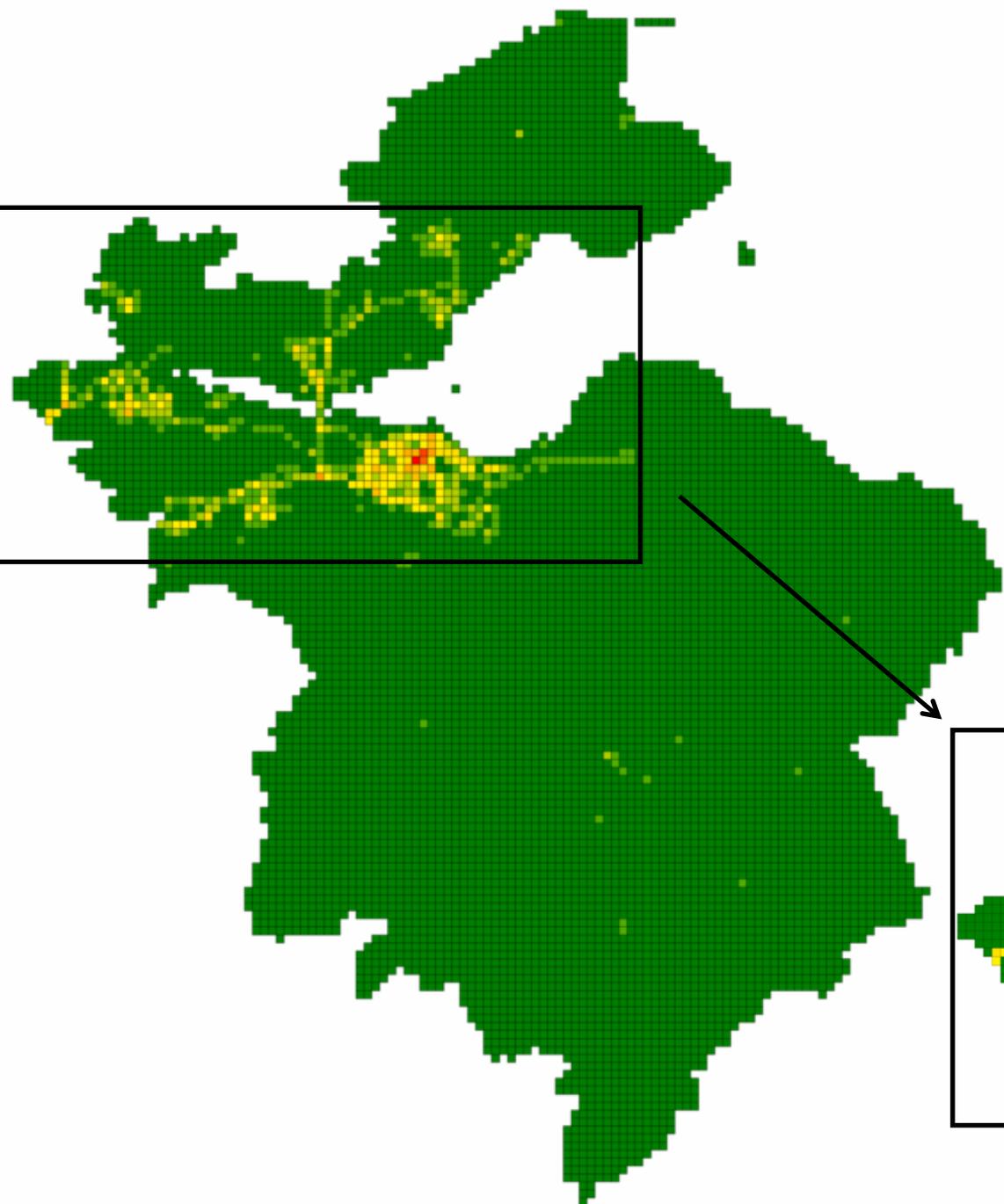


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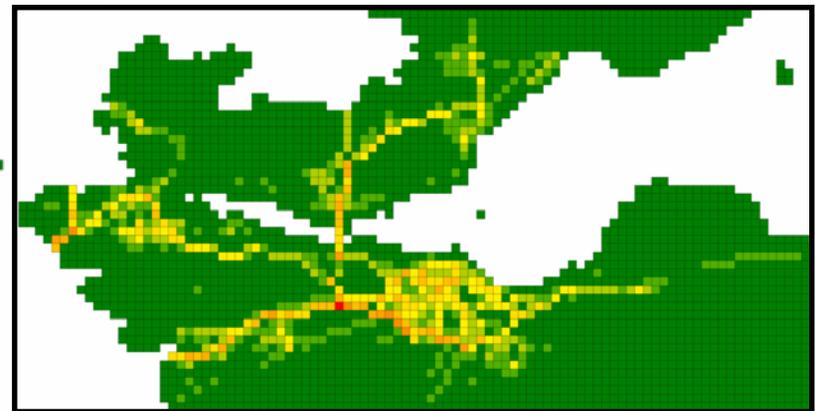
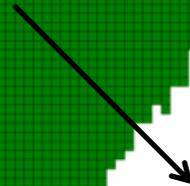
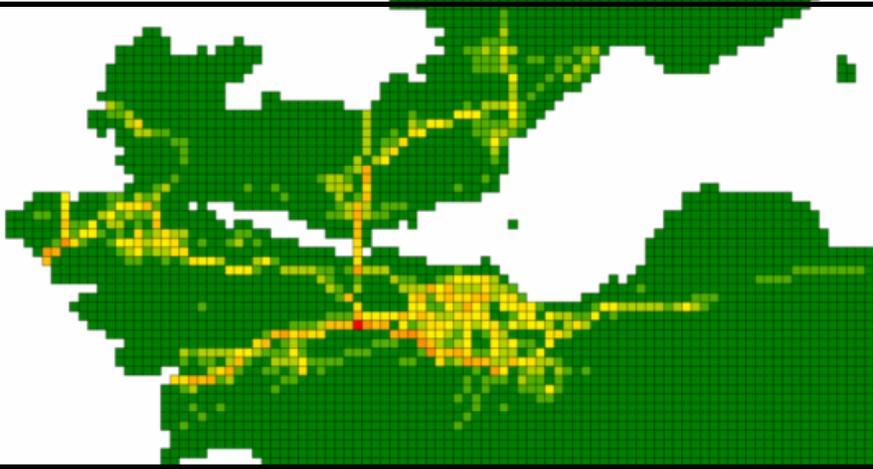
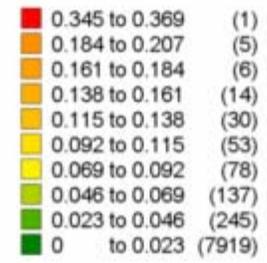


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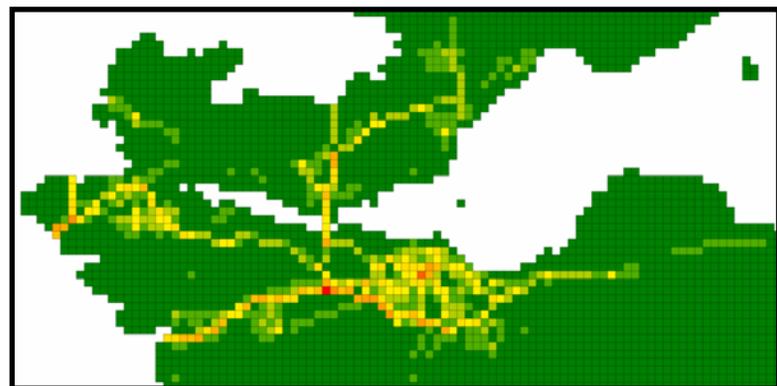
