

SEStran Ferry Toolkit

Section 11: Index of Source Documents

This document is part of iTransfer, a North Sea Region Interreg programme project, which is funded by the European Regional Development Fund.

iTransfer (Innovative Transport Solutions for Fjords, Estuaries and Rivers) aims to make ferry transport more freely accessible and sustainable, and encourage more people to travel by water. In areas in the North Sea Region (NSR) there are opportunities to replace existing vehicle routes with passenger ferries as a viable alternative. Travelling by ferry is more sustainable, easier and quicker. It can also provide lifeline services to remote communities.

For more information visit www.itransferproject.eu

SEStran Ferry Toolkit

Section 11: Index of Source Documents

1. Introduction

2. Development

2.1. SEStran has taken a lead role in the EU promoted iTransfer project in developing a viable ferry proposal including terminal landing design and integration into the local transport system.

2.2. The iTransfer project was developed in several stages for SEStran as follows;

- Review of previous reports on ferries across the Forth
- Looking in detail at the viability of ferries across the Forth looking at various routes and ports.
- Refinement of business case for preferred Ferry and Hovercraft routes.
- Trial of a Hovercraft between Portobello and Kirkcaldy.
- Final assessment of infrastructure, vessels and business case.
- Final assessment of business case.
- Further updating of passenger predictions

3. Summary

3.1. Along with partners Fife Council, The City of Edinburgh Council, Forth Estuary Transport Authority and Forth Ports PLC, the studies were intended to develop and implement the identified ferry routes.

3.2. The following report is intended to review the various reports developed as part of this study and highlight the relevant information that was used to develop the proposals.

3.3. As part of the iTransfer project a detailed review was undertaken of the feasibility studies previously carried out on the potential for a cross Forth ferry. The previous studies were carried out by the Halcrow Group Ltd in their October 2004 report, “Options for a Cross Forth Ferry Passenger Service – Final Report” (1), and an earlier 1999 study undertaken by the Maritime Transport Research Unit, Napier University Business School, “Cross-Forth Passenger Ferry Study – Phase I and II Final Reports” (2).

3.4. The iTransfer studies were carried out in phases, each one refining the proposals further, linking potential patronage to size of boat, size of boat to infrastructure requirements, infrastructure costs to expenditure and costs, and finally costs to revenue and potential patronage. This iterative procedure became more and more refined and detailed as the study progressed.

3.5. The following report abstracts the main issues from the review which were used to develop the final proposals.

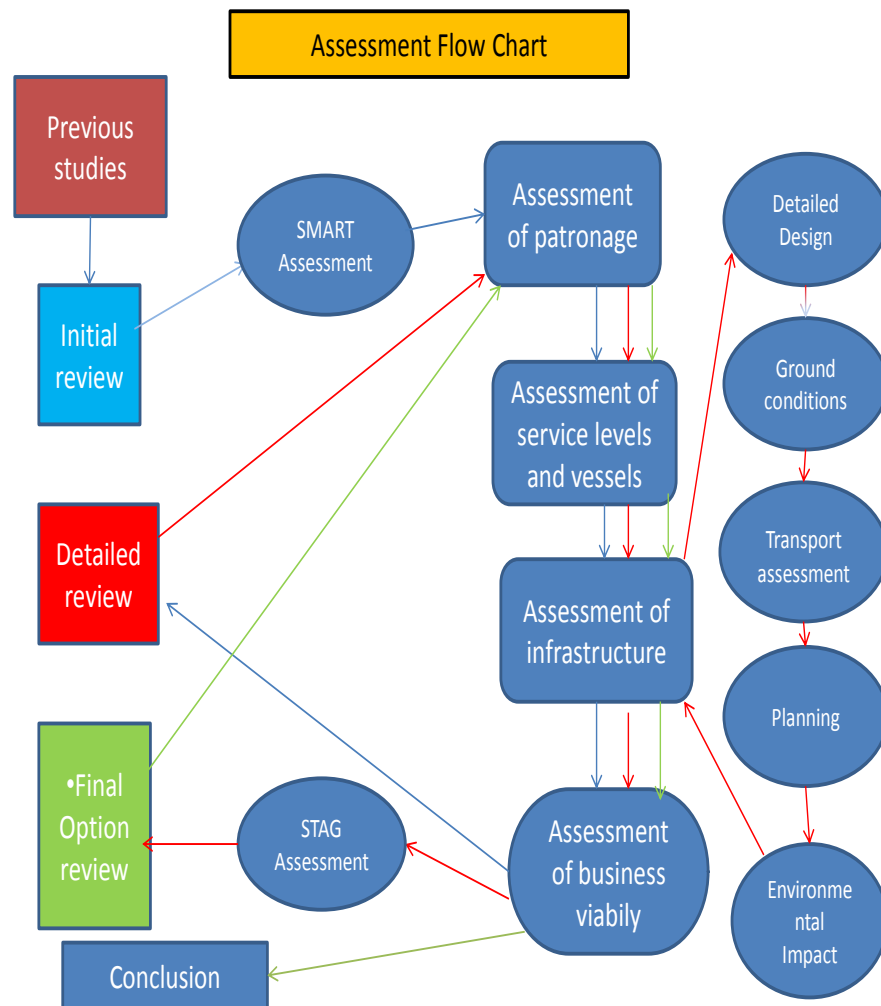


Fig 1

4. Cross Forth Studies prior to iTransfer

4.1. The concept of cross Forth ferries is not an entirely new concept and previous studies have been undertaken to assess the viability of a ferry service. Previous reporting had identified the preferred option for the service was from Kirkcaldy to Leith harbours and the outcomes of these studies are summarised below.

5. Summary of Previous Outcome

5.1. **Vessels** - Costs for the proposed vessels ranged from £2.9 to £3.25M. A Hovercraft option has been considered which is capable of speeds up to 50 knots. The cost for such a vessel would be £4.25M. At least two vessels would be needed for the service.

5.2. **Ports** - Four ports were considered two on the Edinburgh Shore (Leith and Granton) and two on the Fife Shore (Burntisland and Kirkcaldy).

5.3. **Leith Docks** - the recommended landing stage site is at the entrance to the harbour on the western side. Capital costs are in the region of **£14.48M**. An alternative hovercraft landing facility at this site would have a capital cost of **£6.3M**

5.4. **Granton** - the recommended landing stage site is along the central pier. Capital costs are in the region of **£4.80M**. This port is not deemed suitable for hovercraft due to the proximity of future houses which would be adversely affected by the noise from the hovercraft.

5.5. **Burntisland** - the recommended landing stage site is alongside the existing slipway in the outer harbour. Capital costs are in the region of **£2.75M**. An alternative hovercraft landing facility at this site would have a capital cost of **£7.3M**

5.6. **Kirkcaldy** – the recommended landing stage site is inside the inner harbour. Capital costs are in the region of **£6.67M**. An alternative hovercraft landing facility at this site would have a capital cost of **£6.9M**

6. The Maritime Transport Research Study

6.1. The Maritime Transport Research Unit at Napier University Business School undertook two studies spanning between October 1998 and August 1999. The scope of this work was as follows;

6.2. Phase 1 – review of existing information, in particular cross – Forth traffic flows on all modes and on fast ferry services worldwide. Review of potential ports suitable for fast ferry service operations and recommendations for next stages.

6.3. **Phase II** – to establish attitudes of existing cross–Forth commuters towards using a ferry service, to compare ferry/intermodal travel times and costs with other modes and to recommend ferry timetables. Vessel parameters and intermodal connections were established and an estimate of ridership for each route and the viability of the route estimated.

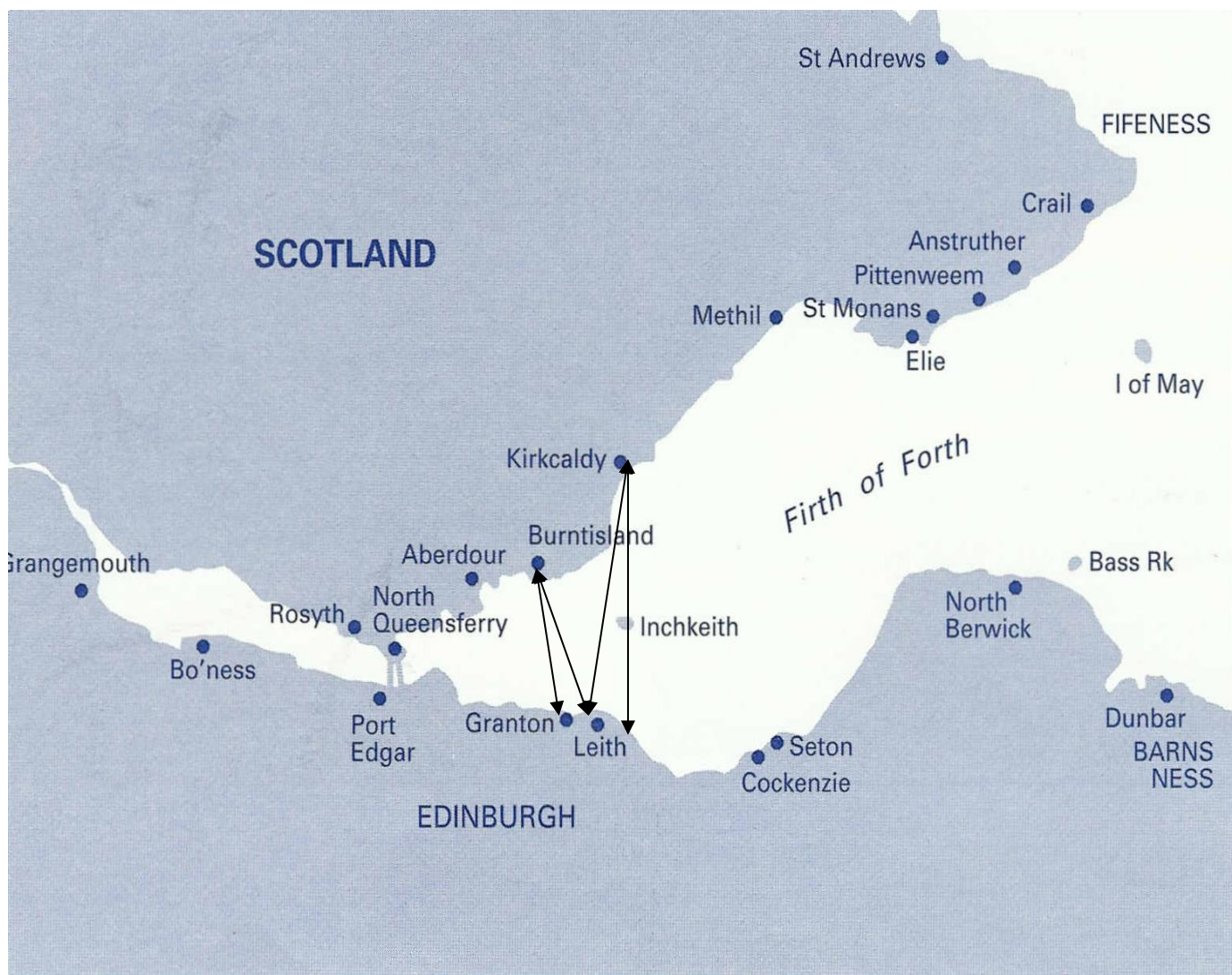


Fig 2 Forth Estuary Plan

6.4. The findings of each stage of this study are set out below;

6.5. The last cross forth ferry service to operate was the “The *Spirit of Fife*” vessel, operated by Forth Ferries Limited from Burntisland to Granton. It commenced in 1991 and was closed down a little over 2 years later.

6.6. Although low patronage was the ultimate cause of its failure (less than 300pax per day) an examination of the causes by the authors determined the following underlying reasons;

- Employment of an inadequate vessel
- Absence of back up craft
- Lack of proper terminal facilities
- Insufficiently comprehensive intermodal connections
- Failure to offer multi-modal integrated ticketing
- Lack of capital required to initiate a higher quality of service; and
- Limited management capability.

6.7. Fast ferry services in seven locations worldwide were examined to determine the key factors to success. These were presented under headings as follows;

- Five of the seven services examined were operated by public sector organizations
- One public sector body owns its own vessels which are operated under a concession basis by a private sector bus operator.
- Fast ferry route distances varied from 6.5km to 46km, with most falling between the 10-35km ranges.
- Peak commute periods departures were between every 10minutes to every 30minutes, reducing to hourly frequencies at off-peak times.

- Frequency of service is a critical issue, with operators maintaining between 20 and in some cases over 40 each way trips per day.
- Fast turnaround (typically 4-5 minutes) means that vessels can be intensely operated.
- Six of the seven services operated twin-hulled catamarans, with at least a pair of vessels allocated to each route. Where other vessels are used they are being phased out in favour of catamarans.
- On all routes (including exposed seaways); fast ferry operations employing modern catamarans are achieving service reliability levels of 99% and above.
- Five of the seven services are in receipt of 100% capital subsidies in respect of vessel and terminal costs.
- Six out of the seven also receive operating subsidies amounting to 30-80% of total operating costs.
- Use of public sector income from transport taxes and tolls towards subsidizing public transport is widely practiced in the USA (e.g. in San Francisco, Golden Gate Transit uses bridge toll revenues to support its Golden gate ferries and other Golden Gate Transit (e.g. bus) operations).
- Capital funding is available in the USA to help part finance new fast ferries.

- Average daily patronage levels for the majority of routes serviced by two vessels are between 1,400 and 4,000.
- Utilisation levels are between 10-30%, reflecting the fact that on commuter runs at peak period the return leg is often empty.
- Commuters make up 30-70% of the patronage, dependant on route.
- Some ferry services are significant tourism attractions in themselves.
- Six of the seven operators offer multi-modal integrated ticketing, with passengers able to use the same ticket across all available public transport modes locally.
- All ferry terminals are served by shuttle buses connecting the main neighbourhoods and business centres.
- Park & Ride facilities are provided at all ferry terminals and there is evidence that car users account for as much as 50% of fast ferry ridership.
- Almost all vessels provide space for bicycles.
- Six of the seven fast ferry operations offer modern terminal facilities with waiting rooms, covered walkways to the vessels, ticket kiosks and retail outlets.
- All recently introduced catamaran ferries, and those currently on order, provide access for disabled passengers.

6.8. The study reviewed the following ports as potentially suitable for the service route;

6.9. **Fife side**

- Rosyth
- Burntisland
- Kirkcaldy
- Methil
- Inverkeithing
- North Queensferry

6.10. **Edinburgh side**

- Leith
- Granton

6.11. The ports highlighted were taken forward for further analysis. Interestingly Leith was discounted because of the difficulties in transiting the sea lock and the potential impact this would have on transit times.

6.12. The study presented information obtained or derived from the MVA report “Forth Trip Travel Patterns” – prepared for the Scottish Office Development Department in September 1998, but did not identify or estimate patronage figures.

6.13. Focus groups were organised to ascertain the needs of regular travellers between Fife and Edinburgh. The key findings were as follows;

- The overall journey time by ferry and bus had to be competitive in comparison with alternative bus and rail routes.
- Car drivers in particular would look to the ferry to reduce their travel times.
- Joint ferry/bus ticketing should not be more expensive than the train.
- Service reliability is extremely important and contingency plans will therefore need to be robust.
- Ferries should offer early morning and late evening sailings, the latter more especially at weekends.
- Leith was considered a superior port location to Granton, but the latter would be accepted as a short term option.
- Burntisland was generally accepted as the most suitable port option for East Fife.
- A limited stop express bus service dedicated to the ferry and taking people directly into Edinburgh City Centre was unanimously considered necessary.
- Delays due to adverse weather and a probable slowing down of the ships at these times were considered a potential problem area.
- There were concerns about safety and a perception that sea transport was less safe than other modes.

- Free parking in a large, secure car park was considered essential to attract Park & Ride users.
- Users would require a variety of ticket options and through ticketing arrangements.

6.14. The study presented estimated service costs and break even analysis for both 32m and 40m vessels and concluded that the larger vessel was less viable.

6.15. The operating scenario for two 32m vessels showed a deficit in the first 5 years of trading, although after this time it would move into profit. Typical load factors for vessels were assessed to be approx. 22%. To break even, load factors would need to be in the region of 34%, which was regarded as overly optimistic.

7. The Halcrow Study

7.1. Halcrow, in conjunction with Accent Marketing and Research Ltd, and Three Quays Marine Services Ltd, were commissioned by Fife Council, City of Edinburgh Council, Forth Ports and Forth Estuary Transport Authority to assess the technical, economic and environmental feasibility of introducing a passenger ferry service across the Forth Estuary. The report was completed in October 2002.³

7.2. The key findings of the study were;

- Kirkcaldy – Leith Route was the preferred option
- Two vessels would be required

- Catamaran/monohull with 150 pax capacity and 35knots operating speed
- Journey time of 25 minutes
- Peak period service frequency 30 minutes
- Single fare of £3.50 and
- 12 hours a day, 7 days a week operation

7.3. It is possible to split the findings of the report into 3 sections

1. Route choice
2. Vessel choice
3. Economic viability

7.4. The study reviewed the following ports as potentials for the route.

7.5. Fife side

Rosyth
Burntisland
Kirkcaldy
Methil

7.6. Edinburgh side

Leith

Granton

7.7. The key findings of the study were that the following ports required:

7.8. Port Name Description Marine Infrastructure Access & Interchange Cost Estimates Notes Leith

- Berthing facility on the outer harbour west wall, behind new breakwater
- New breakwater (approx. 400m long) and shallow dredging and new landing stage
- Covered walkway and ferry terminal on Western side of harbour with link to proposed tram halt and bus stops.
- No Park & Ride site was specified.

Granton

- New landing stage in eastern harbour
- Shallow dredging and new landing stage
- Covered walkway and ferry terminal.
- Covered walkway only provided to car park not bus stop and tram halt.
- No covered walkway to existing bus stops and proposed tram halt.

Rosyth

- New landing stage at “O” berth of Royal Dockyard
- New landing stage Not assessed
- Option not progressed due to navigational constraints for vessels using the LPG terminal

Burntisland

- New landing stage in East Dock
- New landing stage and some shallow dredging
- Ferry terminal only – no covered walkway to park & ride locations
- Site unsuitable due to conflicts with existing profitable operations in East Dock.

Kirkcaldy

- New landing stage in Inner Dock
- New breakwater to south of South Pier and new landing stage and significant dredging
- Covered walkway and ferry terminal. Covered walkway provided to bus stops, car drop off area and park & ride site.

Methil

- New landing stage in channel to Dock No3
- Demolition of length of lead in structure and new landing stage
- Covered walkway and ferry terminal.
- Covered walkway provided to park & ride site
- Significant issues with overtopping of breakwater

7.9. The choice of the Kirkcaldy to Leith route as the preferred option was primarily based on the comparison of economic returns obtained when comparing revenue income against vessel and on-shore operating costs (including vessel maintenance, but excluding any construction capital costs), although both Burntisland to Leith, and Kirkcaldy to Granton routes were also assessed to return sufficient revenue to cover operational costs.

7.10. However only Kirkcaldy to Leith was the only route assessed to deliver a revenue surplus when vessel costs were included. It should be noted that these returns are very sensitive to vessel operating costs and patronage figures.

8. Assessment of Previous Studies

8.1. As a starting point for the iTransfer study work, the results of these studies were appraised and used as an initial basis for further assessment.

8.2. Patronage figures used need to be updated as significant changes have occurred since the previous patronage figures were undertaken (e.g. congestion charging was not implemented).

8.3. A wave climate assessment has been undertaken which identified that wave conditions in the Forth estuary are worse than previously reported. Although this will not prevent the vessel from operating on the route any less than previously anticipated, it will mean that passenger comfort will be lower which may result in lower patronages, although vessels can be selected that will maintain a reasonable degree of comfort.

8.4. A catamaran design is recommended, carrying up to 150 passengers and capable of 25 to 35 knots dependant on route.

8.5. Previous patronage figures on the Kirkcaldy-Leith route were predicted to be 1,700 per day, whilst on the Kirkcaldy – Granton route it was 300 lower. Patronage on the Burntisland – Leith route was predicted to be 1,400, whilst on the Burntisland - Granton route it was predicted to be 100 less.

