

The Falkland Islands



Internal Transport Review
2001

Executive Summary

The development of the road network has already changed the pattern of demand for transport in the Islands, and there are now opportunities to provide an air and sea service more appropriate to today's needs that can develop further as the road system expands.

The MOD duplicates the civilian services in some areas but differing priorities make designing and operating integrated services difficult. It is likely that the Military would make use of civilian services if they were available, regular, and reliable.

FIG spends at least £2.5m p.a. on transport capital and operating costs. The road network capital costs will fall releasing additional funds for maintenance as the network develops. FIGAS and the coastal shipping service have high operating costs, due to the low volumes of traffic, high fixed costs and low load factors.

The sooner the road network is complete, the sooner the benefits can be realised by reducing expenditure on other services, so it is important that the programme does not slow down. However there are some roads for which it is hard to justify the expense on any grounds.

The air service carries high overhead costs and is unlikely to be commercially viable in the foreseeable future, but increasing load factors would reduce operating losses. This could be achieved by closing some airstrips and encouraging the use of others by fare incentives, thus channelling passengers onto selected routes. The overall FIGAS load factors do not support changing to larger aircraft.

The early development of a cross sound ferry is essential. This will enable a more efficient shipping service, and provide the capacity required to transport large numbers of sheep for slaughter. The cross sound ferry must operate between ramps that allow rapid loading and unloading through the stern door.

In the short to medium term the Tamar has the capacity to operate this service, but a more suitable vessel should be found within three to four years. This could cost between £2m and £6m depending upon age and specification.

These changes depend upon taking the fundamental decision to encourage the use of the road network that has been developed; and not to continue to offer subsidised air and sea services as a direct alternative.

The following text is extremely faint and illegible. It appears to be a series of paragraphs or sections of text, but the content cannot be discerned due to the low contrast and blurriness of the scan. The text is organized into several distinct blocks, likely representing different parts of a report or document.

Contents

Executive Summary.....	1
Background.....	5
Terms of Reference	5
Key Questions	6
Introduction.....	7
The Current Civilian Transport System and Development Policy.....	8
Overview.....	8
The Road Network - Current Status and Development Plans.....	9
The Use of the Road Network.....	13
The Cost of the Road Programme - Capital.....	13
The Cost of the Road Programme - Maintenance	18
Summary of the current road development policy.	18
The Coastal Shipping Service	20
The inter-island routes	20
Frequency of service.....	22
Dependence on the service.....	22
Cargo statistics	22
Seasonality	25
The cost of the shipping service	25
The Falkland Island Government Air Service	27
Routes, schedules, and frequency.....	27
Dependence on the service.....	27
Passenger and freight statistics.....	28
Seasonality	33
The cost of the air service	33
Ministry of Defence Coastal Shipping.	34
Summary of current transport system, policy and costs.....	35
The Future for Inter Island Transport.....	36
Coastal shipping and roads.	36
Demand projections	38
Capacity projections	44
Infrastructure for ferry options.	45

Recommendations	46
Roads and Shipping	46
The air service	47
Appendix I - Tamar capital cost.....	49
Appendix II - FIGAS fares.....	51
Appendix III - Bow and Stern Loading Arrangements.....	53
Fixed ramps	53
Adjustable ramps	53

The Falkland Islands - Internal Transport Review 2001

Background

An internal transport review was commissioned by the Falklands islands Government in 1996. This study summarised the transport system existing at that time, the (then) current policy for development, and made recommendations for future development.

Four years on, some of these recommendations have been completed, many are still in progress, others have been deferred or rejected by Executive Council. The road network is now much more extensive, some ports are no longer served by the coastal shipping service, and some airstrips seldom used while others have had their licence revoked. The MOD continues to operate independent air and sea transport services, some of which overlap with civilian operations, and of course common use is made of the road network. There may be scope for partially integrating the MOD and Civilian services.

The pattern of life in the Camp is also changing. Wool farming is still the largest source of income to farmers, but many are diversifying into other activities including, with the Abattoir to be completed this year, meat sheep and beef production. The tourism industry is growing rapidly on the back of improved communications with South America and increased interest in cruising to Antarctica and the unspoilt islands of the southern oceans.

These changes in the physical infrastructure and in the commercial and social activities of life in the Camp, have altered the demand for transport services, and this is an ongoing process. It is important that where economically viable, the transport infrastructure and service mirrors demand and creates further opportunities for the development of the economy of the Islands; and that as one type of infrastructure develops, complementary services adjust to take account of the changing needs of people and businesses. It is timely therefore, once again to review the transport requirements within the islands and determine the most effective options for delivery of integrated services in the 21st Century.

Terms of Reference

The Falkland Islands Government/Development Corporation requires a study of the Military and Civilian air, sea and land transport systems and facilities within the Islands. This study will:

- Review the current civilian situation and development policy. This should include a review of the costs, benefits and efficiency of the current systems and development plans.
- Review the current military transport system and ascertain from the MOD which of their systems might be included in a joint approach.
- Define current demand and project a series of future demand scenarios over a three, five and ten year time scale for both civil and military traffic.

- Assess and comment on the suitability of current transport systems to meet projected demand under each scenario and advise whether current development policy restricts available options for change.
- Research possible alternative integrated air, sea and land transport options to meet projected demand by military and civilians and define their costs and benefits. Assess how robust and flexible each option is against the range of projected scenarios.
- Recommend a programme of developments over the same time scale, which would meet a jointly agreed integrated approach, with options to adjust the programme to take account of changes in demand, the rate of change, or new developments.

Key Questions

The report will focus on, but not be limited to, answering the following key questions:

1. To what extent can the MOD and civilian transport systems be integrated, and what are the cost savings to each organisation?
2. To what extent can air, sea and land transport systems be integrated to allow the use of fewer ports and landing strips? What are the service costs and or benefits to the consumers, what are the cost savings to FIG/MOD?
3. How do we move from here to the optimal situation defined in questions 1 and 2 above, and over what time scale? What are the overall service costs, transitional financial costs, and ultimate benefits of such a move?
4. What are the joint requirements of FIG and the military for a coastal shipping vessel? Should this vessel also be capable of performing the role of a cross-sound ferry?
5. What infrastructure developments will be required to make any new transport system work (and at what cost)?
6. How will the new system operate under different demand scenarios?
7. What options exist for the new system to operate in relation to external links (specifically a sea-link to South America and air-links to the UK and South America) under different demand scenarios?

Introduction

This review focuses on how the road network, the Coastal Shipping Service, and the Government Air Service (FIGAS), the three principal methods of freight and passenger transport inter-relate, and therefore how changes and developments to each impact on the others.

Wool and fuel are by far the biggest freight commodities in terms of volume and weight, and also the ones on which the most detailed data is available. The quantities of these items shipped to and from different parts of the islands have been used to estimate on a pro-rata basis the allocation of deliveries of general cargo for which only the total volumes are known accurately. It is recognised that different types of freight have differing requirements in terms of frequency of service, speed of delivery or unit cost to the customer.

The majority of freight is transported by sea, most passengers are transported by road or FIGAS, with the coastal shipping service carrying a few mainly on cross sound ferry services at Christmas, Camp Sports or Stud Flock sales times.

The question of a ferry service from New Haven to Port Howard has long been discussed, and the advantages, disadvantages and opportunities associated with this idea are examined.

The idea of sharing some facilities with the Military, has had increased support in principle from both FIG and the MOD in recent years. In practice it has proved difficult to turn this support in principle into practical reality due to the very different priorities of each organisation, each of whom has a very different set of customers and stakeholders.

Much of the review contains information that will already be familiar to some readers. This is deliberate, as it ensures that the document can stand alone, and that the arguments can be followed by someone with less detailed knowledge of the Falkland Islands.

The Current Civilian Transport System and Development Policy.

Overview

The three transport services and infrastructure projects in which FIG/FIDC has a direct involvement are:

- The road network for which capital and recurrent maintenance funding is provided by FIG, with some construction contracted out to the private sector.
- The coastal shipping service, for which capital funding is provided by FIDC, and operating costs are subsidised by FIG. The vessel Tamar FI is operated by the private sector company, Byron Marine Ltd.
- The Falkland Island Government Air Service, which is wholly owned and operated by FIG, using air strips maintained by the Civil Aviation department of FIG, but with unpaid ground support provided by users of the service at most camp airstrips.

In principle there is nothing to prevent other operators providing air and shipping services, but most, perhaps all, routes are not commercially viable and the current operators are subsidised by FIG in one way or another. This effectively eliminates competition, as to subsidise competing operations would inevitably be more expensive for Government.

The road system creates opportunities for private and commercial haulage, and of course personal transport, while the airstrips and the civil aviation service, although principally used by FIGAS are both important for private aviation.

The coastal shipping service carries almost all commercial freight within the islands, but there is a limited amount of private use of the jetties and ramps and this could increase in the future.

Overall, the transport and communications infrastructure and services, are critical to the economic development of the Camp, and therefore the social and socio-economic importance of the transport policy cannot be over emphasised. Any changes to the current level of service and the development policy must take this into account.

There is some overlap between civilian and MOD transport services by land, sea, and air, and this should in theory create possibilities and opportunities for combining at least some services. In practice there are major differences in military and civilian priorities and expectations. The military imperative of having absolute control of large and rapid capacity in the event of conflict, must lead to some duplication of effort and capacity in normal times. This extra capacity is already used to some extent by the civilian population. For example, there is usually container space available on the HRS vessels, there is ad hoc charter of the Saint Brandan for heavy loads to West Falkland and the Islands, and occasional use of helicopters to lift the last person off remote airstrips. However it is a major step from here to a fully integrated and combined air and sea transport system.

The Road Network - Current Status and Development Plans.

The East and West Falkland road building programme (99F Rev B) until 2012 is shown diagrammatically on page 12. In recent weeks 99F Rev C which transposes Long Island and Rincon Grande has been approved, together with the bringing forward of the New Haven link and a road to Ruggles Bay. The Long Island and Rincon Grande change reflects the relative state of the existing tracks but is not material to the overall programme. The New Haven link will open up possibilities for a ferry across Falkland Sound, and the road to Ruggles Bay will reduce the cost of distribution of calcified seaweed.

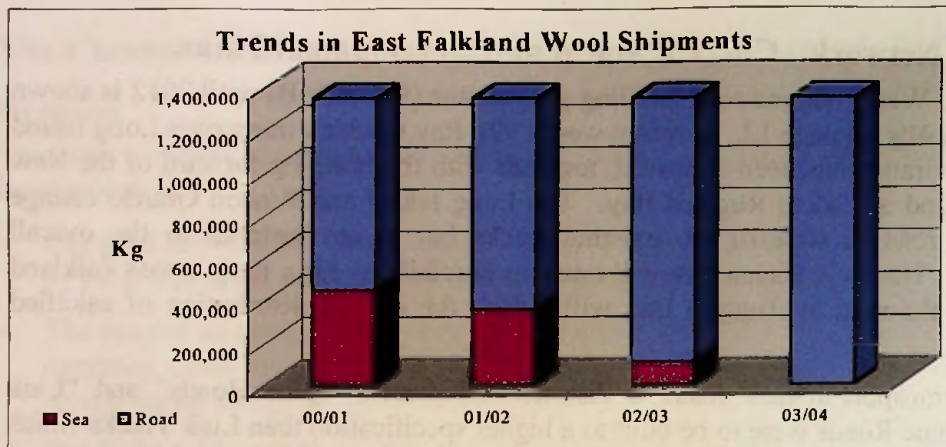
The 1996 transport review made a distinction between "Spine Roads" and "Link Tracks". Spine Roads were to be built to a higher specification than Link Tracks which would branch off to individual settlements. As the same construction equipment is used for both spine roads and link tracks, the specification is now similar for all roads except for the one from Stanley to Darwin, although the differing terrain does cause some variance elsewhere.

However, there is still a valid distinction between that part of a road that goes exclusively to a farm, and that part which is shared with others before the last junction. For example the road from Fox Bay to Port Stephens will be shared with South Harbour, Albemarle, Port Edgar, Spring Point, and Stoney Ridge. Arguably the road is a spine road from Fox Bay until the last junction, whereupon it becomes a link track to Port Stephens. Any assessment of the costs and benefits of the road building programme must look at it from the point of view of the community as a whole as well as that of individual settlements.

East Falkland Roads

By the end of the 2000/01 road building season, all settlements on East Falklands North of Goose Green, except the Murrel, had at least a passable track. Extra funding ensured that the Johnsons Harbour road was completed. In fact both the Murrel and Johnsons Harbour farms have hauled wool and provisions, and transported passengers overland for some time. The Murrel has no practicable alternative, but Johnsons Harbour took the decision some years ago, presumably on economic grounds, not to use its jetty or airstrip.

The development of the road network in recent years has already changed the pattern of transport in the Islands, taking freight from the coastal shipping service and of course passengers from FIGAS. Wool haulage is by no means the only use for the roads, but the proportion of the wool clip that is or could be hauled overland gives an indication of the impact of the road network on life generally in different parts of the camp. Already 67% of the East Falkland wool clip is transported to Stanley overland and this could rise to as high as 73% in 2001/02, and 100% by 2003/4.



Some of the planned road developments on East Falkland will create opportunities for further change whether it is voluntary or driven by government policy. These are:

1. The road to North Arm due for completion in 2002, or late 2001, and;
2. The road to Walker Creek due for completion in 2004, subject to any delay caused by if the acceleration of the New Haven and Ruggles Bay roads.

By which time there will no longer be an absolute need for a shipping service to anywhere on East Falkland, and finally:

3. The road to New Haven, now scheduled for 2001/02 which will benefit West Falkland and open options for a cross sound ferry.

The other proposed developments will have less impact on potential transport policy as they will not significantly alter the pattern of transport or the options for its provision. These are:

1. The links to Wineglass Station, Port Harriet and the Murrel, although they are important for the farmers concerned, and will improve the efficiency of the farms and the quality of life on them.
2. The Volunteer Point track which could, if properly managed, will have positive environmental and tourism development impacts.
3. The Lafonia "to be identified" track which will have a positive agricultural development impact by joining the Ruggles Bay calcified seaweed deposits to the road network.

and

4. The Stanley Gates to Greenfield link which will principally raise the standard of the existing road to all farms on the way to San Carlos, and will complete the loop joining San Carlos with the North Camp road and Port San Carlos, and therefore have positive agricultural and tourism impact. In addition it will overcome the difficulty of reaching Greenfield (from the North Camp road) when the San Carlos river is in spate, by linking it to the Darwin road.

West Falkland Roads

On West Falkland, the principal settlements already joined by the road are Port Howard, Chartres, Fox Bay, Hill Cove and Roy Cove, giving good road access to these ports to other farms including Little Chartres, Teal River, Sheffield, the Saddle, and Leicester Falls, as well as those immediately surrounding the principal settlements. There are others that already use principal settlement ports, although further road improvements are planned. For example East Bay farm already uses Fox Bay but has a link road projected for 2011.

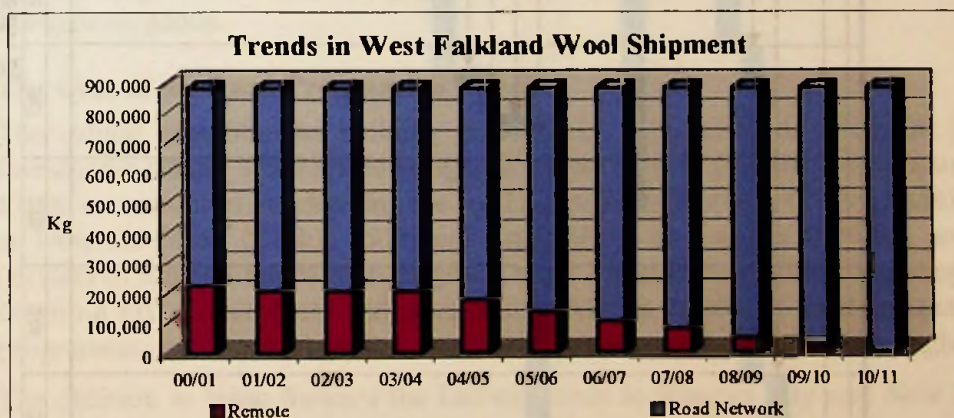
Unlike East Falkland, all the planned road building projects on the West will as they develop have a significant further impact on the options for transport, but the time scale is much longer.

Spring Point should be linked during the 2001/02 season, which will allow calcified seaweed to be delivered by road to all the settlements on the road and also to the Islands or even the East by sea from Fox Bay or other linked ports.