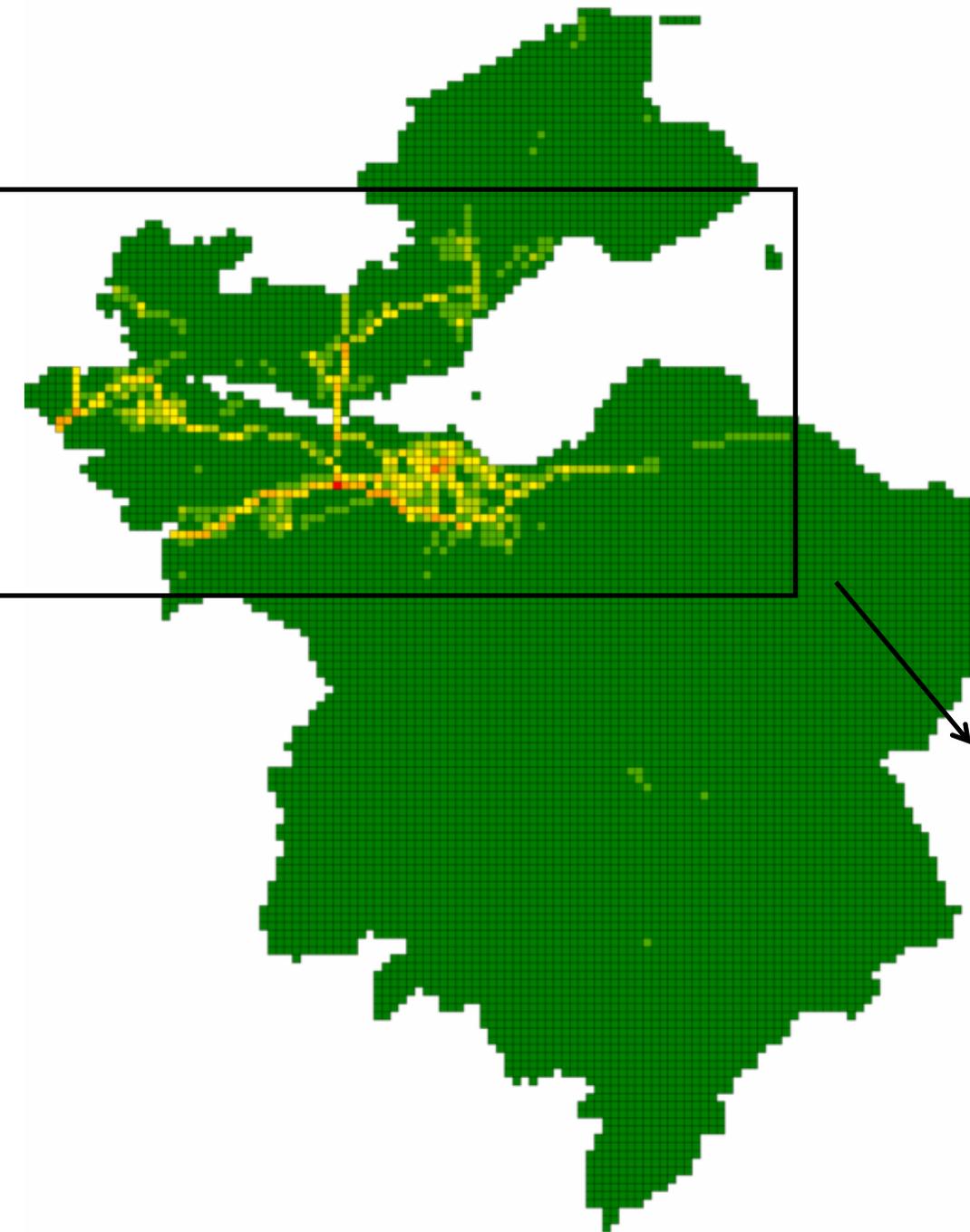
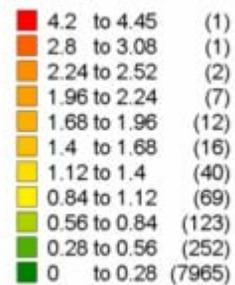
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13.2 to 14.3	(1)
11 to 12.1	(1)
7.7 to 8.8	(2)
6.6 to 7.7	(5)
5.5 to 6.6	(7)
4.4 to 5.5	(32)
3.3 to 4.4	(64)
2.2 to 3.3	(127)
1.1 to 2.2	(259)
0 to 1.1	(7989)