- 8.6. The previously preferred option was calculated to lose approximately £1million a year at the start of the service, whereas a service from Burntisland to Granton would lose £0.6 million. These figures are based on operating costs alone when compared against revenue. Capital costs and vessel costs have not been included.
- 8.7. The capital costs of the scheme have also escalated to above the nominal ceiling of £10 million. The most expensive option was calculated to be a fast catamaran service from Kirkcaldy to Leith at £27.6 million whereas to establish the service from Burntisland to Granton was estimated to cost £13.5 million.
- 8.8. The above costs included infrastructure costs and the purchase of 2 appropriate vessels.
- 8.9. The scheme was not viable as it does not break even and requires significant public sector support.
- 8.10. The report contains a table of probability of wave height occurrence which identified that only 2 days/year waves would be greater than 1.0m high, which was based on only 1 year's data. Further assessment has indicated that this is more likely to be in the order of 9 days/year. Waves between 1 and 1.5m high are unlikely to present an issue for the vessel safety they will have an impact on passenger comfort and hence patronage.
- 8.11. The study report undertook a review of potential vessels and the preferred option was a catamaran or monohull, primarily due to meeting specified operational requirements.
- 8.12. The hovercraft was dismissed on the basis of manoeuvring difficulties and relatively high whole life cost.

8.13. Based on a review of capital and operational costs the catamaran provided the better financial return. This was then used in the economic and financial analysis.

9. Journey Time

Route	Peak Frequency mins	Average speed knots	Journey time mins	Loading mins	Unloading mins	Total travel time mins
Kirkcaldy-Leith/Granton	30	35	17	4	5	26
Burntisland Leith/Granton	30	35	9	4	5	18
Methil-Leith/Granton	45	35	30	4	5	39

Table 1: Breakdown of ferry times by route based on operating speed of 35 knots

9.1. It should be noted that there are significant fuel penalties with a vessel travelling at 35 knots. A further review of vessel types undertaken as part of this study, indicates that, to ensure a 30 minute turnaround, a vessel on the Kirkcaldy Leith/Granton route would need to average 27 knots and on the Burntisland-Leith/Granton route would need to average only 13 knots (a significant fuel cost saving).

9.2. The passenger capacity of the vessel (approx. 150) was determined from Origin/Destination and Stated Preference studies and a peak passenger loading assessment, the base data of which have not been made available. It should be noted that the patronage data was based on the forecast that

congestion charging would be introduced in 2006. This has not occurred.

The Table below is extracted from the Halcrow Report:

Route	Average 12 hour daily demand	Proportion of annual trips in peak	Ferry mode share	Proportion of trips attracted from car
Burntisland - Granton	1,300	52%	4%	66%
Burntisland - Leith	1,400	49%	5%	59%
Kirkcaldy - Granton	1,400	45%	5%	50%
Kirkcaldy - Leith	1,700	41%	6%	40%
Methil - Granton	400	47%	1%	82%
Methil - Leith	400	45%	1%	78%

Table 2: Ferry crossing demand central forecasts (2010 opening year).

9.3. It can be seen that demand is greatest on the Kirkcaldy- Leith route, although the proportion of trips attracted from car is less than other routes.

9.4. It is also not clear from the report whether the stated preference surveys identified particular locations within ports or were general in their nature. As an example, the responses to a ferry terminal at Leith may be very different between an Ocean Terminal terminus and a location at the end of the breakwater with an additional leg of travel to get to the tram.

9.5. A review of the sensitivity analysis of ferry demand to changes in ferry fares and bridge tolls and subsequent financial analysis reproduced below, identifies that revenue would be maximized through a £4.00 single fare, despite the lower patronage. It should be noted that this was based on a

cordon pricing of £2.00 being introduced and an 80p bridge toll. This is shown in table below.

Test	Average fare	Cordon pricing	Bridge Toll	Average 12 hour daily demand
Base	£3.50	£2.00	£0.80	1,700
1	£3.00	£2.00	£0.80	1,900
2	£3.00	£2.00	£1.10	1,900
3	£4.00	£2.00	£0.80	1,500
4	£4.00	£2.00	£1.10	1,500

Table 3: Sensitivity of ferry demand to changes in ferry fares and bridge tolls, Kirkcaldy-Leith (2010)

9.6. It should also be noted that demand forecasts are very sensitive to fare changes with a 50p reduction in fares increasing demand by 200 per day and that patronage does not appear to be sensitive to bridge toll (c.f. Test 2 and 4). It should be noted there is currently no bridge tolls or proposals for cordon pricing.

9.7. Halcrow undertook an economic analysis of the project which identified that all of the route options have (–ve) NPV over the 25 year appraisal period when the vessel costs and infrastructure cost are included in the calculations.

9.8. If infrastructure costs, vessel costs and on-shore operational costs are excluded, only the NPV for Burntisland to Granton route is still (–ve) with the Kirkcaldy to Leith route returning a +£2.4.9M NPV. If the vessel costs are

included the NPV reduces to +£1.3M which would not be attractive to an operator.

9.9. Seasonality has also not been considered and it is apparent that during the winter months a vessel travelling from Kirkcaldy to Leith will experience significant downtime, with knock on effect on patronage and hence viability.

10. Initial iTransfer Review

10.1. Taking on board the results of previous studies, a further business analysis was undertaken and to identify viable options. The previously held assumption was that only economically viable options should be progressed.

10.2. This phase of the review seeks to confirm in greater detail the marine and civil engineering issues associated with the routes and to validate the business viability assessment developed in the Halcrow report. The overall study follows the Scottish Transport Appraisal Guidance (STAG) appraisal methodology with a view to take forward the scheme development to a sufficient degree to justify further public sector investment, permit downstream procurement of onshore and offshore harbour works through a design and build contract and procurement of the vessels to operate the service.

10.3. The previous work identified the preferred route as between Kirkcaldy and Leith although it recognised that there were significant difficulties to be overcome. At Kirkcaldy the harbour dries out and a new breakwater was recommended. At Leith the preferred location was Ocean Terminal, although access requires transition through the lock which would have significant operational costs and would add significantly to the journey time.

11. Smart Assessment and Patronage Modelling

11.1. As part of this study, a Brief Definition Workshop was undertaken, which sought to clarify the brief and to assist in deriving SMART objectives for the scheme which are required for the STAG Appraisal process.

11.2. **SMART** stands for; **S**pecific, **M**easurable, **A**ttainable, **R**elevant and **T**imed

11.3. The workshop initially derived the following broad based objectives for the scheme;

- Broaden choice of travel modes
- Relieve road congestion (both bridge and city centre)
- Improve linkages between city centre and regions
- Assist in regeneration proposals (improve travel to work times, encourage social inclusion, assist Central Fife regeneration)
- Encourage modal shift
- Improve accessibility to services
- Reduce travel times
- Broaden tourism offer
- Derive economic benefit
- Provide reliable service

11.4. For the purpose of the Workshop, 5 specified Government headings were used to define SMART objectives for the scheme. These are shown below in bold, with the subsequent developed SMART objective shown below.

Environmental

- Reduce CO2 emissions from travel between Fife and Edinburgh
- Minimise impact of dredging (capital and maintenance)
- Improve waterfront areas (make better places to work, live and visit)
- Minimise impacts of ferry service on neighbouring properties
- Provide high level of passenger comfort and service

Safety

- Reduce Road accidents
- Improve level of personal Safety

Economy

- Encourage jobs (direct and indirect)
- Reduce travel time
- Provide economically viable scheme
- Maximise potential of tourism benefit
- Maximise integration with other developments

Integration

- Maximise interchange efficiency (time/distance)
- Physically integrate development into community
- Overall journey efficiency
- Public Transport Linkages at terminals and wider

Accessibility

- Improve accessibility
- Minimise fares required to break even
- Ease of access (incline/distance to tram link/bus link/car park)
- Access to jobs

- Provision of additional water usage/access

11.5. The above SMART Objectives were used to populate the draft STAG.

11.6. The requirements for defining a ferry service are as follows:-

- A destination port in Fife (Kirkcaldy or Burntisland)
- A destination port in Edinburgh (Leith or Granton)□
- An approximate vessel type (Draughted vessel or hovercraft)

11.7. The only restriction on the options is that it has been deemed that Granton is unsuitable for hovercraft as the likely noise coming from a hovercraft would be excessive in relation to the adjacent properties.

11.8. **Hovercraft**

11.9. A review has been undertaken at each port to identify how the facilities could be constructed. From this review a series of sub options have been identified for each port; the following summarizes of the key findings.

11.10. To move the project forward, eight general layouts have been prepared and costed. From these, two options have been selected for the possible future infrastructure layout, one for usage by a hovercraft service and one for use with a draughted vessel.

11.11. **Halcrow Estimate**

Kirkcaldy (Hovercraft-Option 2)	Estimate £6,860,000
Kirkcaldy (Draughted vessel-Option 3)	Estimate £6,672,000

Burntisland (Draughted vessel-Option 1)	Estimate £2,750,000
Burntisland (Hovercraft Option 3)	Estimate £ 7,247,000
Granton- Option 1	Estimate £ 4,797,000
Leith (Hovercraft)	Estimate £ 6,297,000
Leith (Draughted Vessel)	Estimate £ 14,479,000

11.12. Each of the options identified has been subject to a STAG appraisal regime. All of the schemes score the lowest mark for economic viability as none of the options reviewed are capable of being self-supporting. This is the most critical item of the entire appraisal. All of the schemes have been costed as being in excess of the nominal £10,000,000 capital budget for the scheme. The table below indicates the costs for each option on the basis that only two vessels are supplied.

Option	Fife port Infrastructure cost (£)	Edinburgh port Infrastructure cost (£)	Vessel cost based on 2 vessels (£)	Total capital cost (£)
A) Hovercraft service between Kirkcaldy and Leith	6,680,000	6,297,000	2 X 4,250,000	21,477,000
B) Catamaran service between Kirkcaldy and Leith	6,672,000	14,479,000	2 X 3,250,000	27,651,000
C) Catamaran service between Kirkcaldy and Granton	6,672,000	4,797,000	2 X 3,250,000	17,969,000
D) Hovercraft service between Burntisland and Leith	7,247,000	6,297,000	2 X 4,250,000	22,044,000
E) Catamaran service between Burntisland and Leith	2,750,000	14,479,000	2 X 2,900,000	23,029,000
F) Catamaran service between Burntisland and Granton	2,750,000	4,797,000	2 X 2,900,000	13,347,000

Table 4: Capital costs of each option based on two vessels

11.13. The most expensive option is the running of a fast catamaran from Leith to Kirkcaldy whereas the cheapest is to run a catamaran from Granton to Burntisland.

12. Smart Assessment

- Against many of the options the SMART objectives have scored a neutral 5 (the scores vary from 1 to 10). This is because the objectives can be met by a standardisation of specification that can be applied across all the options.
- Although the ferry service may be perceived to be a green solution, 2 of the options (A and D) were found to produce a larger carbon footprint per passenger than the alternative car usage. These options are based upon the hovercraft. One of the main factors is that often the vessels are traversing the Forth but are only partially occupied.
- The hovercraft options score relatively highly on some environmental grounds as the necessary infrastructure will necessitate only minimal dredging as opposed to the draughted vessels; conversely they score poorly on noise and this may prove to be a major problem.
- Some SMART objectives cannot be measured such as ‘tourism potential’ as there is a lack of data to allow a robust review. This could possibly be resolved during an updated series of patronage surveys. Another example of this is the objective for the ‘reduction of travel time’ as although the journey time from port to port may be reduced, without knowing the exact destinations and origins of the likely patrons then the option cannot be assessed with any degree of accuracy. However again updated patronage surveys could address this.

12.1. Each Option has had preliminary scores awarded against each of the SMART objectives for comparison purposes. These scores are presented in the table below:

Objective	Option A Hovercraft service between Kirkcaldy and Leith	Option B Catamaran service between Kirkcaldy and Leith	Option C Catamaran service between Kirkcaldy and Granton	Option D Hovercraft service between Burntisland and Leith	Option E Catamaran service between Burntisland and Leith	Option F Catamaran service between Burntisland and Granton
1	4	7	6	5	9	9
2	9	1	2	9	3	3
3	8	7	9	6	5	7
4	1	4	4	1	4	4
5	6	5	5	8	4	4
6	9	9	9	7	7	7
7	5	5	5	5	5	5
8	5	6	6	5	6	6
9	6	5	5	7	4	4
10	1	1	1	1	1	1
11	5	5	5	5	5	5
12	5	5	5	5	5	5
13	4	4	6	6	6	8
14	7	7	7	6	6	8
15	7	6	5	7	4	3
16	4	4	6	6	6	8
17	5	5	5	5	5	5
18	5	5	5	5	5	5
19	5	5	5	5	5	5
20	8	8	8	6	6	6
21	5	5	5	5	5	5
Total	114	109	114	115	106	113

Table 5: Option appraisal matrix

Table 5 Key: Objective

- 1) Reduce CO2 emissions
- 2) Minimise dredging volumes
- 3) Improve waterfront areas
- 4) Minimise noise impacts
- 5) Passenger comfort
- 6) Reduce road accidents
- 7) Improve personal safety
- 8) Encourage new jobs
- 9) Reduce travel time
- 10) Provide an economically viable scheme
- 11) Maximise potential tourism benefit
- 12) Integration with other developments
- 13) Maximise interchange efficiency
- 14) Physical integration with community
- 15) Improve overall journey efficiency
- 16) Maximise public transport interchanges
- 17) Improve accessibility to services
- 18) Minimise fares to break even
- 19) Ease of access to services
- 20) Increase access to jobs
- 21) Encourage water usage

12.2. The summary STAG matrix (table 5) identifies how the various options compare, as can be seen from the matrix each scheme has its advantages and disadvantages. However they all share a common major problem and that is that none of the options seem to be financially viable as none of the service options appear to return a profit when based upon the existing patronage figures and guide ticket price. Below is taken from the Business Viability Study and indicates the scale of the problem.

Option	From	To	Type	Fare	2010 patron age	2035 patron age	AOP 2010 (£m)	AOP 2015 (£m)	AOP 2020 (£m)
A	Kirkcaldy	Leith	Hovercraft	£3.85	1,700	2,300	-1.50	-1.34	-1.17
B	Kirkcaldy	Leith	Fast Cat	£3.85	1,700	2,300	-0.98	-0.81	-0.64
C	Kirkcaldy	Granton	Fast Cat	£3.85	1,400	1,900	-1.34	-1.20	-1.06
D	Burntisland	Leith	Hovercraft	£3.85	1,400	1,750	-1.47	-1.37	-1.28
E	Burntisland	Leith	Catamaran	£3.85	1,400	1,750	-0.54	-0.44	-0.34
F	Burntisland	Granton	Catamaran	£3.85	1,300	1,300	-0.61	-0.61	-0.61

Table 6: Summary table of operating profit (AOP) for all options

12.3. However; there is a lack of confidence in the patronage figures as some of the assumptions made in the original survey are now invalid. If the patronage figures can be increased or the fare increased then it is likely that a service could be found to breakeven.

12.4. To indicate the potential for creating a viable scheme the tables (tables 7 & 8) show two scenarios where the fares have been increased and where the patronage has been increased such that breakeven is achieved within 5 years. Clearly these tables are simplistic as an increase in fares would inevitably lead to a decrease in patronage. Despite this it may be found that if the patronage figures can be reviewed and updated then a combination of fare and patronage increases maybe identified sufficient to make the service viable.

12.5. Option F

Option	From	To	Type	Fare	2010 patronage	2035 patronage	AOP 2010 (£m)	AOP 2015 (£m)	AOP 2020 (£m)
A	Kirkcaldy	Leith	Hovercraft	£5.90	1,700	2,300	-0.23	0.03	0.28
B	Kirkcaldy	Leith	Fast Cat	£5.10	1,700	2,300	-0.20	0.02	0.25
C	Kirkcaldy	Granton	Fast Cat	£6.10	1,400	1,900	-0.19	0.03	0.25
D	Burntisland	Leith	Hovercraft	£6.50	1,400	1,750	-0.12	0.05	0.21
E	Burntisland	Leith	Catamaran	£4.70	1,400	1,750	-0.10	0.02	0.14
F	Burntisland	Granton	Catamaran	£5.20	1,300	1,300	.030	0.03	0.03

Table 7: Indication of necessary increase in fare prices to ensure 5 year breakeven

Option	From	To	Type	Fare	2010 patronage	2035 patronage	AOP 2010 (£m)	AOP 2015 (£m)	AOP 2020 (£m)
A	Kirkcaldy	Leith	Hovercraft	£3.85	2,601	3,519	-0.24	0.02	0.28
B	Kirkcaldy	Leith	Fast Cat	£3.85	2,244	3,036	-0.21	0.01	0.23
C	Kirkcaldy	Granton	Fast Cat	£3.85	2,212	3,002	-0.20	0.02	0.24
D	Burntisland	Leith	Hovercraft	£3.85	2,338	2,923	-0.15	0.01	0.17
E	Burntisland	Leith	Catamaran	£3.85	1,708	2,135	-0.10	0.02	0.14
F	Burntisland	Granton	Catamaran	£3.85	1,742	1,742	0.01	0.01	0.01

Table 8: Indication of necessary patronage for all options to achieve a 5 year breakeven

12.6. As indicated previously not only are the capital sums needed to implement the service higher than previously reported but the

operational/revenue figures indicate that the service will operate at a deficit regardless of which option is selected.

13. Patronage

13.1. The results of a business viability assessment (initial review) undertaken concluded that daily patronage on the Burntisland – Granton route could be as high as 2,835 passengers per day (ppd) from 2012 by combining an increased frequency of service together with integrated ticketing.

13.2. Initial assessments indicated that the overall service would not perform well. None of the options considered broke-even. The previously preferred option (Kirkcaldy – Leith) with a 150pax vessel was calculated to lose approximately £1m a year at the start of the service, whereas a service from Burntisland to Granton would lose £0.6m. On operating costs alone when compared against revenue. Initial start-up, Infrastructure and vessel capital costs were not included but allowance was made for their replacement through depreciation write-down in the business viability case.

13.3. The capital costs of the scheme also escalated to above the nominal ceiling of £10 million. The most expensive option was calculated to be a fast catamaran service (150 pax) from Kirkcaldy to Leith at £27.6m. To establish a similar service from Burntisland to Granton would have cost £13.5m. The above costs included for infrastructure costs and the purchase of 2 appropriate vessels.

14. Business Viability Assessment

14.1. Further patronage modelling was undertaken using the Transport Model for Scotland (TMfS). Patronage was predicted to be considerably less

than the figures taken from previous studies especially on the Kirkcaldy – Leith route which had previously been preferred [621 – 889 passengers per day (ppd) cf. 1,700 ppd originally predicted].

14.2. The review meeting concluded that Option F - Burntisland to Granton was the emerging preferred route but that the level of subsidy required was unsustainable. Further studies were requested to investigate the effects of modelling refinements on increasing patronage together with methods of reducing capital and revenue operating costs on the Burntisland-Granton route. These studies concluded that deployment of smaller vessels (i.e. Incat/Crowther CD701 – 75 pax fast catamaran) offered significant improvements to the capital and operating costs of the ferry service. The Transport Model for Scotland (TMfS) indicated that the effects of combining an increased frequency of service together with integrated ticketing gives major improvements in patronage 64% above previously modelled results.

14.3. The following table summarised the effect of different patronage scenarios. The Spirit 50 class vessel was used as the benchmark although the Incat Crowther CD701 was finally selected as the preferred vessel due to its greater passenger capacity.