Thereafter there is a significant gap until:

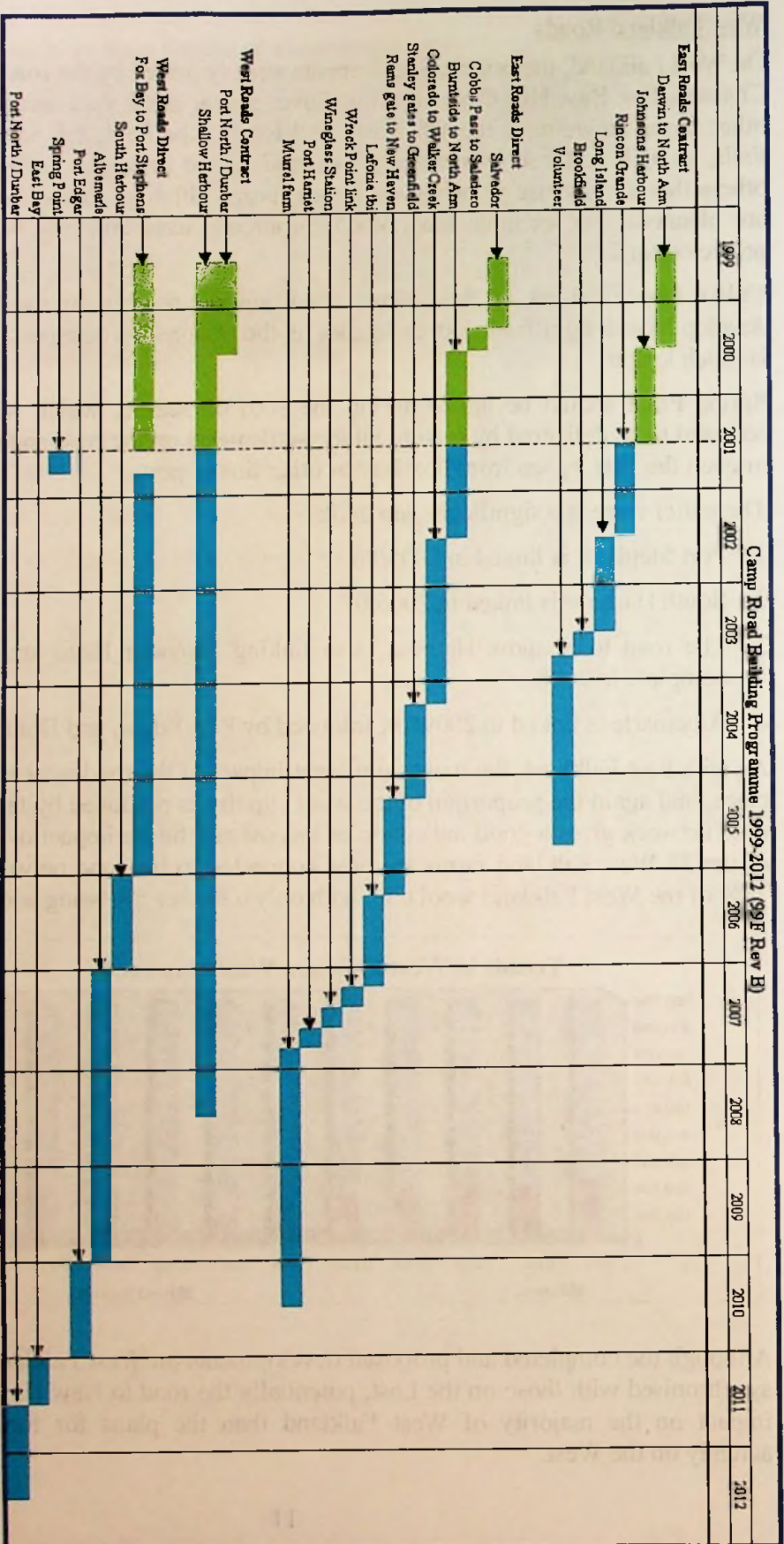
1. Port Stephens is linked in 2005/06
2. South Harbour is linked in 2006/07
3. The road to Shallow Harbour, also linking Dunnose Head and The Narrows, is complete in 2008
4. Albemarle is linked in 2009/10, followed by Port Edgar, and Dunbar

As with East Falkland, the most significant impact of the road system has already taken place, and again the proportion of the wool clip that is produced by farms that are on the road network gives a good indication of its past and future impact overall. A total of 27 of the 38 West Falkland farms are now connected to the road network, accounting for 73% of the West Falkland wool clip, with only a further 5% being added by 2005/6.



Although the completed and proposed developments on West Falkland appear not to be synchronised with those on the East, potentially the road to New Haven will have more impact on the majority of West Falkland than the plans for further road building actually on the West.

Canopy Road Building Programme 1999-2012 (99F Rev B)



The Use of the Road Network

The road network use can be divided into 5 principle categories:

- 1) Social and business travel.
- 2) Shipment of wool and produce to Stanley.
- 3) Transport of fuel and supplies from Stanley.
- 4) Tourism.
- 5) Military.

The only data available relates to fuel and wool transport, but there is no doubt that on both East and West Falkland, the overall impact of the others is significant and the more extensive the road network the more it will be used by all including the Military.

Wool transport has been used as a measure of the impact of roads on life in camp; it can also give an indication of future demand for freight haulage. On East Falkland, of the wool clip of approximately 1,340 tonnes, 919 tonnes is already hauled into Stanley by road and this could increase to 987 tonnes next year (01/02), 1,228 the following year (02/03), and the full 1,340 in the season 2004/05. The introduction of meat sheep may reduce the overall wool clip (although meat sheep will still produce wool as a by-product), but this will be replaced by animals for slaughter and other products.

Fuel is delivered by road to all the settlements on the East except four, Salvador, Port San Carlos, Walker Creek and North Arm, and of these only Walker Creek will absolutely require sea deliveries after early 2002.

The road network has virtually replaced FIGAS as a method of transport on East Falkland and may be used to reduce the number of airstrips served by FIGAS on the West.

On West Falkland 27 farms are using one or more of the five linked ports (Port Howard, Hill Cove, Roy Cove, Chartres, and Fox Bay), for wool shipments, fuel deliveries and general cargo. This effectively gives these farms more frequent deliveries of easily transported goods.

The Cost of the Road Programme - Capital

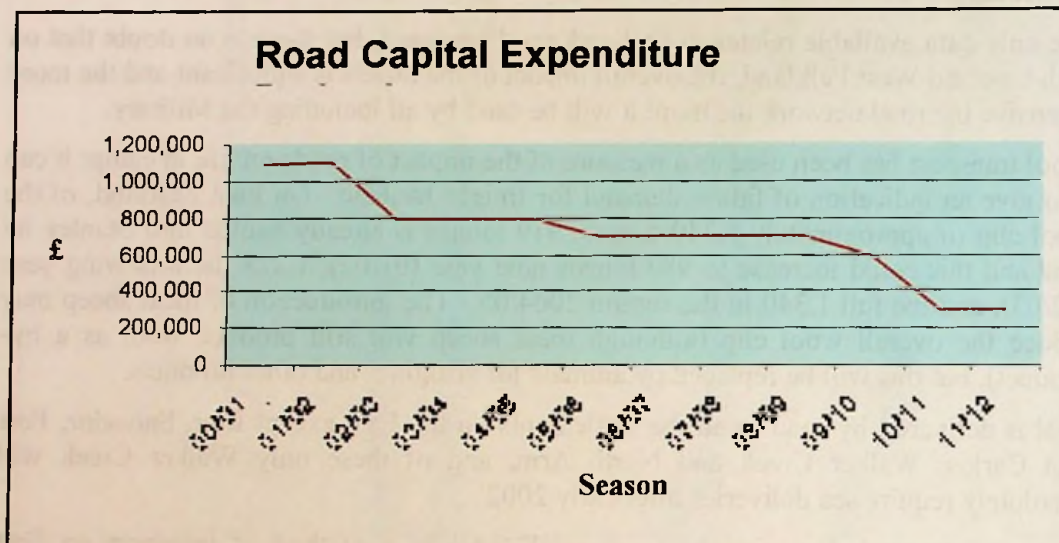
The capital cost of road building programme is budgeted at £800,000 pa, for the foreseeable future. The revised budgeted expenditure in 2000/01 will amount to nearly £1.1m as a result of accelerating the road to Johnsons Harbour (£70k), additional works at Dunnose Head (£25k), additional expenditure on Lafonia (£100k), and a revote (£100k) of funding for the Port Stephens road. These figures do not including the write-down on FIG owned plant and equipment, which is employed on three-quarters of the programme, so the actual capital cost of the programme is considerably higher.

The decision to bring forward the Lafonia roads to Ruggles Bay and New Haven may result in additional expenditure in the year 2001/02.

None of these changes are additional to the plan (with the possible exception of the Ruggles Bay link) but the additional actual cost is not less than 10% of the project cost for each year they are brought forward.

On the other hand, the scale of the road building programme begins to reduce from 2005 onwards, at a rate that will more than compensate for additional expenditure now, unless it is deemed both practical and desirable to allocated additional resources to the remaining parts of the programme, mainly on West Falkland.

Assuming no additional resources are allocated to the remaining projects, as the first ones finish the actual expenditure projections will reduce as shown on the table on page 15.



Road Programme Capital Projections

	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	
Core funding	£	£	£	£	£	£	£	£	£	£	£	£	
East													
27 Contractor	170,000	100,000	100,000	100,000	100,000								
30 PWD squad	400,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000			
West													
33 PWD squad	400,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	
22 Contract and Link tracks assistance	125,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000				
Total Core funding	1,095,000	800,000	800,000	800,000	800,000	800,000	700,000	700,000	700,000	700,000	700,000	600,000	300,000
Possible Additions													
34 Ruggles Bay		300,000											
Total Projections	1,095,000	1,100,000	800,000	800,000	800,000	800,000	700,000	700,000	700,000	700,000	700,000	600,000	300,000

The cost per km of road varies according to location and terrain, but generally is in the region of £15k to £20k using direct labour and not including the write-down of capital plant. The full cost using contractors is in the region of £20k to £25k per km. However as is illustrated below, there may be some major variations to these costs.

Taking the budget allocation for each gang and the projected time scale for each section of road an approximate cost for each is shown below. Once again, in the case of the direct labour (PWD squad) projects, this does not include the capital cost of plant.

These figures can be translated into an approximate cost per km. The number of settlements served and the wool clip produced by them, is included to give an indication of *relative* socio-economic benefit

Road section	Projected cost £k	Approx. Distance km	Cost per km	Settlements	Wool clip tonnes
East Roads Contract					
Rincon Grande	100	15	7	2	30
Long Island	100	5	20	1-2	13
Brookfield	25	2	13	1	12
Volunteer Point	200	15	13	-	0
East Roads Direct					
North Arm road (to finish)	300	-	-	2 **	245
Colorado to Walker Creek	525	32	16	1	112
Stanley gates to Greenfield	300	25	12	6 **	-
Ramsgate to New Haven	300	15	20	West	-
Lafonia (Ruggles Bay)	285	12	24	-	-
Wreck Point	60	5	12	1	14
Wineglass Station	60	4	15	1	15
Port Harriet	60	4	15	1	-
Murrel farm	810	8	101	1	8

** Part "spine road" with shared benefits.

Road section	Projecte d cost £k	Approx. Distance km	Cost per km	Settleme nts	Wool clip Tonnes
West Roads Contract					
Shallow Harbour	525	28	19	3**	15
West Roads Direct					
Fox Bay to Port Stephens	1275	50	26	7**	42
South Harbour	300	5	60	1	20
Albemarle	900	20	45	1	28
Port Edgar	300	15	20	1	26
Spring Point	75	12	6	1	21
East Bay	150	17	9	1	17
Port North / Dunbar	300	18	17	2	24

** Part "spine road" with shared benefits.

In many cases the distances are estimated either because of uncertainty over the precise route, or the exact point reached by the end of the season 2000/01. Furthermore, the projected time scales are also estimates, and the availability of suitable material and varying weather conditions can reduce or increase the actual speed and therefore cost of construction. Moreover some sections involve the upgrading of existing tracks over relatively hard camp, and others involve the construction a completely new road over peat bog. Therefore these costs per km are also estimates and should be treated with extreme caution.

However, even allowing for these variables and possible inaccuracies, some sections are so far from the norm that they warrant:

- a) confirmation of the costs involved, particularly in terms of the time scale for the project, and if confirmed:
- b) a new cost/benefits evaluation.

The roads to South Harbour, Albemarle, and the Murrel, seem to have a particularly high cost per km, while the road to volunteer point at £200k, represents a considerable investment on a private farm already linked to the main road network. There is an analogy between this project and the public investment in the settlement airstrip at Sea Lion Island, and in tourist lodges and facilities in other parts of the islands.

Full allocation of road costs to individual farms is not necessarily relevant as the benefit of the entire network accrues to varying degrees to the entire community. However it is the existence of the farms and settlements that are the reason for building the roads, and a substantial part of the cost must be allocated there however it is calculated.

- It can be argued that the "link track" element of the road cost is entirely to the farm's account.
- The cost of the spine road element can be shared equally between the settlements, or pro-rated in terms of:
 - the length of the section used to reach the main port or airstrip,
 - the volume of goods shipped in or out,
 - the numbers living at the settlement, or
 - some combination of all these

These arguments ignore the benefit to the community as a whole, the potential savings in other areas like coastal shipping and the air service by having a complete network, and the socio-economic benefits and potential opportunities created.

As individual roads are worthless on their own, it is recommended that the capital costs and benefits of the programme are analysed as a whole, on the basis that it is government development policy to link all major settlements for the overall good of the community. However some extreme cases should be examined in detail, and perhaps alternatives sought, where the cost per km is high and the total cost far exceeds the value of the farm or any conceivable economic benefit.

The Cost of the Road Programme - Maintenance

From the Government's point of view the "operating cost" of the road network is the maintenance cost. The maintenance budget has been held at £274k pa for the last two years due to constraints on the overall operating budget. Clearly as the road network grows at the rate of anything between 35 and 55 km p.a., an increased maintenance budget will be required. Funds could be made available from the projected reduction in capital costs from 2005.

There is little data on the marginal maintenance costs resulting from the use of roads. In the Falklands these costs are particularly hard to quantify as regardless of traffic volumes, they can vary significantly according to weather conditions and the axle weight of vehicles used. Therefore the economics of using the roads as opposed to other forms of transport are also uncertain. Even with more precise data, on pure economic grounds it may be difficult to justify the cost of road development and maintenance, but the existence of well maintained roads has an enormous social impact, allows for the development of a variety of enterprises including tourism, and in many cases reduces the need to provide and subsidise other forms of transport by air or sea.

Summary of the current road development policy.

The programme for both East and West roads is now well defined and well advanced, although several years behind the timetable envisaged in the 1996 review. The policy aims to satisfy the greatest need first, as defined by the standard of existing facilities, and the expected volume of traffic; *and* to progress the programme on two fronts on each principal island.

On East Falkland, the critical stages in development will be

1. When the North Arm road is complete in late 2001, and:
2. When the Walker Creek road is complete in 2004 (unless delayed).

Until then, these settlements will have no alternative to the coastal shipping service and FIGAS serving their own port and airstrip. Meanwhile effort is being expended on other East Falkland road links that will have no impact on policy options, but until the New Haven link is complete, the options for changing the shipping service Islands wide are limited.

On West Falkland, a major milestone has already been reached, now that there are five ports on the road system and numerous farms using them. The next critical stages will be:

1. When the Spring Point link is complete in 2001 facilitating the transport of calcified seaweed from there.
2. When Port Stephens is connected in 2006, by which time other settlements on that route will make some use of the road even if wool, fuel, and other heavy goods have to be transported by sea.
3. When Albemarle and Port Edgar are linked in 2009 and later.

But perhaps most importantly of all:

4. When the road to New Haven is built on Lafonia, enabling a cross sound ferry to operate.

Options for the changes in Shipping and Air services depend upon the development of road links and particularly the one to New Haven which opens the option for a sound ferry. That is to be brought forward to 2001/02 after the North Arm road, and if it cannot be financed by additional budget it is preferable that it is not at the expense of the Walker Creek road programme which is the last major East Falkland settlement still requiring shipping services for Wool and Fuel.