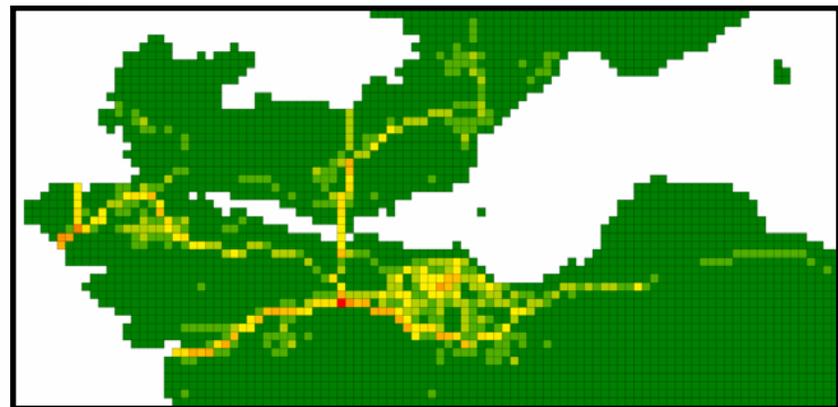
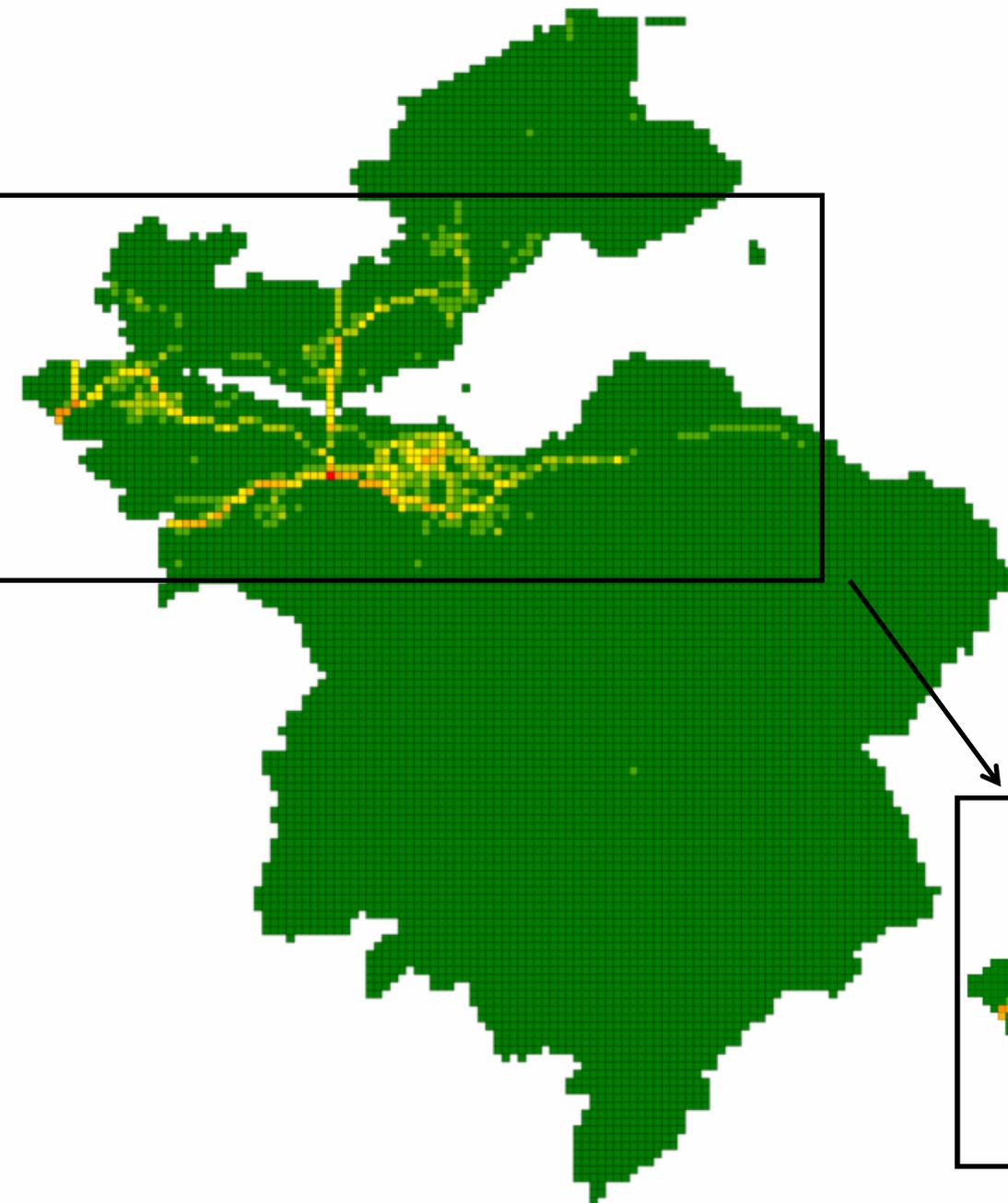
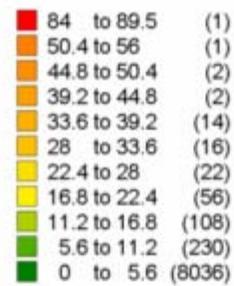