Option	type	2012 patronage	2022 patronage	Peak fares	Inter peak fares	2012 profit (£m)	2022 Profit (£m)
(MVA 4)F - Burntisland to Granton	Catamaran	1618	1760	£2.50	£1.85	-1.15	-1.04
(MVA 5)D - Kirkcaldy to Seafield	Hovercraft	875	775	£3.00	£2.20	-3.17	-3.27
CF13 - Burntisland to Granton (K-S Compete)	Spirit 50	1546	1715	£2.50	£1.83	-0.21	-0.04
CF13 - Kirkcaldy to Seafield (B-G Compete)	Hovercraft	786	682	£3.00	£2.20	-3.26	-3.36
CF15 - Burntisland to Granton (Imp.Freq.)	Spirit 50	2152	1984	£2.50	£1.83	0.16	0.06
CF18 - Burntisland to Granton (Census TtW)	Spirit 50	1075	1216	£2.50	£1.83	-0.64	-0.51
CF19 - Kirkcaldy to Seafield (Census TtW)	Hovercraft	745	736	£3.00	£2.20	-3.31	-3.30
CF20 - Burntisland to Granton (Land Use)	Spirit 50	1618	1784	£2.50	£1.83	-0.10	0.07
CF21 - Burntisland to Granton (Intg Tickt)	Spirit 50	2041	1935	£2.50	£1.83	0.20	0.15
CF22 - Kirkcaldy to Seafield (Intg Tickt)	Hovercraft	1321	1088	£3.00	£2.20	-2.74	-2.93
CF23 - Burntisland to Granton (Cong.20)	Spirit 50	1661	1612	£2.50	£1.83	-0.06	-0.07
CF24 - Burntisland to Granton (Cong.60)	Spirit 50	1569	1571	£2.50	£1.83	-0.10	-0.07
CF25 - Burntisland to Granton (Intg Tickt + Inc Freq)	Spirit 50	2648	2373	£2.50	£1.83	0.51	0.33
CF26 - Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap)	Spirit 50	2835	2793	£2.50	£1.83	0.63	0.65

Table 9: Revised lower fare business plan summary (Patronage refinement with small vessels)

14.4. The following was recommended as the results of Phase 1

- Burntisland - Granton to become the preferred route.
- The Incat/Crowther CD701 or similar to become the preferred vessel.

15. Stagecoach Hovercraft Trial (Kirkcaldy – Portobello)

15.1. Stagecoach ran a trial hovercraft service across the Firth of Forth for two weeks from Monday 16 July to Saturday 28 July, excluding Sunday 22 July. A total of 22 services a day – 11 in each direction were promised between Kirkcaldy (Fife) and Portobello (Edinburgh).

15.2. This trial created an ideal opportunity to gather information in order to be able to validate and inform the previous business case assessment. Therefore, the data collection and assessment of the Hovercraft trial was included in the iTransfer project along with a contribution to the costs of a trial.

15.3. A 28-metre BHT130 hovercraft, manufactured by Isle of Wight-based Hoverwork Limited and incorporating the latest diesel engine technology, was used for the trial. The hovercraft travelled up the east coast from the Solent and, after initial trial runs, a special VIP trip was laid on for Friday 13 July. Subsequent trailing of arrangements for passengers was undertaken on the following Saturday and Sunday.

15.4. With a total of 32,099 passenger trips, the trial attracted greater patronage than had been anticipated by Stagecoach. As a result lengthy queues formed and Stagecoach eventually laid on extra crossings.

- 15.5. For those travelling to the Kirkcaldy hovercraft terminal by bus, fares were set at the same level as the single/return bus fare between Fife and Edinburgh and included concessionary fares. Peak-time services and integrated bus links were designed to accommodate commuters looking to avoid congestion on the Forth Road Bridge. Stagecoach concluded that 2,213 (6.9%) were commuters by assuming that the first two trips of the day were solely occupied by commuters. The figure does not include commuters during the afternoon and evening.
- 15.6. During the trial the Forth Rail Bridge was closed from Sunday 22 to Sunday 29 July 2007 by Network Rail so that it could renew a major set of points at Inverkeithing and improve drainage in the North Queensferry tunnel, thereby improving reliability. Trains from Edinburgh to Dundee or Aberdeen were diverted through Stirling and Perth, whilst services to / from Fife were replaced by buses. The work was timed to coincide with the Fife trade holiday and suspension of road works on the road bridge. This closure was announced well in advance and Stagecoach was quoted as having timed their hovercraft trial to coincide with the closure of the rail bridge.
- 15.7. Figures provided by Stagecoach gave an average daily patronage over the trial of 2,675 ppd with average revenue generated by the trial from fare paying passengers of £2.81. The breakeven patronage required by the Business Viability Assessment was 2,305 ppd at an average fare of £3.85 which is an increase of 840% on the patronage modelled by the Transport Model for Scotland (TMfS). Allowing for the fuel price and consumption figures achieved by Stagecoach on the trial, the breakeven patronage reduces to 2,000 ppd (at an average fare of £3.85).
- 15.8. Using the average fare (£2.81) and fuel consumption (290 litres per hour) generated by the Stagecoach trial, then the breakeven figure varied

between 3,375 and 3,550 ppd for fuel prices between 35 – 50ppl respectively.

15.9. However, from the 1,310 responses received to the Patronage Survey, nearly half the people who responded were travelling on the hovercraft for the experience, rather than to trial the hovercraft as a potential method of commuting.

15.10. This shows that the advertising for the trial had worked and that hovercraft, despite having been used continuously in the UK for over 40 years, still have attractions when introduced to a new area. This indicates a willingness amongst people to try out a new service (just as they did on the Solent in 1961). It also, perhaps, reflects the timing of the trial in the summer holiday rather than in a more “neutral” month (say May or October).

15.11. Average journey time was recorded as 17 mins with an operating speed of 37 knots. The operational statistics received from Stagecoach indicate that the hovercraft achieved a fuel consumption of 290 litres/hour, at an operational speed of 37knots. This would give an annual fuel cost of £511,166 at the quoted 45.9ppl. for 2 hovercraft over the 11.2 nautical mile journey (30min peak / hourly off-peak service). This compared favourably against the Phase 1 business plan assumptions of 669 litres/hour at an operational speed of 35knots at 40ppl, which gave an annual fuel cost of £1,083,463.

15.12. By removing payroll costs from the Business Plan and applying the hovercraft charter costs for the 2 week trial over an annual basis; this gave an annual hovercraft cost of £1,197,000. This figure would include for craft depreciation, accruals for interior and engine refits, maintenance, insurance, transport costs and profit and overheads. This was in line with the Business Plan allowance of £927,750 per hovercraft (exc. Transport and profit) and

thus was taken as a further validation of the Business Viability Assessment of a hovercraft service.

15.13. From the 231 responses received to the Residents' Survey that it was noted that 13% of residents objected to the hovercraft route remaining at the trial locations. Blocking the promenade and other environmental issues (i.e. noise; dust; car parking) seemed to be the main causes of concern for the local residents (particularly at Portobello).

15.14. It is concluded that running a successful hovercraft ferry service between Kirkcaldy and Portobello remains a high-risk business strategy. This view is supported by Stagecoach's initial request for £3.3m public subsidy for the first three years of operation and hence Burntisland – Granton remains the better option.

16. Service Levels and Vessel Selection

16.1. The Business Case predicts that patronage is maximised using the following techniques:

- Integrated ticketing - the cost of “through” ticketing (i.e. bus-ferrybus) is reduced in comparison with individual fares.
- Service Frequency - ferries offer a 20 min peak frequency and 30 min off-peak frequency.
- Adequate Car Park Facilities

16.2. A reduction in any or all of these services will see a significant reduction in patronage. In addition, there is certainly a strong link between quality of service and patronage. A good comparison can be made with bus

services where, for instance, Stagecoach has recently introduced an executive express service to Edinburgh with leather seats and internet access. Not surprisingly patronage figures have risen as a result. The table below provides a comparison of peak hour demand and supply with large catamarans and hovercraft figures provided for comparison purposes only.

Option	Type	Capacity	Peak Frequency	2012 patronage.	2022 patronage	2012 PHD	2022 PHD	2012 PH Cap	2022 PH Cap
(MVA 4)F - Burntisland to Granton	Catamaran	150	30	1618	1760	172	203	300	300
(MVA 5)D - Kirkcaldy to Seafeld	Hovercraft	150	30	875	775	118	203	300	300
CF26 - Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap)	Incat CD701	75	20	2835	2793	275	287	225	225
CF26 - Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap)	3 Incat CD701	75	15	2835	2793	275	287	300	300

Table 10: Route demand / capacity

16.3. Peak hour capacity is predicted at 275 passengers per hour (pph) in 2012 rising to 287 pph. However, operating a 75 pax. capacity vessel limits the route capacity to 225 pph at a 20min frequency. A greater capacity could only be achieved by using more ferries or increasing the size of ferry both of which have cost implications on the business plan. The bottom line of table 10 shows the effect on route capacity of providing 3no. 75 pax catamarans

which could satisfy a 15 minute frequency. At this peak hour frequency it is reasonably expected that patronage would increase above a 20 minute service.

- 16.4. It should be noted that public transport (PT) passengers can and do adjust their travelling times to avoid congestion. Thus, although a 225pph route capacity is 18% less than a 275pph capacity; capping the service at a 225pph level would not necessarily result in an 18% drop in revenue.

17. General Infrastructure

- 17.1. Having decided on a 75 pax size vessel and journey times of 20 minutes, the infrastructure necessary to support it needs to be designed. The most likely vessel will be a catamaran similar to the Incat Crowther CD701 approximately 6.0m wide, 17.5m long with a draught of up to 1.33m.

- 17.2. After taking incident wave period, incident wave approach and the frequency of maximum wave height occurrence into account, and assuming that the harbour beds are soft silt, a minimum maintained bed depth of 1.9m below Chart Datum is recommended for both harbours.

- 17.3. The passenger ferry will need good shore side facilities. However, these need to be tailored to the scale of the service being operated and the lifespan of those facilities. It is necessary to allow not only for growth of the service, but also for development plans for the area within which the facilities are located.

- 17.4. Some of these shore-side facilities need not be land-based but, instead, can be provided on the berthing pontoons. For instance, the London-based Thames Clipper service shows that, where land space is limited or is at a premium, waiting facilities can be provided on the berthing pontoon.

18. Common facilities to be provided

(A). A covered waiting area containing ticketing facilities which shelters the waiting passengers from wind and rain and provides limited seating.

(B). A linkspan and berthing pontoon onto which the passenger ferry can berth.

(C). Bus stop, taxi-rank and cycle lockers. Also there should be provision for the dropping off of 'kiss-and-ride' car passengers.

(D). Alternative transport links should the ferry not be able to run (i.e. due to extreme seas).

(E). Landscaping with the possible inclusion of public art. In order to “future proof” the ferry link, options within both harbours are proposed with a much enlarged pontoon. This would help by providing simultaneous berthing facilities for two ferries. In addition, an enlarged pontoon could provide better facilities for waiting passengers and more space on the land for future development by removing the need for a landside covered waiting facility. Ideally, the pontoon at Granton should be practically identical to that at Burntisland in order to keep design and fabrication costs to a minimum.

19. Harbours Considered in Detail

20. Burntisland Harbour

20.1. The harbour comprises of two inner harbours that can be impounded by sets of operational lock gates and an outer harbour. The northern inner

harbour (West Dock) is currently being used for industrial purposes whereas the eastern inner harbour (East Dock) is used for a number of commercial operations including a minesweeper degaussing station. Access to the inner harbours is via the outer harbour, which is well protected by existing piers.

20.2. Due to the shallower draft vessels now proposed for the route, dredging is not necessary for the chosen location within the outer harbour.

20.3. Three options were considered in detail

1. Option 1A – South Berth – Small Ferry – Pontoon (restrained)
2. Option 1B – South Berth – Small Ferry – Pontoon (piled)
3. Option 1B (3) – South Berth – Small Ferry – Large Pontoon (piled)

20.4. Pivotal to the business case is the provision of a car park at Burntisland. Assuming that the ferry service will be able to cater for the total demand, then 288 car park spaces are required in 2012 rising to 350 spaces in 2022.

20.5. Forth Ports' Development Plans do allow for extra car parking provision in the area however, the options generated provide for 257 spaces with a possible further 80 spaces provided in a two level mezzanine car park on land adjacent to the Burntisland Rail Station as suggested by Forth Ports

(Options 1A & 1B only). Car parking will need to be strictly close to the ferry as there is a possibility that spaces could be filled with non-ferry cars.

20.6. Burntisland is seen as providing the administrative centre for the ferry service. An administrative office could be incorporated within either a nearby office or retail complex both of which are contained within Forth Ports' Development Plans for the area. This could be limited to an office /administrative area, enquiries desk, limited waiting and toilets. Ideally the office should be located within 100m and line-of-sight of the linkspan head. In addition, maintenance and fuelling facilities are essential to keep the ferries operational. Burntisland has engineering facilities available in the West Dock and the preliminary costings include for a 42,000 litre self-bunded fuel storage tank. It would therefore be sensible for all the vessels providing the ferry service to have overnight berthing at Burntisland. This means that the first ferry movements in the morning will be originating from Burntisland.

21. Associated/Alternative Transport Links

21.1. Transport links to Edinburgh are provided with Burntisland Rail Station within 200m of the linkspan head and bus services which, at present pass through Burntisland town centre (within 500m) but could be diverted to the ferry linkspan head provided that the route of the temporary access road between Harbour Place and the swimming pool is maintained as a road in future development plans.

22. Burntisland Option Appraisal

Option 1A (incl. Mezzanine Car Park)	£2,421,600
Option 1B (incl. Mezzanine Car Park)	£2,406,100
Option 1A (excl. Mezzanine Car Park)	£1,461,000
Option 1B (excl. Mezzanine Car Park)	£1,257,000
Option 1B (3) (excl. Mezzanine Car Park)	£2,092,200

22.1. The above costs allow for preliminaries, a 15% design development allowance and a 10% allowance for design, cost and project management. No allowance is made for optimism bias.

22.2. If the mezzanine car parking is excluded from consideration, then Option B looks the better option. Concerns over the structural integrity of the slipway have led to need to secure the pontoon with piling rather than with guide rails off of the slipway and hence Option 1A should be regarded as carrying additional risk. However, Option 1B carries its own risk in connection to marine piling with no suitable borehole information.

22.3. Success of the service would quickly lead to the layout proposed in Option 1B becoming inadequate. Option 1B(3) offers a 'future-proofed' scheme with, in addition, facilities offering better passenger comfort with protection from the wind; rain and cold. These, in themselves, would encourage greater patronage.

22.4. At £2,092,200, the cost includes a £62,000 allowance for the design and installation of a 42,000 litre fuel tank to secure fuel supplies at a cheaper cost than direct tanker delivery to the vessels.

23. Granton Harbour

23.1. Granton Harbour is an artificially enclosed harbour that is now largely unused and is being heavily redeveloped. It comprises of two external Breakwaters (East and West) that encloses a significant body of water. Centrally through the harbour is a pier (named the Middle Pier). To the east of this pier the harbour is generally open for navigation although the landward half of this area is a shallow mudflat (which is also a SSSI and SPA).

23.2. The rest of the navigable portion of the eastern area would appear to have experienced significant deposition. To the west of the Middle Pier there has been ongoing reclamation and recent development on a significant scale. Three options were considered in detail:

1. Option 1A – East Berth – Small Ferry – Pontoon (restrained)
2. Option 2 – West Berth – Small Ferry – Pontoon (restrained)
3. Option 2A – West Berth – Small Ferry – Large Pontoon (piled)

23.3. General

23.4. In spite of the shallower draft vessels now proposed for the route, each layout will still require dredging, albeit less than originally proposed. The west berth offers a deeper channel and dredging volumes are much reduced over the eastern option.

24. Associated/Alternative Transport Links

24.1. Alternative transport links are slightly more problematic at Granton (than Burntisland). There are no stations located within easy access of Granton Harbour. The nearest station is Edinburgh Haymarket approximately 4 km into the city centre. However, Phase 1 of the Edinburgh tram link has received the go-ahead from the Scottish Government.

24.2. Phase 1b of the tram project is proposed to run south from Granton linking with Phase 1a at Haymarket. This will provide a much closer tram stop to the ferry terminal (approx.500m). Forth Ports have confirmed that Lothian Buses propose to run route 17 into the Granton Harbour development. Bus routes 47 and X47 already connect from the road at the root of the harbour to the city centre.

25. Granton Option Appraisal

East Berth Option 1A	£883,200
West Berth Option 2	£824,700
West Berth Option 2A	£1,329,000

25.1. The above costs allow for preliminaries, a 15% design development allowance and a 10% allowance for design, cost and project management. No allowance is made for optimism bias.

25.2. Option 2 looks the better option since it is cheaper and offers slightly better protection from NE seas. However, success of the service would quickly lead to the layout proposed in Option 2 becoming inadequate. In addition, the facilities provided in Option 2B offer better passenger comfort with protection from the wind; rain and cold which, in themselves, would encourage greater patronage

26. Business Viability Assessment

26.1. The table below takes into account the new infrastructure maintenance and liability cost from the Phase 2 and summarises it against the best patronage - vessel option (CF26). The 150 pax catamaran and the Kirkcaldy to Seafield hovercraft (150 pax) options are summarised for comparison

purposes. (Note: The revised infrastructure costs for Burntisland – Granton are not included in the comparison lines). It also summarises the effect on the costs (and bottom line) of providing 3no. 75 pax catamarans (Incat CD701).

Option	Type	2012 Pat	2022 Pat	Peak fares	Inter peak fares	2012 AOP	2022 AOP
(MVA 4)F - Burntisland to Granton	Catamaran	1618	1760	£2.50	£1.85	-1.15	-1.04
(MVA 5)D - Kirkcaldy to Seafield	Hovercraft	875	775	£3.00	£2.20	-3.17	-3.27
CF26 - Burntisland to Granton (Intg Tick + Inc Freq + No P&R Cap)	Incat CD701	2835	2793	£2.50	£1.83	0.64	0.61
CF26 - Burntisland to Granton (Intg Tick + Inc Freq + No P&R Cap)	3 Incat CD701	2835	2793	£2.50	£1.83	0.26	0.22

Table 11: Lower Fare business plan summary

27. Patronage Fares Annual Operating Profit (£m)

27.1. What the table does not show, is the upside to patronage generation that a 15 minute peak service would provide over and above the 20 minute service modelled. Further modelling is needed to determine the extent of this upside. This enhancement is only available with 3 vessels.

27.2. Sensitivity

27.3. It is prudent to check the sensitivity of the Business Viability case to key factors. Fare levels and fuel prices are considered in the following sections.

28. Fare Levels

28.1. An average single fare (peak & off-peak combined) that would enable the service to breakeven would be £1.55 for the 2no Incat service or £2.02 for the 3 ferry service. The average single fare used in the Business Viability Study is £2.29.

28.2. These figures are based on the assumption that patronage would remain constant. As has been established, there is an inversely proportional relationship between fares and patronage (i.e. as fares go up, so patronage goes down). However, with the breakeven fares quoted as less than modelled, then it is reasonable to assume that the fares could be depressed further before the breakeven point is reached.

29. Fuel Prices

29.1. Fuel prices would have to rise to £1.67 per litre for the 2no Incat service or £0.70 per litre for the 3 ferry service from its present level (at the time of the study) of between 40 to 48 ppl in order to wipe out any profit. Whilst a 46% rise in fuel prices was considered possible in the present climate of rising fuel prices (i.e. from 48 to 70ppl), this would take some time to come about.

30. STAG Appraisal - The Appraisal Process

30.1. Scottish Transport Appraisal Guidance - more commonly referred to as STAG - outlines a process that assists transport planners and decision makers in the development of multi modal transport policies, plans, programs and projects.

30.2. It is an objective-led process that seeks to avoid the traditional solution-led approach and requires transport planners to identify what it is they are trying to achieve **before** identifying the means of achieving it.

30.3. A STAG appraisal has two parts:

- Part 1: this is an initial appraisal and broad assessment of impacts designed to decide whether a proposal meets the planning objectives, fits with relevant transport, land use and other policies and hence should proceed to –
- Part 2: the detailed appraisal against the Government's objectives.

30.4. The options have previously been compared but a review highlights the following issues:

- Increased patronage and reduced fuel consumption improves CO2 emission reduction.
- Shallower vessels and optimising the pontoon location minimizes the dredging volume required.
- Providing 3 vessels encourages job creation above 2 vessels.
- Increased service frequency reduces overall journey time and increases overall journey efficiency.
- The site option integrates well with other developments planned by Forth Ports plc.
- The profitability predicted for the service provides an economically viable scheme and provides a greater opportunity to minimise the fare to break-even.