There will, presumably, always be inhabited remote islands, and for many years there will be West Falkland settlements demanding air and ferry services. Once Walker Creek is linked, and the East Falkland road system is effectively complete, the options to satisfy the demand for air and sea links with an alternative to the present Stanley based service, become much greater. From the point of view of coastal shipping, there are three islands nearer to Stanley than New Haven; Lively Is, Bleaker Is, and Sealion Is; but Walker Creek generates a demand for nearly five times as much cargo as these three islands combined.

Future transport policy will depend upon whether to encourage or discourage road use for heavy goods shipments.

The Coastal Shipping Service

The inter-island routes

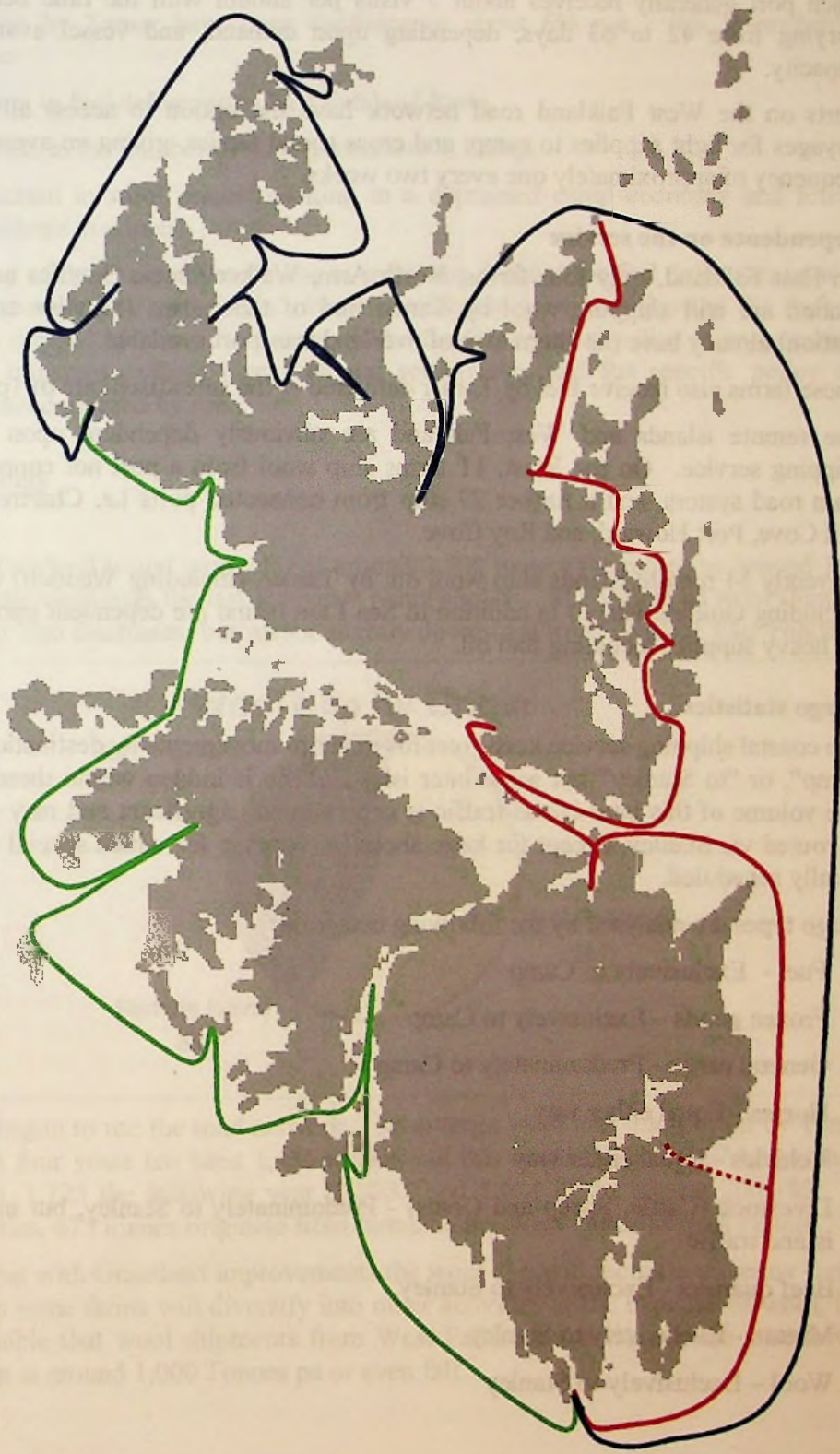
The Tamar operates a flexible timetable, consisting of three basic voyages plus cross sound ferry services and trips to Punta Arenas making five routes in all. The basic voyages may be modified to suit demand, or interspersed with special voyages to comply with demand, e.g. moving sheep or cattle to Stanley or between islands. This demand led scheduling is extremely flexible and has allowed the pattern of operation to change since 1996/97 to satisfy the change in demand. As the road programme develops further changes will almost certainly be demanded unless policy dictates otherwise.

The principal routes are shown on page 21 and colour coded. These are:

Route 1 (Red)	Route 2 (Blue)	Route 3 (Green)	Route 4	Route 5
North	West	South	Sound crossing	Punta Arenas
(Salvador) Port San Carlos, Port Howard, Pebble Is, Golding Is, Saunders Is, Hill Cove, Dunbar, Carcass Is, West point Is	Roy Cove Chartres Dunnose Head Spring Point Double Creek Weddell Is Beaver Is New Is Port Stephens Albemarle	Lively Is, Walker Creek, Bleaker Is Sea Lion Is North Arm Speedwell Is Fox Bay, Port Edgar Albemarle	Port San Carlos And Port Howard Or potentially New Haven and Port Howard	Stanley – Punta Arenas – Stanley -0- With the option of calling at ports in East or West Falkland in either

Fig 7

Inter-island voyages may be truncated and varied to suit demand and the capacity of the vessel. E.g. during the wool collection period the **North** route may be divided into two parts. Normally the pattern of operation is to complete each basic inter-island voyage **North**, **West**, and **South** between trips to Punta Arenas. These may be interspersed by cross Sound ferry services normally at the times of Farmers week, Camp Sports, Christmas and Stud Flock sales.



F1 Shadow Map.jpg

Frequency of service

Each port generally receives about 7 visits per annum with the time between visits varying from 42 to 63 days, depending upon demand, and vessel availability and capacity.

Ports on the West Falkland road network have the option to access all three basic voyages for light supplies to camp, and cross sound ferries, giving an average delivery frequency of approximately one every two weeks.

Dependence on the service

On East Falkland, only four farms, North Arm, Walker Creek, Smylies and Gibraltar Station are still shipping wool by Tamar and of these, two (Smylies and Gibraltar Station) already have the alternative of overland transport available.

These farms also receive fuel by Tamar delivered at the subsidised rate of 1p per litre.

The remote islands and West Falkland are obviously dependent upon the coastal shipping service. On the West, 11 farms ship wool from a port not connected to the main road system, and a further 27 ship from connected ports i.e. Chartres, Fox Bay, Hill Cove, Port Howard, and Roy Cove.

Currently 14 remote islands ship wool out by Tamar, (including Weddell) of which 10 (including Golding island) in addition to Sea Lion Island are dependent upon the vessel for heavy supplies including fuel oil.

Cargo statistics

The coastal shipping service keeps records of cargo movements by destination as i.e. "to Camp", or "to Stanley" but some inter island traffic is hidden within these categories. The volume of this inter-island traffic is generally not significant and may on occasion be routed via Stanley, except for large sheep movements for which special voyages are usually scheduled.

Cargo types are analysed by the following categories:

1. Fuel - Exclusively to Camp
2. Frozen goods – Exclusively to Camp
3. General cargo - Predominately to Camp
4. Horses - Equal either way
5. Vehicles - Equal either way
6. Livestock (Cattle, Sheep and Goats) - Predominately to Stanley, but includes inter island traffic
7. Beef quarters - Exclusively to Stanley
8. Mutton - Exclusively to Stanley
9. Wool – Exclusively to Stanley

By far the most significant categories in terms of volume are fuel, wool, livestock (sheep, goats and cattle) and "general cargo".

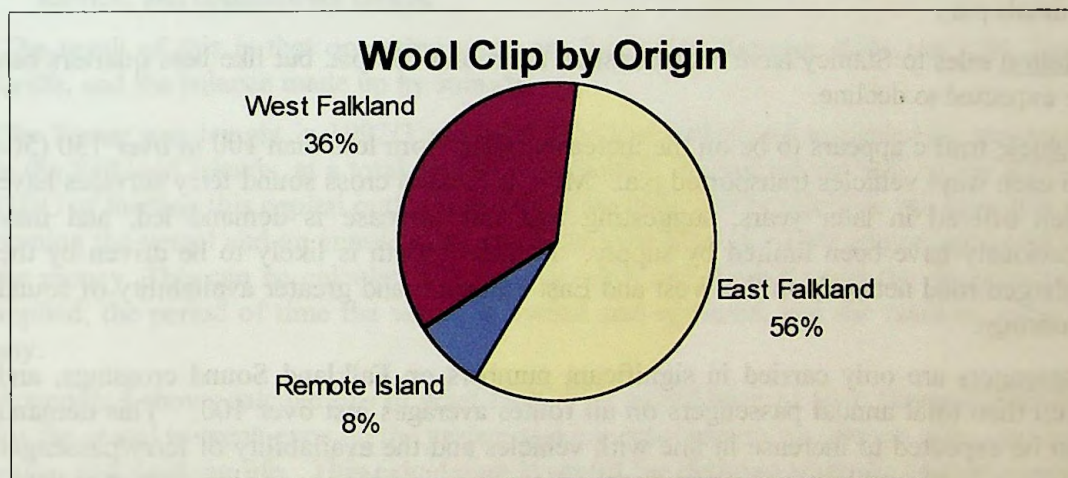
Fuel deliveries by Tamar have been declining at about 6% p.a. this is probably attributable to:

1. A reduction in fuel deliveries to East Falkland Ports
2. The increase in the number of wind generators in Camp.
3. The reduction in wool prices resulting in a depressed camp economy and fewer camp residents in winter.

The economy of the camp will continue to influence demand for fuel deliveries as will the proliferation of wind generators. But the principle drivers of demand for fuel or heavy goods shipped by sea in the future will be the Government policy of encouraging road or sea transport to/from East Falkland settlements, and the specific policy on charges for fuel delivered by road.

Wool Shipments

The annual Falkland Island wool clip of around 2,500 tonnes fluctuates by around 150 tonnes with the trend over the last few years rising slightly. The weight of wool shipped by the Tamar also fluctuates, but with a slightly downward trend as more East Falkland



farms have begun to use the road network. The average wool clip transported by Tamar over the last four years has been 1,435 tonnes and this could fall to 1,367 tonnes next year (01/02), 1,125 the following year (02/03), and 1,014 in the season 2004/05. Of these quantities, 675 tonnes originate from farms on the West Falkland road system.

It is likely that with Grassland improvements the wool clip will increase on many farms. However, as some farms will diversify into other activities at the expense of wool, it is at least possible that wool shipments from West Falkland and the remote islands will stay constant at around 1,000 Tonnes pa or even fall.

Livestock

Livestock movement trends are distorted by the removal of several thousand sheep from Weddell Island in the year 2000.

Apart from anomalies like the evacuation of Weddell, and other unpredictable movements of sheep and goats between farms and islands, the movement of sheep to Stanley, mainly for slaughter has been constant at around 2,500 p.a.. This will increase when, through the abattoir, markets are established for Falkland Island lamb, and for the mutton cull. Initially, the rate of increase will depend upon the speed at which these markets are penetrated, and the ability of farms to produce lamb and cull mutton of suitable quality. Volume of sheep movements can be expected to increase to 50,000 p.a. from West to East in addition to cattle movements as the industry develops.

General cargo volumes to Camp have halved since 1996 to 1500 M³ pa while cargo from Camp has remained constant.

The minor categories:

Beef quarters to Stanley have shown a small decline (5%) which is probably not statistically significant but will be expected to reduce in parallel with an increase in live cattle transported when the new abattoir is commissioned. All the beef quarters transported to Stanley by the coastal shipping service, only amount to an average of 35 animals p.a..

Mutton sales to Stanley have been constant at around 160 p.a. but like beef quarters can be expected to decline.

Vehicle traffic appears to be on the increase, rising from less than 100 to over 130 (50-65 each way) vehicles transported p.a.. More dedicated cross sound ferry services have been offered in later years, suggesting that this increase is demand led, and may previously have been limited by supply. Further growth is likely to be driven by the enlarged road network on the West and East Falkland, and greater availability of sound crossings.

Passengers are only carried in significant numbers on Falkland Sound crossings, and even then total annual passengers on all routes averages just over 100. This demand can be expected to increase in line with vehicles and the availability of ferry/passenger services, but is unlikely to be significant unless there is a change in air transport policy.

Horse transportation is constant at around 40 p.a., and as a user of Sound Ferry services, once again a modest increase could be expected with greater availability of sound crossings.

Frozen Goods volumes are so small as to be insignificant, although some may be wrongly classified in "general cargo". Some facility for frozen goods is clearly required, possibly also on the air service. Any increase over the present provision by sea should be demand led.

Seasonality

There is no very clear pattern of seasonality in general cargo movements or fuel deliveries although the busiest time seems to be the later part of the year as camp activity gears up for the summer. Naturally wool shipments are mainly from November through to March, and sheep movements are concentrated between February and May as many sheep are sold as soon after shearing as practicable. The movement of beef quarters, which will probably reduce in numbers when the abattoir is built, are restricted to winter months.

The cost of the shipping service

The charges for the coastal shipping service have not been increased since 1996, and it has been argued that as the main users are wool farmers who are already in receipt of Government subsidy, there would be little or no net gain to FIG as it would simply raise the pressure to increase subsidies further.

In common with shipping services to island communities in many countries the Tamar operation is subsidised. This subsidy comes in two forms:

1. The capital cost is absorbed by FIDC who own the vessel and "bare boat" charter her to Byron Marine for a nominal annual fee.
2. The operating costs are subsidised by FIG on an arrangement which guarantees an agreed "profit" or management fee for the company, in return for a certain level of service, and control over tariffs.

The result of this is that operating costs are funded by between 44% and 52% from tariffs, and the balance made up by subsidy.

The Tamar was bought in 1992/3 and extensively modified and upgraded for the work in the Falkland Islands, at a total cost of £1,410,000. Of course the bulk of the cost to FIDC of funding this capital outlay was met at the time, but to calculate the total cost of owning the vessel and an annual cost, one must take account of the opportunity cost of the money. This can be calculated in various ways and depend upon the discount rate applied, the period of time the vessel is owned and operated, and the residual value if any.

Appendix I shows calculations of what FIDC/FIG would have to have charged annually for the vessel to break even on the project making assumptions on interest rates, residual value, and working life. This calculation is useful for defining what the current service is costing annually, but the actual expenditure is a sunk cost, and changing the operation now would not recover any of the original expenditure other than the residual value of the vessel.

Assuming a useful life of 12 years (until 2004) a discount rate of 8% (an estimated average cost of capital for FIG) and a residual value of £250,000 the annual cost to FIDC/FIG is around £174,000.

The sensitivity of this calculation to these assumptions is demonstrated in appendix 1. It is demonstrated that the discount rate and useful life make a large difference to projected annual costs, while the residual value, perhaps the most contentious figure, has relatively little impact.

It would seem reasonable to apply the figure of £174k pa to the capital cost of owning the Tamar if she is kept until 2004 or £161k p.a. if she is kept until 2006.

This gives a total annual cost to FIG/FIDC of the coastal shipping service, not including pier and jetty maintenance of around £550,000

However, when assessing the cost of changing to another ship, the relevant comparison involves capital and operating cost of each option from this point onwards, and not the historical sunk cost

The Falkland Island Government Air Service

Routes, schedules, and frequency

The Falkland Islands Government Air Service effectively operates an air taxi service with routes devised daily to suit demand. A "best value" review of the service is currently being undertaken and may make recommendations as to future operational and development policy.

This review is concerned with the current level of operation, how demand and need will be affected by developments in the road network and any changes in the coastal shipping service, and how the service might be operated to provide an appropriate level of service to complement the future road network and shipping service. Ultimately the decision on the type of service and level of Government subsidy provided in the future will be a political one, balancing the needs and wants of the population against what is affordable. Clearly, although a low cost service to every settlement is desirable, it is no longer strictly necessary when the road arrives.

The Government Air Service will in theory provide a direct flight between any two airstrips in the Islands, and in practice will provide a service between any two at a fare based on the direct distance regardless of the actual route flown for operational or economic reasons. For residents, fares are capped at £42.00 per single journey.