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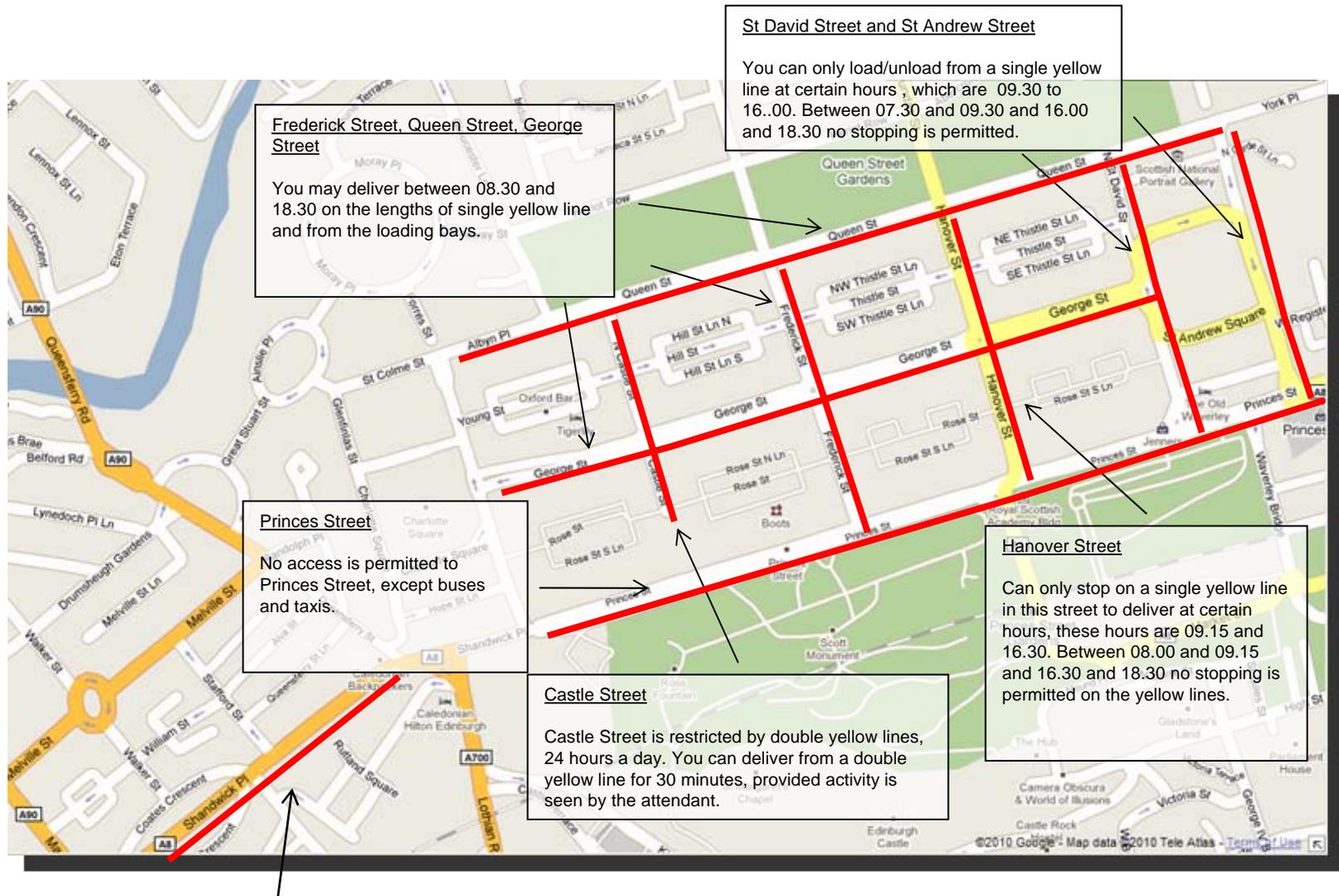