30.5. Using the previously used objectives (see 3.1.11) the following option appraisal matrix was developed:

Objective	Option F Catamaran service between Burntisland and Granton	Option F1 Catamaran service between Burntisland and Granton (2 no.Incat CD701)	Option F2 Catamaran service between Kirkcaldy and Granton (3 no.Incat CD701)
1	8	9	9
2	3	9	9
3	7	7	7
4	4	4	4
5	4	6	6
6	7	8	8
7	5	5	5
8	5	6	7
9	6	5	5
10	1	9	7
11	5	5	5
12	5	7	7
13	8	8	8
14	8	8	8
15	3	5	5
16	8	8	8
17	5	5	5
18	5	8	7
19	5	5	5
20	6	6	6
21	5	5	5
Total	112	138	136

Table 12: Option appraisal matrix

31. Conclusions of Initial Review

31.1. Patronage

31.2. Patronage is sensitive to journey time savings through ease of access to the service (i.e. car parking, public transport provision) and service frequency (i.e. frequency of crossings).

31.3. Patronage is sensitive to service fare levels in comparison with other transport modes.

31.4. Patronage is projected to be 2,835 ppd for a peak service frequency of 20 minutes (Single Fare: £2.50) and an inter-peak frequency of 30 minutes (Single Fare: £1.83). These fares are set at 50p below existing public transport fares.

31.5. Initial car park provision at Burntisland should be 288 car park spaces in 2012 rising to 350 spaces in 2022 in order to achieve patronage projections.

32. Infrastructure

32.1. Burntisland

32.1.1. South Berth Option 1B (3.5.2) is the cheapest option at £1.26m (excluding mezzanine car parking). This option provides protection from the wind and rain for passengers waiting behind the linkspan head. It does not provide protection for passengers walking down the linkspan or waiting on the pontoon.

32.1.2. South Berth Option 1B(3) (3.5.6) is estimated at £2.09m (excluding mezzanine car parking). This option provides an expanded

facility sufficient to enable simultaneous berthing of two ferries and overnight berthing for up to four. It reduces the land ‘footprint’ by removing the covered waiting facility and, instead, providing protection for passengers walking down the linkspan and embarking from the pontoon from the wind and rain. It also offers a heated waiting room on board the pontoon.

32.1.3. A linkspan head in the north-west corner of East Dock would provide a closer link to the railway station and future retail development in the area although its use has been ruled out by Forth Ports for the next 8 –10 years due to ongoing industrial maritime operations. If future use dictates that water impounding is no longer required in East Dock and it is desired to keep this option open, then the design and fabrication of the berthing pontoon will need to be restricted to a maximum width of around 16m (to be confirmed by survey) in order to pass through the Dock Gates.

32.1.4. Maintenance and refuelling facilities are essential to keep the ferries operational. Burntisland has engineering facilities available in the West Dock and the preliminary costings (above) include for an allowance of £62,000 for a 42,000 litre self-bunded fuel storage tank.

32.1.5. Burntisland is seen as providing the administrative centre for the ferry service. An administrative office could be incorporated within either a nearby office or retail complex both of which are contained within Forth Ports’ Development Plans for the area.

32.1.6. Other planning concerns are connected with any archaeological remains of the ‘East Head Fort’, indicated as being located close to the root of Middle Pier and the category B listing of the harbour walls.

32.1.7. Burntisland Harbour offers good alternative transport links for passengers (i.e. bus / railway) should the ferry not be able to run due to poor sea conditions.

32.2. **Granton**

32.2.1. West Berth Option 2 (3.5.12) is the cheapest option at £0.82m. This option provides protection from the wind and rain for passengers waiting behind the linkspan head. It provides little protection for passengers walking down the linkspan or waiting on the pontoon.

32.2.2. West Berth Option 2A (3.5.15) is estimated at £1.33m. This option provides an expanded facility sufficient to enable simultaneous berthing of two ferries. It reduces the land 'footprint' by removing the covered waiting facility and, instead, providing protection for passengers walking down the linkspan and embarking from the pontoon from the wind and rain. It also offers a heated waiting room on board the pontoon.

32.2.3. West Berth Option 2A offers an integrated solution with Forth Ports' revised masterplan that would probably be acceptable to City of Edinburgh planners.

32.2.4. The West Berth Option presents minimal interference with existing users of Granton Harbour.

32.2.5. Granton Harbour, at present, has poor alternative transport links for passengers should the ferry not be able to run due to poor sea conditions but this could be addressed through improved bus and new tram links.

32.3. **General**

32.3.1. An additional allowance of £100,000 should be made for additional CCTV coverage, security and communications provisions such as real-time ferry location information for passengers.

33. Business Viability

33.1. The Business Viability case indicates a potential profit of around £0.61m – £0.64m for the preferred route and vessels (2no2). The Business Viability case indicates a potential profit of around £0.26m – £0.22m for the preferred route and vessels (3no). However, provision of 3 vessels presents the opportunity of further increasing service frequency (i.e. every 15 mins) which would lead to greater patronage. This additional patronage has not been allowed for.

33.2. The Business Viability case is robust in that the break-even fare levels are significantly below those used to generate the patronage (11% / 32% below for 3 / 2 vessels respectively) and fuel prices would have to rise to £0.70 / £1.67 per litre to wipe out any profit (46% / 348% for 3 / 2 vessels respectively).

33.3. The revised infrastructure costs make little difference to the business viability provided that the initial capital costs are borne by the public sector and do not have to be repaid from within the operating costs by loan from the private sector.

33.4. The running costs of a third small ferry does make a significant impact on the profit generation but the upside effect on patronage resulting from this third vessel and the service frequency enhancement that it could offer is not taken into account. However, the service still makes a reasonable 11.4% profit on turnover before interest and tax.

34. Detailed Review

34.1. Having established more robust assessments of the costs and viability of potential options, more detailed assessments were carried out on port infrastructure and vessels to refine to the business viability.

34.2. Design and Ground Conditions

34.2.1. The conceptual design of the infrastructure remains similar to that considered in the Initial Review. Where possible infrastructure has been transferred to the pontoons and good quality, modern passenger interchange standards adopted. This is backed by good quality information technology.

34.2.2. Enlarged pontoons continue to be proposed to “future-proof” the service and enable simultaneous berthing by two 75 pax. ferries.

34.2.3. Discussions with the bus companies have not altered the layouts; however the HAZID workshop identified changes necessary in the positioning and orientation of the pontoon at Granton which has resulted in a longer linkspan

34.2.4. Discussions with both Fife and CEC Planners have noted that the infrastructure should be sympathetic with the heritage status of both harbours and that 1.25m high barriers need to be established on harbour wall copings to protect both vehicles and pedestrians.

34.2.5. These changes have resulted in small but significant increased capital costs at both harbours which are discussed further below. In addition the DDA audit identified the need for clear signage and travel information along with more adequately to consider the need for access between the pontoon and the vessel.

35. **Burntisland Harbour**

35.1. Option 1B (P4) – South Berth – Small Ferry – Large Pontoon (piled)

35.1.1. This layout is similar to Option 1B (3) as previously described

35.2. The report is based on ground conditions determined by two site investigations. A marine borehole was cored at the proposed site of the pontoon during August 2008 by Glover Site Investigations Ltd. Land-based boreholes and trial pits were undertaken during November 2008 by Norwest Holst (Scottish Soils). Laboratory testing was undertaken for both site investigations.

36. **Granton Harbour**

36.1. Option 2C (P4)– West Berth – Small Ferry – Large Pontoon (piled)

36.1.1. This layout is similar to Option 2A, the main changes are the revised location and orientation of the pontoon which resulted from the HAZID workshop and the revised location of the bus turning circle.

36.1.2. The report is based on ground conditions determined by a third party site investigation (Nicholson Site Investigation – 2001) and information provided in a Landmark Envirocheck Report and publically available records. The Nicholson Site Investigation consisted of both land-based trial pits and land-based and marine boreholes.

37. **Planning**

37.1. **Burntisland Harbour**

- 37.1.1. The Middle Pier has informal fishing boat storage upon it and general tipping. This is an area subject to Royal Charter stretching back to King James IV of Scotland which allows local residents to use the area in connection with boating operations.
- 37.1.2. This would require planning permission from Fife Council for a change of use as car parking development is not within the permitted development rights of Forth Ports and the harbour.
- 37.1.3. Phase 3 has also determined that this land is “common land” and, hence, is not in the ownership of Forth Ports. An agreement will have to be reached with the residents of Burntisland if this land is to be used.
- 37.1.4. The OS map obtained for this project identifies that the ‘East Head Fort’ was located close to the root of Middle Pier. This may have implications on the development in terms of buried archaeology. In addition, most of the walls within the harbour are listed with a category B status.
- 37.1.5. It will be imperative to minimise any works upon these due to their status. Land based Site Investigations will help to determine some of these implications. Forth Ports’ development plans do not yet contain facilities for a ferry terminal. However, as discussed above, there is sufficient water depth either side of the pier to the north of the East dock gate and Forth Ports’ proposals for either side of this pier could be made to accommodate the requirements of the ferry terminal.
- 37.1.6. Forth Ports’ development plans also indicate the provision of a road between Harbour Place and the swimming pool to the east of East

Dock. There is a temporary public access road already built to enable Network Rail to begin replacement work of the low railway bridge to the west of Burntisland Station. This offers access for high-sided vehicles to the harbour necessary for buses to operate the route efficiently.

37.1.7. Discussions with Fife Council Planners have resulted in the following requirements before planning permission will be given for the car park:

- Transport Assessment & Statement
- Noise Assessment & Environmental Impact Assessment
- Listed Building Consent
- Archaeological Assessment
- Site Plans

38. Transportation Assessment

38.1. Fife Transportation required the assessment to address the following points at Burntisland:

- Traffic to and from the ferry
- Sustainable links to the ferry
- Origin Destination of users
- Impact of major and minor junctions in the area
- Access to harbour, High Street, Lammerlaws Bridge
- Low Bridge (not suitable for double-deckers)
- Rail Sidings

38.2. The assessment identified access from Harbour Place coupled with reinstatement of an access from the roundabout adjacent to the Beacon Leisure Centre as being the most efficient points of access to/from the development site by sustainable modes to maximise accessibility for pedestrians, cyclists and public transport users. These access points minimised the impact of development-related traffic on the existing road network, particularly Burntisland High Street.

39. Environmental Impact

39.1. Archaeological and Environmental Assessment

39.1.1. An assessment will require footprint plans of all infrastructures which may affect the sub-structure of both the land and marine environment.

39.2. Planning - Granton Harbour

39.2.1. Discussions with CEC Planners have revealed that they would like the following issues to be addressed at Granton:

- Detail of the bankseat area to retain the openness of Heron Square, protect residential amenity for adjacent residential units, ensure public access to the promenade is not compromised (prefer location on Middle Pier).

- Submission of details of the surface finishing/markings/furniture on Middle Pier
- One large bus shelter
- Enhanced weather protection on the pontoon required (i.e. open-air route from waiting room to ferry)
- Submission of artist's impressions of pontoon and linkspan given the proximity to residential units.

39.3. **SEStran Environmental Appropriate Assessment**

39.3.1. SEStran has undertaken an independent Appropriate Assessment on the Cross-Forth Ferry using consultants Natural Capital Ltd.

39.3.2. This study has been undertaken as a Post Adoption Statement (PAS) to SEStran's Strategic Environmental Assessment (SEA) to SEStran's Regional Transport Strategy (RTS). This study has identified the particular types of environmental impact associated with the Cross-Forth Ferry that have the potential for adverse effects on the integrity of European sites within the SEStran area.

39.3.3. The assessment identifies mitigation measures to avoid/reduce these effects so that the integrity of the sites is not affected. This demonstrates that the measures with potential to affect the European sites in the RTS can be mitigated to avoid adverse impact.

40. Firth of Forth SPA and RAMSAR Site Water Pollution

40.1. Ecology – General

- Some likely small-scale habitat loss but mitigation should keep this to an absolute minimum
- Some short-term disturbance to birds likely during construction period but no long-term residual effect anticipated
- The mitigation should ensure that appropriate biodiversity enhancement measures are incorporated into final restoration.
- This could provide opportunities to improve the conservation status in areas around the works

40.2. Water Pollution

- No long-term adverse effects predicted on water quality
- No corresponding damage to estuarine processes and associated habitats predicted

40.3. Ecology – General

- Some likely habitat loss but mitigation should keep this to an absolute minimum
- Some short-term disturbance to birds likely during construction period but no long-term residual effect anticipated
- The mitigation should ensure that appropriate biodiversity enhancement measures are incorporated into final restoration. This could provide opportunities to improve the conservation status.

41. Project-based Appropriate Assessment

41.1. The construction works and operation of the ferries could potentially affect three sites of European importance. The Appropriate Assessment Report comprises statements to inform Appropriate Assessments for these three Natura 2000 sites which are known as the River Teith Special Area of Conservation (SAC), the Forth Islands Special Protection Area (SPA) and the Firth of Forth SPA and Ramsar site.

41.2. A desk study review and site visit were undertaken to inform the assessment of potential impacts. These revealed that the ferry crossing would avoid the coastal waters which form part of the Forth Islands SPA and that the part of the Firth of Forth SPA that is within Granton Harbour would not be directly affected. Nevertheless, the proposals could affect the qualifying bird species. Under the current proposals, the likely impacts on the Forth Islands SPA and the Firth of Forth SPA qualifying bird species are as follows:

41.2.1. Direct Impacts

- Disturbance to the qualifying bird species whilst roosting, loafing or feeding within Granton or Burntisland Harbour during the construction and operation phase;
- Disturbance to the qualifying bird species whilst roosting, loafing or feeding within the Firth of Forth channel during the operation phase; and
- Minor oil and/or fuel spills during operation.

41.2.2. **Indirect Impacts**

- Minor oil and/or fuel spills during operation; and
- Changes in sedimentation and habitat quality in Granton Harbour brought about by dredging.

41.2.3. However, if the mitigation measures are implemented, then the development proposals would lead to No Significant Effects on the Forth Islands SPA. Similarly there would be No Significant Effects on the Firth of Forth SPA. These mitigations measures are:

- The ferries will be designed specifically to minimise wake
- The ferries will come under the Clearwater Forth plan which is the oil spill contingency plan and co-ordination scheme for response to waterborne oil pollution incidents in the Firth of Forth Harbour Area. Normal environmental site controls will be expected to be applied to Contractors working on site.
- Release of sediment into the water column from dredging operations is minimised.

41.3. The RSPB and Scottish Natural Heritage also concurred with this view and the appropriate Assessment has not been taken any further.

42. **Business Viability Assessment**

42.1. **General**

42.1.1. FMBA Marine was approached to provide a budget estimate based on the Functional Vessel Specification. In addition, cost estimates of the revised and more detailed infrastructure plans have been undertaken and the revised estimates have been included in an updated Business Plan which is summarised below.

42.2. Vessel

- Specialist Shipbuilder FMBA Marine (based in the Cebu, Philippines) has provided a budget price based 2 vessels being delivered together. The price is based on a ferry specification - 27knots / 75 pax / HSC 2000 Cat A (using a BMT Nigel Gee Proven Hull form design).
- Price : £3 million
- Delivery : approx. 15months for 2 vessels

42.3. This is regarded as an upper limit on the vessel price as smaller ferries, such as is being proposed) can be built in local shipyards which do not necessarily carry the high overheads of the larger international yards.

42.4. The previous estimate of £840,000 is still regarded as being realistic but vulnerable to the availability of credit in the present market.

43. Burntisland Harbour

Current estimate of capital costs

Burntisland Initial estimate	£2,750,000
Phase 2: Option 1B(3) (exc. Mezzanine Car Park)	£2,092,200
Phase 3: Option 1B(P4)	£2,633,400

43.1. The above costs allow for preliminaries, a 5% design development allowance and a 10% allowance for design, cost and project management.

43.2. Main increases from the Phase 2 estimate are as follows:

- geogrid provision for access and circulation roads
- conservation grade pedestrian paving
- pedestrian and vehicle containment barriers
- extra car park entry / exit barrier
- specific allowances for utility supplies & waste removal
- lubricant and waste lubricant tank provision

44. Granton Harbour

Current estimate of capital costs

Granton Initial estimate	£4,797,000
Phase 2 West Berth Option 2A	£1,329,000
Phase 3 Option 2C (P4)	£1,989,900

44.1. The above costs allow for preliminaries, a 5% design development allowance and a **10%** allowance for design, cost and project management.

44.2. The design development allowance has been reduced from the previous 15% assumed due to the greater detail now developed. No allowance is made for optimism bias but the Strategic Risk Assessment has suggested a contingency value for the total scheme

44.3. Main increases from the Phase 2 estimate are as follows:

- significant layout change to bus turning circle, access and circulation roads
- increase in linkspan length
- specific allowances for utility supplies & waste removal

44.4. Combined Capital Costs

44.4.1. Capital Cost

Land-based Infrastructure

Burntisland	£ 2,633,400
Granton	£ 1,989,900
Sub-Total	£ 4,623,300

Ferries

Vessel (2 no. – 75 pax.)	£ 1,680,000
---------------------------------	--------------------

Scheme Total	£ 6,303,300
---------------------	--------------------

45. Business Plan Summary

45.1. The table below takes into account the new infrastructure maintenance and liability cost from the above and summarises it against the best patronage - vessel option (CF26). The 150 pax catamaran and the Kirkcaldy to Seafield hovercraft (150 pax) options are summarised for comparison purposes. It also summarises the effect on the costs (and bottom line) of providing 3no. 75 pax catamarans (Incat CD701) and the equivalent FBMA budget estimate.

Option	Type	2012 pat	2022 pat	Peak fares	Inter peak fares	2012 AOP	2022 AOP
MVA 4)F - Burntisland to Granton	Catamaran	1618	1760	£2.50	£1.85	-1.15	-1.04
(MVA 5)D - Kirkcaldy to Seafield	Hovercraft	875	775	£3.00	£2.20	-3.17	-3.27
CF26 - Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap) CD701	Incat	835	2793	£2.50	£1.83	0.72	0.69
CF26 - Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap)	FMBA	2835	2793	£2.50	£1.83	0.62	0.58
CF26 - Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap) CD701	3 Incat	2835	2793	£2.50	£1.83	0.25	0.22
CF26 - Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap)	3 FBMA	2835	2793	£2.50	£1.83	0.09	0.06

Table 13: Lower fare business plan summary

45.2. What table 13 does not show is the upside to patronage generation that a 15 minute peak service would provide over and above the 20 minute service modelled. Further modelling is needed to determine the extent of this upside. This enhancement is only available with 3 vessels.

45.3. Sensitivity

45.3.1. It is prudent to check the sensitivity of the Business Viability case to key factors. Patronage, Fare levels, fuel prices and an alternative procurement strategy are considered in the following sections.

45.4. **Patronage**

45.4.1. The breakeven patronage for the Incat CD701 vessels (2no.) is 1,940. If a reserve vessel was also purchased then the breakeven patronage increases to 2,100.

45.4.2. If the FBMA vessel costs are taken into account, then average daily patronage that would enable the service to breakeven would be 1,975 for the 2no FBMA service or 2,300 for the 3 ferry service.

45.5. **Fare levels**

45.5.1. Infrastructure costs make little difference to the operating profit / loss of the service. Hence the assumptions remain valid. An average single fare (peak & off-peak combined) that would enable the service to breakeven would be £1.55 for the 2no Incat service or £2.02 for the 3 ferry service. The average single fare used in the Phase 2 Business Viability Study is £2.29.

45.5.2. If the FBMA vessel costs are taken into account, then average single fare (peak & off-peak combined) that would enable the service to breakeven would be £1.66 for the 2no FBMA service or £2.20 for the 3 ferry service. These figures are based on the assumption that patronage would remain constant. As has been established, there is an inversely proportional relationship between fares and patronage (i.e. as fares go up, so patronage goes down). However, with the breakeven fares quoted

as less than modelled, then it is reasonable to assume that the fares could be depressed further before the breakeven point is reached.