In addition to the hard surface airfields at Stanley and MPA there are approximately 36 licensed camp airstrips, although of these, three East Falkland strips, Teal Inlet, Douglas Station, and Johnsons Harbour, are seldom if ever used for commercial traffic, and three remote island strips, Keppel, Sedge and Golding are used only very occasionally. The surface quality, length, angle to prevailing winds, and approach and departure difficulties, vary considerably from one strip to another. This constrains the payload of aircraft from a maximum of 8 passengers plus luggage and/or freight, to as little as two passengers in some cases, and requires a high level of pilot skill and experience

Dependence on the service

On East Falkland only North Arm and Walker Creek are dependent upon the air service for passenger transport, mail and freight, although other settlement strips are used for convenience and for delivery of mail. Obviously the remote islands are almost totally dependent upon FIGAS for passenger transport, light freight and mail, as are the 11 West Falkland farms not connected by road. The other farms are dependent on an air service, but not necessarily upon it landing at every airstrip.

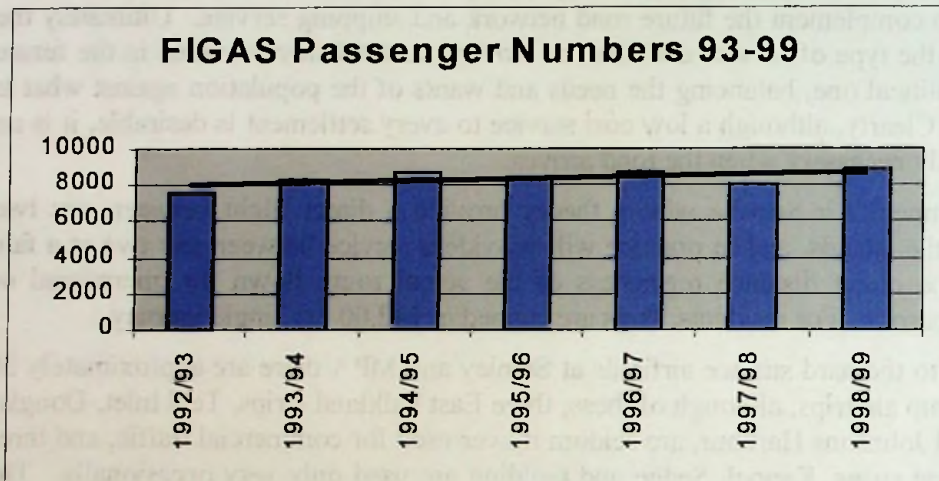
In the year 2000, traffic to/from East Falkland airstrips other than Stanley and MPA accounted for 6% of the total volume, and nearly half of this was to airstrips on the road system.

The road programme on East Falkland has already reduced demand, and will eliminate the *need* for an air service (to the East) except for emergencies, by 2004 when both North Arm and Walker Creek are connected by road. At present, North Arm and Darwin each account for approximately one third of the East Falkland camp landings. No doubt some flights from Darwin are to Stanley, but this strip is also used for flights to West Falkland and the remote islands.

On West Falkland, 75% of traffic is to/from airstrips connected by the road network, and half of that is to/from Port Howard, with Fox Bay and Hill Cove accounting for most of the rest. In theory, as settlements are connected by road, the need (and possibly the demand) for flights to so many airstrips will diminish, but in practice, apart from Spring Point the road programme will not link more West Falkland settlements until 2006. But the road to New Haven and a cross sound ferry could depress demand for flights to the linked settlements if the cost and frequency is attractive.

Passenger and freight statistics

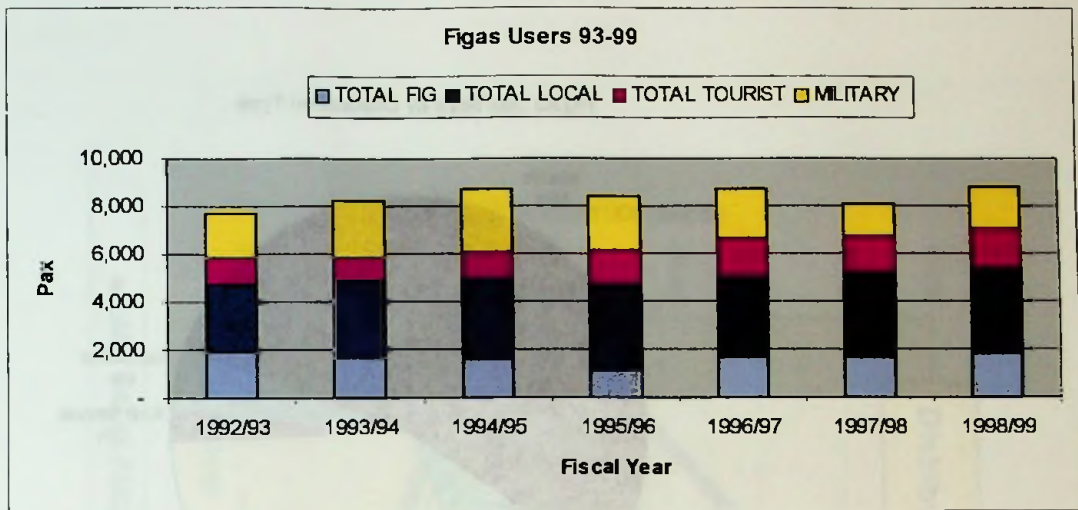
Overall annual passenger numbers have fluctuated between 7,700 and 8,800



over the last decade, but the overall trend has been slightly upwards.

In 2000 there were 8,489 journeys undertaken of which 7,293 or nearly 86% originated or terminated at Stanley or MPA. Given that the number of journeys booked for the flight between Stanley and MPA is insignificant, it follows that only 14% (1,196) of all journeys were between two camp airstrips. This figure includes the movement of shearing gangs, parties of tourists and passengers travelling from for example Darwin or North Arm to West Falkland and vice versa.

In spite of the reduction in demand from East Falkland airstrips following the road building programme the total demand has been sustained by increased tourism demand from the local, overseas, and military markets.

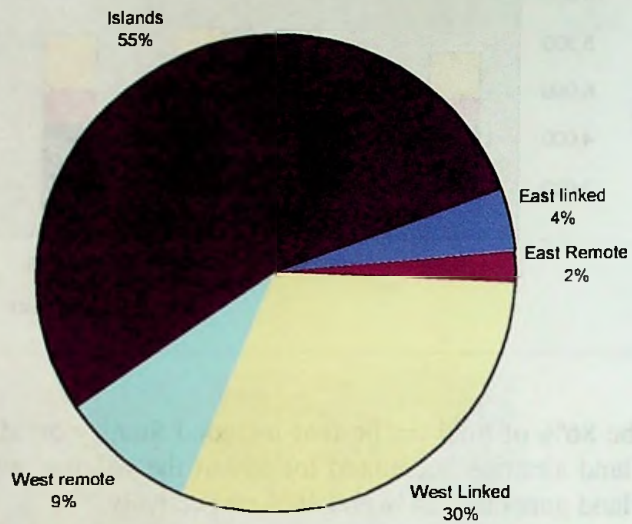


Of the 86% of total traffic that included Stanley or MPA as origin or destination, East Falkland airstrips accounted for 6% of the volume, while the remote islands and West Falkland generated 54% and 40% respectively.

The diagram on page 31 shows the distribution of traffic by destination type, i.e. remote island, West airstrip not connected to the road network, West airstrip connected, and East Falklands. The weight of the lines correlates to the volume of traffic.

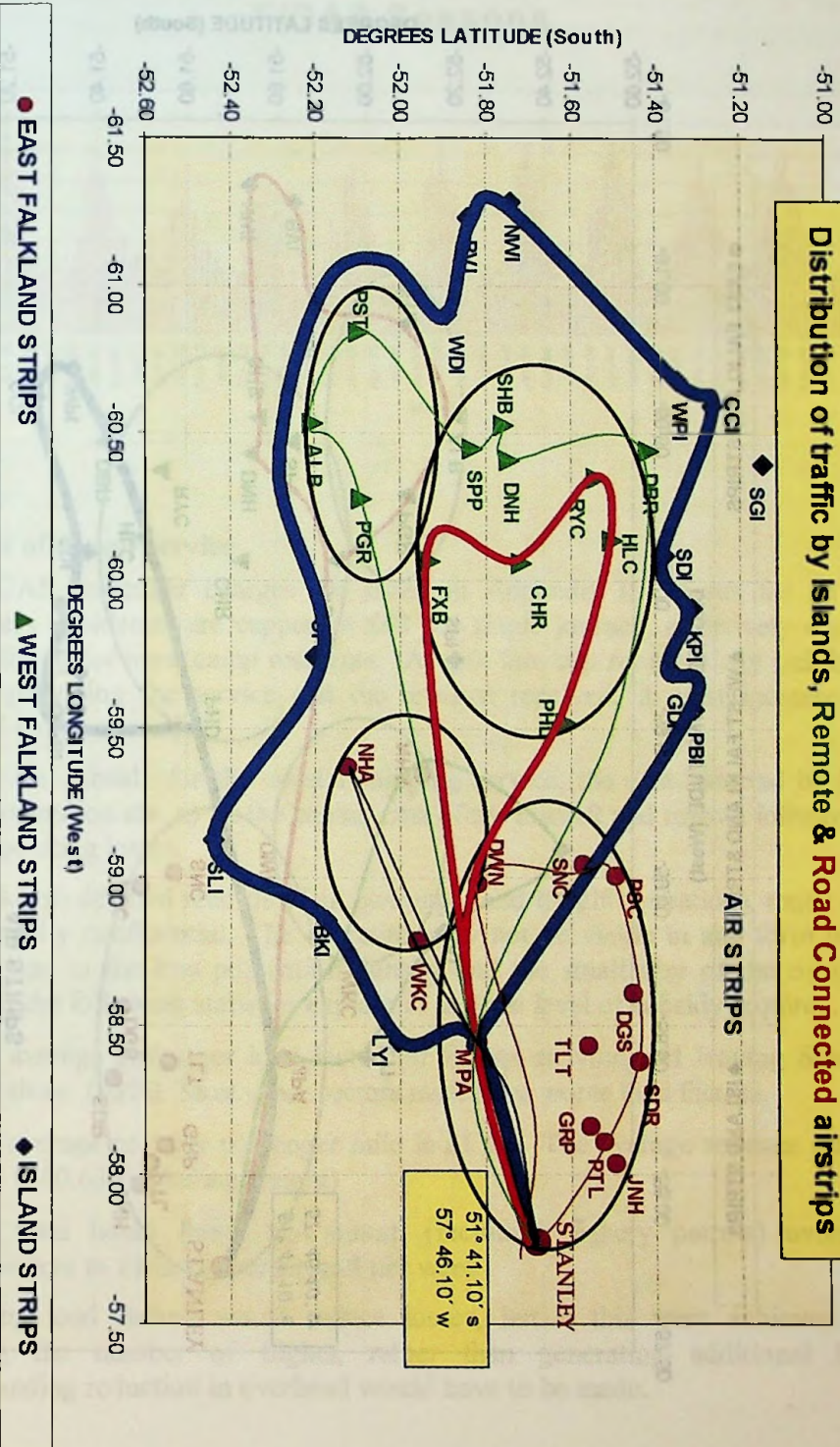
The diagram on page 32 shows the distribution of traffic by geographical destination, i.e. North, West and South. The weight of the lines correlates to volume, showing that the north route has the greatest volume (mainly Port Howard and Pebble Is), followed by the South (mainly Sea Lion Island).

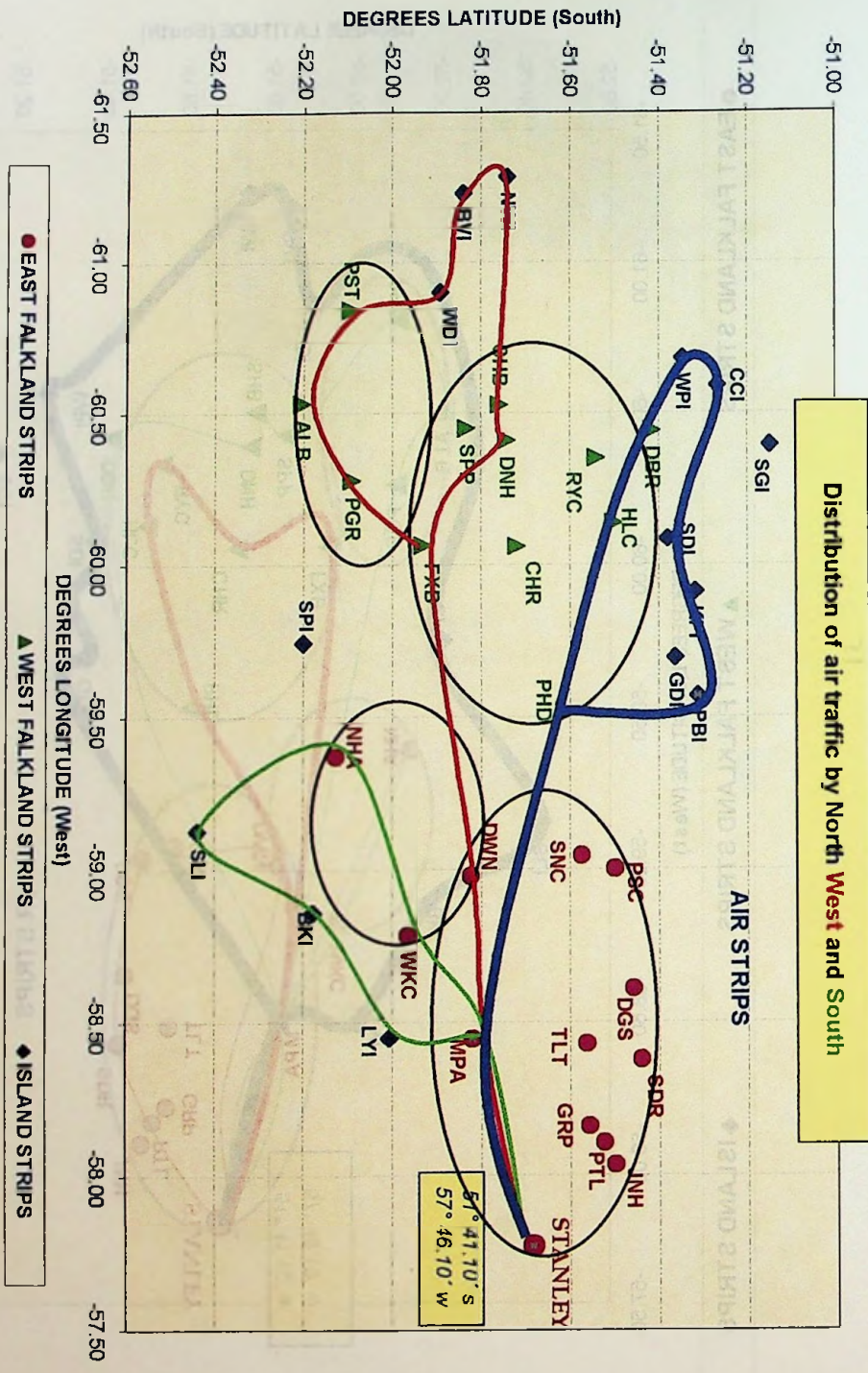
FIGAS Journeys by Destination Type



The vast majority of West Falkland flights are to airstrips on the road network, but together with the remote islands, those still unconnected make up 64% of all flights.

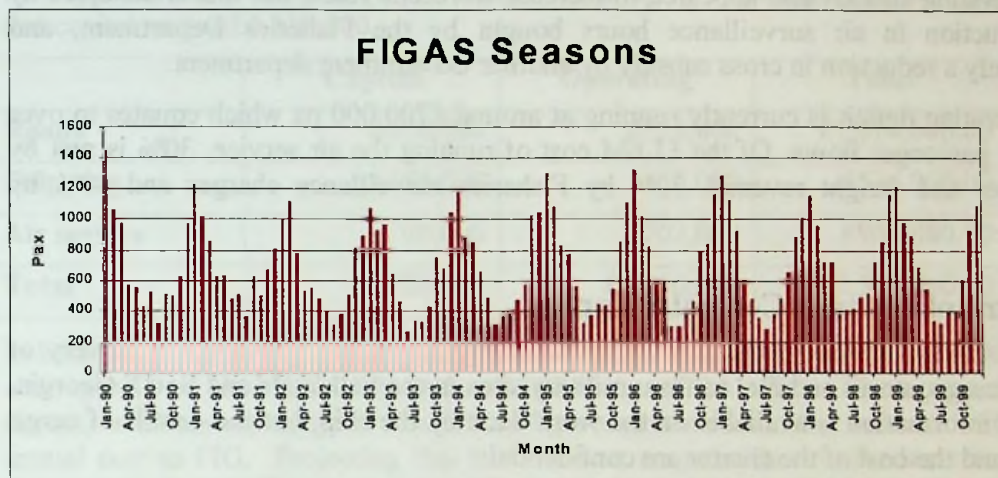
Distribution of traffic by Islands, Remote & Road Connected airstrips





Seasonality

Monthly passenger numbers peak in December at up to 1,300 and dip in January each year to as few as 300.