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Appendix 3- Town Centre Loading Restrictions

Edinburgh delivery time restrictions

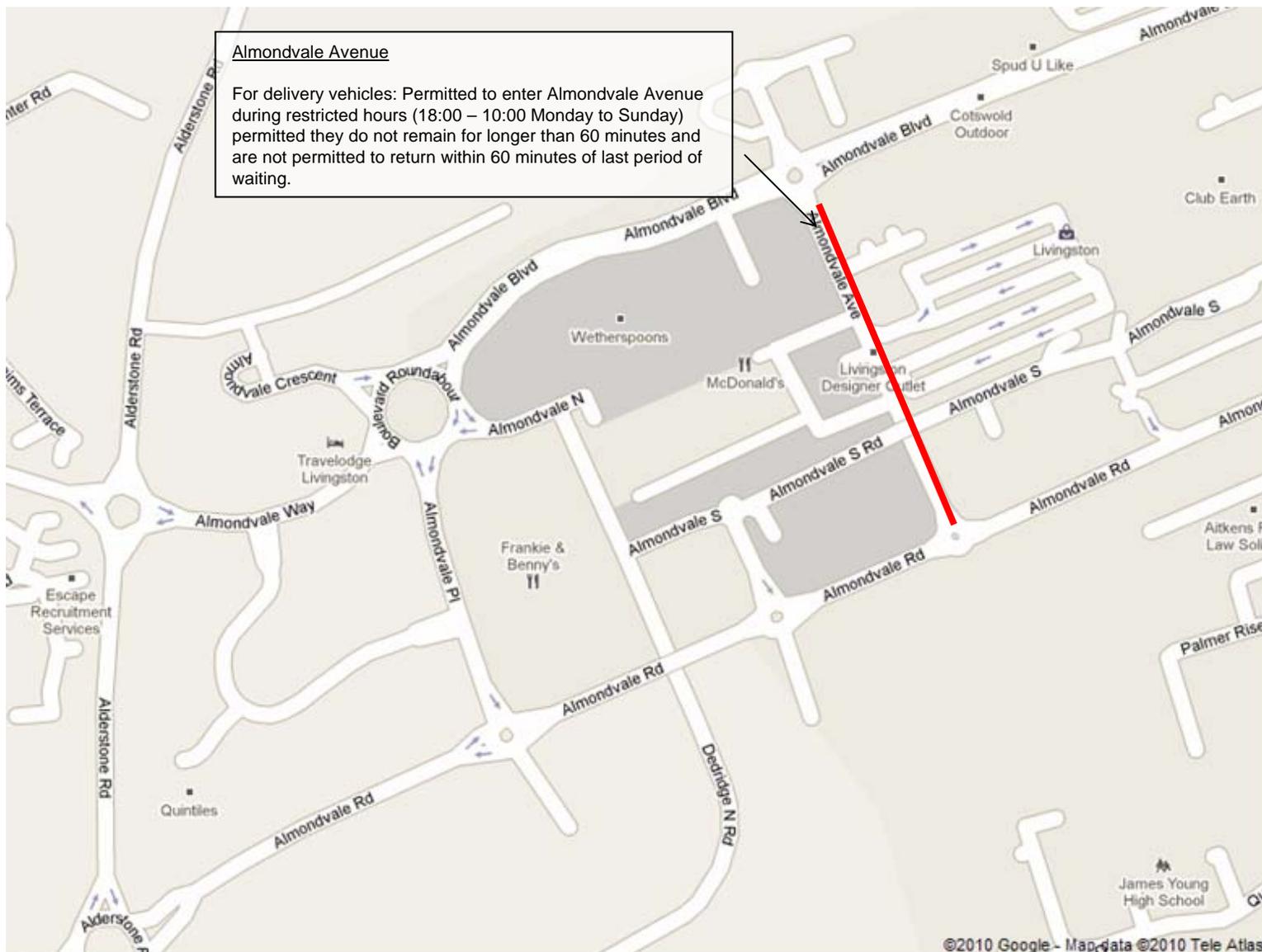


Shandwick Place
You may deliver from the loading bays between 09.30 and 16.00. No stopping is permitted on the red lines, at any time, or in the loading bays between 07.30 and 09.30 and 16.00 and 18.30.