45.5.3. It should also be noted that fare levels have been set at 50p less than the equivalent train fare at the time that initial studies were undertaken. Since then train and bus fares have risen in reaction to recent hikes in fuel prices. Train fares have increased by 15% and bus fares by 10%. A Peak Adult Single Rail Fare between Burntisland & Edinburgh at the time of the study £4.80 (Peak Return: £8.90). HSC ferry trials by Stagecoach between Brixham and Torquay have charged £4.00 (Adult: Single) for a 15 minute crossing. Thus it would be reasonable to conclude that ticket prices could be increased from those used to create the patronage model without losing too much patronage if any.

45.6. Fuel Prices

45.6.1. Fuel prices would have to rise to £1.67 per litre for the 2no Incat service or £0.70 per litre for the 3 ferry service from its present level of between 40 to 48 ppl in order to wipe out any profit.

45.6.2. As noted, a 46% rise in fuel prices is not inconceivable in the present climate of unstable fuel prices (i.e. from 48 to 70ppl), however long-term trends should be assumed for business planning purposes. An annual compounded rise of 3.8% per year for the next 10 years would see this price level come about. It would take 34 years for the same compounded rate to increase price levels to £1.67 per litre.

45.6.3. For the FBMA vessel costs are taken into account fuel prices would have to rise to £1.48 per litre for the 2no FBMA service or £0.50 per litre for the 3 ferry service in order to wipe out any profit. No

difference in performance between the Incat & FBMA vessels is assumed.

46. Finance

46.1. Prudential Borrowing

46.1.1. The Public Works Loan Board has been set up by the UK Government to meet all of a local authority's legitimate need for long-term borrowing. Two types of loan are available from the Board:

- Fixed rate loans, on which the rate of interest is fixed for the life of the loan, and
- Variable rate loans, on which the rate of interest is variable, at one, three or six monthly intervals. Once chosen, the interest payment period will remain unchanged throughout the life of the loan.

46.1.2. There is an option to replace a variable rate loan with a fixed rate loan and vice versa.

46.1.3. Fixed rate loans are repayable by one of the following methods:

- Annuity: fixed half-yearly payments to include principal and interest; or
- EIP: equal half-yearly instalments of principal together with interest on the remaining outstanding balance; or
- Maturity: half-yearly payments of interest only with a single repayment of principal at the end of the term.

46.1.4. Variable rate loans are repayable by one of two methods:

- EIP: equal monthly, quarterly or half-yearly instalments of principal together with interest on the remaining outstanding balance; or
- Maturity: monthly, quarterly or half-yearly payments of interest only with a single repayment of principal at the end of the term.

46.2. **Commercial Borrowing**

46.2.1. Commercial Loans are charged according to the Base Rate, the Commercial Rate and the Liquidity Risk. Loans taken out on the commercial markets now vary between 6 – 7% for borrowing under 5 years but this rate can be exceeded according to the liquidity and refinancing.

46.3. **Alternative Procurement Strategy**

46.3.1. The alternative procurement strategy presently under consideration by the Steering Group is:

- Public sector provision of the port infrastructure
- Private Operator appointed to supply and operate the service

46.4. **Public Sector (JVC)**

46.4.1. The infrastructure would be provided by a Joint Venture Company (JVC) formed from the steering group organisation. A landing charge or leasing arrangement would be levied on the private sector operator to cover the ferry terminal costs such as property lease and rates, routine maintenance (i.e. cleaning), utilities, depreciation, marketing budget and office sundries.

46.4.2. These are built into the business model and amount to £101,000 pa. There is also a capital maintenance allowance associated with repainting etc. amounting to £31,015 pa (i.e. 5% of the Capital Cost).

46.5. Private Operator

46.5.1. With respect to the cost of leasing or finance servicing of borrowing for the vessels, the business viability model allows for capital depreciation over 20 years amounting to £84,000 pa plus £110,000 pa for cabin refurbishment and engine replacement (Capital Cost: £840,000 per vessel).

46.5.2. If the vessels are leased (as new) then it is assumed that the leasing charge will allow for the above and, in addition, will want a return. This return could amount to between 20 – 30% depending on the leasing company's view of the risk. This would give a leasing charge per annum broken down as follows:

• Financing Charge	£ 117,600
• Capital Depreciation	£ 84,000
• Cabin Refurbishment / Engine Replacement	£ 110,000
• Return on investment (25%)	£ 78,000
• Total Leasing Charge	£ 389,600

47. STAG Appraisal

47.1. In Scotland transport proposals that require Government funding, support or approval have to be appraised using the Scottish Transport Appraisal Guidance (STAG, June 2008). Additionally, the use of STAG is

encouraged in other circumstances when there is a need for change in the transport system including:

- Considering public transport and road network coverage;
- Assessing measures to improve the reliability of the transport network;
- Assessing issues in relation to the safety of the transport network;
- Access to services; and
- Land-use development.

47.2. The proposals for a passenger ferry service across the Forth Estuary have been appraised in line with STAG not because it requires Government funding, support or approval but to identify the most appropriate transport option in accordance with the best practice guidance (STAG) and because the proposed ferry service has the potential to change public transport coverage in the southeast region of Scotland.

47.3. The preferred scheme was assessed against the revised STAG criteria in comparison with a do-minimum scenario which is to not introduce a ferry service. The results are summarised below:

- **Environment:** There will be no significant effects on adjacent, designated SAC; SPA and Ramsar sites. There will be some additional noise resulting from traffic associated with the scheme and minor air quality effects (Edinburgh: Positive – Burntisland: Negative). Views are likely to be enhanced by the proposals and no significant ground contamination issues are thought likely. Sensitivity will be required in connection with historic features within both harbours.

- **Safety:** There will be no measurable change in accidents as a result of the scheme but safety in the local area will be enhanced through improved lighting and security.
- **Economy:** The economic efficiency of the scheme results in a NPV Benefit value of £17.4m in 2002 prices giving a corresponding BCR of 1.65. The service has the potential to attract 83,000 trips (one-way) by tourists / leisure users (i.e. 41,500 tourists) equating to a £40.8m boost to the local economy over the 60 year appraisal period. This would particularly help local businesses and the community in Burntisland.
- **Integration:** Overall it is anticipated that the ticketing system and interchange arrangements at the harbours will assist in providing seamless travel. The quality of infrastructure and information provided is judged to be high. The ferry integrates well into development plans for Burntisland and Granton and will enhance rather than detract from regeneration efforts.
- **Accessibility:** The ferry has been designed to be DDA compliant. It has the potential to beneficially influence a number of zones in Fife and Edinburgh, 26 of which are on the Index of Multiple Deprivation in 2006 in Fife. The do-minimum scenario would bring about a worsening of the transport situation between Fife and Edinburgh with increasing congestion.

48. General (Risk and Opportunity)

48.1. Hyder was responsible for updating the Risk and Opportunity Register regularly with the purpose of monitoring the status of the risks and opportunities at a given moment in time. The intention is that the Register is

used as a project management tool with actions against the higher risk items prioritised over the lower.

48.2. Comments and representations from any stakeholder have been added to the register where appropriate. A HAZID assessment and a Strategic Risk Assessment have been undertaken to further the Risk and Opportunity Register. The risks were divided into the following key areas ranging from strategic to technical:

- Political Strategic
- Legal
- Procurement
- Environmental
- Infrastructure
- Operational Technical

48.3. The Health and Safety of users of the service has been given the highest priority throughout the assessment. This is either implicit in the risk/opportunity under consideration or has been explicitly stated.

48.4. The following is a list of identified continuing “showstopper” risks:

- Loss of political support
- Failure to secure funding
- No operator can be found to run the service.
- Value for Money is not demonstrated in the procurement strategy.
- Forth Ports plc fail to confirm that land is available for the proposed ferry infrastructure.

48.5. No showstoppers have been closed as a result of actions taken within Phase 3.

49. High Risk Items

49.1. The Strategic Risk Assessment workshop succeeded in placing values against the likelihood and impact of the risks both previously identified and newly identified in Phase 3. This has resulted in a reduction in the number of risks classified as high level as either their likelihood is not considered as great or their impacts are considered to be not as severe as previously thought (or both).

49.2. The following is a list of the top high risk items which remain to be addressed:

- The funding of lifecycle replacement of the vessels and infrastructure
- One contract delaying another contract
- Weather Delays
- Unknown ground conditions at Burntisland Harbour leading to problems during construction
- Unknown ground conditions at Burntisland Harbour leading to problems with completed infrastructure
- High-sided access to the bus turning circle at Burntisland is not secured

- A new Forth Road bridge crossing is being planned which could have a significant impact on the estimated patronage for the ferry service.
- Planning permission may be refused (i.e. Burntisland Car Park)

50. Opportunities

50.1. The following is a list of the greatest opportunities identified for the scheme:

- In-service gain of reputation, and hence patronage, due to operator service improvements
- Increase in land values due to the presence of the ferry.
- An Operator License Auction could raise greater finance than predicted.
- Other schemes in the area could provide Section 75 contributions to the ferry service.
- Local support could be gained by good consultation / PR.

51. Appropriate Contingency

51.1. The recommendations of the Strategic Risk Assessment were that:

- The scheme should carry an optimism bias of £1,700,000 for capital expenditure.

- The scheme should carry an optimism bias of 17 months for program.
- The business plan should carry an optimism bias of £500,000 per annum for profit.
- Opportunities exist to reduce the optimum bias but these should not be taken into account until positive plans are made to quantify and capture them.

51.2. These are further reduced by the completion of the Transport Assessment, Appropriate Environmental Assessment and Ground Condition Investigations. The recommendations now are that:

- The scheme should carry an optimism bias of £1,400,000 for capital expenditure.
- The scheme should carry an optimism bias of 15 months for the programme.
- The business plan should carry an optimism bias of £475,000 per annum for profit.
- Opportunities exist to reduce the optimum bias but these should not be taken into account until positive plans are made to quantify and capture them.

52. Conclusions of Detailed Review

52.1. Infrastructure

52.1.1. **Burntisland**

52.1.2. South Berth Option 1B (P4) is estimated at £2.63m. This option provides a facility sufficient to enable simultaneous berthing of two ferries and overnight berthing for up to four. It reduces the land ‘footprint’ by removing the covered waiting facility and, instead, providing protection for passengers walking down the linkspan and embarking from the pontoon from the wind and rain. It also offers a heated waiting room on board the pontoon.

52.1.3. A linkspan head in the north-west corner of East Dock would provide a closer link to the railway station and future retail development in the area although its use has been ruled out by Forth Ports for the next 8 – 10 years due to ongoing industrial maritime operations. If future use dictates that water impounding is no longer required in East Dock and it is desired to keep this option open, then the design and fabrication of the berthing pontoon will need to be restricted to a maximum width of around 16m in order to pass through the Dock Gates.

52.1.4. Maintenance and refuelling facilities are essential to keep the ferries operational. Burntisland has engineering facilities available in the West Dock and the preliminary costings (above) include for an allowance for self-bunded fuel and lubricant storage tanks.

52.1.5. Burntisland is seen as providing the administrative centre for the ferry service. An administrative office could be incorporated within

either a nearby office or retail complex both of which are contained within Forth Ports' Development Plans for the area.

52.1.6. There are planning issues in connection with the proposed car park which would require planning permission from Fife Council for a change of use and the dissolution of a Royal Charter for the area. In addition the maintenance of the route of the temporary public road between Harbour Place and the swimming pool is seen as highly desirable for good public transport linkage and important to Fife Council to limit traffic along Burntisland High Street.

52.1.7. Other planning concerns are connected with any archaeological remains of the 'East Head Fort', indicated as being located close to the root of Middle Pier and the category B listing of the harbour walls.

52.1.8. Burntisland Harbour offers good alternative transport links for passengers (i.e. bus / railway) should the ferry not be able to run due to poor sea conditions.

52.1.9. The Transport Assessment has identified access from Harbour Place coupled with reinstatement of an access from the roundabout adjacent to the Beacon Leisure Centre as being the most efficient points of access to/from the development site by sustainable modes to maximise accessibility for pedestrians, cyclists and public transport users.

52.2. **Granton**

52.2.1. West Berth Option 2C (P4) is estimated at £1.99m. This option provides an expanded facility sufficient to enable simultaneous berthing of two ferries. It reduces the land 'footprint' by removing the

covered waiting facility and, instead, providing protection for passengers walking down the linkspan and embarking from the pontoon from the wind and rain. It also offers a heated waiting room on board the pontoon.

52.2.2. West Berth Option 2C (P4) offers an integrated solution with Forth Ports' revised masterplan that would probably be acceptable to City of Edinburgh planners

52.2.3. The West Berth Option presents minimal interference with existing users of Granton Harbour.

52.2.4. Dredging under the pontoon remains a necessity at Granton. Bed samples and chemical analysis taken during Phase 3 indicate that disposal at sea is a viable option and this is confirmed by the Fisheries Research Service (FRS) for Scotland.

52.2.5. Granton Harbour, at present, has poor alternative transport links for passengers should the ferry not be able to run due to poor sea conditions but this is shortly to be addressed through improved bus and new tram links.

52.3. **Business Viability**

52.3.1. The Business Viability case indicates a potential profit of around £0.58m – £0.72m for the preferred route and vessels (2no.)

52.3.2. The Business Viability case indicates a potential profit of around £0.06m – £0.25m for the preferred route and vessels (3no.) . However, provision of 3 vessels presents the opportunity of further increasing service frequency (i.e. every 15 mins) which would lead to greater patronage. This additional patronage has not been allowed for.

52.3.3. The Business Viability case is robust in that the break-even patronage level is significantly below (by 18 - 31%) that predicted by the TMfS. In addition, break-even fare levels are below those used to generate the patronage (by 4 – 33%) and fuel prices would have to rise to £0.70 /£1.67 per litre to wipe out any profit (3 / 2 Incat vessels respectively).

52.3.4. The revised infrastructure costs make little difference to the business viability provided that the initial capital costs are borne by the public sector and do not have to be repaid from within the operating costs by loan from the private sector.

52.3.5. The running costs of a third small ferry does make a significant impact on the profit generation but the upside effect on patronage resulting from this third vessel and the service frequency enhancement that it could offer is not taken into account.

52.4. **STAG**

52.4.1. The STAG appraisal has concluded that there are no significant dis-benefits from the scheme provided that the mitigation measures outlined are put into place.

52.4.2. The economic efficiency of the scheme results in a NPV Benefit value of £17.4m in 2002 prices giving a corresponding BCR of 1.65. The service has the potential to attract 83,000 trips (one-way) by tourists / leisure users (i.e. 41,500 tourists) equating to a £40.8m boost to the local economy over the 60 year appraisal period. This would particularly help local businesses and the community in Burntisland.

53. Section 5 - Final Review

- 53.1. Following an evaluation of options, the Cross Forth Passenger Ferry Study is now concentrating on a fast ferry route between Burntisland and Granton. Separately to this, Stagecoach has also put forward proposals for a hovercraft service between Kirkcaldy (Inveriel) and Portobello with a possible extension to Leith.
- 53.2. Recent economic circumstances have now resulted in the slowdown of developer activity at Granton and the City of Edinburgh Council has decided not to proceed with the tram extension to Granton.
- 53.3. For this assessment it has been assumed that the Development plans for Leith Docks are still going ahead and will eventually be served by the tram. Hence, with the scale of the development proposed, there is an opportunity to reconsider the possibility of running ferry services into Leith. This alternative needs to be compared with the hovercraft option being promoted by Stagecoach (Inveriel to Portobello) and the Burntisland to Granton ferry option.

54. Transport Model for Scotland and Generalized Cost

- 54.1. TMfS generates travel flows on the basis of commuting to work, education, shopping, personal business, recreation & social, visiting friends & relatives and holiday / day trips. TMfS builds up the cost of all public transport options between any two zones based on the costs of each of the possible combinations of public transport sub-modes (bus, train etc). These costs are made up of all the components of the journey: walk and wait times (at each end of the journey), in-vehicle time, any transfer / interchange penalties, and fares. All these factors are turned into 'generalised cost' based on established values of time to convert monetary values into time. Demand is allocated

between the various alternatives based on these costs using a logit formulation.

54.2. The generalised cost function used in the PT model is simply the fare plus the travel time (monetised) weighted using the various components of the journey. For further information, a document can be downloaded from: http://www.latis.org.uk/services/modelling/library/download_reports/TMfS05A_PTCaIValReport_05092008.pdf

54.3. The value of times used and the way that these change over time are standard WEBTAG values (i.e. £5.57/hr non-work: £22.92/hr in work for 2012).

55. Fares

55.1. Tables below state the required test scenarios and fares associated with each test

Option	Burntisland – Granton	Burntisland –Leith	Kirkcaldy – Portobello
High Fare	CF29	CF31	CF33
Low Fare	CF30	CF32	CF34

Table 14: Test Scenarios

55.2. Both fare scenarios have peak and inter-peak ticket prices and previous studies have shown that patronage figures are very sensitive to price.

Period	CF29	CF31	CF33	CF30	CF32	CF34
Peak Fare	Each fare assumed to be 60p less than rail			£2.50	£2.50	£3.00
	£4.30	£4.30	£5.56			
Inter-Peak Fare	Each fare assumed to be 60p less than rail			£1.83	£1.83	£1.83
	£3.00	£3.00	£3.88			

Table 15: Scenarios and fare prices

55.3. The following assumptions have been made as part of the six TMfS 05a (n) patronage scenario tests:

- Removal of tolls from the existing Forth Road Bridge;
- Provision of a new Forth Road Bridge in 2016 (coupled to the conversion of the existing into public transport only) – specification: 2 lanes in either direction to motorway standard (hence capacity & speeds are higher than the current bridge);
- An Edinburgh congestion charge should not be modelled;
- In-vehicle time and boarding fare to be modelled as per that of rail;
- A tram service to and from Granton should not be modelled;
- The use of integrated ticketing, increased frequency of service and uncapped park & ride capacity (from the previous CF26 test case);
- The ‘Quality’ characteristics of the ferry (specifically the in-vehicle time weighting) to be modelled in line with rail, reflecting the high quality of the vessels proposed;
- Rail style ‘wait curves’ to be used, reflecting the frequency of the ferry;
- Park and Ride model to include ferry-related sites with representative catchment areas;
- Interchange penalties between bus / ferry and bus / hovercraft (and vice versa) to be set to ‘low at 5 minutes’;
- Landside bus services to serve the ferry terminals;
- Tram link from Leith into Edinburgh City Centre and beyond to the Airport; and
- Walk link from Public Transport to Burntisland, Granton, Leith and Portobello should reflect 4 minutes loading and 5 minutes unloading at the terminal.

55.4. Patronage Results

55.4.1. TMfS requires a Boarding fare to be added to the cost of the journey. For this study review this boarding fare was set at 60p. Hence, for the purposes of a business plan, 60p should be added to Peak and Inter-Peak fares.

55.5. Profitability

55.5.1. Opportunities were also identified to improve revenue and reduce operational expenditure amounting to £114,000.

55.5.2. The profitability figures quoted in the subsequent sections are estimates only for the purposes of guidance and do not include for optimism bias.

56. Burntisland – Granton Review

56.1. Route Assumptions

56.1.1. The following tabulated frequency assumptions are for the Burntisland-Granton ferry scenario test; Frequency assumptions for Ferry tests CF29 and CF30 **Assumptions for Ferry (Tests CF29 and CF30)**

• Operational days per year (excluding downtime)	365
• Daily operating hours	12
• Peak frequency (mins)	20
• Off-peak frequency (mins)	30
• Off-peak frequency hours per day	6
• Crossing Time	11
• Loading and unloading time (mins)	9

56.2. Also assumed is that there would be direct bus services from Granton to Edinburgh City Centre

56.3. Patronage Results

56.3.1. Low Fare

56.3.1.1. The patronage results for the TMfS'05a (n) (new model) low fare scenario are shown in Table below as run number CF30. The previous results using TMfS'05 (old model) are shown for comparison purposes:

Option	Ferry type	2012 Pat	2016 Pat	2017 Pat	2022 Pat	Peak Fare	Inter Fare
(MVA 4)F – Burntisland to Granton	Catamaran	1618	1675	1689	1760	£2.50	£1.85
CF26- Burntisland to Granton	Spirit 50	2835	2818	2814	2793	£2.50	£1.83
CF30 - Burntisland to Granton	Incat CD701	2575	2574	1954	1953	£2.50	£1.83

Table 16: Patronage results, Burntisland to Granton (new model)

56.4. Comments

56.4.1. There is a significant increase in patronage between the old (MVA 4) and new (CF30) models. This is a result of increased frequency

(from a 30 to a 20 min service), integrated ticketing and no restrictions on Park & Ride capacity.