The cost of the air service

The FIGAS passenger charges are listed in Appendix II. Fares for all qualifying passengers (residents) are capped at £42 per single journey, effectively equalising the cost of flying for most camp residents. As this fare cap removes any link between the cost of providing the service and the revenue received, it must increase the losses incurred by the operation.

As with the subsidy for the coastal shipping service, the cost incurred by FIG on the FIGAS operation are, a) on the capital cost of the aircraft and related infrastructure and, b) the operating losses.

FIGAS keeps detailed records of all passenger and freight operations, much of which is commercially confidential. The operation may not be viable in any form without FIG subsidy due to the low population density and the small size of the overall market. However the following statistics explain in part the level of subsidy required.

- The average passenger load factor for flights arriving and leaving Stanley is less than three. (33%) Most other sectors must have worse load factors.
- The average cost per passenger mile is £1.50. The average revenue per passenger mile is £0.63 (including freight)
- The total hours flown per annum (including fishery patrols) averages 3500, equivalent to 11 hours per aircraft per week

Increasing load factors would reduce losses, but if this were achieved by simply reducing the number of flights, rather than generating additional business, a corresponding reduction in overhead would have to be made.

The capital cost of FIGAS is harder to estimate than that of the coastal shipping service. The investment in aircraft has been spread over many years, the resale value of the aircraft is uncertain, and the useful life of the airframes is potentially long.

The operating subsidy has appeared to increase in recent years, but this is distorted by the reduction in air surveillance hours bought by the Fisheries Department, and effectively a reduction in cross subsidy by another Government department.

The operating deficit is currently running at around £700,000 pa which equates to over £80 per passenger flown. Of the £1.6M cost of running the air service, 30% is met by passenger and freight revenue, 30% by Fisheries surveillance charges and 40% by subsidy.

Ministry of Defence Coastal Shipping.

The MOD charters one dedicated cargo vessel the MV Saint Brandan for delivery of general cargo, stores and fuel to/from military sites in the Falklands and South Georgia. Limited information is available on the work done by the ship, but the details of cargo carried and the cost of the charter are confidential.

The Saint Brandan operates on demand, and in the year to February 2000 undertook 33 coastal re-supply voyages, 16 for general cargo and 17 for fuel, in addition to her voyages to South Georgia. The South Georgia voyages will no longer be required from March 2001 which must free up capacity for other work.

Her total cargo delivered to camp locations is approximately 3000 Tonnes with about 1000 tonnes being returned. These stores amount to 14,000M³.

The MOD is interested in principle in saving costs by sharing facilities, but reluctant to discuss details of operations, due to security restrictions and commercial considerations. The military have indicated that they would be more interested in studying specific proposals that they make use of a service provided by civilian operators, once that service and the infrastructure was in place.

The revenue generated by chartering the St Brandan for civilian use is welcome, provided the ship is not required for military duties.

Summary of current transport system, policy and costs

The current civilian transport systems and development policy as described above costs FIG approximately £2,500,000 per annum, made up of operating costs of £1,350,000 and capital costs of 1,150,000.

	Capital	Operating	Total
Roads	£800,000	£274,000	£1,074,000.00
Shipping	£174,000	£350,000	£524,000.00
Air service	£200,000	£702,000	£902,000.00
Total	£1,150,000	£1,350,000	£2,500,000.00

In both the shipping and air services, the capital costs per annum are estimates based on assumptions on the useful life and residual value of the plant. The operating costs (losses) will vary annually. Overall these figures give a reasonable estimate of the total annual cost to FIG. Projecting this level of cost assumes that no fundamental policy changes are made. This is clearly unlikely in view of the recent decision to build the road to New Haven.

The capital outlay on roads will decline as the programme nears completion, although there will be an increased requirement for road maintenance.

The road network will also make it possible to reduce operating costs on both shipping and air services, although this may require some additional capital expenditure.

The current systems have worked well, but are no longer making best use of resources and as the road network develops, the present shipping and air services become increasingly inappropriate. This does not imply that they have been poor value in the past.

Operating out of Stanley, the coastal shipping service makes long slow voyages to most ports, and loading and unloading by crane onto piers or seatrucks results in a high proportion of loading to sailing time.

FIGAS makes very light use of its fleet of Islanders overall, and averages low passenger load factors.

Whereas the MOD would like to save on costs, in reality different operational requirements make a fully integrated service impracticable. They would however make more use of regular scheduled civilian services if they were available.

The Future for Inter Island Transport.

The coastal shipping service, FIGAS and the road network are currently under utilised. The exception at present being during the shipping of the wool clip to Stanley, and in the future the shipping of live animals to supply the abattoir.

Provided wool and livestock demand can be met, capacity is not the principal issue, and projections for land and sea freight other than live animals have been based initially on current levels of demand.

FIGAS is operating so far below capacity that demand could quadruple without causing constraints other than manpower, and an even greater increase in demand would be required before larger aircraft would be justified. The combination of the developing road network and a cross sound ferry will tend to depress demand for air travel, but may also allow the remainder to be channelled through fewer airstrips

Efficiency and controlling operating costs are where savings will be made.

Coastal shipping and roads.

It is clear that until the road programme is more advanced there is little scope for significant savings in the coastal shipping service costs, but now that the New Haven road is planned making a cross sound ferry service a real possibility, there is an opportunity to increase capacity between East and West Falkland, taking advantage of the money invested in the road network, but without reducing the service to remote settlements. From 2004 onwards (or when the Walker Creek road is complete) there will be no requirement for the Tamar to collect wool or deliver fuel from/to any East Falkland port, although a shipping service will still be required to the remote islands in the South East.

There are essentially three possible options for the future of the coastal shipping service, which will also impact on the options for the air service. These are:

- Option 1. Maintain the existing coastal shipping service, but encourage as much heavy freight as possible to be transported by sea. This could be done by a combination of low freight charges and taxes on fuel and road use.
- Option 2. Maximise the use of the roads and replace the current service with a ferry across Falkland Sound operated by a vessel that is capable of sailing to the remote islands and the other unconnected settlements, (probably from Falkland Sound), and sailing to Punta Arenas as required.
- Option 3. Also maximise the use of the roads, but replace the current service with a ferry across Falkland Sound operated by a ro-ro vessel that is not capable of sailing to the remote islands and the other unconnected settlements, and service them with a separate vessel (MOD or Civilian) which would also sail to Punta Arenas and possibly Montevideo and South Georgia, and could service the Military sites as well.

There are obviously several sub-sets of these options, and as is demonstrated below options 2 and 3 become increasingly viable as the road programme develops.

Option 1.

The advantages of option 1 are:

- 1) there is no additional capital expenditure required,
- 2) only one civilian vessel is required, and
- 3) it is a tried and tested system.

The disadvantages are:

- 1) the system is intrinsically uneconomic as the ship spends a high proportion of her time loading and unloading and sailing long distances with a part cargo.
- 2) the current trend of an increasing subsidy requirement will probably continue even if incentives for the use of the shipping service are introduced. East Falkland has generally opted to use the roads whenever possible. This has contributed to the operating losses on the shipping service, and lower shipping rates will increase losses still further, while taxes on road use will be unpopular.
- 3) It does not provide an alternative to the air service, which may be important if its losses are to be contained, by reducing the scale of the subsidised service and increasing the charges to some users.
- 4) It does not provide an effective solution to the problem of transporting live animals to the Abattoir in terms of flexibility or animal husbandry.

Option 2.

The advantages of option 2 are:

- 1) only one vessel would be required,
- 2) the Tamar could be used in the short term (subject to the infrastructure being suitable)
- 3) this would be a highly flexible system, that could for example deliver full loads of wool to Stanley from remote islands to avoid double handling.
- 4) A short ferry crossing would allow animals to be trucked quickly to the abattoir as required.

The disadvantages are:

- 1) compared to option 3, the vessel would be over specified and therefore relatively expensive to operate on the cross sound route.
- 2) the vessel may be slower docking and loading than a purpose built and smaller ro-ro.

Option 3

The advantages of option 3 are:

- 1) compared to option 2, the vessel would be relatively economical to operate on the cross sound route.
- 2) the vessel would probably be quicker docking and loading than a more general purpose ship.
- 3) there might be an opportunity to share the other tasks (remote islands and South America) with the MOD. Particularly if they could make effective use of a permanent cross sound ferry.
- 4) A short ferry crossing would allow animals to be trucked quickly to the abattoir as required

The disadvantages are:

- 1) very inflexible compare with options 1 and 2.
- 2) dependent upon a second vessel or a shared facility with MOD

It is clear that Options 2 and 3 have far fewer problems of animal welfare, quite apart from providing greater capacity to meet demand

Demand projections

The following tables and charts show the distribution of freight between the conventional shipping service or its successor and the cross sound ferry in options 2 and 3 over the next decade, and indicate the optimal timings of any changes.

The data is based on projected fuel and wool shipments at current levels, assuming that general cargo is carried on a pro-rata volumes. Demand for live animals transport will come from the cull of existing wool sheep and the production of lambs for slaughter. If the road network is used for all East Falkland traffic, there will still be increased demand for live animal transport from West Falkland and the remote islands. Allowing for natural losses the cull market in the medium term is unlikely to exceed 15% of the flock, in practice because of market and quality constraints this will be much less in early years, but could be offset by the growth in meat sheep production

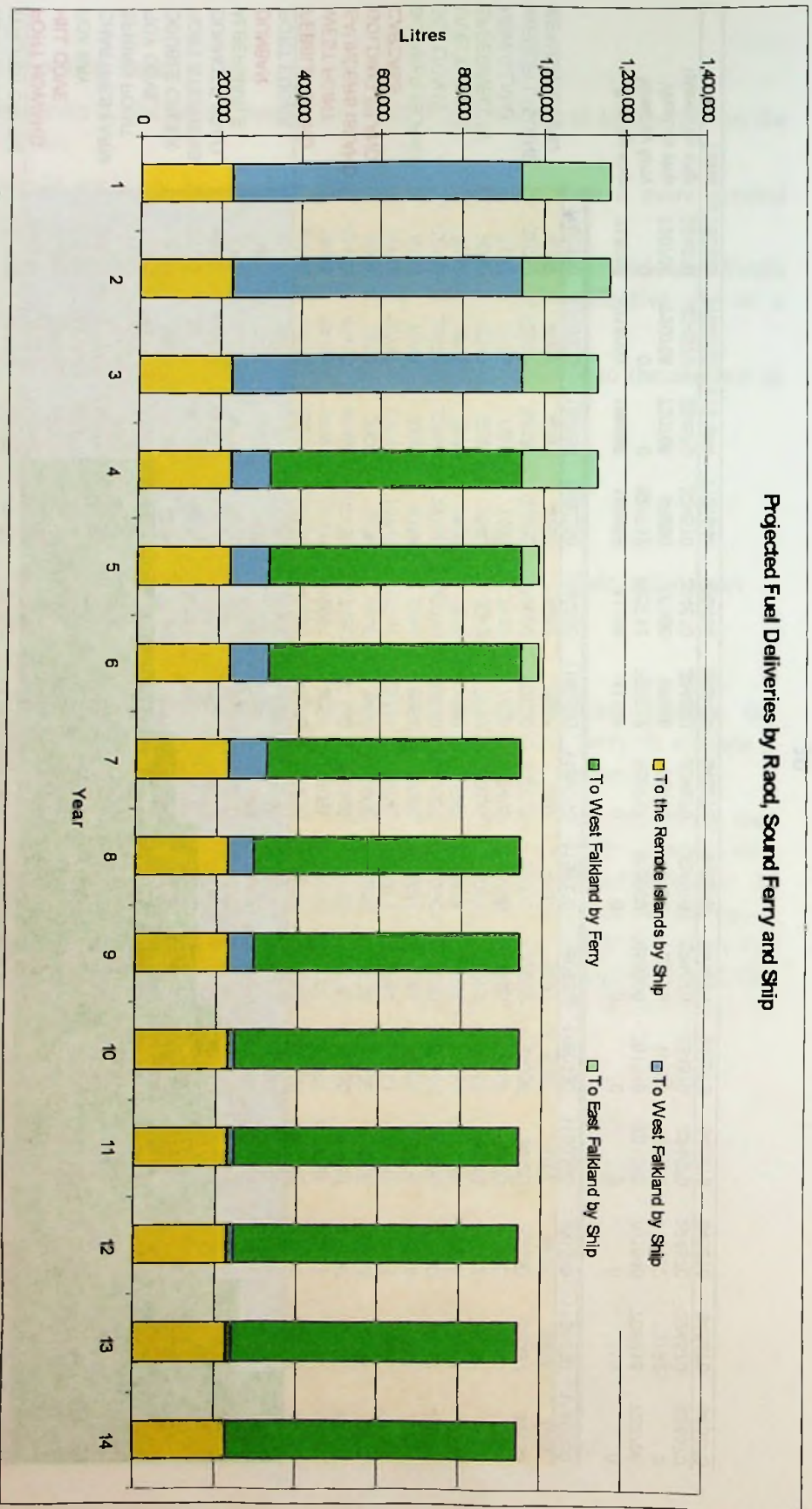
This gives a basis for estimating additional annual demand for transport of sheep.

Source	Low	Medium	High
From East Falkland by road	20,000	40,000	60,000
From West Falkland 75% by cross sound ferry from 2001/02	14,000	28,000	42,000
From remote islands by coastal shipping partly to New Haven	3,000	6,000	9,000

Fuel deliveries - ferry options

	00	01	02	03	04	05	06	07	08	09	10	11	12	13
PORT SAN CARLOS	21490	21490	21490	21490	21490	21490	21490	21490	21490	21490	21490	21490	21490	21490
NALVAOIR	6896	6896	6896	6896	6896	6896	6896	6896	6896	6896	6896	6896	6896	6896
SOUTH ARM	145470	145470	145470	145470	145470	145470	145470	145470	145470	145470	145470	145470	145470	145470
WALKER CREEK	41196	41196	41196	41196	41196	41196	41196	41196	41196	41196	41196	41196	41196	41196
PORT HOWARD	136602	136602	136602	136602	136602	136602	136602	136602	136602	136602	136602	136602	136602	136602
HILL COVE	79085	79085	79085	79085	79085	79085	79085	79085	79085	79085	79085	79085	79085	79085
FOX BAY	367354	367354	367354	367354	367354	367354	367354	367354	367354	367354	367354	367354	367354	367354
CHARTRES FARM	20305	20305	20305	20305	20305	20305	20305	20305	20305	20305	20305	20305	20305	20305
SFRING POINT	7135	7135	7135	7135	7135	7135	7135	7135	7135	7135	7135	7135	7135	7135
ROY COVE	13231	13231	13231	13231	13231	13231	13231	13231	13231	13231	13231	13231	13231	13231
DOUBLE CREEK	3085	3085	3085	3085	3085	3085	3085	3085	3085	3085	3085	3085	3085	3085
PORT STEPHENS	30112	30112	30112	30112	30112	30112	30112	30112	30112	30112	30112	30112	30112	30112
DUNNOSE HEAD	44637	44637	44637	44637	44637	44637	44637	44637	44637	44637	44637	44637	44637	44637
ALBERMARLE	5370	5370	5370	5370	5370	5370	5370	5370	5370	5370	5370	5370	5370	5370
DUNBAR	7401	7401	7401	7401	7401	7401	7401	7401	7401	7401	7401	7401	7401	7401
PORT EDGAR	6391	6391	6391	6391	6391	6391	6391	6391	6391	6391	6391	6391	6391	6391
PEBBLE ISLAND	48296	48296	48296	48296	48296	48296	48296	48296	48296	48296	48296	48296	48296	48296
WEST POINT	19091	19091	19091	19091	19091	19091	19091	19091	19091	19091	19091	19091	19091	19091
SAUNDERS ISLAND	47430	47430	47430	47430	47430	47430	47430	47430	47430	47430	47430	47430	47430	47430
GOLDING ISLAND	2906	2906	2906	2906	2906	2906	2906	2906	2906	2906	2906	2906	2906	2906
CARCASS	19741	19741	19741	19741	19741	19741	19741	19741	19741	19741	19741	19741	19741	19741
BLEAKER ISLAND	8384	8384	8384	8384	8384	8384	8384	8384	8384	8384	8384	8384	8384	8384
SEA LION IS	22330	22330	22330	22330	22330	22330	22330	22330	22330	22330	22330	22330	22330	22330
LIVELY ISLAND	3538	3538	3538	3538	3538	3538	3538	3538	3538	3538	3538	3538	3538	3538
SPEEDWELL IS	9042	9042	9042	9042	9042	9042	9042	9042	9042	9042	9042	9042	9042	9042
NEW ISLAND	7495	7495	7495	7495	7495	7495	7495	7495	7495	7495	7495	7495	7495	7495
WEDDELL ISLAND	32030	32030	32030	32030	32030	32030	32030	32030	32030	32030	32030	32030	32030	32030
BEAVER ISLAND	4287	4287	4287	4287	4287	4287	4287	4287	4287	4287	4287	4287	4287	4287
Total	1160330	1160330	1160330	1160330	1160330	1160330	1160330	1160330	1160330	1160330	1160330	1160330	1160330	1160330
East by ship	215052	215052	186666	186666	41196	41196	0	0	0	0	0	0	0	0
West by ferry	0	0	0	623712	623712	626797	656908	656909	701546	701546	701546	701546	706916	720708
West by ship	720708	720708	720708	96996	96996	93911	63799	63799	19162	19162	19162	19162	13792	0
Islands by ship	224570	224570	224570	224570	224570	224570	224570	224570	224570	224570	224570	224570	224570	224570