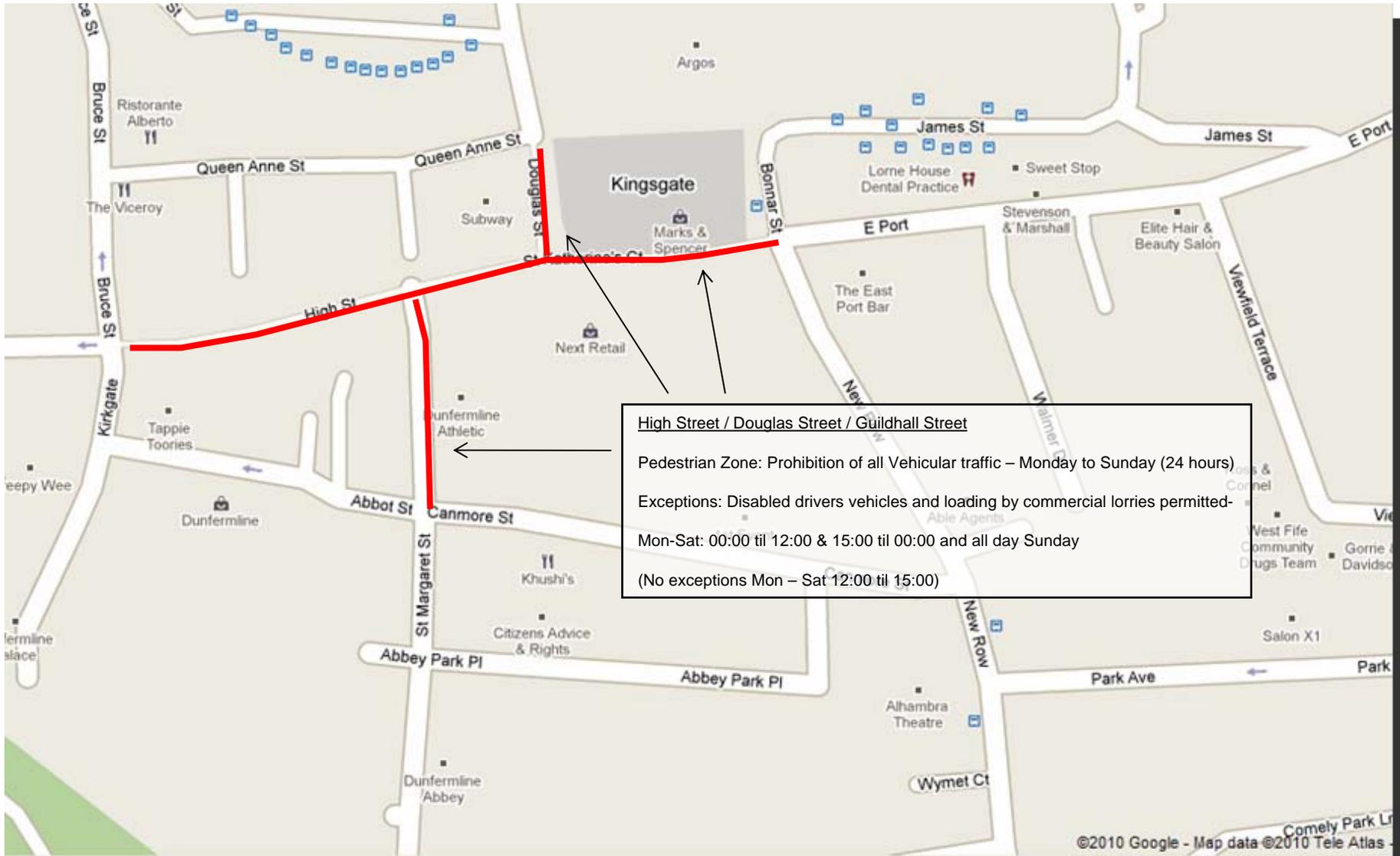
Livingston delivery time restrictions

Almondvale Avenue

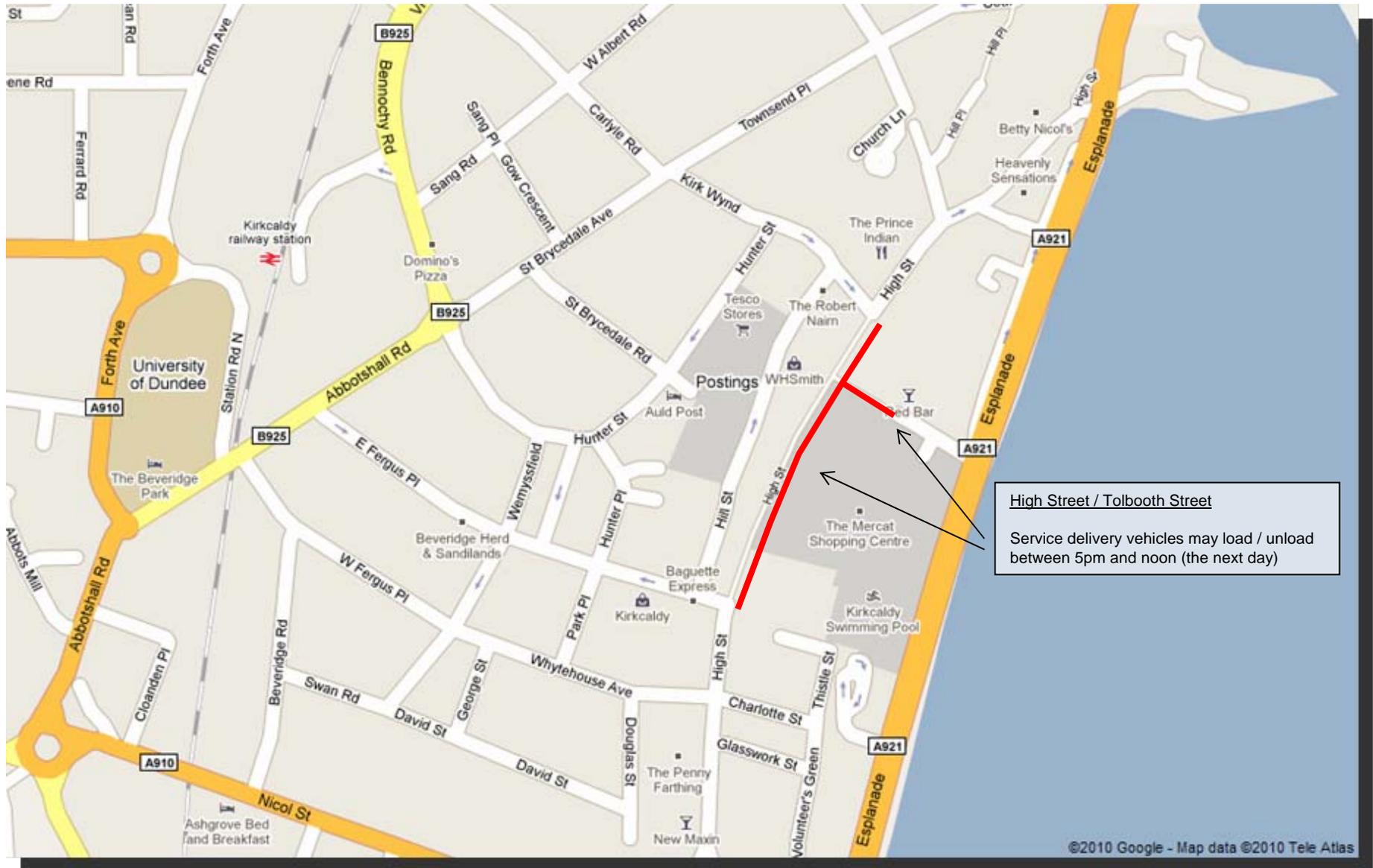
For delivery vehicles: Permitted to enter Almondvale Avenue during restricted hours (18:00 – 10:00 Monday to Sunday) permitted they do not remain for longer than 60 minutes and are not permitted to return within 60 minutes of last period of waiting.