56.4.2. However, it is immediately apparent that there is significant drop in patronage between the old (CF26) and new models (CF30). This is thought to be because of the following:

- Removal of Forth Road Bridge (FRB) Tolls - The removal of the northbound toll has decreased the generalized cost in the northbound direction, thus road may prove to be a more attractive option, and in particular for West Edinburgh to Fife movements.
- New Forth Road Bridge (FRB) Crossing and converting existing FRB into PT only - The implementation of the new Forth Crossing in 2016 will have a positive impact on the generalized cost of road travel between Fife and Edinburgh (i.e. there will be a reduction). The delays normally associated with the approaches to the bridge from the north and south will be somewhat alleviated with the new crossing and its design, particularly around the south bridge head. This, therefore, makes the crossing of the Forth more attractive by car than in CF26 which is shown by the reduction in P&R users at the Burntisland site (i.e. for some travellers it is now cheaper to complete their O-D by car, rather than car, P&R and PT).
- Removal of tram service to/from Granton - The new model has removed the tram connection at Granton. It is replaced by a direct bus service into the centre of Edinburgh. Given the current level of bus services serving the north Edinburgh area, the addition of the direct bus service will barely be seen as an improvement on the CF26 test (i.e. in terms of onward travel transport links to the west and centre of

Edinburgh). The small benefit to generalised cost brought by the direct bus link into the city centre will be outweighed by the negative impact on generalised cost from removing the tram service which served Granton in the CF26 test and provided good links to the west and centre of Edinburgh and the airport.

56.4.3. Further to this, the existing bridge will be converted to public transport only. As a result, we will see improved journey times for buses from Fife to Edinburgh and vice versa since the buses do not get caught up in the bridge traffic congestion as seen in CF26 (bus speeds are based on road congested speeds). This, therefore, adds to the attractiveness of the buses which cross the Forth and may prove a cheaper alternative (in terms of generalized cost) in the new set of results when compared to CF26.

56.4.4. It should be noted that the new Forth Road Bridge is not due to open until 2016, so the effects mentioned above on the feasibility of the proposed ferry route will be delayed for several years.

56.5. Planning data assumptions

56.5.1. The new model uses the most recent economic and demographic forecasts (provided via TMfS:07). The difference in the two sets show evolving assumptions regarding North Edinburgh development and this will impact on the attractiveness of the area. Further investigations are needed in terms of base and future year employment data but initial impressions appear to show negative employment growth in the North Edinburgh area which would account for a drop in its attractiveness as a commuting travel destination.

56.6. Profits

56.6.1. Prior to the opening of the new FRB, there is an expectation of reasonable profits from the service (approx. £400,000 - £500,000). The drop in patronage on the Burntisland - Granton route from 2017 onwards brings the service close to the breakeven patronage with a minimal profit (approx. £5,000 - £20,000 pa).

56.7. High Fare

56.7.1. The patronage results for the TMfS'05a(n) (new model) high fare scenario are shown in Table below as run number CF29. The previous results using TMfS'05 (old model) are shown for comparison purposes:

Option	Ferry type	2012 Pat	2016 Pat	2017 Pat	2022 Pat	Peak Fare	Inter Fare
(MVA 4)F – Burntisland to Granton	Spirit 50	810	866	879	949	£4.30	£3.00
CF29- Burntisland to Granton (Intg Tick + Inc Freq + No P&R Cap)	Incat CD701	1322	1354	1335	1374	£4.30	£3.00

Table 17: Patronage results for Burntisland-Granton ferry (high fare scenario)

56.7.2. Similar to the Low fare scenario, there is significant increase in patronage between the old (MVA 4) and new (CF29) models. Again, this

is a result of increased frequency (from a 30 to a 20 min service), integrated ticketing and no restrictions on Park & Ride capacity. The high fare scenario was not previously modelled. Hence, it is not possible to say whether there is significant drop in patronage between the old and new models.

56.7.3. It is noted that opening of the new FRB does not have the same impact as for the low fare scenario. Post-opening, patronage levels are closer to the low fare scenario, hence it is expected that the business plan could be driven by the high fare scenario with profitability in the region of £150,000 - £300,000 pa.

56.8. Directional Sensitivity

56.8.1. In 2001 it was suggested that there was over 2,000 people living in the east Fife area and working in Edinburgh and over 500 living in Edinburgh and working in east Fife. Although current public transport usage was low, all of these people are potential ferry users and where the addition of a ferry reduces public transport cost, then it can be expected that PT use will increase.

56.8.2. The economic slowdown has affected current development but medium to long-term plans remain the same and the new patronage tests reflect current land-use plans since TMfS is linked to TELMoS (regional economic / land use model of Scotland). Although it was agreed that TMfS'05a(n) should continue to be used for patronage modelling.

56.8.3. TMfS'07 has been used to provide the most up-to-date picture. TELMos provides the opportunity to model the land use response to the introduction of a ferry. The reduced transport costs resulting from the ferry are fed into TELMoS which provides new forecasts of the location of

employment, population, etc. In summary, TMfS predicts a virtuous spiral which is most clearly seen on the Burntisland – Granton route.

56.8.4. In addition to the above, information from the Transport Scotland Rail Patronage Surveys (Survey: 03 – 19 March 2009) extracted from a Public Transport Report⁵ for Fife Council indicates a 15:85 (north : southbound) AM PT travel split between Fife and Edinburgh. Although TMfS stands on its own merits, a sensitivity check is thought prudent to check the effect of a similar split being experienced on the ferry.

56.8.5. By reducing the northbound passenger flow for the AM peak and a corresponding amount in the opposite direction for the PM Peak, overall patronage for the Burntisland – Granton route reduces to 2166 (2012) and 1725 (2022) for the low fare scenario.

Option	Ferry type	2012 Pat	2016 Pat	2017 Pat	2022 Pat	Peak Fare	Inter Fare
(MVA 4)F – Burntisland to Granton	Catamaran	1618	1675	1689	1760	£2.50	£1.85
CF26- Burntisland to Granton (Intg Tick + Inc Freq + No P&R Cap)	Spirit 50	2835	2818	2814	2793	£2.50	£1.83
CF30 – Burntisland to Granton (Intg Tick + Inc Freq + No P&R Cap)	Incat CD701	2575	2574	1954	1953	£2.50	£1.83
Tidal Sensitivity							
CF30 – Burntisland to Granton (Intg Tick + Inc Freq + No P&R Cap)	Incat CD701	2166	2165	1726	1725	£2.50	£1.83

Table 18: Tidal sensitivity patronage results for Burntisland-Granton ferry (low fare scenario)

56.8.6. From the table it can be seen that patronage is initially above the breakeven level for the low fare scenario but drops below breakeven following the opening of the new FRB. Profit expectations would be in the region of £100,000 - £150,000 falling to a subsidy requirement of between £150,000 - £200,000 pa. Overall, at these patronage levels between 2012 – 2022, the service is expected to require a small subsidy but this does not take the virtuous spiral effect predicted by TMfS & TELMoS as described above.

56.8.7. By reducing the northbound passenger flow for the AM peak and a corresponding amount in the opposite direction for the PM Peak, overall patronage for the Burntisland –Granton route reduces to 1116 (2012) and 1180 (2022) for the high fare scenario.

Option	Ferry type	2012 Pat	2016 Pat	2017 Pat	2022 Pat	Peak Fare	Inter Fare
(MVA 4)F – Burntisland to Granton	Spirit 50	810	886	879	949	£4.30	£3.00
CF29- Burntisland to Granton (Intg Tick + Inc Freq + No P&R Cap)	Incat CD701	1322	1354	1335	1374	£4.30	£3.00
Tidal Sensitivity							
CF29 – Burntisland to Granton (Intg Tick + Inc Freq + No P&R Cap)	Incat CD701	1116	1147	1141	1180	£4.30	£3.00

Table 19: Tidal sensitivity patronage results for Burntisland-Granton ferry (high fare scenario)

56.8.8. From the table 19, it can be seen that the opening of the new FRB has only a minor effect on patronage. However, the effect of reducing predicted patronage to match existing directional flow patterns would mean that the service would require an annual subsidy albeit decreasing from 2012 (approx. £100,000) to 2022 (approx.£10,000). As for the low fare scenario, this does not take the virtuous spiral effect predicted by TMfS & TELMoS as described above.

56.8.9. Since patronage levels from the high fare scenario are closer to the low fare scenario following the opening of the new FRB, it is expected that the business plan could be driven by the high fare scenario to reduce the amount of subsidy required following the opening of the new Forth Road Bridge.

56.9. Burntisland – Leith Review

56.9.1. Route Assumptions

56.9.2. It is assumed that it will be necessary to operate with a peak frequency of 30 minutes due to the time taken to transit the Forth (11 min), transit the lock (target: 10 mins) and the additional time from the lock to Ocean Terminal (5 mins). This gives a crossing time of 26 minutes and a minimum vessel turnaround time of 35 minutes.

56.9.3. The following tabulated frequency assumptions are for the Burntisland-Leith ferry scenario test;

- Operational days per year (excluding downtime) 365
- Daily operating hours 12
- Peak frequency (mins) 30
- Off-peak frequency (mins) 60

- Off-peak frequency hours per day 6
- Crossing Time 26
- Loading and unloading time (mins) 9

56.10. A sample timetable is shown below to demonstrate how this would be achieved:

Vessel	Fife	Leith	Fife	Leith	Fife	Leith
A	07:15					
B	07:00	07:45	12:00	13:00	17:30	18:15
C	07:30	08:15	18:00	18:45		
A	08:00	08:45	13:00	14:00	18:30	19:15
B	08:30	09:15	14:00	15:00	19:00	19:45
C	09:00	09:45				
A	09:30	10:15	15:00	16:00		
B	10:00	11:00	16:00	16:45		
C			16:30	17:15		
A	11:00	12:00	17:00	17:45		

Table 20: Extract from a sample timetable (3 Vessels)

56.11. Thus Vessels A & B make a total of 16 runs each whilst Vessel C makes a total of 8 runs (Overall Total = 40 runs). It should be noted that Vessel C would enter the lock at 07:41 and exit at 07:51, whilst Vessel B would enter the lock from the opposite direction at 07:50 and exit at 08:00.

Whilst there is an overlap of 1 minute and the schedule is robust enough to withstand the delay, it would increase transit time by an extra minute. Hence a double lock would be required to operate a 30 minute schedule without any delays to the 26 minute transit time assumed.

56.12. A 4 vessel service would provide the following timetable:

Vessel	Fife	Leith
B	-	07:20
A	07:00	07:40
C	07:20	08:00
D	07:40	08:20
B	08:00	08:40
A	08:20	09:00
C	08:40	09:20
D	09:00	09:40
B	09:20	10:00
A	09:40	-

Table 21: Extract from sample timetable (4 vessels)

56.13. It should be noted that Vessel B would enter the lock at 07:25 and exit at 07:35, whilst Vessel C would enter the lock from the opposite direction at 07:31 and exit at 07:41. Whilst there is an overlap of 4 minutes and the schedule is just robust enough to withstand the delay, the transit time would have to be increased to 30 mins to account for the delay.

56.14. A double lock would be required to operate a 30 minute schedule without any delays to the 26 minute transit time assumed. A single lock would be sufficient to operate a 20 minute schedule but the increased transit time would result in a drop in patronage.

56.15. Patronage Results

56.15.1. Low fare

56.15.1.1. The patronage results for the TMfS'05a(n) (new model) low fare scenario are shown in the table below as run number CF32. The previous results using TMfS'05 (old model) are shown for comparison purposes

Option	Ferry type	2012 Pat	2016 Pat	2017 Pat	2022 Pat	Peak Fare	Inter Fare
(MVA 3) E - Burntisland to Leith	Catamaran	1448	1454	1455	1463	£2.50	£1.85
CF32 - Burntisland to Leith (intg Tckt + Inc Freq + No P&R Cap)	Incat CD701	869	827	800	747	£2.50	£1.85

Table 22: Patronage comparison results for Burntisland-Leith ferry (low fare scenario)

56.15.2. The results show a significant drop in patronage for the **26 minute transit** from the previous results (MVA 3) which were for an **11 minute transit**. Hence the results are not surprising. The results also show a slight drop in patronage over time coupled with a drop following

the opening of the new FRB. A subsidy, in the region of £1,400,000 pa., could be expected at these patronage levels.

56.16. High Fare

56.16.1. The patronage results for the TMfS'05a(n) (new model) high fare scenario are shown below as run number CF31. The previous results using TMfS'05 (old model) are shown for comparison purposes:

Option	Ferry type	2012 Pat	2016 Pat	2017 Pat	2022 Pat	Peak Fare	Inter Fare
(MVA 3) E - Burntisland to Leith	Spirit 50	725	741	745	765	£4.30	£3.00
CF31 - Burntisland to Leith (intg Tckt + Inc Freq + No P&R Cap)	Incat CD701	357	359	351	354	£4.30	£3.00

Table 23: Patronage comparison results for Burntisland-Leith ferry (high fare scenario)

56.16.2. Similar to the low fare scenario, the results show a significant drop in patronage for the **26 minute transit** from the previous results (MVA 3) which were for an **11 minute transit**. Hence the results are not surprising. The results also show a slight drop in patronage over time coupled with a drop following the opening of the new FRB. A subsidy, in the region of £1,600,000 pa., could be expected at these patronage levels.

56.17. Infrastructure

- 56.17.1. The water within the Port of Leith is retained within the harbour by a dam that was built across the harbour entrance. Adjacent to this dam is a ship lock that allows all tides access into the port.
- 56.17.2. The dam itself appears to be built from contiguous sheet piled infilled dolphins. Reportedly this structure has some structural problems although exactly what these problems are has not been defined.
- 56.17.3. The lock is located next to the dam and was designed for large ships although there is a facility whereby a shortened length of the lock can be flooded and emptied for a smaller vessel such as the envisaged ferry. This locking system poses a number of issues:-
- A. For a ferry service to run effectively it is imperative that the service is quicker than other competing services. However reportedly it could take approximately 30 minutes for a vessel to cycle through the lock. This would add a significant time to the overall journey time with the effect of reducing the likely patronage and hence viability of the journey.
 - B. The cost of a single lock movement has been advised as being £500 (i.e. the power and manpower cost). This is a significant cost that the ferry is unlikely to support, since it is greater than the average revenue per trip (£30 - £50)
 - C. Adapting the existing lock for smaller vessels would be possible but, potentially, to the detriment of the overall function of the lock which is still needed for other commercial operations.
 - D. Making the port tidal (i.e. remove the dam and lock altogether) is an option but likely to be highly undesirable as this again would potentially

affect the other commercial operations in the port, this would also have an effect on HMY Britannia which is permanently moored at the dock.

- E. It may be possible to construct a purpose built lock designed for rapid transit times to accommodate the ferry. This would be an expensive option (Forth Ports have indicated verbally that the cost would be circa £16 million) but it could conceivably assist in the redevelopment of the port by also accommodating pleasure craft.

56.18. **Lock Facility**

- 56.19. Lock options need to address the lock arrangement, build ability and cost of construction.

Below shows the mean tidal range at Leith Docks.

Mean High Water (+mCD) –	Spring	5.6m
	Neap	4.4m
Mean Low Water (+mCD) -	Spring	0.8m
	Neap	2.0m

56.20. Mean High Water

- 56.20.1. The level of water within Leith Dock is controlled within 300mm of +3.8m CD (+6.7m ODN) The bed depth is recorded as around -1.9m CD along the length of the dam on the river estuary side with a minimum reported water depth of 5.5m inside the dam. This would give a resultant bed level inside the dam of around -1.7m CD. Thus some dredging would

be required on the outer approach channel to the lock, but none is expected within Leith Dock.

56.20.2. Target arrangements for the lock would be a transit time of 10 minutes at a cost of around £20 per transit which will have to be built into the business plan but are include in the above profitability estimates.

56.20.3. In order to “future-proof” the lock arrangement, the proposed target vessel would be 31.5m long x 9.3m beam x 1.5m draught.

56.21. Ocean Terminal berth

56.21.1. It is envisaged that any berth would be adjacent to the Royal Yacht Britannia which is berthed to the rear of the Ocean Terminal building. This site offers excellent facilities in terms of car, taxi, bus and future tram access but the route from the berth to the interchange facilities would require some work to make it safe for pedestrians and yet provide adequate security facilities for the Royal Yacht Britannia. As noted above, the level of the water within the Port of Leith is tightly controlled. This means that the length of any linkspan needed to connect the pontoon landing stage to the dock edge will be substantially shorter than other location considered in the study where the full tidal range has to be accommodated.

56.22. Kirkcaldy (Inveriel) – Portobello Review

56.23. Route Assumptions

56.23.1. The following tabulated frequency assumptions is for the Kirkcaldy-Portobello hovercraft scenario test;

Frequency Assumptions for Hovercraft (Tests CF33 and CF34)

- Operational days per year (excluding downtime) 365
- Daily operating hours 12
- Peak frequency (mins) 30
- Off-peak frequency (mins) 60
- Off-peak frequency hours per day 6
- Crossing Time 18
- Loading and unloading time (mins) 9

56.23.2. Although it would be possible to operate this route on a 20 minute frequency, it would require 3 vessels to achieve this frequency which would require a large subsidy.

56.24. Patronage Results

56.24.1. Low Fare

56.24.1.1. The patronage results for the TMfS'05a(n) (new model) low fare scenario are shown in the table below as run number CF34. The previous results using TMfS'05 (old model) are shown for comparison purposes:

Option	Ferry type	2012 Pat	2022 Pat	Peak Fare	Inter Fare
(MVA 5)D – Kirkcaldy to Seafield	Hovercraft	875	775	£3.00	£2.20
CF34 – Kirkcaldy to Portobello (Intg Tckt + Inc Freq + No P&R Cap)	Hovercraft	1112	898	£3.00	£2.20

Table 24: Patronage comparison results for Kirkcaldy-Portobello ferry (low fare scenario)

56.24.2. The above shows a modest increase in patronage from the previous results (MVA 5).

56.24.3. The direct bus links in the new model from Portobello to Ocean Terminal & Edinburgh City Centre probably accounts for the some or all of the improvement in the patronage. Other factors to be considered would be the slight improvement now given in transit time between the models (1 minute) and Kirkcaldy's distance from the zone of influence of the existing and proposed Forth Road Bridge. This latter factor would act as an insulator from the possible draw-down effect of improved road linkage provided by the new FRB and removal of tolls.

56.24.4. A subsidy, in the region of £3,000,000 pa., could be expected at these patronage levels.

56.25. High Fare

56.25.1. The patronage results for the TMfS'05a(n) (new model) low fare scenario are shown in the Table below as run number CF33. The previous results using TMfS'05 (old model) are shown for comparison purposes:

Option	Ferry type	2012 Pat	2022 Pat	Peak Fare	Inter Fare
(MVA 5)D – Kirkcaldy to Seafeld	Hovercraft	245	273	£5.56	£3.85
CF33 – Kirkcaldy to Portobello (Intg Tckt + Inc Freq + No P&R Cap)	Hovercraft	291	308	£5.56	£3.85

Table 25: Patronage comparison results for Kirkcaldy-Portobello ferry (high fare scenario)

56.25.2. Previous runs using the old model had fares set lower than for other routes in order to favour this route. The new model has fares set at the same level as the other routes (i.e. equivalent train fare less 50p) for a true comparison.