Projected Fuel Deliveries by Raod, Sound Ferry and Ship

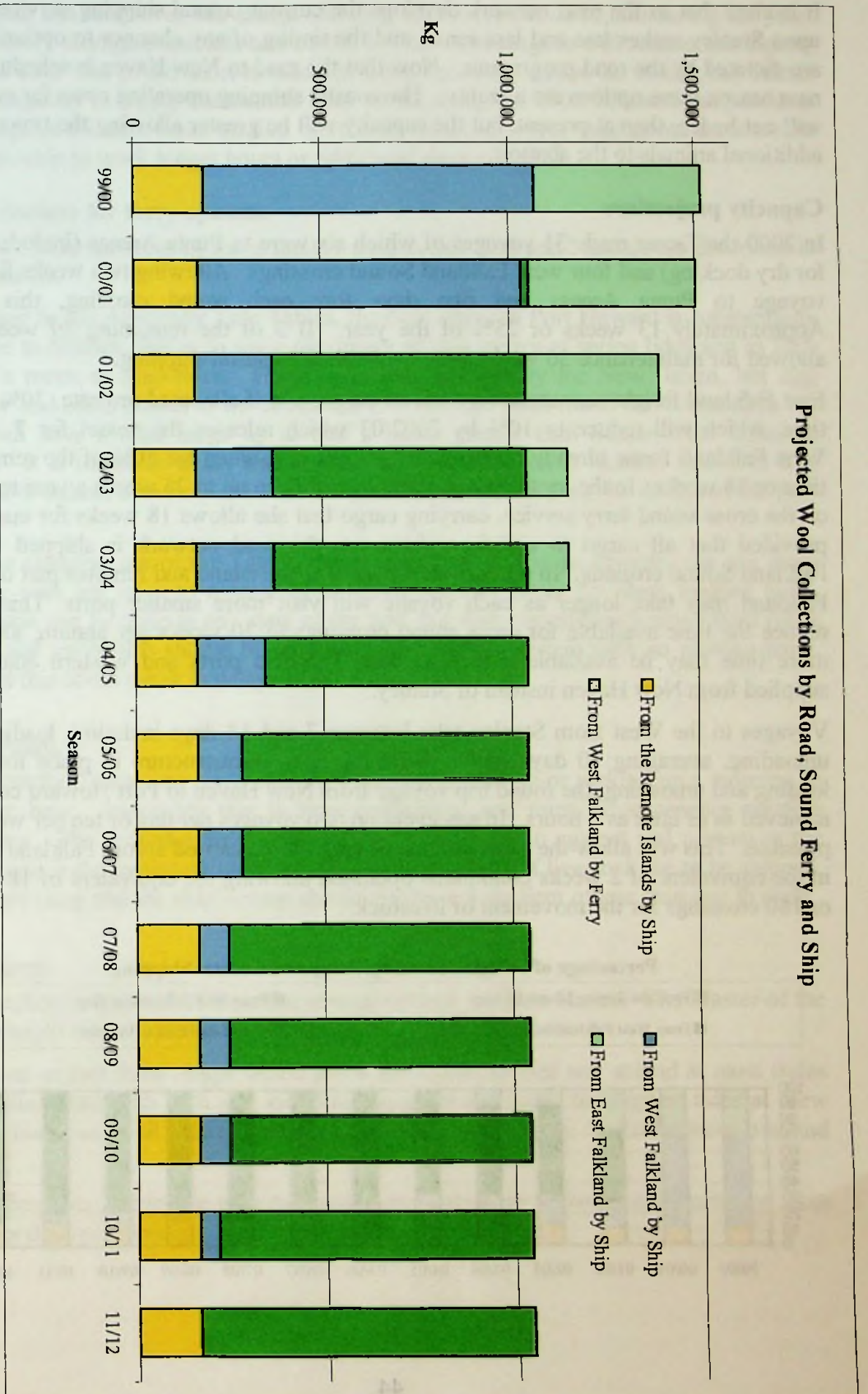


Wool collections - ferry options	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
FARM NAME	Port	Salvador	PSC/Stanley	North Arm	Walker Creek	Sheffield/PH	Chartres	Chartres	Chartres	Chartres	Chartres	Chartres	Chartres
GIBRALTAR STATION	57,436	33,917	247,358	110,590	19,497	62,102	832	20,337	18,010	35,527	17,231	22,669	21,812
SMYLLIES	33,917	247,358	110,590	19,497	62,102	832	20,337	18,010	35,527	17,231	22,669	21,812	20,306
NORTH ARM	247,358	110,590	19,497	62,102	832	20,337	18,010	35,527	17,231	22,669	21,812	20,306	36,585
WALKER CREEK	110,590	19,497	62,102	832	20,337	18,010	35,527	17,231	22,669	21,812	20,306	36,585	35,748
SHEFFIELD	19,497	62,102	832	20,337	18,010	35,527	17,231	22,669	21,812	20,306	36,585	35,748	14,364
CHARTRES	62,102	832	20,337	18,010	35,527	17,231	22,669	21,812	20,306	36,585	35,748	14,364	21,118
LITTLE CHARTRES	832	20,337	18,010	35,527	17,231	22,669	21,812	20,306	36,585	35,748	14,364	21,118	15,162
SADDLE	20,337	18,010	35,527	17,231	22,669	21,812	20,306	36,585	35,748	14,364	21,118	15,162	17,702
TEAL RIVER	18,010	35,527	17,231	22,669	21,812	20,306	36,585	35,748	14,364	21,118	15,162	17,702	16,337
COAST RIDGE	35,527	17,231	22,669	21,812	20,306	36,585	35,748	14,364	21,118	15,162	17,702	16,337	18,677
EAST BAY	17,231	22,669	21,812	20,306	36,585	35,748	14,364	21,118	15,162	17,702	16,337	18,677	11,696
LAKE SULLIVAN	22,669	21,812	20,306	36,585	35,748	14,364	21,118	15,162	17,702	16,337	18,677	11,696	17,128
LAKELANDS	21,812	20,306	36,585	35,748	14,364	21,118	15,162	17,702	16,337	18,677	11,696	17,128	15,976
LEICESTER FALLS	20,306	36,585	35,748	14,364	21,118	15,162	17,702	16,337	18,677	11,696	17,128	15,976	15,687
PHILOMEL	36,585	35,748	14,364	21,118	15,162	17,702	16,337	18,677	11,696	17,128	15,976	15,687	142,550
RINCON RIDGE	35,748	14,364	21,118	15,162	17,702	16,337	18,677	11,696	17,128	15,976	15,687	142,550	12,363
BOUNDARY	14,364	21,118	15,162	17,702	16,337	18,677	11,696	17,128	15,976	15,687	142,550	12,363	7,383
MAIN POINT	21,118	15,162	17,702	16,337	18,677	11,696	17,128	15,976	15,687	142,550	12,363	7,383	16,639
MOSSVALE	15,162	17,702	16,337	18,677	11,696	17,128	15,976	15,687	142,550	12,363	7,383	16,639	21,892
SHALLOW BAY	17,702	16,337	18,677	11,696	17,128	15,976	15,687	142,550	12,363	7,383	16,639	21,892	26,840
THE PEAKS	16,337	18,677	11,696	17,128	15,976	15,687	142,550	12,363	7,383	16,639	21,892	26,840	42,883
WEST LAGOONS	18,677	11,696	17,128	15,976	15,687	142,550	12,363	7,383	16,639	21,892	26,840	42,883	18,613
WESTLEY	11,696	17,128	15,976	15,687	142,550	12,363	7,383	16,639	21,892	26,840	42,883	18,613	15,200
BOLD COVE	17,128	15,976	15,687	142,550	12,363	7,383	16,639	21,892	26,840	42,883	18,613	15,200	8,777
HARPS	15,976	15,687	142,550	12,363	7,383	16,639	21,892	26,840	42,883	18,613	15,200	8,777	15,118
MANYSBRANCH	15,687	142,550	12,363	7,383	16,639	21,892	26,840	42,883	18,613	15,200	8,777	15,118	15,118
PORT HOWARD	142,550	12,363	7,383	16,639	21,892	26,840	42,883	18,613	15,200	8,777	15,118	15,118	15,118
CROOKED INLET	12,363	7,383	16,639	21,892	26,840	42,883	18,613	15,200	8,777	15,118	15,118	15,118	15,118
PICKTHORNE	7,383	16,639	21,892	26,840	42,883	18,613	15,200	8,777	15,118	15,118	15,118	15,118	15,118
PORT NORTH	16,639	21,892	26,840	42,883	18,613	15,200	8,777	15,118	15,118	15,118	15,118	15,118	15,118
SPRING POINT	21,892	26,840	42,883	18,613	15,200	8,777	15,118	15,118	15,118	15,118	15,118	15,118	15,118
STONEY RIDGE	26,840	42,883	18,613	15,200	8,777	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118
PORT STEPHENS	42,883	18,613	15,200	8,777	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118
SOUTH HARBOUR	18,613	15,200	8,777	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118
DUNNOSE HEAD	15,200	8,777	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118
NARROWS	8,777	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118
SHALLOW HARBOUR	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118	15,118

ALBEMARLE STATION	Albemarle	28,591	28,591	28,591	28,591	28,591	28,591	28,591	28,591	28,591	28,591	28,591	28,591	28,591	28,591	28,591	28,591	28,591	28,591	28,591	
DUNBAR	Dunbar	10,043	10,043	10,043	10,043	10,043	10,043	10,043	10,043	10,043	10,043	10,043	10,043	10,043	10,043	10,043	10,043	10,043	10,043	10,043	10,043
HOPE HARBOUR	Dunbar	14,057	14,057	14,057	14,057	14,057	14,057	14,057	14,057	14,057	14,057	14,057	14,057	14,057	14,057	14,057	14,057	14,057	14,057	14,057	14,057
PORT EDGAR	Port Edgar	25,371	25,371	25,371	25,371	25,371	25,371	25,371	25,371	25,371	25,371	25,371	25,371	25,371	25,371	25,371	25,371	25,371	25,371	25,371	25,371
BEAVER ISLAND	Beaver Is	8,753	8,753	8,753	8,753	8,753	8,753	8,753	8,753	8,753	8,753	8,753	8,753	8,753	8,753	8,753	8,753	8,753	8,753	8,753	8,753
BLEAKER ISLAND	Bleaker Is	3,646	3,646	3,646	3,646	3,646	3,646	3,646	3,646	3,646	3,646	3,646	3,646	3,646	3,646	3,646	3,646	3,646	3,646	3,646	3,646
CARCASS ISLAND	Carcass Is	5,157	5,157	5,157	5,157	5,157	5,157	5,157	5,157	5,157	5,157	5,157	5,157	5,157	5,157	5,157	5,157	5,157	5,157	5,157	5,157
GEORGE / BAREN	George/Barren	5,790	5,790	5,790	5,790	5,790	5,790	5,790	5,790	5,790	5,790	5,790	5,790	5,790	5,790	5,790	5,790	5,790	5,790	5,790	5,790
GOLDING ISLAND	Golding Is	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239
GREAT ISLAND GROUP	Gt. Is group	9,781	9,781	9,781	9,781	9,781	9,781	9,781	9,781	9,781	9,781	9,781	9,781	9,781	9,781	9,781	9,781	9,781	9,781	9,781	9,781
LIVELY ISLAND	Lively Is	21,526	21,526	21,526	21,526	21,526	21,526	21,526	21,526	21,526	21,526	21,526	21,526	21,526	21,526	21,526	21,526	21,526	21,526	21,526	21,526
PEBBLE ISLAND	Pebble Is	35,493	35,493	35,493	35,493	35,493	35,493	35,493	35,493	35,493	35,493	35,493	35,493	35,493	35,493	35,493	35,493	35,493	35,493	35,493	35,493
SAUNDERS ISLAND	Saunders Is	35,571	35,571	35,571	35,571	35,571	35,571	35,571	35,571	35,571	35,571	35,571	35,571	35,571	35,571	35,571	35,571	35,571	35,571	35,571	35,571
SEDGE ISLAND	Sedge Is	362	362	362	362	362	362	362	362	362	362	362	362	362	362	362	362	362	362	362	362
SPEEDWELL ISLAND	Speedwell Is	22,700	22,700	22,700	22,700	22,700	22,700	22,700	22,700	22,700	22,700	22,700	22,700	22,700	22,700	22,700	22,700	22,700	22,700	22,700	22,700
WEDDELL ISLAND	Weddell Is	25,242	10,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WEST POINT	West Point Is	6,181	6,181	6,181	6,181	6,181	6,181	6,181	6,181	6,181	6,181	6,181	6,181	6,181	6,181	6,181	6,181	6,181	6,181	6,181	6,181
NEW ISLAND NORTH *	New Is	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Total wool collection by sea	1,517,565	1,502,323	1,400,970	1,153,612	1,153,612	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022
From East Falkland by Ship	449,301	449,301	357,948	110,590	110,590	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
From West Falkland by Ferry	0	19,497	675,330	675,330	675,330	702,170	763,666	763,666	802,761	802,761	802,761	802,761	802,761	802,761	802,761	802,761	802,761	802,761	802,761	802,761
From West Falkland by Ship	880,823	861,326	205,493	205,493	205,493	178,653	117,157	117,157	78,062	78,062	78,062	78,062	78,062	78,062	78,062	78,062	78,062	78,062	78,062	78,062
From the Remote Islands by Ship	187,441	172,199	162,199	162,199	162,199	162,199	162,199	162,199	162,199	162,199	162,199	162,199	162,199	162,199	162,199	162,199	162,199	162,199	162,199	162,199
Total projected wool collection by sea	1,517,565	1,502,323	1,400,970	1,153,612	1,153,612	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022	1,043,022

Projected Wool Collections by Road, Sound Ferry and Ship



It is clear that as the road network develops the current coastal shipping service based upon Stanley makes less and less sense, and the timing of any changes to option 2 or 3 are dictated by the road programme. Now that the road to New Haven is scheduled for next season these options are a reality. The coastal shipping operating costs for option 2 will not be less than at present, but the capacity will be greater allowing the transport of additional animals to the abattoir.