Dunfermline delivery time restrictions



Kirkcaldy delivery time restrictions



Appendix 4- Freight Modal Zone System

Table Appendix 4: Freight Model Zone List

Zone	Name	Sector	Zone	Name	Sector	Zone	Name	Sector
1	Edinburgh Centre	01 Edin	25	Port Seton	05 SB+EL+ML	49	Rosyth	04 Fife+Clack
2	Hermiston Gait	01 Edin	26	Haddington	05 SB+EL+ML	50	Dalgety Bay	04 Fife+Clack
3	Cameron Toll	01 Edin	27	Dunbar	05 SB+EL+ML	51	Kirkcaldy	04 Fife+Clack
4	Fort Kinnaird	01 Edin	28	North Berwick	05 SB+EL+ML	52	Glenrothes	04 Fife+Clack
5	Leith	01 Edin	29	Peebles	05 SB+EL+ML	53	Leven	04 Fife+Clack
6	Granton	01 Edin	30	Galashiels	05 SB+EL+ML	54	Cupar	04 Fife+Clack
7	Airport	01 Edin	31	Earlston	05 SB+EL+ML	55	Saint Andrews	04 Fife+Clack
8	Ratho	01 Edin	32	Selkirk	05 SB+EL+ML	56	Blank	Blank
9	Newbridge	01 Edin	33	Hawick	05 SB+EL+ML	57	Blank	Blank
10	South Queensferry	01 Edin	34	Jedburgh	05 SB+EL+ML	58	Blank	Blank
11	Linlithgow	02 W Loth	35	St Boswells	05 SB+EL+ML	59	Blank	Blank
12	Broxburn	02 W Loth	36	Kelso	05 SB+EL+ML	60	Blank	Blank
13	Houstoun Ind Est	02 W Loth	37	Duns	05 SB+EL+ML	61	SPT (N)	06 SPT
14	Livingston	02 W Loth	38	Bo'ness	03 Falk	62	SPT (Central)	06 SPT
15	Brucefield Ind Est	02 W Loth	39	Falkirk	03 Falk	63	SPT (S)	06 SPT
16	Whitehill Ind Est	02 W Loth	40	Grangemouth	03 Falk	64	SWESTRANS	07 SWESTRANS
17	Bathgate	02 W Loth	41	Bankside Ind Est	03 Falk	65	TACTRAN (W)	08 TACTRAN (W)
18	Armadale	02 W Loth	42	Clackmannan	04 Fife+Clack	66	TACTRAN (Central)	09 TACTRAN
19	Whitburn	02 W Loth	43	Alloa	04 Fife+Clack	67	TACTRAN (E)	09 TACTRAN
20	Penicuik	05 SB+EL+ML	44	Tillicoultry	04 Fife+Clack	68	NESTRAN	10 NESTRAN
21	Loanhead	05 SB+EL+ML	45	Dunfermline	04 Fife+Clack	69	HITRAN	11 HITRAN
22	Bonnyrigg	05 SB+EL+ML	46	Cowdenbeath	04 Fife+Clack	70	NE Uk	12 UK/World
23	Dalkeith	05 SB+EL+ML	47	Mosmorran	04 Fife+Clack	71	Rest Uk	12 UK/World
24	Tranent	05 SB+EL+ML	48	Burtonisland	04 Fife+Clack	72	Rest World	12 UK/World

Appendix 5- Methodology for Goods Distribution System

The model adjusts the movements of goods according to the following processes:

- The centre point of each zone is assigned a grid reference
- The distances (crow flight) for each zone pair is calculated from the centre points
- A set of one or more distribution centres is designated. The designated distribution centres are assumed to be located on the centre point of a zone
- In the case of a single distribution centre being designated, each zone within 40km of the designated distribution centre is assumed to be linked to that distribution centre for all collections/deliveries
- In the case of more than one distribution centre being designated, each zone within 40km of a designated distribution centre is assumed to be linked to the closest distribution centre for all collections/deliveries
- For each zone linked to a distribution centre the two distances are calculated
- The direct distance (D_d) between other zones
- The “two leg” distance (D_t) comprising the sum of the distance from the origin zone to the distribution centre (D_o-dc) and the distance from the distribution centre to the destination zone (D_{dc-d})
- Where the ratio of (D_t): D_d exceeds 1.5, the zones are delinked from the distribution centre
- The assignment of goods’ movements follows two rules:
- If the zone is not linked to a distribution centre, the goods move directly between origin and destination using conventional transport for distance D_d
- If the zone is linked to a distribution centre, the goods move from origin to the distribution centre and then from the distribution centre to destination zone using conventional transport for distance D_o-dc and sustainable transport for distance D_{dc-d}
- Tonnekm are calculated for all goods’ movements and aggregated by conventional and sustainable transport.
- Conventional transport is assumed to have a cost of one unit per tonnekm and sustainable transport is assumed to have a cost of half a unit per tonnekm.

Key points to note on model assumptions are:

- The distances between zone pairs are crow flight distances and are not representative of actual road distances.
- Each distribution centre is linked to a discrete set of non-overlapping collection/destination zones (ie no zone is linked to more than one distribution centre).
- Where the two leg journey distance exceeds 1.5 times the direct interzonal distance the zone is not linked to a distribution centre. This is an arbitrary cut off figure to seek to represent practical decisions that would be made by organisations purchasing transport services where journey distances through distribution centres are significantly longer than direct distances.
- There is an assumption that all goods between zones linked to a distribution centre travel through the distribution centre
- The unit costs per tonne – kilometre (tonnekm) are purely indicative.