56.25.3. Patronage shows a slight increase possibly due, in part, to a modelled drop in transit time of 1minute and the changed land use model. Other factors such as the improved bus linkage to Ocean terminal and Edinburgh City Centre would account for the rest.

56.25.4. It should be noted that the operating costs of a hovercraft are much higher than those of a Fastcat and have been verified by reference to costs revealed by Stagecoach from their trial, A subsidy, in the region of £3,500,000 pa., could be expected at these patronage levels.

56.26. Conclusions on Route Reviews

56.26.1. The patronage results for the TMfS'05a(n) (new model) scenarios are summarized in the tables below (Run number CF29 – CF34). The previous results using TMfS'05 (old model) are shown for comparison purposes

56.27. Low Fares

Option	Ferry	2012 Pat	2016 Pat	2017 Pat	2022 Pat	Peak Fare	Inter Fare
(MVA 3)E – Burntisland to Leith	Catamaran	1448	1454	1455	1463	£2.50	£1.85
(MVA 4)F – Burntisland to Granton	Catamaran	1618	1675	1689	1760	£2.50	£1.85
(MVA 5)D – Kirkcaldy to Seafield	Hovercraft	875	835	825	775	£3.00	£2.20
CF26 – Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap)	Spirit 50	2835	2818	2814	2793	£2.50	£1.83
CF32 – Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap)	Incat CD701	869	827	800	747	£2.50	£1.83
CF30 – Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap)	Incat CD701	2575	2574	1954	1953	£2.50	£1.83
CF34 – Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap)	Hovercraft	1145	1059	1005	898	£3.00	£2.19

Table 26: Patronage results for Cross Forth Ferry (low fare scenario)

56.27.1. Integrated Ticketing, increased service frequency and no restrictions on Park & Ride

56.27.2. Capacity all serve to increase ferry patronage with resultant significant improvements in patronage for the Burntisland – Granton and Kirkcaldy Portobello routes.

56.28. High Fares

Option	Ferry	2012 Pat	2016 Pat	2017 Pat	2022 Pat	Peak Fare	Inter Fare
(MVA 3)E – Burntisland to Leith	Catamaran	725	741	745	765	£4.30	£3.00
(MVA 4)F – Burntisland to Granton	Catamaran	810	866	879	949	£4.30	£3.00
(MVA 5)D – Kirkcaldy to Seafield	Hovercraft	245	256	259	273	£3.85	£3.85
CF29 – Burntisland to Granton (Intg Tick + Inc Freq + No P&R Cap)	Incat CD701	1322	1354	1335	1374	£4.30	£3.00
CF31 – Burntisland Leith (Intg Tick + Inc Freq + No P&R Cap)	Incat CD701	357	359	351	354	£4.30	£3.00
CF33 - Kirkcaldy to Portobello (Intg Tick + Inc Freq + No P&R Cap)	Hovercraft	303	310	300	308	£5.56	£3.88

Table 27: Patronage results for Cross Forth Ferry (high fare scenario)

56.29. Integrated ticketing, increased service frequency and no restrictions on Park & Ride Capacity continue to provide an increase ferry patronage on the Burntisland – Granton route.

56.30. Directional Sensitivity

56.31. The same pattern in northbound and southbound flows is still being experienced between the old model and the new model. This trend is evident throughout all tests. However, the balance has slightly widened for the Burntisland – Granton route with the new model predicting a 35:65 split (north: southbound) in the AM peak (c.f. old model 42:58 splitCF26).

56.32. For the Kirkcaldy - Portobello Route the new model predicts a 55:45 split (north: southbound) in the AM peak (c.f. old model 74:26 split – MVA5).

56.33. Tidal Sensitivity tests undertaken for the Burntisland – Granton route (the only route not predicted to require a subsidy) indicates that profitability levels would be reduced prior to the opening of the new Forth Road Bridge. Since high fare users seem to be less affected by the advantages of the new bridge, it is concluded that a change to a high fare model would help remove the need for subsidy.

56.34. **Infrastructure reassessment**

56.34.1. In light of the reassessment of patronage, the infrastructure requirements were re-examined. The following is concluded from the infrastructure review:

56.34.2. The Burntisland – Granton Route offers the cheapest infrastructure capital cost:

56.35. **Option Capital Cost**

- 1B (P5) Burntisland: Outer Harbour – South Berth– Small Ferry £2,999,500
- 2C Granton Harbour: West Berth – Small Ferry £2,306,300

TOTAL £ 5,305,800

56.36. The Kirkcaldy (Invertiel) – Portobello Route offers infrastructure capital costs above that for Burntisland – Granton:

56.37. Option Description Capital Cost

- | | |
|---------------------------------------|--------------------|
| • 1 Kirkcaldy (Invertiel): Hovercraft | £ 3,552,200 |
| • Portobello: Hovercraft | £ 2,663,800 |
| TOTAL | £ 6,216,000 |

56.38. The Burntisland – Leith (Ocean Terminal) Route offers the most expensive infrastructure capital cost:

56.38.1. Option Description Capital Cost

- | | |
|--|----------------------------------|
| • 1B (P5) Burntisland: Outer Harbour – South Berth – Small Ferry – | |
| £2,999,500 | |
| • 1A Leith Port: Small Ferry Berth (OceanTerminal) Small Boat Lock- | £ |
| 17,408,800 | |
| • 1B Leith Port: Small Ferry Berth (OceanTerminal) Large Boat Lock - | £ |
| 29,654,600 | |
| • 1C Leith Port: Small Ferry Berth (Ocean Terminal) Twin Large Boat Lock – | £ |
| 50,327,900 | |
| TOTAL | £ 20,408,300 – 53,327,400 |

56.38.2. If the capital cost of the lock can be excluded from the above route, then the total capital cost reduces to **£4,231,800**.

57. Business Viability

57.1. Business viability assumptions associated with each route are contained in **Appendix A**.

57.2. Frequency assumptions for each route are contained in the Patronage Review with 20 mins (peak) and 30 mins (off-peak) being assumed for the Burntisland – Granton route and 30 mins peak) and 60 mins (off-peak) being assumed for the other routes. The major difference is that 3 vessels will be required for the Burntisland – Leith route in order to maintain a 30 min peak frequency because transit through the lock delays transit time to 26 minutes with a 9 min turnaround time for passenger embark / disembarking.

57.3. A 150 passenger capacity hovercraft is assumed. This is backed up by the Stagecoach trials which utilised a 130 capacity hovercraft. For the routes out of Burntisland a 75 passenger capacity vessel is assumed. The costs associated with a hovercraft are significantly greater than for the small fast catamaran ferries. This applies to fuel consumption, purchase, maintenance and crewing. Route passenger capability offers sufficient peak hour capacity for all routes except for the southbound direction for the Burntisland to Granton route in 2012 as indicated in the table below.

Option	Ferry	Ferry capacity	Vessel Headway	Daily Patronage		Max peak hourly demand		Max Peak hourly Capacity	
				2012	2022	2012	2022	2012	2022
CF30 – Burntisland to Granton	Incat CD701	75	20	2575	1953	234	204	225	225
CF32 – Burntisland to Leith	Incat CD701	75	30	869	747	87	81	150	150
CF34 – Kirkcaldy to Portobello	Hovercraft	150	30	1145	898	91	69	300	300

Table 28: Low fare route demand/capacity (all Intg Tick + Inc Freq + No P&R Cap)

57.4. Although there is an under supply indicated, it is nominal at 4% and represents 9 passengers each day who would be inconvenienced by having to wait until the next ferry. This not believed to be significant and it should be noted that public transport (PT) passengers can and do adjust their travelling times to avoid congestion.

Option	Ferry	Ferry capacity	Vessel Headway	Daily Patronage		Max peak hourly demand		Max Peak hourly Capacity	
				2012	2022	2012	2022	2012	2022
CF29 – Burntisland to Granton	Incat CD701	75	20	1322	1374	114	134	225	225
CF31 – Burntisland to Leith	Incat CD701	75	30	357	354	29	31	150	150
CF33 – Kirkcaldy to Portobello	Hovercraft	150	30	30	308	19	20	300	300

Table 29: High fare route demand / capacity (all Intg Tick + Inc Freq + No P&R Cap)

57.5. The table indicates that high fare demand does not exceed route capacity.

57.6. The Patronage Review Report recommended that fares levels should be updated to reflect current rail fare levels. Current peak (&off-peak) rail fares are:

- Burntisland (BTS) – Edinburgh (Waverley) (EDB) Single: £5.10 Annual: £1,508
- Kirkcaldy (KDY) - Edinburgh (Waverley) (EDB) Single: £6.30 Annual: £1,916

Thus an equivalent ferry fare at 60p less than the rail would be:

- Burntisland – Granton / Leith Single: £4.50 (peak & inter-peak)
- Kirkcaldy – Portobello Single: £5.70 (peak & inter-peak)

57.7. This closely matches the £4.30 and £5.66 fares (respectively) assumed for the patronage modelling for the high fare scenario. It should be noted that an equivalent ferry fare at 60p less than the rail fare (annual) would be:

- Burntisland – Granton / Leith Single: £2.54
- Kirkcaldy – Portobello Single: £3.39

57.8. This closely matches the £2.50 and £3.00 fares (respectively) assumed for the patronage modelling for the high fare scenario.

58. Burntisland – Granton Review

58.1. Low Fare

58.1.1. The business model results for the TMfS'05a(n) (new model) low fare scenario are shown in the below as run number CF30 with the patronage results in table 16. The previous results using TMfS'05 (old model) are shown for comparison purposes.

58.2. 2016 2017 2022 Peak

Option	Ferry	Fares		Annual Operating Profit (Millions)			
		Peak	Inter	2012	2016	2017	2022
(MVA 4)F – Burntisland to Granton	Catamaran	£2.50	£1.85	-1.15	-1.11	-1.10	-1.04
CF26 – Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap)	Spirit 50	£2.50	£1.83	0.63	0.62	0.61	0.60
CF30 – Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap)	Incat CD701	£2.50	£1.83	0.50	0.50	0.00	0.00

Table 30: Business Viability results for Burntisland – Granton

58.3. It is immediately apparent that the drop in patronage following the opening of the new Forth Road Bridge (FRB) has a serious impact on the

annual profitability of the route which drops from £0.5m to breakeven. However, it is still significantly above the original projections for large catamarans (>150 pax.) on a 30 min peak frequency schedule. Increasing all fares to £2.54 increases profitability by between £200,000 and £270,000.

58.4. High Fare

58.4.1. The business model results for the TMfS'05a(n) (new model) high fare scenario are shown in the table below as run number CF29 with the patronage results in table 19. The previous results using TMfS'05 (old model) are shown for comparison purposes:

58.5. 2012 2016 2017 2022 Peak

Option	Ferry	Fares		Annual Operating Profit (Millions)			
		Peak	Inter	2012	2016	2017	2022
(MVA 4)F – Burntisland to Granton	Spirit 50	£4.30	£3.00	-0.29	-0.21	-0.19	-0.09
CF29 – Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap)	Incat CD701	£4.30	£3.00	0.21	0.26	0.23	0.28

Table 31: Business Viability results for Burntisland-Granton (high fare scenario)

58.6. Operating P

58.6.1. The table above confirms the expectations of the Patronage Review. It shows that although profitability is “dented” by the opening the new FRB, it shows a resilience not demonstrated by the low fare business model. The Patronage Review Report recommended that fares levels should be updated to reflect current rail fare levels. Increasing all fares to £4.50 improves the profitability by approximately £450,000.

58.7. Patronage Sensitivity

58.7.1. The breakeven patronage for the Incat CD701 vessels (2no.) has increased slightly to **1,950** passengers per day (ppd) (low fare) (from 1,9402) as a result of rising infrastructure costs. The breakeven patronage for the high fare scenario is **1,160**. If the FBMA vessel costs are taken into account (i.e. £1,935,500 per vessel), then the average daily patronage that would enable the service to breakeven would be **2,090** (low fare) / **1,245** (high fare) for the 2no. FBMA service.

58.7.2. Fare Levels Sensitivity

58.7.3. Infrastructure costs make little difference to the operating profit / loss of the service assuming that the initial capital costs are not borne by the operator. However, the drop in patronage predicated by the TMfS’05a(n) model results in an increase required by the average breakeven single fare (peak & off-peak combined) to **£1.71** for the 2no Incat service (from £1.552). Single fares would have to rise by an additional £0.54 for the service to breakeven as a result of the new Forth Road Bridge opening.

58.7.4. If the FBMA vessel costs are taken into account, then average single fare would be **£1.82** for the 2no Incat service. Single fares would have to rise by £0.60 for the service to breakeven as a result of the new FRB opening. These figures are based on the assumption that patronage would remain constant. As has been established, there is an inversely proportional relationship between fares and patronage (i.e. as fares go up, so patronage goes down). However, with the breakeven fares quoted as less than modelled, then it is reasonable to assume that the fares could be depressed further before the breakeven point is reached.

58.8. Fuel Prices Sensitivity

58.8.1. Fuel prices would have to raise to **£1.28 per litre** for the 2no Incat service in order to wipe-out any profit for an operator starting in 2012. This represents an annually compounded rise of 10% over the next 10 years from present marine diesel prices. For the FBMA vessel, fuel prices would have to rise to **£1.09 per litre** to remove any profit. No difference in performance between the Incat and FBMA vessels is assumed.

59. Directional Sensitivity

59.1. Directional sensitivity issues were explored in the Patronage Review. Their effects on route profitability are demonstrated in the tables below with the directional sensitivity taken into account in the highlighted green row.

Option	Ferry	Fares		Annual Operating Profit (Millions)			
		Peak	Inter	2012	2016	2017	2022
(MVA 4)F – Burntisland to Granton	Catamaran	£2.50	£1.85	-1.15	-1.11	-1.10	-1.04
CF26 – Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap)	Spirit 50	£2.50	£1.83	0.63	0.62	0.61	0.60
CF30 – Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap)	Incat CD701	£2.50	£1.83	0.50	0.50	0.00	0.00
CF30 – Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap)	Incat CD701	£2.50	£1.83	0.13	0.13	-0.21	-0.22

**Table 32: Tidal Sensitivity Business Viability results for Burntisland - Granton
(low fare scenario)**

59.2. For the low fare scenario, profitability reduces to 8% of turnover from 2012 as a result of directional “losses”. This converts into loss of 15% against turnover following the opening of the new FRB.

Option	Ferry	Fares		Annual Operating Profit (Millions)			
		Peak	Inter	2012	2016	2017	2022
(MVA 4)F – Burntisland to Granton	Spirit 50	£4.30	£3.00	-0.29	-0.21	-0.19	-0.09
CF29 – Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap)	Incat CD701	£4.30	£3.00	0.21	0.26	0.23	0.28
CF29 – Burntisland to Granton (Intg Tickt + Inc Freq + No P&R Cap)	Incat CD701	£4.30	£3.00	-0.10	-0.06	-0.07	-0.02

Table 33: Tidal Sensitivity Business Viability results for Burntisland - Granton (high fare scenario)

59.3. For the high fare scenario, profitability is converted into a loss of 7% of turnover from 2012 as a result of directional “losses”. This converts into a loss of 15% against turnover following the opening of the new FRB.

59.4. Burntisland – Leith Review

59.4.1. Low Fare

59.4.2. The business model results for the TMfS’05a(n) (new model) low fare scenario are shown in the Table below as run number CF32 with

the patronage results in table 22. The previous results using TMfS'05 (old model) are shown for comparison purposes:

2012 2016 2017 2022 P

Option	Ferry	Fares		Annual Operating Profit (Millions)			
		Peak	Inter	2012	2016	2017	2022
(MVA 3)E – Burntisland to Leith	Catamaran	£2.50	£1.85	-1.35	-1.36	-1.36	-1.35
CF32 – Burntisland to Leith (intg Tckt + Inc Freq + No P&R Cap)	Incat CD701	£2.50	£1.83	-1.40	-1.44	-1.46	-1.50

Table 34: Business Viability results for Burntisland - Leith (low fare scenario)

59.4.3. Reasons for the changes in patronage are discussed in the Patronage Review with patronage showing a steady decline between 2012 to 2022 and the opening of the new FRB accelerating the process.

59.4.4. Although the costs of running small ferry vessels are significantly cheaper than that originally analysed for the route [(MVA 3) E – Burntisland – Leith], it is apparent that the drop in patronage which results from running passengers into Ocean Terminal more than overcomes the savings. Thus the route is predicted to make a loss in the region of £1,390,000 - £1,490,000 per annum.

59.5. High Fare

59.5.1. The business model results for the TMfS'05a(n) (new model) low fare scenario are shown in the table below as run number CF31 with the patronage results in table 23. The previous results using TMfS'05 (old model) are shown for comparison purposes:

Option	Ferry	Fares		Annual Operating Profit (Millions)			
		Peak	Inter	2012	2016	2017	2022
(MVA 3)E – Burntisland to Leith	Spirit 50	£4.30	£3.00	-0.47	-0.44	-0.44	-0.41
CF31 – Burntisland to Leith (intg Tckt + Inc Freq + No P&R Cap)	Incat CD701	£4.30	£3.00	-1.63	-1.62	-1.64	-1.63

Table 35: Business Viability results for Burntisland - Leith (high fare scenario)

59.5.2. The table above confirms the expectations of the Patronage Review. It predicts that the route will lose between £1,610,000 and £1,620,000 per annum. Similar to the low fare scenario, updating fares levels to reflect current rail fare levels would only bring about a minor improvement in the situation.

59.6. Patronage Sensitivity

59.6.1. The breakeven patronage for the Incat CD701 vessels (2no.) is **2,550** (low fare) and **1,525** (high fare). If the FBMA vessel costs are taken into account (i.e. £1,935,500 per vessel), then the average daily

patronage that would enable the service to breakeven would be **2,750** (low fare) and **1,640** (high fare) for the 2no. FBMA service.

59.7. Fare Levels Sensitivity

59.7.1. Infrastructure costs make little difference to the operating profit / loss of the service assuming that the initial capital costs are not borne by the operator. However, the patronage predicted by the TMfS'05a(n) model results in an increase required by the average breakeven single fare (peak & off-peak combined) to **£6.80** for the 2no Incat service based on the low fare patronage. If the FBMA vessel costs are taken into account, then average single fare would be **£7.33** for the 2no Incat service. Single fares would have to rise further as a result of the falling patronage predicted between 2012 and 2022.

59.7.2. These figures are based on the assumption that patronage would remain constant. As has been established, there is an inversely proportional relationship between fares and patronage (i.e. as fares go up, so patronage goes down). Thus, since the breakeven fares quoted are higher than modelled, then it is reasonable to assume that the fares would have to be increased even further before the true breakeven point is reached (if it could ever be reached).

59.8. Kirkcaldy (Invertiel) – Portobello Review

59.8.1. Low Fare

59.8.1.1. The business model results for the TMfS'05a(n) (new model) low fare scenario are shown in the table below as run number

CF34 with the patronage results in table 24. The previous results using TMfS'05 (old model) are shown for comparison purposes:

2012 2016 2017 2022 Peak

Option	Ferry	Fares		Annual Operating Profit (Millions)			
		Peak	Inter	2012	2016	2017	2022
(MVA 5)D – Kirkcaldy to Seafield	Hovercraft	£3.00	£2.20	-3.17	-3.21	-3.22	-3.27
CF34 – Kirkcaldy to Portobello (intg Tckt + Inc Freq + No P&R Cap)	Hovercraft	£3.00	£2.19	-2.80	-2.88	-2.93	-3.04

Table 36: Business Viability results for Kirkcaldy (Invertiel) - Portobello (low fare scenario)

59.8.2. Reasons for the changes in patronage are discussed in the Patronage Review with patronage showing a steady decline between 2012 and 2022 and the opening of the new FRB having a slight accelerating impact on the process. No changes in the operating costs of a hovercraft have been assumed since the original business plan. This assumption is backed by Hyder's review of Stagecoach's operating costs from the trial in the summer of 2007. Thus, although patronage is predicted to rise in the new model, it is not predicted to rise anywhere near the level required to enable the service to breakeven. Thus the

route is predicted to make a loss in the region of £2,800,000 - £3,040,000 per annum.