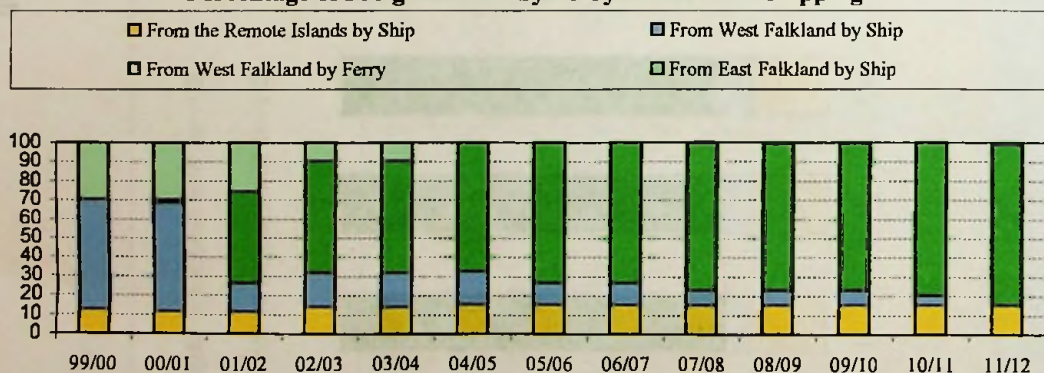
Capacity projections

In 2000 the Tamar made 31 voyages of which six were to Punta Arenas (including one for dry docking) and four were Falkland Sound crossings. Allowing two weeks for each voyage to Punta Arenas and two days for each sound crossing, this takes approximately 13 weeks or 25% of the year. If 3 of the remaining 39 weeks are allowed for maintenance 36 weeks were available for coastal shipping.

East Falkland freight accounted for 30% of cargo, and if allocated pro rata, 30% of the time, which will reduce to 10% by 2002/03 which releases the vessel for 7 weeks. West Falkland farms already on the road network accounted for 50% of the remaining time or 18 weeks. In theory therefore, the ship will have up to 25 weeks a year to spend on the cross sound ferry service, carrying cargo that she allows 18 weeks for currently, provided that all cargo to and from farms on the road network is shipped by the Falkland Sound crossing. In practice the voyages to the island and remote part of West Falkland may take longer as each voyage will visit more smaller ports. This could reduce the time available for cross sound crossings to 20 weeks per annum, although more time may be available if remote West Falkland ports and western island are supplied from New Haven instead of Stanley.

Voyages to the West from Stanley take between 7 and 14 days including loading and unloading, averaging 10 days each. With the right infrastructure in place for rapid loading and unloading, the round trip voyage from New Haven to Port Howard could be achieved in as little as 4 hours. In any event up to two voyages per day or ten per week are possible. This will allow the same volume of cargo to be carried across Falkland Sound in the equivalent of 2 weeks continuous operation allowing the equivalent of 18 weeks or 180 crossings for the movement of livestock.

Percentage of Freight Moved by Ferry and Coastal Shipping



The Tamar can carry over 400 sheep, allowing the movement of 72,000 during the year. Undoubtedly timing constraints and conflicts with wool cargoes will reduce this figure, but it is clear that in the short to medium term, operating across the sound, the Tamar has the capacity to supply the abattoir with all the sheep the West Falkland can produce. These figures are also based on five 8-10 hour days per week. Additional crew would allow the ship to work longer hours or additional days per week.

Infrastructure for ferry options.

Details of different types of shore facility used in Scotland and Norway are described in Appendix III.

According to the Admiralty Tide Tables, the tidal range in Port Howard is substantially the same as Stanley, that is to say a maximum of two metres at spring tides and as little as half a metre at neap tides. There is no data specifically for New Haven, but *Egg Harbour* and *Swan Island* to the south and *Brenton Loch* and *North West Islands* to the North, all have a tidal range up to half a metre greater than Stanley (i.e. 2.5m) in springs. It is therefore likely that the range in New Haven is similar. However it is essential to collect data from the New Haven site before finalising the design of the jetty facility.

To make effective use of the Tamar, there needs to be a system whereby she can moor securely with her stern to a ramp onto which she can lower her stern loading ramp. Ideally this can be done at any state of the tide, but with the relatively small tidal range in Falkland sound this should be possible with a simple system with no moving parts. At worst this could result in delays at extremes of tide.

Port Howard

At present the Tamar can come stern to a jetty by anchoring or picking up a mooring to hold her bow. Inevitably this is time consuming and must be somewhat weather dependent. The provision of at least a pile or piles to lean against and a ramp at the right height is the minimum requirement if large numbers of livestock are to be shipped. The shore ramp and the ship's ramp should not have a gradient of less than one in eight.

New Haven

The sketches in Appendix III outline several options for New Haven. The Master of the vessel should be involved in the design, positioning and layout.

Using one or two fixed ramps would allow the Tamar to load and unload at most states of the tide. Although high and low tide can be at any time, the *highest* tides at New Haven always occur at between seven and nine o'clock and the *lowest* between one and three.

If the tides does restrict the time of loading and unloading it would seldom be on more than four days per month.

Recommendations

Roads and Shipping

The following timetable for change, based upon only minor alterations to the road programme, is recommended.

1. The Tamar operates as normal during 2001 and until New Haven is usable, whereupon a gradual change of sailing schedule is introduced. Calls to West Falkland ports on the road network will be reduced, ferry services across Falkland Sound will be increased, but the calls to remote Islands and unconnected West Falkland ports will remain the same, subject to demand.

East Falkland Farms should not be offered the option of sea freight after 2004 (or when Walker Creek is linked to the road network) by which time all settlements will have the road option.

2. It should be planned to replace the Tamar in 2004/5 with a vessel for either option 2 or 3 depending on the result of cost analysis and negotiations with the MOD. An option 2 vessel does not rule out moving to option 3 at a later date, but may impact of the design of piers at New Haven and Port Howard. The vessel will be based in Falkland Sound, and whichever ship services the West remote ports and islands will also sail from New Haven. The option will remain open to supply the South East islands direct from Stanley or Mare Harbour.
3. The new vessel should be expected to operate on the same basis until 2007/08 by which time more, but not all West Falkland ports will be on the road network, and fewer voyages to remote settlements will be required.
4. As the road work on the East is completed, additional funds should be allocated to the West Falkland to speed up the programme. Additional road maintenance funds will also need to be allocated.

The air service

The economics of the air service are complex and many businesses depend upon it for their survival. No doubt the best value report will throw more light on the options.

Nevertheless it is clear that increasing the average load factors from the current 2-3 paying passengers per sector could increase profitability. Now that the road system is so advanced, and with the possibility of frequent ferry services across Falkland Sound, changes in operating procedures could achieve this. A lower level of service may still be acceptable. At present there is no incentive for passengers to select flights and routes that could lower costs for FIGAS. Such incentives should be introduced. Scheduling services may not on its own achieve savings, but many people might find schedules more convenient, and moves in that direction are inevitable.

It is recommended that some or all of the following measures be introduced.

1. Flights to the road linked airstrips on West Falkland will only qualify for the duty fare to designated airstrips on a particular day. In the low season the designated airstrip may alternate between Port Howard and Fox Bay and perhaps Hill Cove. In the high season there may be more than one designated strip on each day. There will be a similar fare differential to encourage those not entitled to the duty fare to use designated airstrips.
2. Flights to remote airstrips only qualify for the duty fare if they are extensions to the flight to a designated airstrip on that day. i.e. Airstrips in the area of the Port Stephens peninsular would qualify as extensions to Fox Bay; airstrips in the Saunders, Carcass, Pebble Is. area would qualify as extensions to Port Howard. Dunnose Head and Shallow Harbour traffic should operate from whichever airstrip is designated by FIGAS and Civil Aviation, and would probably best qualify as an extension of Fox Bay flights. A similar regime could be operated in the South East Islands and Lafonia. There will be a similar fare differential to encourage those not entitled to the duty fare to use designated airstrips.
3. All flights from East Falkland to the West or South East would be prepared to call at MPA, and most flights to the West would also be prepared to call at Darwin *or* Port San Carlos as appropriate, as the detours are relatively small. However all passengers taking advantage of this service would be charged as if from Stanley as almost invariably an empty seat is kept for the passenger on that sector, and the extra landing will actually increase costs. Passengers from other East Falkland airstrips to the West would be subject to similar arrangements, except for Walker Creek and North Arm until such time as they are on the road network. There will be a similar fare differential to encourage those not entitled to the duty fare.
4. Inter island flights e.g. Pebble Is. to Port Stephens or North Arm to Port Howard would be subject to surcharge, but there could be exceptions for gangs of shearers, large pre-booked groups or Falkland Islanders with particular needs. FIGAS would reserve the right (as it does now) to route the journey through Stanley or another airstrip.
5. In the low season FIGAS at its own discretion could fly to any number of destinations on one flight if that were the most cost effective way of satisfying

demand. It could also fly on fewer days per week to concentrate traffic in those flying days.

Appendix I - Tamar capital cost

Total cost pa	£000 164.096	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		-1,410												250		
Discount rate	6%		164	164	164	164	164	164	164	164	164	164	164	164	164	164
NPV	£90.232	-1,410	164	164	164	164	164	164	164	164	164	164	164	164	414	

Total cost pa	£000 173.895	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		-1,410												250		
Discount rate	8%		174	174	174	174	174	174	174	174	174	174	174	174	174	174
NPV	-£0.001	-1,410	174	174	174	174	174	174	174	174	174	174	174	174	424	

Total cost pa	£000 208.454	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		-1,410												250		
Discount rate	10%		208	208	208	208	208	208	208	208	208	208	208	208	208	208
NPV	£90.233	-1,410	208	208	208	208	208	208	208	208	208	208	208	208	458	

Total cost pa	£000 185.869	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		-1,410												200		
Discount rate	8%		186	186	186	186	186	186	186	186	186	186	186	186	186	186
NPV	70.380	-1,410	186	186	186	186	186	186	186	186	186	186	186	186	386	

Total cost pa	£000 173.895	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		-1,410												250		
Discount rate	8%		174	174	174	174	174	174	174	174	174	174	174	174	174	174
NPV	-£0.001	-1,410	174	174	174	174	174	174	174	174	174	174	174	174	424	

Total cost pa	£000 180.599	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		-1,410												300		
Discount rate	8%		181	181	181	181	181	181	181	181	181	181	181	181	181	181
NPV	£70.376	-1,410	181	181	181	181	181	181	181	181	181	181	181	181	481	

Total cost pa	£000 160.675	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		-1,410												250		
Discount rate	8%		161	161	161	161	161	161	161	161	161	161	161	161	161	161
NPV	-£0.008	-1,410	161	161	161	161	161	161	161	161	161	161	161	161	411	

Total cost pa	£000 173.895	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		-1,410												250		
Discount rate	8%		174	174	174	174	174	174	174	174	174	174	174	174	174	174
NPV	-£0.001	-1,410	174	174	174	174	174	174	174	174	174	174	174	174	424	

Total cost pa	£000 206.287	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		-1,410												250		
Discount rate	8%		206	206	206	206	206	206	206	206	206	206	206	206	206	206
NPV	£90.235	-1,410	206	206	206	206	206	206	206	206	206	206	206	206	456	

Total cost pa	£000 187	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		-1,410												250		
Discount rate	8%		187	187	187	187	187	187	187	187	187	187	187	187	187	187
NPV	£115.279	-1,410	187	187	187	187	187	187	187	187	187	187	187	187	437	187

	£000	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total cost pa	187	-1,500												250		
Discount rate	8%		187	187	187	187	187	187	187	187	187	187	187	187	187	187
NPV	£8.525	-1,500	187	187	187	187	187	187	187	187	187	187	187	187	437	187

	£000	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total cost pa	187	-1,500												250		
Discount rate	8%		187	187	187	187	187	187	187	187	187	187	187	187	187	187
NPV	£8.525	-1,500	187	187	187	187	187	187	187	187	187	187	187	187	437	187

	£000	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total cost pa	187	-1,500												250		
Discount rate	8%		187	187	187	187	187	187	187	187	187	187	187	187	187	187
NPV	£8.525	-1,500	187	187	187	187	187	187	187	187	187	187	187	187	437	187

	£000	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total cost pa	187	-1,500												250		
Discount rate	8%		187	187	187	187	187	187	187	187	187	187	187	187	187	187
NPV	£8.525	-1,500	187	187	187	187	187	187	187	187	187	187	187	187	437	187

	£000	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total cost pa	187	-1,500												250		
Discount rate	8%		187	187	187	187	187	187	187	187	187	187	187	187	187	187
NPV	£8.525	-1,500	187	187	187	187	187	187	187	187	187	187	187	187	437	187

	£000	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total cost pa	187	-1,500												250		
Discount rate	8%		187	187	187	187	187	187	187	187	187	187	187	187	187	187
NPV	£8.525	-1,500	187	187	187	187	187	187	187	187	187	187	187	187	437	187

	£000	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total cost pa	187	-1,500												250		
Discount rate	8%		187	187	187	187	187	187	187	187	187	187	187	187	187	187
NPV	£8.525	-1,500	187	187	187	187	187	187	187	187	187	187	187	187	437	187

Appendix II - FIGAS fares

E10.50 Fixed Landing Fee
 E0.59 Variable Mileage Rate
 E42.00 Maximum Resident Fare