59.9. High Fare

59.9.1. The business model results for the TMfS'05a(n) (new model) low fare scenario are shown in the table below as run number CF33 with the patronage results in table 25. The previous results using TMfS'05 (old model) are shown for comparison purposes:

Option	Ferry	Fares		Annual Operating Profit (Millions)			
		Peak	Inter	2012	2016	2017	2022
(MVA 5)D – Kirkcaldy to Seafield	Hovercraft	£3.85	£3.85	-3.70	-3.68	-3.68	-3.66
CF33 – Kirkcaldy to Portobello (intg Tckt + Inc Freq + No P&R Cap)	Hovercraft	£5.66	£3.88	-3.39	-3.38	-3.40	-3.38

Table 37: Business Viability results for Kirkcaldy (Inveriel) - Portobello (high fare scenario)

59.9.2. The table above is slightly below the expectations of the Patronage Review. It predicts that the route will lose between £3,380,000 to £3,400,000 per annum. Similar to the low fare scenario, updating fares

levels to reflect current rail fare levels would only bring about a minor improvement in the situation.

59.10. Patronage Sensitivity

59.10.1. The breakeven patronage for the hovercraft (2no.) is predicted as **4,850** (low fare) and **2,300** (high fare).

59.11. Fare Levels Sensitivity

59.11.1. Infrastructure costs make little difference to the operating profit / loss of the service assuming that the initial capital costs are not borne by the operator. However, the patronage predicted by the TMfS'05a(n) model results in an increase required by the average breakeven single fare (peak & off-peak combined) to **£9.60** for the 2no. Hovercraft service based on the low fare patronage.

59.11.2. These figures are based on the assumption that patronage would remain constant. As has been established, there is an inversely proportional relationship between fares and patronage (i.e. as fares go up, so patronage goes down). Thus, since the breakeven fares quoted are higher than modelled, then it is reasonable to assume that the fares would have to be increased even further before the true breakeven point is reached (if it could ever be reached).

59.12. Conclusions

59.12.1. The following conclusions are reached for the study review:

59.12.1.1. The Burntisland – Granton Incat CD701 ferry route remains the only profitable route in comparison to the Burntisland – Leith (fast catamaran) and Kirkcaldy (Inveriel) –Portobello (hovercraft) routes.

59.12.1.2. Directional sensitivity tests undertaken on the Burntisland - Granton route indicates a drop in profitability of between £210,000 and £360,000. It still predicts that the route will make a profit of around £135,000 prior to the opening of the new Forth Road Bridge (i.e. 8% of turnover).

59.12.1.3. The opening of the new Forth Road Bridge has a detrimental effect on the profitability of the Burntisland – Granton route. Interestingly, greater resilience is shown by high fare patronage to the opening of the bridge than by the low fare patronage.

59.12.1.4. Updating ferry fares to reflect current rail fares predicts an improvement in profitability for the Burntisland – Granton route by circa. £235,000 for the low fare scenario and £450,000 for the high fare scenario. These increases should not impact on patronage.

59.12.1.5. The breakeven patronage for the Burntisland – Granton route is **1,950** ppd (low fare) / **1,160** ppd (high fare). Comparative figures for the Burntisland – Leith and Kirkcaldy – Portobello routes are **2,750** / **1,640** ppd (low / high fare) and **4,850** / **2,300** ppd (low / high fare) respectively.

59.12.1.6. The breakeven fare level for the Burntisland – Granton route is **£1.71** assuming low fare patronage. Comparative figures for the Burntisland – Leith and Kirkcaldy – Portobello routes are **£6.80** and **£9.60** respectively.

59.12.1.7. Fuel prices would have to rise to **£1.28 per litre** for the 2no Incat Burntisland – Granton service in order to wipe-out any profit for an operator starting in 2012.

60. Hovercraft Proposals

60.1. Following the successful trials of the Hovercraft between Portobello and Kirkcaldy (see 3.2), Stagecoach developed proposals making the service permanent.

60.2. In developing their proposals Stagecoach were able to use the data and information developed through this study. In recognition of the financial analysis carried as part of this study, Stagecoach were looking for financial support from Fife and City of Edinburgh Councils over the first few years of operation.

60.3. In December 2009 Stagecoach submitted planning applications for permanent terminal facilities at Kirkcaldy and Portobello, based on the sites used in the trial. In 2011 Fife Council approved the plans for the terminal in Kirkcaldy but unfortunately City of Edinburgh Council rejected the proposal for the terminal at Portobello on the basis of noise disturbance to neighbours.

60.4. Following the above decision Stagecoach withdrew their proposals and decided not to pursue their proposals any further.

60.5. Study Conclusions

60.5.1. The considerable study work carried out for the cross Forth ferry has not resulted in a positive proposal being implemented. There are reasons for this, as became apparent through the study process. There

are also lessons to be learnt on the processes and procedures that are required to provide the required business case to operators and authorities.

60.5.2. From the very start of the iTransfer study work it was obvious that the viability of any new ferry operation was marginal and this resulted in a fairly detailed analysis in the early stages of the study work to establish whether viability could be achieved.

60.5.3. In proceeding with this study work, major influences on the project viability became obvious, the main ones being the removal of tolls on the Forth Road Bridge and proposals for an upgraded replacement bridge. Also detrimental to the case were the removal of proposals for cordon road charging in Edinburgh and the postponement of the extension of the tram proposals to Granton.

60.5.4. Although the more detailed modelling gave greater confidence in the patronage and revenue forecasts, the examination of the tidal nature of demand did not contribute positively to the case.

60.5.5. In general the protracted study process required constant re-examination of the business case to take on board the evolving implications of political decisions. The assessment procedure as outlined in fig 1 provides a good model for developing the business case for a ferry, refining the analysis as the optimum option is developed, taking on board government assessment requirements and best practice.

60.5.6. In this study the case was made more complicated by the inclusion of a parallel proposition by Stagecoach for a hovercraft service between Portobello and Kirkcaldy and the late appreciation of the implications of the gated access into the port of Leith.

60.5.7. The most important lesson of this process is that it is essential to give high priority to statutory requirements such as planning permission. No matter how good the business case is, without planning permission the project will never become a reality. In this case City of Edinburgh council's decision to refuse permission for a terminus at Portobello was a critical blow to the proposal, even though the trial had proved the proposal to be popular with travelling public. It has to said that the later viability assessments of the proposed hovercraft operation was instrumental in Stagecoach's decision not to pursue this proposal further.

60.5.8. The risk assessment highlighted that planning permission was a key risk to the project but this maybe not have been addressed as vigorously as required to get a positive result.

61. Appendix A – 2012 Results (SEStran Regional Model Scenarios)

- 1) Introduction
- 2) Test Specification
- 3) Wider Cross Forth Forecast Picture
- 4) The Market for Cross Forth Travel
- 5) Census Travel to Work

1.1. Since the last transport modelling runs, a SEStran Regional Transport Model has been developed which is a more detailed version of TMfS05 as previously described. The ferry has now been tested in two SEStran Regional Model (SRM) scenarios. The '2010' scenario represents a near 'present day' situation and the '2024' scenario is based on GROS SESplan-wide household projections as represented in the SESplan SDP Proposed Plan. The 2024 scenario is also built on the 'Alternative Forecast Scenarios' recently developed by Transport Scotland. This new scenario updates previous LATIS based forecasts to reflect the economic situation since 2008 and the ultimate economic recovery. The main impact of this is reduced employment levels compared to previous, pre-recession forecasts.

1.2. The main Fife (SESplan area) and City of Edinburgh household and population data associated with the new SRM SDP Scenario for 2024 are shown below

SDA	Additional	Households	
	2007-24	Total Population 2007	Total Population 2024
Edinburgh	35,111	471,692	517,411
Fife SESplan	26,433	261,084	302,792
SESplan TOTAL	116,951	1,154,587	1,338,400

Forecast Households and Population in 2024

2. Test Specification

2.1 The key features of the ferry service have been coded as follows:

- timetable / frequency / crossing time as laid out in email from Stagecoach dated 23 January 2012;
- additional / amended bus services as laid out in email from Stagecoach dated 23 January 2012;
- park and ride car park in Burntisland with a capacity of 350 as previously specified; and
- Fares inherited from previous work – lower fares as reported have been used.

The results of this test re-run are shown below.

Boardings	AM Peak Hr		Inter Peak Hr		PM Peak Hr		Daily	Annual
	NB	SB	NB	SB	NB	SB		
2010 XF07 LF	12	179	31	31	139	15	1,121	359,996
2024 XF07 LF	13	116	35	28	73	17	850	289,413

2012 Patronage Forecasts

2.2. Note that the P&R model in the SRM operates in the AM Peak only (as per TMfS07). P&R figures for the inter peak have therefore been assumed at 35% of AM peak levels – this figure has been drawn from previous TMfS05 cross Forth ferry tests.

2.3. It can be seen that the 2010 figures for the ‘main’ flows of 179 southbound AM and 139 northbound PM are similar to the comparable result of CF30. The forecast patronage then drops by 2024 by around 20% however. A major factor influencing this is that the 2024 scenario has the second Forth road crossing in place (with an upgrade in standard from dual carriageway to motorway leading to higher capacity and speeds). In addition, there are a number of cross Forth rail improvements associated. All of this erodes the competitive position of the ferry to some degree. In addition, the new forecast economic scenario is much less optimistic than in previous test series and this will have affected new development areas and hence employment levels in north Edinburgh.

2.4. The implied car park usage for 2010 and 2024 is 191 and 169 for 2010 and 2024 respectively.

2.5. The other main difference from previous tests is in counter tidal flows, i.e. AM northbound and PM southbound – where the new forecasts are very much lower. One potential explanation for this

is that the model zoning on the Edinburgh side is much more coarse in the SRM than was the case in TMfS, a reflection of the 'buffer' coding in this area. This means that northbound 'walk in' catchment is less well modelled, i.e. the zones are larger and walk distances are longer.

2.6. Previous tests for Burntisland–Granton showed an AM Peak northbound to southbound ratio of around 0.6:1. However, the 2001 Census suggests that the ratio of Edinburgh-Fife to Fife-Edinburgh commuting is around 4:1.

2.7. The tables below include two assumptions for counter-tidal flows based on the above ratios as sensitivity tests (S1 and S2):

S1 - AM northbound = AM southbound * 0.6: PM southbound = PM northbound * 0.6 (based on TMfS05 forecasts); and

S2 - AM northbound = AM southbound * 0.25: PM southbound = PM northbound * 0.25 (based on census inter local authority commuting).

Boardings	AM Peak Hr		Inter Peak Hr		PM Peak Hr		Daily	Annual
	NB	SB	NB	SB	NB	SB		
S1 2010 XF07 LF	107	179	31	31	139	83	1,477	455,128
S1 2024 XF07 LF	70	116	35	28	73	44	1,029	337,824
S2 2010 XF07 LF	45	179	31	31	139	35	1,235	390,764
S2 2024 XF07 LF	29	116	35	28	73	18	887	299,688

2012 Patronage – Counter-Tidal Sensitivity Tests

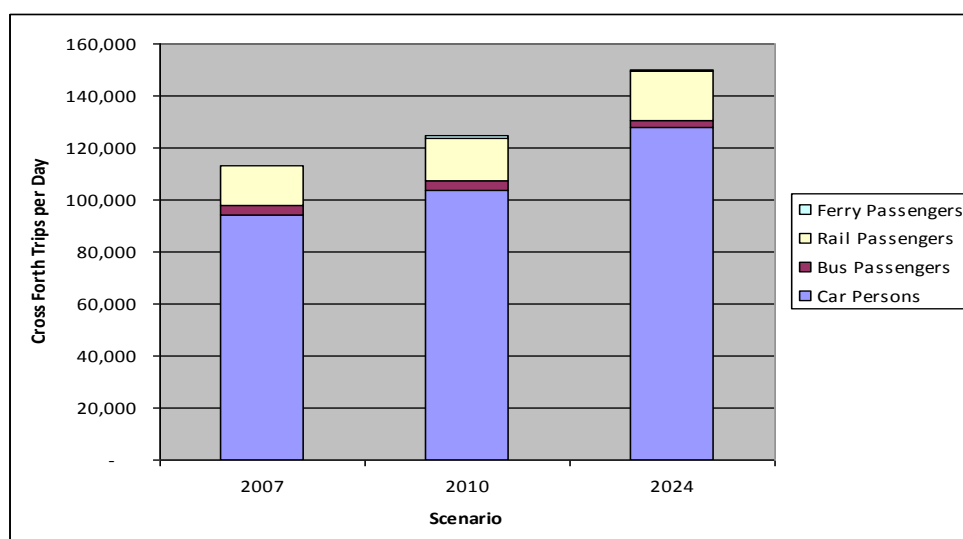
The table below shows the implied fares revenue for each of the six tests.

Annual Fares Revenue	
2010 XF07 LF	£795,700
2024 XF07 LF	£617,600
S1 2010 XF07 LF	£1,033,200
S1 2024 XF07 LF	£738,300
S2 2010 XF07 LF	£872,300
S2 2024 XF07 LF	£643,000

2012 Implied Revenue Forecasts

3. Wider Cross Forth Forecast Picture

3.1 This section briefly considers total forecast cross Forth travel to put these ferry forecasts into context. The figure below shows the 2007 base and 2010, 2024 forecast levels of total daily cross Forth



Forecast Growth in Total Cross Forth Travel

3.2. The major forecast increase in car persons between 2010 and 2024 is evident here. Nevertheless, these data confirm that the cross Forth travel market is forecast to grow strongly between 2007 and 2024, providing an expanding market for the ferry to target.

4. The Market for Cross Forth Travel

4.1. The SRM (and its TMfS predecessor) are based on average daily travel patterns. This section outlines the current cross Forth travel 'market' to provide context for the potential market for the cross Forth ferry.

5. Census Travel to Work

5.1. The 2001 Census Travel to Work data provides a key record of commuting travel behaviour. Although this data is now aging, it does provide a valuable overview of the travel to work patterns in the cross Forth area. The next section has been reproduced from analysis undertaken in 2007.

5.2. The Fife and Edinburgh areas were divided into the 'sectors' shown in the following maps.



Census Travel to Work – Fife Sectors

5.3. The Fife sectors pick out the main potential markets of Kirkcaldy, Leven / Buckhaven / Methil and Glenrothes. The settlements of Cupar and Kinghorn are also highlighted with the rest of east and central Fife being split into larger areas. The main potential market for the ferry services is considered to be east Fife. Areas in central Fife are more likely to use existing cross Forth travel opportunities unless specifically destined for north Edinburgh.



Census Travel to Work – Edinburgh Sectors

5.4. In Edinburgh, the north Edinburgh area has been split into the areas immediately around the potential Granton ferry termini (2 and 3 above) where use of the ferry as a destination would be most likely, with a further 'buffer' area (1, 4 and 5) where competition between the train and the ferry may be closer. The rest of Edinburgh is split into broad sectors.

Fife Areas	Total travel to work trips	% travelling to Edinburgh	No. travelling to Edinburgh	% travelling to north Edinburgh (2&3)	No. travelling to north Edinburgh (2&3)	%travelling to north Edinburgh (1,4 &5)	No. Travelling to north Edinburgh (1,4 &5)
Buckhaven / Methil / Leven	8,178	1.7	135	0.2	15	0.2	15
Kirkcaldy	18,272	4.9	904	0.4	69	0.5	96
Glenrothes	16,466	2.4	399	0.3	45	0.2	33
Cupar	3,610	2.8	102	0.2	9	0.2	9
St. Andrews	3,621	1.0	36	0.0	0	0.2	6
Kinghorn	1,289	6.7	87	0.7	9	0.2	3
Burntisland	2,210	10.2	225	0.4	9	1.4	30
Rest of East Neuk	6,176	2.7	165	0.2	12	0.4	27
Potential ferry users			2,053		168		219
Potential AM Peak Period ferry users			924		76		99

Census Travel to Work, East Fife to Edinburgh

5.5. The above figures suggest that in 2001, there were around 2,000 people living in the east Fife area and working in Edinburgh, almost half of these from Kirkcaldy. In general, the proportion working in Edinburgh increases further west in Fife in line with expectation. Less than 400 (168 + 219) of this 2,000 worked in north Edinburgh with only around 170 working in the north Edinburgh areas closest to the shore (2-3). So the key East Fife to Edinburgh north market amounts to around

400 commuters. Note that not all of these people will travel to work on any given day, with only around typically 60% of employed adults travelling to work on any given weekday (given leave, holidays, sickness, part time working etc). Around three quarters of workers will make their journey to work between 0700 and 1000. Applying these factors gives figures of 924 to Edinburgh and 175 to north Edinburgh (sectors 1-5).

5.6. The table below shows similar information for travel to work northbound between Edinburgh and east Fife.

Fife Areas	Total travel to work trips	% travelling to East Fife	No. travelling to east Fife	% travelling to Leven/ Kirkcaldy/ Glenrothes	No. travelling to Leven/ Kirkcaldy/ Glenrothes
Edin North 2 / 3	12,545	0.3	33	0.2	21
Edin north 1, 4-5	33,697	0.4	150	0.4	126
Edin city centre	16,965	0.5	84	0.4	63
Edin west	41,298	0.2	96	0.2	81
Edin east	34,697	0.1	39	0.1	24
Edin south	45,646	0.3	135	0.2	108
Potential ferry users			537		423
Potential AM Peak Period ferry users			242		194

Census Travel to Work, Edinburgh to East Fife

5.7. The proportion of Edinburgh residents working in east Fife is of course much lower than the proportion of east Fife residents working in Edinburgh, at less than 0.5%. Nevertheless there were over 500 Edinburgh residents working in east Fife, with over three quarters of these working in

Kirkcaldy, Glenrothes or Buckhaven / Leven / Glenrothes. It can be seen that the number of commuters travelling between north Edinburgh and East Fife is around 185 (i.e. 150 + 33).

5.8. The above figures therefore suggest that in 2001, the number of commuters travelling between north Edinburgh (1-5) and east Fife was around 185 (Edinburgh to Fife) and 400 (Fife to Edinburgh) – which would represent around 260 on a typical AM peak period. These figures include travellers across all modes. Typical mode shares are around 5% public transport (Edinburgh to Fife) and 15% public transport (Fife to Edinburgh). This would suggest very low levels of travel by public transport between north Edinburgh and east Fife on a typical day – a figure of less than 50.

5.9. This analysis suggests that in order to be successful:

- The ferry services must be able to compete with cross Forth rail / bus to destinations beyond north Edinburgh; and / or
- North Edinburgh (and Granton in particular) must accelerate as a major employment destination to create more 'local' demand.

6. Summary

6.1. The 2012 update shows results similar to those of the 2009 runs. A key factor in the drop between 2007 and 2009/2012 results is the inclusion of the Forth Replacement Crossing. Although replacing a two lane bridge with a two lane bridge, the new bridge is of motorway rather than dual carriageway standard, leading to a significant increase in capacity and free flow speeds, and therefore a shift in the balance of costs for cross Forth travel in general. The EGIP package of measures and the Edinburgh Gateway (Gogar) station also improves the competitive position of cross Forth rail.

6.2. The table below summarises the key patronage forecasts from the three work phases.

Tested..	Test Name	AM Peak Hr		Inter Peak Hr		PM Peak Hr		Daily	Annual
		NB	SB	NB	SB	NB	SB		
2007	2012 CF26 LF	196	275	82	85	212	161	2,833	920,301
	2022 CF26 LF	182	287	82	91	206	136	2,791	916,249
2009	2012 CF30 LF	100	185	61	59	149	87	1,855	612,983
	2022 CF30 LF	90	204	60	61	155	69	1,850	613,469
2012	2010 XF07 LF, S1	107	179	31	31	139	83	1,477	455,128
	2024 XF07 LF, S1	70	116	35	28	73	44	1,029	337,824

Summary of Cross Forth Forecasts

iTransfer is part funded by the North Sea Region programme, part of the EU Inter-regional (Interreg) initiative. Investing in the future by working together for a sustainable and competitive region, Interreg is financed through the European Regional Development Fund (ERDF).