MILES	ALB	BVI	BKI	CCI	CHR	DWN	DGS	DBR	DWH	FNB	GDI	HLC	KPI	LYI	MPA	NWA	NVA	PBI	PGR	PHD	PSC	PST	RNC	SDR	SNC	SQI	SLI	SEG	SHB	THS	SPI	SPF	STY	WKC	WID	WPI	
Albermarle	34	30.58	45.90	44.13	30.58	43.88	58.88	38.82	27.93	24.06	45.31	37.05	44.72	54.75	56.52	38.51	35.28	48.08	17.96	40.59	51.21	18.17	34.89	69.80	48.85	41.77	41.18	46.28	28.43	27.02	24.07	71.27	48.28	24.07	41.18		
Beverly Island	60	61.83	35.25	35.87	57.70	87.14	32.82	29.20	35.29	47.08	30.48	44.13	89.50	89.81	14.63	51.21	50.03	32.33	47.87	58.88	22.88	31.74	71.88	69.80	48.85	41.77	41.18	27.84	44.13	27.02	63.07	61.93	18.17	54.75	56.88		
Blaker Island	67	63.57	40.99	30.48	37.05	53.57	48.48	37.05	44.72	48.48	37.05	48.48	48.48	21.71	25.84	89.81	44.03	40.59	39.28	34.89	52.79	48.44	78.82	69.80	48.85	41.77	59.47	48.85	29.38	45.80	39.41	18.17	54.75	56.88			
Carcass Island	37	42	63	68	30.68	50.03	52.88	18.09	28.20	37.05	39.87	28.48	23.25	82.42	89.47	32.82	50.82	32.33	40.59	39.48	44.72	40.59	21.71	67.70	44.72	22.30	62.42	18.40	20.20	48.26	31.15	71.27	95.99	54.10	14.04		
Chartres	34	43	51	34	33.51	42.38	44.72	41.18	34.10	32.82	37.84	33.48	21.71	58.88	24.07	32.82	39.41	24.88	22.30	51.21	14.18	39.38	18.84	38.82	32.82	48.85	43.54	31.74	41.77	39.46	18.84	18.84	31.21	50.03			
Darwin	60	80	22	87	39	28.64	44.72	41.18	34.10	32.82	37.84	33.48	21.71	58.88	24.07	32.82	39.41	24.88	22.30	51.21	14.18	39.38	18.84	38.82	32.82	48.85	43.54	31.74	41.77	39.46	18.84	18.84	31.21	50.03			
Douglas Station	82	80	45	72	54	28	48.85	50.03	43.31	33.51	42.85	29.23	30.56	24.07	87.79	39.41	31.74	52.38	30.56	18.35	82.42	47.08	18.81	54.16	40.59	18.17	58.52	20.59	22.88	42.38	25.84	14.04	85.98	45.80	22.30	25.84	
Dunbar	48	38	73	11	23	58	85	29.30	30.56	28.43	17.58	28.30	57.11	54.75	31.74	44.72	28.38	34.89	31.15	41.18	28.43	18.17	84.75	84.75	40.00	25.25	47.08	31.74	33.45	32.33	14.04	85.98	45.80	22.30	25.84		
Dunmore Head	29	30	61	30	13	52	87	20	20.59	31.15	21.12	28.38	52.88	51.80	28.79	38.48	34.10	23.48	28.07	47.08	41.18	28.43	18.17	84.75	40.00	25.25	47.08	31.74	33.45	32.33	14.04	85.98	45.80	22.30	25.84		
For Bay	24	42	46	45	13	40	59	34	17	28.38	38.33	28.84	32.82	44.72	44.72	37.05	35.28	18.17	27.82	37.84	28.20	26.84	50.03	39.87	30.58	18.78	50.82	22.02	32.82	40.59	33.51	52.28	39.41	42.38	31.15		
Golding Island	59	82	58	33	28	38	39	27	35	37	21.12	18.81	45.31	41.77	48.48	38.82	14.04	39.41	20.59	23.84	45.80	25.84	38.23	28.43	18.78	50.82	22.02	32.82	40.59	33.51	52.28	39.41	42.38	31.15	23.48		
Hill Cove	45	44	81	22	14	46	55	12	18	28	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	
Kepnell Island	58	57	94	25	25	48	47	20	32	38	9	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	
Lively Island	75	100	18	88	89	22	34	78	72	58	59	68	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	
Mount Pezmont	39	7	90	38	44	18	23	75	70	58	53	63	61	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	
New Island	78	89	28	83	56	18	23	75	70	58	53	63	61	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	
North Arm	42	68	19	88	35	23	48	58	44	28	48	47	53	34	38	72	52.88	50.03	35.28	47.87	58.47	28.48	31.74	72.45	87.70	38.82	82.42	38.82	28.43	47.08	28.79	84.25	89.80	20.53	28.38		
Pebble Island	64	67	58	37	31	38	36	32	40	42	8	24	18	58	51	87	50	48.08	47.87	29.28	34.10	41.77	40.00	42.85	31.74	72.45	87.70	38.82	82.42	38.82	28.43	47.08	28.79	84.25	89.80	20.53	
Port Edgar	12	37	51	51	24	49	71	41	22	13	49	36	49	68	67	42	33	54	34.10	44.72	28.30	48.54	28.20	38.28	20.53	25.25	41.18	35.28	32.33	31.74	47.87	37.05	37.05	37.05	37.05		
Port Howard	51	63	42	44	21	24	34	35	33	28	17	23	23	45	40	83	32	19	40	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	
Port San Carlos	89	82	41	58	40	20	15	52	52	46	26	41	35	37	28	83	40	24	58	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	
Port Stephens	13	21	71	51	38	89	88	44	27	30	60	44	58	85	87	27	53	68	20	56	75	54.75	38.82	24.07	19.46	34.10	44.13	42.88	44.13	40.00	43.54	37.05	37.05	37.05	37.05		
Roy Cove	41	38	88	19	15	52	82	9	19	28	28	8	21	73	70	33	55	50	31	34	40	38	52.88	38.28	18.78	51.80	24.88	18.35	32.33	31.74	47.87	47.87	47.87	47.87	47.87		
Salvador	80	104	48	80	82	32	8	74	75	47	47	83	55	23	105	55	43	78	40	48	38	71	47	25	38.51	41.18	42.85	42.85	42.85	42.85	42.85	42.85	42.85	42.85	42.85		
San Carlos	65	80	37	58	38	18	17	51	50	43	27	38	35	34	26	80	38	25	54	17	5	71	47	25	38.51	41.18	42.85	42.85	42.85	42.85	42.85	42.85	42.85	42.85	42.85	42.85	
Saunders Island	53	50	65	20	21	48	53	13	25	34	14	8	8	70	64	48	52	18	44	25	40	51	14	61	38	38.51	41.18	42.85	42.85	42.85	42.85	42.85	42.85	42.85	42.85	42.85	
Sea Lion Island	82	83	19	88	55	38	82	78	82	45	88	87	73	38	45	88	21	70	48	48	57	65	60	74	86	52	78	69.80	48.85	48.85	48.85	48.85	48.85	48.85	48.85		
Seddon	84	52	83	10	37	65	66	17	38	49	28	24	20	86	80	48	70	31	57	42	54	60	24	74	55	18	80	69.80	48.85	48.85	48.85	48.85	48.85	48.85	48.85		
Shallow Harbour	27	26	65	30	17	56	71	21	5	20	38	21	35	78	74	27	47	44	22	37	57	24	15	78	54	28	65	38	39	38.51	41.18	42.85	42.85	42.85	42.85		
Speedwell Island	28	57	32	64	31	36	80	54	37	20	51	45	54	42	52	62	14	54	21	37	58	40	18	78	53	31	80	42	6	34	38.51	41.18	42.85	42.85	42.85		
Spring Point	23	28	60	35	16	53	68	26	6	15	39	23	37	72	72	41	43	45	17	36	58	20	18	78	53	31	80	42	6	34	38.51	41.18	42.85	42.85	42.85		
Starbuck	103	123	49	103	82	44	33	96	84	83	71	85	78	31	28	125	83	88	63	63	45	112	82	28	48	84	88	88	88	88	88	88	88	88	88	88	
Walker Creek	64	87	18	77	48	11	32	68	80	48	49	56	56	13	15	90	23	49	54	34	30	74	82	35	26	88	31	76	63	37	80	40	34	38.51	41.18	42.85	
Weddell Island	23	13	75	40	32	69	88	30	20	30	54	38	50	88	88	17	57	59	26	28	72	16	29	94	68	43	71	48	16	45	17	112	78	38.51	41.18	42.85	
West Point Island	52	38	82	6	32	67	74	30	26	42	35	22	28	88	88	32	67	40	47	45	61	48	17	82	80	62	88	16	26	62	31	108	77	34	38.51	41.18	42.85

Faint, illegible text, possibly bleed-through from the reverse side of the page.



Appendix III - Bow and Stern Loading Arrangements.

Ferries in the West of Scotland and Norway use two basic types of shore facility for bow or stern loading. There are of course numerous minor variations.

Fixed ramps

The first is a wide ramp with a gradient of about 1:8. Suitable only for ships that are specially designed for this type of ramp. These ships come in several basic designs:

1. The "landing craft" type, although usually with a much deeper draft than military landing craft, rudders and propellers well aft, aft bridge and accommodation, reinforced skids under the bow, and a large bow door and ramp. Long vehicles have to back either on or off.
2. A double ended type which is similar to the landing craft in many ways but has a ramp at both ends and the steering and propulsion systems amidships. The bridge is either at one side amidships or an actual bridge over the vehicle deck. These vessels do not need to turn round as they go equally well in either direction. They are often equipped with unconventional and usually combined steering and propulsion systems which make them very manoeuvrable. Vehicles do not have to turn round or back on or off.

Both types can use the same shore ramps. In some places they literally drive up the ramp until the bow is firmly aground, drop the door, and motor ahead while unloading and loading. Care must be taken not to be stranded on a falling tide, but the design of the ship is such that this does not cause damage.

These vessels usually have open main decks and are not generally used for exposed sea passages, but some have Class IIa passenger certificates, and operate in waters similar to Falkland Sound.

In exposed places or where the tidal current is strong there is a pier or a series of piles or dolphins that the ship can lean against or moor to after driving up the ramp.

Passengers, vehicles and animals all use the ramp to embark.

3. There is a third type which come alongside the shore ramp (which therefore has to have a vertical side and be about two metres above the beach level) and lowers an angled ramp onto the shore ramp. There are many variants of this type, but none are very seaworthy and they are only used for short sheltered crossings.

Adjustable ramps

The second type of shore facility is the adjustable link span, which can in principle be used by any design of bow or stern loading ship.

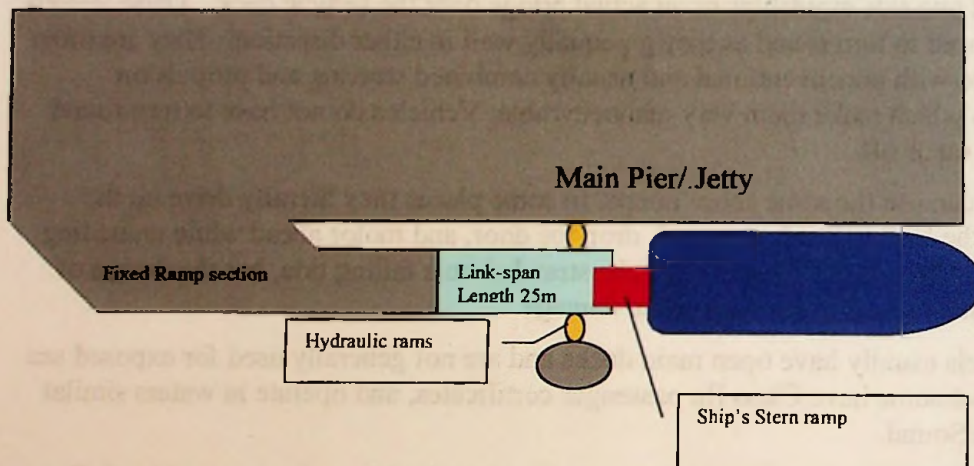
There is a fixed ramp parallel to the docking face of the jetty, descending to about one metre or less above the high water mark, and beyond that a hinged adjustable section which is raised or lowered hydraulically to suit the state of the tide and the deck height of the particular ship. The ship then lowers its bow or stern ramp onto the link-span. The ship is moored in relatively deep water and does not have to endanger its rudders or propellers by backing onto a submerged ramp. The link span can be floating at the

outer end which allows it to adjust automatically for the tide, but not for different ships. Floating link-spans are seldom used in practice.

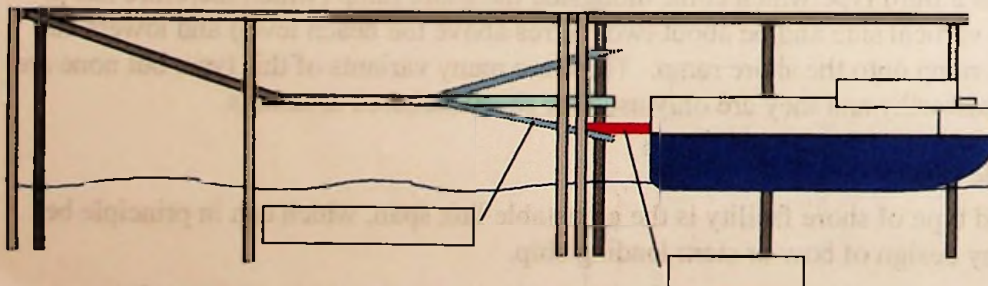
There is a variation where the same arrangement is set into the face of the pier and used with the ship's side door. This variant appears to have few advantages, but is useful for old ships that may have only side doors or the now disused side loading lift system. It takes up less quay frontage space if conventional ships are also using the jetty.

Tidal ranges in the West of Scotland are up to 5 metres in springs. This means that to keep the angles reasonable the link span has to be up to 30 metres long, but are individually designed for each location and kept as short as local conditions allow.

The diagrams below show a typical layout where the maximum tide range is about 4 metres.

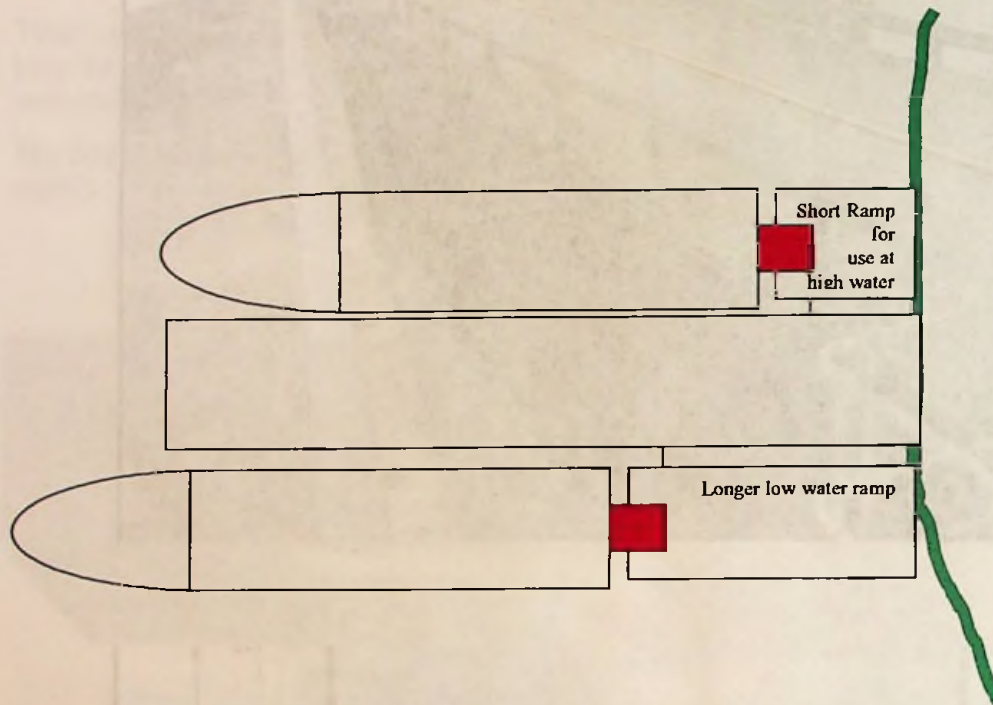


In addition to the cost of building the jetty, an adjustable link span will cost between £750,000 and £1,000,000 in the UK.

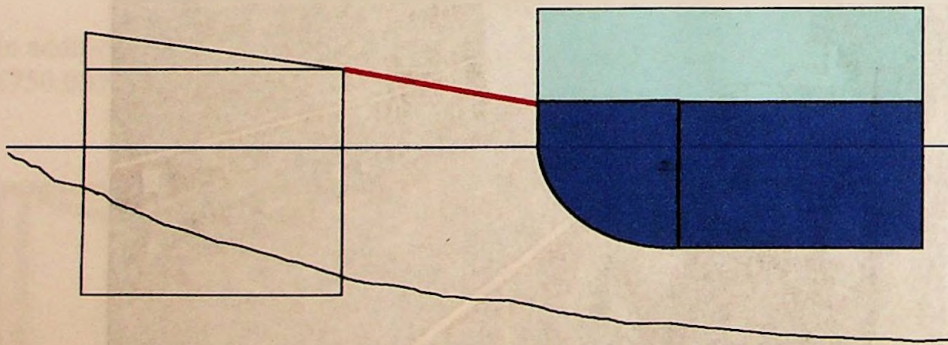




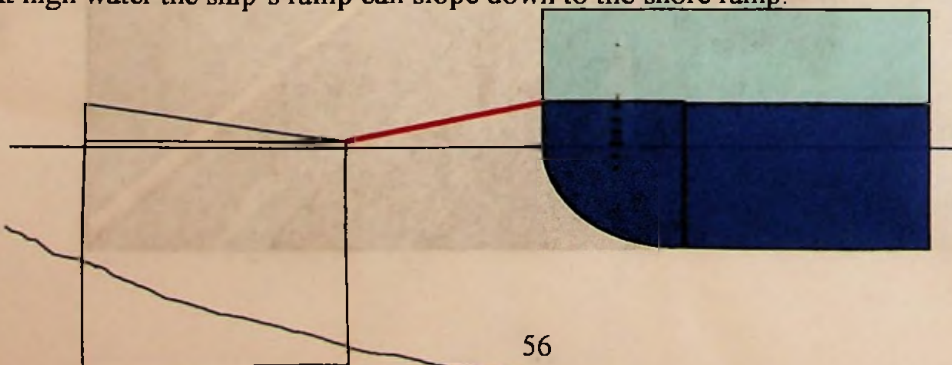
In some locations where the tide range is very small, the simpler and cheaper solution of one or two fixed ramps is used. The longer the ship's stern ramp and the smaller the tide range the more practical this becomes.



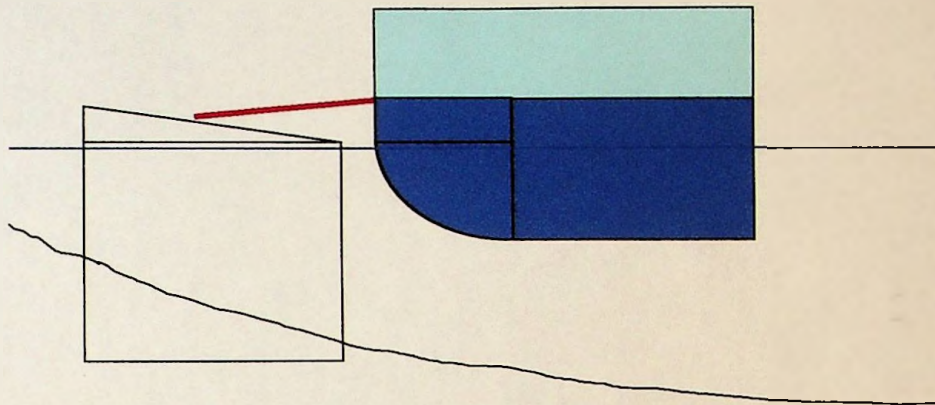
Using a single fixed ramp at low water. Assumes ramp has gradient of 1:8 and ship's stern ramp slopes up to meet it at same angle.



At high water the ship's ramp can slope down to the shore ramp.



At high water, the angles can be improved if the ship can move nearer to the shore



ramp. The length of the ship's ramp determines how much difference this can make.

